DEPARTMENT OF TRANSPORTATION

Federal Motor Carrier Safety Administration

49 CFR Parts 385, 390 and 395

[Docket No. FMCSA–2004–19608; formerly FMCSA–1997–2350]

RIN–2126–AA90

Hours of Service of Drivers

AGENCY: Federal Motor Carrier Safety Administration (FMCSA), DOT.

ACTION: Final rule.

SUMMARY: FMCSA is publishing today its final rule governing hours of service for commercial motor vehicle drivers, following its Notice of Proposed Rulemaking published January 24, 2005. The rule addresses requirements for driving, duty, and off-duty time; a recovery period, sleeper berth, and new requirements for short-haul drivers. The hours-of-service regulations published on April 28, 2003, were vacated by the U.S. Court of Appeals for the District of Columbia Circuit on July 16, 2004. Congress subsequently provided, through the Surface Transportation Extension Act of 2004, that the 2003 regulations will remain in effect until the effective date of a new final rule addressing the issues raised by the court or September 30, 2005, whichever occurs first. Today's rule meets that requirement.

DATES: This rule is effective October 1, 2005.

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Table of Abbreviations

AHAS Advocates for Highway and Auto Safety
AMI Acute Myocardial Infarction
AMSA American Moving and Storage Association
ANPRM Advance Notice of Proposed Rulemaking
APA Administrative Procedure Act
ATA American Trucking Associations
BAC Blood Alcohol Content
BLS U.S. Bureau of Labor Statistics
BMI Body Mass Index
CATF Clean Air Task Force
CDL Commercial Drivers License
CEQ Council on Environmental Quality
CFR Code of Federal Regulations
CHP California Highway Patrol
CMV Commercial Motor Vehicle
CRASH Citizens for Reliable and Safe Highways
CRMCA Colorado Ready Mixed Concrete Association
CTC Corporate Transportation Coalition
CVD Cardiovascular Disease
CVSA Commercial Vehicle Safety Alliance
dBA Decibels Adjusted
DE Diesel Exhaust
DOT Department of Transportation
EA Environmental Assessment
ECMT European Conference of Ministers of Transport
EEI Edison Electric Institute
EOBR Electronic On-Board Recorder
EPA U.S. Environmental Protection Agency
FARS Fatality Analysis Reporting System
FHWA Federal Highway Administration
FMCSA Federal Motor Carrier Safety Administration
FMCSR Federal Motor Carrier Safety Regulations
FMP Fatigue Management Program
FONSI Finding of No Significant Impact
FR Federal Register
GVWR Gross Vehicle Weight Rating
HEI Health Effects Institute
HOS Hours of Service
IBT International Brotherhood of Teamsters
ICC Interstate Commerce Commission
ICCTA ICC Termination Act of 1995
IIHS Insurance Institute for Highway Safety
IRP International Registration Plan
ISO International Standards Organization
LBP Lower Back Pain
LH Long Haul
LR Long Regional
LTL Less-Than-Truckload
MCMIS Motor Carrier Management Information System
MCSAP Motor Carrier Safety Assistance Program
MFCA Motor Freight Carriers Association
MPH Miles per Hour
MTA Minnesota Trucking Association
NACA National Armored Car Association
NAICS North American Industrial Classification System
NEPA National Environmental Policy Act
NHTSA National Highway Traffic Safety Administration
NIH National Institutes of Health
NIOSH National Institute for Occupational Safety and Health
NITL National Industrial Transportation League
NPRM Notice of Proposed Rulemaking
NPTC National Private Truck Council
NRMCA National Ready Mixed Concrete Association
NSSGA National Stone, Sand, and Gravel Association
NTSB National Transportation Safety Board
OMB Office of Management and Budget
OOIDA Owner-Operator Independent Drivers Association
OOS Out-of -Service
OSHA U.S. Occupational Safety and Health Administration
OTR Over-the-Road
PATT Parents Against Tired Truckers
PM Particulate Matter
PMC PubMed Central
PRA Paperwork Reduction Act of 1995
PVT Psychomotor Vigilance Test
RIA Regulatory Impact Analysis
RMA Risk Management Association
R&T Research and Technology
RODS Records of Duty Status
SBA Small Business Administration
SH Short Haul
SR Short Regional
STAA Surface Transportation Assistance Act
TCA Truckload Carriers Association
TIFA Trucks Involved in Fatal Accidents
TL Truckload
TOT Time-on-Task
TRB Transportation Research Board
UMTRI University of Michigan Transportation Research Institute
UPS United Parcel Service
USV Utility Service Vehicle
VIUS Vehicle Inventory and Use Survey
VMT Vehicle Miles Traveled
VSL Value of a Statistical Life
VTTI Virginia Tech Transportation Institute
WBV Whole Body Vibration

A. Legal Basis for the Rulemaking

This rule is based on the authority of the Motor Carrier Act of 1935 and the Motor Carrier Safety Act of 1984.

The Motor Carrier Act of 1935 provides that ''The Secretary of Transportation may prescribe requirements for—(1) qualifications and maximum hours of service of employees of, and safety of operation and equipment of, a motor carrier; and (2) qualifications and maximum hours of service of employees of, and standards of equipment of, a motor private carrier, when needed to promote safety of operation'' [49 U.S.C. 31502(b)].

The hours-of-service regulations adopted today deal directly with the ''maximum hours of service of employees of * * * a motor carrier [49 U.S.C. 31502(b)(1)] and the ''maximum hours of service of employees of * * * a motor private carrier'' [49 U.S.C. 31502(b)(2)]. The adoption and enforcement of such rules was specifically authorized by the Motor Carrier Act of 1935. This rule rests squarely on that authority.

The Motor Carrier Safety Act of 1984 provides concurrent authority to regulate drivers, motor carriers, and vehicle equipment. It requires the Secretary of Transportation to ''prescribe regulations on commercial motor vehicle safety. The regulations shall prescribe minimum safety standards for commercial motor vehicles.'' Although this authority is very broad, the Act also includes specific requirements: ''At a minimum, the regulations shall ensure that—(1) Commercial motor vehicles are maintained, equipped, loaded, and operated safely; (2) the responsibilities imposed on operators of commercial motor vehicles do not impair their ability to operate the vehicles safely; (3) the physical condition of operators of commercial motor vehicles is adequate to enable them to operate the vehicles safely; and (4) the operation of commercial motor vehicles does not have a deleterious effect on the physical condition of the operators'' [49 U.S.C. 31136(a)].

This rule is based on the authority of the 1984 Act and addresses the specific mandates of 49 U.S.C. 31136(a)(2), (3), and (4). Section 31136(a)(1) of 49 U.S.C. deals almost entirely with the mechanical condition of commercial motor vehicles (CMVs), a subject not included in this rulemaking. The phrase ''operated safely'' in paragraph (a)(1) refers primarily to the safe operation of the vehicle's equipment, but to the extent it encompasses safe driving, this rule also addresses that mandate.

Before prescribing any regulations, FMCSA must also consider their ''costs and benefits'' [49 U.S.C. 31136(c)(2)(A) and 31502(d)]. Those factors are also discussed later.

B. Background Information

B.1. History of the Hours-of-Service Rule

The Interstate Commerce Commission (ICC) promulgated the first Federal hours-of-service regulations (HOS) in the late 1930s. The rules were based on the Motor Carrier Act of 1935. The regulations remained largely unchanged from 1940 until 2003, except for an important amendment in 1962. Prior to 1962, driver hours-of-service regulations were based on a 24-hour period from noon to noon or midnight to midnight. A driver could be on duty no more than 15 hours in a 24-consecutive-hour period. In 1962, among other rule changes, the 24-hour cycle was removed and replaced by minimum off-duty periods. A driver could ''restart'' the calculation of his or her driving and on-duty limitations after any period of 8 or more hours off duty.

Section 408 of the ICC Termination Act of 1995 (ICCTA) (Pub. L. 104–88, 109 Stat. 803, at 958) required the Federal Highway Administration (FHWA) to conduct rulemaking ''dealing with a variety of fatigue-related issues pertaining to commercial motor vehicle safety.'' In response, FHWA published an advance notice of proposed rulemaking (ANPRM) on November 5, 1996 (61 FR 57252). FMCSA was established as a separate Agency on January 1, 2000. At that time, responsibility to promulgate CMV regulations was transferred from FHWA to FMCSA, which published an hours-of-service Notice of Proposed Rulemaking (NPRM) on May 2, 2000 (65 FR 25540) and a final rule on April 28, 2003 (68 FR 22456). Technical amendments to the final rule were published on September 30, 2003 (68 FR 56208). Motor carriers and drivers were required to comply with the final rule on January 4, 2004.

FMCSA's 2003 rule did not change any hours-of-service requirements for motor carriers and drivers operating passenger-carrying vehicles. They were required to continue complying with the hours-of-service rules existing before the 2003 rule (see 68 FR 22461–22462). Changes in hours-of-service provisions in the new rule applied only to motor carriers and drivers operating property-carrying vehicles. Compared to the previous regulations, the 2003 rule: (1) Required drivers to take 10, instead of 8, consecutive hours off-duty (except when using sleeper berths); (2) retained the prior prohibition on driving after 60 hours on duty in 7 days or 70 hours in 8 days; (3) increased allowable driving time from 10 to 11 hours in any one duty period; and (4) replaced the so-called 15-hour rule (which prohibited drivers from driving after being on duty more than 15 hours, not including intervening off-duty time) with a 14-hour rule (which prohibited driving after the 14th hour after the driver came on duty, with no extensions for off-duty time). Note that the 15-hour limit had been cumulative—so it could be interspersed with off-duty time—while the non-extendable 14-hour limit was consecutive. Additionally, FMCSA allowed drivers to ''restart'' the calculations for the 60- and 70-hour limits by taking 34 consecutive hours off duty. Based on the data and research available at the time, FMCSA was convinced that these new rules constituted a significant improvement in the hours-of-service regulations, compared to the rules they replaced, by providing drivers with better opportunities to obtain off-duty time offering daily restorative sleep, thereby reducing the incidence of crashes wholly or partially attributable to drowsiness or fatigue.

On June 12, 2003, Public Citizen, Citizens for Reliable and Safe Highways (CRASH) and Parents Against Tired Truckers (PATT) filed a petition to review the new hours-of-service rule with the United States Court of Appeals for the District of Columbia Circuit (D.C. Circuit). On July 16, 2004, the D.C. Circuit issued an opinion holding that the rule was arbitrary and capricious because the Agency failed to consider the impact of the rules on the health of drivers, as required by 49 U.S.C. 31136(a)(4). *Public Citizen et al.* v. *Federal Motor Carrier Safety Administration*, 374 F.3d 1209, at 1216. The D.C. Circuit noted, however, that neither Public Citizen nor the court was ''suggest[ing] that the statute requires the agency to protect driver health *to the exclusion* of those other factors [*i.e.*, the costs and benefits of the rule], only that the agency must consider it.'' *Id.* at 1217 (emphasis in original). Although FMCSA argued that the effect of driver health on vehicle safety had permeated the entire rulemaking process, the court said that driver health and vehicle safety were distinct factors that must be considered separately.

In *dicta* the court also stated that: (1) FMCSA's justification for increasing allowable driving time from 10 to 11 hours might be legally inadequate because the Agency failed to show how additional off-duty time compensated for more driving time, and especially

because it failed to discuss the effects of the 34-hour recovery provision; (2) splitting off-duty time in a sleeper berth into periods of less than 10 hours was probably arbitrary and capricious, because FMCSA itself asserted that drivers need 8 hours of uninterrupted sleep; (3) failing to collect and analyze data on the costs and benefits of requiring electronic on-board recording devices (EOBRs) probably violated section 408 of the ICC Termination Act, which requires FMCSA to ''deal with'' EOBRs; and (4) the Agency failed to address or justify the additional on-duty and driving hours allowed by the 34-hour recovery provision.

On September 1, 2004 (69 FR 53386), FMCSA published an ANPRM requesting information about factors the Agency should consider in developing performance specifications for EOBRs. As the Agency said in the preamble to that document, ''FMCSA is attempting to evaluate the suitability of EOBRs to demonstrate compliance with the enforcement of the hours-of-service regulations, which in turn will have major implications for the welfare of drivers and the safe operation of commercial motor vehicles.'' The ANPRM asked for comments and information, both on technical questions relating to EOBRs, and on the potential costs and benefits of such devices. The EOBR rulemaking has been and will remain separate from this hours-of-service rulemaking. (For additional discussion of EOBRs, see Section J.13.)

On September 30, 2004, the President signed the Surface Transportation Extension Act of 2004, Part V (Public Law 108–310, 118 Stat. 1144). Section 7(f) of the Act provides that ''[t]he hours-of-service regulations applicable to property-carrying commercial drivers contained in the Final Rule published on April 28, 2003 (68 FR 22456–22517), as amended on September 30, 2003 (68 FR 56208–56212), and made applicable to motor carriers and drivers on January 4, 2004, shall be in effect until the earlier of—(1) the effective date of a new final rule addressing the issues raised by the July 16, 2004, decision of the United States Court of Appeals for the District of Columbia in *Public Citizen, et al.* v. *Federal Motor Carrier Safety Administration* (No. 03–1165); or (2) September 30, 2005.'' (118 Stat. at 1154).

B.2. Notice of Proposed Rulemaking (January 24, 2005)

FMCSA published an NPRM on January 24, 2005 (70 FR 3339) to reconsider the 2003 rule and determine what changes might be necessary to correct the deficiencies identified by the court. The Agency used the 2003 rule as a proposal for the purpose of soliciting public comments, but also announced that ''[t]his rulemaking is necessary to develop hours-of-service regulations to replace those vacated by the Court'' (70 FR 3342). The NPRM asked a series of questions on driver health, sleep loss and deprivation, driving time, sleeper berths, and other subjects; the answers are discussed later. While awaiting the submission and review of docket comments, the Agency pursued a research program to identify relevant studies on the same issues; the results of that effort are also described in later sections of the preamble.

C. Executive Summary

Today's rule requires all drivers of property-carrying commercial motor vehicles (CMVs) in interstate commerce to take at least 10 consecutive hours off duty before driving, limits driving time to 11 consecutive hours within a 14-hour, non-extendable window after coming on duty, and prohibits driving after the driver has been on duty 60 hours in 7 consecutive days, or 70 hours in 8 consecutive days. Drivers may restart the 60- or 70-hour ''clock'' by taking 34 consecutive hours off duty.

These provisions are the same as those of FMCSA's 2003 final rule that was vacated by the U.S. Court of Appeals for the D.C. Circuit and then reinstated by Congress for the duration of fiscal year 2005. These limits, however, are significantly different from the pre-2003 HOS regulation, which required only 8 hours off duty before driving, allowed 10 hours of driving time, and prohibited driving after having been on duty for 15 hours (but allowed any off-duty time taken during the work shift to be excluded from the calculation of the 15-hour limit). The pre-2003 rule had no counterpart to today's 34-hour recovery provision. The recovery role was played by the 60- and 70-hour limits, the only element of the pre-2003 rule which has been adopted without change for property-carrying vehicles in today's rule.

The 14-hour driving window and the 10-hour off-duty requirement of today's rule combine to move most drivers toward a 24-hour cycle, which allows the body to operate in accord with its normal circadian rhythm and the driver to sleep on the same schedule each day. A driver may remain on duty after the 14-hour window closes or go off duty after the 11th hour of driving, in each case returning to work after 10 hours off duty on something other than a 24-hour cycle. Nonetheless, FMCSA believes that most drivers, most of the time, will go off duty at or before the end of the 14th hour, since their principal responsibility—driving—is illegal after that point. The circadian friendliness of today's rule is bolstered by the requirement for 10 consecutive hours off duty. This is enough time to enable drivers to get the 7–8 hours of sleep most people need to maintain alertness and prevent the onset of cumulative fatigue.

The original restart provisions were the 60- and 70-hour limits. Drivers could not drive after having been on duty for those periods until they had been off duty long enough to reduce their 7- or 8-day on-duty totals below the 60- or 70-hour threshold. These limits are being adopted in today's rule, but the Agency is also adding a second and more flexible recovery provision, as it did in 2003—the 34-hour restart. A 34-hour period gives a large majority of drivers the opportunity for two night sleep periods, and all drivers the opportunity for two consecutive 8-hour sleep periods separated by a full 18-hour day. Comments to the docket stated that the 34-hour restart provides far more flexibility than the 60- and 70-hour limits alone, enabling drivers to tailor their schedules to their business requirements while still spending more time at home.

Today's rule also creates a new regulatory regime for drivers of CMVs that do not require a CDL, provided they operate within a 150-mile radius of their work-reporting location. These drivers are not required to keep logbooks, though their employers must keep accurate time records, and the driver may use a 16-hour driving window twice a week. Driving time may not exceed the normal 11 hours, but the longer operational window twice a week enables short-haul carriers to meet unusual scheduling demands. Short-haul drivers rarely drive anything close to 11 hours, and available statistics show that they are greatly under-represented in fatigue-related accidents. On a per-mile basis, long-haul trucks are almost 20 times more likely to be involved in a fatigue-related crash. One study suggested that a contributing factor to this statistical imbalance is the variety of work short-haul drivers typically perform; variety seems to minimize fatigue.

The rule adopted today balances considerations of driver and public safety, driver health, and costs and benefits to the motor carrier industry—all factors the Agency is required to take into account. The provisions are described separately in the preamble, but they constitute an interconnected whole and cannot be adequately understood in isolation.

The rule addresses driver health issues in detail, and provides a lengthy explanation and justification for the requirements adopted today. FMCSA has examined a wide range of scientific evidence, independently collected, summarized, and reviewed by a health panel created at the Agency's request by the Transportation Research Board of the National Academies of Science. FMCSA has concluded that the operation of CMVs under this rule does not have a deleterious effect on the physical condition of drivers. Because relatively little of the available evidence was derived from motor carrier operations, the Agency had to evaluate and weigh information from different fields and adapt it to a trucking environment. We believe our conclusions accurately reflect a preponderance of the scientific data. The additional off-duty time provided by the rule, along with the 14-hour driving window, should have a particularly beneficial effect on drivers' sleep opportunities, and indirectly on their health as well. In an indication of the fatigue-reducing benefits of the 2003 rule, preliminary information on sleep habits under that rule shows drivers are getting, on average, at least an additional hour of sleep compared to the pre-2003 rule. There is no indication that drivers are averaging more hours of work, as opponents of the 2003 rule had feared.

The Agency has examined all of the data on crash risk. Virtually every study has weaknesses or limitations. The largest database on fatal truck crashes (Trucks Involved in Fatal Crashes, or TIFA) records accidents that occurred entirely under the pre-2003 HOS rule, when off-duty time could have been as short as 8 hours. Furthermore, while the crash risk reflected in TIFA data rises with the number of hours driven before the crash, the risk in the 11th hour generally reflects illegal driving, since the normal limit at the time was 10 hours. Also, despite being the largest database available, the data contain relatively few fatigue-related crashes after long hours of driving. All in all, we thus must be careful in applying this data to the 2003 rule or today's rule, where the minimum off-duty time is 25 percent greater.

On the other hand, we also examined recent data collected while the 2003 rule was in effect. Although this data suggests that fatigue-related crashes have fallen since the 2003 rule became effective, this newer data is mostly preliminary, self-reported without statistical controls, and also reflects small sample sizes, all of which—once again—sometimes leads to inconsistent findings.

The rule and the Regulatory Impact Analysis discuss the strengths and weaknesses of each data source and balance the shortcomings of one against the advantages of another. The TIFA data from 1991 to 2002 are very comprehensive. In order to ensure that its safety analysis erred on the side of caution, the Agency used TIFA data to estimate the risk of additional driving hours, knowing that the risk is probably over-stated given the better opportunities for restorative sleep available under the 2003 rule and today's final rule. It is also clear that newer CMVs, with their quieter and more comfortable cabs, are less fatiguing to drive. That change may also affect the usefulness of the TIFA data, though this factor is impossible to quantify.

Using the most conservative estimates of crash risk for a given amount of driving time, FMCSA's analysis shows that the safety differential between a 10-hour and an 11-hour driving limit is very small while the economic cost differential is very large. The operational and scheduling flexibility of an 11-hour limit, even when it is not utilized fully, is both economically and socially valuable. According to the drivers who commented to the docket, the 11-hour limit in the 2003 rule enables them to get home more often, when the 10-hour limit would leave them stranded at roadside, out of hours. It also allows them to get home without pushing quite as hard as they might be tempted to do under a 10-hour limit.

FMCSA examined a range of options and found that today's rule is the only one that is cost-beneficial, with a net annual benefit estimated at $270 million. Reducing driving time from 11 to 10 hours, while leaving the rest of today's rule intact, would increase net costs by $526 million per year. To confirm our findings, we conducted a sensitivity analysis of the data and assumptions used. We changed these parameters in a way that was unfavorable to today's rule in general and to allowing 11 hours of driving in particular. No parameters tested, either singly or in combination, produced a basis for either replacing the 11-hour driving limit with a 10-hour limit, or suggested that another option could be more cost-beneficial.

D. Research Review Process

In preparing this final rule, FMCSA thoroughly, systematically, and extensively researched both U.S. and international health and fatigue studies and consulted with Federal safety and health experts. In addition, FMCSA asked the Transportation Research Board (TRB) of the National Academies to contract with a research team of experts in the field of health and fatigue to prepare a summary of relevant literature through the TRB Commercial Truck and Bus Safety Synthesis Program. The literature review was conducted using two teams of health and transportation experts to identify and summarize the available research literature relevant to this HOS rulemaking. This review included research findings that discussed in a scientific, experimental, qualitative, and quantitative way the relationship between the hours a commercial motor vehicle driver works, drives, and the structure of the work schedule (on-duty/off-duty cycles, time-on-task, especially time in continuous driving, sleep time, etc.), and the impact on his/her health.

Dr. Peter Orris, M.D., Professor of Occupational Health at the University of Illinois, led a team of six prominent medical doctors, epidemiologists, and an ergonomist to identify relevant research on CMV driver health. Dr. Alison Smiley, President of Human Factors North Inc., Professor in the Department of Mechanical and Industrial Engineering, University of Toronto, and the Department of Civil Engineering, Ryerson University, led a team of three leading transportation and fatigue experts to review relevant fatigue studies. Each team conducted two literature reviews, a review of the literature at the beginning of the project and a review of the literature that was submitted by commenters to the 2005 NPRM. It was through this rigorous process that FMCSA ensured that not only the latest research, but the best available science was used to support this rulemaking. The final reports are located in the docket and are entitled ''Literature Review on Health and Fatigue Issues Associated with Commercial Motor Vehicle Driver Hours of Work,'' Part I and Part II.

The driver health team used PubMed Central (PMC), which is the U.S. National Institutes of Health (NIH) digital archive of biomedical and life sciences journal literature. PMC includes MEDLINE, which is the premier bibliographic database covering the fields of medicine, nursing, dentistry, veterinary medicine, the health care system, and the preclinical sciences. MEDLINE contains over 12 million bibliographic citations dating back to the mid-1960s and author abstracts from more than 4,800 biomedical journals published in the United States and 70 other countries.

The initial driver health literature search from 1975 to present resulted in

over a thousand research articles. The driver health team screened these studies based on relevance to the topics of commercial vehicle operator health and the health effects of work hours, shift work, and sleep schedules. A total of 55 of the relevant studies were reviewed in greater detail. Twenty-five were chosen and summarized by a primary reviewer to be included in the Part I final report. The criteria for inclusion were the validity of the methodology, the relevance of the studied population to truck driving, and the quality of the statistical analysis of health outcomes.

Similarly, the TRB driver fatigue team used the TRANSPORT database, a bibliographic database of transportation research and economic information produced by the 25-nation Organization for Economic Co-operation and Development, together with the United States TRB, and the 31 nations of the European Conference of Ministers of Transport (ECMT). TRANSPORT includes the Transportation Research Information Services, International Road Research Documentation, and ECMT's TRANSDOC.

Collectively these sources contain over 530,000 citations from publications, most with abstracts, of research information on all surface transportation modes, air transport, and highway safety. The driver fatigue team searched these studies for relevance concerning hours of service, and CMV operator performance and fatigue. Because FMCSA had previously docketed summaries of fatigue-related studies used in preparing the 2003 rule, the scope of this literature review was limited to studies published after 1995. Primary sources were selected if they addressed truck driver performance (on road or simulated), and included driving performance measures (vehicle control or critical incidents). Only studies were selected which involved drivers on typical work-rest schedules, involving extended hours of driving, driving in a sleep-deprived state, and/or driving at night. After the initial set of research reports was screened based on relevance, the driver fatigue team reviewed a total of 26 relevant studies, and 13 were chosen to be summarized for the Part I report.

As a result of the questions posed in the 2005 NPRM, commenters referenced over 200 studies. The driver health and fatigue teams reviewed the titles and abstracts of studies referenced by commenters using the identical criteria that were used for screening the initial research discussed earlier. Articles considered most relevant were those involving epidemiological studies, studies of CMV crash risk, or field studies of performance of commercial drivers in relation to fatigue issues such as daily and weekly hours, time of day, and short sleep, or studies of non-CMV drivers showing the effects of sleep loss and comparing sleep loss and alcohol impacts. The reasons for not reviewing the remaining articles suggested by commenters included the following: an article was not published as a report of a recognized Agency or in a peer-reviewed journal; an article was very general in nature (*e.g.* a discussion of circadian rhythm); or, an article was not sufficiently relevant to the task of CMV driving. The driver health team selected 11 of these studies to review and summarize for inclusion in the Part II report, while the driver fatigue team selected 21 studies for the Part II report.

In addition to reviewing the studies mentioned above, FMCSA internally reviewed, summarized, and evaluated research reports that were previously cited in the 2003 rule, 2004 litigation, 2005 NPRM, and driver fatigue and performance studies that were excluded from the TRB literature review (*i.e.*, published before 1996).

The Agency also assembled an intermodal team of experts on operator fatigue and health to help FMCSA further identify and analyze relevant research. The Federal agencies represented were the Federal Aviation Administration, Federal Railroad Administration, U.S. Coast Guard, and the National Institute for Occupational Safety and Health (NIOSH).

E. Driver Health

The D.C. Circuit held that FMCSA failed to consider the possibly deleterious effect of the 2003 hours-of-service rule on the physical condition of drivers, as required by 49 U.S.C. 31136(a)(4).

To assess driver health and better comprehend the impact of the findings, one must understand the differences in the types of relevant medical research. Epidemiology is the study of diseases in populations of humans or animals, specifically how, when, and where they occur. Epidemiology attempts to determine what factors are associated with diseases (risk factors). Epidemiological studies can never prove causation; that is, they cannot prove that a specific risk factor actually causes the disease being studied. Epidemiological evidence can only show that a risk factor is associated (correlated) with a higher incidence of disease in the population exposed to that risk factor. The higher the correlation the more certain the association, but it cannot prove the causation.

Another type of study is a dose-response study. A dose-response study is based on the principle that there is a relationship between a toxic reaction (the response) and the amount of substance received (the dose). Knowing the dose-response relationship is a necessary part of understanding the cause and effect relationship between chemical exposure and illness.

A third type of study is a case-control study, which investigates the prior exposure of individuals with a particular health condition and those without it to infer why certain subjects, the ''cases,'' become ill and others, the ''controls,'' do not. The main advantage of the case-control study is that it enables the study of rare health outcomes without having to track thousands of people. One primary disadvantage of a case-control study is a greater potential for bias. Because the health status is known before the exposure is determined, the study does not allow for broader-based health assessment.

These are important distinctions for the following discussion of the research on driver health, specifically regarding exposure to environmental stressors such as exhaust, chemicals, noise, and vibration. FMCSA has reviewed and evaluated the available and pertinent information concerning driver health, with emphasis on chronic conditions potentially associated with changes from the pre-2003 and 2003 rules, to this final rule. The research on CMV driver health falls into several broad categories: (1) Sleep loss/restriction, (2) exposure to exhaust, (3) exposure to noise, (4) exposure to vibration, (5) cardiovascular disease, (6) long work hours, and (7) shift work and gastrointestinal disorders.

E.1. Sleep Loss/Restriction

The lack of adequate sleep has been shown to have detrimental impacts on the overall health of humans. Research suggests that sleep deprivation adversely affects human metabolism as well as the endocrine and immune systems [Spiegel, K., *et al.* (1999), p. 1438]. Chronic partial sleep loss is associated with decreased glucose tolerance, decreased leptin levels, increases in evening cortisol levels, and adverse cardiovascular effects [Spiegel, K., *et al.* (2004), p. 5770]. Consistent with these studies, epidemiologic research demonstrates that short sleep duration is modestly associated with symptomatic diabetes [Ayas, N. T. *et al.* (2003), p. 383], cardiovascular disease, and mortality [Alvarez, G.G., & Ayas, N. T. (2004), p. 59]. Other studies have shown that short sleepers (less than 6

hours) have hormone and metabolic changes which result in weight gain [Hasler, G., *et al.* (2004), p. 661; Morikawa, Y., *et al.* (2003), p. 136; Taheri, S., *et al.* (2004), p. 210; Vioque, J., *et al.* (2000), p. 1683]. Interleukin 6 (IL–6) is a marker of systemic inflammation that may lead to insulin resistance, cardiovascular disease, and osteoporosis. Sleep loss of as little as two hours per night increases daytime IL–6 and causes drowsiness and fatigue during the next day, whereas post-deprivation decreases nighttime IL–6 and is associated with deeper sleep [Vgontzas, A. N., *et al.* (2004), p. 2125].

As to the amount of sleep necessary, the National Sleep Foundation recommends 8 hours per day. This standard comes primarily from studies by the National Institutes of Health (NIH), which notes that this was the mean time period that healthy young adults gravitated to when external influences were removed. Not all sleep researchers agree with this conclusion, particularly with regard to individual health and well-being. Two large-scale studies have found no relationship between longer sleep and better health [Kripke, D. F., *et al.* (2002), p. 131; Patel, S. R., *et al.* (2004), p. 440]. The epidemiological research on sleep duration suggests that mortality may even begin to rise with sleep durations greater than 8 hours. Likewise, mortality risk increases for short sleep durations less than 6 hours per day [*Id.*].

The research identified that prior to the 2003 HOS rule, CMV drivers were not getting enough sleep (*i.e.*, 7–8 hours per day) as needed to maintain individual health. In four major research studies, where sleep was verified using either an actigraph watch (wrist-worn monitoring device) or electroencephalogram, CMV drivers averaged from 3.8 to 5.25 hours of sleep per day [Dinges, D. F., *et al.* (2005), p. 38; Balkin, T., *et al.* (2000), p. 4–48; Mitler, M. M., *et al.* (1997), p. 755; Wylie, C. D., *et al.* (1996), p. ES–10]. These averages are below the 6 to 8 hours of sleep that are associated with lower mortality or a healthy lifestyle.

Preliminary data from the following sources suggest that, on average, CMV drivers are obtaining more sleep than before under the 2003 rule, which requires at least 10 consecutive hours of off-duty time. First, an ongoing joint National Highway Traffic Safety Administration (NHTSA) and FMCSA study conducted in 2005 found that drivers were averaging 6.28 hours of sleep per day, a figure that was verified with an actigraph watch [Hanowski, R.J., *et al.* (2005), p.1]. Second, in a survey of its membership, the Owner-Operator Independent Drivers Association (OOIDA) found that of the 1,264 drivers responding, 355 or 30 percent of drivers stated that they were getting more rest as a result of the 2003 HOS rule with 10 consecutive hours of off-duty time. The other 70 percent of the drivers responded that they were getting either the same amount of rest or no additional rest was needed as a result of the 2003 rule.

Comparing study findings before and after the 2003 HOS rule change suggests that drivers are getting more than an hour of additional sleep per night than they previously were able to obtain. While the Agency would like to see drivers obtain a sleep period between 7 to 8 hours per day to maximize driver alertness, the finding of 6.28 hours of sleep per night is within normal ranges consistent with a healthy lifestyle and is a vast improvement over previous sleep findings. Based on the research that led to the 2003 final HOS rule, FMCSA knew that short sleep (less than 6 hours) among drivers was a concern from both a safety and health standpoint. As a result, FMCSA increased off-duty time to 10 consecutive hours thereby increasing driver sleep by up to an additional two hours per day. This final rule adopts the requirement for the 10 consecutive hours of off-duty time.

E.2. Exposure to Diesel Exhaust

The Environmental Protection Agency's (EPA) Health Assessment Document for Diesel Engine Exhaust (2002) concluded that ''long-term (*i.e.*, chronic) inhalation exposure is likely to pose a lung cancer hazard to humans, as well as damage the lung in other ways depending on exposure'' [EPA (2002), p. ii].

Diesel exhaust (DE) is not a single ''thing'' but a mixture of hundreds of gases and particles, which differ with the type of engine generating them, operating conditions, and fuel formulations. Some of the components of DE are known carcinogens (*e.g.*, benzene) and others are mutagenic or toxic. Particulates from diesel engines, which constitute about 6 percent of the total ambient particulate matter (PM) with an aerodynamic diameter of 2.5 micrometers or less (PM–2.5), are highly respirable and able to reach the deep lung. Yet EPA has not formally declared DE to be a carcinogen. There are several reasons for this ambiguity.

A dose/response curve is the classic means of measuring the effect of exposure. A curve is typically established in a laboratory. Very high doses are given over a relatively short period, and the physiological response is measured. A dose/response curve is assumed to be a straight line, which can be extended downward to the lower exposures typical of ambient conditions outside the laboratory. If the dose/response curve is not a straight line (because the physiological response decreases disproportionately when exposure is reduced), the curve will overstate the effect of ambient exposure by some unknown amount. In that case, long-term population studies might be an alternative, provided long-term exposure can be established.

Attempts to establish a dose/response curve for DE have not produced clear-cut results. In animal studies, rats develop lung tumors after lifetime inhalation of DE at exposures vastly higher than any ambient condition; but these cancers appear to be at least partially the result of particle overload, which prevents lung clearance and causes chronic inflammation and subsequent lung disease. Chronic inhalation studies in mice show equivocal results, and hamsters do not develop cancer [Bunn, W.B., *et al.* (2002), p. S126; EPA (2002), p. 7–139]. EPA therefore concluded that ''the rat lung tumor response is not considered relevant to an evaluation of the potential for a human environmental exposure-related hazard'' [*Id.*]. EPA further noted that ''[t]he gaseous phase of DE (filtered exhaust without particulate fraction) was found not to be carcinogenic in rats, mice, or hamsters'' [*Id.*].

Although EPA has declared DE to be a ''probable human carcinogen,'' based in part on a review of 22 epidemiologic studies of workers exposed to DE in various occupations, it also noted that the

> ''Increased lung cancer relative risks generally range from 1.2 to 1.5, though a few studies show relative risks as high as 2.6. Statistically significant increases in pooled relative risk estimates (1.33 to 1.47) from two independent meta-analyses further support a positive relationship between DE exposure and lung cancer in a variety of DE-exposed occupations. The generally small increase in lung cancer relative risk (less than 2) observed in the epidemiologic studies and meta-analyses tends to weaken the evidence of causality. When a relative risk is less than 2, if confounding factors (*e.g.*, smoking, asbestos exposure) are having an effect on the observed risk increases, they could be enough to account for the increased risk'' [EPA (2002), pp. 7–138 and 7–139].

Overall, the evidence is not sufficient for DE to be considered a proven human carcinogen because of exposure uncertainties (lack of historical exposure data for workers exposed to DE) and an inability to reach a full and direct accounting for all possible confounders [*Id.*].

The actual cancer risk involved in operating a diesel-engine truck depends on the degree and duration of exposure to DE, and especially to smaller particulate matter (PM–2.5). Information on the real-world DE exposure of truck drivers is limited by many uncertainties. Because trucks spend a great deal of time in motion, the exposure levels of different highway, municipal, and regional environments have to be collected and combined. Idling time at terminals, in traffic jams, or while using a sleeper berth presumably generates higher exposure than does highway driving, but estimating the possible combinations of conditions for a large population of drivers is difficult. Furthermore, because of the long latency period of most cancers, the extent of the risk to truck drivers depends on the length of their exposure. This in turn is influenced by the factors that existed several decades ago: engine design, formulation of diesel fuel, prevalence of smoking among driver populations, total particulate levels from all sources, etc. In most cases, this information is less well known than comparable data on these factors today. Nor can one project previous (assumed) conditions forward or current conditions backward; virtually everything about DE has been changing in the last few decades and will continue to change as EPA tightens the regulations that govern diesel engine design and diesel fuel. Also, given EPA initiatives to reduce truck idling, and Federal financing available for idle-reduction programs, FMCSA expects additional reductions in exposure of CMV drivers to DE.

Before discussing the studies reviewed by the driver health team, it is useful to analyze a potential exposure effect of a feature of the 2003 rule, which is adopted in this final rule—the availability of additional driving and on-duty hours through the use of the 34-hour recovery provision. If utilized to the extreme, this would allow another 17 hours of driving time and 24 hours of on-duty time in a 7-day work week, compared to the limit of 60 hours of driving time without the recovery provision. To examine the effect of the 2003 rule on driver work hours, FMCSA compared an earlier survey of drivers operating under the pre-2003 rule with a recently completed survey. In a 7-day work week, the 451 drivers who responded to the earlier survey worked, on average (driving and other on-duty time), 64.3 hours per week [Campbell, K.L., & Belzer, M.H. (2000), p. 104]. In 2005, FMCSA evaluated a sample of driver logs and determined that the 489 drivers included, with a total of 5,397 7-day periods, worked an average of 61.4 hours (driving and other on-duty time) per week [FMCSA Field Survey Report (2005), p. 4].

At the annual meeting of the TRB in Washington, D.C. in January 2005, Schneider National, a large motor carrier, provided a distribution of the weekly (8-day period) on-duty hours for its drivers (available in the docket for this rule). The data shows that Schneider's employee drivers averaged 62 hours on duty per 8-day period and its leased drivers averaged 65 hours on duty per 8-day period. In addition, J.B. Hunt, another large motor carrier, in comments to the NPRM, reviewed the work records of 80 randomly selected over-the-road drivers for a 30-day period. J.B. Hunt found that 74 percent of its drivers used the 34-hour restart at least once during the 30-day period. On average, J.B. Hunt's drivers accumulated 62.25 hours on duty per eight-day period.

This data provides some indication of the hours worked as a result of the 2003 rule. Given the data from surveys and comments regarding work hours from motor carriers, it does not appear that CMV drivers are working on average significantly more hours as a result of the 2003 rule as compared to the pre-2003 regulation. Consequently, based on review of the data, the average exposure of drivers to DE has remained essentially unchanged.

The driver health team identified and reviewed four studies that address the issue of hours of work and duration of DE exposure in transportation workers. A large case-control study in Germany found significant associations between lung cancer and employment as a professional driver. The risk reached statistical significance for exposures longer than 30 years [Bruske-Hohlfeld, I., *et al.* (1999), p. 405]. An exposure response analysis and risk assessment of lung cancer and DE found a 1 to 2 percent lifetime increased risk of lung cancer above a background risk of 5 percent among workers in the trucking industry, based on historical extrapolation of elemental carbon levels [Steenland, K., *et al.* (1998), p. 220]. A large case-control study of bus and tramway drivers in Copenhagen found a negative association between lung cancer and increased years of employment [Soll-Johanning, H., *et al.* (2003), p. 25]. Finally, a meta-analysis of 29 studies addressing occupational exposure to DE and lung cancer showed that 21 of the 23 studies meeting the inclusion criteria, observed relative risk estimates greater than one (probability of a CMV driver developing lung cancer divided by the probability of the control group developing lung cancer). A positive duration response was noted in all studies that quantified exposure [Bhatia, R., *et al.* (1998), p. 84].

Several studies have shown an association between truck driving and bladder cancer. The driver health team reviewed three studies that addressed the association between duration of exposure to DE and bladder cancer. A population-based case-control study in New Hampshire found a positive association between bladder cancer and tractor-trailer driving, as well as a positive trend with duration of employment [Colt, J.S., *et al.* (2004), p. 759]. A large study in Finland found increased standard incidence ratios for six types of cancer in truck drivers. Cumulative exposure to DE was negatively associated with all cancers except ovarian cancer in women with high cumulative exposure [Guo, J., *et al.* 2004, p. 286]. A meta-analysis of 29 studies on bladder cancer and truck driving found an overall significant association between ''high'' exposure to DE and bladder cancer as well as a dose-response trend. The authors concluded that DE exposure may result in bladder cancer, but the effects of misclassification, publication bias, and confounding variables could not be fully taken into account [Boffetta, P., & Silverman, D.T. (2001), p. 125].

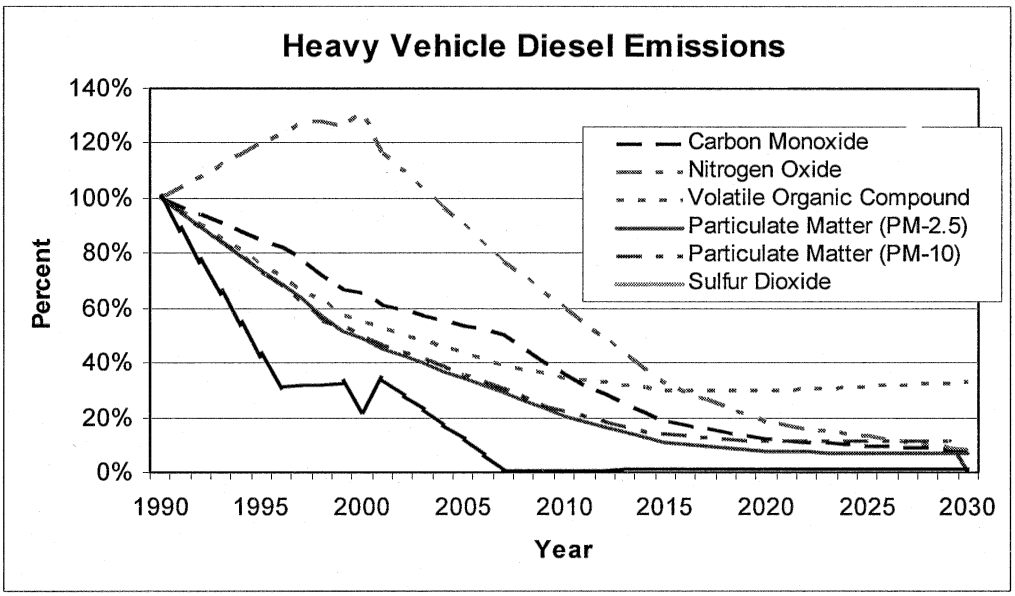
As a result of the number of studies showing an association, DE is considered to be a ''probable'' carcinogen by the World Health Organization and the U.S. Department of Health and Human Services' National Toxicology Program. Because of the complexity of proving a definitive link between DE and cancer, no organization, other than the California EPA, has classified DE as a known carcinogen [Garshick, E., *et al.* (2003), p. 17]. Studies have a great degree of uncertainty due to study design and exposure assumptions, measurement issues, and synergistic effects of various pollutants, among other variables. [Bailey, C.R., *et al.* (2003), p. 478]. Excluding rats, animal studies are overall negative with regard to lung tumor formation following DE exposure. In rats, lung tumors are produced by lifetime inhalation exposure to many different particle types. These exposures are characterized as ''lung overload;'' however, numerous analyses point to a lack of relevance of data from lung-overloaded rats to human risk calculations, particularly at environmental or ambient levels [Bunn, W.B., *et al.* (2002), p. S122]. As noted earlier, EPA's risk assessment on DE, based on long-term (chronic) exposure,

concludes that DE is ''likely to be carcinogenic to humans by inhalation.'' Studies show a causal relationship between exposure to DE and lung cancer, but EPA has not concluded that DE is a human carcinogen and cannot develop a quantitative dose-response cancer risk. The rat inhalation studies underpinning these findings resulted from overloading DE and are unrealistic exposure scenarios for humans [Ris, C. (2003), p. 35].

The acute (short-term) effects of DE, which would allow us to determine safe exposure levels, are not currently known [*Id.*]. Also, there are not enough human test data to make a definitive risk assessment on the chronic long-term respiratory effects of DE. Tests on animals, however, suggest chronic respiratory problems exist [*Id.*]. Cleaner burning diesel fuel standards (2006) combined with cleaner diesel engine technologies from more stringent emission standards (2007) will generate a net reduction in pollutant emissions, despite growth in diesel use [Sawyer, R.F. (2003), p. 39].

EPA models project on a national basis the amount of emissions or pollutants expected annually from all mobile sources. These are based on estimates of vehicle miles traveled and new vehicles entering and old vehicles leaving the inventory, and they reflect changes in vehicle emissions standards. The models project emissions for the following pollutants: Carbon Monoxide, Oxides of Nitrogen, Volatile Organic Compounds, Particulate Matter (PM–2.5), Particulate Matter (PM–10), and Sulfur Dioxide. EPA estimates show that vehicle emissions from all mobile sources have declined significantly from 1990 to 2005 (average 35 percent reduction in emissions) and are projected to decline further until 2030 (average 55 percent reduction in emissions). DE from heavy vehicles represents about 23 percent of all emissions from mobile sources. DE from heavy vehicles has also declined from 1990 to 2005 (average 55 percent reduction in emissions) and is projected to decline further until 2030 (average 88 percent reduction in emissions). The following chart shows the projections of heavy vehicle DE from the on-the-road fleet by type of emission from 1990 to 2030. The chart is based on U.S. EPA's ''National Annual Air Emissions Inventory for Mobile Sources,'' which was conducted for a variety of pollutants emitted by on-road vehicles. [EPA (January 2005)]. Mobile source emission inventories were directly modeled for 2001, 2007, 2010, 2015, 2020, and 2030. Other years were obtained by linear interpolation. EPA's Air Inventory was developed using the National Mobile Inventory Model [EPA (March 2005)].

Figure 1. Heavy Vehicle Diesel Emissions



Source of Data: EPA National Mobile Inventory Model

If diesel or all engine emissions are in fact carcinogenic (not yet proven), then the risk of developing cancer is a function of both the amount of DE being inhaled and cumulative exposure (time). Based on EPA emission projections of lower emissions from on-the-road heavy vehicles, continued reduction in health impacts can be expected over time.

It appears that chronic (long-term) exposure to DE may cause cancer. The exposure/dose required, however, is currently unknown due to the extreme difficulty in measuring and modeling exposure. EPA has noted that there is great

''uncertainty regarding whether the health hazards identified from previous studies using emissions from older engines can be applied to present-day environmental emissions and related exposures, as some physical and chemical characteristics of the emissions from certain sources have changed over time. Available data are not sufficient to provide definitive answers to this question because changes in DE composition over time cannot be confidently quantified, and the relationship between the DE components and the mode(s) of action for DE toxicity is unclear'' [Ris, C. (2003), p. 35].

Some of those flaws might be addressed by Garshick's effort to quantify lung cancer risk in the trucking industry through an epidemiological study using up to 72,000 subjects [Garshick, E., *et al.* (2002), p. 115]. At this time, however, according to EPA,

NIOSH, the Centers for Disease Control and Prevention, and NIH, there is not enough evidence to declare DE a carcinogen. Nonetheless, EPA's finding that DE is a probable carcinogen is a cause for concern. EPA has therefore adopted new diesel engine performance requirements and will by 2007 require refiners to produce low-sulphur fuel [66 FR 5002]. EPA's previous and forthcoming regulatory changes lead to a projection of dramatically lower DE through 2030, which will greatly reduce any health effects of DE exposure.

Still, the question remains whether today's rule, regarding exposure to DE, ensures that ''the operation of commercial motor vehicles does not have a deleterious effect on the physical condition'' of CMV drivers [49 U.S.C. 31136(a)(4)]. After reviewing all the studies mentioned, there is no evidence that today's rule has a deleterious effect. This is not to deny the possibility that DE may have some impact on truck drivers. The Agency, however, cannot attempt to address a problem without data on its extent and severity. The data on exposure to DE is notoriously deficient. As Garshick and his colleagues noted,

> ''The ideal marker of DE exposure would be a single marker that would be inexpensive, easy to measure, and clearly linked to the source of diesel emissions. However, the reality is that DE is a complex mixture, and in many real-life scenarios it may not be the only important source of exposure to the individual particles and gases that constitute DE. In addition, the mechanism of the health effects and specific causal agents are uncertain. The best diesel exposure marker is likely to be more complex and involve the measurements of molecular organic tracers and elemental carbon. The nature of the exposure assessment and marker chosen may also depend on mechanism of health effect postulated, and may include measurement of exhaust gases (such as ozone and nitrogen oxide) in the setting of nonmalignant respiratory diseases. Although current literature identifies DE as a health hazard, insight into a dose-response relationship is limited by factors related to both cohort selection and exposure assessment. The development of an exposure model in the existing DE epidemiologic literature is hindered by a lack of exposure measurements upon which an exposure model can be developed, uncertainty regarding the best measurement or marker(s) indicative of exposure, and uncertainty regarding historical exposures'' [Garschick, E., *et al.* (2003), p. 21].

One of the best works to date on DE, lung cancer, and truck driving is a series of studies by Steenland and his colleagues published between 1990 and 1998. The abstract of the 1998 study concludes that, ''[r]egardless of assumptions about past exposure, all analyses resulted in significant positive trends in lung cancer risk with increasing cumulative exposure. A male truck driver exposed to 5 micrograms/m^3 of elemental carbon (a typical exposure in 1990, approximately five times urban background levels) would have a lifetime excess risk of lung cancer of 1–2 percent above a background risk of 5 percent.'' The difference between 1 percent and 2 percent is obviously quite large, but the absence of a dose/response curve for DE and uncertainties in the exposure data make greater precision impossible.

In 1999, however, the Health Effects Institute (HEI), a non-profit corporation chartered in 1980 to assess the health effects of pollutants generated by motor vehicles and other sources, and supported jointly by EPA and industry, found significant flaws even in the 1998 Steenland study. As summarized by Bunn *et al.* [Bunn, W.B., *et al.* (2002), p. S127], the HEI found that the Steenland study ''quite likely suffers from an inadequate latency period, making it completely unsuitable for reaching any qualitative or quantitative conclusions about the link between DE exposure and lung cancer.'' Furthermore, the workers in the study were exposed to an inseparable mix of gasoline and diesel fumes. ''Indeed, during the 1960s (the critical years of the Steenland study from a latency perspective), diesel fuel represented only 4–7 percent of the total fuel sales (cars and trucks). Moreover, in the 1960s, gasoline-fueled vehicles had no after-treatment, so that emissions from gasoline-fueled vehicles likely would have been comparable to those from diesel vehicles'' [*Id.*].

Given the uncertain effects of exposure to DE, FMCSA could not include this factor in any cost/benefit analysis for any regulatory change it wished to consider. Some changes are beyond FMCSA's authority. EPA has exclusive authority to set emission standards for new trucks, and NHTSA has comparable jurisdiction over equipment standards for new vehicles. FMCSA retains a degree of authority to order the retrofitting of safety equipment to vehicles already in service [see 49 CFR 1.73(g)], but it is unclear what CMV equipment, if any, could be installed on the current fleet to reduce the driver's exposure to DE. A driver's ability to open one or both side windows could defeat any air-cleaning technology that might be added to the tractor, and all drivers spend time outside the vehicle at terminals, truck stops, and other locations where exposure to DE is unavoidable.

Another possible means of reducing drivers' DE exposure would be to curtail driving and on-duty time, or even to limit a driver's career to a certain number of years, all in the interest of improved health. As indicated above, however, there is no dose/response curve for DE and the Agency could not be sure that a given reduction in hours or years of service would produce a clear benefit. Forced retirement after a certain number of years on the job is especially problematical. There is nothing in the legislative history of 49 U.S.C. 31136(a)(4) to indicate that Congress wanted FMCSA to protect the health of drivers by limiting their livelihood. A limit on driving or on-duty hours for the specific purpose of reducing DE exposure seems unnecessary, because the available evidence shows that drivers have not increased their driving or on-duty time in response to the 2003 rule.

One of the benefits of the 2003 HOS rule has been that it limits driver duty periods to 14 consecutive hours per day with no extensions for intervening off-duty periods. Under the pre-2003 rule, drivers were allowed a 15-cumulative-hour duty period but could extend their maximum duty period indefinitely by taking off-duty time during their workday. This perpetuated the problem of excessive waiting time for pick up and delivery of freight at shippers and receivers, because the drivers were expected to place themselves in off-duty status while waiting. A 1999 study of dry freight truckload carriers by the Truckload Carriers Association (TCA) revealed that drivers spent nearly seven hours waiting for each freight shipment that they picked up and delivered.

The non-extendable 14-hour provision of the 2003 rule has given motor carriers greater leverage to insist that shippers and receivers reduce waiting time. At the 2005 Annual Meeting of the Transportation Research Board (TRB) in January 2005, in Washington, DC, several large carriers stated that as a result of the 14-hour rule, they are increasingly charging detention fees when shippers and receivers cause delays. As a result of the 14-hour provision, shippers and receivers have had to improve the efficiency and productivity of loading docks. Many drivers have commented that waiting time has been significantly reduced. Reduced waiting time has a positive impact on drivers. First, it reduces the total duty period for the driver, and reduces unproductive and often uncompensated time. Second, loading docks were cited by Garshick [Garshick, E. *et al.* (2003), pp. 24–25] as having high levels of DE particulate

matter. Thus, reduced waiting time reduces driver exposure to DE and could have beneficial impacts on driver health.

Diesel emissions have been falling steadily since the early 1990s and will continue to decline for many years to come. To whatever unknown extent DE may cause lung cancer, EPA's long-range regulatory program is expected to reduce that risk. Three recent developments may accelerate that downward trend. The first is the cost of diesel fuel, which makes idling more expensive. The second is the spread of local regulations that limit CMV engine idling time. The third is the proliferation of truck-stop services available to drivers that eliminate idling by providing hot or cold air for the sleeper berth, cable TV, and internet access through an attachment to the side window of the tractor. The expected reduction in engine idling in the next few years should amplify the health and environmental benefits of EPA's regulations. FMCSA has thus concluded that, while DE probably entails some risk to drivers, after a thorough review of the data available, it is the Agency's best judgment that, compared to the pre-2003 rule, today's rule neither causes nor exacerbates that risk.

E.3. Exposure to Noise

The Occupational Safety and Health Administration (OSHA) noise exposure standard for the workplace for unprotected ears is 90 decibels adjusted (dBA) limited to 8 hours per day (29 CFR 1910.95). FMCSA also has adopted a 90 dBA noise standard (49 CFR 393.94). Twenty-five percent of the work force in the United States is regularly exposed to potentially damaging noise [Suter, A.H., & von Gierke, H.E. (1987), p. 188]. In 1995, the FHWA Office of Motor Carriers conducted a study of noise in CMVs. The study showed that noise levels in CMV cabs as reported over the previous 25 years (1970–1995) had decreased [Robinson, G.S., *et al.* (1997), p. 36]. The following table summarizes noise findings from several studies:

FIGURE 2.—CMV CAB NOISE LEVELS DOCUMENTED FROM SEVERAL STUDIES

Study (year)	Model year (# of trucks)	dBA
Enone (1970)	1960s era (4)	>100 dBA.
Morrison & Clark (1972)	1960s era (16)	85–90 dBA.
Hessel (1982)	1972–1977 (8)	74–87 dBA.
Reif & Moore (1983)	1968–1978 (58)	85–90 dBA.
Morrison (1993)	1993 (4)	<80 dBA.
Micheal (1995)	1995 (6)	<80 dBA.
Van den Heever (1996)	1995 (16)	83 dBA.
Robinson (1997) [1]	1990–95 (9)	89 dBA.
Seshagiri (1998) [1]	400 measurements	83+ dBA.

Note 1: Study findings added to the table reported by Robinson (1997).

The truck-cab noise levels for nine trucks Robinson *et al.* evaluated were found to be 89.1 dBA for eight conditions of highway driving. This was very close to the FMCSA permissible exposure limit of 90 dBA. A sound dosimeter [1] was used to determine the noise doses experienced by 10 truck drivers during normal commercial runs of 8 to 18 hours. The noise doses were measured with rest breaks, meal breaks, and refueling breaks included, so they represented realistic projections of actual truck trip noise doses experienced by drivers. Robinson *et al.* also conducted pre- and post-workday audiograms for a group of 10 drivers. Those results indicated that CMV drivers suffered no temporary hearing loss after a normal driving shift.

In a more recent study of tractors of different models, makes, and ages operating on routes that covered different types of Canadian terrain, noise exposure was measured (over 400 measurements) under several conditions. The noise level recorded ranged from 78 to 89 dBA, with a mean of 82.7 dBA. The noise levels increased by 2.8 dBA with the radio on, 1.3 dBA with the driver's side window open, 3.9 dBA with both the window open and radio on, and 1.6 dBA for operations on four-lane highways. Cab-over-engine vehicles appeared to be quieter than conventional tractors by about 2.6 dBA. Long-haul (city to city) operations on hilly terrain appeared to be quieter than on flat terrain by about 2.2 dBA, probably indicating the strong effect of speed (tire, wind, and engine noise). These researchers found conditions where CMVs exceeded the Canadian noise limit of 85 dBA, mainly when the radio was on and the driver's side window open [Seshagiri, B. (1998), p. 205].

In its comments to the docket, the American Trucking Associations (ATA) reported that modern tractors usually have dBA levels ''in the low 70's'' and that a ''typical Class 8 sleeper tractor cruising at 60 mph on level ground pulling a load will have a sound pressure level of about 69–73 dBA.''

The research discussed earlier suggests cab noise levels are well within FMCSA's 90-dBA noise standard. The noise levels documented have not been shown to exceed OSHA or FMCSA standards. Therefore, the noise levels in CMVs should not result in significant hearing loss over a lifetime of on-the-job exposure, even if drivers drove the maximum hours allowed by this final rule.

E.4. Exposure to Vibration

Exposure to whole body vibration (WBV) is believed to cause fatigue, insomnia, headache, and ''shakiness'' shortly after or during exposure. After daily exposure over a number of years, WBV can affect the entire body and may result in a number of health disorders. Occupational exposure to WBV may contribute to circulatory, bowel, respiratory, muscular, and back disorders. The combined effects of body posture, postural fatigue, dietary habits, long hours, and loading and unloading are the possible other causes for these disorders.

Vibration in CMVs is a function of the age and maintenance of the vehicle, speed, type of roadway, and driving behavior and performance; and the most important variable is the condition of the roadway. There are no vehicle manufacturing or operational standards for the control of WBV, either in this country or abroad. The medical and research communities use the 1997 International Standards Organization (ISO) 2631–1 guidelines for evaluating WBV.

[1] A sound dosimeter is an instrument used to measure exposure to sound.

Teschke conducted a thorough review of the research on WBV and back disorders (including over 99 studies). This research found a number of potential risk factors associated with lower back pain (LBP). Besides WBV, the study identified a number of other confounding variables that are associated with lower back pain. The following risk factors have been found identified in the review of research in this area: (1) Driver's age, (2) working postures, (3) repeated lifting and heavy lifting, (4) smoking, (5) previous back pain, (6) falls or other injury-causing events, (7) stress-related factors including job satisfaction and control, and (8) body condition and morphology including weight, height, physical condition, and body type [Teschke, K., *et al.* (1999), p. 7]. The number of potential risk factors and confounding variables makes it difficult to isolate the effects of WBV, or even to conclude that WBV is the cause of lower back pain.

A recent study of volunteer drivers at a large transport company in Canada found that operators were not on average at increased risk of health effects from daily exposure when compared to the ISO guidelines. The study did, however, find several instances where drivers in a 10-hour shift were exposed to WBV levels established in an earlier ISO standard. These instances were highly correlated to road conditions [Cann, A.P., *et al.* (2004), p. 1432]. One of the criticisms of this study was that vibration was measured at the floor or base of the driver's seat, and measurements did not take into account the attenuation of vibration by the driver's seat. Most seats in CMVs today are air suspended to better isolate the driver from vibration.

Much of the WBV research is based on self-reporting through surveys and questionnaires to identify factors that are associated with lower back pain and back problems. For instance, a questionnaire study of bus and truck drivers in Vermont and one in Sweden found a significant association between long-term vibration dose and low back pain [Magnusson, M.L., *et al.* (1996), p. 710]. Another questionnaire survey in the Netherlands found significant associations between vibration and low back pain as well as a significant dose-response [Boshuizen, H.C., *et al.* (1990), p. 109]. A recent review of the health literature on WBV and lower back pain (LBP) concluded that, while ''there is probably an association between WBV and LBP,'' there was no evidence of dose-response [Lings, S. & Leboeuf-Yde, C. (2000), p. 290].

Studies addressing musculoskeletal disorders in truck drivers by and large evaluate the effects of WBV. A questionnaire survey of Japanese truck drivers found short resting time and irregular duty time to be significant risk factors for lower back pain. It also found positive but insignificant associations with long driving time per day and week, but the hours classified as long were not specified [Miyamoto, M., *et al.* (2000), p. 186]. A study of knee pain in taxi drivers found a significantly increased risk of knee pain in workers with more than 10 hours of daily driving. A significant dose-response trend was also seen [Chen, J.C., *et al.* (2004), p. 575].

Our review of the literature on WBV and its potential health effects, such as low back syndrome, is inconclusive because the studies rely primarily on self-reporting and application of risks derived from other environments. The literature related to commercial driving and other musculoskeletal disorders suffers from the same limitations. A causative relationship can only be viewed as suggestive within this context.

The studies that tested vibration in CMVs found that vibration was close to the ISO health risk threshold, but it did not consistently exceed the threshold. The introduction of new trucks, which reduce the driver's exposure to WBV, would be expected to mitigate any potential effects of vibration. ATA submitted comments to the docket that modern truck cabs are much quieter, are well ventilated, and have well designed, efficient heating and air conditioning units. Physical stress on drivers, including road vibration, is reduced by power steering. Many trucks are also equipped with automatic transmissions, further reducing stress. Improved suspension gives the driver a better ride, and provides better handling. ATA maintained that the comfort and safety improvements in truck tractors improve the driver's conditions, leading to a reduction in stress and fatigue. Two carriers also commented that modern trucks have greatly reduced noise and vibration.

Much of the research on whole body vibration within a CMV and its effects on lower back pain or musculoskeletal disorders was based on subjective measures and only weak associations have been found. Given all the other confounding factors that have been shown to be associated with these conditions (age, postures, lifting, smoking, falls, job satisfaction, and body condition, including weight) it is highly unlikely that vibration is the cause of LBP or musculoskeletal disorders. The few studies of more objective measures of vibration have not shown vibration to be, on average, above the health risk level (with ISO standard).

When comparing the 2003 HOS rule to today's rule, it is the Agency's best judgment that, based on the studies reviewed and comments received, WBV does not pose a significant health risk to CMV drivers.

E.5. Cardiovascular Disease

Cardiovascular disease (CVD), principally heart disease and stroke, is the nation's leading killer for both men and women among all racial and ethnic groups. Almost one million Americans die of CVD each year— 42 percent of all deaths. CVD does not kill just the elderly—it is also the leading cause of death for all Americans age 35 and older. More than 16 percent of the deaths due to CVD are individuals 35 to 64 years old. The causes of CVD are complex. The following table identifies some of the known risk factors:

FIGURE 3.—RISK FACTORS FOR CARDIOVASCULAR DISEASE

Individual factors	Occupational factors	Lifestyle factors
Genes		
Age	Sedentary Work	Smoking
Gender	Working Long Hours	Alcohol/Drug Use
High Cholesterol	Work Stress	Sedentary Lifestyle
Amino Acid—Homocysteine	Exposure to Physical Stressors and Injuries	Lack of Exercise
High Blood Pressure	Shift Work	Stress
Obesity		Short Sleep
Diabetes		

Source: American Heart Association.

The NIOSH representative to FMCSA's health group reviewed the literature regarding CMV driving and the risk of developing CVD. Since 1992, a number of population research studies from Sweden and Denmark have presented data suggesting an association between driving and CVD. In contrast to occupational studies undertaken in the United States, these research studies did not attempt to quantify ''hours of service driving a truck'' or ''occupational chemical and particulate exposures.'' Thus, these studies provide no data that could be used to correlate individual or group ''exposures'' and CVD outcomes. No studies conducted in the United States were found that permitted examination of long hours of driving among truck drivers and the possible association with CVD.

Swedish and Danish population studies provide support for the hypothesis that driving occupations have elevated risks for cardiovascular disease. Among drivers, Swedish population studies indicate the greatest risk elevations occur among bus drivers, with relative risks ranging from 50 percent to 114 percent in excess of comparison populations [Bigert, C., *et al.* (2003), p. 333]. The greatest risk ratio reported for truck drivers (a relative risk of 1.66), was reduced to 1.10 following statistical adjustment for competing health and disease risk factors. A recent study suggests that truck drivers experience no more than a 14 percent elevated risk [Bigert, C., *et al.* (2004), p. 987].

Most epidemiologists take a fairly rigorous view of relative risk values. In observational studies, results are not normally accepted as significant if a relative risk ratio is less than 3 and is never accepted if the relative risk ratio is less than 2 [Brignell, J. (2005)]. In epidemiologic research, increases in risk of less than 100 percent are considered small and are usually difficult to interpret. Such increases may be due to chance, statistical bias, or the effects of confounding factors that are sometimes not evident.

A number of Japanese hospital record studies have examined the association between long hours of work (not hours of driving) and acute myocardial infarction (AMI). The most recent study suggests that weekly work time in excess of 60 hours is related to increased risk of AMI [Liu, Y., & Tanaka, H. (2002), p. 447]. This research suggests a two-fold increased risk for overtime work (crude risk of 2.1, reduced to 1.81 after statistical adjustment for competing health and disease risk factors). The authors conclude that overtime work and insufficient sleep may be related to the risk of AMI.

Research is under way at NIOSH to evaluate mortality risk of independent truck drivers in the United States. However, this study is not designed to collect data on hours of service and other CVD risk factors.

FMCSA's NIOSH representative concluded that current research suggests the presence of only a weak association between CVD and truck driving. Additionally, CVD is associated with many other occupational types. No research studies were found that permitted an examination of whether additional hours of driving a CMV impacts driver health as measured by increased CVD or AMI. After thoroughly reviewing the collective data, in the Agency's best judgment, based on the research available, nothing implicates today's HOS rule in a heightened risk of CVD or AMI.

Any increased risk of CVD or AMI may be mitigated by the increased off-duty time (10 hours off duty) as well as the increase in stabilization from the pre-2003 rule to the 2003 and today's rule of the drivers' schedules (circadian rhythm). Changes implemented in truck cab design, reducing exposure to exhaust, whole body vibration, and noise may also mitigate the risk of CVD and AMI as well.

E.6. Long Work Hours

The average number of hours worked in the United States annually has increased over the past several decades and currently surpasses most countries in Western Europe and Japan [Caruso, C.C., *et al.* (2004), p. 1]. Worker health and safety is a growing area of concern, and thus more attention is being placed on whether there should be limits on hours of work—similar to the hours of service regulations for CMV drivers. The primary question being asked is whether there are more adverse health consequences as a result of longer hours of work.

Beyond the previous study mentioned regarding CVD and long hours [Liu, Y., & Tanaka, H. (2002), p. 447], the driver health team was able to find only one other study that met their selection criteria and was directly related to CMV drivers and long work hours [Jansen, N.W.H., *et al.* (2003), p. 664]. This study focused on employees from 45 companies in the Netherlands. Self-administered questionnaire data from 12,095 employees of the Maastricht Cohort Study on Fatigue at Work were used. The researchers concluded that employees needed greater recovery because their recovery scores (subjective measure of the self-perceived need for rest) were significantly elevated in those working 9 to 10 hours per day, more than 40 hours per week, and frequent overtime [*Id.*].

The lack of research literature on driver work hours required the driver health team to expand its literature review into occupations other than transportation workers. Particularly useful was a study published by NIOSH in April 2004 entitled ''Overtime and Extended Work Shifts: Recent Findings on Illnesses, Injuries, and Health Behaviors'' [Caruso, C.C., *et al.* (2004)]. The NIOSH report documents published research on long work hours (greater than 8 hours work per day) and an extended work week (greater than 40 hours per week).

The NIOSH review generally concluded that long work hours appear to be associated with poorer health, increased injury rates, more illnesses, or increased mortality. NIOSH found that individuals working long hours generally have greater risk of unhealthy weight gain, increased alcohol use, increased smoking, increased health complaints, increased injuries while working, poorer neuropsychological performance, reduced vigilance on task measures, reduced cognitive function, reduced overall job performance, slower work, and decreased alertness and increased fatigue, particularly in the 9th to 12th hours of work. The adequacy of these study findings is addressed later in this section of the preamble.

The NIOSH review examined the relationship between hypertension (a risk factor for CVD) and long hours. It concluded that the research findings regarding hypertension were inconsistent. Park [Park, J., *et al.* (2001), p. 244] found no correlation between the hours worked by Korean engineers, whose work hours during the previous month ranged from an average of 52 hours to a high of 89 hours per week, and increased hypertension. This study is relevant because the work-hour limits are reasonably close to the limits a CMV driver could work under this final rule.

CMV drivers, on average, work slightly more than 60 hours per week, but FMCSA operational data show they rarely reach the maximum of 84 work hours per week. This number of work hours is beyond the typical number of work hours examined by the research in the NIOSH review. The NIOSH review did, however, examine three studies that identified the relationship between very long shifts and immune function or performance. Nakano [Nakano, Y., *et al.* (1998), p. 32] reported better immune function in taxi drivers who were allowed to work overtime as compared with drivers having work-hour

restrictions. This study examined taxi drivers working 48-hour or longer shifts in 1992 and again in 1993. Leonard [Leonard, C., *et al.* (1998), p. 22] reported declines in two tests of alertness and concentration in medical residents who had worked 32-hour on-call shifts. They reported no significant declines in a test of psychomotor performance or a test of memory. A survey of anesthesiologists linked long working hours to self-reported clinical errors [Gander, P.H., *et al.* (2000), p. 178].

Two studies in the NIOSH review identified the relationship between long hours and compensation. Siu and Donald [Siu, O.L., & Donald, I. (1995), p. 30] and van der Hulst and Geurts [van der Hulst, M., & Geurts, S. (2001), p. 227] suggested that compensation may reduce adverse effects of long work hours. Siu and Donald [Siu, O.L., & Donald, I. (1995), p. 31] reported a relationship between perceived health status and overtime pay. Men from Hong Kong who received no payment for overtime reported more health complaints when compared with men who received payment. In addition, van der Hulst and Geurts examined the relationship between reward and long working hours in Dutch postal workers. Rewards included salary, job security, and career opportunities. They reported that high pressure to work overtime in combination with low rewards was associated with a three-fold increase in the odds for somatic complaints as compared with a reference category of low overtime pressure in combination with high rewards. Alternatively, high pressure in combination with high rewards did not differ from the reference category. [van der Hulst, M., & Geurts, S. (2001), p. 227] This research suggests that if workers are adequately compensated for their time, they are less likely to have health complaints. This is an important variable that can play a significant factor in conducting subjective types of research on the effects of long work hours and health. It also raises concerns regarding most subjective data regarding the health consequences of long hours that do not look at compensation as a factor.

With regard to the relationship between long work hours and worker health, the NIOSH review concluded that ''research questions remain about the ways overtime and extended work shifts influence health and safety. Few studies have examined how the number of hours worked per week, shift work, shift length, the degree of control over one's work schedule, compensation for overtime, and other characteristics of work schedules interact and relate to health and safety. Few studies have examined how long working hours influence health and safety outcomes in older workers, women, persons with pre-existing health problems, and workers with hazardous occupational exposures.''

The NIOSH review of the literature on long work hours documents a significant lack of data on general health effects. NIOSH reported that even when looking at fatigue and accidents, identifying ''differences between 8-hour and 12-hour shifts [is] difficult because of the inconsistencies in the types of work schedules examined across studies. Work schedules differed by the time of day (*i.e.*, day, evening, night), fixed versus rotating schedules, speed of rotation, direction of rotation, number of hours worked per week, number of consecutive days worked, number of rest days, and number of weekends off'' [Caruso, C.C., *et al.* (2004), p. IV].

Additionally, van der Hulst conducted a review of 27 recent empirical studies of long work hours [van der Hulst, M. (2003), p. 171]. He showed that long work hours are associated with some adverse health outcomes as measured by several indicators (CVD, diabetes, disability retirement, subjectively reported physical health, subjective fatigue). He concluded, however, ''that the evidence regarding long work hours and poor health is inconclusive because many of the studies reviewed did not control for potential confounders. Due to the gaps in the current evidence and the methodological shortcomings of the studies in the review, further research is needed.''

The driver health team found very little research to evaluate specifically the association between long work hours and CMV driver health. No research studies were found that permitted an examination of whether additional hours of driving or non-driving time would impact driver health. Research on other occupations is mixed and does not show conclusively that long hours alone adversely affect worker health. Also, FMCSA's 2005 survey of driver hours indicates that the 2003 rule has not increased the overall number of hours a driver actually works (see Section I.1). Overall, this rule improves driver health compared to the pre-2003 and 2003 rules through a combination of provisions (see discussion of Combined Effects, Section J.11). The Agency has adopted the non-extendable 14-hour driving window and the 10-hour off-duty requirement; these provisions shorten the driving window allowed before 2003 by one hour (or more, in some cases) and lengthen the off-duty period by two hours. In short, based on current knowledge and the limited research that is available, in the Agency's best judgment there is no evidence that the number of work hours allowed by the HOS regulation adopted today will have any negative impact on driver health.

E.7. Shift Work and Gastrointestinal Disorders

The term ''shift work'' covers a wide variety of work schedules and implies that shifts rotate or change according to a set schedule. These shifts can be either continuous, running 24 hours per day, 7 days per week, or semi-continuous, running 2 or 3 shifts per day with or without weekends. Workers take turns working on all shifts that are part of a particular system. Shift work is a reality for about 25 percent of U.S. workers. Similarly, 22 percent of CMV drivers work between the hours of 12 p.m. and 6 a.m. [Campbell, K.L., & Belzer, M.H. (2000), p. 115].

This final rule is intended to make work schedules more regular by adhering more closely to a 24-hour clock than the pre-2003 rule. It increases the number of consecutive off-duty hours to 10 and provides for a non-extendable daily driving window of 14 hours. The pre-2003 rule provided only 8 hours of consecutive off-duty time and prohibited driving after a cumulative total of 15 hours on duty per day. Under that rule, however, drivers could extend the 15-hour limit by taking off-duty time. Today's rule should provide some health benefits to CMV drivers, because, as previously shown, drivers are getting more consecutive hours of sleep and will generally adhere more closely to a 24-hour clock (14 hours on-duty and 10 hours off-duty = 24 hours).

By minimizing on-duty time and maximizing driving time, however, a driver could operate on a backward rotating 21-hour schedule (11 hours driving and 10 hours off duty = 21 hours). Although drivers might conceivably employ that schedule, data suggests drivers do so only rarely. Even when it does occur, this schedule is still beneficially closer to 24 hours than the pre-2003 rule, which allowed a backward rotating 18-hour work day (10 hours driving and 8 hours off duty = 18 hours).

The driver health team examined research on the health effects of disrupting the circadian rhythm. The circadian rhythm spans about a twenty-four-hour day, exemplified by the normal sleep-waking cycle. Circadian rhythms in humans originate from a clock circuit in the hypothalamus that is set by information from the optic nerve

about whether it is day or night. One of the earliest studies and most definitive works in the area of shift work by Taylor and Pocock showed no relationship between shift work and mortality [Taylor, P.J., & Pocock, S.J. (1972), p. 201]. Two recent studies used experimental conditions to evaluate the impact of an altered circadian rhythm on insulin secretion. The first [Morgan, L., *et al.* (1998), p. 449] found a longer sleep-wake cycle, such as might occur in rotating shift work, to be associated with increased insulin resistance and glucose response. In the second study, 261 shift workers completed a Standard Shift Work survey in an investigation of health and well-being [Barton, J., & Folkard, S. (1993), p. 59]. Workers using a forward rotating schedule were more likely to complain of digestive and cardiovascular disorders than those on a backward rotating system. This finding is counterintuitive because most fatigue and shift work research suggests that a forward rotating schedule is better from a sleep and fatigue standpoint. The authors concluded that the combination of direction of rotation and length of break when changing from one shift to another may be a critical factor in the health and well-being of shift workers [*Id.*, p. 63].

In a thorough review of the literature on shift work and health up to 1999, Scott [Scott, A.J. (2000), p. 1057] concluded that gastrointestinal, CVD, and reproductive dysfunctions are more common in shift workers, and that these effects may be due to rotating or fixed shifts, number of nights worked consecutively, predictability of schedule, and length of shift and starting time. Exacerbation of medical conditions such as diabetes, epilepsy, and psychiatric disorders, as well as the diseases noted above, may occur due to sleep deprivation and circadian rhythm disruption. It should be noted, however, that individuals with these conditions would not generally be qualified to drive under FMCSA's medical standards.

˚ In a more recent study, Ingre and Akerstedt [Ingre, M., & Akerstedt, T. (2004), p. 45] investigated the effects of lifetime accumulated night work based on monozygotic (from a single egg) twins. The authors studied 169 pairs of twins where one of the two twins worked night shifts while the other twin worked day shifts. The subjects were all over 65 years old and retired. The study found no significant difference between education, weight, body mass index (BMI), diurnal or circadian rhythm, habitual rise times, habitual bed times, and sleep times. The study found that the twin exposed to night work was significantly more likely than the twin exposed to day work to report lower ratings of subjective health (17.8% versus 10.7% who stated that their health was poor). The study did not look at objective measures of health. The most significant finding was how similar the twins remained and that shift work did not adversely affect important health measures (such as BMI, weight, sleep habits).

The general consensus in the shift work research community therefore is that while certain work schedules may result in health problems, there are few epidemiological studies of shift workers, and more empirical data is needed. Furthermore, no aspect of the 2003 rule or this final rule promotes the use of shift work within the transportation industry. FMCSA knows that some drivers will drive at night because of backward rotations of schedules or as a result of their preference to drive at night. The rule is ''shift-neutral'' with regard to driving during the daytime or nighttime. Therefore, in the Agency's best judgment, this final rule should pose no greater risk to driver health than the pre-2003 and 2003 rules with respect to shift work. By promoting 24-hour cycles, today's rule should, in point of fact, aid driver health in regard to shift work.

E.8. Efforts to Improve CMV Driver Health

Recognizing the important role that driver health and wellness play in driver safety, performance, job satisfaction, and industry productivity, FMCSA began a research project in May 1997 to design, develop, and evaluate a model truck and bus wellness program. The results of the research led to the creation of the ''Gettin'' in Gear'' program to create heightened awareness of and interest in driver health and wellness. Materials from this program were distributed within the truck and bus industry and provided basic health, nutrition, and fitness information to CMV drivers. The ''Gettin'' in Gear'' program was found to have a positive health impact on drivers who participated in the program, both initially and when the Agency followed-up with participants [Roberts, S., & York, J. (1999), pp. 15–28]. This was shown in both lifestyle habits (*e.g.*, exercising, resting, eating balanced meals) and physical data (*e.g.*, body mass index; pulse; diastolic blood pressure; aerobic, strength, and fitness levels).

In addition, FMCSA has assessed the prevalence of sleep apnea among CMV drivers and the safety impacts of this condition. FMCSA is currently working with the National Sleep Foundation to develop an education and outreach program to inform the motor carrier industry of the problem of sleep apnea and how it can be effectively addressed.

E.9. Driver Health Summary

Today's rule provides for 10 hours of consecutive off-duty time, giving drivers the opportunity to obtain 7 to 8 hours of restorative sleep per day. Research on the implementation of the 2003 rule shows that drivers are sleeping 6.28 hours of verified sleep and this is within normal ranges consistent with a healthy lifestyle. Actually, the data shows that, compared to pre-2003, drivers are on average sleeping more than an hour longer per day.

On the issue of exposure, FMCSA has not found any evidence that drivers are working significantly longer hours as a result of implementation of the 2003 HOS rule, although it would be permissive. While exposure to diesel exhaust may pose a cancer risk, no definitive link has been yet established. Without a definitive link it is impossible to determine the actual risk or estimate the societal costs of DE to CMV drivers' health. However, based on EPA estimates of lower emissions (starting in 1990 and continuing until 2030), and the fact that drivers do not appear to be working longer hours, the Agency believes that any potential health risk to CMV drivers already has been reduced and will be reduced more in the coming years.

The noise levels documented in the research have not been shown to exceed OSHA or FMCSA standards. Therefore, the noise levels in CMVs should not result in a significant risk of hearing loss. The studies that tested vibration in CMVs found that on average vibration was close to the ISO health risk threshold, but it did not consistently exceed the threshold. Changes in CMV cabs, diesel fuel, and engine designs appear to have greatly reduced any potential health risks associated with CMV driving. These changes have reduced drivers' exposure to diesel exhaust, vibration, and noise. The research has shown that exposure to these stressors do not to pose a significant health risk to CMV drivers.

The research suggests the presence of only a weak association between CVD and truck driving. No research studies were found that permitted an examination of whether additional hours of driving a CMV impacts driver health as measured by increased cardiovascular disease or myocardial infarction. In the Agency's best judgment, based on the research available, nothing implicates today's

HOS rule in a heightened risk of CVD or AMI.

The research on long hours and driver health is very limited. Research on other occupations is mixed and does not show conclusively that long hours alone adversely affect worker health. Also, FMCSA has not found any evidence that drivers are working significantly longer hours as a result of the 2003 rule. Therefore, the Agency has concluded that there is no clear evidence that the number of work hours allowed by the HOS regulation will have any impact on driver health.

While it is generally believed that shift work may result in health problems, there are few epidemiological studies conducted on shift workers. The most definitive research of shift work and health showed no relationship between shift work and worker mortality. A recent study of twins suggests that shift work does not alter important health measures (such as BMI, weight, and sleep). Regardless, today's rule is ''shift-neutral'' with regard to driving during the daytime or nighttime. Therefore, as previously stated, in the Agency's best judgment this final rule should pose no greater risk to driver health with respect to shift work.

F. Driver Fatigue

Over the past decade FMCSA has been conducting research and reviewing the literature on driver fatigue in support of its effort to revise the Agency's HOS regulations. In preparing this final rule, FMCSA internally reviewed and evaluated numerous research reports that were published prior to 1995. The TRB driver fatigue team already mentioned conducted a literature review to identify studies concerning hours of service and CMV driver performance and fatigue published after 1995. Additionally, the driver fatigue team reviewed additional studies that were referenced in the comments to the 2005 NPRM. The pertinent information from all these reviews was used in guiding the development of this rule and is discussed in context under the relevant provisions in Section J of this preamble. This section provides a discussion of driver fatigue research relevant to the various provisions finalized in today's rule. The following subsections will discuss research on: (1) Issues related to driver fatigue (2) Circadian influences (3) Driving, duty, and off-duty times, (4) Split-sleep, (5) Recovery, and (6) Short haul. In addition, the Agency's current and future fatigue research activities are discussed in Section G of this preamble.

F.1. Issues Related To Driver Fatigue

This regulation addresses the phenomenon of driver fatigue, *i.e.*, the partial and at times total loss of alertness resulting from insufficient quantity or quality of sleep. Sleep plays a critical role in restoring mental and physical function, as well as in maintaining general health. For most healthy adults, 7 to 8 hours of sleep per 24 hour period appears to be sufficient to avoid detrimental effects on waking functions. Young adults, for example, report sleeping an average of 7.5 hours per night during the week and 8.5 during the weekend [Carskadon, M.A., & Dement, W.C. (2005), p. 18]. In a laboratory study that compared the performance of two groups of subjects that spent 7 and 9 hours in bed, respectively, performance improved throughout the study. With 7 hours in bed, impaired performance was only found on the more sensitive tasks [Balkin, T., *et al.* (2000), p. ES–8]. Time in bed does not necessarily equate to time asleep; and time asleep does not always equate to quality sleep. For example, eight hours in bed is not likely to yield the same restorative benefit for someone with a sleep disorder or someone sleeping in a noisy, hot/cold, or otherwise uncomfortable environment, as it does for a ''normal'' sleeper. Studies of shiftworkers show that a given number of hours of sleep obtained during the late morning (waking hours) does not yield the equivalent amount of restorative sleep as the same number of hours obtained during the late night/early morning (sleeping) hours [Monk, T. H. (2005), p. 676].

F.2. Circadian Influences

Humans ''are biologically wired to be active during the day and sleepy at night'' [Monk, T. (2005), p. 674]. We have a homeostatic drive to sleep that interacts with the circadian cycle [Van Dongen, H.P.A., & Dinges, D.F. (2005), p. 440]. It has been well established that mental alertness and physical energy rise and fall at specific times during the circadian cycle, reaching lowest levels between midnight and 6 a.m., with, for some people, a lesser but still pronounced dip in energy and alertness between noon and 6 p.m. [Van Dongen, H.P.A., & Dinges, D.F. (2005), p. 439]. To stay alert throughout one's waking period, especially during these circadian troughs, most adults require 7 to 8 hours of quality sleep per day. Sleep obtained during the daylight hours of the circadian cycle is generally of poorer quality than sleep obtained during the nighttime/early morning ''sleeping hours.'' Working/driving during the ''third shift'' (midnight to 6 a.m.) has the combined effect of affording poorer quality daytime sleep, while requiring the driver to work/drive during times when the physiological drive for sleep is strongest. Changes of two or more hours in sleep/wake times cause one to become out of phase with the circadian cycle. This disrupts the synchronization of behavioral and biological processes (*e.g.*, cognitive performance, sleep, digestion, and body temperature), often resulting in increased fatigue and performance decrements. Circadian de-synchronization results from irregular or rotating shifts, especially those that are not anchored to a 24-hour day (*i.e.*, that start and end at different times each day), resulting in poor quality sleep and leading to accumulated fatigue. Backward rotating shifts that start an hour or more earlier each day also cause one to become out of sync with the circadian cycle, restricting sleep and leading to cumulative fatigue. ''Forward rotating shifts—starting at a later time each day— are not as good as a non-rotating shift, but are more compatible with the properties of the circadian system than are backward-rotating shifts.'' [Czeisler, C.A., *et al.* (1982), p. 462]. The importance of maintaining a 24-hour day was highlighted in the 1998 HOS expert panel report [Belenky, G., *et al.* (1998), p. 5].

The effects of the circadian cycle on driver alertness are addressed in this final rule in the 14-hour maximum on-duty and 10-hour minimum off-duty provisions (see Sections J.6 and J.7), which move drivers closer to a 24-hour day, while allowing some scheduling flexibility. This rule is far better than the pre-2003 HOS rule which allowed a backward-rotating schedule of 18 hours per day. Being more closely aligned to a 24-hour circadian cycle will allow drivers to obtain better rest, mitigate driver fatigue, and improve CMV safety.

F.3. Driving, Duty, and Off-Duty Times

A review of the past and current research provides support for adopting a maximum 14-hour driving window, which, when combined with the 10 hours off-duty provision, helps maintain a 24-hour clock (circadian cycle) and provides enough time for most drivers to obtain adequate sleep before returning to work.

Two studies that assess the length of driving time have been conducted since the 2003 rule went into effect.

One is an analysis of data from an on-road field test of a drowsy driver-monitoring device. The study monitored, among other things, driver

sleep quantity and the number of critical incidents (*e.g.*, crashes, near-crashes, and evasive actions) in which the driver became involved, and assessed driver fatigue and performance during critical incidents. Analysis of the study data, which were collected from May 2004 to May 2005, found that drivers included in the study were sleeping an average of 6.28 hours under the 2003 rule, which requires at least 10 hours off duty. For drivers who drove in both the 10th and 11th hour, no significant difference was found between the 10th and 11th hours of driving with respect to either alertness or involvement in critical events [Hanowski, R.J., *et al.* (2005), p. 9]. A similar but pre-2003 on-road study [Wylie, C.D., *et al.* (1996), p. ES–9] with 80 long-haul drivers who drove either 10 (U.S. rule) or 13 hours (Canadian rule) found that drivers were averaging 5.18 hours sleep per night. Both the Canadian and U.S. HOS rules that were in effect at the time required a minimum 8 hours off duty. Thus, comparing these two studies, drivers working under the 10-hour minimum off-duty rule are averaging over 1 hour more sleep per night. In the Wylie, *et al.* [Id.] study, there was no difference in the amount of drowsiness observed in video records (for comparable daytime segments) between the 10-hour and the 13-hour driving times. Self-rating of fatigue increased with driving duration even though there were no strong performance changes, leading the authors to conclude, ''Time on task was not a strong or consistent predictor of observed fatigue'' [Wylie, C.D., *et al.* (1996), page ES–9].

Another study under the pre-2003 rule, ''Trucks Involved in Fatal Accidents'' (TIFA) [Campbell, K.L. (2005)], found an increase in crash/fatality risk with increasing driving time. This study included only data on crashes that occurred from 1991 to 2002, prior to the 2003 HOS rule change. Additionally, among the 50,000 trucks involved in fatal crashes that occurred over the 12-year period, only nine crashes involving drivers who drove in the 11th hour of driving were fatigue-related. Note that these drivers were probably driving illegally, since the pre-2003 rule had a 10-hour driving limit.

A recent study [Jovanis, P.P., *et al.*, (2005)] used time-based logistic regression models to develop crash risk estimates by hours of driving. While all drivers drive during the first hour of the trip, relatively few drive through the 11th hour. Therefore, the sample sizes in the 11th hour of driving are typically so small that the resulting model has a large standard error, particularly at the upper limits of the driving time. As a result, the model's 95 percent confidence intervals in the crash risk estimates for the 11th hour of driving show that the crash risk could be significantly higher than driving in the first hour, or it could be just slightly elevated above the first hour of driving. The most likely cause for this inconclusive result is small sample size.[2]

Sleepiness, performance decrements and crash risk follow the circadian cycle, that is, they peak in the late afternoon at one of the circadian low points [Wylie, C.D., *et al.* (1996), pp. 1–3; Akerstedt, T. (1997), p. 106]. This fact emphasizes the value of moving toward a 24-hour work/rest day. The 14-hour maximum driving window, combined with the 10-consecutive-hour minimum off-duty time provided in today's rule, moves toward stabilizing the 24-hour clock by helping to avoid driver shift rotation, and providing enough time to obtain 7–8 hours of sleep for most drivers. Rotating shifts that advance or delay the starting time for each subsequent shift can cause drivers to become out of phase with their circadian rhythm, depending on the extent of the change in their starting time. The 14-hour driving window and 10-hour off-duty time provisions of this final rule provide an opportunity to maintain a 24-hour work/rest day that will allow drivers to maintain circadian rhythm. FMCSA analysis indicates that approximately 22 percent of CMV drivers drive during the early morning hours (midnight to 6 a.m.). These drivers will benefit from the 10-hour minimum off-duty provision in order to maximize their sleep time.

Longer daytime work hours combined with good quality and quantity of sleep (7–8 hours) per day do not appear to pose a safety or health problem to CMV drivers. In a driving simulator study, the schedule of 14 hours on duty/10 hours off duty for a 5-day week did not appear to produce significant cumulative fatigue over the three-week study period [O'Neill, T.R., *et al.* (1999), p. 2].

In Wylie, *et al.* [*Id.*] and other studies, the authors point out that many of the drivers showed signs of, or reported, fatigue early in the workweek after their ''weekend'' off-duty period [Morrow, P.C., & Crum, M.R. (2004), p. 14; Hanowski, R.J., *et al.* (2000), p.17; Wylie, C.D., *et al.* (1996), p. ES–9], implying that sleep habits on non-work days are likely a significant contributor to driver fatigue. FMCSA regulations can provide an opportunity for sleep, but drivers need to maintain responsible sleeping habits.

Lin and his colleagues formulated an elapsed time-dependent logistic regression model to assess the safety of motor carrier operations [Lin, T.D., *et al.* (1993), p. 2]. Using crash data, this model provides estimates of the probability of CMVs having a crash. The estimates indicate that increased driving time had the strongest direct effect on crash risk. All of the data for these estimates were obtained from a single-less-than-truckload motor carrier. This study has many of the same problems associated with the time-based logistic regression models mentioned earlier; *i.e.*, small sample size in the later hours of driving. The authors concluded that crash risks ''are particularly disturbing at 8th hour of driving. Unfortunately this is when mathematical structure of the model becomes less certain * * * it weakens our conviction to recommend reducing driver hours regulations'' [Lin, T.D., *et al.* (1993), p. 10]. Understanding the limitations of their models, these authors did not recommend reducing driving time. They did, however, recommend increasing the minimum off-duty time from 8 hours to 10 hours.

The research findings associated with driving time are conflicting. The research on the effects of fatigue in operational (on-road) and simulated/laboratory settings generally have found no statistically significant difference in driver drowsiness or performance between the 10th and 11th hours of driving. The research analyzing crash data by time of day are typically conducted with small sample sizes, particularly in the 10th and 11th hours of driving, and the driver samples are arguably not representative of the whole industry. These studies generally find increasing risk with longer driving hours. On-road/simulator studies, however, have found no increase in fatigue or critical incidents while driving as many as 11 or as many as 13 hours per day. The Agency regards the research on driving time as inconclusive. FMCSA is adopting an 11-hour driving limit for the reasons given in sections H and J.5. The data on off-duty time is less problematical. Drivers appear to be obtaining more sleep as a result of the 10-consecutive-hour off-duty provision in the 2003 rule. The Agency has therefore decided to adopt a 10-hour off-duty requirement for CMV drivers, coupled with a 14-hour driving window. This will move CMV drivers toward a more-stable 24-hour clock. Because there is a good deal of evidence that hours of continuous wakefulness

[2] Statistical estimates based on small sample sizes tend to have large sampling variations, meaning that detecting statistically significant differences between two estimates may not be possible.

are a better predictor of fatigue than driving time, a 14-hour non-extendable driving window will help to reduce driver fatigue, compared to the extendable 15-hour window included in the pre-2003 rule. See Sections H.6 and J.5 through J.7 for a more detailed discussion of the Agency's findings and decisions regarding driving, duty, and off-duty times.

F.4. Split Sleep

In the 2003 rule, drivers using trucks equipped with sleeper berths were allowed to split their 10-hour off-duty/sleep time into two periods of varying length as long as the shorter of the two periods was a minimum of two hours. This exception to the 10-consecutive-hours off-duty rule had, in many instances, resulted in drivers splitting their sleep into two periods. Drivers could, for example, divide their sleep over two 5-hour periods. The National Transportation Safety Board (NTSB) has been critical of the split sleep provision in the past, noting that, ''* * * sleep accumulated in short time blocks is less refreshing than sleep accumulated in one long time period'' [NTSB (1996), p. 46)].

Sleep becomes fragmented when drivers elect to take their sleep in two shorter periods, rather than one 7 to 8 hour period. Fragmented sleep has less recuperative value and has been shown to be similar to partial sleep deprivation in its effects on performance [Belenky, G., *et al.* (1994), p. 129]. Studies of truck crash fatalities indicate that split sleep taken by drivers has an adverse effect on CMV safety. In a study of heavy truck crashes and accidents, NTSB cited police accident reports that show decrements in performance occurring earlier for drivers using sleeper berths. NTSB also found that ''drivers using sleeper berths had a higher crash risk than drivers obtaining sleep in a bed.'' NTSB reported that ''split-shift sleeper berth use increases the risk of fatality more than two-fold;'' and ''[s]plit-sleep patterns are among the top three predictors of fatigue-related accidents'' [NTSB (1996), p. 46]. In summary, NTSB concluded that accumulating 8 hours of rest in two sleeper-berth shifts increases the risk of fatality to tractor-trailer drivers who are involved in crashes.

An earlier study by the Insurance Institute for Highway Safety (IIHS) examined the association between sleeper berth use in two periods and tractor-trailer driver fatalities [Hertz, R.P. (1988)]. The findings from this study were similar to those reported by the NTSB. The IIHS found that, ''* * * split-shift sleeper berth use (driving without an eight-hour consecutive rest period), increased the risk of fatality over twofold;'' and that, ''* * * split-shift sleeper berth use increased the risk of fatality in all analyses except those limited to urban crashes and local pick-up and delivery crashes'' [*Id.*, p. 7]. The results of this analysis also found that accumulating 8 hours of rest over two sleeper berth periods increases the risk of fatality to tractor-trailer drivers who are involved in crashes. IIHS further concludes ''[t]he fact that risk remained the same regardless of team status suggests that increased risk of fatality is associated with nonconsecutive sleep rather than disturbance from the motion of the truck while sleeping'' [*Id.*, p. 11].

Today's rule is based on the research cited and addresses the concerns about driver fatigue resulting from sleep fragmentation by requiring a consecutive 8-hour sleeper berth period to allow drivers to obtain one primary period of sleep and a second 2-hour off-duty or sleeper berth period to be used at the driver's discretion for breaks, naps, meals, and other personal matters. The new sleeper berth provision is fully described in Section J.9 of this preamble.

F.5. Recovery

Sleep restriction over several days leads to a degradation in alertness and driving performance. When sleep is restricted by extended duty periods or night work, cumulative fatigue occurs and an extended off-duty period is needed to recover. Past studies have indicated that a large percentage of drivers (commercial and noncommercial) get less than the commonly recommended 7 to 8 hours sleep per day. [Dinges, D.F., *et al.* (2005), p. 38; Balkin, T., *et al.* (2000), p. 4–48; Mitler, M.M., *et al.* (1997), p. 755; Wylie, C.D., *et al.* (1996), p. ES–10]. Many drivers who obtain less than their daily requirement of sleep over time incur a sleep debt; the resulting cumulative fatigue leads to an increased crash risk [Hanowski, R.J., *et al.* (2000), pp. 11–12]. Recovery time is required to restore the mind and body to normal function and health, as well as to erase the deleterious effects that sleep loss has on alertness and performance.

The TRB fatigue team found five studies that provided information regarding the recovery time needed for CMV drivers after working a long week. Four of these studies provide support for recovery periods of 34 hours or less while only one of these studies supports a recovery period longer than 34 hours.

Two studies suggest that a single 24-hour period is sufficient time for a driver to recover from any cumulative fatigue. Alluisi's research [Alluisi, E.A. (1972), p. 199] involved subjects who worked 8 hours a day for 3 days, followed by a 4 hours on/4 hours off schedule (similar to driving with a sleeper berth) over a 2-day period. He found that the average performance of drivers dropped to 67 percent of baseline toward the end of this period. A 24-hour rest period was sufficient to permit recovery back to baseline. A simulator study examined daytime driving of 14 hours on/10 hours off over a 15-day period [O'Neill, T.R., *et al.* (1999), p. 36]. These authors found that 24 hours was an adequate amount of time for recovery. A third study [Feyer, A.M., *et al.* (1997), p. 541] found a dramatic recovery with respect to fatigue in team drivers who stopped overnight in the middle of a 4 to 5 day trip. Thus, with less than 24 hours off, a single night of sleep was very helpful for recovery. A fourth study [Balkin, T., *et al.* (2000), p. 1–2] found that whether or not 24 hours was sufficient depended on the sensitivity of the performance measure used to assess recovery. Subjects who carried out performance tasks during the day and were restricted to 3, 5, or 7 hours in bed at night were fully recovered after 1 day of recovery sleep of 8 hours in bed, if the performance measure was lane tracking or simulator driving crashes. If the measure was performance on the psychomotor vigilance test (PVT), a more sensitive test of fatigue, then recovery required more than 24 hours. The group who had 9 hours in bed during the work period, but were then restricted to 8 hours in bed during the recovery period, did not perform well on lane-tracking as well as during the work period, clearly illustrating how sensitive and essential one's performance is to even one additional hour of sleep.

The TRB driver fatigue team found two recovery studies that were conducted with CMV drivers in a field environment. The Wylie [Wylie, C.D., *et al.* (1997)] study was a small demonstration study of a methodology that could be used to evaluate drivers' recovery periods. Twenty-five drivers were assigned into small groups (four to five drivers) and were used to evaluate different recovery (12-, 36-, and 48-hour) periods and driving time. None of the recovery periods examined were found to be of sufficient length for driver recovery. However, the study concluded that the small subject sample limited the ability to make reliable estimates of observed effects [Wylie, C.D., *et al.* (1997), p. 27].

The methodology and sample size nullifies Wylie study findings, and the

Agency has not relied on this study in determining the appropriate recovery period for CMV drivers. Balkin [Balkin, T., *et al.* (2000), p. 5–1] as discussed in the previous section, found that after 7 days of daytime work, when sleep had been restricted to 5 or 7 hours in bed, a recovery period of more than 24 hours was required to return to baseline levels of the most sensitive performance task. For extreme sleep restriction of 3 hours in bed, 72 hours recovery was insufficient to bring performance of the PVT task back to baseline.

While the research on driver recovery appears limited to five studies that particularly focus on CMV driver recovery, two simulator studies suggest that 24 hours is sufficient for recovery after 70 hours of daytime driving [O'Neill, T.R., *et al.* (1999), p. 2; Alluisi, E.A. (1972), p. 199]. One on-the-road study found that drivers achieve adequate recovery after 24 hours off duty. Another on-road study suggests that 36 hours is not quite sufficient with regard to PVT measures, but is adequate for driving parameters, including lane-tracking performance during daytime driving.

In balance, most of the research with CMV drivers supports the assessment that a recovery period of 34 consecutive hours is sufficient for recovery from moderate cumulative fatigue. The importance of two night (10 p.m.–6 a.m.) recovery periods was highlighted by the 1998 HOS expert panel report [Belenky, G., *et al.* (1998), p. 13]. The majority of drivers (approximately 80 percent) are daytime drivers, and would likely start their recovery period between 6 p.m. and midnight. All of these drivers would have the opportunity for two full nights prior to the start of the next work week. For a more detailed discussion regarding the recovery period provision of this rule, see Section J.8 of this preamble.

F.6. Short-Haul

Motor carrier operations that are conducted solely within a 150 air-mile radius from their terminals and require drivers to return to their work-reporting location every night are generally considered short-haul operations. A review of the research literature revealed only a few studies on short-haul operations. The first study reviewed was the Massie study [Massie, D.L., *et al.* (1997)] which found that short-haul drivers have significantly fewer fatigue related crashes as compared to drivers for longer trips (0.4 percent for short-haul trucks compared to 3.0 percent for other trucks). Another important finding was that ''class 7–8 trucks [26,001 pounds gross vehicle weight rating (GVWR) and up] have a fatigue-related fatal involvement rate 8 times higher than class 3–6 trucks [10,001–26,000 pounds GVWR]; over-the-road trucks have a rate 18 times higher than local service trucks; and the rate for tractors exceeds the rate for single-unit straight trucks by a factor of 11'' [Massie, D.L., *et al.* (1997), p. 35].

A second study evaluated the stress that short-haul drivers face daily. Researchers that administered a cross-sectional questionnaire to 317 CMV drivers found that short-haul drivers have significantly higher stress-related symptoms than the general adult population [Orris, P., *et al.* (1997), p. 208]. These drivers perceived their daily events to be more stressful than the norm because of heavy workloads and inflexible schedules.

Hanowski, *et al.* (1998; 2000) conducted two studies on short-haul drivers—a focus group and a field study. The first study provided a better definition of what constituted a short-haul driver and the varied tasks and demands they encounter [Hanowski, R.J., *et al.* (1998), p. 1]. The focus groups concluded that driving was not their primary task, accounting for about 40 percent (less than 5 hours) of their work time, scattered throughout the day. The two safety problems most often mentioned by short-haul drivers were dealing with poor driving by operators of cars, pickups, SUVs, etc., and ''stress due to time pressure.'' Additionally, Hanowski, *et al.* [Hanowski, R.J., *et al.* (2000), pp. 1–162] conducted a field study of short-haul drivers with instrumented vehicles to gain a better understanding of critical incidents that occur within short-haul operations. A critical incident was defined as a near crash event, *i.e.*, an event that without evasive action by the driver would likely have resulted in a crash. Of the 249 critical incidents found in the study, 137 were attributed to ''other'' (*i.e.*, non-CMV) drivers, 77 to the short-haul drivers, and 35 were attributed to incidents outside the control of the driver, such as an animal in the road. Fatigue played a role in only 6 percent of those incidents, and no fatigue crashes were reported [*Id.*].

In determining whether to allow short-haul drivers additional time to complete their deliveries, the Agency relied on both laboratory and field research studies which confirm the ability of drivers to work a 16-hour shift without significant degradation of performance. A laboratory study of 48 healthy adults found the critical wake period beyond which performance began to lapse was statistically estimated to be about 16 hours [Van Dongen, H.P.A., *et al.* (2003), p. 125]. A study of New Zealand drivers found that drivers could maintain their performance until about the 17th hour of wakefulness; beyond the 17th hour, performance capacity was sufficiently impaired to be of concern for safety [Williamson, A.M., *et al.* (2000), p. 3].

Some short-haul drivers do accrue fatigue, however, and in a field study of CMV drivers, it was found that short-haul drivers take short naps of 1- to 2-hours duration in order to reduce any fatigue accrued during the course of a normal work day. This study showed that these drivers take naps within the work shift while they are waiting for their vehicle to be loaded or unloaded or during normal breaks for meals [Balkin, T., *et al.* (2000), p. 4–63]. Short-haul drivers are unique in that they do not drive for long periods of time. As mentioned, Hanowski [Hanowski, R.J., *et al.* (2000), p. 17] found that only 40 percent of their time is actually spent driving, and that time was scattered throughout the day. Therefore, traditional performance models (time-on-task) do not apply because periods of driving are interrupted during their work day. Based on this evidence, FMCSA has concluded that because of the uniqueness of short-haul operations, and because short-haul drivers are involved in fewer crashes than long-haul drivers, they will be able to maintain alertness and vigilance for an additional 2 hours for 2 days per week.

The short-haul provision in this final rule takes into account the available research on short-haul drivers and addresses one of the key problems confronted by short-haul drivers—the stress of tight schedules. To set the context, the research discussed in Section F, ''Driver Fatigue,'' and elsewhere in this preamble suggests that driver fatigue is much less of an issue with short-haul drivers than with long-haul truckers, primarily because they return home nightly. Many also have fixed work schedules. Short-haul drivers typically operate during the daytime hours and are able to sleep at night, which is generally preferable to sleeping during the day. Short-haul drivers do not drive for long periods each day, either cumulatively or in a single session, and driving is usually followed by the physical activity of unloading throughout the day, which improves alertness. Short-haul drivers are less likely to fall asleep at the wheel due to driving monotony. In addition, short-haul driving generally occurs in urban settings requiring high levels of alertness, but also providing more stimuli to drivers. Short-haul crashes, when they happen, are more likely to

involve property damage than severe injuries or fatalities. Because the short-haul regime adopted by this final rule increases the work window available to short-haul drivers, it should relieve them, at little risk to CMV safety, from the stress and need to hurry caused by inflexible schedules and limited work hours. The new regulatory regime for short-haul drivers is described in more detail in Section J.10.

G. Current and Future FMCSA Research

In the 2005 NPRM, the Agency requested information on hours-of-service research issues, including data gaps and processes, and methodologies to facilitate data collection and analysis [70 FR 3350]. The Agency received no specific responses to this request. However, FMCSA continues to proactively research health and safety issues relevant to HOS.

The FMCSA Research and Technology (R&T) 5-Year Strategic Plan outlines a vision for delivering an appropriately targeted research and technology program that will assist in fulfilling FMCSA's primary mission to reduce crashes, injuries and fatalities involving large trucks and motorcoaches. One of the challenges identified in the R&T 5-Year Strategic Plan is to curtail driver fatigue and lack of alertness. Fatigue and the lack of alertness are factors in CMV crashes, but more research is needed to better understand the causes of fatigue and methods of improving alertness. Hours-of-service rules and driver-oriented programs will need to be continually evaluated and improved. R&T will investigate, by means of simulator and field studies, the factors affecting fatigue and the recovery times. Other initiatives identified in the R&T 5-Year Strategic Plan will also result in the research and evaluation of driver health issues. Moreover, in an effort to address the complex HOS health issues confronting CMV drivers, FMCSA anticipates working with NIOSH on areas of mutual concern and interest.

FMCSA is identifying, through the use of surveys, the best practices employed by experienced CMV drivers to manage their fatigue. This study will be published later this year. In addition, FMCSA has the following fatigue-related studies that are under way in 2005 and will continue for the next several years.

This research and survey of best practices may contribute to educational initiatives, to technological aids, to the rulemaking process on EOBRs, and to other aspects of CMV operation and regulation.

G.1. Fatigue Management Program

The FMCSA Fatigue Management Program (FMP), under development in partnership with Transport Canada, provides managers and drivers with a framework for managing driver fatigue through, among other items, awareness and education on screening for sleep disorders, biocompatible scheduling practices, and an understanding of the need and implications of good sleep habits. The program has been developed, pilot tested in the U.S. and Canada, and is currently in an evaluation phase where its cost and safety effectiveness will be assessed in an operational environment. Pending a positive result from the evaluation, the FMP materials will be revised and finalized, implementation guidelines will be developed, and comprehensive program materials and guidelines will be made available to motor carriers and individuals who wish to implement them.

G.2. Shift Changes and Driver Fatigue Recovery

The FMCSA Shift Changes and Driver Fatigue Recovery Study currently under way has two primary goals:

- Investigate and make recommendations regarding the minimum duration of off-duty periods required for CMV drivers to recover from the effects of cumulative fatigue resulting from various work shift conditions.
- Complete a study and publish a report with conclusions and recommendations from the Shift Changes and Driver Fatigue Recovery Study.

Hours-of-service initiatives in both the United States and Canada have highlighted scheduling issues closely related to shift changes, in particular, the issue of ''weekend'' recovery from cumulative fatigue. Although CMV drivers may take their ''weekends'' on any day of the week, the issue of concern is the recovery process that occurs during these days off. If some degree of sleep deprivation occurs during the workweek for drivers (especially when that week has involved night driving and/or shift changes), it is critical that drivers have sufficient time off during their ''weekend'' to recover full alertness and physical vitality. This continuing research is focusing on the recovery process in the context of various schedules including day driving, night driving, and rotating shifts. After conducting a review of the relevant literature (Phase I), a research plan was developed that includes recommended hypotheses to be examined and empirical research methodologies to be employed (Phase II). In 2005, a contract was awarded to conduct the empirical studies (Phase III). A final report stating study conclusions and recommendations (Phase IV) will be completed by the end of 2007.

G.3. Advanced Driver Fatigue Alerting Technology

The objective of FMCSA's Advanced Driver Fatigue Alerting Technology research initiative is to increase driver alertness through a fatigue-alertness monitor. This will be done by establishing a low cost, reliable, comfortable, rugged, and user-friendly driver fatigue and alertness technology. Driver fatigue-alerting technology is intended to monitor driver drowsiness, provide continual alertness level feedback to the driver, and provide alerts and warnings when the driver's alertness level falls below a specified threshold.

Currently, FMCSA in partnership with NHTSA is conducting a proof-of-concept test of a drowsy-driver detection system based on the PERCLOS (percent of time the eyelids are closed 80% or more over a given time period) concept. PERCLOS has been demonstrated to be the most valid measure of driver fatigue. The current infrared-based technology to measure PERCLOS appears to work well at night, but has the limitation of not working in daylight, limiting the system's utility to night driving. FMCSA plans to explore new technologies and combinations of technologies or measures, such as steering, lane tracking, etc. that may overcome these limitations, and investigate development of a more robust system. The objective is to identify and develop a relatively low-cost device to be used primarily to reinforce driver fatigue training and promote behavioral change to assure drivers are well rested.

G.4. Effects of Vehicle Ergonomics on Driver Fatigue

The FMCSA Effects of Vehicle Ergonomics on Driver Fatigue initiative plans to identify design alternatives to assess the effects of vehicle ergonomics on driver fatigue. There have been many human factor studies designed to determine the effects associated with driving a CMV. However, there are no current studies to determine the effects of ergonomics on driver fatigue and CMV safety. Therefore, it is difficult for FMCSA to provide guidance or support to ergonomic-related rules that could improve safety. This study will review the project objective, conceive design

alternatives, examine methods, evaluate feasibility, and develop a final design incorporating a pilot study capable of demonstrating the approach's viability.

H. Crash Data

FMCSA compiled and reviewed recent large truck crash data throughout the industry to assess the impacts of the 2003 rule on crash rates, and to determine if there are ways to improve the 2003 rule to better address fatigue and fatigue-related crashes. This review consisted of examining the following studies and data sources: (1) Trucks Involved in Fatal Accidents (TIFA), (2) Virginia Tech Transportation Institute (VTTI) (preliminary), (3) Penn State University (preliminary), (4) data submitted in comments to the NPRM, and (5) Fatality Analysis Reporting System (FARS).

H.1. Trucks Involved in Fatal Accidents (TIFA) Data

The Trucks Involved in Fatal Accidents (TIFA) file combines data from the FARS with additional data on the truck and carrier collected by the University of Michigan Transportation Research Institute (UMTRI) in a telephone survey with the truck driver, carrier, or investigating officer after the fatal crash. TIFA records six variables: fatigue, time of day, power unit type, carrier type, intended trip distance, and hours driving since the last 8-hour off-duty period.

The report used by the Agency [Campbell, K.L. (2005)] reviewed TIFA data for the years 1991 through 2002 (the most recent year available). The sample size of this file represents over 50,000 medium/heavy trucks involved in fatal crashes in the U.S., roughly 1,000 of which were fatigue related. The objective of this report was to identify the operating conditions where the most fatigue-related crashes occur and to determine the association of fatigue risk factors with fatal crashes.

Over the period reviewed, the report found a gradual decline in the percent of trucks involved in all fatal crashes where truck driver fatigue was present at the time of the crash, with fluctuations around the downward trend. Campbell also noted that ''[b]oth prevalence and risk point to long-haul tractor drivers as the appropriate focus of efforts to reduce the incidence of fatigue.''

When examining the prevalence of fatigue-related fatal crashes by the number of hours driven at the time of the crash, the data reveal that the majority of such crashes occur in the early hours of the trip. This is largely attributable to exposure, since each trip necessarily begins with the first hour, which must be the most frequently driven. However, when examining the relative risk of a fatigue-related crash by hours of driving, or the number of trucks involved in fatigue-related fatal crashes in a given driving hour as a percent of all large trucks involved in fatal crashes in the same hour, the results trend differently. The likelihood a truck driver was fatigued at the time of a fatal crash generally increases with the number of hours driven. TIFA data show that the relative risk of a large truck being involved in a fatigue-related crash in the 11th hour of driving or later is notably higher than in the 10th hour of driving.

Despite its scope and complexity, however, TIFA data must be treated with caution. The number of fatigue-related crashes that occurred in the 11th hour of driving or later is extremely small. Of the roughly 1,000 trucks involved in fatigue-related fatal crashes between 1991 and 2002, only nine were operating in the 11th hour of driving time.

The HOS rule in effect when the TIFA data were collected allowed only 10 hours of driving, required a minimum off-duty period of only 8 hours, and allowed driving within a 15-hour window that could be extended by the amount of off-duty time taken during that period. The 2003 rule, which allows up to 11 hours of daily driving but requires 10 hours off duty, may have reduced the risk of driver fatigue and thus the percent of large truck fatal crashes involving fatigue. The applicability of TIFA data under the regulatory environment created by the 2003 rule is no longer clear.

FARS, the source of the crash data for the TIFA study, does not contain information on driving hours at the time of the crash. TIFA researchers therefore contact the driver (or the employing carrier) after the fatal crash to collect such information. However, a good deal of time can elapse (more than a year in some cases) between the date of the crash and the date the TIFA researcher first contacts the driver (or the employing carrier). This delay raises the question whether the driver can accurately recall his/her driving time so long after the incident.

H.2. Virginia Tech Transportation Institute Study

FMCSA contracted with the Virginia Tech Transportation Institute (VTTI) to collect and analyze data on crash risk during the 10th and 11th hour of driving as part of an on-the-road driving study VTTI was conducting under an FMCSA/NHTSA joint initiative. This study offered an opportunity to analyze empirical, real-world data obtained under the 2003 HOS rule. The primary goal was to determine the effect of the 11th hour of driving on driver performance and drowsiness.

Data collection for the study, ''A Field Operational Test of a Drowsy Driver Warning System,'' began in May 2004. All data collected through May 1, 2005 were used in this analysis. The researchers have found no statistically significant difference in the number of ''critical'' incidents in the 10th and 11th hours of driving [Hanowski, R. J., *et al.* (2005), p. 9]. The study defines critical incidents as crashes, near crashes (where a rapid evasive maneuver is needed to avoid a crash) and crash-relevant conflicts (which require a crash-avoidance maneuver less severe than a near-crash, but more severe than normal driving). When the occurrence of critical incidents is used as a surrogate for driver performance decrements, there is no statistical difference between the 10th and 11th hour of driving. The study has also determined that drivers are not measurably drowsier in the 11th than the 10th hour of driving. These results may be related to another finding, that drivers appear to be getting more sleep under the 2003 rules than they did when the minimum off-duty period was only 8 hours. Compared to four sleep studies conducted under the pre-2003 rules (see section E.1), the Hanowski study found that drivers operating under the 2003 rule are obtaining over 1 hour of additional sleep per day [*Id.*, p. 8]

It should be noted, however, that the study is not yet complete. The study involves 82 drivers working for three trucking companies who had driven a total of 1.69 million miles as of May 1, 2005, under the 2003 HOS rule. A copy of this VTTI analysis is in the docket.

H.3. Crash Risk and Hours Driving: Interim Report II

In January 2003, the Pennsylvania Transportation Institute at Pennsylvania State University began work for FMCSA to model the effects of various commercial driving operational measures (hours driving, hours of rest, multi-day driving patterns) on crashes [Jovanis, P.P., *et al.* (2005)]. This study collected records of duty status (RODS) for 7-day periods prior to crashes, as well as for a non-crash control group. The RODS were collected between January 2004 and December 2004. Through time-dependent logistic regression modeling, the study found a pattern of increased crash risk associated with hours of driving,

particularly in the 9th, 10th and 11th hours, and multi-day driving. The study also suggests a higher crash risk associated with sleeper-berth operations. For all operations, the study found that the 11th hour of driving has a crash risk of more than three times that of the first hour.

Like the VTTI study, this study is incomplete. All RODS were collected from 3 for-hire motor carriers. The researchers obtained RODS for 231 7-day periods with one or more crashes and 462 7-day control periods with no crashes. Driving in the 11th hour occurred only 34 times.

H.4. Comments on Crash Risk and Data

Many companies and associations submitted data on crash and injury rates. Figure 4 shows changes in DOT recordable accidents, preventable accidents, and injuries under the 2003 rule, as reported in several comments. In general, the data show that crash and injury rates were lower in the year since the 2003 rule went into effect in January 2004.

FIGURE 4.—CHANGES IN ACCIDENT AND INJURY RATES FROM 2003 TO 2004

[Per million miles]

Commenter	Fleet size	Crash or injury type	2003	2004	Percent change
Maverick Transportation	1100 power units	DOT recordable accidents	0.63	0.60	·4.8
		Preventable accidents	0.32	0.24	·25
		Crash-related injuries			·30
Roehl Transport	1600 power units	DOT accidents involving injuries	0.08765	0.06554	·25
ABF Freight System	1635 road tractors	Over-the-road accidents	*1.49	1.42	·4.6
		Preventable road accidents	*0.715	0.586	·15
		Injuries for over-the-road drivers			·41
CR England	2550 power units	Collision-related injuries			·1.9
Overnite Transportation	6000 power units	DOT recordable accidents	0.84	0.80	·4.8
		DOT preventable accidents	0.31	0.31	0
		Collision-related injuries			·8.6
Werner Enterprises	8700 tractors	DOT recordable accidents	0.6898	0.7092	+2.8
		Chargeable accidents	0.3311	0.3238	·2.2
J.B. Hunt	11,000 tractors	DOT recordable accidents			·10
		DOT preventable accidents			·16
		Driver injuries as a result of motor vehicle accidents.			·19
Schneider National	13,340 tractors	Preventable major (over $100,000 in cost accidents.			·36
		Fatigue-related major accidents			·50
		Worker's compensation claims from vehicle accidents.			·10
ATA survey	77,000 to 79,000 trucks	DOT recordable accidents	0.60	0.57	·5.0
		DOT preventable accidents	0.24	0.24	0
		Injuries	0.81	0.75	·7.4
FedEx	71,000 motorized vehicles.	At FedEx Express, fatigue-related accidents.			·3.8
		At FedEx Ground, DOT recordable accident rate.			·9
		At FedEx Freight, driver injury rate			·4
National Private Truck Council.	63 questionnaires	DOT recordable accidents	0.4921	0.4248	·13.7
Minnesota Trucking Association survey.	85 questionnaires (61% long-haul carriers).	Preventable/recordable crashes			61% of members reported no change. 33% reported a decrease.

* Five-year average. Blank cells indicate data not reported.

In addition to the information provided in Figure 4, eighteen other companies and associations reported a decrease in crash rates, but did not provide data to support their claims, and 8 others found little change in crash rates between 2003 and 2004. The Commercial Vehicle Safety Alliance (CVSA) cautioned that additional data over a longer period of time are needed to determine to what extent the 2003 rule has impacted large truck safety.

ATA reported data showing that carriers had statistically significant lower average crash rates in 2004, causing ATA to believe that the 2003 rule is superior to the pre-2003 rule from the perspective of overall safety. Two State government agencies, however, pointed out that the FMCSA Motor Carrier Management Information System (MCMIS) data show an increase in CMV crashes. FMCSA considered the use of MCMIS data to examine changes in truck-related crashes between 2003 and 2004. However, the Agency decided to utilize FARS data for this analysis (see below), in lieu of available MCMIS data, for two reasons. First, the MCMIS crash data do not provide researchers the ability to isolate fatigue-related crashes, which are critical for this rulemaking. FARS data do provide this ability. Second, FMCSA crash data experts believe that, for a variety of reasons, MCMIS currently fails to capture roughly 20 percent of the fatal crashes that are reported in FARS. Because of these MCMIS limitations, FMCSA chose to use FARS data for its analysis.

The information provided by commenters is not available from any other source, but there is undoubtedly some variability in the methods and accuracy with which the data were collected. Equally important, the crash and injury reductions reported by

commenters cannot be definitively attributed to the effects of the 2003 rule, though some commenters noted that the rule is the only major variable that changed from 2003 to 2004.

H.5. Fatality Analysis Reporting System (FARS)

FARS is a national census of fatal crashes involving motor vehicles, including large trucks. FARS data are reported annually by the States, maintained by NHTSA, and are generally recognized as the most reliable national motor vehicle crash data available.

FMCSA began by analyzing the 2003 FARS Annual Report File. Because the 2004 Annual Report File had not yet been released at the time the analysis for this rulemaking was conducted, FMCSA examined its predecessor, the ''Early Assessment File,'' which typically contains most of the fatal crashes that eventually appear in both the Annual Report and Final FARS data sets. For example, a NHTSA comparison of calendar years 2002 and 2003 indicates that the Early Assessment File captured at least 75 percent of the total crashes and fatalities later included in the Annual Report Files for those years. Since the earlier months of the calendar year are reported more completely in the Early Assessment File, FMCSA restricted its analysis to the first 9 months of 2003 and 2004.

FMCSA examined all fatal crashes involving large trucks from January through September of 2003 and 2004, as well as those where the truck driver was coded as fatigued at the time of the crash. Results from this year-to-year comparison are presented in Figure 5.

FIGURE 5.—FATAL CRASHES INVOLVING LARGE TRUCKS

[Calendar years 2003 and 2004 (first 9 months of each year)]

Calendar year	Total crashes	Number	Fatigue-related (truck driver) crashes
			Percent
2003	3,120	54	1.7
2004	2,954	43	1.5
Year-to-Year Difference (Number)	·166	·11	·0.2
Year to-Year % Difference	·5.3	·20.4	·11.8

Source(s): 2003 Fatality Analysis Reporting System (FARS) Annual File; 2004 FARS Early Assessment File, National Highway Traffic Safety Administration.

Figure 5 shows that the total number of fatal crashes involving large trucks decreased by 166, from 3,120 in 2003 to 2,954 in 2004. This represents a 5.3 percent reduction. The number of large truck crashes where the driver was coded as fatigued dropped by 11 crashes, or 20.4 percent. More importantly, however, fatigue-related fatal crashes are down from 1.7 percent of all crashes in 2003 to 1.5 percent in 2004, an 11.8 percent reduction.

These reductions in fatigue-related fatal crashes are very small, and are not enough to allow final conclusions about the long-term impact of the 2003 rule on highway safety. However, the available information may suggest that fatigue-related crashes overall are trending in the right direction.

H.6. Conclusion

Available information on the effect of allowing 11 hours of driving time is inconclusive. TIFA is a large data set based on crashes that occurred across the nation over a relatively extended period. While the statistical risk increases rather sharply in the 11th hour of driving, in all the years from 1991 to 2002 TIFA classified only 9 fatal crashes that occurred in the 11th hour of driving as fatigue-related. Furthermore, TIFA data were collected at a time when Federal HOS regulations required only 8 hours off duty, and allowed driving within an extendable 15-hour window, both of which may have ensured that drivers operating in the 11th hour were more fatigued than would be the case under the 2003 rule. Finally, the pre-2003 rule allowed only 10 hours of driving, which means that drivers operating in the 11th hour were out of compliance with the rules at the time, and therefore may not be representative of drivers legally operating in the 11th hour after adoption of the 2003 rule.

The on-going studies by the Virginia Tech Transportation Institute and the Pennsylvania Transportation Institute are being conducted under the 2003 HOS rule and therefore avoid one of the problems associated with TIFA data. One finds that the 11th hour of driving poses an increased crash risk while the other finds no statistical difference between the 10th and 11th hours of driving. Because of the relatively short time since the 2003 rule was adopted, both studies acknowledge a considerable amount of uncertainty which may be resolved once the datasets increase.

Nearly all of the motor carriers and trucking organizations that submitted comments to the docket reported lower crash and injury rates in 2004, when the 2003 HOS rule was first enforced, than in 2003. This downward trend reveals nothing specific to the 11th hour of driving time, nor can it be attributed directly to the 2003 rule, but it does suggest that the net effect of the various provisions of the 2003 rule has not been harmful. However, the data summarized in Figure 4 were undoubtedly collected and reported with differing degrees of statistical sophistication. Still, the number of drivers employed by the carriers that provided information is very large and the downward trend in accidents and injuries is unmistakable.

Preliminary FARS data show that there were fewer fatigue-related fatal CMV crashes in the first nine months of 2004, when drivers and carriers were subject to the 2003 rule, than in the same months of 2003, when they were subject to the previous rule. Fatigue-related fatal crashes as a percentage of all CMV fatal crashes were also down in 2004. This result is similar to the information provided in motor carrier comments to the NPRM. The downward trend is clear, but the data do not allow a calculation of crash risk for each additional hour of driving.

In short, the available crash data do not clearly indicate whether the 11th hour of driving, combined with the other provisions of the 2003 rule, poses a significant risk. Because the data are not clear, for the purposes of this rulemaking's RIA, FMCSA conservatively assumed that the increased fatigue crash risk of driving in the 11th hour could be explained by the TIFA data as summarized in Campbell 2005, and FMCSA tests the robustness of the conclusions of this analysis

through a sensitivity analysis that assumes an even higher relative fatigue crash risk of driving in the 11th hour.

FMCSA carried out a cost/benefit analysis of a 10- and 11-hour driving limit and other aspects of this final rule. The results are described fully in section K.1 and in the Regulatory Impact Analysis (RIA) filed separately in the docket. Motor carrier operations were modeled very elaborately. As discussed above, the Agency used a time-on-task multiplier based on the TIFA data. The model assumed that the risk of the 11th versus the 10th hour of driving increased, as based on the TIFA data. FMCSA estimated that a 10-hour driving limit would save no more than 9.3 lives per year compared to an 11-hour limit, but at an annualized net cost of $526 million ($586 million in gross costs minus $60 million in safety benefits), relative to an 11-hour limit. In other words, a 10-hour driving limit would cost more than $63 million per life saved.

FMCSA conducted a number of sensitivity analyses regarding the relationship between fatigue-related crash risk and driving in the 11th hour to test the sensitivity of the RIA results to the assumptions built into the model. The sensitivity analyses are contained in Chapter 6, Section 8, of the RIA.

While the Agency did not explicitly estimate the marginal costs and benefits of limiting daily driving to 8 or 9 hours, FMCSA believes that such a change would not be any more cost beneficial than a 10-hour limit. This is due to the fact that, while the increase in the relative risk of a fatigue-related crash generally rises after the 8th hour of driving (according to the TIFA data), the increase is more notable in the 10th hour and later. Therefore, since the Agency's economic evaluation shows that a 10-hour driving limit results in considerably higher costs than benefits, compared to an 11-hour limit (holding all other HOS regulations constant), it logically follows that limiting driving time to 8 or 9 hours would yield the same result. Additionally, limiting daily driving to 8 hours, for instance, could increase the impact of a backward rotating schedule for some drivers (8 hours of driving + 10 hours off duty = 18 hours) relative to the 2003 rule (11 hours of driving + 10 hours off duty = 21 hours). Such a change has the potential to increase fatigue-related crash risks due to the disruption of driver circadian rhythms.

Although FMCSA's mission is improved CMV and highway safety, the Agency is required by statute to consider the costs and benefits of requirements it may impose [49 U.S.C. 31136(c)(2)(A) and 31502(d)]. Such consideration is clearly expected to influence the Agency's rulemaking decisions. The Department of Transportation currently uses $3 million as the ''value of a statistical life'' (VSL) for rulemaking purposes. A 10-hour driving limit would essentially have a VSL more than 21 times the current DOT standard. This cost per life saved is substantially higher than the maximum $10 million per statistical life cited by the Office of Management and Budget (OMB) in its guidance to Federal agencies on conducting regulatory impact analyses [OMB Circular A–4, p. 30]. Setting the maximum driving time at 10 hours would impose upon the motor carrier industry, an important sector of the American economy, regulatory costs entirely disproportionate to regulatory benefits. Most of the studies and analyses that report an increased crash risk in the 11th hour of driving are based on data collected while the driving limit was 10 hours and the minimum off-duty period 8 hours. The agency expected the new 10-hour off-duty period required by the 2003 rule to reduce driver fatigue and improve safety, despite allowing 11 hours of driving time instead of 10 hours. Comprehensive data to test that assumption are not yet available, but many motor carriers have reported lower crash and injury rates under the 2003 rule, and preliminary FARS data indicates that fatigue-related fatal truck crashes have declined, both in number and as a percentage of all fatal CMV crashes. This suggests that the pre-2003 studies and data connecting the 11th hour of driving with a higher crash risk may no longer be relevant because the 2003 rule has created better opportunities for restorative sleep, opportunities which drivers have used to good effect. In short, it is FMCSA's best judgment that the $526 million net cost of a 10-hour driving limit is too high to justify the modest benefits it would generate. This factor, coupled with the inconclusive nature of available crash data, has led the Agency to set the maximum allowable driving time at 11 hours after 10 consecutive hours off duty.

I. Operational Data

To better understand how the motor carrier industry has implemented the 2003 HOS rule and to help assess the safety and cost impacts, FMCSA compiled and reviewed several data sets on industry's current use of the 34-hour recovery provision, the 11th hour of driving, the 14-hour tour of duty, and split sleeper berth. Additionally, the Agency examined average weekly hours worked after implementation of the 2003 rule, as well as average nightly sleep. Data compiled or reviewed to answer these questions included that obtained from the 2005 FMCSA Field Survey, the 2004 Owner-Operator Independent Drivers Association (OOIDA) survey, the 2004 Stephen Burks Private Carrier Survey, Schneider National, Inc. (a large, for-hire truckload carrier), and the Virginia Tech Transportation Institute study.

I.1. 2005 FMCSA Field Survey

In January 2005, FMCSA initiated a survey by its field staff to assess the motor carrier industry's implementation and use of the 2003 rule. The data collected were based upon the driver records of duty status, or time records, as applicable, and included the months of July 2004 through January 2005. The survey results are based upon the collection of data from a cross-section of industry in 44 States, and represent a sizeable population of commercial drivers and on-duty periods in calendar years 2004 and 2005.

The project was conducted in conjunction with normal motor carrier review activities during the period of January 24, 2005 to February 4, 2005. While the survey was conducted, all compliance and enforcement decisions and actions followed established Agency procedures. To enhance the quality of the data collected, the Agency excluded drivers that were found to have falsified their records.

Overall, 269 motor carriers were surveyed, with 542 driver records examined. The majority of the survey (81 percent) was completed in conjunction with a compliance review; with the remaining (19 percent) in conjunction with a safety audit. A compliance review is an in-depth review of a motor carrier's compliance with the Federal Motor Carrier Safety Regulations (49 CFR parts 382 to 399) and Hazardous Materials Regulations (49 CFR parts 100 to 180), as applicable. Motor carriers are selected for review based upon safety performance or receipt of a non-frivolous complaint, or in follow-up to previous compliance/enforcement actions. A safety audit, on the other hand, is a review of the carrier's safety-management practices and controls, and is conducted within the first 18 months of the motor carrier beginning interstate operations. The safety audit is used to both educate the carrier and gather data to evaluate and determine whether the carrier has in place basic safety management controls to ensure safe operation of CMVs.

Of the carriers surveyed, 85 percent were classified as for-hire motor

carriers. Of the drivers surveyed, 80 percent were classified as over-the-road (OTR) drivers. For the purpose of this survey, OTR was defined as a driver who did not return to the terminal (work-reporting location) or home nightly.

The survey found the following:

34-Hour Recovery

Of the 542 drivers included in the survey, 393 (or 72.5 percent) used the 34 or more hours recovery provision at least once. For these 393 drivers, a total of 1,411 recovery periods were recorded. Looking at the length of all the recovery periods recorded in the survey (1,411), 67 percent exceeded 44 hours, 10.8 percent were 36 or fewer hours, and 4.68 percent were the minimum 34 hours. Slightly less than 27 percent of the drivers had one recovery period of 36 or fewer hours, while 11.4 percent had one recovery period of the minimum 34 hours.

11th Hour Driving

Of the 6,850 driving periods reviewed, 20.7 percent exceeded 10 hours of driving. This includes 4 percent that reflected driving beyond the 11th hour. In those cases where daily driving exceeded 11 hours, either the driver was in violation or not subject to the rule at that time. Looking just at the driving periods of OTR drivers, FMCSA found that 22.9 percent of these driving periods exceeded 10 hours of driving.

14 Hour Tour of Duty

Of the 7,262 tour-of-duty periods reviewed, 15.3 percent exceeded 12 hours, and 4.3 percent exceeded 14 hours. Looking just at OTR driver tours of duty, FMCSA found that 16.4 percent exceeded 12 hours and 4.6 percent exceeded 14 hours.

Sleeper Berth

Of the 2,928 sleeper-berth periods recorded, 68 percent exceeded 6 hours, and 52.6 percent exceeded 8 hours. A comparison of split-sleeper-berth periods found that the first period typically had longer hours (on average 1.5 more hours) recorded than the second split.

Midnight to 6 a.m. (Circadian Trough)

Of the 9,798 records evaluated, a total of 2,776 (28.3 percent) was found to have recorded duty/driving time between midnight and 6 a.m. In 1,149 of the records (or 11.7 percent) drivers exceeded 3 hours duty/driving during the midnight to 6 a.m. time period. It should be noted that 80 percent of drivers included in this survey were classified as over-the-road drivers (or those that did not return to their work-reporting location nightly), and as such, night driving may be over-represented in this sample.

Total Work Hours

On average, drivers recorded 8.78 hours of work per day (driving and on-duty not-driving), with a standard deviation in average hours worked per day of 2.9 hours. The daily hours worked produce a 7-day average of 61.4 hours.

While the drivers included in this survey are not representative of the entire interstate commercial driver population, this survey does provide a valuable snapshot of current operations (those under the 2003 rule), as well as the ''real world'' HOS habits of drivers.

I.2. OOIDA Survey

The Owner-Operator Independent Drivers Association (OOIDA) conducted a web-based survey of its members in 2004 to assess their experience with the 2003 rule. The survey comprised 17 questions and addressed such issues as the use of daily driving, the recovery period, and sleeper-berth provisions, as well as the rule's effect on income, wait times, time at home, naps, breaks, hours worked, fatigue, and other factors.

The OOIDA survey asked respondents to provide information on their type of operation by identifying themselves as either short-haul, regional, or long-haul drivers. However OOIDA provided no definitions (*i.e.*, ranges of daily miles driven) for the terms regional, short-, and long-haul driver. Of the 1,223 OOIDA members who provided such information in their survey responses, 153 (or 12 percent of respondents) identified themselves as short-haul drivers with total weekly miles averaging 2,041 and average runs (or lengths of haul) of 387 miles. According to the definition of short-haul operations used in the 2003 regulatory impact analysis (RIA), and the definition used in the RIA for this final rule, short-haul drivers are those with average lengths of haul of 150 miles or less. As such, the self-identified ''short-haul'' driver respondents to this survey represent what FMCSA considers to be regional or long-haul drivers, or those with average lengths of haul greater than 150 miles.

There were 377 respondents to this survey (or 31 percent) who identified themselves as regional drivers, for whom total weekly miles averaged 2,369 and average runs equaled 629 miles. Lastly, there were 693 self-identified long-haul drivers (57 percent) in this survey, for whom total weekly miles averaged 2,709 and average runs equaled 1,196 miles. Additionally, 666 (or almost 55 percent) of the 1,223 survey respondents indicated that they were leased to a motor carrier, 284 (or 23 percent) operated under their own authority, and the remaining 273 (or 22 percent) identified themselves as company drivers.

Regarding implementation of the 2003 rule, the survey inquired about OOIDA member use of the 11th hour of daily driving, 34-hour recovery, and split sleeper berth. Results indicate that during the month of June 2004 (the period for which information was requested), all survey respondents as a single group used the 11th hour of driving an average of 8.4 times, the 34-hour recovery period an average of 3.1 times, and the split-sleeper-berth exception an average of 4.0 times. To examine these survey results as a percentage of total work periods available to the driver, we divided survey results by 7- and 30-day periods, where applicable. For instance, we see that the 11th hour of driving was used during 28 percent of the 30 days in June (or 8.4 divided by 30). Additionally, the split-sleeper-berth-provision was used during 13 percent of the total days available (or 4.0 divided by 30). Lastly, the 34-hour recovery was used in 80 percent of the 3.9 available work weeks in June 2004 (or 3.1 divided by 3.9). OOIDA members who identified themselves as short-haul drivers tended to use each of these provisions the least. Regional drivers used the 11th hour of driving and the 34-hour recovery the most on average, and long-haul drivers used the split sleeper berth the most on average.

With regard to the rule's potential impact on drivers, one survey question asked, ''Have the new HOS regs helped you to establish and maintain a 24-hour work/rest cycle?'' 34 percent of driver respondents felt that the 2003 rule had in fact helped them to establish and maintain a 24-hour cycle, while 64 percent indicated they experienced no improvement within the first six months (two percent did not respond). Among driver types, long-haul drivers revealed the greatest improvement, with 38 percent indicating that the 2003 rule helped them establish and maintain a 24-hour cycle, while 30 percent of short-haul drivers indicated that the 2003 rule helped them to establish and maintain a 24-hour cycle.

In response to the question, ''Do you get more time at home under the new HOS regs regime?'' 20 percent felt they did in fact get more time at home as a result of the 2003 rule, while 77 percent indicated they experienced no increase

within the first six months (two percent did not respond). In response to this question, regional drivers reported the greatest improvement (22 percent), followed by long-haul drivers (21 percent), and then short-haul drivers (18 percent).

To the question, ''Do the new HOS regs allow you to get more rest and therefore reduce your level of fatigue?'' 29 percent of driver respondents replied the 2003 rule did in fact allow them to get more rest, while 60 percent indicated no improvement in rest time within the first six months. Regarding the second part of this question, 14 percent of respondents indicated that they never had fatigue. To this last question, long-haul drivers indicated the greatest improvement. Thirty-two percent received more time at home and felt less fatigued under the 2003 rule. Twenty-three percent of short-haul drivers felt that they received more time at home and therefore felt less fatigued under the 2003 rule. Driver responses to the complete set of OOIDA survey questions can be found in the docket.

I.3. Burks' Private Carrier Survey

Dr. Stephen Burks of the University of Minnesota, Morris, conducted a survey of private fleets in 2004 to determine the percentage of runs that utilized the three major provisions of the 2003 rule; namely, the 11th hour of driving, 34-hour recovery, and split sleeper berth. Additionally, several other operations-related questions were posed. A total of 31 firms responded to the survey, representing a total of 7,115 power units and 30.3 million miles traveled during the month of June 2004. The average run for this group of respondents was 537 miles, with a minimum reported run of 41 miles and a maximum reported run of 2600 miles. A more detailed summary of these survey results is included in the docket.

Results indicate that the 34-hour recovery period is the provision most used by private firms responding to this survey. The 34-hour recovery period was used on average in 61 percent of the respondents' runs. This does not necessarily mean, however, that all recovery periods utilized the minimum 34 hours recovery. In fact, as was seen in the FMCSA Field Survey, many drivers took more than the minimum required 34 hours off duty. The 11th hour of driving and split sleeper berth were used less often, according to Burks' survey. The 11th hour of daily driving was used on average in 31 percent of runs, while the split sleeper berth was used on 26 percent of runs.

The above percentages are averages, so there is variation among firms in the use of the provisions. Some private firms indicated they used each of these provisions on 100 percent of their runs, while others indicated that they never used them. As a result, when reporting mean values, any extreme outliers on either side can skew the results. Thus, the data may be better understood by examining the median value of responses to each of these questions, or the point at which half of the survey respondents indicated less use of a particular provision and half indicated more.

The median for the 34-hour recovery provision was 85 percent, indicating that half of survey respondents used the provision in fewer than 85 percent of its runs, while the other half used it in more than 85 percent of its runs (by ''run,'' it is assumed the researchers were referring to a firm's weekly runs when discussing the 34-hour recovery provision). Reporting the median value for the 34-hour recovery seems to validate the relatively high mean value reported earlier (61 percent), in that private firms appear to be utilizing this provision quite extensively. Regarding the 11th hour of daily driving, the median was 10 percent, indicating that half the firms surveyed used it in fewer than 10 percent of runs, while the other half used it in more than 10 percent. With regard to split sleeper berth, the median value was 2 percent. Thus, the median values for the 11th hour of daily driving and split sleeper berth indicate low usage of these provisions, respectively, by private firms responding to this survey.

I.4. Schneider National

At the Annual Conference of the Transportation Research Board (TRB), held in January 2005, in Washington, DC, a session was entitled, ''Truck Drivers Hours-of-Service: One Year Later.'' As part of this session, Mr. Donald Osterberg, a representative from Schneider National, Inc., one of the largest for-hire trucking companies, presented information on his company's experience under the 2003 HOS rule. During this presentation, Mr. Osterberg noted that roughly 10 percent of the Schneider fleet used the 11th hour of daily driving during the months of June and October 2004. The portion of the Schneider drivers using a sleeper berth to split their minimum 10-hour daily off-duty periods was 6 percent in early 2004, falling to roughly 2 percent in June of 2004, and falling further to fewer than 0.5 percent of drivers in October 2004. Also, Mr. Osterberg noted that between 26 and 32 percent of Schneider drivers used the recovery provision to take between 34 and 44 hours off between weekly on-duty periods. These results are consistent with those found in the FMCSA Field Survey discussed earlier. Mr. Osterberg's statements were supported by data provided upon request in a handout to FMCSA after the session. This handout consisted of various summary calculations of logbook entries pulled for the months of June and October 2004. These summaries are in the docket.

Regarding commercial drivers' current use of the most important provisions from the 2003 rule, a summary of responses from the aforementioned data sources is contained in Figure 6.

FIGURE 6.—SUMMARY OF SURVEY INFORMATION, CARRIER/DRIVER USE OF 11TH HOUR OF DAILY DRIVING, 34-HOUR RECOVERY PERIOD, AND SPLIT SLEEPER BERTH EXEMPTION

Date source	Percent of runs (daily or weekly) using HOS provision		
	11th driving hour (daily runs or on-duty periods)	34-hour recovery (weekly runs or on-duty periods)	Split sleeper berth (daily runs or on-duty periods)
FMCSA Survey	21	[1] 73	[2] N/P
OOIDA Survey	28	80	13
Burks Survey	31	61	26
Schneider National Logbook Summary	[1] 10	[2] N/P	[1] .05–6

[1] Percent of drivers (not daily or weekly on-duty periods).
[2] Not provided (NP) because of how the survey data were compiled and/or how they were reported publicly.

I.5. Virginia Tech Transportation Institute Study

An analysis was conducted of data collected from an ongoing FMCSA–NHTSA sponsored Field Operational Test of a Drowsy Driver Warning System. This on-the-road driving study, performed by Virginia Tech Transportation Institute (VTTI), began collecting data in May 2004. All data collected through May 1, 2005 were used in the current analysis [Hanowski, R.J., *et al.* (2005)]. In all, operational data were collected and analyzed from 82 CMV drivers working for one of three licensed trucking companies.

Preliminary results from this study reveal some interesting patterns concerning sleep duration. The results, based on 1,736 days of data for 73 drivers, show a mean daily sleep time of 6.28 hours with a standard deviation of 1.4 hours. Data collected from 80 truck drivers under the pre-2003 rule and with different driving schedules, found ''drivers averaged 5.18 hours in bed per day and 4.78 hours of electrophysiologically verified sleep per day over the five-day study (range, 3.83 hours of sleep . . . to 5.38 hours of sleep)'' [Mitler, M.M., *et al.* (1997), p. 755].

The ''hours in bed'' value from Mitler, *et al.* is a comparable measure to the mean hours of sleep value resulting from this new study. A study of long-haul drivers [Dingus, T., *et al.* (2002), p. 205] found self-reported sleep per night for single drivers, while on the road, to be approximately 5.8 hours. This study was conducted under the pre-2003 rule. The VTTI study also used single drivers (i.e., no teams); consequently, the Dingus *et al.* study can serve as another reference point to compare results.

In summary, preliminary results from the VTTI study have found drivers are sleeping considerably more (up to 1.5 additional hours per night on average) under the 2003 rule than either the Mitler *et al.* study or the Dingus *et al.* study found under the pre-2003 rule. One rationale for instituting the 2003 rule was to provide drivers with additional time off to provide more opportunity to obtain sufficient sleep. Based on the results of the Virginia Tech Study to-date, drivers appear to be getting more sleep per night on average, compared to data collected from drivers under the pre-2003 HOS regulations [Mitler, M. M., *et al.* (1997); Dingus, T., *et al.* (2002)].

J. Comments to Docket and FMCSA Response

Between January 24, 2005, and April 5, 2005, FMCSA received 1,790 comments from approximately 1,590 commenters on the 2005 NPRM. Figure 7 shows the number of comments by type of submitter. The number of comments, particularly for drivers, is greater than the number of individual commenters because some submitted multiple documents, answering in separate submissions each of the questions FMCSA posed.

FIGURE 7.—NUMBER OF COMMENTERS BY TYPE

Commenter type	Number of comments
Trucking Associations	20
Safety Advocacy Groups	9
Other Associations	31
Law Enforcement	4
Unions	3
Carriers	223
Drivers: Long Haul	312
Drivers: Short Haul	42
Drivers: Not otherwise specified	1,010
Other Industries	57
Others	79
Total	1,790

Of the carriers submitting comment letters, 203 letters were from for-hire firms and only 20 from private carriers; 112 identified themselves as long-haul carriers and 30 as short haul; 71 described themselves as owner-operators. It is likely that some of those classified as drivers are owner-operators, but unless they specifically stated that, they were not classified in that group. The ''Others'' group includes private citizens, a few third-party vendors, and one academic researcher; most of the private citizens may be drivers, but did not state that or provide a clear indication that identified them as drivers.

The following issue sections provide further details regarding comments submitted to this docket. Although issues are discussed one at a time, the Agency stresses that the proper focus is on their joint effects and on the resulting response. Section J.11 discusses the combination more directly.

J.1. Sleep Loss

In the 2005 NPRM, FMCSA requested information on both the beneficial and adverse effects of the 2003 rule on the health of CMV drivers, and expressed particular interest in information about any increase or reduction in sleep deprivation generated as a consequence of the 2003 rule. How much sleep do drivers operating under the new regulations average on a daily basis, the Agency asked, and how has this average changed as a result of the 2003 HOS rule.

One hundred thirty-four commenters, primarily drivers, responded to the question. Twenty-nine said that the 2003 rule made no difference to the amount of sleep they obtained, but 60 said they obtained more sleep under the new rule.

The Insurance Institute for Highway Safety (IIHS) reported that a survey it had conducted found that there was a ''slight increase in the percentage of drivers (from 40 percent in 2003 to 42 percent in 2004) who said they had driven while sleepy at least once in the past week.'' The percentage of drivers who reported actually dozing at the truck wheel on at least one occasion in the past month was 13 percent in 2003 and 15 percent in 2004.

FMCSA Response

When asked about the amount of sleep drivers were getting with regard to the 2003 rule and specifically the 10 consecutive hours off-duty provision, commenters confirm that drivers are in fact obtaining more rest today than under the pre-2003 HOS rule. An OOIDA survey referenced in Section I.2 and a joint NHTSA/FMCSA study referenced in Section I.5 of this preamble add additional support for this conclusion.

IIHS' data regarding drivers dozing while driving is not supported by current crash data; the data suggest that the number of fatigue crashes have decreased in the first 9 months of 2004 (43 fatigue crashes) compared to the first 9 months of 2003 (54). Therefore, even if the IIHS data is accurate and statistically significant, the dozing behavior does not appear to be relating to an increase in fatigue-related crashes. It is difficult to comment without knowing all of the details regarding the IIHS survey. However, based on the Agency's experience, one would expect that a two percentage point increase in reported dozing could be a function of sampling error and statistically insignificant.

J.2. Exposure to Environmental Stressors

FMCSA requested comments on how the 2003 rule, and in particular the extension of driving time from 10 to 11 hours and the shortened driving window created by the 14-hour limit, would affect a driver's exposure to environmental stressors, such as vehicle noise, vibration, and emissions.

Fifty-nine commenters, including 13 carriers, 44 drivers, one law enforcement organization, and one private citizen, responded that the 2003 HOS rule had little or no effect on

exposure to environmental stressors. They stated that modern truck technology has reduced vibration, noise levels, and emissions and that the consequences of any additional driving time were either offset by the workday restriction, or insignificant. ATA commented that potential driver exposure to diesel exhaust (DE) has decreased to a point below both Environmental Protection Agency (EPA) and OSHA requirements, and will probably further improve. ATA included tables illustrating the improvements. One carrier commented that more stringent regulations, improvements in technology and road conditions, and better maintenance practices had reduced environmental stressors.

ATA commented that modern truck cabs are much quieter, far quieter than the maximum requirement, are well ventilated, and have well designed, efficient heating and air conditioning units. Physical stress on drivers, including road vibration, is reduced by power steering. Many trucks are also equipped with automatic transmissions, further reducing stress. Improved suspension gives the driver a better ride, and provides better handling. The comfort and safety improvements in truck tractors improve the driver's conditions, leading to a reduction in stress and fatigue; and operators could drive an additional hour, ''yet be safer than drivers in the past.'' Two carriers also commented that modern trucks have greatly reduced noise and vibration. One carrier said that due to the lack of vibration, the quality of sleep in a new truck is ''great,'' while another wrote that drivers become less fatigued in the improved trucks.

In contrast to the commenters who identified little or no exposure to environmental stressors, Public Citizen, Advocates for Highway and Auto Safety (AHAS), and the National Institute for Occupational Safety and Health (NIOSH) responded with extensive summaries and citations of current research applicable to the question of exposure to environmental stressors.

Public Citizen stated that the largest source of diesel emissions is diesel-powered ''big-rigs,'' and other highway diesel vehicles. Truck drivers are constantly exposed to DE fumes, ''waiting for a load, stopping at a truck stop, or operating the truck.'' The long-term effect of breathing DE and other chemicals poses a significant potential source of risk for truck drivers, Public Citizen argued, providing numerous citations of articles and studies relating particularly to the health impacts of DE. It pointed out that while FMCSA expected that EPA emissions standards would result in a significant reduction in emissions from new diesel vehicles beginning in 2007, current, unmodified, diesel powered trucks would probably be operating through the 2030s. Public Citizen cited a report recently released by the Clean Air Task Force (CATF), of which Public Citizen is a supporting member, highlighting the toxicity of diesel emissions and numerous acute health risks associated with exposure to diesel emissions. Public Citizen concluded that ''Diesel particulate matter is well established as a probable carcinogen. * * * Moreover, fine particles have been documented by literally thousands of studies as associated with respiratory and cardiovascular diseases as well as premature mortality.''

Public Citizen disagreed with FMCSA that the impact of a one-hour increase in driving hours is unclear. Arguing that the 2003 HOS rule allowed an increase of more than 600 annual driving hours over the pre-2003 rule, Public Citizen stated that this increase represented hundreds of additional hours per year when truckers would be exposed to elevated levels of DE fumes. They concluded that ''A robust body of evidence indicates that the exhaust[s] are highly toxic and tied to a multitude of health risks, and therefore it is negligent of FMCSA to promulgate an hours of service rule that so significantly increases drivers' exposure to these fumes.''

AHAS criticized FMCSA for using in the 2005 NPRM almost exclusively studies that dealt only with commercial drivers, arguing that much relevant research literature existed in other work-related areas such as shift work fatigue and performance failures. AHAS provided numerous citations for studies that it regards as providing directly relevant findings from other occupational areas. AHAS asserted that FMCSA ignored relevant research, which it cited, from EPA and others that conclude that chronic DE inhalation exposure might be a cancer hazard for humans. AHAS also provided an extensive list of studies in the field of occupationally related whole-body vibration, and asserted that FMCSA had not included the most relevant studies in the docket.

AHAS listed and summarized numerous studies addressing the psychological and physiological effects of long working hours, irregular shiftwork, and accumulated sleep debt, and provided lists of sources of statistics and analysis on injuries and illnesses, including psychological disorders, digestive disturbances, headaches, high blood pressure, anxiety, gastrointestinal diseases, and reproductive dysfunction that it considered potentially affecting truck drivers.

NIOSH commented extensively on the issue of driver exposure to diesel fuel exhaust and other vehicle emissions. NIOSH conceded that assessing driver exposure to vehicle exhaust is complicated because of the variety of possible exposure scenarios, including driving, sitting in the cab, or working at a loading dock. NIOSH noted that few exposure assessments of commercial drivers had been conducted prior to the 2003 HOS rule and none have been conducted since. NIOSH reported that current research indicates that some health risks from DE are associated with particulate matter (PM) in emissions. EPA emissions standards have led to cleaner burning diesel fuel, and newer engines produce less PM. NIOSH wrote that DE particles increase allergic responses, and might lead to harmful structural changes in the airways, and that there is an association between PM and cardiovascular and respiratory morbidity and mortality.

FMCSA Response

Most, if not all, of the concerns raised by commenters regarding driver health have been evaluated and are addressed earlier in this preamble. FMCSA notes that the majority of commenters, particularly drivers, stated that the rule will have little or no impact on driver health. The Agency agrees with ATA's assessment that modern truck technology has reduced vibration, noise levels, and exposure to DE, and that the consequences of any additional driving time are either offset by the workday restriction, or insignificant.

Public Citizen and AHAS cited a number of studies that found an association between DE and cancer. The TRB driver health team reviewed these studies and selected studies relevant to this rulemaking to be summarized for the driver health evaluation discussed earlier in this preamble. The standards for inclusion were the validity of the methodology, the relevance of the studied population to truck driving and the quality of the statistical analysis of health outcomes. FMCSA has reviewed the research and does not dismiss the association; however, there have been significant changes in diesel engine design, changes in emissions standards, and changes in emission types and composition, which make many of these studies inapplicable to today's environment. EPA has stated there is considerable uncertainty about whether ''health hazards identified from previous studies using emissions from

older engines can be applied to present-day environmental emissions and related exposures, as some physical and chemical characteristics of the emissions from certain sources have changed over time. Available data are not sufficient to provide definitive answers to this question because changes in DE composition over time cannot be confidently quantified, and the relationship between the DE components and the mode(s) of action for DE toxicity is unclear'' [Ris, C. (2003), p. 33].

Public Citizen commented that the largest source of diesel emissions is from heavy vehicles. While that is true, DE is only one contributor to a complex pollution mixture, and there are many other combustion sources. DE from heavy vehicles represents only 23 percent of all emissions from all mobile sources. EPA models show that vehicle emissions from all mobile sources have declined significantly from 1990 to 2005 (average 35 percent reduction in emissions). DE has also declined 55 percent from 1990 to 2005 and it is projected to decline an additional 88 percent by 2030. Therefore, drivers are being exposed to less pollution than they were in the early 1990s when accurate data first became available.

Further, any health risk associated with DE will continue to diminish with planned changes in standards for diesel fuel and engines. EPA projections are based on estimates of vehicle miles traveled and new vehicles entering and old vehicles leaving the inventory, and reflect changes in vehicle emissions standards. Reductions in diesel particulate matter are occurring now; these are not reductions that will be seen in the next generation of diesel engines. The CATF study supported by Public Citizen argues that the Federal government needs to cut DE further and retrofit existing trucks to further reduce DE. However, as shown the mainstream research community has not quantitatively determined a precise dose-response relationship between DE and cancer. In fact, DE at current ambient environmental levels is not thought to be predictive of cancer; testing on rats at environmental levels has not led to the development of cancer [*Id.*, p. 35]. EPA has stated ''the DE exposure-response data for humans are considered too uncertain to derive a confident quantitative estimate of cancer unit risk, and with the chronic rat inhalation studies not being predictive for environmental levels of exposure, EPA has not developed a quantitative estimate of cancer unit risk'' [*Id.*, p. 36]. Additionally, the CATF study is based on some unrealistic and misleading assumptions. The study suggests that heavy trucks will remain in the inventory for more than 30 years; therefore changes in EPA standards will have little effect for many years [Schneider, C. G., & Hill, L.B. (2005), p. 8]. FMCSA analysis of commercial vehicle registration data from Polk & Co., a proprietary data collection firm, found that fewer than 50 percent of 2004 registered vehicles (Large Trucks over 26,001 GVWR) were greater than 10 years old and 87 percent were less than 20 years old. This means that the data being quoted in the CATF study are from a model that does not appear to be accurate—the productive life of a CMV is far less than 30 years. Potentially, this flaw could have dramatic changes in the predications regarding DE.

In addition, comments from Public Citizen, AHAS, and others regarding the increased health risk due to DE exposure are all predicated on the assumption that drivers are working more hours as a result of the 2003 HOS rule. A drastic increase in driving or on-duty time under that rule is impossible to reconcile with economic reality. The U.S. economy has been expanding strongly for some time, creating renewed demand for trucking services and a steady increase in vehicle miles traveled. But there has been no quantum leap in economic activity that would demand or support the greatly extended driving hours asserted by these commenters. Federal Highway Administration data show that the vehicle miles traveled (VMT) by all trucks increased by 26.03 percent between 1994 and 2002, the last year for which complete statistics are available. That works out to an average VMT increase of 2.89 percent per year [calculated from *www.fhwa.dot.gov/policy/ohpi/qftravel.htm].* The theoretical availability of many more driving and on-duty hours under the 2003 rule is largely irrelevant. Truckers drive to meet the demand for transportation, and VMT statistics show that demand increases (and occasionally decreases) in modest annual increments. Most of the additional demand is satisfied by adding new trucks and drivers to the motor carrier industry. The Agency has not found any data that suggests drivers are actually working significantly longer hours. Therefore, in the Agency's best judgment, drivers are not exposed to increased health risk as a result of the 2003 or today's rule.

J.3. Workplace Injuries and Fatalities

The 2005 NPRM requested comments about the impact of fatigue and loss of alertness on CMV driver workplace injuries and fatalities, and any evidence connecting workplace injuries and fatalities to specific aspects of the 2003 rule or previous HOS regulations. FMCSA explained that it was interested only in injuries directly related to the HOS regulations and operating a CMV, not other workplace injuries that are outside its jurisdiction.

Twenty-eight commenters said that the 2003 rule does not have an impact on workplace injuries. One carrier, B.R. Williams Trucking, which had reviewed the company's workplace injuries, stated that there had been neither an adverse nor a positive change related to the rule. Work schedules, hours driving, and hours off duty did not affect the company's injury rate.

Twenty-seven commenters expressed other views about workplace injuries and fatalities. Nearly all of them agreed that fatigue and loss of alertness can be a contributing factor, but some commenters pointed out that the amount of the contribution varies from one individual to another. One commenter suggested that injury and fatality statistics should be broken out by type of operation.

Other commenters were uncertain about the impact of the rule. Four thought the rule gave drivers more rest and limited their hours of work, so crashes and injuries should be reduced. Six mentioned data indicating that injuries had decreased in recent years, but they said those decreases were not necessarily attributable to the 2003 rule. Four believed the rule's lack of flexibility, the extra hour of driving allowed, or the inability to stop the 14-hour clock, could contribute to fatigue and lead to more crashes. Five commenters pointed out that many drivers' injuries occur when they are loading or unloading and said that drivers should not be required or allowed to perform these activities.

Public Citizen asserted the rule has a direct effect on injuries, and accused the 2005 NPRM of suggesting groundless limitations on FMCSA's legal responsibility to address them in the rule. For example, they stated that the ''Workplace Injuries and Fatalities'' section of the NPRM drew an ''unsupportable'' distinction between injuries relating directly to the HOS regulations and operating a CMV, and other workplace injuries and environmental stressors, such as loading and unloading. Rejecting the Agency's position, Public Citizen cited several FMCSA reports, technical analyses, and literature reviews that assessed non-driving issues, including loading and unloading, sleep apnea, and physical activity and their impacts.

Many commenters suggested workplace injuries and illnesses have decreased in 2004. The Motor Freight Carriers Association (MFCA) asked its membership to provide data and information regarding workplace injuries. MFCA's preliminary analysis of that data suggests that injuries and fatalities have decreased in 2004. They commented that ''while we are encouraged by these findings, it would be premature to attribute the results singularly to the change in hours of service rules.'' FedEx commented that ''in their pick up and delivery and their short and long haul divisions combined, there was a 5.44 percent reduction in injuries even with a 2.2 percent increase in hours worked for all employees.'' FedEx Freight reports the overall injury and illness rates for its driver population decreased by almost 4 percent from 2003 to 2004. Landstar Systems, Inc. commented that it had experienced 8.6 percent fewer on the job injuries with the 2003 HOS rule. Maverick Transportation, Inc. commented that it does not track injuries by loading/unloading, but the total number of injuries experienced by its drivers in 2004 decreased by 19 percent and crash-related injuries decreased by 30 percent compared to 2003. J.B. Hunt commented that it has on-going safety initiatives concurrent with the hours-of-service changes, so it is difficult to independently conclude that any changes in injuries are attributable to a single factor. J.B. Hunt reported that it experienced a 19 percent reduction in injuries categorized as ''driving/riding'' from 2003 to 2004. The carrier also found that injuries related to getting in and out of the truck declined by 18 percent.

FMCSA Response

The Agency agrees with ATA's assertion that the occupational injury and illness record of the trucking transportation industry has improved in the last five years. U.S. Bureau of Labor Statistics (BLS) data show that there have been significant reductions in workplace illness and injuries in the trucking industry—the number of nonfatal occupational injuries and illnesses involving days away from work has decreased from 152,803 in 1996 to 129,068 in 2001, a 16 percent decrease. Although the industrial categories changed slightly in 2003, the number of nonfatal occupational injuries and illnesses for truck drivers decreased 31 percent between 1996 and 2003.

BLS statistics for 2004 are currently being collected and analyzed and will not be available until November 2005. For this reason FMCSA requested data from the public in the 2005 NPRM regarding 2004 workplace injury and illnesses.

Many commenters cited data that showed that workplace injuries and illness have decreased in 2004. The Agency recognizes these comments are not a representative sample of the whole industry; however, FMCSA is encouraged that the information provided suggests that workplace injuries and illness appear to have decreased from 2003 to 2004. No commenters have suggested that injuries and illness have increased solely as a result of the 2003 HOS rule; nor does FMCSA.

Many commenters, particularly drivers, said that they did not see the connection between the HOS regulation and workplace injuries and illness. The Agency, based on its experience, however, believes that there clearly is a connection between driver fatigue and alertness. Further, one driver responded that ''the loss of alertness or fatigue affects a truck driver's ability to focus and judge distances causing crashes. These crashes are less prevalent under the new HOS because a driver gets more rest under these rules than under the old rules.''

Public Citizen asserted that the NPRM drew an ''unsupportable'' distinction between injuries relating to HOS regulations and other workplace injuries, which are outside the jurisdiction of the Agency. ''FMCSA expressly distinguishes injuries and fatalities relating to workplace hazards such as loading and unloading.'' The NPRM stated that FMCSA did not intend to focus on workplace injuries caused by conditions beyond the jurisdiction of the Agency [70 FR 3345], *e.g.*, falling down a staircase at a motor carrier terminal because a step was loose. OSHA has the authority to regulate that kind of threat to workplace safety. Public Citizen seems to assume that fatigue is an element in many non-driving accidents suffered by drivers, and that the HOS rule is therefore a ''major contributing factor'' to such mishaps.

FMCSA did not deny that drivers engaged in loading or unloading are subject to the HOS regulations; the 60- or 70-hour clock continues to run while drivers handle cargo. The Agency simply directed commenters' attention to injuries that are immediately related to the HOS regulations and away from loading or unloading injuries that might be caused by any number of other factors completely unrelated to HOS, such as shifting cargo, broken securement straps, inadequate packaging, incorrectly marked loads, poorly maintained forklifts, or slippery loading dock surfaces. Public Citizen concluded that ''FMCSA may not limit its statutory responsibility to driver health for only the period when a trucker is driving.'' FMCSA has not attempted to confine its responsibility to driving time. The Motor Carrier Safety Act of 1984, however, requires only that ''the [Agency's] regulations * * * ensure that * * * the operation of commercial motor vehicles does not have a deleterious effect on the physical condition of the operators' [49 U.S.C. 31136(a)(4)]. FMCSA is not, and cannot be, responsible for every physical infirmity experienced by truck drivers. There are many threats to health and safety in the modern world, and most of them have nothing to do with the HOS regulations. The NPRM concentrated on matters the Agency can address.

J.4. Lifestyle Choices

In the 2005 NPRM, FMCSA noted that lifestyle choices, including diet and exercise, may impact driver health and safety, but also concluded that ''Realistically, such choices cannot be regulated by FMCSA.'' The Agency requested commenters to provide information on the effect lifestyle choices, such as diet, exercise, and the use of off-duty time, have on driver safety and health.

Only 36 commenters responded to this request; all appeared to agree that proper diet and exercise are important elements in maintaining driver health, but two or three commenters were less certain about the effect of lifestyle choices on safety. Ten of the commenters insisted that healthy options are difficult to find on the road, and they were particularly critical of fast-food meals at truck stops and the lack of exercise facilities.

Ten commenters argued that lifestyle choices are individual decisions and cannot be regulated by the HOS rule, except to the extent the rule provides an opportunity for healthy choices and sufficient off-duty time. Three commenters approved of the additional off-duty time provided by the 2003 rule, but others thought the 14-hour provision made it difficult to maintain a proper diet. One commenter believed that too much off-duty time had a negative effect. Two commenters suggested that private-sector training is a more effective method of helping drivers with lifestyle choices than HOS requirements. Two other commenters mentioned FMCSA rules that require medical screening and monitoring for drivers and pointed out that those rules

already encourage drivers to maintain healthy habits.

Public Citizen, however, alleged the NPRM's ''Lifestyle Choices'' discussion was illegitimate and a disingenuous attempt to narrow FMCSA's oversight of driver health. In the opinion of this commenter, the HOS rule had significant potential to influence a driver's diet and exercise regime, which in turn could greatly influence an individual's bodyweight, blood pressure, and other health indicators. The commenter provided no research or data to support this assertion.

With regard to lifestyle choices and their effect on driver fatigue, Express Inc. commented that its ''experience indicates the lifestyle decisions made by a driver prior to getting behind the wheel as well as decisions made while on the road, are by far the most significant factors in fatigue related accidents.'' Additionally, FedEx stated that ''lifestyle choices, more than anything else, have the greatest impact on fatigue related accidents. Without question, the lifestyle choices drivers make during their off duty time are extremely significant. Coupled with decisions made on-duty during a trip, they are the most critical choices relating to fatigue prevention.'' Lastly, with regard to drivers meeting FMCSA medical requirements, Brink Farms noted that ''FMCSA can't regulate driver's lifestyle choices, but regulating their blood pressure levels is regulating driver's health. Many of our drivers have had to change their lifestyle due to higher blood pressure than allowed by these limits. Many of our drivers have begun walking more, and watching their diet more. Exercise alone keeps a driver healthier and that also keeps them more alert.''

FMCSA Response

The Agency included questions on this issue in the NPRM because lifestyle choices appear far more likely to directly affect driver health than many of the occupational and environmental factors faced by CMV drivers.

Roberts and York (1997) conducted a study for FMCSA entitled ''Design, Development and Evaluation of Driver Wellness Programs.'' They cited a number of areas where drivers make poor lifestyles choices, for instance by smoking. The percentage of smokers among truck drivers is nearly double that of the U.S. population. A 1993 study of 2,945 truck drivers reported 54 percent of the respondents smoke cigarettes or cigars [Roberts, S., & York, J. (1997), p. I–2]. In contrast, national statistics in 1996 showed that 27.7 percent of all males and 25 percent of all men and women were smokers [*Id.*]. The use of tobacco products is the leading preventable cause of death in the United States. Smoking substantially increases the risk of cardiovascular disease, causes about 30 percent of all cancer deaths, and is the leading cause of chronic lung disease [*Id.*, p. I–1]. Truck drivers who smoke in their cabs are perhaps at even greater risk of developing illnesses. They can get a double dose of toxins by inhaling smoke directly from the cigarette or cigar and by breathing in any second-hand smoke that remains inside the cab.

A significantly higher percent of CMV drivers were classified as obese compared to the population in general [*Id.*, p. I–2]. Of 2,945 truck drivers at a trade show, 73 percent were classified as being either overweight or obese. Of these drivers, 33 percent were classified as obese (*i.e.*, Body Mass Index Greater than 30) and 40 percent were classified as overweight (*i.e.*, Body Mass Index between 25 and 30) [*Id.*]. Nationally, only 33 percent of men and women combined are classified as being overweight [*Id.*, p. I–3]. In the research literature, obesity is a well-established risk factor for many diseases such as stroke, cardiovascular disease, hypertension, and diabetes. It also exacerbates problems with conditions such as arthritis or back pain. Evidence also suggests that obesity, in conjunction with other risk factors, places men and women at a higher risk of cancer [*Id.*, p. I–2].

Roberts and York [*Id.*, p. I–8) identified the prevalence of poor eating habits among CMV drivers. A 1993 study of 2,945 truck drivers revealed over 80 percent of these drivers ate only one or two meals per day and 36 percent had three or more snacks per day [*Id.*, p. I–6]. Furthermore, a 1996 study of 30 drivers in a wellness program revealed that their favorite meal item while on the road was steak or burgers and typical snacks were chips, fruit, candy, donuts, and cookies. Only 15 percent of these drivers ate five or more servings of fruits and vegetables per day, compared to 19.1 percent of all males.

CMV drivers are more likely to be inactive or underactive as compared to the population in general [*Id.*, p. I–7]. Despite the importance of regular exercise to disease prevention and health, 50 percent of the truck drivers in a 1993 study never participated in any type of aerobic exercise and only 8 percent of these drivers ''regularly'' participated in aerobic exercise [*Id.*]. The 1997 National Health Interview Survey showed 60 percent of adults do engage in physical activity for at least 20 minutes per day. Both epidemiological evidence and medical research demonstrate the ability of physical activity to reduce the risk of many physiological diseases, including heart disease, high blood pressure, osteoporosis, diabetes, and breast and colon cancer, as well as reduce the risk of psychological illnesses such as depression, anxiety, and stress [*Id.*].

On three important lifestyle variables, CMV drivers rank well below average. CMV drivers smoke tobacco at nearly twice the rate of the U.S. population, have questionable eating habits, and do not exercise regularly. As a result, twice as many CMV drivers are overweight compared to the U.S. population. These lifestyle choices are bound to have profound effects on the health and wellness of CMV drivers, and in the Agency's best judgment may, by themselves, be predictive of higher rates of cancer, cardiovascular disease, diabetes, and back problems.

J.5. Driving Time

FMCSA solicited comments in the NPRM on the impacts of incremental increases in driving time on driver health, the safe operation of CMVs, and industry economics. In particular, it asked, to what extent did the increase in maximum driving time from 10 to 11 hours affect health, safety, and economic factors?

Support for 11-Hour Limit

The majority of commenters (208 out of 360 or 58 percent) who expressed opinions on the 11-hour driving rule supported it, including the American Trucking Associations (ATA), the Truckload Carriers Association (TCA), the Owner-Operator Independent Drivers Association (OOIDA), and the National Private Truck Council (NPTC).

In all, six trucking associations expressed support for the 11-hour driving limit. ATA agreed with the 11-hour limit and said that it should be retained. However, ATA also acknowledged that the establishment of any driving time limit would benefit from continued fatigue-related research. TCA stated that the limited scientific data available did not show a significant distinction between 10- and 11-hour drive times. NPTC said that the 11-hour limit had improved the quality of drivers' rest by allowing drivers to make it all the way home and sleep in their own beds. NPTC said that if FMCSA reverted to a 10-hour limit, the drivers would have to forego returning to home each evening, or the company would have to schedule additional drivers and shipments.

The National Industrial Transportation League (NITL) said that

the additional hour of driving is warranted and justified in light of the amount of rest that drivers obtain under the 10-hour off-duty requirement. NITL said that the additional hour of driving time increases driver and asset productivity, and, in the aggregate, reduces the need to bring additional trucks onto the roads, which translates into fewer accidents. The National Armored Car Association (NACA) said that the 11-hour limit is appropriate and reduces risk to the drivers of armored cars, who are not allowed to pull off to the side of a road or stop overnight at a motel as they approach permissible workday limits, because of the risk of crime. NACA said that the additional hour provides a margin of safety for responding to such contingencies.

Five other carriers also provided substantive comments supporting the 11-hour driving limit. The carriers said that the one-hour increase in the daily driving limit has benefited them economically without having any detrimental impact on safety. Two of the carriers said their drivers had benefited from the 11-hour driving limit. ABF Freight said that some of its drivers who performed defined runs that required close to ten full hours of driving reported feeling less stress under the 11-hour driving limit. Crete Carrier Corporation said that its operation cycles indicated that its drivers' work and sleep patterns had begun to benefit from the 2003 rule. The carrier said that its drivers appeared to have adjusted their driving routines to more closely resemble the traditional workday. The carrier also said that it had teamed with shippers and consignees to schedule pick-up and delivery times that were more consistent with drivers' circadian rhythms and to decrease drivers' non-driving workload and extended detention periods.

A short-haul carrier that hauls loads with special hauling permits said the 11-hour limit had been especially helpful, because in most states it could only move loads during daylight hours. The 11-hour limit allowed drivers to take advantage of the longer daylight in the summer months to drive additional miles, thus increasing efficiency. The carrier also said that the extra hour of driving enabled its drivers to get through metropolitan areas that had a curfew during rush hour periods. Some of its drivers were now able to deliver one additional load per week, which increased driver earnings while improving the company's efficiency.

Opposition to 11-hour Limit

Opposition to the 11-hour daily driving limit came from 152 commenters, including safety advocacy groups, unions, and a minority of drivers.

Advocacy groups presented the most detailed arguments. IIHS stated that it did not believe the increase in daily driving time from 10 to 11 hours was supported by scientific evidence. Public Citizen argued that FMCSA had not presented in the 2005 NPRM any evidence demonstrating that any changes the Agency would make to the HOS rules would make the eleventh driving hour safe, much less improve safety, in accordance with the Agency's statutory mandate. These commenters argued that FMCSA had failed to demonstrate how a driver's initial restfulness can ''offset'' the safety risk presented by the additional hour of consecutive driving.

AHAS said that FMCSA had recognized and documented in its May 2000 proposed rule that the risk of a crash by a commercial driver increases at a geometric or logarithmic rate as the consecutive hours of driving increase in each shift. AHAS concluded that by allowing an eleventh consecutive hour of driving, the Agency has increased the absolute risk of commercial drivers being involved in fatigued-related crashes.

The International Brotherhood of Teamsters said that any benefits of the 10-hour rest period and the 14-hour duty-tour were offset by the one-hour increase in daily driving time and the 34-hour restart provision. The Transportation Trades Department of the AFL–CIO said that ''[r]equiring a ten percent increase in driving time as a solution to driver fatigue makes little sense.''

Some commenters suggested that drivers were being pressured to drive the entire 11 hours. An attorney with the Truckers Justice Center, who said that he had represented drivers in proceedings under the Surface Transportation Assistance Act (STAA) in which the drivers were disciplined for refusing to drive while impaired due to fatigue, opposed the 11-hour daily driving limit. He said that the Truckers Justice Center had spoken with drivers who were concerned about the new hours of service provision allowing a carrier to force a driver to drive up to 11 hours in a single tour of duty.

Several commenters presented detailed arguments in favor of a 10-hour limit. The National Institute of Occupational Safety and Health (NIOSH) said that its comments submitted to FMCSA in December 2000 were still valid. Those comments supported a limit of 10 hours of driving within a 24-hour work/rest cycle of 12 hours on duty and 12 hours of free time. NIOSH said that this daily cycle would be consistent with common scheduling practices in other industries that use shifts longer than 8 hours.

Both Public Citizen and AHAS suggested that drivers should be allowed to accrue no more than 10 consecutive hours of driving in a shift. Both added that the research literature and FMCSA itself have shown that allowing fewer than 10 consecutive hours would result in even safer operations. Several drivers also supported a 10-hour limit.

Economic Effects of 11-Hour Limit

The Corporate Transportation Coalition (CTC) stated that its few member companies that engage in long-haul operations believe the 11th hour of driving has permitted modest productivity gains. Brandt Truck Line, Inc. stated that the additional hour had improved productivity (especially in a 50-mph State) by eliminating the need to incur a sleeper-berth period during the return trip. This allowed the use of day cab tractors (not sleepers), and a miles per gallon improvement of 15 percent, and a ''gain'' of nearly 20 hours per week in scheduling continuity, which allows drivers to continue the same scheduled route each day, rather than changing routes on a day-to-day basis.

ABF Freight stated that in 2004, only 4.6 percent of its dispatches required the 11-hour rule to complete runs. While this might rise slightly should the rule become permanent, it was not likely to affect the majority of its dispatches, due to the fixed nature of its service center markets. The Overnite Transportation Company stated that the 11-hour driving rule made its operations cheaper and more efficient, because it could now haul freight directly, thus using fewer drivers and fewer tractors and trailers driving fewer miles. The company saves over $110,000 annually and is able to provide faster transit times.

Georgia-Pacific Corporation stated that productivity is an appropriate factor for FMCSA to consider because the only other alternative is to increase the numbers of trucks on the highways, with accompanying congestion and crashes.

J. B. Hunt said that it randomly selected 80 of its over-the-road drivers and tracked them for a 30-day period. The carrier found that the drivers used the 11th hour of driving only 10 percent of the time. National Ready Mixed Concrete Association (NRMCA), the Massachusetts Concrete and Aggregate Producers Association, and a carrier

stated that driving time is generally not a critical issue in the ready mixed concrete industry. NRMCA cited its 2000 Survey of Ready Mixed Concrete Truck Driver Activities and Company Operations (Appendix II), which it said showed that ''concrete delivery professionals'' on average spend less than half of their time actually driving under the U.S. DOT definition. Therefore, the 1-hour increase in driving time contained in the 2003 rule was ''largely inconsequential'' to the ready mixed concrete industry.

Health and Safety

Commenters generally reported that the increased driving time either had no impact (57 commenters) or a negative impact (62 commenters) on health or safety.

Advocacy groups saw a clear negative impact. For example, IIHS cited numerous scientific studies that it said show an increase in crash risk among drivers operating large trucks for more than 8 to 10 hours. No scientific evidence, IIHS concluded, supports the argument that the increase in the daily off-duty requirement meant that the 1-hour increase in driving time would not compromise safety.

Public Citizen argued that numerous studies demonstrate that increased fatigue and risk are associated with longer consecutive hours of driving. They claimed that FMCSA's proposed addition of an hour of driving time would add an hour of exceedingly heightened crash risk, because the latter hours of driving are the most dangerous. Further, they asserted that the proposal undermined the Agency's duty to enhance safety. It cited a 1996 study that found a strong relationship between single-vehicle truck crashes and the length of consecutive hours spent driving, with the risk of a crash found to double after 9 hours of continuous driving. Public Citizen reported another study of truck driving that found that ''Accident risk increases significantly after the fourth hour, by approximately 65 percent until the seventh hour, and approximately 80 percent and 150 percent in the eighth and ninth hours,'' respectively. They also cited FMCSA's statement in the 2000 NPRM that ''performance begins to degrade after the eighth hour on duty and that this degradation increases geometrically during the 10th and 11th hours.'' They pointed to a chart in the 2000 NPRM based on data from the University of Michigan Transportation Research Institute (UMTRI), Trucks Involved in Fatal Accidents (TIFA) database, which it said clearly showed a striking rise in the relative risk of a fatigue-related crash once drivers pass the 9-hour mark. In fact, it asserted that risk doubles between the tenth and eleventh hours of consecutive driving. Public Citizen also stated that the 1-hour reduction in on-duty hours, from 15 hours to 14 hours, is irrelevant in terms of the number of driving hours. Drivers will tend to gravitate toward the maximum driving hours possible to enhance their earnings and meet trip deadlines, they argued, and will minimize non-driving on-duty hours.

In contrast, the California Highway Patrol stated that the increased risk from the 11th hour of driving would be offset by limits on the length of the driver's overall work day.

Yellow Roadway Corporation stated that about six percent of Roadway's single man line-haul operations use the 11-hour clock. However, it was unable to break out OSHA data for those drivers. The company did compare OSHA Recordable Injury data of line-haul drivers in total for the years 2003 and 2004, and said these data show an improvement of 55 percent from 2003 to 2004. Roadway suggested that although there may not be a direct correlation to the 11-hour driving rule, the significant decrease in injury rate for the entire line-haul operation would suggest that there is no safety or health related need to change the 11-hour rule.

Alertness Solutions, a scientific consulting firm, submitted a literature review and technical argument supporting the proposition that there are very limited data to address a drive-time restriction and, from a physiological perspective, less foundation to establish how drive time relates to fatigue. The minimal data available, the commenter said, do not show significant differences between 10- and 11-hour drive times. However, Alertness Solutions agreed that a drive-time limitation could be useful in creating breaks within a duty period, and breaks have been demonstrated to be an effective strategy to maintain performance and alertness.

American Moving and Storage Association (AMSA) stated that the additional hour of driving time has had no adverse effect upon fatigue-related highway crash experience. The benefits of the existing hours-of-service rules, however, extend beyond highway safety to driver acceptance. AMSA reported that one carrier's driver out-of-service rate declined from 14 percent in 2003 to ten percent in 2004, a 29 percent improvement. That carrier's number of HOS out-of-service violations similarly experienced a 29 percent improvement. Another carrier found the number of its drivers who received false log citations during roadside inspections decreased 23 percent from 2003 to 2004. AMSA attributed this to the implementation of the 2003 rule, which more naturally fit a driver's daily routine and natural circadian cycle. AMSA also suggested that the 2003 rule is easier for drivers to understand and easier for dispatchers to work with than the former hours-of-service regulations. Moreover, the ability to drive for an additional hour provides operators of household goods moving vans the flexibility they need to arrive at a destination. Even the relatively small 1-hour addition to allowable driving time is a tremendous advantage to the operational efficiency required of all motor vehicle operations, considering the improvement in comfort, noise penetration, and maneuverability of commercial motor vehicles today that makes them less fatiguing to operate than those of even ten years ago. AMSA concluded that given the one-hour reduction in a driver's overall 14-hour duty day, the additional hour of driving time was desirable, and an equitable and balanced complement to a driver's schedule.

OOIDA reported that a survey it had conducted indicated that the 11th hour of available driving time was not always used frequently by drivers. For the month of June 2004, the average driver used the 11th hour 8.3 times. According to OOIDA, drivers reported that the occasional use of this extra driving time had given them the ability to arrive at a familiar facility where there is room to park their truck, or to get them home where they have the best opportunity for rest and restorative sleep. This 11th hour is also used to complete the delivery of a load, taking the pressure off the driver to deliver the next day. OOIDA reported that drivers said they do not believe that the extra hour of driving impaired their safe operation of a CMV, and that it often put them in a position to obtain better rest or sleep. They would like to retain this flexibility.

FedEx Corporation reported that FedEx Freight has no drivers who were consistently logging 11 hours of driving. FedEx Freight has no regular runs that require a driving time of 11 hours. Only about 2 percent of bid runs had a driving time of between 10 and 10.5 hours. No crashes had occurred after the 10th hour of driving.

Several drivers suggested that the 11-hour driving period should be limited by other requirements, or they suggested other limits.

FMCSA Response

Because of the importance of driving time to this rule and the conflicting

views of the commenters, FMCSA examined a wide range of research literature and statistical data and performed a careful cost/benefit analysis of two alternative driving limits: 10 hours and 11 hours. The agency has decided to adopt a driving-time limit of 11 hours within a 14-hour window following 10 consecutive hours off duty.

Crash Data

Although FMCSA's analysis of the available crash data is presented in detail in section H, some of the information bears repeating here.

Trucks Involved in Fatal Accidents (TIFA) Data

The TIFA file combines data on fatal crashes from FARS with additional data collected by UMTRI, including the number of hours driven since the last 8-hour off-duty period at the time of the crash.

Campbell [Campbell, K.L. (2005)] reviewed TIFA data for the years 1991 through 2002 to identify the operating conditions where the most fatigue-related crashes occur and to determine the association of fatigue risk factors with fatal crashes. He found that the majority of fatigue-related crashes occur in the early hours of the trip. This is a function of exposure, since all drivers drive in the first hour, while fewer drive in later hours, i.e., the early hours of trips are the most frequently driven. However, when examining the relative risk of a fatigue-related crash by hours of driving, the results are different. The likelihood a truck driver was fatigued at the time of a fatal crash generally increases with the number of hours driven. TIFA data show that the relative risk of a large truck being involved in a fatigue-related crash in the 11th hour of driving or later is substantially higher than in the 10th hour of driving.

TIFA data are not necessarily applicable to this rulemaking, however. Only 9 fatigue-related fatal crashes where the driver was operating in the 11th hour were recorded between 1991 and 2002. The statistical significance of such a small number is questionable. TIFA data were collected when the minimum off-duty period was only 8 hours and the driving limit 10 hours. The current 10-hour off-duty requirement means drivers have so much more opportunity for restorative sleep that the relative risk of the 11th hour of driving revealed by TIFA may no longer be relevant. Finally, UMTRI conducts interviews with drivers or carriers to supplement the FARS data, but may do so as much as a year after a crash. It is unclear whether drivers can accurately recall the number of hours they had driven that long after the event.

Virginia Tech Transportation Institute Study

The Virginia Tech Transportation Institute (VTTI) is currently conducting a real-world, empirical study of crash risk during the 10th and 11th hour of driving.

The researchers have found no statistically significant difference in the number of ''critical'' incidents in the 10th and 11th hours of driving [Hanowski, R.J., *et al.* (2005), p. 9]. The study has also determined that drivers are not measurably drowsier in the 11th than the 10th hour of driving. These results may be related to another finding, that drivers appear to be getting more sleep under the 2003 rules than they did when the minimum off-duty period was only 8 hours. Compared to four sleep studies conducted under the pre-2003 rules, Hanowski and his colleagues found that drivers operating under the 2003 rule are averaging over 1 hour of additional sleep per day [*Id.*, p. 8].

Crash Risk and Hours Driving: Interim Report II

The Pennsylvania Transportation Institute at Pennsylvania State University is currently modeling the effect on crashes of hours of driving, hours of rest, multi-day driving patterns and other factors under the 2003 rule [Jovanis, P.P., *et al.* (2005)]. This study collected records of duty status (RODS) for 7-day periods prior to crashes, as well as for a non-crash control group. The study found an increased crash risk associated with hours of driving, particularly in the 9th, 10th and 11th hours, and multi-day driving.

Comments on Crash Risk and Data

Many companies and associations submitted data on crash and injury rates. In general, their data show that crash and injury rates were lower in the year since the 2003 rule went into effect in January 2004.

ATA reported data showing that carriers had statistically significant lower average crash rates in 2004, causing ATA to believe that the 2003 rule is superior to the pre-2003 rule from the perspective of overall safety.

The information provided by commenters is not available from other sources, but there is certainly some variability in the methods and accuracy with which the data were collected. In addition, the lower crash and injury rates cannot be definitively attributed to the effects of the 2003 rule, though some commenters noted that the rule is the only major variable that changed from 2003 to 2004. Finally, the data do not reveal anything about the relative risk of the 10th or 11th hour of driving.

Fatality Analysis Reporting System (FARS)

FARS is generally recognized as the most reliable national database on fatal motor vehicle crashes. FMCSA compared the first 9 months of FARS crash data from the 2003 Annual Report with the first 9 months from the 2004 Early Assessment File (the difference is explained in Section H).

The total number of fatal crashes involving large trucks decreased from 3,120 in 2003 to 2,954 in 2004, a 5.3 percent reduction. The number of large truck crashes where the driver was coded as fatigued dropped as well. More important than either of these figures, however, are the data showing that fatigue-related fatal crashes are down from 1.7 percent of all crashes in 2003 to 1.5 percent in 2004, an 11.8 percent reduction.

Although the data are still preliminary, all FARS measures of fatigue-related crashes are trending downward. The data, of course, do not allow any firm conclusion about the extent to which the 2003 rule may have contributed to that result.

Operational Data

FMCSA gathered operational data during compliance reviews and safety audits to determine how the various provisions of the 2003 rule are being employed by the motor carrier industry. The Agency also reviewed other survey material and comments to the docket on this subject. Available data indicate that driving into the 11th hour is far from universal, with utilization rates ranging from 10 to 28 percent. FMCSA's own survey of driver records found that only 20.7 percent of the recorded driving periods exceeded 10 hours. There is no reason to believe that a full 11 hours of driving will ever become the standard for the industry. Drivers need to deal with operational, administrative, and personal matters which typically reduce driving time well below the maximum allowable hours.

As stated above, numerous carriers support the 11th hour of driving since it allows drivers to return home within a day so they can sleep in their own beds. FMCSA also notes that the provision has increased industry productivity through increased flexibility without impacting safety based on available data, specifically crash rates (see Crash Data discussion, above). A number of commenters said that, since trip lengths have not changed

as a result of the 2003 rule, the 11th hour serves primarily to reduce the stress of trying to complete a run by the end of the 10th hour. With an extra hour of driving time, drivers are able to relax a bit and perhaps drive less aggressively.

As noted in the comments, use of the 11th hour is also justified due to improvements in truck comfort, noise penetration, and maneuverability, which have decreased trucker fatigue over the past decade.

Research and Literature Review

The scientific literature on fatigue and performance factors includes notably different, and indeed inconsistent, results. The Agency found that the research on driving time is limited and the conclusions mixed. A fatigued driver is prone to perform less effectively on tasks requiring vigilance and decision-making than a person who is alert. Fatigue is associated with a higher degree of crash risk. In practice, however, it is difficult to establish the precise effect a given driving or on-duty period will have on fatigue, alertness, or driver performance. Modest differences in study designs may produce surprisingly different results.

Research on the effects of driving time falls into three categories: (1) Operational studies of on-road working environments, (2) laboratory studies under controlled conditions, sometimes using driving simulators, and (3) analysis of crash or performance data. The results are far from uniform.

Operational and laboratory studies have generally found little or no statistically significant difference in driver drowsiness or performance between the 10th and 11th hours of driving [O'Neill, T.R., *et al.* (1999), p. 48; Wylie, C.D., *et al.* (1996), pp. 5.13–5.14; Hanowski, R.J., *et al.* (2005), p. 9]. These findings are contradicted by other research involving drivers operating under the pre-2003 HOS rule. A frequently-cited 1978 study found evidence of fatigue, measured both subjectively and objectively, in less than the 10 hours of driving then allowed by the HOS rules [Mackie, R.R., & Miller, J.C. (1978), pp. 219–221]. This study, however, required a driver to take only 8 consecutive hours off-duty, which probably limited the hours actually available for sleep (as discussed later in section J.7). The 2003 rule and today's final rule provide drivers an additional 2 hours off duty, creating a much improved opportunity for 7 to 8 hours of sleep per day.

Research analyzing crash and performance data usually focuses on police reports and driver records of duty status (RODS) to establish crash-risk factors, like the time of day the crash occurred, the number of hours driven since the last off-duty period, the number of hours since the last sleep period, and the length of the last sleep period. As mentioned above, these studies typically find that the risk of a fatigue-related crash increases with the number of hours driven, and particularly after the 10th hour. On the other hand, sample sizes for the 11th hour of driving, and beyond, are very small, and data collection procedures for TIFA are less than optimal.

The evaluation of some research, particularly in the operational category, is complicated by the variations in study design and data collection.

A 1996 operational study of 80 long-haul drivers engaged in revenue-generating runs in the U.S. (under the 10-hour driving limit) and Canada (under that country's 13-hour driving limit) reported that time-on-task was not a strong or consistent predictor of observed fatigue. This study found no difference in drowsiness, as observed in video records of comparable daytime segments, between 10 and 13 hours of driving. Some measures, such as lane tracking, individual cognitive performance, and self-rating of fatigue were better at 10 hours of driving than at 13 (lane tracking was confounded by differences in driving routes and road conditions in the two countries). Conversely, reaction time was better at 13 hours of driving than at 10. The authors noted that the lack of variance in drowsiness between the driving periods may be attributable to the fact that the study measured only daytime drowsiness. Other research suggests the body's circadian rhythm limits the negative effects of longer hours during daytime operations [Wylie, C.D., *et al.* (1996), pp. 5.13–5.14].

A 1999 study evaluated the effects on fatigue and performance during a daytime schedule of 14 hours on duty and 10 hours off duty, with drivers performing simulated driving and loading/unloading tasks. The authors found mild cumulative effects on subjective measurements of sleepiness; a slight but statistically significant deterioration in duty-day subjective sleepiness, reaction time response, and measures of driving performance over the course of a week; but no cumulative deterioration of driver response in crash-likely situations. The authors reported that a schedule of 14 hours on duty (with 12 hours of driving) and 10 hours off duty for 5 consecutive day periods did not appear to produce significant cumulative fatigue over the 2-week testing period [O'Neill, T.R., *et al.* (1999), p. 48].

Breaks, Naps and Driver Fatigue

The Agency considered a mandatory rest period (break) to mitigate any possible fatigue related to the 11th hour of driving. Scientific research suggests that rest breaks, including naps, while not reducing accumulated fatigue, refresh drivers and enhance their level of performance and alertness on a short-term basis [Belenky, G. L., *et al.* (1987), p. 1–13 ; Wylie, D. (1998), p. 13]. The Agency concluded that such a break would be difficult for State and Federal enforcement personnel to verify and would significantly interfere with the operational flexibility motor carriers and drivers need to manage their schedules.

Still, FMCSA encourages carriers to establish a break or napping policy as part of an overall fatigue management program. Several studies have shown that a nap during a night shift can lessen the fatigue felt overnight [Matsumoto, K., & Harada, M. (1994), p. 899; Rogers, A.S., *et al.* (1989), pp. 1202–1203]. A study found that a 20-minute ''maintenance'' nap helped to improve daytime self-rated sleepiness and performance levels on a variety of tasks, including logical reasoning, mathematical calculations, and auditory vigilance [Hayashi, M., *et al.* (1999), p. 272]. Research suggests that a short nap of 10 to 20 minutes (but generally for less than 45 minutes) can provide a beneficial boost in driver alertness.

Driver Health Impact

The issue of CMV driver health is complex, and involves many external factors (lifestyle, diet, and other personal behavior/choices) that are beyond the scope of the HOS rules. As discussed above (Section E—Driver Health), FMCSA found little research on a possible relationship between HOS regulations and driver health. Longer driving time increases driver exposure to diesel exhaust and chemicals, noise, and vibration, but dose/response curves clarifying the effect of such exposure do not exist. Therefore, in the Agency's best judgment, the difference between a driving limit of 10 and 11 hours is inconsequential from the standpoint of driver health.

Conclusion

Available information on the effect of allowing 11 hours of driving time is inconclusive. TIFA classified only 9 fatal crashes that occurred in the 11th hour of driving as fatigue-related between 1991 and 2002. Whatever the statistical risk of driving in the 11th

hour, FMCSA cannot make a reasonable choice between a 10- and an 11-hour driving limit on the basis of only 9 fatal crashes over a 12-year period.

The on-going studies by the Virginia Tech Transportation Institute and the Pennsylvania Transportation Institute seem to have reached completely incompatible conclusions. The latter finds that the 11th hour of driving poses a significant crash risk while the former detects no statistical difference between the 10th and 11th hours of driving. The different methods used by both research teams appear to be valid.

Trucking industry comments to the docket generally reported lower crash and injury rates in 2004 than in 2003. This reveals nothing about the 11-hour driving limit or the 34-hour restart provision, nor can the improvements be clearly linked to the 2003 rule, but it certainly implies that the 2003 rule has not harmed highway safety.

Preliminary FARS data show that fatigue-related fatal crashes as a percentage of all CMV fatal crashes were down in the first nine months of 2004 compared to the same period in 2003. This is consistent with the information provided in motor carrier comments to the NPRM. The data do not allow a calculation of crash risk for each additional hour of driving. It is also possible, however unlikely, that the FARS Early Assessment File for 2004 does not accurately reflect the data in the 2004 Annual Report, which was not available when FMCSA conducted its analysis.

In summary, the available crash data do not clearly indicate whether the 11th hour of driving, combined with 10 hours of off-duty time, poses a significant risk.

An 11-hour driving limit is favored by most motor carriers and drivers, and is economically beneficial to some carriers. On the other hand, it provides no real advantage over a 10-hour limit for many short-haul carriers. Advocacy groups and some drivers prefer shorter driving times, though there is no consensus on what the shorter limit should be. Use of the 11th driving hour varies widely among motor carriers and individual drivers, but all available data show utilization rates far below 50 percent. The research literature on driver health is not sufficiently detailed to differentiate between any possible effects of a 10- and an 11-hour driving limit. Like the crash research and data, the comments and operational data do not point unambiguously toward a single conclusion.

FMCSA carried out a cost/benefit analysis of a 10- and 11-hour driving limit and other aspects of this final rule, as reported in section K.1 and the stand-alone Regulatory Impact Analysis (RIA) filed in the docket. Motor carrier operations were modeled in detail. The Agency used a time-on-task multiplier which assumed that the crash risk from the 10th to the 11th hour of driving increased based on the TIFA data. The analysis demonstrated that a 10-hour driving limit would save no more than 9.3 lives per year compared to an 11-hour limit. The annual net cost of a 10-hour limit, however, compared to an 11-hour limit, would be $526 million ($586 million in gross costs minus $60 million in safety benefits). A 10-hour driving limit would cost more than $63 million per life saved.

While the Agency did not explicitly estimate the marginal costs and benefits of limiting daily driving to 8 or 9 hours, FMCSA believes that such changes would be even less cost beneficial than a 10-hour driving limit and would allow a driving/rest cycle less consistent with driver circadian rhythms than an 11-hour limit. See section H for further discussion of this issue.

FMCSA is required by statute both to improve motor carrier and driver safety and to consider the costs and benefits of its requirements [49 U.S.C. 31136(c)(2)(A) and 31502(d)]. The Department of Transportation currently uses $3 million as the ''value of a statistical life'' (VSL) for rulemaking purposes. Because a 10-hour driving limit would cost $63 million per life saved, compared to an 11-hour limit, the VSL for the lower limit would be 21 times the DOT standard. A $63 million VSL is over six times higher than the maximum VSL cited by the Office of Management and Budget (OMB) in its guidance to Federal agencies on conducting regulatory impact analyses, *i.e.*, $10 million [OMB Circular A–4, p. 30]. The Agency cannot impose regulatory costs so far in excess of regulatory benefits. FMCSA expected the new 10-hour off-duty period required by the 2003 rule to reduce driver fatigue and improve safety, despite allowing 11 hours of driving time instead of 10 hours. Many, though not all, motor carriers have reported lower crash and injury rates under the 2003 rule, and preliminary FARS data show that fatigue-related fatal truck crashes have declined as a percentage of all fatal CMV accidents. This suggests that the pre-2003 studies and data showing a sharply increased crash risk in the 11th hour of driving may no longer be relevant because drivers have used the 10 off-duty hours required by the 2003 to reduce fatigue. It is thus FMCSA's judgment that the $526 million net cost of a 10-hour driving limit is too high to justify the potential benefits it would generate. Today's final rule therefore sets the maximum allowable driving time at 11 hours after 10 consecutive hours off duty.

J.6. Duty Tour

In the 2005 NPRM, FMCSA requested comments on the impacts of the 2003 rule decrease in the duty period for drivers from 15 non-consecutive hours to a non-extendable 14 consecutive hours.

Impacts on Safety and Health

Almost 600 drivers and about 100 carriers, as well as OOIDA, the National Association of Small Trucking Companies, CTC, and NPTC, urged that breaks, meals, and time spent loading and unloading be exempted from the 14-hour duty tour. A substantial majority of commenters, mostly drivers and owner/operators, opposed the change from 15 cumulative hours to 14 consecutive hours of on-duty time. Drivers, in particular, stated that the consecutive duty time requirement caused them to skip meals or naps when they were needed, and generally increased stress that leads to speeding and more aggressive driving. Several commenters believed the opportunity to work 14 consecutive hours compromised safety and favored a return to the previous requirement of 15 cumulative duty hours. Most of the commenters cited the need for meal breaks and other breaks for rest and exercise to be ''off the clock,'' so drivers are not penalized for taking time to eat a meal or nap when they feel fatigued. Several trucking associations cited fatigue as the primary impact of the consecutive 14-hour rule. Because, they claim, drivers are discouraged from taking breaks to rest or have a meal, they drive straight through causing fatigue and stress. Two associations noted that the consecutive 14-hour rule has the unintended consequence of increasing the number of driver layovers, meaning that drivers more frequently sleep away from home, even though studies cited by FMCSA suggest that drivers who return home every day experience fewer fatigue-related, serious crashes than those who sleep while on the road. Many commenters urged FMCSA to revise the HOS rules to allow a driver to extend the 14-hour window by up to two hours by taking off-duty rest breaks throughout the day as needed. The Minnesota Trucking Association (MTA) reported that 51 percent of its drivers took naps to supplement sleep or maintain alertness. However, of the 49 percent who did not nap, 42 percent

said that the 14-hour consecutive duty rule discouraged naps.

The 131 commenters who approved the change to 14 consecutive duty hours made a variety of arguments in its favor. Several commenters believed the change was a positive one because it prevents shippers, receivers, and companies from abusing the off-duty hours and forcing drivers to use them as unpaid time. The National Industrial Transportation League (NITL) commented that 2003 rule ''supports driver productivity because the 14-hour window allows drivers ample time to perform such tasks as loading, unloading, fueling, vehicle inspection, and completion of paperwork that are part of a typical day.'' Advocates for Highway and Auto Safety stated that a return to a cumulative measure of duty time would restore the abusive practices that prevailed with the previous HOS rules, including the ability of shippers and receivers to intimidate drivers to wait in line for loads, load and unload their freight, and exceed maximum driving hours by concealing these actions as ''off the clock'' rest or meal breaks. Several commenters also noted that the consecutive hours requirement would promote safety by keeping drivers on a 24-hour circadian schedule.

Economic Impacts

Several carriers noted that the 14-hour rule had increased their productivity and made their fleets more efficient. One carrier stated that the rule allowed it to pressure customers to speed up loading and unloading. In concert with a positive economic environment, this allowed a rate increase. Another carrier noted that the consecutive 14-hour rule made it easier for a company to audit and manage driver hours, and that the rules were easier for drivers to understand and log their time accurately. The general consensus among drivers was that their workday, on average, is shorter under the new rules. They no longer work 20-hour days due to the 14-hour consecutive requirement. One driver stated that this is because shippers and receivers are more aware of the time restrictions that drivers face and do not delay drivers as long as they did in the past.

The NITL commented that shippers have made significant changes. For example, ''operations at loading docks have been reconfigured to decrease dwell time and to expedite loading and unloading in order to minimize driver on-duty time not devoted to driving, and to maximize driving time with the new 14 consecutive hour rule.'' The changes were necessary given the ''new'' value associated with a driver's time. They too suggest that shipper and motor carrier operations have become more efficient in response to the 14-hour duty tour rule.

Several other carriers, however, stated that the consecutive 14-hour rule had caused a loss of productivity and fleet utilization, while increasing costs, thereby reducing profits. Some commenters noted that the inflexibility of the consecutive 14-hour rule disproportionately affects small businesses, many of which are forced to hire additional drivers to accommodate irregular delivery schedules. A few of these commenters also cited public safety concerns associated with the lack of flexibility. For example, the National Propane Gas Association stated that nearly 60 percent of its members are experiencing difficulty in handling emergency or after-hours calls requiring an immediate response. Short-haul drivers also stated that the 14-hour rule had increased costs and reduced productivity and driver earnings. The American Bakers Association surveyed its members and estimated the cumulative cost increase to its companies' distribution systems to be between 12 and 15 percent. Several commenters noted that the impacts to short-haul drivers are more significant than those imposed on long-haul drivers. Four commenters cited FMCSA's admission that, while the benefits of the new HOS rules accrue mostly to long-haul drivers, the cost burden falls largely on short-haul operators.

Two carriers stated that the consecutive 14-hour rule imposes an economic penalty on long-haul drivers who wish to take a rest break and decreases their earning potential by not allowing the 14 hours to be extended.

FMCSA Response

Under the pre-2003 HOS rule, a driver could extend the 15-hour on-duty period by taking breaks during the day. Thus, the pre-2003 rule permitted an operator to drive after having been at work over 15 hours. The Agency ended this in the 2003 rule, by prohibiting drivers from extending their on-duty period with ''off-duty'' breaks. The 2003 rule prohibited driving after the 14th consecutive hour of beginning work or coming on-duty. This created a non-extendable period within which the driver could drive up to 11 hours and effectively ended the allowance of breaks to extend daily duty tours. The Agency's research found time spent working (and not simply time spent driving) contributes to a driver's fatigue and thereby impacts performance in long-haul operations [Williamson, A.M., *et al.* (1996), pp. 713–717; Williamson, A.M., *et al.* (2000), pp. 43–44; Van Dongen, H.P.A., *et al.* (2003), p. 125].

In developing this final rule, the Agency considered whether the scientific research, studies, data, and comments justified adopting a 14-hour driving window, or required some other provision. As noted earlier, a number of commenters, drivers in particular, reported that the consecutive duty time requirement causes them to skip meals or naps when they are needed, and generally increases stress and leads to speeding and more aggressive driving. After a thorough evaluation of the data and comments, FMCSA has decided to allow drivers to drive up to 11 hours within a 14-hour window after coming on duty.

Crash Data

The crash data reviewed by the Agency in developing this rule is discussed earlier in Section H. Several motor carriers and associations submitted data with their comments reflecting a decrease in crash and injury rates in 2004 compared with 2003. The data suggest a positive improvement in safety performance. It is impossible to definitively link a specific provision of the 2003 rule with the improved safety performance during 2004; however, the research and crash analysis show longer continuous work hours can increase the risk of a fatigue-related crash, as discussed later in this section. Further analysis suggests that the crash-impact of longer work hours is more specifically associated with large CMVs (greater than 26,000 pounds). Analysis of 1994–2002 crash data found that these CMVs account for 87.3 percent of all fatigue-related fatal crashes [Campbell, K.L. (2005)].

Operational Data

Based on the recent FMCSA survey [See Section I, FMCSA Field Survey Report (2005)] of 7,262 tour-of-duty periods, the Agency found that 15.3 percent exceeded 12 hours and 9.2 percent exceeded 13 hours. Looking at over-the-road (OTR) driver tours of duty, 16.4 percent exceeded 12 hours and 9.4 percent exceeded 13 hours. These data show that the vast majority of drivers are not using the full 14-consecutive hour duty tour. The data suggest that drivers represented in the survey have time available within the current 14-hour duty tour to take breaks. The survey findings are based upon the review of 269 motor carriers, of which 85.9 percent (231) were for-hire motor carriers and 14.1 percent (38) were private motor carriers. Of the for-hire motor carriers surveyed, the majority

(96.3 percent) were considered over-the-road. In contrast, of the private motor carriers surveyed, a slight majority (57.6 percent) were considered local. Additionally, the majority of motor carriers surveyed were classified as a truckload (92.6 percent) [FMCSA Field Survey Report (2005), p.4].

Research & Literature Review

As described earlier in Section D, the Agency initiated an extensive review of scientific literature and research in developing this rule, which included the use of subject matter experts to assist in the effort.

The Agency found general consensus within the research that cumulative wakeful hours have a direct correlation with a person's alertness and ability to maintain performance. Specifically, longer wakeful hours result in alertness and performance degradation. The research conclusions are conflicting, depending upon the type of research conducted, on the specific number of hours after which the degradation in alertness and performance adversely affect a driver's ability to safely operate a CMV.

A 1999 simulator study found only a negligible difference in fatigue between a typical day (morning to evening) shift of 10- or 12-hour duty day and a 14-hour day. This same study found that ''a daytime work schedule of 14-hours on-duty with a 10-hour off-duty period for a 5-day week did not appear to produce cumulative fatigue'' [O'Neill, T.R., *et al.* (1999), pp. 37–41].

A more recent study (2000) of New Zealand CMV drivers found ''0.05% BAC (Blood Alcohol Content) equivalence occurred at between 17 and 19 hours of sleep deprivation for most tests. This means that after around 17 hours of wakefulness, a person's performance capacity is sufficiently impaired to a level of concern for safety'' [Williamson, A.M., *et al.* (2000), pp. 43–44]. Another study of 48 healthy adults under standardized laboratory conditions found the critical wake period beyond which performance began to lapse was statistically estimated to be about 16 hours [Van Dongen, H.P.A., *et al.* (2003), p. 125]. These findings are generally consistent with comments by Alertness Solutions, which emphasized the importance of continuous wakefulness as a predictor of fatigue [Alertness Solutions, (2005) NPRM Docket comments].

The role of continuous wakefulness is important in predicting fatigue, and thereby protecting driver safety and consequently public safety. Therefore, a duty period provision to control driver work hours is an important component of the HOS regulatory scheme. There is consensus among researchers that a schedule that promotes a 24-hour clock is beneficial in creating regularity of work/sleep schedules. Researchers also agree that individuals need 7–8 consecutive hours of sleep per day. The 14-hour duty tour along with a 10-hour off-duty period meets both of these universally accepted findings. This final rule promotes movement toward a 24-hour clock and provides all drivers with the opportunity to obtain 7–8 consecutive hours of sleep per day.

Driver Health Impact

As discussed earlier, an FMCSA driver health team, despite extensive efforts, found little research to evaluate the specific impact or association between the specific hours driven or worked and CMV driver health. One can conclude, based upon the research, that sleep, along with hours worked, plays a role in a person's overall health.

If long work hours adversely affect driver health ''which current research does not clearly indicate ''the 14-hour limit will protect drivers better than the pre-2003 rule. Drivers ordinarily are not allowed to extend their duty tour beyond 14 hours. The 14-hour provision is a substantial improvement over the pre-2003 rule, with its 15-hour limit extendable by the amount of off-duty time taken during the duty tour, because this provision generally reduces daily work hours and any associated health effects. However, drivers operating under the new short-haul rule (described in section J.10) are allowed to drive up to the end of the 16th hour twice a week. There is no evidence that this short-haul schedule adversely affects drivers' ability to drive safely, and there is no available information on the health implications of an occasional 16-hour workday.

Conclusion

After thorough consideration of the research studies, crash and operational survey data, and comments to the NPRM, the Agency has decided to prohibit driving after 14 consecutive hours after coming on duty. The Agency believes the information is clear on the need to limit the cumulative hours that a driver may work and continue to drive.

It is the best judgment of the Agency that a 14-hour non-extendable duty tour period, in conjunction with 11 hours driving and 10 hours off duty, will reduce driver fatigue, promote driver health, and improve CMV transportation safety.

J.7. Off-Duty Time

In the NPRM, the Agency requested comments on the extent to which the increase in the minimum off-duty time from 8 hours to 10 hours affected driver health, the safe operation of CMVs, and economic factors in the CMV industry. Of the 452 commenters who discussed the off-duty requirement, 270 (60 percent) approved of increasing off-duty time to 10 hours. For drivers who commented, the level of support was the same; 60 percent of the 366 expressed approval of the increase.

Impacts on Health and Safety

A substantial majority (73 percent) of the comments on the health and safety impacts of the 10-hour break included positive consequences, particularly comments from drivers, but also from carriers.

ATA, National Ready Mixed Concrete Association (NRMCA), National Industrial Transportation League (NITL), the Specialized Carriers and Rigging Association, the California Highway Patrol (CHP), the International Brotherhood of Teamsters, and three carriers said the increase in mandatory off-duty time gives drivers enough time to get 8 hours of sleep as well as to attend to other personal needs. The AFL-CIO, CHP and a carrier said that the 10-hour off-duty requirement, when combined with the consecutive 14-hour on-duty requirement, benefits drivers by putting them on a 24-hour daily schedule. Grammer Industries, Inc. said that the 10-hour off-duty requirement provides its drivers with the ability to exercise, take care of personal hygiene matters, eat meals, and spend time for relaxation. The carrier said that any break over 10 hours makes drivers out on the road ''nervous'' and causes them stress.

Commenters also pointed out detrimental impacts. Werner Enterprises and two drivers said that the 10-hour period posed problems for over-the-road drivers. Werner explained that because the break must be a full 10 hours, which is often more than a driver needs for sleep and daily personal maintenance, many drivers are frustrated when they wake because they must wait an additional 3 to 4 hours before they can go back on duty. The 10 hours off has little impact on long-haul drivers' personal or family activities because they are generally away from home then.

J.B. Hunt also argued that the change had a negative impact on long-haul drivers. It reported surveying 697 drivers. The survey found that 32 percent indicated that going from 8 to

10 hours off was the ''least liked'' part of the new 2003 rule. The reason given by many was that they must now begin looking for parking locations by late afternoon or be forced to use ramp areas or other less safe break locations. Because there is no flexibility in requiring 10 consecutive hours of break time, with the limited exception for split-sleeper periods that do not allow drivers to take care of their basic needs, drivers must often try to sleep in less-than-optimal sleeping conditions. Eleven drivers said that 10 hours off-duty is overly restrictive for those drivers who do not need 8 to 10 hours of sleep per night. Over-the-road and team drivers, in particular, found 10 hours too long. Boston Sand and Gravel stated that the rule does not necessarily lead to increased sleep time, based on personal choices of the drivers in their use of off-duty time. Massachusetts Concrete and Aggregate Producers Association, Inc. also argued that 8 hours of rest was sufficient. ABF stated that most of its drivers would have preferred retention of the 8-hour rest period when away from home but liked the 10-hour period at home.

Other commenters recommended a more substantial increase in the required break. NIOSH reiterated its support for a 24-hour work-rest cycle of 12 hours on-duty and 12 hours of free time. They also observed that the 12-on/12-off daily cycle is consistent with common scheduling practices in other industries that use shifts longer than 8 hours. IIHS said that the increase in required daily off-duty time is an important improvement, but it asserted that a 10-hour off-duty requirement still is inadequate for drivers to obtain restorative sleep and attend to other daily requirements. AHAS said that solo drivers should have at least 10 consecutive hours off-duty that are taken in a single block of time, regardless of whether that off-duty rest time is taken in a sleeper berth.

McCormick proposed that any rest period equal to or greater than 10 consecutive hours, within a 24 hour period, be considered the driver's sleep time. Under this approach, rest would be defined as sleep time, unloading delay time, or delays due to equipment breakdown.

Kimberly Clark agreed that valid science supported a 24-hour work-rest cycle. However, it recommended reducing the mandatory break from 10 to 9 hours and allowing for a short nap during the duty day.

Economic Impacts

Those carriers that commented generally said that the 10-hour break has a negative economic impact on them. One carrier stated that its trucks idle during each rest period, and longer periods reduce motor life and increase fuel costs. In addition, the trucks are less productive. Brandt Truck Lines reported an increase in drivers and vehicles of 15 to 25 percent, depending on schedules and how ''tight'' the operation was under the old regulations. Similarly, Colorado Ready Mixed Concrete Association stated that for overnight projects and during peak seasons, companies have had to hire additional drivers to comply with this provision of the regulation. However, ABF Freight and another carrier reported minimal impact.

Relatively few drivers commented on the overall economic impact of the 10-hour off-duty period. One driver stated that the incremental increase in the minimum required off-duty period resulted in drivers making less money, as they are usually paid by the mile or trip, and more off-duty time means fewer miles or trips. Another driver said the rule increased frustration because it diminishes a driver's income.

FMCSA Response

After thoroughly evaluating all of the information gathered, FMCSA has decided to require drivers to take a minimum of 10 consecutive hours off duty.

Crash Data

The Agency has reviewed studies related to crash risk based upon the hours off duty and opportunity for sleep. Studies of truck drivers, [Lin, T.D., *et al.* (1993), p. 9; McCartt, A.T., *et al.* (1997), p. 63] point specifically to increased crash risk and recollections of increased drowsiness or sleepiness after less than 9 hours off duty. A study by the National Transportation Safety Board [NTSB (1996), p. 37] found the most critical factors in predicting fatigue were the duration of the most recent sleep period prior to the crash, length of time since last sleep period, sleep over the preceding 24 hours, and split-sleep patterns. Drivers in fatigue-related crashes averaged 5.5 hours of sleep in the most recent sleep period prior to the crash (6.9 hours in the last 24 hours), while drivers in non-fatigue-related crashes averaged 8.0 hours of sleep (9.3 hours in the last 24 hours).

Operational Data

As discussed earlier in Section I, industry surveys found that the 2003 rule, with a minimum of 10 consecutive hours off duty, has generally improved driver rest (less fatigued) and encouraged movement toward a 24-hour work/rest cycle. The Minnesota Trucking Association (MTA) commented that a survey of their members found the 10 hours off has reduced fatigue, by providing more sleep and promoted better health. A study directed by FMCSA with VTTI (See Section H), which began monitoring 82 CMV drivers in May 2004, has found that drivers on average are getting more than an hour more sleep daily under the 2003 rule. This finding is based upon comparisons of the VTTI data collected through May 1, 2005, to findings reported in research studies conducted under the pre-2003 rule.

In addition to the operational data and surveys received from commenters, drivers submitted comments reporting that under the 2003 rule they have more time at home and obtain more rest, resulting in reduced fatigue. The Agency believes that the increased sleep reported through industry surveys, operational data, and commenters can be attributed to the additional 2-hours off-duty time provided by the 2003 rule.

Research & Literature Review

As mentioned, FMCSA has found general consensus among scientific researchers regarding the human physiological need for 7–8 hours of sleep to maintain performance and alertness.

Studies performed in laboratory settings, as well as studies assessing operational situations, have explored the relationship between sleep obtained and subsequent performance [Dinges, D.F., & Kribbs, N.B. (1991), pp. 98–121; Bonnet, M.H., & Arand, D.L. (1995), pp. 908–11; Belenky, G., *et al.* (1994), pp. 127–135; Dinges, D.F., *et al.* (1997), pp. 274–276; Belenky, G.L., *et al.* (1987), pp. 1–15 to 1–17]. These studies generally found poorer performance levels when sleep is restricted. More recent studies [Balkin, T., *et al.* (2000), p. ES–8; Belenky, G., *et al.* (2003), pp. 9–11; and Van Dongen, H.P.A., *et al.* (2003), p. 124] found that even a relatively small reduction in average nighttime sleep duration (*i.e.*, approximately 6 hours of sleep) resulted in measurably decremented performance. Another report [Rosekind, M.R., *et al.* (1997), pp. 7.2–7.5] concluded that ''scientific data are clear regarding the human physiological requirement for 8 hours of sleep to maintain performance and alertness.'' ''Therefore, an average individual who obtains 6 hours of sleep could demonstrate significantly degraded waking performance and alertness * * *'' In addition, the authors found the effects of sleep loss/deprivation to accrue, and stated,

''* * * data have demonstrated that not only does the sleep loss accumulate but that the negative effects on waking performance and alertness also are cumulative and increase over time.''

A past study of 80 over-the-road drivers in the U.S. and Canada, [Wylie, C.D., *et al.* (1996), p. ES–10] found that drivers obtained nearly 2 hours less sleep per principal sleep period than their stated ''ideal'' (5.2 hours versus 7.2 hours).

In a survey [Abrams, C., *et al.* (1997), pp. 11–12] of 511 medium- and long-distance truck drivers in the United States, the authors found no statistically significant differences in the stated rest needs among various categories of drivers (owner-operator, company driver, regular route, irregular route, solo, or team). On an average day, a driver reported needing an average of 7 hours of sleep.

In 1998, an expert panel [Belenky, G., *et al.* (1998), p. 7] convened to advise the Agency on potential hours-of-service regulations for CMV drivers. The panel reported that ''off-duty hours must include enough continuous time off duty so that drivers are able to meet the demands of life beyond their jobs and are also able to obtain sufficient uninterrupted rest.'' In addition, the panel recognized that ''although there is no guarantee that off-duty time will be spent in sleep, sufficient sleep cannot occur unless there is enough time allowed for it.'' The panel concluded that, ''the time allotted for sleep [off-duty time] must be a minimum of 9 [hours].'' The observations and recommendations made regarding continuous daily time off duty for CMV drivers supports the Agency's decision in this final rule to adopt the 10-hour provision.

FMCSA is convinced, based upon the research, that drivers need the opportunity for 7 to 8 hours of consecutive sleep to maintain alertness and performance, and reduce fatigue on a daily basis. The Agency recognizes there are individual differences in the amount of sleep needed. However, the research overwhelmingly supports that on average humans require between 7 and 8 consecutive hours of sleep per day to restore performance. The Agency must ensure that this rule sufficiently provides for the average sleep needs of all CMV drivers. Establishing a rule requiring less than the average would result in sleep restriction over time that would lead to increased fatigue and reduced performance, thus elevating crash risk and compromising safety.

Driver Health Impact

As discussed earlier, FMCSA found, despite its extensive literature review, little conclusive research to evaluate the specific impact or association between the specific hours driven or worked and CMV driver health. Anecdotally, one can conclude, based upon the research, that sleep plays a role in a person's overall health. Sleep deprivation has been associated with poorer health and increased health related problems, most notably cardiovascular disease, diabetes, and general health risks associated with obesity. The research supports 6–8 hours of sleep on average, as having a positive impact upon a person's health. Therefore, from a driver health standpoint, it is important that drivers be afforded the opportunity to obtain this amount of sleep. Based on the research that led to the 2003 rule, FMCSA knew that short sleep (sleep less than 6 hours) among drivers was a concern from both a safety and health perspective. As a result, FMCSA increased off-duty time from 8 to 10 consecutive hours, thereby increasing the driver's opportunity for sleep by up to an additional two hours per day. Data, highlighted earlier, from multiple sources confirm that CMV drivers are obtaining more sleep as a result of the 2003 HOS rule, averaging more than an extra hour daily.

Conclusion

After thorough consideration of the research studies, crash analysis reports, operational survey data, and comments to the NPRM, it is the Agency's best judgment that a requirement for a minimum of 10 consecutive hours off duty is essential to give drivers the time needed to obtain restorative sleep every day. The Agency believes scientific research is clear on the need for 7 to 8 hours of sleep to maintain alertness and performance. Lack of sufficient sleep results in greater risk of involvement in a fatigue-related crash, and is associated with health-related complications. To ensure that drivers are afforded the opportunity to obtain 7 to 8 hours of sleep, the rule must afford a period of time greater than the minimum required for sleep. Drivers report being more rested, now that they have been afforded the opportunity to obtain 7 to 8 hours of sleep due to the increased off-duty time. Adopting this provision acknowledges the importance of ensuring that the duration of the most recent sleep period before each duty tour is adequate to eliminate fatigue on a daily basis. The Agency's decision to adopt a 10-hour off-duty provision results in no new cost implications, compared to the 2003 rule.

In addition, the Agency believes that a 10-hour off-duty period coupled with the 14-hour duty tour will promote movement within the industry toward a 24-hour clock. A 14-hour non-extendable duty tour, in combination with the longer off-duty period, enhances the opportunity for drivers to achieve restorative daily sleep compared to the pre-2003 rule by eliminating the opportunity for the duty period to be extended. Ensuring that drivers have the opportunity for sufficient sleep, coupled with moving toward a 24-hour schedule, will reduce driver fatigue, promote driver health and improve CMV transportation safety.

J.8. The 34-Hour Restart and 60/70-Hour Rules

Introduction

The following summarizes discussions contained in this and earlier sections of this preamble that are pertinent to the 34-hour restart and the 60/70 hour rules.

This rulemaking addresses the phenomenon of driver fatigue, *i.e.*, the partial and occasional total loss of alertness resulting from insufficient quantity or quality of sleep. Sleep plays a critical role in restoring mental and physical function, as well as in maintaining general health. For most healthy adults an average of 7 to 8 hours of sleep per 24-hour period has been shown to be sufficient to avoid detrimental effects on performance.

It has been well established that mental alertness and physical energy rise and fall at specific times during the circadian cycle, reaching lowest levels between midnight and 6 a.m., with a lesser but still pronounced dip in energy and alertness between noon and 6 p.m. Changes of two or more hours in sleep/wake times cause one to become out of phase with the circadian cycle.

Circadian de-synchronization results from irregular or rotating shifts that are not anchored to a 24-hour day (*i.e.*, that start and end at different times each day), resulting in poor quality sleep and leading to accumulated fatigue. Sleep loss over several days leads to a degradation in alertness and driving performance. Sleep loss over extended periods or during night work can result in cumulative fatigue. Recovery from cumulative fatigue requires an extended off-duty period. CMV drivers who repeatedly obtain less than their daily requirement of sleep incur a sleep debt of some magnitude. In serious cases, the resulting cumulative fatigue can increase the driver's crash risk.

Recovery time is needed to erase the effects of sleep loss on performance, and in aggravated cases, to restore the mind and body to normal functioning.

FMCSA has determined that the research on CMV drivers supports the assessment that a recovery period of 34 hours is sufficient for recovery from cumulative fatigue. The importance of two night (midnight to 6 a.m.) rest periods was highlighted in the 1998 HOS expert panel report. The majority of drivers (about 80 percent) are daytime drivers, who would likely start their recovery period between 6 p.m. and midnight, and therefore these drivers would have the opportunity for two full nights of sleep prior to the start of the next work week. Also, in examining the operational data, FMCSA has determined that many drivers are extending their recovery periods beyond 34 hours, making it even more likely that they are getting 2 full nights of sleep. More than 50 percent of drivers are getting 3 nights of sleep. FMCSA has concluded from its review of the few scientific studies of recovery periods that 34 hours off duty provides enough time for drivers to recover from cumulative fatigue that might occur during multi-day operations.

In adopting the 34-hour recovery period, FMCSA has taken into account the weekly accumulation of driving and on-duty time allowed during each 7- and 8-day period, the adequacy of the 34-hour recovery, the costs versus benefits of retaining restart, the overwhelming support of the 34-hour recovery by the transportation industry, including motor carriers and drivers, the long-term effect on driver health, and the overall safety aspects of adopting this provision.

Support for Restart

Of the 564 drivers who commented on the 34-hour restart provision, 465 or 82 percent support it. Drivers cited a number of reasons why they like the 34-hour restart. It is long enough for them to get adequate rest before returning to work, but it is short enough that it does not significantly lessen their earnings. The provision gives drivers more time at home, gives them back the full allowable 70 hours for the coming 8-day week, and allows drivers to change shifts easily.

Nearly all of the 113 carriers (including owner-operators) that discussed the 34-hour restart favor it. FedEx Corporation (FedEx) noted that the ''vast majority'' of FedEx Ground's contractors and their drivers use the restart provision, and anecdotal evidence from those contractors supports the 34-hour restart as a way to allow for sufficient rest and to address any potential HOS compliance issues. J.B. Hunt Transport said that it had conducted a survey of 697 drivers and that 67 percent of them thought the 34-hour restart provision was the ''most liked'' aspect of the new HOS rule. Schneider National, Inc. said that it had interviewed 46 experienced drivers and they all voiced support for the 34-hour restart provision, because the restart, in combination with the 10-hour off-duty requirement, prevents the build-up of cumulative fatigue.

Crete Carrier Corporation reported that since January 2004, its drivers more frequently request and receive longer periods of time off between consecutive days of driving in order to utilize the 34-hour restart. The carrier said that it now sees drivers proactively scheduling extended off-duty recovery periods into their workweeks and returning after these extended periods with ''positive attitudes and appearing rejuvenated.'' A regional carrier said that the restart provision benefits drivers by giving them a full day away from work to rest and relax. One carrier said its drivers haul over-dimensional loads that they cannot move on Saturday afternoons and Sundays in a number of states. With the 34-hour restart, however, these drivers get their 70 hours back after waiting out the weekend. Another carrier urged FMCSA to keep the restart provision because it directly affects its ability to retain and recruit drivers.

Eighteen trade associations (trucking and other industries) also commented in favor of the provision. They cited benefits for both drivers and carriers. The associations said that the restart provision provides carriers with additional flexibility and allows increased productivity. In addition, they said that drivers are able to get home earlier and more often than they could under the pre-2003 rule.

Opposition to Restart

A total of 109 commenters disapproved of the 34-hour restart period. Those drivers that opposed the 34-hour recovery period cited a number of reasons. For example, one thought it is too short to provide sufficient restorative sleep for short-haul drivers, and another thought it too long. Other drivers suggested that some carriers are forcing drivers to sit at truck stops for 34 hours rather than letting them spend their off-duty time at home. For example, one driver explained that ''A dispatcher can run a driver out of time (60/70 hours). Then set him/her at a truck stop for 34 hours, 100 miles from home, then put him/her back on the road for another 60/70 hours. At least the old way, a driver could get home for a day or two. This way, the dispatcher can keep a driver out for a long time.''

Public Citizen called the 34-hour restart provision one of the most harmful aspects of the proposed rule and strongly urged that it be eliminated. The group said that drivers should not be able to restart their driving hours by taking only 34 hours off duty. Public Citizen thought that drivers should be afforded a weekly off-duty period that includes at least two to three nights of rest after a week of driving.

AHAS also opposed allowing drivers to restart their driving hours by taking only 34 hours off duty. It stated that drivers should be guaranteed the opportunity of at least three separate periods of sleep that are each equivalent to about 8 hours of sleep per night. It recommended that drivers have approximately 56 to 60 hours off duty before starting a new tour of duty, so that they can return to a regular pattern of waking and sleeping. AHAS referenced previous instances in which FMCSA acknowledged the importance of sleep periods taken at night. AHAS asserted that no research has shown that drivers can eliminate their fatigue, recover alertness and performance, and appropriately expunge an accumulated sleep debt with a 34-hour rest period. Furthermore, the group said that FMCSA had adopted the 34-hour restart provision ''in the face of a wealth of contrary evidence * * *.''

The Insurance Institute for Highway Safety (IIHS) maintained that there is no scientific basis for the 34-hour restart rule. The group questioned the applicability of the 1999 study by O'Neill *et al.*, which FMCSA cited as support for the 34-hour restart provision. IIHS noted that the study considered the effects of a 58-hour off-duty period, not a 34-hour period, and said that the study's authors cautioned about generalizing the results to operations with different characteristics. IIHS also noted that other studies have not reached the same conclusions. According to IIHS, a 1997 observational study of over-the-road drivers found that a 36-hour recovery period was inadequate, and a 2005 analysis of data from a national LTL firm suggested that there may be increases in crash risk associated with off-duty periods as long as 48 hours.

The Transportation Trades Department of the AFL–CIO also asserted that the 34-hour restart contributes to the physical exhaustion of drivers, because they receive only 34 hours off duty before beginning another ''marathon'' 7- or 8-day work assignment. The union said that the

restart provision dramatically cuts into the time drivers who operate on a weekly schedule would otherwise have to recover, catch up on sleep, and spend with their families. The International Brotherhood of Teamsters claims that any benefits of the 10-hour rest period and the 14-hour tour of duty provision are offset by the increase in driving time and the use of the 34-hour restart provision. The union asserted that the 34-hour restart has become mandatory for most drivers who are not protected by collective bargaining agreements. The union said that their collective bargaining agreements do not provide for the use of the 34-hour restart. Despite this fact, the union does not think that the companies for which its members work have been competitively disadvantaged.

Elisa Braver, University of Maryland School of Medicine, asserted that there is an absence of scientific evidence that the cumulative sleep deficits and fatigue incurred by working 60 hours can be remedied by having 34 hours off duty. She said that the scientific evidence cited by the Agency in support of the 34-hour restart is marred by small numbers, inapplicability to the driving population, and failure to study the effects of having 34 hours off after working according to the schedule permitted by the rule. As an example, Braver said that the study cited by O'Neill [O'Neill, T.R., *et al.* (1999)] featured small numbers of volunteers in driving simulators following a schedule unlike that of typical drivers who had 58 hours off between five-day work shifts. Braver cited a 2005 study which purportedly showed that 34 hours is an insufficient period for recovery [Park, S-W., *et al.* (2005)]. Braver cited another study [Belenky, G., *et al.*, (2003)] that she said indicated recovery from sleep deprivation can take longer than 48 hours.

Adequacy of 34-Hour Recovery To Eliminate Fatigue

By a large margin, the commenters who directly discussed the effect of the restart on fatigue said that it is long enough to provide sufficient restorative sleep, regardless of the number of hours worked prior to the restart. Of the 132 commenters who addressed the topic, 113 said that 34 hours is long enough to provide sufficient restorative sleep.

The Owner Operator Independent Drivers Association (OOIDA) noted that none of its members had reported needing more than two consecutive nights to obtain restorative sleep. The association said that drivers who use their 10 hours off duty to get sufficient restorative sleep never accrue a sleep deficit, so they are more than prepared to operate safely after the 34-hour restart. ATA said that the restart provision has improved the sleep/rest recovery period for drivers and enhanced their quality of life. It believes that the provision encourages carriers to more regularly schedule extended off-duty periods for drivers and that drivers are seeking to take that time off as a result of the restart provision. ATA also noted that the provision has helped to avoid the shifting of daytime to nighttime schedules, which research indicates can affect circadian rhythm and decrease alertness. CR England, Inc. said that the 34-hour restart offers irregular-route, long-haul drivers great relief from fatigue and sleepiness. The carrier noted that the restart is particularly beneficial to its drivers who want the rest but prefer to not spend their off-duty days away from home. The carrier called the restart provision a ''win-win situation for the driver'' because it allows higher earnings, enhanced safety, and improved family morale.

Alertness Solutions provided a lengthy commentary on the rule. It stated that the 34-hour period provides sufficient time for two 8-hour sleep periods and one 18-hour period of intervening wakefulness that should allow recovery from a cumulative sleep debt. The daily 10-hour off-duty period is intended to minimize or eliminate any acute sleep loss, so any cumulative sleep debt that might exist under the HOS rule should be minimal or none. Any sleep debt that might occur under the rule should be sufficiently ''zeroed'' in the context of the 34-hour restart period. Alertness Solutions also argued that there are no scientific data that specifically address the number of work hours per week (or per month or per year) that would be required to cause fatigue serious enough to reduce performance, alertness, or safety. However, limiting the number of work hours in a specified timeframe is a common approach used in scheduling practices and in regulatory policies to address fatigue. Often these weekly limitations are calculated based on the daily limitations. For example, Alertness Solutions pointed out that a 14-hour duty limit, worked for 5 days yields a total of 70 hours of work. If considered in terms of historical practice related to a five-day workweek and two days off for a ''weekend,'' 70 hours of cumulative work hours in a 7-day period is consistent. As reflected in the FMCSA rule, these total work-hour limitations are even more conservative than this calculation. Also, because the daily limitations on duty and the provided off-duty rest are intended to minimize or eliminate acute fatigue, they represent a rational basis for calculating the cumulative work hours total. A core premise in the weekly work-hour limitations is that they both restrict the total work hours and provide a recovery period within a certain timeframe. The 34-hour restart specifically addresses the recovery opportunity. Although there is no scientific basis for the weekly work-hour limitations, there are scientific data to address the recovery issue. Alertness Solutions also said there are some studies that have consistently demonstrated that two nights of sleep result in performance and alertness recovery following significant sleep deprivation.

AHAS, however, said that FMCSA did not (and could not) demonstrate that drivers utilizing the 34-hour restart provision are no more fatigued and are just as safe as drivers were when operating under the prior regulatory regime. AHAS claimed that FMCSA ''simply relied upon its rulemaking authority to pronounce new, more demanding HOS requirements and to assert, without specific support anywhere in the record, that this expansion in driving hours and reduced time off would nevertheless somehow generate a net gain in safety.''

IIHS agreed that FMCSA ignored studies showing an association between long driving hours and reports of falling asleep at the wheel of a large truck. IIHS added that among drivers it had interviewed, those reporting work hours longer than 60–70 per week, or other hours-of-service violations, were 1.8 times as likely to report falling asleep while driving during the month prior to their interviews as drivers who reported they worked fewer hours.

IIHS also critiqued Alertness Solution's comments. IIHS believes that the studies it referenced were not based on commercial vehicle drivers, but were primarily experiments that examine the effects on simulated performance of continuous hours of wakefulness, not time on task. IIHS said that the Alertness Solution commentary did not consider the range of factors that may affect sleep debts among truck drivers (*e.g.*, split rest time in a sleeper berth) and their ability to get adequate recovery sleep in the real world. For example, IIHS noted that for many drivers the 34-hour recovery period occurs on the road rather than at home.

Public Citizen thought that none of the research cited by FMCSA justifies a restart that provides for only two sleep periods, regardless of the time of day.

The group asserted that the minimum weekly recovery period that is supported by studies cited in the NPRM and earlier rulemaking notices is two consecutive nights of sleep. According to Public Citizen, the 1999 simulator study concluded that two full nights and one intervening day—about 32 hours off duty—would be a minimum restart period, although the study actually studied 58-hour recovery periods and never looked at recovery periods brief as 32 hours. The group also said that another study cited by the Agency, performed in 1997, found that when participants using simulators received 36-hour and 48-hour recovery periods after four workdays, ''there was no objective evidence of driver recovery.'' Public Citizen also said that a 1997 literature review, which attempted to assess scientific support for a 36-hour restart, found no such support, and in fact found only one study even dealing with an operational schedule that allowed such a brief weekly recovery. Public Citizen quoted the authors that this was because ''such a short reset period would result in schedules that would exceed current hours-of-work regulations in most countries.''

Regarding the current 24 consecutive hour restart for utility service drivers, groundwater well transporters, and construction material truck drivers, which is not affected by this rule, Public Citizen noted that in 2000 FMCSA conceded that it ''ha[d] found no sleep or fatigue research that supports any of the current exceptions or exemptions, including the 24-hour restart provisions.'' The group said that at that time FMCSA recommended that these drivers be provided a weekly recovery that included at least two consecutive nights of sleep.

The California Highway Patrol said that the 34-hour restart rule should be increased for all CMV drivers from 34 consecutive hours to 58 consecutive hours. This would allow a driver time to commute, a minimum of three uninterrupted 8-hour rest periods, and 2 full days off duty before returning to work with zero hours on their 60/70-hour rule. Several drivers suggested that the restart period should be shorter (*e.g.*, 24 hours) when drivers are on the road. One driver said, ''Spending 34 hours (less sleeping time) doing nothing in a truck stop is more fatiguing than working.'' Another driver suggested that the restart period should be only 24 hours for team drivers.

Length of the Recovery

Nearly half of the 87 commenters who discussed the appropriate length of the restart period suggested that it should be 24 hours; 48 hours was the next most popular choice. Sixteen commenters voiced approval for 34 or 36 hours.

Use of Restart

FMCSA requested information on how frequently the restart provision is being used. Ninety-five commenters responded, of whom 68 said that restart is being used weekly. Sixteen commenters said that the restart provision is being used one to three times per month. OOIDA indicated that among the members it surveyed, the 34-hour restart is the most consistently used feature of the current HOS rule, but it would be inaccurate for FMCSA to assume that all drivers are continuously maximizing use of the weekly 60 or 70 hours by using the 34-hour restart. NITL believes that substantial and/or continuous use of a ''21-hour day'' by drivers is a hypothetical result, rather than a likely consequence of the 2003 rule in the real world. NITL goes on to state that as a practical matter drivers must take breaks and complete non-driving tasks over the course of the day, such as meals and mandatory vehicle inspections. IIHS stated that among the drivers it interviewed, more than 90 percent said they used the restart provision during 2004. IIHS said a large majority reported that the restart provision was part of their regular schedule. J.B. Hunt Transport reviewed the work record of 80 randomly selected over-the-road drivers for a 30-day period, and found that 74 percent of them used the 34-hour restart at least once during that period. On average, the drivers accumulated 62.25 hours per eight-day period. Werner Enterprises, Inc. said that its drivers use the 34-hour restart extensively and that they report feeling adequately rested after doing so. Schneider National said that 26.1 percent of its driver breaks are between 34 and 44 hours.

Interaction of Weekly 60/7 and 70/8 Rules With Restart

FMCSA explained in the 2005 NPRM that, under both the pre-2003 and 2003 rules, most drivers are prohibited from driving after reaching a maximum of 60 hours of on-duty time in any consecutive 7-day period, or 70 hours in any consecutive 8-day period. Of the 106 commenters who addressed the topic, 80 (75 percent) expressed opposition to the weekly limits and particularly their interaction with the restart provision.

IIHS stated that, although the rule purports to maintain the prior 60/70-hour limits on ''weekly'' driving, the restart provision actually allows drivers to log up to 88 hours of driving during an 8-day period (an increase of up to 30 percent), and up to 77 hours of driving during a 7-day period (an increase of up to 25 percent). IIHS claims that many drivers have dramatically increased their multi-day driving and work time, and they may do so week after week. Such a change should be allowed only if there is convincing scientific evidence that beginning another week of driving after such a short period of rest will not adversely affect safety.

Public Citizen agreed that weekly driving and on-duty time would be radically increased under the rule. Under 7- or 8-consecutive-day limits, the most exhausted drivers, that is, those driving the daily maximums repeatedly, would in practice receive the longest weekly recovery period, while those driving and working less would reach the 60-hour or 70-hour limits later in the week and have a shorter weekly recovery time. The 34-hour restart, on the other hand, has the effect of allowing truckers who maximize their driving to drive more per week with less required recovery time. Public Citizen said scientific studies show that as drivers log more hours on the road over multiple days, their performance declines. They concluded that drivers should not be able to accrue more than 60 hours of driving over 7 consecutive calendar days or more than 70 hours of driving over 8 consecutive calendar days. Fewer hours of driving would further improve safety.

In contrast, Alertness Solutions stated that once any cumulative sleep debt has been erased through recovery sleep, an individual should be considered rested and without any acute sleep loss or sleep debt. From a physiological perspective, after a 34-hour restart period, a driver would be considered to have zero sleep loss, acute or cumulative, and be appropriately rested for duty. Alertness Solutions suggested that any subsequent duty hours accrued would be accrued from a rested or ''zeroed'' sleep loss calculation and added to the following total of work hours. Adding these subsequent work hours retroactively to a ''weekly'' total, after a recovery period, is misleading and inappropriate. Alertness Solutions said the weekly timeframe is an arbitrary constraint in this physiological context. While the total hours can be calculated to be higher in a ''week'' by adding retroactively, this ignores the physiological status of a driver who should be rested and ready for duty. In fact, the primary objective of a recovery or restart period is to ''zero out'' any

accumulated fatigue effects and have a rested operator prepared for duty.

Limits on Use of Restart

The NPRM asked whether a driver who has already exceeded 60 hours on duty in 7 days, or 70 hours in 8 days, should be permitted to utilize the 34-hour restart at any time, or should instead be required to take enough days off duty to be in compliance with the 60-/70-hour provision before beginning the restart period. An Agency policy directive issued on November 25, 2003, provides guidance to roadside law enforcement officials on how to implement the 34-hour restart provision, when drivers have exceeded the 60/70 hour rule. The current policy guidelines require drivers to come into compliance with the 7/8-day weekly duty time before applying the 34-hour restart provision.

J.B. Hunt Transport argued that if the purpose is to punish the driver for working over the 60 or 70 hours (which they can do without a violation as long as they do not drive), then the driver who exceeds the 60 or 70 hours should be required to wait before using the restart provision. On the other hand, if the purpose is to ensure the driver is rested and safe, then many of the current studies and reports would support allowing the restart at any time. J.B. Hunt urged FMCSA to clearly indicate which of these two purposes it has chosen. The carrier said that the current regulatory wording is not consistent with the interpretive guidance that has been issued by the Agency.

OOIDA questioned FMCSA's interpretation of the 2003 rule, which appeared to mean a driver who has driven for 59.9 hours in 7 days or 69.9 hours in 8 days, respectively, could use the 34-hour restart, but a driver who has driven 60.1 or 70.1 hours would be required to go off duty for as many as three days before being allowed to return to duty or begin a 34-hour restart period. OOIDA said it is unaware of any study that supports the conclusion that drivers whose driving time is separated by just minutes need such dramatically different amounts of off-duty time to obtain restorative sleep. OOIDA asserted that a driver could obtain more than sufficient rest during a 34-hour restart regardless of whether the driver has exceeded the 60- or 70-hour rule. OOIDA asked FMCSA to withdraw its interpretation of the rule or to change the language of the rule. FedEx said that if a driver exceeds the rule's limits, the driver is in violation and should be held accountable. However, if a driver exceeds the rule's limits, either in the non-driving mode, which is legal, or in the driving mode, which is not, the 34-hour restart should reset the driver's clock to zero. FedEx noted that otherwise there is no foundation for enforcement. Because a driver is only required to carry the previous seven days' logs, it is impossible for a field enforcement officer to look back far enough to know if a reset was legitimate or not. Because a driver cannot legally drive after 70 on-duty hours in eight days or 60 on-duty hours in seven days, and given the impracticality of enforcement, FedEx Freight proposed that the restart be applicable to those cases in which a driver exceeds the 70-hour or 60-hour limit prior to the restart.

Robert Transport suggested that a driver should be allowed to use the 34-hour restart in any circumstances. The carrier said that when drivers exceed their weekly limit, it is usually because of unpredictable events such as a snowstorm, an unusually long wait at a border crossing, or an excessive loading or unloading time. The carrier did not think that drivers should be penalized in these situations by having to wait before utilizing the restart.

In contrast, the CHP asserted that drivers must be in compliance with the applicable cumulative total before using the restart provision. The CHP said that if a driver is allowed to use the 34-hour restart provision without regard to the 60/70-hour rules, the driver could easily work in excess of 98 hours in an 8-day period before driving is prohibited. A regional carrier also said that drivers should have to wait until they are below the 60/70-hour period before using the 34-hour restart. Otherwise, a carrier could send a long-haul driver back out on the road after only one day off, which the commenter said was insufficient time off.

Economic Impact of Eliminating Restart

FMCSA requested comments on the impact of eliminating restart in terms of productivity, annual revenues, and operational costs. Responding to FMCSA's request, 68 commenters (49 drivers, 18 carriers, and one trade association) indicated that eliminating the 34-hour restart would have a negative economic impact on the trucking industry.

J.B. Hunt Transport said that eliminating the restart provision would have a negative impact on the company, but the company had not quantified it. A sample of its drivers averaged 62 hours on duty in 8 days, which indicated that the drivers were not using the restart provision to work the maximum number of hours possible. Given that fact, J.B. Hunt reported that eliminating the restart provision would not necessarily reduce the number of hours that its drivers worked each week. Roehl Transport estimated that eliminating the restart provision would reduce its productivity by 1 to 2 percent. The carrier believed that it would also incur higher fuel costs, because drivers would be waiting at truck stops more often and would burn the fuel to maintain comfortable cab temperatures. The carrier also thought that drivers would spend more money for meals and other living expenses, because they would be spending more time waiting while out on the road. A regional carrier of agricultural products noted that there are only certain times of the week when its drivers get tight on hours under the rolling weekly limits on hours. The carrier said that if the restart provision were eliminated, it would have trouble hiring drivers to work for only a few days a week. It also believed that its overhead costs would increase.

Brandt Truck Line, a short-haul carrier, said that eliminating the restart provision would not affect local carriers operating under the 60/70 weekly limit, but it would hurt the productivity of local operations working under the 70/8 limit. The carrier noted that those carriers either would have to revise their local Monday-to-Friday work schedules to be four days (14 hours each), or would have to reduce the hours of each 5-day driver from 14 hours per day to 11.67 hours per day. The carrier would then have to hire one additional driver for every seven drivers that it currently employs. Perishable Distributors of Iowa indicated that eliminating the 34-hour restart would hurt it financially because it would not be able to use the 16-hour rule as often. (As provided by § 395.1(o)(3), drivers who have returned to their normal work-reporting locations for the five previous tours are allowed to operate up to the 16th hour once a week, unless they take a 34-hour restart during that week.) The carrier said it would also have a labor issue, because it would have to shorten its routes and create more of them. The drivers would be working fewer hours, creating financial hardships.

Safety and Health Impact of Eliminating Recovery

FMCSA asked about the health impact and the safety impact of eliminating the 34-hour restart. Both carriers and drivers said that elimination of the restart provision would be harmful to driver health.

Werner Enterprises and Roehl Transport stated that elimination of the 34-hour restart would likely have a deleterious effect on driver health, and

would encourage drivers to adjust their work schedules to let them run every day without taking a day off. For long-haul drivers it would mean more non-productive sitting and waiting time during a week in a truck stop. The carriers asserted that wasting time results in a host of medical and life-style issues, including over-eating, frustration, stress, and a general feeling of job dissatisfaction in an industry where turnover is a significant issue. Drivers away from home during the week need to be allowed to work as much as they would like within the confines of safe operations. Maverick Transportation had no data to support a negative impact on health and safety but believed that elimination would have a big impact on driver lifestyle and morale. J.B. Hunt Transport said that removing the restart could have an adverse affect on drivers' health and could also negatively impact crash frequencies, because its drivers appear to use the restart as much to reduce stress and to obtain longer periods of rest when needed as they do to simply work and drive longer. Two carriers stated the restart impacts drivers' health positively because they start fresh after the period of time off that is spent at home the majority of the time. Two other carriers, however, noted that it would have no impact.

One driver thought that eliminating the restart provision would contribute to older, experienced drivers leaving the industry. The resulting increase in the number of newer drivers would increase the number of crashes, fatalities, and injuries. Another driver said that elimination of the provision would increase the number of drivers who violate the HOS rules. Two drivers noted that the restart allows them to stay on a regular 24-hour cycle, and changing it would disrupt the cycle. Three drivers stated that elimination would increase driver stress. One driver stated that by the end of the 8-day cycle, drivers are working odd hours because they are trying to work around what they did 8 days before. If they start over after being off duty for 34 hours they will not be punished for working the week before. Without the restart they must sometimes drive a short day and work long hours during the early morning hours in order to make deliveries. This disrupts their sleep cycle and directly contradicts what the new regulations are supposed to correct.

Finally, as described earlier under ''Opposition to Restart,'' several groups, including Public Citizen, AHAS, and IIHS expressed strong opposition to the restart provision.

FMCSA Response

Based on the scientific data and comments it has received, FMCSA has decided to prohibit drivers from driving after reaching a maximum of 60 hours of on-duty time in any consecutive 7-day period, or 70 hours in any consecutive 8-day period. The Agency will also allow any 7- or 8-day period to end with the beginning of any off-duty period of 34 or more consecutive hours. FMCSA has determined that a 34-hour recovery period permits a majority of drivers to have enough time for two uninterrupted nights of 8 hours recovery sleep before returning to work in a new multi-day duty period. While the research on adequate recovery periods is somewhat limited, there is general agreement that two nighttime periods (midnight to 6 a.m.) are sufficient for full recovery from fatigue. Data reviewed by FMCSA shows that 22 percent of CMV driving takes place at nighttime, between midnight and 6 a.m. [Campbell, K.L, & Belzer, M.H. (2000), p. 115]. Many of these drivers would have to sleep during the day. However, the 34-hour recovery period would give drivers who perform the other 78 percent of driving (between 6 a.m. and midnight) an opportunity to obtain two nights of recovery sleep prior to starting the next work week. In adopting the weekly limit and recovery provisions, the Agency considered all relevant research, appropriate economic factors, and comments received on the NPRM addressing driver health and public safety.

In the 2000 NPRM, the Agency proposed to require a weekly off-duty period or ''weekend'' which would have imposed a regulatory requirement for a weekly off-duty period containing two midnight to 6 a.m. blocks for all CMV drivers (65 FR 25562). In the 2003 rule, FMCSA explained that it opted for a 34-hour restart provision in light of the concerns expressed by commenters that the proposed ''weekend'' requirement would increase daytime congestion and accident risks and produce irregular sleep schedules (68 FR 22477). Commenters pointed out that the ''weekend'' proposal ''assumes that every driver is subject to weeklong sleep deprivation.'' FMCSA admitted that it ''may have overreached trying to prevent the most extreme abuses by imposing restraints on the whole driver population'' [*Id.*].

Studies indicated that cumulative fatigue and sleep debt can develop over a weekly period, and at least two nights of sleep are needed to ''restore'' a driver to full alertness [Belenky, G., *et al.* (1998), p. 13; Jovanis, P.P., *et al.* (1991), p. 2; Linklater, D.R. (1980), p. 198; Williamson, A.M., *et al.* (1994), p. 104]. The Agency determined that the 34-hour recovery period, which is based on a full 24-hour period plus an additional 10-hour period available for sleep, is the minimum restart which would provide adequate restorative rest. FMCSA explained in the 2003 rule that it considered a number of competing factors and opted for a uniform rule that ''represents the best combination of safety improvements and cost containment that can realistically be achieved'' (68 FR 22457). In the 2005 NPRM, FMCSA reiterated that, ''The 34-hour restart was considered as a flexible alternative to the ''mandatory weekend'' proposed in the 2000 NPRM * * * [70 FR 3348].

The D.C. Circuit criticized FMCSA for neither acknowledging nor justifying that the 2003 rule ''dramatically increases the maximum permissible hours drivers may work each week'' (*Public Citizen*, at 1222–1223). In the 2005 NPRM, the Agency explained that the restart provision provides an opportunity for increases in the total hours of permissible on-duty time in a 7-day period, after which a driver may not drive a CMV, from 60 hours to 84 hours. It also provides an opportunity for increases in the maximum driving time permitted in a 7-consecutive-day period (from 60 hours to 77 hours). Likewise, the restart provision provides an opportunity for increases in the total hours of permissible on-duty time in an 8-day period, after which a driver may not drive a CMV, from 70 hours to 98 hours and, provides an opportunity for increases in the maximum driving time permitted in an 8-consecutive-day period (from 70 hours to 88 hours). A number of advocacy groups argue that these extra on-duty and driving hours virtually guarantee that drivers are far more fatigued under the 2003 rule than under the pre-2003 regulations.

Several commenters argued against retaining the recovery period. Their comments can be placed into three related categories: (1) Two nights of sleep are needed for full recovery; (2) science does not support the 34-hour recovery period; and (3), the recovery period should be eliminated or increased in length due to the potential for drivers to significantly increase their daily and weekly working hours. The Agency decided to adopt a 34-hour recovery period based on an extensive scientific review of the literature, data, and comments. Adopting a recovery period is based upon seven main points: (1) Impacts of potentially longer weekly hours; (2) Operational data; (3) Economic impact of the rule; (4) Review

of the literature regarding recovery and fatigue; (5) Public comments; (6) Public safety and operational concerns and (7) Health impacts of eliminating or modifying the recovery provision.

Impacts of Potentially Longer Weekly Hours

Some of the commenters paint a picture of drivers working every additional hour allowed by the 34-hour recovery provision, and accumulating dangerous levels of fatigue. As indicated by the docket comments of motor carriers and industry associations, these images have little to do with the real world. Information collected and analyzed by FMCSA shows that most drivers are taking longer recovery periods than the minimum 34-hour recovery period that FMCSA is establishing under this rule. FMCSA believes the average driver is not, and cannot realistically, drive and work the longer weekly hours, on a regular basis, as described by some of the commenters.

The 2005 FMCSA Field Survey (see Section I.1) shows that between July 2004 and January 2005, 393 drivers used 1,411 recovery periods. The survey found that 95 percent of recovery periods exceeded 34 hours in duration. Figure 8 shows that 50 percent of the recovery periods were longer than 58 hours, in contrast to 5 percent that were only 34 hours long. The data appear to confirm that, in fact, a majority of drivers are obtaining two midnight to 6 a.m. sleep periods.

FIGURE 8.—RECOVERY PERIODS

[Local & OTR]

Restart period (hours)	Instances	Percent
34	66	
35 to 58	635	45
>58	710	50
Total	1411	100

Source: 2005 FMCSA Field Survey.

In the 2005 NPRM, the Agency acknowledged that a driver using the 34-hour recovery period could work a maximum of 77/88 driving hours or 84/98 driving and other on-duty hours depending upon which weekly rule the motor carrier operated under (*i.e.*, 60/7 or 70/8). It is highly unlikely that drivers could, in practice, continually maximize their driving and on-duty time and minimize their off-duty time. Many of the larger carriers that commented to the 2005 NPRM agreed that in most instances drivers do not consistently have the opportunity, nor are they taking it, to accumulate the maximum amount of driving and on-duty hours that are theoretically allowed under the 2003 rule. For example, J.B. Hunt Transport said that a sample of its drivers averaged 62 hours on duty per 8 days under the 2003 HOS rule, which indicates that the drivers are not using the restart provision to work the maximum number of hours possible. Werner Enterprises, Inc. also, said that there has been no significant change in the number of hours worked by its drivers as a result of the 34-hour restart. FMCSA's Field Survey showed the average weekly (7-day) hours worked by CMV drivers is 61.4 hours.

To reach the maximum driving or driving and on-duty hours requires that nearly perfect logistics for picking up and delivering a load are routinely in place; in other words, total elimination of waiting time to load, mechanical and equipment problems, and traffic- and weather-related delays. Additionally, as explained in this rulemaking, FMCSA and other independent survey data collected since the 2003 rule was adopted indicate that drivers are not, in fact, maximizing their driving hours or total on-duty time, nor do they routinely take the minimum number of off-duty hours. In view of these facts, drivers will not routinely accrue the maximum weekly driving and on-duty hours feared by some commenters.

This is not surprising. As indicated above in section J.5, driving and on-duty hours under the 2003 rule would not be expected to increase suddenly unless there had been an equally sharp spike in demand for trucking services. Although the U.S. economy is expanding, there was no unprecedented eruption of demand for transportation in 2004 and 2005 that might have overwhelmed the normal, measured growth of the motor carrier industry and forced drivers to maximize their work hours in order to handle a huge volume of new cargo. The data FMCSA has collected bear this out. While some drivers may occasionally drive the maximum hours allowed by the 34-hour restart rule, most will continue to work about the same number of hours they did before the 2003 rule. According to commenters, the great advantage of the restart provision is not the increased work hours it allows, which are not regularly used, but the scheduling flexibility it gives motor carriers and the added time at home it gives drivers.

Operational Data

As mentioned earlier, the 2005 FMCSA Field Survey (see Section I.1) shows that between July 2004 and January 2005, 393 drivers used 1,411 recovery periods. The survey found that 95 percent of recovery periods exceeded 34 hours in duration. Figure 8 shows that 50 percent of the recovery periods were longer than 58 hours, in contrast to 5 percent that were only 34 hours long. The data appear to confirm that, in fact, a majority of drivers are obtaining two midnight to 6 a.m. sleep periods.

2004 FARS data suggest that fatigue-related crashes, as a percent of all fatal truck crashes, have decreased under the 2003 rule. Similarly, carriers commenting on the 2005 NPRM generally cite either stable or decreasing crash rates (see Section H-Crash Data). FMCSA agrees with many commenters that the limited data available does not provide a definitive picture of the impact the 2003 rulemaking has had on fatigue-related CMV crashes. However, the preliminary data reported and reviewed to date does suggest that fatigue related crashes have decreased as a result of the 2003 rulemaking.

Economic Impact of the Rule

The safety and health effects of modifying or eliminating the recovery provision need to be weighed against the significant economic costs that would be incurred by the transportation industry. As discussed in detail in the RIA accompanying this rule, increasing the restart period to 44 hours would result in an extremely high cost relative to benefits. Specifically, the annual costs to implement a 44-hour recovery period were estimated at approximately $600 million. The cost to eliminate the 34-hour recovery provision in isolation, or with no other HOS-related changes implemented, was even higher, with annual costs more than $1.5 billion from productivity losses to motor carriers, while safety benefits were estimated at less than one-tenth the cost. In summary, the cost to modify the recovery provision was estimated to be significant, which is due in part to its extensive use by the industry, as discussed in detail throughout this rulemaking.

As discussed further in this section, an analysis of survey data by Campbell and Belzer [Campbell, K.L., & Belzer, M.H. (2000), p.115] found that the average commercial truck driver drives approximately 22 percent of his or her weekly driving time during the midnight to 6:00 a.m. period. While the economic impacts of restricting driving during the midnight to 6:00 a.m. period were not explicitly measured as part of this rulemaking, such a restriction would undoubtedly result in significant economic impacts to the motor carrier industry, given that 22 percent of current driving time would have to be

shifted to the remaining 18 hours of the workday, or that period in which most highway congestion already occurs. These impacts would come in the form of both reduced safety benefits as well as new operational costs to carriers. Numerous comments submitted to the docket in response to the 2000 HOS NPRM spoke to this point. For instance, comments submitted by the National Private Truck Council, American Trucking Associations, Watkins-Shepard Trucking, the National Association of Small Trucking Companies, and many others, noted that restrictions placed on nighttime driving would force trucking companies to place more of their trucks on public roadways during the already congested daytime hours. Additionally, some carriers would have to purchase additional trucks that would be required to operate during the daytime period, in those instances where a single truck was previously utilized by two drivers operating on separate day and night schedules. As a result, all of these trucks would be operating at a portion of the day when traffic congestion is the worst, resulting in an increase in truck-related crashes and thereby offsetting any potential safety benefits resulting from a reduction in fatigue-related truck crashes from nighttime driving restrictions. Such a restriction would also impose major operational costs to those segments of the industry that use nighttime runs to support daytime operations. For instance, a sizeable portion of the driving done during the nighttime period is performed by line-haul drivers of LTL companies, which haul freight between terminals during the midnight to 6 a.m. period in preparation for local delivery services the following day.

Review of the Literature Regarding Recovery and Fatigue

FMCSA is convinced that the combined impact of today's rule, including the 34-hour recovery period, increases the safety to CMV drivers and is not deleterious to their health. Other provisions of this rule restrict the total on-duty time to 14 hours that cannot be extended by breaks, require drivers to take 10 consecutive hours off duty before beginning a new duty period, and eliminate the split sleeper-berth provision, by requiring that drivers utilize one sleeper-berth period of at least 8 hours. These provisions limit duty time, while affording ample time for drivers to obtain the 7 to 8 hours of sleep that the majority of the research indicates is sufficient to restore a driver to full alertness on a daily basis (see Combined Effects discussion, section J.11).

FMCSA believes the 34-hour recovery period serves as an additional safety benefit that affords a majority of drivers two nights of sleep recovery, which should sufficiently enable drivers to eliminate or ''zero out'' any cumulative fatigue that may occur over several days. While some research suggests that a 24-hour period is sufficient to reduce cumulative fatigue [Bonnet, M.H. (1994), p. 62], most research agrees that optimal recovery occurs when there are two consecutive 8-hour sleep periods from midnight to 6 a.m. [Dinges, D.F., *et al.* (1997), p. 276; Rosekind, M.R. *et al.* (1997), p. 7.3]. Under the 34-hour recovery period, 78 percent of the drivers will be able to obtain two consecutive nights of sleep, and those whose schedules do not permit night sleep will at least be provided with two 8-hour sleep periods and some schedule regularity. However, as stated by FMCSA's 2000 NPRM expert panel, ''If the work shift ends late in the evening, *e.g.*, 11:30 p.m., it is conceivable that the driver could be in bed by midnight if there is an adequate place to sleep nearby. Under these circumstances the total recovery time period could be as short as 31 or 32 hours and still allow for two uninterrupted time periods between midnight and 6:00 a.m.''

Additionally, nighttime drivers will be less fatigued on a daily and weekly basis, compared to the pre-2003 rule, through the combined effects of the provisions of the rule being enacted today (see Combined Effects, section J.11). While the two consecutive 8-hour sleep periods that some night drivers will utilize for sleep are not ideal, today's rule will limit the build-up of cumulative fatigue; hence, the two 8-hour sleep periods give drivers an adequate opportunity to help minimize such acute and cumulative fatigue, regardless of their driving schedule.

FMCSA has determined that, in general, recovery time periods must take into consideration the necessity for overcoming cumulative fatigue caused by sleep debt. [Dinges, D.F., *et al.* (1997), p. 267; Balkin, T., *et al.* (2000), p. ES–8; Belenky, G., *et al.* (2003), p. 11; Van Dongen, H.P.A, *et al.* (2003), p. 125] Fatigue resulting from sleep loss is usually characterized as acute, resulting from a single insufficient sleep period, or cumulative, resulting from two or more insufficient sleep periods [Rosekind, M.R., *et al.* (1997), p. 7.2]. Rosekind describes three types of sleep loss: ''Sleep loss can occur either totally or as a partial loss. Total sleep loss involves a completely missed sleep opportunity and continuous wakefulness for about 24 hours or longer. Partial sleep loss occurs when sleep is obtained within a 24-hour period but in an amount that is reduced from the physiologically required amount or habitual total. Sleep loss also can accumulate over time into what is often referred to as ''sleep debt.'' Sleep loss, whether total or partial, acute or cumulative, results in significantly degraded performance, alertness and mood'' [*Id.*].

Under today's rule, most drivers have an adequate opportunity to limit the accumulation of fatigue. Ten hours off duty gives drivers enough time for 7–8 hours of sleep. In addition, adopting a non-extendable 14-hour duty tour (reduced by one or more hours from the pre-2003 rule) will also limit the accumulation of fatigue. The off-duty and duty-tour provisions collectively help ensure that drivers can maintain a 24-hour cycle. Comments also support the notion that the restart helps drivers stay on a 24-hour circadian cycle. In addition, today's rule moves drivers from an 18-to 21-hour driving time/off-duty cycle, which is far closer to a 24-cycle than previous rules achieved, thereby reducing the severity of a backward rotating schedule, resulting in less driver fatigue. Further, the revised sleeper-berth requirement provided by this rulemaking also gives drivers the opportunity to obtain 7–8 hours sleep. These provisions, together with the 34-hour recovery period, are more than adequate to allow drivers to return to baseline alertness levels.

This provision protects a majority of drivers because 78 percent of driving time occurs between 6 a.m. and midnight [Campbell, K.L., & Belzer, M.H. (2000), p. 115]. Specifically, the 10 hours off duty coupled with the reduced, non-extendable 14-hour duty tour will provide drivers the opportunity for sufficient recuperative rest on a daily basis to drive and work the daily maximum limits allowed by today's rule. Therefore, the recovery period serves as an added safety net to protect drivers from instances when cumulative fatigue does occur over a 7- or 8-day period.

Research concerning specific recovery periods is limited. Most sleep researchers agree the ideal recovery time for cumulative sleep loss would be an opportunity to obtain sleep during two uninterrupted periods from midnight to 6 a.m. [Belenky, G., *et al.* (1998), p. 13; Bonnet, M.H. (1994), p. 62].

The 2003 rule treats daytime and nighttime driving equally, both in terms of hours permitted and required recovery time. While it is recognized that daytime sleep obtained by night

drivers is not equivalent in quality to night sleep [Akerstedt, T. (1997), p. 105] research concerning specific recovery requirements, particularly for night drivers, is limited. Working/driving during the night, especially midnight to 6 a.m., has the combined effect of affording poorer quality sleep (daytime sleep) and requiring the driver to work and drive during the time when the physiological drive for sleep is strongest. In preparation for the 2000 NPRM, FHWA convened a panel of experts to advise the Agency on science associated with various aspects of the proposed hours of service regulation.

With respect to night driving, the Expert Panel, after reviewing the relevant literature, came to the conclusion that accident risk is substantially higher during nighttime hours, independent of the length of time on the job, and this elevated risk cannot be ignored. The expert panel also determined that driving between the hours of midnight and 6:00 a.m. is associated with as much as a 4-fold or more increase in fatigue-related crashes, because our body clock is ''set'' to wake us up in the morning and to send us to sleep at night. The panel concluded that even when adequate sleep time is available during the day, the time actually spent sleeping is less than at night. Shift work and night work are associated with acquisition of less sleep, even when night work is permanent. The panel surmised that this is caused by disrupting effects of circadian cycles and that sleep obtained is not only reduced in length, but also poorer in quality.

The science supports the notion that drivers should be provided recovery periods after a sustained period of daily work to compensate for any build-up of cumulative fatigue or sleep deprivation [Belenky, G., *et al.* (1998), p. 12]. There is, however, no scientific basis for concluding that every driver, or even every nighttime driver, is sleep deprived. As mentioned, FMCSA has determined that the 34-hour recovery period gives the majority of drivers the opportunity to obtain two uninterrupted nights of 8 hours of recovery sleep.

However, other sleep researchers indicate that recovery to baseline performance levels can be achieved with as little as 24 hours recovery time [Alluisi, E.A. (1972), p. 199; Feyer, A.M., *et al.* (1997), pp. 541–553; O'Neill, T.R., *et al.* (1999), p. 2]. Smiley and Heslegrave [Smiley, A., & Heslegrave, R. (1997), p. 8], in their literature review regarding 36-hour recovery, identified a study that suggests one day off is insufficient for night workers to pay off the accumulated sleep debt from 5 days of work.

IIHS and Elisa Braver cited Park *et al.* (2005), as a study that purportedly showed that 34-hour restart is an insufficient period for recovery. The Park study is an analysis of pre-existing crash and non-crash data representing an estimated 16 million vehicle miles of travel. The study reported, in part, that there is some evidence, although not persuasive, that there may be risk increases associated with significant off-duty time, in some cases in the range of 24–48 hours. The study suggests that ''restart'' programs should be approached with caution. Two sets of models were estimated with the data. Model 1 was developed to assess the effect of driving time which is divided into 10, one-hour periods with the first hour serving as the baseline. The second model retained driving time and added as covariates 43 driving schedules manually derived and developed by cluster analysis. The most significant deficiency in the study was that there were a number of HOS rule changes in 2003 that make the data not applicable. First, the off-duty time has increased from 8 to 10 hours and the on-duty time went from 15 plus hours per day to only 14 hours per day. Both of these changes were intended to reduce any cumulative fatigue that might result. Second, the study and particularly the models used could have been significantly improved if the study had undergone a peer review process. Lastly, the authors concluded that ''there is some evidence, although it is far from persuasive, that there may be risk increases associated with significant off-duty time, in some cases in the range of 24–48 hours'' [Park, S–W., *et al.* (2005), p. 16]. The Agency has examined the study, and like its authors, has concluded that the findings are not persuasive that a shorter recovery period presents greater risk to CMV safety.

Additionally, IIHS cited the Wylie [Wylie, C.D., *et al.* (1997)] study as stating that 36-hour recovery was an insufficient period to ''zero out'' any cumulative fatigue. This study was also based on the pre-2003 rule—drivers operating under the new rule should be less susceptible to cumulative fatigue. The Wylie study was a small demonstration study of a methodology that could be used to evaluate drivers' recovery periods. Twenty-five drivers in small groups (4–5 drivers each) were used to evaluate different recovery periods (12, 36, and 48 hours) and driving time. None of the recovery periods examined were found to be of sufficient length for driver recovery. The study concluded that the small subject sample limited the ability to make reliable estimates of observed effects [Wylie, C.D. (1997), p. 27]. Given the authors' conclusion, the Agency has not relied upon the Wylie study to evaluate the adequacy of the 34-hour recovery period.

As explained earlier, few studies address the effect of recovery periods between work periods spanning multiple days, such as a workweek [O'Neill, T.R., *et al.* (1999), p. 2; Wylie, C.D., *et al.* (1997), p. 27; Smiley, A., & Heslegrave, R. (1997), p. 14]. After reviewing the studies relevant to the 34-hour recovery period, as cited in the 2003 rule and those submitted by commenters to the 2005 NPRM, the Agency has determined that current scientific evidence is limited. Therefore, changes in HOS regulations must, in addition to considering the relevant science and research, be accompanied by sound regulatory evaluation that encompasses all relevant issues, including public interest, cost, and public safety.

The Agency considered implementing a restart period of 44 hours. This would give more drivers, specifically nighttime drivers, an opportunity to be off duty for two nighttime periods between midnight and 6 a.m. However, it would also encourage drivers to operate on a rotating shift, not to mention shifting more drivers to day time, thereby increasing traffic during the day. A forward-rotating schedule would result in a driving schedule that would cause a driver to begin working at a later time of day than the previously used weekly schedule. Therefore, toward the end of each work week, the driver would begin work later and later each day, ultimately shifting the driving and on-duty time into the nighttime hours. Consequently, the added recovery hours would have a negative impact on a driver's circadian cycle.

The Agency attempted to determine whether the added hours of recovery, through the use of a 44-hour recovery period, created a net benefit in reducing fatigue compared to the potential negative impact on circadian rhythm of establishing a rotating schedule. The Agency has determined there is no conclusive scientific data to guide it in determining which factor (recovery time vs. circadian disruption) is more effective in alleviating fatigue. In sum, in deciding to adopt a 34-hour recovery period, the Agency considered that compliance with a 34-hour recovery period results in a CMV driver restarting work at approximately the same time of day as his or her prior shift. The 34-hour recovery period also avoids the shifting of daytime to nighttime schedules,

which research indicates can disturb the circadian rhythm and decrease alertness.

Public Comments

In the 2005 NPRM, the 34-hour recovery period received support from more comment letters than any other provision (591 approved versus 109 disapproved). The commenters said that the 34-hour recovery period makes scheduling much easier than working with the old rolling weekly limits. Comments also indicated that 34 hours off duty are long enough to allow recovery (111 of 130 comment letters that addressed the issue). According to a 2004 survey, among 31 fleets that responded, the 34-hour restart is the most utilized feature of the 2003 rule. The survey, titled ''A Survey of Private Fleets on their Use of Three New ''Hours of Service Features','' conducted by Stephen V. Burks of the University of Minnesota, found that ''most widely used among survey respondents is the 34-hour Restart, which is employed on average of 61 percent of the runs of firms in the sample'' [Burks, S.V. (2004), p. 2]. Additionally, driver surveys have shown time to spend at home and with family was identified as a major priority [Belenky, G., *et al.* (1998), p. 41].

Public Safety and Operational Concerns

As mentioned earlier in this section, many comments to the 2000 NPRM suggested that by requiring all drivers to take two midnight to 6 a.m. recovery periods, FMCSA would be increasing the number of heavy vehicles operating in daytime traffic. The commenters stated that this would create greater hazards to public safety. While ideally all CMV drivers can benefit from obtaining two nights of sleep, FMCSA continues to believe, as stated in the 2003 rule (68 FR 22477), that restricting nighttime driving by mandating a midnight to 6 a.m. off-duty period for all CMV drivers would have the unintended consequence of substantially increasing the number of heavy vehicles in daytime traffic, creating greater hazards for the average motorist simply because of the higher density of vehicles.

The Agency also took into consideration that not all motor carrier operations work on a ''fixed and recurring 7-day period,'' instead having intense days of work followed by slack times, and that other operations can be disrupted by weather. For example, one commenter discussed how weather affects the logging transportation industry. The commenter explained that a CMV driver might begin the workweek on Monday, fully rested and work a full 14-hour day, which is interrupted by a full day of rain (Tuesday). The commenter explained the 34-hour recovery period allows the CMV driver to resume work on Wednesday and be able to work in compliance with the regulations to accomplish the work required during that work week. The Agency has decided the 34-hour recovery gives motor carriers and drivers the option of restorative rest during the times work is not available or is interrupted. Given that the recovery provision can be taken at any time, it is a flexible safety tool that can be used by drivers as an added restorative safety measure.

Health

The 34-hour recovery provision has turned out to be one of the most popular provisions of the 2003 rule among CMV drivers. Several carriers indicated they now see drivers proactively scheduling extended off-duty recovery periods into their workweek and returning after these extended periods with ''positive attitudes and appearing rejuvenated,'' which promotes improved driver health.

FMCSA examined the effect of the new rule on driver work hours by comparing survey data obtained before and after the 2003 rule was implemented. A detailed discussion of those results along with confirming data from multiple carriers can be found in Section E'' Driver Health. These data show that CMV drivers are not working longer hours as a result of the 2003 rule than they did under the pre-2003 rule. In addition, the Field Survey conducted by FMCSA showed that many drivers are taking recovery periods considerably longer than the 34-hour minimum. Fifty percent of the drivers were found to have taken 58-plus hours of recovery time per week and 67 percent of drivers took 44 hours recovery time per week, as explained in Section I.1.

One of the reasons that the 34-hour recovery rule is so popular among drivers is that it appears to provide for longer blocks of consecutive hours away from work than the pre-2003 rule provided ''to rest, to be with family, and to recover prior to the start of the next work week. In a survey of its membership, OOIDA asked ''Do you get more time at home under the new HOS regulation?'' Twenty percent of OOIDA drivers responded ''yes''—that they were getting more time at home as a result of the 2003 rule. A slightly higher percent (21 percent) of long haul drivers responded that they were getting more time at home compared to short-haul drivers (18 percent). The survey question's wording did not allow for an examination of how many drivers may be spending less time at home as a result of the 34-hour recovery. It appears that for some drivers the 34-hour recovery period may allow more time at home and provide for greater stabilization of family life. The impact of these factors is difficult to quantify from a driver health perspective, but an improved quality of life may lead to improved health. Few research studies have been conducted that address this particular issue. (See Combined Effects—Section J.11, for further discussion.)

As explained earlier, the 34-hour recovery period provides the potential opportunity for drivers to increase their weekly driving and on-duty time. The National Institute of Occupational Safety and Health (NIOSH) reviewed the relationship between long hours and worker health. It generally concluded that long work hours are associated with poorer health, increased injury rates, more illnesses, or increased mortality. However, the NIOSH review of the literature on long work hours also documented a significant lack of data on general health effects. NIOSH raised doubts about the strength of its own conclusions, stating that ''research questions remain about the ways overtime and extended work shifts influence health and safety.'' NIOSH did, however, examine three studies that identified the relationship between long shifts, those typically worked by a CMV driver, and health or performance. The results are documented in Section E—Driver Health.

Research indicates that psychological factors do play a role in the health of individuals, including CMV drivers. For example, CMV drivers generally want the freedom to manage their workplace and schedule. Given the shortage of CMV drivers, the ready availability of jobs, and the high level of reported driver turnover, it is unlikely that any one employer could require a driver consistently to work the maximum hourly limits available in the 2003 rule or today's rule—unless a driver chose to do so. In other words, working long hours is an individual choice. A driver has the right to choose to work longer hours to earn greater pay as long as he or she can operate a CMV safely. Survey data presented and discussed earlier, from multiple sources, indicate that contrary to the concerns expressed by some commenters, drivers are, in fact, not driving more under the 2003 rule than they were under the pre-2003 rule. Instead, the 34-hour recovery period is being used in a positive way, i.e., more driver time with family and greater operational flexibility and productivity.

Two studies in the NIOSH review found that compensation has a strong effect on the perceived impact of long working hours. Siu and Donald [Siu, O.L., & Donald, I. (1995), p. 30] and van der Hulst and Geurts [van der Hulst, M., & Geurts, S. (2001), p. 227] suggested that compensation may reduce the adverse effects of long work hours. The Siu and Donald study [p. 48] reported a relationship between perceived health status and overtime pay. Men from Hong Kong who received no payment for overtime work had more health complaints than men who received payment for overtime work hours. In addition, the van der Hulst and Geurts study [p. 227] examined the relationship between reward and long working hours in Dutch postal workers. This study also showed that if workers are compensated, they are able to work longer hours without negative consequences to their psychological health [*Id.*, p. 237].

Few studies have examined how the number of hours worked per week, shift work, shift length, the degree of control over one's work schedule, compensation for overtime, and other characteristics of work schedules interact and relate to health and safety [Caruso, C.C., *et al.* (2004), p. 30.] Van der Hulst, who also conducted a review of research literature on long work hours, concluded ''that the evidence regarding long work hours and poor health is inconclusive because many of the studies reviewed did not control for potential confounders. Due to the gaps in the current evidence and the methodological shortcomings of the studies in the review, further research is needed'' [van der Hulst, M. (2003), p. 171].

There is no conclusive research showing that long hours alone are associated with poor health, especially when taking into account individual choice, compensation, and degree of control over one's work schedule. Also, given the results of FMCSA's 2005 survey of driver hours, it is unlikely that the current HOS rules increase the overall number of hours a driver actually works. In short, given current knowledge, there is no clear evidence that the work hours allowed by today's rule will have any impact on driver health.

Limits on the Use of the 34-Hour Restart Period

During the implementation of the 2003 final rule, several enforcement issues were identified and subsequently addressed through an Agency policy directive dated November 25, 2003. The policy memo provides guidance to roadside law enforcement officials on how to implement the 34-hour restart provision, when drivers have exceeded the 60/70 hour rule. Regulatory officials, motor carriers and CMV drivers complained that the interpretive guidance provided by FMCSA was not consistent with the wording of the regulation.

After reviewing the comments and considering all enforcement remedies available to Federal and State regulatory agencies, FMCSA has decided that if a driver has exceeded the 60/70-hour rule, the driver does not have to come into compliance with the 60/70-rule before utilizing the 34-hour recovery period. However, the driver could be subject to appropriate penalty provision as provided by 49 CFR Part 386 for violating the provisions of 49 CFR 395.3(b). FMCSA is considering additional enforcement remedies in its EOBR rulemaking for both motor carriers and CMV drivers that violate the provisions of 49 CFR 395.3(b).

Questions also arose concerning the appropriate amount of time a driver must be placed Out-Of-Service (OOS) prior to being allowed to drive again for exceeding the 60/70-hour rule in 7/8 days. The length of an OOS period required to bring a driver back into compliance is currently determined based on the number of hours the driver is in excess of the rule. The Agency did change this practice with the implementation of the 2003 final rule.

In this rulemaking FMCSA has decided the driver should be placed OOS for the minimum amount of time necessary to bring the driver into compliance with the provisions of § 395.3(b), or be allowed to take a 34-hour recovery period, whichever is less. As explained earlier in this preamble, a 34-hour recovery period will allow a driver ample opportunity to obtain sufficient rest, even if the driver has exceeded the 60 or 70 hour limits.

Conclusion

In adopting a 34-hour recovery period, FMCSA has taken into account the weekly accumulation of driving and on-duty time allowed during each 7- and 8-day period, the adequacy of the 34-hour recovery, the cost/benefit ratio, the overwhelming support of the 34-hour recovery by the transportation industry, including motor carriers and drivers, the long-term effect on driver health, and the overall safety aspects of retaining this provision.

FMCSA is charged with creating minimum safety standards for CMV drivers under the Motor Carrier Safety Act of 1984 [49 U.S.C. 31136(a)]. The Agency is also required to consider the economic costs and benefits that the rule would impose on the trucking industry and the public [49 U.S.C. 31136(c)(2)(A) and 49 U.S.C. 31502(d)]. As a regulatory Agency, FMCSA must sift through general, and often conflicting, scientific data and attempt to apply it ''in the real world.''

When considering previous studies cited in the 2003 rule in support of the 34-hour recovery period and subsequent studies cited in comments to the 2005 NPRM, the Agency determined that, in light of the scientific evidence, FMCSA's best judgment is that 34 hours provides a minimum amount of time for a majority of drivers to recover from any cumulative fatigue that might occur during any multi-day duty period.

J. 9. Sleeper-Berth Use

Under the 2003 rule, drivers are permitted to accumulate the minimum off-duty period of ten consecutive hours four separate ways: (1) A minimum of 10 consecutive hours off duty; (2) A minimum of 10 consecutive hours in a sleeper berth; (3) By combining consecutive hours in the sleeper berth and off-duty time that total 10 hours; or (4) By combining two separate sleeper berth rest periods totaling at least 10 hours, provided that neither period is less than 2 hours (split sleeper berth exception).

Although FMCSA has found that drivers need 10 consecutive hours of off-duty time to obtain the necessary 7 to 8 hours of restorative sleep per day, the split sleeper berth exception in the 2003 rule allows a driver to accumulate his or her sleep in two separate periods that totaled at least 10 hours.

Splitting sleep into short periods is a concern. One study, ''The Effects of Sleep Deprivation on Performance During Continuous Combat Operations'' [Belenky, G., *et al.* (1994), p. 129)], found that ''Brief fragmented sleep has little recuperative value and is similar to total sleep deprivation in its effects on performance.'' While this study was conducted on soldiers attempting to sleep in busy, noisy command centers, it may still be relevant in some cases when discussing sleeper berth rest, depending upon the environment in which the vehicle is parked and the physical condition of the sleeper berth or truck-tractor cab.

Sleeping in a sleeper berth has been studied as it relates to truck fatalities. A study by the Insurance Institute for Highway Safety [Hertz, R.P. (1988), p. 7] found that splitting sleep into two sleeper berth periods without having 8 consecutive hours in the sleeper berth ''increased the risk of fatality over twofold.'' Hertz also found that split

sleeper berth use increased fatality risk ''in all analyses except those limited to urban crashes and local pick-up and delivery crashes.'' [*Id.*, p. 9]

In a 1996 safety study, the NTSB found that the duration of the most recent sleep period in the 24 hours prior was the most important factor for predicting a fatigue-related crash [*Id.*, p. 51]. The NTSB also noted that the hours of service regulations at the time (8 hours off-duty) did ''not provide the opportunity to obtain an adequate amount of sleep'' and recommended that the use of split sleeper berth time be eliminated [*Id.*]

FMCSA has determined that the available science and literature do not support the continued use of the current split sleeper berth provision. Surveys indicate that only a small percentage of drivers split their sleeper berth time to obtain the necessary off-duty time. An OOIDA survey conducted in 2004 indicates that their members use a split sleeper berth 13 percent of available workdays each month. A survey of private motor carriers [Burks, S.V. (2004), pp. 3–4] indicates that split sleeper berth use in the private fleets is on average about twice as high as the OOIDA number. However, Burks pointed out that of the private firms that use sleeper berths ''half the sample utilizes the [split] [s]leeper berth 2% of the time or less'' [*Id.*, p. 3].

The split sleeper berth exception is also problematic from a driver health standpoint. There is a growing body of research demonstrating that sleep periods of 4 hours, or less, can result in a number of adverse physiologic medical symptoms or conditions that result from having a specific disease, including reduced glucose tolerance, increased blood pressure, activation of the sympathetic nervous system, reduced leptin levels, and increased inflammatory markers [Alvarez, G.G., & Ayas, N.T. (2004), p. 59]. Consistent with these studies, epidemiologic research demonstrates that short sleep duration is modestly associated with symptomatic diabetes, cardiovascular disease, and mortality [*Id.*]. Given the uncertainty with regard to combining two sleep periods these studies suggest that drivers need one period of sleep that is between 7 to 8 consecutive hours daily in order to maintain a healthy lifestyle.

Comments

Approval of the Split Sleeper-Berth Exception. The FMCSA asked commenters to address the fundamental question of whether the Agency should eliminate the split sleeper-berth exception and require drivers to take 10 consecutive hours off duty (either in a sleeper berth or in combination with off-duty time).

A total of 130 commenters expressed general approval of the split sleeper-berth provision. Of these, four were trucking associations (ATA, OOIDA, Associated Petroleum Carriers, and Corporate Transportation Coalition), 42 were carriers, 80 were drivers, and four were private citizens. Commenters stated that the provision allowed drivers to take naps when needed, and to avoid traffic congestion.

Maverick Transportation, C.R. England, OOIDA, and Werner stated that the split sleeper-berth exception is the only way a driver can take a needed nap without being penalized. Werner noted that over 80 percent of its drivers use the sleeper berth on a regular basis. C.R. England described a study of split sleeping time which indicates that total sleep time per 24 hours is the most important determinant of performance, and that sleep can be split into an anchor period of at least 6 hours sleep and another period of 2 hours with a combined effect roughly equivalent to the performance and alertness that is obtained from a continuous 8 hour sleep period. The commenters concluded that the sleeper berth, when used properly, did not reduce drivers' ability to obtain adequate restorative sleep.

Disapproval of the Split Sleeper-Berth Exception. Almost as many commenters (a total of 112), however, expressed general disapproval of the split sleeper-berth exception. These included AHAS, Public Citizen, 18 carriers, 86 drivers, the Georgia Department of Motor Vehicle Safety, and four others. The reasons for disapproval varied. Several commenters noted that the rule was an invitation for cheating, while others stated that split sleeper berth periods do not provide enough rest.

Public Citizen strongly opposed the split sleeper-berth provision and stated that the exception allowed solo drivers to divide their rest time any way they wanted, despite FMCSA's repeated findings that drivers need 8 hours of uninterrupted sleep. They noted that the increase in minimum off-duty time in the current HOS rule from 8 to 10 hours was based on FMCSA's assertion that a driver with only 8 hours of off-duty time generally obtained only 5 hours of sleep, and cited FMCSA's statements that studies point specifically to increased crash risk after fewer than nine hours of off-duty time. They noted that FMCSA has acknowledged that research from all transportation modes suggested a need for off-duty periods of 10 to 16 hours to ensure the needed block of sleep. They stated that studies are unanimous that drivers get both less sleep and lower quality sleep when it is taken in two separate sleeper-berth or other rest periods. Public Citizen cited a study suggesting drivers usually got no sleep during logged sleeper-berth periods.

Public Citizen noted that a 1997 OOIDA study showed that nearly 75 percent of drivers took their off-duty time in a single block. The study showed that those who split their sleeper-berth breaks on average took two 4-hour breaks. Public Citizen recommended that solo drivers should take at least 10 consecutive hours off in a single block of time, regardless of where the time was spent.

The Minnesota Trucking Association recommended that the split sleeper-berth option be changed to reduce the minimum time block to 1 hour, and to allow up to three periods for the calculation of the total split sleeper-berth time.

Minimum Necessary Length of Split-Sleeper-berth Periods. The Agency requested information on the minimum time in each of two split-sleeper-berth periods necessary to provide restorative sleep. Figure 9 provides the breakdown of responses to FMCSA's question on minimum sleeper-berth periods.

FIGURE 9.—COMMENTERS: SUGGESTED MINIMUM SLEEPER BERTH PERIOD

Minimum time	Carriers	Drivers	Other
<2 hours	11	30	1
2–3 hours	3	11	
3–4 hours	2	2	
4–5 hours	5	7	1
5–6 hours	.....	6	
6–7 hours	.....	1	
7–8 hours	1	4	1 (NTSB)

Alertness Solutions reported research showing that obtaining 2 hours less sleep than needed (for an average adult this equates to about 6 hours of sleep) produces a reduction in performance and alertness. The data showed that obtaining a total of 8 hours of sleep per 24-hour period is critical. However, sleep can be split into an ''anchor period'' of at least 6 hours of sleep and a period of 2 hours of sleep at another time with a combined effect of performance and alertness that is roughly equivalent to that obtained from a continuous 8 hour sleep period. Rosekind of Alertness Solutions concluded that translating these scientific results into operational practice would suggest that an ''anchor sleep opportunity'' of 6.5 hours and another sleep opportunity of 2 hours would likely provide the minimum

number of sleep hours needed to maintain a performance level equivalent to one 8-hour sleep period. He said no data indicate whether the order of the two split sleep periods would have a significant effect. He also noted that a sleeper berth provides significant flexibility and proximity that should be regarded when determining the role and opportunity for the use of split sleep. Although there could obviously be a variety of combinations that might be considered for split sleep, Rosekind concluded that two factors are critical. First, at least one sleep period should provide sufficient opportunity for a minimum of 6 hours of sleep. Second, the combined total sleep obtained in the split sleep periods should approximate 8 hours. AHAS, however, criticized Rosekind for ignoring contradictory research that the split sleeper berth periods do not provide sufficient rest and performance restoration.

Several carriers reported on the sleeper-berth patterns of their drivers. Yellow Roadway reported that 70 percent of its team drivers split their sleeper-berth time into two 5-hour periods. C.R. England said its teams split 5 and 5 or 6 and 4; its solo drivers usually split 6 and 4 or 7 and 3. Overnite reported that its teams split 5 and 5, explaining that this pattern means that a driver never drives more than 5 hours at a time. Brink Farms and a driver also supported a 5-hour minimum. Schneider said it limits solo drivers to 8 and 2 only and believes the foundation period for solo drivers should be 8 hours. Schneider provides its team drivers more flexibility.

Some carriers suggested mandatory split sleeper periods. Schneider recommended that the total off-duty time be 9 hours, with an 8 and 1 split, citing a study that advised strategic naps of no more than 45 minutes. FedEx cited a study that showed that two periods totaling 7.4 hours resulted in performance equal to that obtained from a single 8.2 hour sleep period. J.B. Hunt also cited the same study to argue for an anchor period of 6 hours, which could be combined with another 2 hours of sleep and 2 hours off duty.

Most trucking associations endorsed a 5 and 5 split. ATA stated that 5 and 5 has worked for team drivers and recommended continuation of the 2003 rule. The Motor Freight Carriers Association (MFCA) also supported 5 and 5 splits, and stated that company crash data indicate that this does not result in an unsafe operating environment. MFCA stated that a rule change that reduced team flexibility could have a negative impact on driver safety, but provided no supporting data for the assertion.

The California Highway Patrol (CHP) stated that the minimum sleeper-berth period should be at least 5 hours; periods of less than 5 hours should count against the 14-hour day. CHP also asked that ''qualifying sleeper-berth period'' be defined.

The NTSB essentially rejected the split sleeper-berth option, arguing that FMCSA should eliminate any provision that provides for a daily sleep period of less than 8 continuous hours. The current split exception allows for less than 8 hours of sleep in conditions that are not optimal for sleeping, it said.

Impact of Increasing Minimum Split Time for Longer Periods. FMCSA asked what the impact would be on driver health, the safe operation of CMVs, and economic factors, if the Agency were to retain the split-sleeper-berth provision, but require that one of the two periods be at least 7, 8, or 9 hours in length. Four carriers, the California Highway Patrol, and 25 drivers responded to this question. Eight commenters (seven drivers and a carrier) stated that a single break of 7 hours would be sufficient and no additional sleeper-berth period would be needed. Seven commenters (six drivers and McLane Company) supported 7 hours plus another break, not necessarily in the berth. Four drivers and McLane also argued that everyone is different and a single rule is not appropriate.

The California Highway Patrol stated that requiring 7, 8, or 9 hours as a minimum for one of two qualifying sleeper-berth periods would allow a driver to rest only 1, 2, or 3 hours (during the second period) and then drive for an extended period of time. This might also lead to disruption of the 24-hour cycle upon which the regulations are based. Brink Farms argued that, for teams, an 8 and 2 split would do more harm than good and supported a 5 and 5 split for teams. It also supported allowing the second period to be out of the berth.

Yellow Roadway did not agree that 7 or more hours in the berth are the equivalent of 10 hours off duty. The 10-hour period gives a driver a chance for sleep and other personal time. A split with less than a 10-hour total would put the driver in a drive-sleep-drive-sleep position that adds fatigue and diminishes ability.

McLane supported a combination of sleeper-berth and off-duty time because few people sleep for 10 hours. FedEx Ground said the single 10-hour period is rarely used; 2 and 8 and 3 and 7 are also rarely used. Their drivers normally split 5 and 5 or 6 and 4. FedEx stated that it had no evidence that the current rule has had negative effects on fatigue or health and did not support requiring a single 10-hour sleeper-berth period.

Frequency of Sleeper-Berth Use. In the NPRM, the Agency requested information about how often split sleeper-berth periods are used to obtain the required 10 or more hours of off-duty time. Sixty-five commenters responded. Thirty commenters, including 7 carriers, 2 owner/operators, and 21 drivers, said they only rarely or never used the split sleeper berth option. Thirty-one commenters, including 27 drivers, said they used it often.

Among the carriers, B.R. Williams Trucking stated that less than 10 percent of its drivers use the exception. The reason the drivers give is that it is too confusing. Tennessee Commercial Warehouse discourages its contractors from using the exception, although about a quarter do. J.B. Hunt stated that a survey of randomly selected over-the-road driver logs showed that 14 percent of the time drivers use the exception. Schneider stated that only 0.4 percent of its drivers used the exception routinely. International Paper cited research presented at a Transportation Research Board conference in January 2005 indicating that 26 percent of drivers use the exception.

OOIDA noted that the exception is the least used feature of the 2003 rule among respondents to its survey. About 55 percent of drivers reported never using it, and 75 percent of drivers used it from zero to four times in June 2004.

In contrast, Maverick stated that 70 percent of its drivers use the exception. The Georgia Department of Motor Vehicle Safety stated that its inspections and observations indicate that use of the exception is very common.

Health and Safety Impacts of Eliminating the Sleeper-Berth Exception. Four carriers, ATA, 22 drivers, and OOIDA commented on the health and safety impacts of eliminating the exception. Eighteen drivers stated that eliminating the exception would force drivers to drive when tired.

Although OOIDA noted that the split sleeper berth exception is the least used feature of the 2003 rule, it is ''appreciated'' by those who use it. They include drivers who need to rest, but otherwise face pressure not to take short breaks that decrease their available on-duty and driving time. It is the only flexibility in the rule available to drivers who absolutely need to rest. The sleeper berth also serves drivers whose runs are of a certain length or whose pick-up or drop-off times are arranged in a way that permits a continuous two-hour break.

Team drivers also find the sleeper-berth exception useful.

Yellow Roadway stated that the exception gives drivers flexibility to divide driving time and take breaks when needed and where they choose. Reducing team drivers' control of their work and rest opportunities could have a negative impact on driver health, safety, and business operations.

Economic Impact of Eliminating Split Sleeper-Berth Exception. Five drivers and five carriers commented on this issue. Schneider stated that only six percent of teams use the exception with any regularity. However, elimination of this option within Schneider's teaming operations would impact the organization by jeopardizing $250 million in business opportunities with customers requesting team service.

Werner stated customer scheduling and delivery requirements are such that regular hours are impossible. In addition to the limited availability of motels with truck parking, there is a significant cost to drivers staying in motels and the inconvenience factor of maneuvering a large truck through urban or suburban areas to locate a motel. If the sleeper berth exception were not available, there would likely be a further increase in the truck parking problem, congestion, and driver turnover.

McLane stated that elimination of the exception would virtually eliminate use of sleeper-berth by all but cross-country long-haul drivers. McLane's operating costs would significantly increase, due to the need to hire additional drivers and equipment, while the overall earnings for existing drivers would be reduced.

Quality Transport stated that eliminating the sleeper berth exception would largely defeat the purpose of team driving. If the teams cannot use the sleeper-berth rule, then they have no option but to show on-duty time for any time spent not driving. This would be a huge economic loss to companies using team operations, as it would basically do away with the benefit of running as a team. The loss would affect income for teams, plus income for the company they are leased to or drive for. It would affect the current national market by curbing deliverability of many products.

A driver also believed that the effect of eliminating the exception would be to eliminate team operations. One driver said he would have to stop driving over-the-road. Three stated that it would affect drivers who use it to avoid traffic and shipper delays. One carrier simply stated that it would decrease efficiency.

However, another driver saw a positive effect in eliminating an opportunity for shippers, carriers, and receivers to use the exception to pressure drivers to extend their work day. One said it would not change anything, but would eliminate a lot of logbook fines.

Impact of Not Allowing a Single Sleeper-Berth Period to Extend the Duty Period. FMCSA asked commenters to provide information about how prohibiting the extension of the 14-hour tour of duty through the use of a single sleeper-berth period affects driver health, safe operations, and economic factors.

Numerous commenters addressed this issue. Nineteen drivers, two carriers, a consulting group, OOIDA, and the California Highway Patrol responded to the question about the health and safety impacts.

The Georgia Department of Motor Vehicle Safety described the problem created by the current rule. An officer who encounters a driver with a single sleeper period in the current tour of duty must either predict the driver's future actions, or question the driver, and make a judgment call about the driver's status.

The California Highway Patrol addressed the negative impact of extending a driver's work day with only one sleeper-berth period, stating that it effectively circumvents the intent of the regulation and changes the driver's 24-hour cycle. It would allow drivers to operate CMVs long after the completion of the intended 14-hour work period. The Daecher Consulting Group also noted that allowing the extension would permit a slippage or rotation of the duty day.

OOIDA described the requirement that both periods be in the sleeper berth, even if the driver is at home, as ''absurd.'' They stated that there is no justification for the requirement and are not aware of any study that indicates that sleeping in a sleeper berth is better than a bed. OOIDA recommended that the driver be able to replace the second period with 10 hours off. This would allow the driver the flexibility to restart the next day's schedule without having to relate back to the first sleeper period. UPS supported the OOIDA position.

Combining Sleeper-Berth Periods With Off-Duty Periods To Calculate Off-Duty Time. FMCSA asked whether the rule should allow sleeper-berth periods to be combined with off-duty periods when calculating a continuous off-duty period. The Agency also asked whether a sleeper-berth period that is part of a period of 10 or more consecutive hours off duty should be combinable with a later sleeper-berth period as part of a split sleeper-berth calculation.

Support for combining sleeper-berth and off-duty time came from 141 commenters, including ATA, Minnesota Trucking Association, the National Association of Small Trucking Companies, 41 carriers (including UPS, FedEx, J.B. Hunt, Con Way, and Werner) and 94 drivers. Three drivers were opposed.

The California Highway Patrol recommended that a driver who combines a last sleeper-berth period with 10 hours off duty not be penalized for resting at home or be forced to sleep in the truck. However, if sleeper berth and off-duty time are combined, this same sleeper-berth period should not be used in combination with a subsequent sleeper-berth period. CHP recommended definitions of ''qualifying sleeper-berth period'' and ''subsequent sleeper-berth period.''

The Georgia Department of Motor Vehicle Safety stated that a full 10-hour period of sleeper-berth time should not be combinable with a shorter period of time.

ATA submitted an extensive argument in favor of amendments to the split sleeper-berth provisions. ATA used four hypothetical schedules to illustrate its argument, with three of the schedules in compliance with the 2003 rule, and one not in compliance. ATA claimed its hypothetical schedules demonstrated that, despite FMCSA's statement that drivers are free to take naps or other rest breaks, the rule is a strong disincentive to doing so if time in the sleeper berth results in lost work time.

ATA also argued that the rule creates uncertainty for logbook inspectors. Whether an extended work period is legal or illegal depends on the intentions and subsequent actions of the driver, neither of which can be known to the enforcement officer at the time of a logbook check.

Based on its analysis, ATA recommended, and provided an extensive discussion of the benefits of, detailed amendments to 49 CFR 395.1(g)(1)(iii) and 395.3(a)(2) and the addition of a new exception specifying the following:

> A property-carrying driver is exempt from the requirements of § 395.3(a)(2), and may extend the 14-hour limit in the event that the driver has one sleeper-berth period with a minimum duration of 2 hours, provided that the driver does not exceed 14 cumulative hours of work or 11 hours of driving, and that the on-duty time is followed by an off-duty time of at least 10 consecutive hours.

The American Bakers Association stated the inability to combine off-duty

and sleeper-berth time ''must have been an oversight,'' arguing that it made no sense for operators to be tying up equipment on the lot in the sleeper berth when they want to go home and go to bed.

Some carriers supported the ATA position. Others made their own recommendations for changes. UPS proposed permitting drivers to extend the 14-hour on-duty window to account for breaks of at least 2 hours taken in a sleeper berth when they are combined with 10 hours of off-duty time immediately following the shift. UPS also proposed that drivers be permitted to extend the 14-hour on-duty window to account for sleeper-berth periods of at least 2 hours when they are combined with a subsequent sleeper-berth period of any length, if it is immediately followed by at least 10 hours of off-duty time. Both FedEx Ground and Werner recommended strongly that drivers be able to finish their 10 hours at home if they have a previously qualifying sleeper-berth period. J.B. Hunt concurred and recommended that this be allowed for other sleeping accommodations as well. It noted that an FMCSA enforcement bulletin allowed this, but many jurisdictions refused to implement the bulletin because it directly contradicted the plain language of the regulation.

FMCSA Response

Primary Sleep Period. Although the comments to the docket are closely divided over how to address the split sleeper berth exception, the majority of studies and science clearly demonstrate that drivers need to have at least one primary sleep period of 7 to 8 consecutive hours.

A study of chronic sleep restriction [Maislin, G., *et al.* (2001)] showed that it is possible for a person to avoid physiological sleepiness or performance deficits on less than 7 hours of sleep; however, the subjects in the study were obtaining their primary sleep period at night and were supplementing their sleep with longer naps later in the day. Maislin *et al.* found that subjects who slept for 6.2 hours at night combined with a nap of 1.2 hours had lower levels of sleepiness and higher levels of performance, compared to subjects who slept shorter periods without naps. While 6 hours of sleep at night with a nap may be the minimum needed to maintain an adequate performance level, it is unrealistic to think that the Agency can regulate what time of day a driver goes off duty or sleeps in a sleeper berth.

Consequently, today's final rule modifies provisions for the use of sleeper berth time. The Agency will continue to allow drivers to use the sleeper berth to obtain their required off-duty time; however, drivers using this option will be required to obtain one primary sleep period of at least 8 consecutive hours. Unlike drivers who have to commute to and from work and perform personal tasks after going off duty, sleeper-berth drivers do not need 10 consecutive hours off duty in order to have an opportunity for 7–8 consecutive hours of sleep. Because their bedroom travels with them, sleeper-berth drivers can obtain adequate sleep in an 8-hour period. These drivers will also be required to take another separate two consecutive hours of off-duty time, sleeper berth time, or a combination of both. These additional hours will allow time for naps and other breaks, and will prevent drivers from operating on a 19-hour schedule (8 hours in the sleeper berth followed by 11 hours of driving) that would seriously compromise their circadian rhythm.

For example, a driver who takes 9 consecutive hours in the sleeper berth would later have to take at least 2 consecutive hours of sleeper-berth or off-duty time or a combination thereof to meet the minimum requirements. Since the driver did not obtain a single period of 10 consecutive hours of off-duty or sleeper berth time, the driver is required to make up the balance of his or her off-duty or sleeper berth time later in the duty period.

These requirements will ensure that drivers using the sleeper berth to obtain the minimum off-duty time have at least one primary sleep period of a sufficient length to provide restorative benefits. The second period will allow a driver to have time for a nap or rest break or provide an opportunity to attend to personal matters. The opportunity to take a nap later in the day is an important benefit, especially since drivers taking advantage of the sleeper berth provision may be operating on an irregular/rotating schedule, getting out of phase with their natural circadian rhythm.

Overwhelmingly, the research literature supports the need for most people to obtain 7 to 8 hours of sleep per day. A study of driver fatigue [Wylie, C.D., *et al.* (1996), p. ES–10] found that the average amount of ''ideal'' sleep time reported by participating drivers was 7.2 hours. The NTSB [NTSB (1996), p. 26] found that drivers in non-fatigue related crashes had averaged 8 hours of sleep during their last sleep period prior to the crash versus drivers involved in fatigue-related crashes whose prior night sleep averaged only 5.5 hours. A study of soldier performance [Belenky, G.L., *et al.* (1987), p. 1–10] noted that ''the vast majority of adults required 6–8 hours of sleep each night to maintain adequate, normal levels of daytime arousal.'' Belenky *et al.*, further noted that a person getting ''six to eight hours sleep each night will maintain cognitive performance'' [*Id.*, p. 1–17].

Research supports the benefits of sleeping at night, rather than during the day, but the needs of the U.S. economy and the operational realities of the motor carrier industry make it is impossible for FMCSA to ensure that drivers obtain all of their rest during nighttime hours. Given this, and the results of earlier studies that suggest sleep obtained in a sleeper berth is not as restorative as sleep obtained in a bed, today's rule will require drivers using the sleeper berth exception to obtain at least one primary sleep period of 8 consecutive hours in the sleeper berth. This provision maintains some of the flexibility provided by the 2003 rule, and ensures that drivers have the opportunity for 7 to 8 consecutive hours of uninterrupted sleep.

The economic impact of this provision will be the greatest in the long-haul sector of the industry; however, the ''Commercial Motor Vehicle Driver Fatigue, Alertness, and Countermeasures Survey'' [Abrams, C., *et al.* (1997), p. 12] found that the majority of drivers using the split sleeper berth exception already average 6 to 7 hours in the sleeper berth. In addition, the 2005 FMCSA Field Survey data show that of the 2,928 sleeper berth periods reviewed, 68 percent exceeded 6 hours and 52.6 percent exceeded 8 hours, so the overall impact on the industry should be relatively small [FMCSA Field Survey Report (2005), p. 2].

Rest Breaks. The requirement for an additional 2 consecutive hours of off-duty or sleeper-berth time for drivers using the sleeper berth provides a number of additional benefits. It ensures that all drivers (those using a sleeper berth, and those not using a sleeper berth) will have the same amount of time to drive and work every week. It also provides the opportunity for a sleeper berth driver to eat meals, bathe, exercise, and conduct other personal activities. Most importantly, the 2 consecutive hours provide the driver with the opportunity to nap, if and when needed.

Rest breaks, and especially naps, are an important tool in combating fatigue and the FMCSA encourages their use. As noted by Wylie [Wylie, D. (1998), p. 13], ''[n]aps in trips with judged

drowsiness appeared to result in recovery effect, compared to the relatively high levels of drowsiness seen in the hour prior to napping.'' Research on napping indicates that while it does not reduce accumulated fatigue, it does refresh a driver and improves performance in the near term. In another study of military operations [Caldwell, J.A., *et al.* (1997), pp. 2–5] the subjects performed better after napping compared to resting without sleep. In addition to working as a short-term countermeasure to fatigue experienced during working hours, another study [Garbarino, S., *et al.* (2004), p. 1300] found that napping ''before night work can be an effective countermeasure to alertness [deterioration] and performance deterioration.''

The Agency recognizes that drivers who are able to get 7 to 8 hours of sleep per day may not require additional sleep and it would be unreasonable to require the driver to stay in the sleeper berth for an additional two hours. For this reason, the FMCSA will permit drivers to accumulate the additional two hours as sleeper berth time, off-duty time, or a combination of both. Two hours are long enough to permit time for a nap, as well as time to attend to personal matters. Studies have found that naps do not have to be long to improve performance. A study of working at night [Sallinen, M., *et al.* (1997), p. 25] found that naps of less than one hour most influenced performance, and a survey of train engineers found that 20 minute napping was effective for enhancing alertness [Moore-Ede, M., *et al.* (1996), p.10].

Although this provision on the use of sleeper berths does reduce the total flexibility provided in the 2003 rule, it provides motor carriers and drivers with some operational flexibility while ensuring that drivers are afforded the opportunity of at least one 8-hour sleep period each 24 hours, with the additional benefit of providing the option for a nap or break.

Enforcement. The prior split sleeper berth provision caused some confusion in law enforcement and the motor carrier industry. The question has been how to calculate split sleeper berth time, and how split sleeper berth periods affect the calculation of the 14-hour duty ''window.''

The calculation of the driver's 11-hour driving limit and 14-hour duty ''window'' will restart once a driver has at least 10 hours of off-duty time, whether it is (1) 10 consecutive hours of sleeper berth time; (2) 10 consecutive hours of off-duty time; or (3) a combination of 10 consecutive hours of sleeper berth and off-duty time. Drivers using sleeper berths have a fourth option to obtain the equivalent of 10 hours off duty by combining two separate periods of sleeper berth or off-duty time that total at least 10 hours. When calculating off-duty time for drivers using sleeper berths under this rule, only two separate periods may be used and both must add up to at least 10 hours. One period must be at least 8 consecutive hours of sleeper berth time. The second period must be at least 2, but less than 10, consecutive hours of sleeper berth time, off-duty time, or a combination of both.

For drivers using two separate periods of sleeper berth and off-duty time, the calculation of the driver's 11-hour driving limit and 14-hour duty ''window'' will begin from the end of the first period used in the calculation. This will provide a simplified method for calculating a driver's on-duty and driving time and address some of the enforcement concerns received in the comments.

For example, following 10 consecutive hours off-duty, a driver begins driving at 5 a.m. At 10 a.m., the driver takes 2 consecutive hours off-duty (1 hour of off-duty time followed by 1 hour of sleeper berth time). At noon, the driver drives for another 5 hours. At 5 p.m., the driver goes into the sleeper berth for 8 consecutive hours. At 1 a.m. the driver begins driving again. In this example, the calculation of the driver's on-duty and driving time begins at the end of the first off-duty/sleeper berth period, or noon. Therefore, this driver has 5 hours of driving time available at 1 a.m. At no time will a driver have a combination of more than 11 hours of driving time on either side of a sleeper berth period or off-duty period that is less than 10 hours in length.

The driver's 14-hour duty ''window'' is calculated differently from the way it was calculated under the 2003 rule. As identified in a petition filed by ATA on November 3, 2003, and numerous docket comments on this subject, FMCSA will not count any sleeper berth period of at least 8 but less than 10 consecutive hours toward the 14-hour limit after coming on duty. The ATA petition requested that any sleeper berth period of at least two consecutive hours be excluded from the calculation of the 14-hour duty ''window,'' provided that the driver took 10 consecutive hours off-duty either upon reaching his or her 14-hour limit, or 11-hour driving limit. The Agency's response to that request, and the comments provided to the docket, is to allow any sleeper berth period of at least 8 but less than 10 consecutive hours to be excluded from the calculation of the 14-hour duty ''window.'' This will ensure that drivers using a sleeper berth to obtain their minimum off-duty time are not negatively impacted by having to take at least one sleeper berth period of at least 8 consecutive hours, which would normally count against their 14-hour duty ''window,'' leaving the driver with only 6 hours of time to work and drive. Any period of less than 8 consecutive hours in the sleeper berth will count toward calculation of the 14-hour ''driving window.''

In the earlier example, the driver would have reached the 12th hour of his or her 14-hour duty ''window'' at 5 p.m. when he or she went into the sleeper berth for 8 consecutive hours. Because the driver has 10 hours of off-duty time (2 hour break, combined with 8 consecutive hours in the sleeper berth), the calculation of the 14-hour duty ''window'' begins at the end of the 2-hour break (noon). However, when the driver starts driving at 1 a.m., he or she would only be at the 5th hour of his or her 14-hour duty ''window,'' because the 8 consecutive hours in the sleeper berth are excluded from the calculation. The Agency believes that this will simplify the calculation used by enforcement officers during roadside inspections, as well as by drivers as they calculate their daily on-duty and driving limits.

In the Agency's best judgment based on available data and comments, this sleeper berth provision creates an optimal balance by providing drivers with one 8-hour sleep period, combined with an additional sleeper berth or off-duty period, while maintaining operational flexibility so as not to impose an unreasonable burden on motor carrier productivity.

J.10. Regulation of Short-Haul Operations

Motor carriers whose operations require the driver to return to their work-reporting location every night and are conducted solely within a 150 air-mile radius from their terminals are generally considered short-haul operations. Short-haul drivers perform a variety of non-driving tasks during the day, including receiving the day's schedule, loading and unloading the vehicle, making deliveries, getting in and out of the vehicle numerous times, lifting and carrying packages, and engaging in customer relations. Because of the nature of short-haul operations, smaller vehicles (*i.e.*, less than 26,001 pounds) tend to be favored for their maneuverability, which makes them ideal for pick up and delivery in a local, or urban setting.

A review of the U.S. Census Bureau's Vehicle Inventory and Use Survey (VIUS), 2002, shows that trucks weighing 26,000 pounds or less make up about half of all registered trucks and represent about a quarter of all truck miles traveled. Trucks weighing 26,000 pounds or less accounted for only one-seventh of all trucks involved in non-fatal crashes, and only one-tenth of all trucks involved in fatal crashes, according to data found in the Motor Carrier Management Information System (MCMIS) and the Fatality Analysis Reporting System (FARS). Relative to their share of registered trucks and annual truck miles traveled, trucks weighing 26,000 pounds or less are underrepresented in fatal and non-fatal truck-involved crashes.

A study of the Impact of Local/Short Haul Operations on Driver Fatigue by Richard Hanowski and others suggested ''fatigue may not be the most critical issue'' in the safety of short-haul operations [Hanowski, R. J., *et al.* (1998), p. 72]. Short-haul drivers who were asked to describe the safety problems they faced ranked fatigue fifth, below problems as obscure as the design of loading docks and freeway on- and off-ramps. In explaining why short-haul operations did not produce critical levels of fatigue, the drivers said that ''unlike long-haul drivers, [they] typically work during daylight hours, have work breaks that interrupt their driving, end their shift at their home base, and sleep in their own beds at night'' [*Id.*]. Hanowski *et al.* concluded that ''[p]erhaps, when it comes to fatigue, [local/short-haul] drivers are more like workers of non-driving professions where fatigue may not result from their work, as in long-haul, but may be impacted by their personal lives (such as not getting enough sleep at night)'' [*Id.* p. v]. While FMCSA cannot control drivers' off-duty behavior, the 2003 HOS rule and today's final rule give local/short-haul drivers two more hours off duty than the regulations in effect in the late 1990s, when the Hanowski study was completed. If fatigue was not critical at that time, it is even less likely to be a significant threat today. Compared to long-haul drivers, local short-haul drivers have a better opportunity to obtain the daily restorative rest needed to maintain vigilance in an environment that provides quality sleep.

Historically, the Federal Motor Carrier Safety Regulations have recognized differences between long-haul and short-haul operations. FMCSA realizes that short-haul operations are involved in crashes, and sometimes even fatal crashes, as evidenced by the crash data referenced earlier. However, the representation of short-haul vehicles weighing less than 26,001 pounds in large truck crashes is much lower than their share of the total truck population and miles traveled. The regulatory impact analysis (RIA) for the 2003 HOS rule bore this out, and researchers estimated the costs of imposing that rule on short-haul carriers would far exceed any safety benefits resulting from a reduction in fatigue-related crashes. Conversely, the net benefits of imposing those HOS rules on long-haul carriers were quite positive, primarily due to a reduction in fatigue-related crashes by long-haul drivers.

Today's HOS rule adopts two exemptions for short-haul drivers also provided in the 2003 rule, though neither significantly improves the regulatory cost/benefit ratio of short-haul operations. The first is known as the ''100 air-mile exemption,'' and provides relief from a paperwork burden for drivers who meet specific duty time requirements (report to and leave from work within 12 consecutive hours) and operate in a 100 air-mile radius of their work reporting location [49 CFR 395.1(e)]. Because drivers operating within a limited radius commonly make frequent stops, deliveries, and pick-ups throughout the day, which would normally require many entries on their records of duty status (RODS), this provision exempts drivers from completing RODS, as long as the motor carrier maintains a proper daily time record. The Interstate Commerce Commission adopted this provision, as a 50-mile exemption, in 1952.

The second exemption gives drivers the flexibility to extend the 14-hour duty ''window'' by two hours once a week [49 CFR 395.1(o)]. The two extra hours can be used by the driver to meet peak demands, accommodate training, stage trucks for the next day's deliveries, or complete required recordkeeping. This final rule adopts both of these exemptions; however, as discussed later, the ''100 air-mile exemption'' is incorporated into the new regulatory regime provided for short-haul drivers of small CMVs in today's rule. Today's final rule makes no changes to the ''16-hour'' provision found at 49 CFR 395.1(o).

Comments

In response to the discussion of short-haul operations in the 2005 NPRM, the Agency received 18 comments addressing the need for different HOS rules for this class of operation. Specifically, five carriers, four trade associations or firms representing the construction industry, two other trade associations, and seven drivers recommended different rules for short-haul operations.

Associations

The National Ready Mixed Concrete Association (NRMCA), the National Sand, Stone, and Gravel Association (NSSGA), the Colorado Ready Mixed Concrete Association (CRMCA), and an independent supplier of ready-mixed concrete recommended separate rules for short-haul drivers that would recognize they operate under different conditions having varied impacts on driver safety, fatigue, and health. NRMCA stated that the 2003 HOS rule mainly addresses the fatigue problems of long-haul truckers while ignoring the fact that short-haul drivers work within a limited radius, do not spend the majority of their time driving, begin and end their shifts at the same location, and sleep at home every night. A survey conducted by the NRMCA in 2000 indicates that drivers of ready-mixed concrete trucks spend, on average, only 49 percent of their time driving. The NRMCA, supported by the NSSGA and the CRMCA, recommended extending the current 100 air-mile radius to 150 miles, and offering drivers a 16-hour duty window, with no driving allowed after 14 consecutive hours from the start of the duty period.

Construction operations are mainly short-haul in nature, but other commenters argued that the characteristics of their particular industries also require special HOS rules. These other comments focused on drivers transporting farm products or delivering fuel to farms during peak seasons; drivers performing seasonal log hauling in remote areas; pipeline repair truck drivers; propane delivery drivers who make night service calls and respond to emergencies; and drivers of vehicles involved in environmental remediation and emergency response. The American Bakers Association asked that short-haul operators be allowed to retain the once-a-week 16-hour duty-period. Two contractors to the U.S. Postal Service opposed the current 14-hour provision, arguing that unless split-shift time spent at home or in a designated sleeping area qualifies the same as a sleeper-berth, the rule will hurt small companies. These companies would then have to hire more drivers to accommodate the additional off-duty time required, which in turn would put more inexperienced drivers on the road.

The U.S. Chamber of Commerce stated that the FMCSA's 2003 RIA demonstrated that short-haul operators were not expected to see any benefits from the rule adopted that year, which

supports the need for separate handling of short-haul and long-haul operations. The Chamber argued that short-haul operations should not be subject to a rule that fails to produce a net benefit for those operations.

Carriers

United Parcel Service (UPS) cited research showing that fatigue effects are less likely in short-haul drivers because they work daylight hours, have work breaks, begin and end at their home location, and sleep in their own bed at night. The research also found that drivers who work in short-haul operations have varied task responsibilities compared to the monotonous task of driving long-haul routes, and this is also a factor in the lower level of fatigue.

UPS noted that if short-haul driving is not a substantial cause of fatigue, strict HOS regulations are less likely to have beneficial safety effects. UPS concluded that the HOS rule should be modified to recognize the differences between long-haul and short-haul operations. UPS proposed that FMCSA permit an individual who drives less than 25 hours per week and 5.5 hours per day, and whose driving is primarily local, to extend the 14-hour duty-period by the amount of time taken in breaks and other off-duty time, and to combine split periods of off-duty time for the purpose of acquiring the ten hours of off-duty time necessary to return to duty. UPS also proposed that the 100 air-mile radius rule allow a driver to return to his or her work reporting location within 14 consecutive hours, instead of the 12 hours currently specified.

Other trucking companies also expressed concern with the short-haul provisions. One small carrier urged FMCSA to retain the exemption that allows an additional 2 hours of duty time once per week. Another supported the exemption and suggested a traditional time clock formula for tracing duty time by requiring the drivers to ''punch in and out.''

FMCSA Response

The research and data reviewed by the Agency demonstrate that fatigue has relatively little impact on short-haul trucking. The comments also strongly support that conclusion. Because the benefits of HOS regulations for those operations are quite disproportionate to their costs, FMCSA has decided to create a new regulatory regime for a more specific subset of short-haul operations.

Under the rule adopted today, drivers of CMVs that do not require a CDL to operate will be allowed to extend their 14-hour duty ''window'' by 2 hours twice per week, but the driver must: (1) Have 10 consecutive hours off-duty prior to the start of the workday; (2) not drive after the 14th consecutive hour since coming on-duty on the days he or she does not use the 2 additional hours provided by this provision; (3) not drive more than 11 hours after coming on duty; (4) not drive after having been on duty for 60 hours in a 7-day period, or 70 hours in an 8-day period, including the 34-hour recovery provision; (5) not operate beyond a 150 air-mile radius from the location where he or she reports to, and is released from, work; and (6) return to his or her work reporting location at the end of each work day. In addition, these drivers will not have to keep records of duty status. However, the employing motor carrier must maintain a time record for six months showing the time the driver reports to, and is released from work, consistent with the time keeping requirements under the current 100 air-mile radius exemption. To simplify compliance with this new short-haul HOS provision, drivers to whom it applies will not be able to use the sleeper berth exception or the current 100 air-mile radius short-haul exemption.

Short-haul drivers are unique to the motor carrier industry in that they do not drive for long periods of time. The nature of short-haul operations (repeated pickups and deliveries) and vehicles (too small for operations that require long driving stints) make driving long hours logistically and economically unfeasible and unnecessary. Hanowski [Hanowski, R.J., *et. al* (1998), p.5] found that only 50 percent of a short-haul driver's time is actually spent driving, and that time was scattered throughout the day. However, these operations do experience occasional extended days during peak times of the year where the necessity to extend their work day by 2 hours is needed.

Due to the variety of tasks short-haul drivers conduct throughout the day, traditional ''time-on-task'' models do not apply. However, through the Agency's literature search both laboratory and field research studies were found that support the ability to work a 16-hour shift without significant degradation of performance. A laboratory study of sleep restriction and sleep deprivation found the critical limit to wakefulness when performance begins to lapse was statistically estimated to be about 16 hours [Van Dongen, H.P.A, *et al.* (2003), p. 123]. In a study of drivers in New Zealand, researchers found that drivers could maintain their performance until about the 17th hour of wakefulness, after which performance capacity was sufficiently impaired to be a safety concern [Williamson, A.M., *et al.* (2000), p. 19].

While the short-haul industry can experience long work days during peak times of the year, it is the Agency's best judgment that longer workdays will not translate into longer driving times in the short-haul environment where there is relatively little driving, but rather several other job-related activities. As noted earlier, short-haul drivers rarely, if ever, accumulate 11 hours of driving, regardless of the workday length. FMCSA concludes that the rhythm of local operations will limit the use of this new provision in any case, but the Agency wants to give this segment of the motor carrier industry as much flexibility as possible to structure their operations efficiently, while still providing a safety regime to address deficiencies.

The research is limited on issues related to the health of short-haul drivers. However, one study specifically addressed driver health issues and short-haul drivers. This study identified the occupational stress that short-haul drivers encounter on a daily basis. Orris *et al.* administered a questionnaire to 317 short-haul drivers who worked out of distribution centers in New Jersey, Wisconsin, Texas, and California [Orris, P., *et al.* (1997)]. Each participant was given a packet that included six self-administered questionnaires related to occupational stress. The results indicated that short-haul drivers had a significant elevation of stress-related symptoms over the general adult population. Further analyses indicated that one reason for the stress was that drivers believed that their workload was unreasonable, and that they were faced with rigid deadlines.

Another study [Hanowski, R. J., *et al.* (1998)] conducted focus groups with 82 experienced short-haul drivers to identify safety problems in the short-haul industry. The two top concerns most often mentioned by short-haul drivers were the problems caused by drivers of light non-commercial vehicles and stress due to time pressure [*Id.*, p. 70]. As identified in the comments to the docket, occupational stress due to rigid time pressure and not having enough time in the day to get the job done was mentioned as a safety problem.

The short-haul provision in this final rule does not increase the maximum permissible weekly work hours (the 60 and 70-hour rules are still applicable to short-haul drivers) or daily driving time (the 11-hour driving limit per day)

allowed in today's final rule. However, the provision does provide short-haul operations greater flexibility in scheduling, especially during periods of peak demand. For 2 days per week, short-haul drivers will be allowed 2 additional hours during which they can drive, although their total maximum daily driving time remains the same. The Agency believes this will reduce the occupational stress short-haul drivers feel when trying to make too many deliveries in a limited time. FMCSA has concluded that this short-haul provision will not adversely affect the health of short-haul drivers.

Short-haul drivers do experience fatigue, however, and in a field study it was found that these drivers take 1-to 2-hour naps to reduce any fatigue accrued during the course of a normal work day. The study showed that these naps are taken while drivers wait for their vehicle to be loaded or unloaded or during normal meal breaks [Balkin, T., *et al.* (2000), p. 4–63]. These naps are in addition to the routine breaks these drivers utilize through the course of their day. FMCSA has concluded that the unique characteristics of their operations enable short-haul drivers to maintain the alertness and vigilance needed to drive up to the 16th hour after coming on duty twice a week, a conclusion supported by the fact that short-haul drivers are involved in fewer crashes per vehicle miles traveled than long-haul drivers.

Vehicles that require the driver to have a CDL are defined as any ''motor vehicle or combination of motor vehicles used in commerce to transport passengers or property if the motor vehicle (a) Has a gross combination weight rating of 11,794 kilograms or more (26,001 pounds or more) inclusive of a towed unit(s) with a gross vehicle weight rating of more than 4,536 kilograms (10,000 pounds); or (b) Has a gross vehicle weight rating of 11,794 or more kilograms (26,001 pounds or more); or (c) Is designed to transport 16 or more passengers, including the driver; or (d) Is of any size and is used in the transportation of hazardous materials as defined in this section'' [49 CFR 383.5]. Drivers of vehicles transporting placardable quantities of hazardous materials will not be able to use this new rule because they are required to have a CDL, regardless of the weight of the vehicle. However, the new regulatory regime is applicable to drivers who possess a CDL, but drive a vehicle that does not require a CDL to operate.

By limiting the applicability of this short-haul rule to operators of vehicles not requiring a CDL, the Agency is using a recognized and logical break point. Vehicles with a weight of less than 26,001 pounds have long been acknowledged by law enforcement, the International Registration Plan (IRP) requirements, truck manufacturers, and Congress as a distinct vehicle class. In most cases, the size of a vehicle determines the class of driver's license needed to operate it. Only when a vehicle carries a placardable amount of hazardous materials do the size and weight of the vehicle not make a difference. The IRP is a commercial vehicle registration system entered into by the individual states of the United States (excluding Alaska and Hawaii), the District of Columbia, and various provinces of Canada that allows one IRP member to process commercial vehicle registrations and collect fees for other members. The IRP uses 26,000 pounds as its weight threshold, demonstrating that States consider this weight a non-arbitrary divide between vehicles likely to be operated in interstate commerce over long distances and those that operate locally. The IRP ''apportioned'' license plate will also help alert law enforcement officers to vehicles that are most probably over 26,000 pounds, thus identifying drivers not eligible for this new regulatory regime. In addition, regardless of license plate, law enforcement officers are trained under 49 CFR 383.91 to recognize vehicles under 26,001 pounds by their appearance. The classification system used by truck manufacturers and the National Highway Traffic Safety Administration has long specified 26,000 pounds as the upper limit for a Class 6 truck [49 CFR 565.5, Table III]. Congress itself recognized the limited operational role of lighter vehicles by requiring a CDL only for drivers of Class 7 and 8 trucks starting at 26,001 pounds GVWR (and certain passenger and hazmat vehicles).

Groups such as the NRMCA, NSSGA, and the CRMCA represent short-haul motor carriers, but virtually all of their operations involve CMVs that weigh more than 26,000 pounds. FMCSA has decided not to extend the new regime to all short-haul carriers, but only those using smaller (*i.e.* under 26,001 lbs) vehicles. Many short-haul operators use van or tank trailers indistinguishable from those employed in long-haul trucking, for example, to re-supply supermarkets or gas stations. While ready-mixed concrete trucks are not used in long-haul operations, they do require a CDL to operate. Vehicles that require a CDL are likely to be driven more than smaller vehicles that do not, simply because their capacity makes them ideal for transporting large loads point-to-point, but not for local delivery. The combination of more driving time and greater mass makes these vehicles potentially more dangerous than smaller trucks. FMCSA has therefore concluded that the new HOS regime should be limited to operators of lighter truck (*i.e.*, those not requiring the driver to hold a CDL).

When reviewing the activities of CMV drivers, the Agency found that drivers of light vehicles spend less time driving and more time completing other non-driving tasks, such as those referenced earlier. The economics of this concept are fairly straightforward: The greater the cargo capacity of the vehicle, the greater the benefit of operating it longer distances and for longer hours. Conversely, the less cargo capacity, the less economic sense it makes to operate the vehicle over longer distances, or for longer hours. Thus, drivers in operations that use lighter vehicles are less likely to spend time driving. Operationally, the lighter vehicles tend to be smaller and more maneuverable, making them ideal for local pick up and delivery operations in localized settings. The drivers spend most of their time in and out of the vehicle, serving their customers and doing ancillary duties, such as stocking shelves and checking inventories.

This analysis is supported by data in the U.S. Census Bureau's 2002 Vehicle Inventory and Use Survey (VIUS) which shows that about 90 percent of all trucks weighing 26,000 pounds or less operate within a 150-mile radius. VIUS also shows that trucks with a GVWR of less than 26,001 pounds with a primary range of operation within 150 miles comprise about 46 percent of all trucks operated in the United States. Only a small portion of these vehicles require the driver to possess a CDL.

Trucks Involved in Fatal Accidents (TIFA) data from the years 1994 to 2002 (excluding 2001) show that about 12.7 percent of all CMVs involved in fatigue-related crashes weighed less than 26,001 pounds. Additionally, TIFA data indicate that CMVs weighing less than 26,001 pounds and engaged in trips of 150 miles or less account for only 6.8 percent of all large trucks involved in fatigue-related fatal crashes between 1994 and 2002. Conversely, these vehicles represent 52 percent of all large trucks registered in 2002, according to the U.S. Census Bureau's Vehicle Inventory and Use Survey.

A study of Short-Haul Trucks and Driver Fatigue by Dawn Massie and her colleagues found that short-haul trucks (which they defined as Class 3–6 straight trucks, i.e. 10,001 to 26,001

pounds) have a very low fatal-involvement rate compared to other trucks [Massie, D.L., *et al.* (1997), pp. 20–21]. As FMCSA pointed out in the 2000 HOS NRPM, the Massie study concluded that ''[l]ocal single-unit straight trucks had an average of 0.0022 fatigue-related fatal involvements per 1,000 registered trucks. The comparable figure for long-haul tractor-trailers was 0.0781, approximately 35 times higher. On a per-mile basis, long-haul trucks were almost 20 times more likely to be involved in a fatigue-related crash.'' [65 FR 25540, at 25546].

There are some possible reasons for these lower fatigue-related crash rates. Drivers in short-haul and local operations spend relatively little time actually driving the vehicle. The drivers in the study by Hanowski [Hanowski, R.J., *et al.* (2000), p. 77] reported an average shift time of 10.89 hours but only averaged 92 miles of driving per shift. The drivers primarily worked 5 days per week. In fact, of the 462 shifts examined by Hanowski, there were only two instances where a driver worked on a Saturday and both of those shifts were less than 8 hours long. Hanowski found that about 61 percent of drivers' time was spent completing tasks other than driving—35 percent on loading/unloading and 26 percent on other assignments (vehicle inspections, merchandising, etc.).

In addition to reduced driving time, reports suggest that light to moderate physical activity during the workday lessens a driver's physiological fatigue. For example, Mackie and Miller stated that ''light work stress did not lead to any cumulative fatigue'' and there were ''[n]o significant differences in subjective fatigue between drivers who engaged in light versus moderate cargo loading'' [Mackie, R.R., & Miller, J.C. (1978), p. X]. Hanowski found that drivers classified as not fatigued spent over an hour more time loading and unloading the vehicle. The explanation, he and his colleagues concluded, ''is that the physical loading/unloading helps drivers avoid fatigue'' [Hanowski, R.J., *et al.* (2000), p.112].

For all of these reasons, in the Agency's best judgment, a new HOS regime for a specific subset of short-haul operations is warranted. However, FMCSA will closely monitor fatigue data, particularly fatigue-related crash data for this group of carrier operations, and will look at further fatigue-related research on short-haul operations.

J.11. Combined Effects

Commenters provided a variety of responses to the Agency's NPRM request to provide studies or other data on the ''combined or net effects'' of the various regulatory provisions in the 2003 rule on driver health, the safe operation of CMVs, and economic factors. The Agency also asked about ''mutual interactions'' of the various provisions. Consequently, commenters discussed the combined effects and interactions of the provisions on health and safety. In addition, they discussed both how health and safety are related to each other separately and when considered with various provisions. Combined effects for purposes of this discussion are distinguished as follows: (1) A cumulative effect refers to the net impacts of various provisions; and (2) interactions refer to how changes to one or more provisions impact one or more other provisions.

Comments

Paradigm Shift Needed? Circadian Technologies stated that the complexity of the issues requires consideration of a new, flexible paradigm. A summary of their comments follows: The 2003 rule focuses on effects of the number of hours allocated to the existing provisions after beginning a work week, but does not acknowledge that alertness, safe performance, and health of a driver depend far more on how sleep-deprived a driver is than how many hours he or she has been on duty or driving. Continuous wakefulness (which can be longer than duty-tour time), sleep length and quality, and sleep obtained over the prior week are highly relevant to fatigue. According to Circadian Technologies, the 2003 rule may unintentionally require drivers to rest when sleep is difficult to obtain, compress their sleep when it is most needed, and discourage them from interrupting their duty time to take brief naps. This may result in high levels of chronic and acute sleep deprivation. The complex interaction between sleep science and trucking operations defies a one-size-fits-all rule that is understandable by drivers and enforceable by regulators.

FMCSA Response

In drafting this final rule, the Agency balanced the potential safety and health impacts, and costs, while considering compliance and enforcement issues. In the 2000 NPRM, FMCSA attempted to tailor the rule to specific industry sectors and their unique operating environments to avoid a blanket approach. This tailored approach, however, was firmly rejected by a substantial majority of industry as unduly complex. Circadian Technologies was the sole commenter suggesting a paradigm shift was needed, and neither the public interest advocates nor industry supported replacing the 2003 provisions with a new paradigm in the 2005 rule. A significant body of research supports retaining the major provisions of the rule, modified by the changes discussed earlier.

Comments

Health. Different perspectives were provided by commenters regarding the health risks of the 2003 rule, though all were described as cumulative, versus interactive. ATA stated that potential driver exposure to diesel exhaust emissions have decreased substantially over the last several years and such decreases will likely continue. In addition, these potential DE hazards are now within levels established by EPA and OSHA. ATA also stated that the 2003 rule provides a sufficient sleep opportunity to mitigate the potentially adverse health outcomes from sleep debt.

Others disagreed with this assessment, based on substantive and procedural issues. Regarding their substantive concerns, Public Citizen requested that FMCSA address diesel emission-related health risks by significantly decreasing both daily and weekly driving hours. NIOSH commented that there are potential long-term health effects associated with repeated periods of extended duty, especially given that the 2003 regulations permit up to 84 duty hours per 7 days, or double the duty hours of the average U.S. worker. They also noted that long-term exposure to extended work hours and driving in particular may have health consequences, including raised risks of myocardial infarction and back injury. Alertness Solutions agreed that driver health factors related to fatigue, such as total and partial sleep loss, extended wakefulness, and circadian disruption, have been associated with degraded physiological and health outcomes. However, Alertness Solutions pointed out that the studies generally have shown that total sleep loss or sleep restriction to 4 hours for 6 consecutive nights is required to trigger these associations.

Of the several points AHAS made on health impacts, two are summarized as follows: first, the rule does not address the health impact of potentially increasing duty tours by 40 percent and driving hours by 30 percent, or allowing drivers to alternate between 11 hours of driving and 10 hours of off-duty time; and second, sleep debt from long or irregular shifts is strongly associated with major changes in metabolic and endocrine function.

AHAS maintained that there was not an independent review of health effects by FMCSA prior to issuing the 2003 rule. Also, they stated that the Agency cited but failed to apply health study findings previously cited in its 2000 NPRM and 2003 final rule.

FMCSA Response

It appears that chronic exposure to DE may cause cancer. The exposure/dose required, however, is currently unknown, due to the extreme difficulty in measuring and modeling exposure. For instance, EPA has noted that there is great ''uncertainty regarding whether the health hazards identified from previous studies using emissions from older engines can be applied to present-day environmental emissions and related exposures, as some physical and chemical characteristics of the emissions from certain sources have changed over time. Available data are not sufficient to provide definitive answers to this question because changes in DE composition over time cannot be confidently quantified, and the relationship between the DE components and the mode(s) of action for DE toxicity is unclear'' [Ris, C. (2003), p. 35]. EPA's combined actions of tightening the standards for DE and fuel standards lead to a projection of dramatically lower DE through 2030. Based on these projections, the health effects linked to DE should be reduced over time.

The Agency has two responses regarding the health impacts of longer hours permissible under the new regulations. First, based on research conducted by FMCSA, including literature reviews performed by the National Academies (see process discussion in next paragraph), there is a lack of knowledge on, and great deal of uncertainty about, whether the potential long hours alone adversely affect driver health. Second, even if there is a potential for impacts from longer hours for drivers, despite the uncertainties of detection and modeling described above, based on FMCSA's driver survey, data from Campbell and Belzer (2000), and data submitted by carriers, including Schneider National and FedEx, there is no evidence that drivers have drastically increased their hours of driving or work. Therefore, there is no evidence drivers will be subject to deleterious health effects [under 49 U.S.C. 31136(a)(4)] resulting from their exposure to DE based on changes to the rule published today. In conclusion, regarding DE exposure and health impacts, FMCSA believes that while DE probably entails some risk to drivers, today's HOS rule neither causes nor exacerbates that risk, compared to the pre-2003 rule.

From a process perspective, in preparing the final rule FMCSA extensively researched both health and fatigue studies through consultation with an inter-agency group of Federal safety and health experts. First, the Agency reviewed numerous studies, which included those findings previously cited in its 2000 NPRM and 2003 final rule. Second, as discussed in detail in section D, we tasked nationally known health and fatigue experts associated with the National Academies' Transportation Research Board (TRB) with conducting a thorough literature review of studies relevant to this rulemaking. Specifically, this review included research findings that discussed in a scientific, experimental, qualitative, and quantitative way the relationship between the hours a person works and drives, the structure of the work schedule (on-duty/off-duty cycles, time-on-task, especially time in continuous driving, sleep time, *etc.*), and the impact on the health and fatigue of a commercial motor vehicle driver.

As a result of the questions raised in the NPRM, commenters cited over 200 studies to the HOS docket concerning health and fatigue. Of these, the TRB team utilized the screening criteria from the original research stage and selected key studies to review and summarize for this health and safety evaluation.

Comments

Fatigue: Cumulative effects. Several commenters raised concerns about the perceived negative cumulative effects of the 2003 rule. Also, based on interviews of long distance drivers in two States, the Insurance Institute for Highway Safety (IIHS) found that drivers are driving more hours and that fatigued driving is at least as common as it was previously. IIHS, Public Citizen, and AHAS voiced concern about the potential for increased fatigue based on the increase in driving of both daily and weekly hours. IIHS also emphasized that the impact is due to the fact that up to 42 percent of drivers in one interview said they drove 10 or more hours a day and used the recovery provision. AHAS criticized Alertness Solutions' paper submitted to the docket as an attempt to cast doubt on relevant studies while ignoring a significant amount of key literature supplied both by AHAS and FMCSA showing that the rule's provisions in combination lead to increased fatigue, lower performance, and a higher risk of crashes. AHAS further asserted that while Rosekind of Alertness Solutions agrees with FMCSA in his earlier literature that two successive nights of sleep are needed for recovery, he contradicts this in his comment submitted to the docket via Alertness Solutions by arguing that two 8-hour periods are adequate.

On the other hand, numerous carriers raised the point that over the 2003–2004 year crash frequency declined, resulting in a marked safety improvement. The National Private Truck Council (NPTC) was one of many industry representatives which acknowledged that, while it is hard to definitively link these safety improvements to the hours-of-service rules, the rule was in many cases the ''only variable'' that changed over that year. This data, according to these commenters, refutes arguments made by others about the negative impact of the 2003 rule. Several commenters, such as FedEx Ground, noted that such safety improvements were notable in light of an overall increase in vehicle miles traveled. The Motor Freight Carriers Association stated that the cumulative effect of the various provisions resulted in positive safety benefits. The National Industrial Transportation League (NITL) stated that the provisions in the 2003 rule combined to significantly ameliorate chronic fatigue. The American Moving and Storage Association (AMSA) cited data they collected to support the safety benefits of the new rule, which stem from a more natural circadian routine and additional rest time.

Fatigue: Interactions/Offset. Several commenters raised concerns about how the various provisions interacted or offset each other. Some disagreed with how the various provisions were allocated quantitatively (*e.g.*, hours of driving time) and argued that their interaction resulted in reduced safety. For instance, AHAS stated that even assuming the benefits of increasing off-duty time by two hours under the 2003 rule, the dramatic increase in weekly driving hours permitted by the 34-hour recovery period ensures that drivers will be more, not less fatigued and be more exposed to risk. Similarly, Public Citizen noted that even assuming positive benefits of the decreased tour of duty provision under the 2003 rule, the increased driving allowed may negatively offset such benefits. They also said that crash risk may increase as a result. The AFL–CIO maintains that the cumulative fatiguing effects of an extra hour of driving each day and the 34-hour recovery provision negate the positive aspects of establishing a 24-hour clock.

Many commenters supported the safety benefits resulting from the interactions of the provisions. For example, ATA supported the Agency's

conclusion that it could permit a 1-hour increase in driving time from 10 to 11 hours because it had mandated an overall reduced tour of duty. Also, while the length of duty tour needs to be limited based on research concerning continuous wakefulness, little is known about the impacts of driving time. According to C.R. England, the interaction of the current provisions provides good balance by allowing additional driving time (11 hours) with more rest opportunity (10 hours) and a 34-hour recovery period to recover from any cumulative fatigue that may occur. They also pointed out that the 10-hour off-duty provision eliminates daily fatigue while the two 8-hour sleep periods in the 34-hour recovery provision provide an adequate opportunity for full recovery. Schneider National Inc. agreed that the 10-hour off-duty provision eliminates daily fatigue, while the 34-hour recovery provision eliminates cumulative fatigue on a weekly basis. They also noted that the 10-hour off-duty period supports both the 11 hours of driving and 34-hour recovery provisions. Fresenius Medical Care stated that under the 2003 rules, the driver usually has adequate time to commute and attend to personal matters, while still obtaining 8 consecutive hours of sleep. FedEx Freight argued, regarding the 11th (added) hour of driving provided by the 2003 rule, that ''statistically'' no crashes happened after the 10th hour of driving; therefore, no offsetting adjustments in other provisions are needed. Based on International Paper's experience with the rule, the majority of drivers do not have the opportunity to drive a full 11 hours, given the impact of the maximum ''on-duty'' of 14 hours, and any reversal of this would not achieve the desired increase in safety.

Fatigue: 24-hour Cycle. The interactions resulting in a movement towards a 24-hour clock were characterized by commenters as beneficial, though some concerns were raised. The two main issues were: First, the composition of the 24-hour cycle through the combination of the 10-hour off-duty period with the 14-hour driving window; and, second, the impact of backward rotating schedules. First, according to ATA, the 14 consecutive hour on-duty limit, coupled with 10-hours off-duty requirement, is a synergistic safety feature of the new rule resulting in a consistent 24-hour work-rest cycle. Tennessee Commercial Warehouse noted that for long-haul drivers, the 14 consecutive hour shift, coupled with the 11 hours of driving, has allowed them to maintain their income level and establish a 24-hour cycle; consequently, drivers take their off-duty break about the same time every day. Second, according to Circadian Technologies, by extending both the number of hours of off-duty time required per day (from 8 to 10), and the number of hours of driving allowed (from 10 to 11), the new rule extends the minimum day-night cycle from 18 hours to 21 hours, assuming drivers drive the maximum allowable (and have no on-duty not-driving time). This reduces the likelihood of drivers falling into backward rotating schedules that can impact health and fatigue. While such schedules are still permissible under the rule being adopted today, the added off-duty hours help reduce the severity of the rotation. ATA's comment on this topic typified other associations, suggesting that even if a driver maximizes driving time with little additional duty time and takes the minimum 10 hours off-duty, this 21–22 hour cycle comes closer to a 24-hour circadian cycle than the 18-to 19-hour cycle possible under the pre-2003 rule.

Among those raising concerns about the 24-hour cycle, Circadian Technologies maintained that a 24-hour clock does not help a driver whose first off-duty period starts during a time of day when it is difficult from a circadian standpoint to sleep. Public Citizen noted that, based on FHWA's 1996 study, the strongest and most consistent factor influencing driver fatigue and alertness was time of day; drowsiness was markedly greater during night driving than during daytime driving. They also noted that while the Agency has suggested that the 14-hour duty tour/10-hour off-duty provisions combine to establish a 24-hour schedule, the one hour reduction in duty tour is not relevant to the number of driving hours because drivers will utilize the maximum driving hours to enhance their wages and meet deadlines. On the other hand, drivers will tend to minimize clocking on-duty hours, because they do not typically get paid on that basis. To address these perceived shortcomings, Public Citizen suggested that drivers on long shifts be required to use the remaining on-duty hours available after they finish driving or add on the remaining hours to their off-duty period. This would ensure that drivers remain on a true 24-hour schedule.

Fatigue: Breaks. According to ATA, the benefit of having a work limit within a duty period is that it creates other time within which breaks can be taken; such breaks can have a beneficial effect on fatigue. Other commenters, including Circadian Technologies and several drivers, argued that, despite the positive benefits of attempting to achieve a 24-hour cycle, the 14-hour on-duty cycle has the negative effect of discouraging rest breaks, which may include beneficial naps.

Fatigue: Quality of Life Impacts. FMCSA asked whether drivers were obtaining more rest under the 2003 rule and whether the quality of their lives had improved. The results are shown below in Figure 10.

FIGURE 10.—COMMENTS ON REST AND QUALITY OF LIFE UNDER 2003 RULE

	Carriers	Drivers	Other*
More Rest:			
Yes	29	114	5
No	4	46	2
Quality of life:			
Better	18	70	2
No Change	1	16	1
Worse	3	34	1

* Includes comments from trucking associations.

Commenters mentioned that the rule's off-duty time provided the opportunity not only for sleep, but also for relaxation and personal tasks. Of the drivers and owner-operators who stated that they do not get more rest, some criticized the 14-consecutive-hour provision because naps and rest periods do not stop the duty-tour ''clock.'' Drivers also thought that off-duty/sleeper-berth time was too long, and waiting for the time to end was very tiring. Other drivers said that

the rule caused them to waste more time and to drive in worse conditions.

The commenters who said the quality of their lives had improved under the rule credited the reduced or regulated workday that allowed them to have more time at home and for leisure activities. They also mentioned an improved relationship with carriers, shippers, and receivers because the companies recognize that the rule limits the time a driver can be on duty. Those who reported no change or a worse quality of life cited the 14-hour rule and the requirement for a 10-hour off-duty period when away from home.

Two commenters thought their quality of life was better in some ways and worse in others because of the rule. One commenter noted that there was confusion about the rule's provisions, *e.g.*, some drivers think they are required to sleep for 10 hours. Two carriers had surveyed their drivers. Landstar Systems found that 73 percent of the drivers thought their personal lives had not changed and 44 percent said they were home less often under the rule. J.B. Hunt found that 38 percent of the drivers saw no effect on their personal lives and only 15.8 percent thought their personal lives had improved under the rule.

Fatigue: Regulatory Impact Analysis. Public Citizen noted that FMCSA failed to demonstrate how the extra off-duty time enhances a driver's ability to drive an additional hour. Public Citizen also stated that while the Agency claimed the rule produced substantial net safety benefits, the RIA did not take time-on-task into account. In addition, the notion that time-on-task effects are zero is implausible. If driver fatigue rises with additional consecutive driving hours and drivers are fatigued after 8 hours, they will be more tired after 11 compared to 9 or 10 hours; if they are fatigued after working 60–70 hours in 7 or 8 days, they will be even more so after working 84–98 hours in the same periods.

FMCSA Response

Cumulative Effects, Interactions/offsets, Breaks, Quality of Life, and RIA. The Agency requested and received comments about both cumulative and interaction impacts on fatigue, has collected new data, and has thoroughly reviewed the scientific evidence. FMCSA's best judgment is that the rule finalized today provides the best possible regulation considering both the cumulative and interaction impacts on fatigue. Our response to both types of effects are discussed together later in this section.

Today's rule can be summarized in six points: (1) Adopts 11 hours of daily driving time as the maximum allowed following a 10-hour off-duty period; (2) adopts a 14-hour duty tour ''driving window;'' (3) eliminates the split sleeper berth exception traditionally allowed by requiring 8 hours of consecutive anchor sleep and an additional two hours of off-duty or sleeper-berth time; (4) requires a 10-hour off-duty period; (5) allows a 34-hour recovery provision; and (6) provides that short-haul drivers of vehicles not requiring a CDL who operate within a 150-mile radius of their normal work reporting location may drive 11 hours within a 16-hour work shift 2 days in any period of 7 consecutive days, while, among other provisions (further described in Section J.10 on short-haul operations) requiring compliance with the same provisions applicable to other drivers (described in this paragraph above) for the other 5 days.

The Agency's seven fatigue-related rationales for the rule being adopted today, based on extensive research into these provisions and how they are related, follow.

First, compared to pre-2003, the Agency is adopting a shorter and stricter duty tour ''window'' to prevent drivers from drastically extending their day through the use of breaks. Adopting this provision is justified because continuous daily wakefulness is among the strongest predictors of fatigue, and the Agency's best judgment indicates it outweighs driving time as a predictor of fatigue. Therefore, FMCSA is requiring this provision to reduce driver fatigue by ensuring that the provision extending the work day is eliminated.

Second, the Agency modified the 2003 sleeper berth provision to ensure all drivers have the daily opportunity to obtain 8 hours of consecutive rest and a total of 10 hours off-duty. Specifically, the split sleeper berth provision has been eliminated and each driver using a sleeper berth must obtain a primary period of 8 consecutive hours of off-duty time in the berth. Such drivers must also take an additional 2-hour off-duty period that is in or outside of the sleeper berth, either consecutively with, or separately from, the primary 8-hour period. The 10-hour off-duty period will enable drivers to combat daily fatigue, provide opportunities to attend to personal matters, and obtain rest, including naps. The ability for the driver to take a nap later in the day is an important benefit, especially considering that drivers taking advantage of the sleeper berth exception could be on a rotating schedule, or off a natural circadian rhythm.

Third, the Agency concluded that an 11-hour driving time provision combined with a 14-hour non-extendable driving window provide a greater opportunity for daily sleep compared to the pre-2003 rule, which allowed for a 15-hour extendable driving window with only 8 hours off duty. The available research and crash data do not clearly indicate whether the 11th hour of driving, combined with other provisions of the 2003 rule, poses a significant safety risk to drivers. Since industry and Agency data show that the 11th hour is not fully utilized, any safety risk to drivers is lower than the possible worst case scenarios, which assume full use of all allowable driving hours, would suggest. In sum, it is the Agency's best judgment that the potential safety benefits to eliminating the additional one hour of driving are not great enough to justify the high cost of such a change. As noted above, the 10-hour off-duty period ensures that all drivers, including those utilizing a sleeper berth, have an opportunity to obtain an uninterrupted block of 8 consecutive hours so that fatigue is eliminated, or significantly reduced, on a daily basis. Adopting a 10-hour off-duty period is supported by NTSB's 1996 report finding that the most critical factors in predicting fatigue were the duration of the most recent sleep period prior to the crash, length of time since last sleep period, sleep over the preceding 24 hours, and split-sleep patterns. The Agency recognizes that drivers, beyond sleep, have other needs to attend to, including commuting, performing errands, and addressing other personal and family matters. The extra 2 hours beyond those needed for sleep ensures a driver can complete such tasks. The interaction between these provisions enables the vast majority of drivers to work and drive to the maximum permissible limits per day (even if they chose not to do so), without developing a cumulative sleep debt.

Fourth, the Agency considers the 34-hour recovery provision to be a safety net for the other provisions in the exceptional case where a driver has not obtained sufficient rest, despite 10 hours off duty (including for sleeper berth drivers) combined with a 14-hour non-extendable driving window. Given that the Agency has reduced the driving window requirement by 1 or more hours, the negative effects of longer weekly driving hours has been addressed on a daily basis. The Agency acknowledges that the recovery provision allows a driver to drive

additional weekly hours, but we believe the 34-hour period affords sufficient time for 2 nights of 8-hour sleep for the vast majority of drivers and an 18-hour intervening period of wakefulness that in combination allow for weekly recovery from any sleep debt accumulated by a driver over multiple days. In addition, night drivers will accumulate less fatigue on a daily or weekly basis compared to the pre-2003 rule through the combined effects of the provisions discussed in this section. For night drivers, the two 8-hour sleep periods give drivers an adequate opportunity to help minimize acute and cumulative fatigue, regardless of their driving schedule. However, worst-case scenarios presented by commenters (and FMCSA in the NPRM) regarding total hours operators may drive under the 2003 rule are not realistic nor supported by operational and safety data (see rationale seven below for detailed discussion). Another major benefit to adopting a recovery period is that it allows drivers to begin their work schedule at approximately the same time each day as their last shift; hence, this will avoid shifting of daytime to nighttime schedules that research shows can disrupt the circadian rhythm by promoting fatigue and potentially higher crash risk. Also, because recovery can be taken at any time, it can be used when needed most by drivers to maximize safety.

The Agency considered adopting a 44-hour recovery period. The Agency has concluded, however, there is no conclusive scientific data available at this time to guide us in determining which factor (recovery vs. circadian disruption) is more predictive in alleviating fatigue. Hence, considering a longer recovery period illustrates the profound complexity concerning this issue.

The Agency has weighed the concerns with night driving and the benefits of night sleep; however, the fatigue risks of restricting night driving are outweighed by two counterproductive consequences: safety problems from increasing daytime traffic, and the significant economic impact on industry. For example, a 44-hour recovery period would cause the severe traffic-related and economic impacts described above (see Section J.8). After reviewing the combined effects of all the provisions compared to the pre-2003 rule, the Agency is adopting a 34-hour recovery provision because it acts as a flexible, weekly safety net that will benefit the vast majority of drivers who fail to obtain daily rest with two extra hours (10 hours) of daily off-duty time (including sleeper-berth users), and a non-extendable (14-hour) driving window.

Fifth, the Agency concluded that for drivers who take their 10-hour off-duty period in tandem with the 14-hour driving window (*i.e.*, one after the other), these provisions collectively will help keep them on a 24-hour cycle, thereby mitigating or eliminating the deleterious effects of the circadian de-synchronization on driver sleep and alertness. There was near consensus among commenters that the combined effects of these provisions reduce fatigue, leading to positive safety benefits. The Agency believes that the 2003 rule's movement toward a 24-hour cycle has helped to regularize drivers' schedules and thereby minimize fatigue. FMCSA acknowledges that neither the 2003 rule nor today's rule eliminates the possibility that drivers will utilize backward rotating schedules by combining driving and off-duty time, while minimizing other on-duty not-driving time (*e.g.*, long-haul driver on day two of a trip that requires no additional loading). The change from an 18- to 21-hour cycle between the pre-2003 and 2005 rule reduces the likelihood and severity of drivers falling into backward rotating schedules that induce fatigue.

Sixth, the Agency is creating a new regulatory regime for drivers of small, short-haul CMVs in today's rule that allows them to drive within a 16-hour window twice a week. This industry segment experiences less driving-related fatigue and poses a lower crash risk compared to the long-haul trucking operations also covered by this rule. Today's rule does not increase the maximum number of work hours (60- and 70-hour rules are still applicable to short-haul drivers) or daily driving time (11-hour driving limit per day) allowed small, short-haul CMVs. This provision is expected to be utilized intermittently and to provide flexibility to meet seasonal and peak demands without leading to longer driving or significantly longer duty-tour times. Therefore, due to the unique attributes of the short-haul sector described below (and detailed in the short-haul section, J.10) and given that the limited number of added hours do not create a net increase in driving or duty hours over multiple days, this provision will not adversely impact drivers' health or safety.

Short-haul drivers have an opportunity for daily and weekly fatigue recoveries that typically exceed those of other trucking sectors. Short-haul operators drive less than 40 percent of their total duty tour, and their driving tasks are broken up by frequent deliveries and light to moderate work-related physical activity. Both factors lead to less accumulation of driving-related fatigue compared to long-haul drivers. In addition, the regularity of typical short-haul drivers' schedules differs from other drivers in that they sleep at home each night, have 5-day schedules with limited weekend work, and usually are provided at least a 48-hour recovery period over the weekend, consistently providing the opportunity for two 8-hour nights of sleep.

Based on the scientific literature analyzed by FMCSA, and when considered with the combined effect of other provisions enacted by this rule, the Agency concludes that this provision will not lead to negative health or safety impacts. FMCSA believes this 16-hour provision is justified under the continuous wakefulness literature discussed earlier which indicates that performance declines and crash rates increase beyond 16 hours of work. Although we have adopted a 14-hour driving window provision discussed above for other categories of drivers, we believe this 16-hour provision is justified because (1) limiting the availability of this provision to two days per week will not negatively impact short-haul driver safety; (2) the enhanced opportunity for daily and weekly recovery in this unique industry segment creates a reduced fatigue risk, especially since these short-haul provisions, when combined with the other provisions of the 2005 rule, do not create a net increase in driving or duty hours over multiple days; and (3) the FMCSA Field Survey found that these drivers take 1–2 hour naps to reduce any daily fatigue that may occur.

Since these drivers are typically on a fixed schedule, the Agency does not believe that the provision allowing two 16-hour duty tours each week will be used frequently, especially due to the disruption caused by the forward-rotation of the schedule. The Agency has found few studies discussing related health impacts; however, based on the 4 hours of additional duty tour per week and the unique schedule and recovery periods typical to this sector, the Agency concludes there will be no deleterious impacts from this provision.

Seventh, the agency concluded that the worst-case driver fatigue and health scenarios suggested by commenters regarding the 2003 rule's operational impact are not realistic. Most drivers are taking longer recovery periods than the minimum FMCSA is establishing under this rule, indicating that drivers value their rest and personal time and do not always seek to maximize driving time. Further, the average driver is not able to, and realistically cannot, drive and work

the longer weekly hours by utilizing the recovery provision on a regular basis, as described by some commenters. Another reason to doubt the worst-case scenarios advanced by certain commenters is that there is no clear data suggesting that fatigue-related crash risks have risen under the 2003 rule. In fact, FARS data show some decrease in such crashes. Moreover, numerous drivers reported that the 2003 rule's off-duty time provided the opportunity not only for sleep, but also for relaxation and personal tasks. Consequently, their quality of life has been enhanced by the 2003 rule. Furthermore, even for drivers maximizing their driving time (11 hours of driving followed by 10 hours off duty) the resulting 21-hour cycle is closer to the ideal 24-hour cycle than the previous 18-hour ''day'' (10 hours of driving followed by 8 hours off duty). In sum, comments and data by drivers and industry representatives do not substantiate the worst-case scenarios advanced by commenters.

In conclusion, the Agency believes that the combined cumulative and interaction effects of the provisions discussed above will result in less fatigue for drivers and thereby greater safety for the drivers and the public compared to past hours-of-service requirements.

Comments

Health and Safety. Several commenters believe that the 2003 rule has beneficial impacts for both the health and safety of drivers. Regarding health, a commenter cited a potential decrease in sick days. Carriers report that drivers seem to be getting more sleep due to having two extra hours off-duty, giving them more time to relax and rest, which is facilitated by the establishment of a more routine schedule. The routine sleep schedule leads to better quality of sleep. The Distribution and LTL Carriers Association cited net benefits from having more time for rest, errands, and social matters, resulting in general driver satisfaction, which ordinarily leads to a healthy driver. J.G. MacLellan Concrete suggested that the health and safety of drivers is not impacted by the extra driving hours provided by the 2003 rule because most of their drivers work on-site and are not utilizing such driving hours.

Others characterized the cumulative health and safety impacts as negative. Specifically, Public Citizen made the point that the recovery provision adversely affects driver health and safety in two ways: It dramatically increases both weekly driving and duty hours while significantly curtailing much needed weekly rest.

Interactions/offset. The Owner Operator Independent Drivers Association (OOIDA) stated that if there is any negative impact of the use of the 11th hour, it is more than compensated for by the aggregate benefits of a 24-hour clock and an additional 2 hours daily rest per day. Furthermore, FMCSA should not narrowly analyze whether the 1 or more hour reduction in on-duty time offsets the increase in 1 hour of driving time. Instead, the Agency should compare all of the benefits of the rule with any effects of the occasional use of the 11th hour of driving.

Some parties discussed the health and safety aspects of individual provisions. NIOSH concluded that the current data are not adequate to characterize any acute health or safety consequences associated with the 14 hours of daily duty and 11 hours of driving under the 2003 rule. In addition, it is not feasible to conduct an epidemiological investigation of short-term effects for the 2003 rule.

Citing a portion of our NPRM, AHAS stated that the Agency's effort to analyze the combined effects of health and safety issues that are ''inextricably linked'' [70 FR 3343] ignores the court's request to treat health separately from fatigue and safety.

24-hour cycle. Several commenters supported the rule's move toward a 24-hour circadian sleep cycle to benefit drivers' safety and health. For instance, the National Industrial Transportation League (NITL) maintained that by combining a 14-hour workday with the 10-hour off-duty requirement, the HOS rule moves drivers toward a 24-hour cycle that approximates the body's natural circadian rhythm. The benefits of the 24-hour cycle include reduced stress and protection against other deleterious health impacts from abnormal sleep patterns. NITL also suggested that while a 21-hour day is unlikely because of the non-driving tasks, such as breaks and inspections, that drivers must perform, it is superior to an 18-hour day. OOIDA noted that the adoption of both the 14 consecutive on-duty hours and 10 consecutive off-duty hours provisions has been helpful to some drivers in achieving a 24-hour schedule. OOIDA also noted that a 24-hour schedule is beneficial to a driver's overall safety and health on all performance measures. International Paper noted the importance of the circadian rhythms on a driver's health, physical condition, and alertness. They argued that such rhythms provide a strong rationale for the 34-hour recovery because a driver can take 10 hours of off-duty rest, take 24 hours off, and begin work at the same time, thereby following the circadian rhythm.

Others took issue with the Agency's effort to move towards a 24-hour cycle. For example, Public Citizen challenged FMCSA's statement regarding our effort at moving toward a 24-hour work cycle, providing drivers with sufficient time off to obtain 8 hours sleep, while preserving flexibility for carriers in meeting schedule demands. They asserted that no studies cited by the Agency suggest safety and driver health will be improved by ''moving toward'' requiring a 24-hour work cycle or that a backward-rotating 21-hour schedule is any improvement over a backward-rotating 18-hour schedule.

FMCSA Response

The following response addresses health and safety comments pertaining to interactions/offsets and the 24-hour cycle. In the 2005 NPRM, FMCSA asked for information on combined effects of the provisions (driving time, duty time, and recovery) on ''driver health, the safe operation of CMVs, and economic factors.'' In the 2005 NPRM and in today's rule, FMCSA treated health and safety impacts independently pursuant to the court's request. Specifically, in the 2005 NPRM, in addition to asking how health and safety may be related, we devote four sections and five separate questions to specific health concerns [70 FR 3344–3346]. AHAS asserts that we do not treat health and safety separately. The Court notes that while FMCSA must separately address driver health from safety, this does not ''suggest that the two factors are unrelated: Healthy drivers presumably cause fewer crashes and drivers who have fewer crashes suffer fewer injuries.'' AHAS seems to oversimplify the combined effects of these provisions that the court acknowledged.

Based on the studies, data, and comments, FMCSA believes those drivers who take 10 hours off-duty in tandem with the 14-hour driving window are more likely to maintain their 24-hour cycle compared to drivers utilizing the pre-2003 rule, thereby increasing the probability that drivers using today's rule are alert. The rule we are adopting today does not eliminate the possibility that drivers could utilize backward rotating schedules by combining driving and off-duty time; however, the new rule is an improvement for drivers' circadian rhythm over the 18-hour ''day'' possible under the pre-2003 rule. Specifically, today's rule moves drivers from an 18- to 21-hour driving time/off-duty cycle, which is far closer to a 24-hour cycle

than the pre-2003 rule achieved, and reduces the severity of a backward-rotating schedule. In addition, the combined effects of the various provisions, including adding 2 hours of daily off-duty time, utilizing a 14-hour non-extendable driving window, and removing the split sleeper berth provision, allow for more rest to drivers than was possible under the pre-2003 rule. The Agency also concludes that the health impacts between the 11 and 10 hours of driving are inconsequential.

As noted above, FMCSA is adopting the duty-tour and off-duty provisions first enacted in the 2003 rule. In the rule adopted today, the Agency further bolsters CMV driver health and safety by a new provision that eliminates the use of the split sleeper berth time to ensure that all drivers have the opportunity to obtain eight hours of consecutive sleep on a daily basis. While fatigue should be eliminated for most drivers on a daily basis, the recovery provision is adopted as a flexible safety net that will protect most drivers when fatigue is not eliminated on a daily basis. Moreover, despite potential risks from DE, today's rule neither causes or exacerbates those risks; therefore, the rule has no deleterious effects on CMV driver health. Based on the combined effects and interactions of provisions of today's rule, in the agency's best judgment, today's rule enhances the health and safety of CMV drivers.

J.12. Effective and Implementation Dates

Only one commenter, the Commercial Vehicle Safety Alliance (CVSA), addressed the issue of when the proposed HOS rule should become effective. CVSA asked FMCSA to provide enough time for enforcement agencies and industry to make the appropriate changes required by any change in the HOS rules. It stated that the 8-month implementation period allowed for the 2003 HOS rules was barely enough time.

FMCSA Response

Today's final rule is effective on October 1, 2005. The HOS rule adopted on April 28, 2003, became effective 30 days after publication, but drivers and motor carriers were required to continue complying with the previous regulations until January 4, 2004. That interval gave industry and enforcement officials a substantial amount of time to revise their HOS training materials, re-train personnel and, in some cases, reprogram computer equipment.

FMCSA cannot use a similar implementation procedure for this rule because the D.C. Circuit vacated the 2003 rule, and the statute re-instating it provides that the rule shall expire no later than September 30, 2005. Under Section 7(f) of the Surface Transportation Extension Act of 2004, Part V, the 2003 rule is automatically replaced when today's rule becomes effective. The Agency cannot retain, or require compliance with, the 2003 rule for an interim period while motor carriers, drivers, and the enforcement community prepare to deal with the new requirements adopted today.

FMCSA recognizes that neither enforcement agencies nor the motor carrier industry will be able to implement the new regulations immediately upon the notice effective date. Some States require legislative action to conform their HOS statutes to this rule, though others adopt FMCSA's safety regulations by reference. All States, however, will have to revise their enforcement manuals, re-program their computers, and retrain roadside enforcement personnel. Motor carriers face a similar challenge to revise their internal compliance procedures and re-train large numbers of drivers, dispatchers, and other staff. Therefore, prior to the effective date of today's final rule, the Agency will issue a policy statement announcing its expectations for compliance and enforcement during the first several months after it takes effect.

J.13. Electronic On-Board Recording Devices

Approximately 170 comments were submitted addressing EOBRs. Of these, 124 commenters expressed general opposition to the required use of EOBRs, while 46 commenters favored their use. Of the 122 drivers who discussed EOBRs, 34 of them (28 percent) were in favor of a rule requiring their use. Seven trucking and other industry associations lined up against an EOBR requirement, while two safety advocacy groups strongly supported such a requirement.

FMCSA Response

FMCSA has published an ANPRM (69 FR 53386, September 1, 2004) requesting information about factors the Agency should consider in developing performance specifications for EOBRs. As the Agency said in the preamble to that document, ''FMCSA is attempting to evaluate the suitability of EOBRs to demonstrate compliance with the enforcement of the hours-of-service regulations, which in turn will have major implications for the welfare of drivers and the safe operation of commercial motor vehicles.'' The ANPRM asked for comments and information, both on technical questions relating to EOBRs and about the potential costs and benefits of such devices. The Agency is actively collecting and analyzing data on the costs and benefits of EOBR use to industry. Beyond cost issues, developing rules or technical specifications for EOBR devices is a highly complex endeavor. In addition, such technology issues must be evaluated in the context of developing and implementing effective new compliance and enforcement policies. In short, the complexity of the technical and policy issues involved in EOBRs warrants a separate rulemaking effort. Therefore, comments on EOBRs are not addressed in this rulemaking. However, the EOBR rulemaking will consider alternative means to effect HOS compliance through that technology. FMCSA has provided copies of the EOBR-related public comments to the ongoing EOBR rulemaking docket (FMCSA–2004–18940). Any additional comments on EOBRs should be addressed to that docket.

J.14. Other Provisions

Exemption for Utility Service Vehicle Drivers

Complete exemption from the HOS rule for operators of utility service vehicles (USVs) was suggested in a comment from The Edison Electric Institute (EEI). Twenty-five other commenters, including utility companies, workers, and associations, supported EEI's arguments. These comments noted that Congressional committees have recognized a need for special treatment of the utility industry in the HOS rules, and stated that a number of State and local regulatory and emergency response agencies support an exemption. Commenters stated that, unlike other CMVs, USVs are driven only a fraction of the total time the vehicles are in use, so there is less potential for fatigue-related crashes. They typically are driven locally for a few hours a day or less, have low mileage, do not transport freight, and are used as mobile tools. These commenters argued that the special safety responsibilities and operating characteristics of the utility industry had not been considered in the rulemaking. They asserted that FMCSA had presented no evidence that including USVs in the rule would improve highway safety. Nor, they said, would an exemption for USVs impinge on the Agency's goals of improving safety for the commercial driving industry. The American Gas Association

argued that in the past FMCSA had failed to adequately consider utility industry arguments for exemption.

The Edison Electric Institute argued that crash rates were lower for USVs than for CMVs in general, for CMVs operating within 100 air-miles of their point of origin, and for all large trucks. EEI said that FMCSA had not shown that USVs operating during ''emergencies'' have a detrimental effect on safety. Seven commenters supported those comments. Three were utility companies whose own experience showed a low or negligible number of accidents caused by employee fatigue.

The Commercial Vehicle Safety Alliance opposed a broad exemption for USVs. CVSA argued that emergency situations were generally already addressed by other rules, and concluded, based on MCMIS data ''that the utility industry's safety record is no better than the rest of the trucking industry that is subject to the hours-of-service rules. In fact, one could argue that based on this data the utility industry is overrepresented in fatalities compared to other segments of the industry.''

FMCSA Response

FMCSA previously addressed exemption requests from utility companies, and has considered the issue again in this rulemaking. The Agency continues to believe that existing exemptions applicable to USVs provide a proper balance between operational needs and public safety. The regulations at 49 CFR 390.23 already provide an HOS exemption for USVs operating in local or regional emergencies. Some commenters noted that the types of ''emergencies'' cited by the utilities (*e.g.*, downed power lines) occur frequently. The Agency believes USV operators should, therefore, be able to adjust the work schedules of their employees to ensure that drivers who have not reached their maximum limits under Part 395 are available when needed to handle these recurrent ''emergencies.'' As for the relative safety of utility operations, compiled crash data for this group of drivers is not extensive enough to be conclusive.

Outside Scope of Rulemaking

Some comments to the docket discussed a variety of topics outside the scope of this rulemaking. For example, the National Ready Mixed Concrete Association (NRMCA) sought a change in the Part 395 definition of ''driving time.'' It stated that about 23 percent of the truck fleet in the ready-mixed concrete industry is composed of front-discharge mixers, which dispense concrete by means of a chute on the front of the truck. NRMCA stated that front-discharge mixer drivers are an anomaly with respect to the current definition of driving time. Operators of rear-discharge mixers have to exit the truck to dispense concrete from the rear, thus the time spent dispensing concrete is classified as on-duty, not driving. A key element of the front-discharge design is that the driver can remain in the driver's seat to operate the mixer controls. During this time on the job site, the driver is at the controls of the CMV, meaning that this time must be classified as on-duty, driving, but the driver is in fact not actually driving. To rectify this claimed misclassification of driving time, NRMCA recommended that FMCSA alter the definition of driving time to be ''all time spent at the controls of the CMV in operation on public roadways'' to more accurately capture ''on-duty, driving'' time versus ''on-duty, not driving'' time.

FMCSA Response

Because this issue was not raised for comment in the NPRM, the Agency lacks the information to evaluate the implications of the NRMCA proposal. In this rulemaking, FMCSA will take no action on this issue.

FMCSA may consider these topics for future rulemaking as appropriate.

Outside Jurisdiction of Agency

Several topics addressed by commenters are not within the statutory authority of FMCSA. The Agency has no jurisdiction over any shippers and receivers, except to enforce certain hazardous materials regulations adopted from its sister DOT Agency, the Pipeline and Hazardous Materials Safety Administration, formerly the Research and Special Programs Administration. FMCSA also has no authority to regulate a driver's pay or other compensation. The Agency has acknowledged potential problems involving shortages of truck parking space, and has worked with other agencies and organizations to address the issue. However, FMCSA has no authority over any public or private property used for parking. Because FMCSA does have jurisdiction over a CMV driver, the Agency may prohibit or limit the driver from parking the vehicle in certain situations, but the Agency cannot require anyone to allow parking.

Alaska HOS

Although not mentioned by commenters to this docket, FMCSA is aware that technical amendments (which do not require advance public notice and comment) are needed to correct inconsistencies in 49 CFR 395.1 (g) and (h) relating to HOS in the State of Alaska. Those sections have been revised to clarify the text in a manner consistent with current Agency policy and interpretation.

J.15. Legal Issues

Procedural Issues

Seven commenters, including two labor unions, three trade associations, and two advocacy groups, expressed disapproval of the approach FMCSA had taken in the NPRM. The Transportation Trades Department of the AFL–CIO asserted that the NPRM did little more than challenge outside groups to demonstrate that some other rule or combination of provisions would be less harmful than the vacated rule. The International Brotherhood of Teamsters (IBT) argued that the language of the NPRM indicated that FMCSA had no intention of complying with the Court of Appeal's mandate to revise the HOS rule, and was instead seeking to shift the burden of proof to the opponents of the rule. IBT asserted that the NPRM invited opponents, by submitting additional scientific information, to demonstrate that the rule did not adequately comply with the statutory requirements. Instead, to comply with the court's decision FMCSA should have reexamined the scientific data already in the docket and addressed directly the documented health effects of chronic sleep deprivation, such as increased sensitivity to insulin, and increased risk of heart disease, hypertension, and obesity. In particular, FMCSA should not have published the NPRM before the literature review being conducted by the Transportation Research Board was completed and incorporated into the rulemaking.

The National Association of Wholesalers and Distributors argued that the content of the NPRM failed to shed any light on the thinking of FMCSA, and that this was a misuse of the regulatory process. The American Bakers Association also strongly objected to the regulatory approach followed in the NPRM, which it characterized as an attempt to thrust onto the regulated community the Agency's responsibility to justify the regulatory initiative through extensive and detailed scientific and technical data.

Two advocacy groups, Public Citizen and Advocates for Highway and Auto Safety (AHAS), strongly disapproved of the approach followed in the NPRM on a number of grounds. First, according to Public Citizen, the Agency did not ''go back to the drawing board'' and draft a

new rule incorporating some of the best aspects of the 2003 rule, such as the shortened daily on-duty period, nor did it include safeguards from the old rule, such as the weekly driving hour limits. According to AHAS, ''[t]he notice neither provides any indication of what, if any, changes to the [April 2003] HOS regulations the Agency is considering, nor how it plans to resolve the issues raised in the Court's opinion.'' Because the notice did not narrow the possible issues or focus public comment on specific actions under consideration, AHAS argued, the notice ''is equivalent to an advance notice of proposed rulemaking, but does not rise to the level of a NPRM within the meaning of the Administrative Procedures [sic] Act (APA).''

Commenters also requested FMCSA to leave the record open so that useful data, such as the 2004 NHTSA crash data, could be provided. The Truckload Carriers Association (TCA) said that the short comment period had diminished its ability to provide evidence, and that keeping the docket open was essential. AHAS and Public Citizen asked that the Agency provide time for the public to examine and comment on the literature review being conducted by the Transportation Research Board (TRB) of the National Academy of Sciences.

FMCSA Response

Rulemaking as complex as this action would normally require several years to complete. The entire process had to be compressed into one year, because that was the time provided by Sec. 7 (f) of the Surface Transportation Extension Act of 2004, Part V. The Agency alluded to this dilemma in the NPRM and explained its effort to reconcile the requirements of notice and comment rulemaking with the realities of an expanding, time-consuming research program needed to address the issues raised by the court. ''In order to allow effective public participation in the process before the statutory deadline, FMCSA is publishing this NPRM concurrently with its ongoing research and analysis of the issues raised by the court. To facilitate discussion, the Agency is putting forward the 2003 rule as the ''proposal'' on which public comments are sought. This NPRM, however, asks the public to comment on what changes to that rule, if any, are necessary to respond to the concerns raised by the court, and to provide data or studies that would support changes to, or continued use of, the 2003 rule'' [70 FR 3339].

As the quotation marks around ''proposal'' indicate, the 2003 rule was merely the starting point of a research and rulemaking program to determine whether that rule could be reconciled with the *Public Citizen* decision. Most of the critical comments summarized above simply overlooked the fact that FMCSA did not have enough time in one year sequentially to complete its research on a wide variety of issues, prepare and publish an NPRM, accept and analyze comments, make necessary changes to the regulatory proposal, submit the draft for intragovernmental review, and publish a final rule. Instead, the Agency opted for a parallel process; the public was asked to comment on changes to the 2003 rule that might be needed to comply with the court's decision, while the research and analysis on driver health and other issues identified by the court went forward simultaneously. There is no principle of administrative law that requires an Agency to forswear the search for additional information in an NPRM; on the contrary, agencies always seek new information from commenters.

This parallel procedure is fully consistent with the requirements of the Administrative Procedure Act. The provisions of the 2003 rule that FMCSA has adopted in this rule were, of course, proposed in detail in the NPRM. To the extent revisions have been made, they are in response to issues raised in the NPRM. For example, the discussion of sleeper berths included the statement that ''FMCSA will consider a variety of possible changes to the sleeper-berth provisions, including but not limited to: * * * (2) allowing one continuous sleeper-berth period of less than 10 hours, such as 8 hours, to substitute for the otherwise minimum 10 hours'' [70 FR 3349]. After examining a variety of alternatives, the Agency adopted that very option. The NPRM also discussed the unique operational conditions affecting local or short-haul drivers and concluded that, ''[s]ince local short-haul drivers typically work daytime hours, they are much more likely to maintain regular schedules that are less intense than many long-haul drivers. Short-haul drivers are significantly less likely to be working 13 or more hours or to have irregular circadian patterns. Also, local short-haul drivers typically sleep at home every night in their own beds. Thus local short-haul drivers are much more likely to be getting the daily restorative sleep necessary to maintain vigilance'' [70 FR 3351]. The Agency's new regulatory regime for drivers of short-haul vehicles that do not require a CDL is strongly foreshadowed by these passages.

In the NPRM instructions we were particularly interested in how various provisions impacted different sectors of the industry as we considered our regulatory options. We specifically asked in our guidance for commenters to provide information on the current type of operations, including ''(a) whether your primary operations are short-haul (*i.e.*, operations limited to 150 miles or less, with drivers typically spending the night at home) or long haul.''

FMCSA has always allowed the docketing of information submitted after the comment period closes. The NPRM said that ''[c]omments received after the comment closing date will be included in the docket and we will consider late comments to the extent practicable. FMCSA may, however, issue a final rule at any time after the close of the comment period.'' The Agency accepted and read many comments filed after the closing date (March 10, 2005), and posted additional material to the docket as it became available.

Driver Health

Both Public Citizen and AHAS argued that the NPRM sought to create a misleading and improper focus on the vacated 2003 rule and the issue of whether that rule should be changed. Public Citizen found it unacceptable for FMCSA to frame the discussion regarding driver health as if the 2003 final rule was an acceptable baseline against which modifications should be judged. AHAS similarly argued that the proposal continued to promote the invalidated April 2003 HOS final rule, notwithstanding its wholesale rejection by the Court of Appeals.

Both argued that the NPRM also incorrectly sought to narrow the scope of the Agency's responsibility to safeguard driver health (Public Citizen) or tried to avoid distinguishing between safety effects and health effects, as the Court of Appeals had required (AHAS). They both accused FMCSA of seeking to address only injuries or health conditions directly related to the HOS regulations and operation of a CMV, not other workplace injuries or health conditions suffered by drivers. AHAS argued that the NPRM's focus should have been broader than driver injuries resulting from crashes or adverse health impacts attributable to the act of driving. In AHAS's view, the issue of fatigue, alertness, and safe driving was factually and legally distinct from the issue of the health, physical condition, and well-being of truck drivers, but throughout the NPRM driver health, safe operation, and economics were treated as inextricably linked factors whose effects could not be separated and dealt with individually.

Finally, both Public Citizen and AHAS argued that the NPRM failed to provide any scientific support for the crucial elements of the Agency's proposal. Public Citizen stated that the proposal ''flies in the face'' of scientific evidence. AHAS asserted that the NPRM contained ''not a scintilla of data and scientific evidence'' that FMCSA had produced and applied any information with which to assess and compare the health effects of the pre-2003 HOS rule and the health effects of the April 2003 HOS regulation. No scientific information had been placed in the rulemaking record showing that drivers obtained more sleep under the new rule than under the old rule; or that they were more alert and had less fatigue; or that the new regulation had discernible safety benefits. AHAS asserted that FMCSA could not satisfy its statutory responsibility to consider existing scientific literature by asserting, as it did in the NPRM, that ''[t]he implications of these studies are not always clear.'' AHAS concluded that the NPRM did not satisfy either FMCSA's legal burden or its statutory obligation, arguing that the Agency had not demonstrated in the NPRM ''any intention to actively engage in a rulemaking action that directly confronts the application of existing research on worker health and physical condition to appropriate amendment of the current HOS regulation. Moreover, the Agency has failed to address its legal and statutory duty to ensure that the regulations it promulgates does [sic] not have a deleterious impact on truck driver health, physical condition, and well being.''

FMCSA Response

The alleged deficiencies in the Agency's approach to driver health are answered by the discussion of that issue elsewhere in this preamble. FMCSA did not treat the 2003 rule as the baseline for analyzing driver health, as charged by Public Citizen. The Agency essentially used the pre-2003 regulations as the baseline. In any event, the effect on driver health of the HOS changes made in the 2003 rule proved to be inconsequential. As for AHAS's charge that FMCSA improperly linked health, safety and economic considerations, rather than dealing with them individually, the Agency is required by statute to consider the costs of any regulations it believes necessary, including those to protect driver health [49 U.S.C. 31136(c)(2) and 31502(d)]. Although the Agency ultimately determined that no such regulations were needed, the health data examined proved too uncertain to allow a reliable calculation either of the benefits or the cost of such a regulation. This is discussed more fully in section E.2, dealing with exposure to diesel exhaust.

Docketing Issues

Public Citizen stated that ''FMCSA has haphazardly provided only abstracts in the docket for a number of studies that the Agency cites in this rulemaking notice, citing copyright protection concerns. This is a completely illegitimate claim. FMCSA may not base any rulemaking on materials not made publicly available and open to public scrutiny and comment. To do so would be a violation of the transparency requirements of the Administrative Procedures [sic] Act (APA). * * * FMCSA may not rely for its decision on any study for which it has provided only an abstract.'' In a supplemental comment, Public Citizen identified 23 studies provided only in abstracts; five of these had been available in full in the docket of the 2003 rule. The group asserted that the 2003 docket made available many copyrighted documents, and added that this docket apparently had been modified to substitute an abstract for a paper that was originally part of the docket. AHAS also objected to the posting of abstracts, rather than complete copies, of some studies.

FMCSA Response

FMCSA placed abstracts of the copyrighted reports in the docket well before the close of the comment period. The abstracts identified the research under review by the Agency, summarized the conclusions of the authors, and supplied publication details. As FMCSA noted in correspondence responding to AHAS' concern over the abstracted reports, the full versions of the reports were readily available in the Library of Congress, the National Library of Medicine in Bethesda, and other sources such as university libraries. AHAS therefore could have obtained copies to review when those abstracts were docketed. FMCSA is not aware of any APA requirement that the Agency produce the complete text of copyrighted studies which are otherwise reasonably obtainable from other sources. Nonetheless, FMCSA has created a reading room where the copyrighted materials referred to in the NPRM may be examined [Department of Transportation, Nassif Building, 400 Seventh St., SW., Room 403, Plaza Level, Washington, DC].

K. Rulemaking Analyses and Notices

K.1. Executive Order 12866 (Regulatory Planning and Review) and DOT Regulatory Policies and Procedures

Overview

The FMCSA received numerous comments regarding the economic impacts of the 2003 rule with regard to daily driving time, daily on-duty and off-duty periods, the recovery period, and combined economic effects. Today's preamble has discussed these comments separately as part of its individual discussions of those issues. As such, comments concerning the economic impacts of individual provisions will not be addressed in detail here. However, several comments were received regarding other cost impacts of the 2003 rule, as well as limitations of the models used in the 2003 regulatory impact analysis (RIA). See the RIA document in the docket for more details.

Several commenters stated that they would incur additional employee training costs if further changes were made to the HOS rules. Some also commented that they would incur software reprogramming and update costs due to their use of electronic logbook software. The FMCSA recognizes that today's rule will result in new costs to motor carriers to train their drivers and other employees. As such, the RIA prepared for today's rule estimated employee training costs to motor carriers and drivers as part of its estimate of the total costs. Details regarding these costs are included in the RIA summary that follows this discussion, as well as in the separate RIA, entitled ''Regulatory Impact Analysis and Small Business Analysis for 2005 Hours of Service Regulatory Options,'' contained in the docket. Regarding software costs, not enough information was available on overall use of electronic logbook software to explicitly estimate such costs to the industry. However, such costs are indirectly estimated in this rulemaking as part of estimating the dollar cost of record of duty status (RODS) paperwork burden to industry from today's rule. The Agency's paperwork burden document, entitled ''Supporting Statement for Driver Hours of Service Regulation,'' is contained in the docket.

Advocates for Highway and Auto Safety (AHAS) commented to the 2005 NPRM docket that ''the Agency failed to account for the increased risk of crashes as time-on-task commensurately increases in its final benefit-cost analysis' and Public Citizen commented that FMCSA's RIA made ''no attempt to take time-on-task into account.'' In

developing its RIA for today's rule, the Agency updated the sleep-performance model used to estimate the safety impacts of the 2003 rule. To incorporate the potential effects on safety in the most comprehensive way, the Agency used a commercially-available computer program called the ''FAST/SAFTE'' Model. This program is designed to take workers'' schedules and predict their level of performance at each point in time. These performance levels were then used to estimate changes in crash risks for those time periods when the simulated operations schedules showed that the truck drivers were at the wheel (and thus vulnerable to crashing). The FAST/SAFTE Model is able to predict changes in drivers' levels of performance caused by varying degrees of sleep deficits over recent days and weeks. In addition, it accounts for a driver's circadian rhythms, and predicts the degree to which performance is degraded by driving at certain times of day or in certain parts of a daily cycle. The disruptive effects of rapid changes in circadian rhythms are also taken into consideration. However, according to our research, all currently-available, peer-reviewed sleep-performance models, including the FAST/SAFTE Model, are limited in their ability to take time-on-task (TOT) effects explicitly into account. The Agency corrected for this limitation by adding an independent TOT multiplier to the results of the FAST/SAFTE model. Despite the limitations of the available data, as was noted earlier in this preamble, FMCSA addressed TOT effects in its modeling and did so by basing its TOT multiplier on data from the Trucks Involved in Fatal Accidents (TIFA) database [Campbell, K.L. (2005), p. 8], which examined the number of trucks involved in fatigue-related fatal crashes by driving hour.

Options Considered

After reviewing almost 1,800 written comments submitted in response to the 2005 NPRM, current safety research, and recently compiled industry operations data, FMCSA identified four regulatory options for detailed economic benefit-cost analysis.

- Option 1 is to readopt provisions of the 2003 rule, which allow up to 11 hours of driving within a consecutive 14-hour tour of duty; minimum consecutive 10 hours daily off-duty period, or alternatively allowing each 10-hour off-duty period to be split into two periods of at least 2 hours each, provided a sleeper berth is used and certain other requirements are met; and drivers to re-start their 60- or 70-hour on-duty count after 34 hours of consecutive off-duty time.
- Option 2 (today's rule), allows 11 hours of driving in a tour of duty, restricts the splitting of off-duty time in sleeper berths to ensure that there is one period of at least 8 hours and counts the shorter part of a split period against the 14-hour tour-of-duty clock; and allows drivers to re-start their 60- or 70-hour on-duty count after 34 hours of consecutive off-duty time.
- Option 3 does not allow more than 10 hours of driving or the splitting of off-duty periods, and requires 58 hours off before restarting.
- Finally, Option 4 is a variant on Option 3 that allows operators to restart the ⅞-day clock by taking a 44-hour off-duty period. It is intended to test whether the costs of a much longer restart or recovery period can be mitigated while keeping some of the presumed fatigue-reducing benefits of a longer break.

It should be noted here that Options 2 through 4 include the new short-haul regulatory regime, so there are no cost differences among the Options with regard to short-haul operational changes.

Baseline for the analysis. According to Office of Management and Budget (OMB) guidance in OMB Circular A–4, the benefits and costs of each regulatory alternative must be measured against a baseline. The OMB guidance to Federal agencies states that the baseline ''should be the best assessment of the way the world would look absent the proposed action.'' [Office of Management and Budget, Circular A–4, 2003]. In most cases this would be the current operating or existing regulatory environment, and the impacts of all regulatory alternatives must be measured against this baseline. FMCSA first consulted with OMB to ensure that the baseline chosen for this RIA, the current operating environment, was the most appropriate starting point for the RIA. In discussions with OMB, it was decided that the current operating environment prior to today's rule was the most appropriate baseline for this analysis for several reasons. Industry is currently operating under the 2003 rule and the RIA must provide an estimate of the marginal or incremental economic impacts of potential Federal regulatory changes for use by decision makers.

Please note, however, that the relative ranking of the options described and analyzed in the RIA would not be affected by the choice of a baseline. For example, although we believe that the 2003 rule is the most appropriate baseline for this analysis, it may also have been of interest to use the pre-2003 rule as a baseline for the analysis. Compared to the current analysis, using the pre-2003 baseline would have meant that the values for costs and benefits of each option would have changed, but their relative rankings would have remained intact, since the values for costs and benefits would have changed by the same amount under each option (as represented by the difference between the pre-2003 rule and the 2003 rule).

Using the pre-2003 rule as a baseline, however, may have affected the choice of options in one respect. For instance, if, using the pre-2003 baseline, the 2003 rule had negative net benefits that were larger than the positive net benefits seen under Option 2 using the 2003 baseline, then the net benefits of Option 2 relative to the pre-2003 rule would be negative, and adopting the pre-2003 rule would maximize net benefits. Fortunately, the Agency has already substantially evaluated the marginal economic impacts of the 2003 rule (a copy of which is contained in the docket), so the evaluation for today's rule could be considered in some respects the second phase of a two-phase evaluation of the economic effects between the pre-2003 rule and today's rule.

According to the 2003 RIA, the 2003 rule resulted in net benefits totaling $1.1 billion annually, relative to the pre-2003 rule. Since the adoption of the 2003 rule, however, the analysis of HOS regulations has advanced in a number of important ways that could have affected the regulatory impact analysis of the 2003 rule. In other words, had the agency fully updated the 2003 RIA using the latest available data and analytical methodology, it is probable that the net benefits would be different. For instance, the agency has included a substantial revision to the model to allow for TOT effects, and has explicitly accounted for shifting circadian rhythms resulting from a driver's schedule changes.

The agency concludes, however, that the net benefits of the 2003 rule relative to the pre-2003 rule would remain highly positive. This conclusion is based on several factors. First, the available data on risk since the 2003 rule was put in place indicates a lower crash risk, as the agency concluded in the 2003 analysis. Although these data are not comprehensive, many motor carriers have reported lower crash and injury rates under the 2003 rule, and preliminary FARS data indicates that fatigue-related fatal truck crashes have declined, both in number and as a percentage of all fatal CMV crashes.

Second, the RIA includes many analyses that are relevant for comparing

the 2003 and pre-2003 rules. In the RIA, Option 3 contains many of the provisions in the pre-2003 rule, most notably, 10 hours of daily driving and no restart provision. In addition, the agency ''stress tested'' the allowance of the 11th hour of driving in the sensitivity analysis described below. In that analysis, even assuming a greatly increased fatigue crash risk of driving in the 11th hour and other assumptions favoring the restriction of the 11th hour of driving, Option 2 is still the most cost-beneficial option. In other words, the agency very thoroughly analyzed the incremental impact of one of the most important differences between the pre-2003 and the 2003 rule, namely a 10 versus 11-hour daily driving limit, and concluded it was cost-beneficial to allow the 11th hour of driving.

For additional details the reader is referred to the stand-alone 2003 and 2005 RIAs contained in the docket.

Presented below is a summary of the net economic impacts of the alternative regulatory options considered (Options 2, 3 and 4), with the effects broken out by those impacting the long-haul (LH) sector and those impacting the short-haul (SH) sector. The costs of Option 1 (commonly referred to as the ''Status Quo'' option) are not discussed in detail here, as there would be no incremental cost or benefit changes relative to the baseline, or 2003 rule; however, if readers wish to examine the specific costs and benefits of Option 1 relative to the pre-2003 rule, they may refer to the 2003 RIA in the docket. Following this summary of net impacts are individual discussions of the costs and benefits associated with these Alternative Options.

Discussion of Net Effects

Figure 11 includes estimates of the net effects of the alternative options considered for this rulemaking.

FIGURE 11.—NET IMPACTS BY OPTION

Net Incremental Annual Costs, Benefits, and Net Costs of the Options Relative to Option 1
(Millions of 2004 dollars, rounded to nearest $10 million)

	Option 2	Option 3	Option 4
Total Annual—LH	30	2,140	1,390
Incremental Cost—SH	·280	·280	·280
Total Crash Reduction—LH	20	120	120
Benefits—SH	0	0	0
Net Annual Costs	·270	1,740	990

Note: LH = Long Haul; SH = Short Haul.

The analyses and figures presented below in detail under the Costs and Benefits sections of this discussion indicate that Option 2 would provide net savings relative to the baseline, or 2003 rule, while the other two regulatory alternatives considered here yield net annual costs.

Total net benefits of Option 2, as listed in Figure 11, are estimated at roughly $270 million annually. This total is comprised of $10 million in net costs to the long-haul (LH) sector (*i.e.*, $30 million in LH costs minus $20 million in LH safety benefits), offset by $280 million in annual net benefits to the short-haul (SH) sector.

Total net costs of Option 3 are estimated at approximately $1,740 million annually. This total is comprised of $2,020 million in net costs to the LH sector (*i.e.*, $2,140 million in LH costs minus $120 million in LH safety benefits), offset by $280 million in annual net benefits to the SH sector.

Total net costs of Option 4 are estimated at approximately $990 million annually. This total is comprised of $1,270 million in net costs to the LH sector (*i.e.*, $1,390 million in LH costs minus $120 million in LH safety benefits), offset by $280 million in annual cost savings or net benefits to the SH sector.

The differential economic impacts incurred by the LH and SH sectors of the motor carrier industry, as seen in Figure 11, are due to the nature of LH versus SH operations. Specifically, the 11th hour of daily driving, the recovery provision, and the split sleeper-berth provision are used almost exclusively by long-haul and regional operations, and as such, the costs of today's rule are concentrated in the LH sector. Meanwhile, the majority of benefits of today's rule accrue to SH operators by way of the new regulatory regime, which grants substantial paperwork savings and incremental productivity benefits to large portions of the SH sector.

Sensitivity Analysis for a 10-hour Driving Limit. In addition to examining options 2, 3, and 4 relative to Option 1, a variant of Option 2 was considered. This variant combined the other features of Option 2 with the 10-hour driving limit included in Options 3 and 4. This option was found to be considerably less cost-effective than the basic version of Option 2, as shown in the first row of Figure 12. Whereas Option 2 has net benefits of $270 million per year, the 10-hour variant has net benefits of negative $256 million per year (*i.e.*, it has net costs). The conclusion that imposing a 10-hour driving limit was not cost-effective was tested by reexamining costs and benefits under a series of sensitivity assumptions, which are shown in the other rows of Figure 12. Doubling the assumed use of the 11th hour increased the net costs of the 10-hour variant from $256 million to $782 million, making Option 2 with 10 hours driving even less cost effective relative to Option 2. More than tripling the value for each statistical life saved (from $3 million to $10 million) improved the relative cost effectiveness of Option 2 with 10 hours driving, but it was still neither cost beneficial on its own (with net costs of $170 million) nor cost effective relative to Option 2. Also, raising the relative risk of a fatigue-related crash in the 11th hour of driving by 1.4 times the value used in time-on-task (TOT) multiplier in the RIA did not make Option 2 with 10 hours driving cost effective relative to Option 2 ($232 in net costs versus $270 in net benefits respectively), nor did substantially raising the baseline level of fatigue in truck-related crashes (*i.e.*, $189 million in net costs for Option 2 with 10 hours driving relative to $287 million in net benefits for Option 2). Each change improved the showing of the 10-hour variant, but still left it with net costs rather than net benefits. Only in a very unlikely scenario that combines all three of the assumptions favorable to the 10-hour limit does the 10-hour variant show any net benefits. Even in this scenario, though, its net benefits are far below that of Option 2 without the 10-hour restriction, indicating that it is implausible that eliminating the 11th hour would be cost-effective.

FIGURE 12.—SENSITIVITY ANALYSES OF THE NET BENEFITS OF A 10-HOUR DRIVING LIMIT

[Millions of 2004$ per year]

	Net Benefits of Option 2	Net Benefits of Option 2 w/10 hrs
Basic Assumptions	270	·256
Twice as Much Use of 11th Hour	270	·782
Higher Value of Statistical Life (VSL)	291	·170
Higher TOT Impact	270	·232
Higher Baseline Fatigue	287	·189
Higher VSL, TOT Impact, and Baseline Fatigue	326	60

What follows is a detailed discussion of the marginal costs and benefits of the alternative regulatory options relative to the baseline.

Costs of the Alternative Options

This section presents the results of the cost analysis and includes estimates of the required changes in the commercial driver population as a result of impacts to long-haul operations.

Assessing Costs

The analysis of costs presented here recognizes that the different provisions within each option will affect carrier operations in complex and interacting ways. It also recognizes that these effects will depend strongly on the carriers' baseline operating patterns, which vary widely across this diverse industry. To produce a realistic measurement of each option's impacts, we divided the industry into broad segments, collected information on operations within these segments, and then created a model of carrier operations as they are affected by HOS rules. Because of the very wide array of operations, we have limited our analysis to the predominant parts of the industry.

Industry Segments Analyzed

The trucking industry is made up of distinct segments with different operating characteristics. As a consequence, HOS rules and changes in HOS rules will have different impacts on different segments. Figure 13 illustrates the division of the industry into its major segments.

FIGURE 13.—DIVISION OF INDUSTRY INTO MAJOR SEGMENTS

Long-Haul and Regional	Random	Regular		
	Random Truckload (TL)	Regular TL	Private Carriage	Less-Than-Truckload (LTL)
Short-Haul and Local				

The first major division within the industry is between long-haul and regional—what one can call over-the-road (OTR) trucking—and short-haul/local. The great preponderance of short-haul/local operations resemble ''normal'' employment, quite different from the working environment of the over-the-road driver. In short-haul/local operations, drivers work fairly regular schedules, return to their homes each night, and have the familiar weekends off. Because much of their on-duty time is for activities other than driving, they rarely, if ever, approach 11 hours of driving in a day. They do not use sleeper berths, and the restart provisions are not relevant to workers with regular weekends off. As such, impacts associated with potential changes to daily driving time, as well as the sleeper berth and restart provisions, are restricted to drivers and carriers operating in the regional and long-haul segments.

For analytical purposes, the major division in long-haul and regional trucking is between random and regular operations. The difference is critical because the two kinds of operation must be treated differently in the simulation model that is our principal analytical tool.

In random service, a company's trucks do not follow any fixed pattern. Following restarts at home, drivers pick up outbound loads near their home terminal and begin a road tour. Thereafter, the company's sales force does its best to find loads for the random drivers and keep them moving profitably until they complete their road tours and come home. Most road tours will last from one to three weeks.

The defining characteristic of regular service is that it operates on predictable schedules; both managers and drivers know, with a high degree of certainty, what they are going to be doing over a projected time period. Regular service entails regularly repeating patterns. These may be fixed patterns where trucks follow the same series of origin-destination pairs in the same sequence over the same time cycle. This could also be service from one or a few fixed origin points to a limited set of destinations in which loads are not moved over the same routes in a fixed sequence, but the operation is confined to that set of origins and destinations. Service like this can be planned for efficiency, and the planning can address driver-retention issues; regular drivers tend to spend familiar weekends at home.

Private carriage is regular; loads move from a fixed set of origins—the firm's factories and warehouses—to a fixed set of destinations—its own warehouses or stores or the warehouses and stores of its customers. Part of regular truck-load (TL) operation is outsourced private carriage—so-called dedicated service. In this kind of service, the TL firm's drivers will operate in the same way as a private carrier's drivers—they are doing the same kind of work. Other kinds of regular TL service are similar to dedicated service but with different contractual arrangements; the service is limited to a known set of origins and destinations and can be planned for efficiency and for driver retention. Many TL firms, especially the larger ones, have both random and regular operations.

Less-than-truckload (LTL) firms have two parts to their operations. They have local pick-up and delivery service in

which freight is taken out from a terminal to its ultimate destination and freight is picked up and brought into a terminal for movement over the road to another terminal where local service will take it to its destination. The over-the-road service among an LTL company's terminals is highly regular. Trucks make overnight runs between pairs of terminals. Most drivers will be home again by the next morning; in some cases they will sleep out one night and return the next night. Drivers are home for weekends. It is a highly planned operation.

Finally, in each of the OTR segments, there is a difference between solo and team-driving operations. For long-distance operations with high time sensitivity, pairs of drivers can substantially increase a truck's range per calendar day. The tradeoff is that team drivers cannot, on average, work as much as a solo driver.

Analytical Approach to Estimating Costs by Industry Segment

As noted above, for-hire TL operations are divided into ''random'' and ''regular'' segments. The impacts of different HOS rule options on the random group were measured using a simulation model. The Agency developed an Excel macro-driven spreadsheet model to simulate a CMV driver operating in compliance with hours-of-service (HOS) regulations. The model simulates how a CMV operator would behave, starting from his or her home terminal and making various stops to pick up and deliver shipments over a pre-defined duration. For further details on this model, the reader is referred to the stand-alone 2005 RIA in the docket.

We controlled for the prevalence of splitting sleeper berth periods by running cases in which the drivers either took advantage of their ability to split, or did not use that option even if it appeared to be beneficial.[3]

A year's worth of driving was simulated for each case, varying the intensity of effort and the typical length of haul for each option. The average number of hours per day of driving is the productivity measure used to compare the outputs from option to option. There are some random components to the analysis, which result in some uncertainty in the comparisons among options, but the effect of this uncertainty is minimized once several runs are combined.

Regular, for-hire TL operations are modeled in essentially the same way as private carriage. The same basic simulation model is used, but with different assumptions about patterns of operation. Its distinguishing features are more regular work schedules (in terms of repeating starting and ending times), more regular weekends off, and less time spent waiting for loads. The LTL portion of the industry is also modeled in this way; though almost all over-the-road LTL runs are overnight rather than during the day, the regularity of the schedules makes it reasonable to treat them like other regular drivers.

Team operations were treated separately for all of these segments because of the special way in which the options interact with their schedules. Team operations should be very little affected by the 34-hour restart, but could be substantially affected by restrictions on the use of split sleeper berth periods, and by the elimination of the ability to use the 11th hour as a buffer when the drivers aim at an average of 10 hours of driving per day. In addition, team operations will tend toward regularity and high utilization. As a result, team operations were more easily modeled off-line, concentrating on the effects of sleeper berth rules on driver alertness under a limited number of scenarios.

Measured Productivity Impacts of Options

Figure 14 shows the average percentage change in driving hours between Option 1 (status quo), Option 2 (today's rule), Option 3, and Option 4.

FIGURE 14.—ESTIMATED LOSS IN PRODUCTIVITY BY OPTION AND CASE

			Relative reduction in driving hour (percent)		
			Option 2 compared to option 1	Option 3 compared to option 1	Option 4 compared to option 1
Run characteristics					
For-hire, Random	*COM041*Using Split Sleeper Berths.	SR	1.1	24.9	10.3
		LR	5.9	26.2	19.4
		LH	·3.1	17.9	9.6
	No Split Sleeper Berths	SR	0	24.1	9.3
		LR	0	21.4	14.2
		LH	0	20.4	12.5
Regular Routes (Private TL, LTL, Regular For-Hire).	Full Weekend Off	Weekly Route	0	16.1	5
		Daily Route	0	·2.0	·1
	Six-Day Work Week	Weekly Route	0	29.2	19
		Daily Route	0	8.9	10
Team Drivers*	Using Split Sleeper Berths		0	5.0	5.0
	No Split Sleeper Berths		0	5.0	5.0

* These impact estimates were based on simplified scenarios rather than model runs.
Note: SR = Short Regional; LR = Long Regional; LH = Long Haul.

The impacts of Options 2, 3, and 4, relative to Option 1, varied widely across the runs. Some patterns were readily apparent, however. The impacts tended to be greater for drivers assumed to take advantage of split sleeper berths, for both short-regional (SR) and long-regional (LR) drivers. This effect is expected, given that Option 1 allows

[3] No use of the restricted split sleeper berth provision was assumed under Option 2 for the purposes of improving productivity. To the extent it is used, it can be expected to be used for convenience, with productivity consequences that would be difficult to assess.

drivers to enter their sleeper berths if they need to wait several hours before a load can be picked up or delivered. Because under Option 1 the use of the sleeper berth extends the 14-hour driving window, there are circumstances in which the drivers can be more productive, or can accept more advantageous loads. This use of the sleeper berth is more important if there are more waiting periods and less driving, which tends to be characteristic of operations with shorter lengths of haul. Thus, it is not surprising that the relative impact of not having the split break available is absent for the long-haul (LH) cases (and the positive effect of eliminating the split break for LH drivers can be attributed to random elements in the simulation procedure). Overall, the loss of the split break appeared to be of minor importance for the productivity of solo drivers. This observation is likely due to the fact that, while the opportunity to initiate a split break provides flexibility, the rules for using this feature imparts rigidity to a driver's schedule for subsequent tours of duty. For team drivers, we concluded that there was no necessary reason for a productivity impact from eliminating split break periods because two drivers alternating 10-hour driving periods can drive as much as two drivers alternating 5-hour driving periods.

The relative productivity loss caused by Option 3 is substantially greater than that for Options 2 and 4 in almost all cases. This pattern comes from the fact that the important difference between these options is the length of the restart period. For the random drivers, the lack of a regularly scheduled off-duty period means that a short restart can be very advantageous, especially for the hard-working drivers that were modeled. The exceptions to this trend can be explained by the reduced value of the restart in particular cases. The regular weekly and daily routes (which generally have a full weekend off), and team drivers (who share duty hours each day) do not need to restart because their cumulative 8-day on-duty totals do not reach 70 hours. Finally, it should be noted that the one case of a negative measured impact of Options 3 and 4 is the result of the random elements in the simulation procedure, and would not be expected to persist if these runs were repeated a large number of times.

Looking at the last two rows of Figure 14, or those operations involving team drivers, we see that in all cases, the team drivers were expected to lose 5% of their productivity as a result of adopting either Option 3 or 4. This results from the loss of the 11th hour of driving. This impact could occur despite the fact that teams are not expected to use more than 10 hours per day per driver on average. Without the possibility of driving into the 11th hour, the only way to average 10 hours of driving per day is for each member of the team to drive exactly 10 hours per day. Because rest stops are found only at discrete points along the highway, though, it will generally be impractical to stop exactly at 10 hours—meaning that drivers will generally have to stop before 10 hours have elapsed in order to avoid violating the 10-hour limit.

Weighting of the Individual Runs

Because the impacts of the options in the individual runs vary so widely, it was important to find the weighted average impacts across the runs, rather than relying on unweighted averages or simply presenting the range. The weighting procedure was based, in the first instance, on estimates of the fraction of total vehicles miles traveled (VMT) accounted for by each operational pattern. For example, teams account for about 9 percent of total LH VMT, and LTL over-the-road operations account for another 5 percent. The remaining VMT are split about equally between for-hire and private fleets. We found that about 60 percent of for-hire TL VMT can be considered random as opposed to regular, and that within the random component long regional and long haul operations are of greater magnitude than shorter operations. We also found that somewhat more than half of for-hire operations, and somewhat less than half of private fleet operations, are intensive enough to press the HOS limits and should therefore be affected by changes in those limits.

In addition to representing the typical patterns in the industry, however, it was important that the modeling reproduce the usage of the important features of the HOS rules that differ between the options. To ensure that the weighting resulted in an accurate reflection of the use of these features (and realistically measured the impacts of the options), the weights reflected, in part, data such as that shown in Figure 15 (see stand-alone 2005 RIA for details).

FIGURE 15.—USE OF THE 11TH DRIVING HOUR

[Use of the 11th hour by run]

			Percentage of tours with more than 10 hours of driving in option 1 (percent)
Run characteristics			
Random Truckload	Using Split Sleeper Berths	Short Regional	0
		Long Regional	10
		Long Haul	21
	No Split Sleeper Berths	Short Regional	0
		Long Regional	11
		Long Haul	28
Regular Service (Regular TL, Private Carriage, LTL).	Full Weekend Off	Weekly Route	31
		Daily Route	55
	Six-Day Work Week	Weekly Route	29
		Daily Route	34
Team Drivers	Using Split Sleeper Berths		50
	No Split Sleeper Berths		50

Source: Results of ICF Modeling.

Weighted Productivity Impacts of the Options

The weights used in the modeling are shown in the middle column of Figure 16 under ''Weight.'' This table also shows each operational type's contribution to the nationwide weighted impact, which is calculated by multiplying the relative impacts in Figure 14 by the weights in Figure 16.

The sums of these weighted contributions are also shown at the bottom of Figure 16. Option 2 was found to reduce average driver productivity by only 0.042 percent, while Option 3 reduced average driver productivity over 7.1 percent. Option 4 was found to have an impact between Options 1 and 3, at 4.6 percent.

The cost impact of these changes in productivity was calculated by adapting the same methodology that was applied for the 2003 RIA for the 2003 rule, updated to 2004 dollars (see the stand-alone RIA for details). Using that methodology, two main types of costs were considered: Labor (or driver) costs and non-driver costs. Each is explained in more detail below.

Labor (Driver) Costs

A significant portion of the cost resulting from changes in productivity was estimated to be driver-related labor cost changes. That is, changes in the HOS options were first translated to changes in drivers' labor productivities that were then used to calculate changes in the number of drivers needed. Changes in the number of drivers were then translated into labor cost changes using an estimated ''wage vs. hours worked'' functional relationship for truck drivers. Details of the regression model used for this are explained in the Appendix of the stand-alone RIA.

FIGURE 16.—WEIGHTED LOSSES IN PRODUCTIVITY

Weighted changes in LH productivity by option and case

Run characteristics			Weight (percent)	Option 2 impact (percent)	Option 3 impact (percent)	Option 4 impact (percent)
For-hire, random	Using split sleeper berths	SR	0.5	0.01	0.14	0.06
		LR	1.2	0.07	0.32	0.24
		LH	1.2	·0.03	0.21	0.11
	No split sleeper berths	SR	2.4	0.00	0.57	0.22
		LR	4.9	0.00	1.05	0.70
		LH	4.4	0.00	0.89	0.55
Regular routes (private TL, LTL, regular for-hire).	Full weekend off	Weekly	6.9	0.00	1.11	0.32
		Daily	7.9	0.00	·0.15	·0.06
	Six-day work week	Weekly	5.9	0.00	1.73	1.15
		Daily	8.9	0.00	0.79	0.88
Team drivers	Using split sleeper berths		4.5	0.00	0.23	0.23
	No split sleeper berths		4.5	0.00	0.23	0.23
Unaffected (due to less-intense schedules)			45.1	0.00	0.00	0.00
Total			100.0	0.042	7.12	4.61

Note: SR = Short Regional; LR = Long Regional; LH = Long Haul.

Non-Driver Costs

Another part of the direct cost effects of the HOS options were related to the non-driver changes necessary as a result of the changes in the number of drivers. Several categories of non-driver costs were estimated as follows:

- Non-Driver Labor
- Trucks
- Parking
- Insurance
- Maintenance
- Recruitment

Analysis performed originally for the 2003 RIA and reviewed again for this rulemaking revealed that a 1 percent change in labor productivity translated to approximately $275 million (in 2000 dollars) or $298 million (in 2004 dollars).[4] Multiplying the costs per 1 percent decrease in productivity by the weighted average productivity losses associated with Options 2, 3 and 4 and outlined in Figure 16, we see the following results.

The productivity impact of implementing Option 2, which was estimated to result in a productivity loss to industry of 0.042 percent, yields $13 million per year in direct productivity costs (*i.e.*, 0.042 multiplied by $298 million). As shown in Figure 16, Option 3 was estimated to reduce industry productivity by 7.12 percent. The result is total annual costs to industry of $2.12 billion (or 7.12 multiplied by $298 million). The productivity cost of implementing Option 4 was estimated at approximately $1.374 billion (or 4.61 multiplied by $298 million).

Retraining Costs

Because several commenters to the 2005 NPRM provided data on the potential costs to re-train drivers and other personnel, we added this to the other non-driver cost components discussed above. Using the total re-training costs provided by the commenters, we estimated a cost per driver based on the number of drivers for these companies. These ''unit costs'' varied between $75 and $150 per driver. The wide range is due to the variability in the level of detail provided by different companies. In particular, some companies did not make it clear whether the costs they estimated were only for driver re-training or if they included other non-driver staff re-training as well. For details about these re-training costs, the reader is referred to the docket, with particular reference to comments submitted by McLane Company, Inc., Williams Trucking, Brink Farms, and CR England.

The lower end of the cost range was reported by C.R. England, and it appeared to have estimated only driver re-training costs. The Agency decided that this may be too low if training for

[4] The factor for scaling costs from year 2000 dollars (as used in the 2003 RIA) to year 2004 dollars (for this document) is 1.0824, based on the ratio of GDP deflator values for these two years from Bureau of Economic Analysis National Income and Product Accounts (NIPA) tables.

both drivers and supporting staff were necessary. As a result, we assumed $100 per driver as a reasonable point estimate for the re-training costs. We assumed these costs to be in 2004 dollars.

Using a 7 percent discount rate, 10 years as the amortization period, and three million total truck drivers (Bureau of Labor Statistics, Current Population Survey), we calculated the annualized re-training costs to be $21 million in 2004 dollars. While retraining costs may in fact vary somewhat by Alternative Option, the RIA for today's rule has taken these costs as constant, for a simple analysis. For instance, while it might be the case that certain carriers would only retrain their LH drivers who currently use the sleeper-berth provision, it may also be the case that some carriers would want to train their entire driver workforce, depending on how many drivers do, or might, use the sleeper berth provision. For this reason, we assumed constant costs for driver retraining. As such, retraining costs for Option 2 could be considered conservative, in that they may be an overestimate of true retraining costs. Also, it must be noted that while we expect motor carriers to incur any driver/employee retraining costs associated with today's rule within the first year of the rule's implementation, we have spread these costs out over a 10-year period and discounted them back to present year values for reporting purposes (*i.e.*, so as to present total cost figures as a single ''average annual cost'' estimate).

Total Costs

As seen in Figure 16, implementation of Option 2 (today's rule) entails total annual costs of $34 million, which is composed of $13 million in direct productivity losses and $21 million in driver training costs.

Implementation of Option 3 would entail total annual costs of $2.142 billion, or $2.121 billion in direct productivity losses and $21 million in driver training costs.

Implementation of Option 4 would entail total annual costs of $1.395 billion, or $1.374 billion in direct productivity losses and $21 million in driver training costs.

FIGURE 17.—TOTAL ANNUAL COSTS BY OPTION

Incremental Annual Costs of the Options for LH Operations Relative to Option 1			
	Option 2	Option 3	Option 4
Change in LH Productivity	0.042%	7.12%	4.61%
Change in Annual Costs Due to Productivity Impact (millions of 2004$)	$13	$2,121	$1,374
Incremental Annualized Retraining Cost (millions of 2004$)	$21	$21	$21
Total Annual Incremental Cost	$34	$2,142	$1,395

Source: ICF analysis.

Other Costs

As discussed earlier in this preamble, FMCSA conducted an extensive literature review examining the potential health effects of changes in the hours of service rules to commercial drivers. However, following this review, the Agency concluded that neither the current data nor the peer-reviewed research findings published to date were sufficient to allow the Agency to quantify and monetize any marginal acute health impacts to commercial drivers from today's rule. As a result, such impacts were not incorporated into the cost and benefits estimates developed for the RIA accompanying today's rule.

Increases in Long-Haul Drivers Needed

We are assuming that, because the same total ton-miles of freight will need to be transported under all three options, the reductions in productivity can be translated directly into percentage increases in the number of drivers. Thus, Option 2 (today's rule) would require an additional 0.042 percent of 1.5 million long-haul drivers. The result is that the industry will need to hire about 600 additional drivers as a result of changes implemented as part of today's final rule. If Option 3 were to be implemented, it would result in a need for 107,000 additional long-haul drivers (or 7.12 percent of 1.5 million). If Option 4 were to be implemented, it would result in a need for 69,000 additional long-haul drivers (or 4.61 percent of 1.5 million). These estimates would be reduced somewhat if the effect of productivity changes on mode choice (i.e., if freight were to shift to rail as a result) were taken into account; thus, they can be assumed to represent upper bounds on the required increase in drivers.

Benefits

Two types of benefits were estimated as a result of today's rule. These include safety benefits to long-haul operations and non-safety benefits to short-haul operations as a result of changes in the maximum daily driving time (*i.e.*, under Options 3 and 4), the recovery provision (*i.e.*, under Options 3 and 4), and the split sleeper berth exemption (*i.e.*, under Options 2, 3, and 4). Recall from the discussion in the costs section that short-haul drivers were determined to be largely unaffected by the changes in these provisions, given that they rarely, if ever, use these provisions in their day-to-day operations. As such, any safety impacts to short-haul operations were determined to be minimal. The second type of benefits estimated were non-safety benefits to short-haul operations as a result of the new short-haul regulatory regime implemented in today's rule. These benefits accrue by way of relief from the RODS completion burden for many drivers within this segment, as well as slight productivity benefits from use of a second 16-hour day.

Safety Impacts

FMCSA estimated the benefits of the HOS alternatives to long-haul operations using a multi-step process to relate changes in HOS rules to changes in crashes. Conceptually, FMCSA took the following steps for each alternative:

(1) Constructed a set of sample working and driving schedules of different intensities and degrees of regularity;

(2) Used the results of the modeling performed for the cost analysis to determine the percentage of drivers following each sample schedule, and determined the shifts in these percentages caused by different HOS alternatives;

(3) Translated the amount of on-duty time in each schedule into expected amounts of sleep, using a function based on Effects of Sleep Schedules on Commercial Motor Vehicle Driver Performance (Walter Reed Army Institute of Research) [Balkin, T., *et al.* (2000)];

(4) Used the FAST/SAFTE Sleep Performance Model to estimate the effects of different sleep and driving schedules on a measure of alertness;

(5) Translated changes in alertness into relative changes in crash risk, based on a driving simulator, and adjusted certain estimates upward through use of a time-on-task multiplier for those crash risks associated with longer driving schedules;

(6) Calibrated the results of the simulated crash risk modeling to the real world using independent estimates of the total numbers and percentages of crashes attributable to fatigue; and

(7) Translated the estimated changes in fatigue-related crashes into dollar values for avoided crashes using existing estimates of the damages from fatal, injury, and property-damage only crashes.

Safety Benefits

The quantified and monetized safety benefits of the options are derived from their effects on truck crashes in the long-haul sector. Changes in work and sleep schedules of long-haul drivers due to the HOS alternatives can be translated into relative changes in modeled fatigue-related crashes, and can be calibrated to correspond to independent estimates of numbers of fatigue-related crashes. The damages from fatigue-related crashes can be projected for each of the alternatives.

Changes in Crash Damages Due to Schedule Changes

As discussed earlier in this preamble, analysis of TIFA data over an 11-year period reveals that fatigue-related crashes are a significant problem in long-haul operations. This fact can be attributed in part to the relatively heavy work schedules of long-haul drivers, but also to the fact that long-haul operations are much more likely to subject drivers to irregular and rotating schedules. In this analysis, FMCSA estimated that all of the alternative regulatory options considered here (Options 2, 3, and 4) would reduce crashes relative to the current rules with full compliance. However, there are differences in the relative effectiveness of these three alternative options, which differ in terms of their allowance for improved rest during the workweek.

Reductions in crash risks under all three alternative options are expected to result from longer and more consolidated periods of rest; and under Options 3 and 4, additional reductions are expected to result from a combination of increased rest at the end of a work week (or similar multiday period), and shorter maximum driving periods. These effects can be complex and subtle, and can interact with each other and the range of schedules in the industry under different options. To incorporate these potential effects on safety in the most comprehensive way, we ran the on/off-duty schedules resulting from the simulation modeling through a commercially available computer program called FAST/SAFTE. This program is designed to take workers' schedules and predict their level of performance at each point in time. These performance levels were then used to estimate changes in crash risks for those time periods when the operational simulation showed that the truck drivers were at the wheel (and thus vulnerable to crashing). FAST/SAFTE, which was calibrated using the results of the Walter Reed laboratory study of truck drivers, is able to predict changes in drivers' levels of performance caused by varying degrees of sleep deficits over recent days and weeks. In addition, it accounts for a driver's circadian rhythm, and predicts the degree to which performance is degraded by driving at certain times of day or certain parts of a daily cycle. The disruptive effects of rapid changes in circadian rhythm are also taken into consideration. The model yields output in terms of psychomotor vigilance test (PVT) scores, which were found in previous work to be related to changes in driving performance.

Because of research that points to significant time-on-task (TOT) effects, and empirical evidence that fatigue-related crashes rise as a percentage of total crashes after long hours of driving, we have added an independent TOT multiplier to the results of the FAST/SAFTE model. This multiplier is to TIFA data [Campbell, K.L. (2005), Figure 7, p. 8]. While the TIFA data do have limitations, as discussed earlier in this preamble, based on our knowledge they represent the only recently-published data available for considering such effects. The Campbell data, relative to the other studies, also show a relatively high increase in risk in the 11th hour of driving, although all of the studies acknowledge a large degree of uncertainty. In the face of this uncertainty, the agency felt it prudent to use a study that shows a higher risk, in order to ensure that the model does not underestimate the risk of driving in the 11th hour. In addition, the agency further tests the robustness of our conclusions by performing a sensitivity analysis which assumes an even larger TOT effect in the 11th hour, which is described in more detail earlier in this section of the preamble, as well as in the stand-alone RIA contained in the docket.

In order to use the FAST/SAFTE model to process the outputs of the operational model, we needed to determine how much sleep the drivers were getting and when that sleep would occur during given off-duty periods. We estimated quantities of sleep for drivers using data from the Walter Reed field study, which provided actual sleep amount and hours worked for drivers in that study. The total sleep hours were plotted against total on-duty hours for each 24-hour period, revealing a general negative relationship between daily hours worked and total daily sleep amount. A cubic regression function was then fitted to the data, which was then used to predict sleep given modeled numbers of hours on duty. Assumptions were also made that drivers avoid sleeping in very short off-duty periods, try to consolidate their sleep toward the end of their daily off-duty periods, but awaken at least a half hour before starting to drive (to avoid the effects of sleep inertia).

Crash Risk Results by Operational Case

The results of the crash risk modeling are presented in Figure 18, after scaling the results to yield an average fatigue-related value of 7 percent in Option 1. This scaling was performed to incorporate the beneficial effects of the 2003 rule on fatigue-related crashes, as estimated in the RIA for that rule. Overall, the impacts are relatively small, as might be expected for options that are making marginal changes to the 2003 rule. Some patterns are visible: in almost every case, Options 2, 3, and 4 show lower crash risks than Option 1. In most cases, the crash risk reductions were greater for six-day schedules than for five-day schedules.

Options 3 and 4 have generally greater reductions in risks (shown as negative numbers) than Option 2, as is expected due to the greater stringency of those options. Impacts on team drivers, which were modeled as being the same for Options 3 and 4, were greater for drivers who split their rest periods under Option 1 than for those who did not.

FIGURE 18.—DETAILED CRASH RISK ESTIMATES

			Relative change in crash risk (percent)		
			Option 2 compared to option 1	Option 3 compared to option 1	Option 4 compared to option 1
Run characteristics					
For-hire, random	Using split sleeper berths	SR	·7.4	·6.3	·2.4
		LR	1.4	·5.6	·7.5
		LH	2.0	·7.2	·7.6
	No split sleeper berths	SR	0	1.1	5.0
		LR	0	·6.9	·8.9
		LH	0	·9.3	·9.6
Regular routes (private TL, LTL, regular for-hire).	Full weekend off	Weekly	0	0.2	·0.4
		Daily	0	·0.7	·0.3
	Six-day work week	Weekly	0	·0.7	·1.2
		Daily	0	·0.9	·0.5
Team drivers [5]	Using split sleeper berths		·5.7	·6.4	·6.4
	No split sleeper berths		·0	·0.7	·0.7
Weighted average impacts (raw)			·0.3	·1.4	·1.4
Weighted average impacts (scaled)			·0.1	·0.6	·0.6

Weighting the crash risk results in the same manner as the productivity results, we found the overall reductions in crash risk associated with Options 2, 3 and 4 to be relatively small compared to the baseline. For instance, under Option 2, the weighted reduction in crash risk across all regional and long-haul operational types was equal to 0.1 percent. For Options 3 and 4, the weighted reduction in crash risk across all operational types equaled approximately 0.6 percent.

Value of the Crash Risk Changes

The above percentage changes in crash risk were valued by multiplying them by an estimate of the total annual damage associated with long-haul and regional truck crashes. A recent analysis of total large truck crash damages estimated the average annual cost at $32 billion in year 2000 dollars, or about $34.6 billion in year 2004 dollars. Research was conducted for this 2005 RIA to separate the percentage of total crash-related damages that were caused by the long-haul segment of the industry. Results revealed that the long-haul segment was involved in approximately 58 percent of the total damages associated with large truck-related crashes. Therefore, applying this 58 percent to $34.6 billion yields approximately $20.1 billion in crash damages for which the long-haul segment is responsible.

Applying the estimated reductions in crash risk due to Option 2 (i.e., 0.1 percent) to the $20 billion in crash damages involving the long-haul segment yields a total safety benefit from Option 2 (today's rule) of roughly $20 million per year (or 0.1 multiplied by $20.1 billion). The risk reduction attributable to Options 3 and 4 is equal to $120 million per year, or the crash risk reduction for Options 3 and 4 (0.6 percent) multiplied by $20.1 billion.

Time Savings and Productivity Benefits to Certain Short-Haul Drivers

Recall that today's rule effectively provides relief from the previously defined filing requirements for particular segments of the short-haul sector. This involves certain commercial drivers operating vehicles with a gross vehicle weight rating (GVWR) of less than 26,001 pounds, who return to their primary duty station each day and whose range of operations is within a 150 air-mile radius. Not all drivers meeting these criteria would be provided relief as a result of today's rule because some already engage in operations that do not require a logbook.

Figure 19 outlines the types of short-haul drivers of vehicles below 26,001 pound GVWR that would potentially be affected by today's rule and explains which of these cases stands to accrue benefits as a result of paperwork savings. Additionally, Figure 19 presents the dollar estimates of these savings. Specifically, as the Figure shows, analysis of the rule, especially of the change in the logbook exemption, requires consideration of three different cases for operations under the current rule:

- Driving inside the 100-mile range and choosing not to keep a log;
- Driving inside the 100-mile range and choosing to keep a log; and
- Driving in the 100–150 mile range, where logs currently are required.

Safety effects of the second 16-hour exemption are not reported in the Figure or discussed further in this paper because, as noted in the safety impacts discussion of today's rule, they were estimated to be minimal. Based on analysis conducted in the 2003 RIA, it was estimated that the reduction in safety benefits caused by these safety effects would be well below $10 million per year.

[5] These impact estimates were based on simplified scenarios rather than model runs.

FIGURE 19.—TYPES OF POTENTIALLY AFFECTED SHORT-HAUL DRIVERS

[Annual savings in millions, rounded to the nearest $10 million]

	Case 1	Case 2	Case 3	Total annual savings ($ millions)
Description	Now operating within 100-mile range and not keeping logs. Duty tours ≤12 hours.	Now operating within 100-mile range and keeping logs. Duty tours up to 14 hours.	Now operating in 100 to 150 mile range. Must keep logs and observe 14-hour limit.	
Logbook effects	No effect: Already exempt from log requirement. Case-1 benefit: $0.	Relieved from log requirement. Case-2 benefit: $100.	Relieved from log requirement. Case-3 benefit: $40.	$140
Logbook exemption	May use 14-hour tour now, if they keep log. Log cost is $2.00/day. Tour >12 hours of little value to this group. Benefit: Minimal.	Already choosing logbook and 14-hour tour. Benefit: $0.	Already have 14-hour tour	0
Second 16-hour day	Case-1 trucks would not use the 16-hour day because they already choose not to use the 14-hour tour. Savings: $0.	Analysis is an extension of analysis of second 16-hour day that was done for the 2003 RIA. This approach did not distinguish between cases 2 and 3		140
				280

Overview of Short-Haul Impact Analysis

In the 2003 RIA, the Agency estimated the savings from a second 16-hour day (*i.e.*, under the ''ATA Option''). We have used that figure as the basis for our current estimate, adjusting for inflation and the number of affected drivers. Both for the second 16-hour day and the logbook exemption, we had to estimate the number of truck-days that would be affected.

A truck-day is the relevant unit, because the magnitude of effects of both logbook and 16-hour exemptions depends on the number of days on which they are used. In effect, a truck-day is the same as a driver-day. This is based on the premise that, on any given day, each truck in use has one driver. This is virtually always the case in over-the-road trucking (except for teams); it is also the case for short-haul operations. One could imagine cases in which two different construction workers drive the same truck on the same day or one worker uses two different trucks, but we expect such cases to be rare and likely to cancel each other out.

Details of Analysis

For estimating truck-days, the starting point is the Vehicle Inventory and Use Survey (VIUS) from the 2002 Economic Census. Table 4 of the VIUS survey provides the number of 10,000- to 26,000-pound trucks (10–26 trucks) in each of the reported operating ranges. Each truck in the survey is assigned to an operating range on the basis of respondents' statements about the range in which the truck runs the most miles. The table shows that 2.24 million 10,000- to 26,000-pound trucks are assigned to all operating ranges. This number is converted to truck-days for our purpose in a series of steps discussed in the stand-alone 2005 RIA. The result of the various steps and adjustments is 1.68 million truck-years on the basis of actual use of 10,000–26,000 pound GVWR trucks within 150 miles. This figure is the basis of our benefit estimates for both the logbook exemption and second 16-hour day.

For the logbook savings, truck-years are converted to truck-days (driver-days) with two factors. First, we assume the average driver works 48 weeks a year, allowing for vacations, holidays, and sick days. Second, on the basis of an analysis of survey data on daily and weekly hours of work for a sample of short-haul drivers, we use 5.5 days worked per week for the average short-haul driver. The next steps in the benefit calculation for the logbook exemption involve the two types of drivers known as ''Case 2'' drivers (those operating within a 100-mile radius but using logs) and ''Case 3'' drivers (those operating in the 100–150 air-mile radius who were previously required to keep logs). Under Case 2, we have estimated 1.61 million truck years and for Case 3, we have estimated 73,000 truck years, which results in the total of 1.68 million truck years mentioned previously.

For Case 1 drivers, or those who currently do not keep logs and stay within the 12-hour limit, there is a chance that some would choose to keep logs in order to be able to extend their tours beyond 12 hours. We have found, however, that any driver with a need to extend a tour even a fraction of an hour beyond the 12-hour limit would have already found (*i.e.*, under the 2003 rule) that it would be worthwhile to keep a log to secure that increase in productivity. We based this conclusion on the fact that keeping a log for a day imposes a cost of only about $2, whereas the increased productivity of a driver able to work another 15 minutes has a value of that same small magnitude. Cases in which drivers would choose to extend their tours of duty as a result of today's rule would be limited to those few cases in which very short extensions were desired. Furthermore, the added savings from these cases can be shown to be quite small. Thus, we concluded that the savings from drivers in Case 1 would be minimal and have left these savings out of the analysis.

Time Savings Benefits for Each Case

For Case 2 operations, we have to estimate the number of trucks operating inside 100 miles and choosing to keep logs. For this purpose, we rely on the FMCSA field survey. In the survey, 10.4 percent of short-haul drivers reported tours of duty longer than 12 hours. We assume these drivers were keeping logs; thus, we estimate that 10.4 percent of 0- to 100-mile drivers (1.61 million, after rounding) are using logbooks. With this factor, and our assumptions of 48 weeks per year and 5.5 days per week, we arrive at 44,215,000 truck-days for which a logbook would not have to be completed as a result of today's rule. We convert this to dollars using the following estimates (originally developed for the 2003 rule): 9.5

minutes to do the log, $12.62/hour for the driver's wage, and an inflation adjustment for 2004 dollars. The result is a stream of annual savings of $95.6 million, which we have rounded to $100 million.

For Case 3, the same procedure is followed with one exception. All Case-3 trucks (73,000) are now keeping logs, so there is no need to adjust for those not keeping logs, as was done above with Class 2 drivers. The result is 19,340,000 driver-days for which a logbook would not have to be completed. Monetizing this benefit using the above wage rate and time savings figure, the result is an annual stream of savings of $41.9 million, which we have rounded to $40 million.

Summing the benefits from Case 2 and Case 3 operations yields total annual time savings benefits of $140 million. This total represents the time savings associated with today's rule, which will exempt Case 2 operations (trucks/drivers operating within a 100 air-mile radius and keeping logs) and Case 3 operations (trucks/drivers operating between 100–150 air-mile radius and keeping logs) from the logbook requirement.

Benefits from the use of the first 16-hour day were originally estimated in the RIA for the 2003 rule, and were found to equal approximately $470 million annually. A calculation using the same methodology showed that the savings from a second 16-hour day in each week would be about one-quarter as great. Thus, for 1.5 million short-haul drivers, annual savings are estimated at $118 million (in year 2000 dollars). Updated to year 2004 dollars (to adjust for inflation over this period), the result is an annual savings stream of $143.3 million, which we have rounded to $140 million.

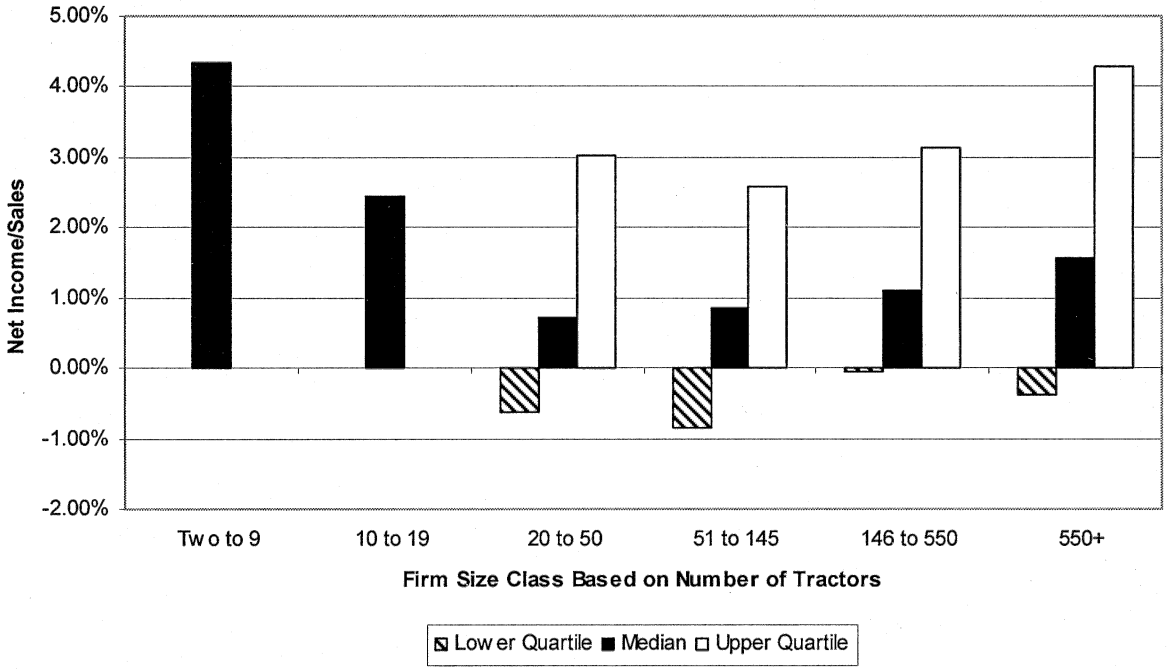
Total Short-Haul Time Savings and Productivity Benefits

Combining the time savings benefit to certain short-haul operations with the productivity benefits obtained from use of the second 16-hour day yields total annual benefits of $280 million. Given that the new, short-haul regulatory regime was included as part of Options 2, 3 and 4, the short-haul operations benefits estimates are the same under all the options.

Total Safety and Non-Safety Benefits

Figure 20 lists total benefits associated with the alternative options.

Figure 20. Baseline Profitability of Representative Carriers



Under Option 2 (today's rule), total annual safety and non-safety benefits equal $300 million (in 2004 dollars). Under Options 3 and 4, total annual safety and non-safety benefits equal $400 million (again, in 2004 dollars).

K.2. Regulatory Flexibility Act

In compliance with the Regulatory Flexibility Act (5 U.S.C. 601–612), FMCSA has evaluated the effects of this proposed rule on small entities, including small businesses, small non-profit organizations, and small governmental entities with populations under 50,000. Most of these small entities operate as motor carriers of property in interstate or intrastate commerce.

This discussion summarizes the small business impact analysis performed for today's rule. The small business impact analysis is broken out by impacts to long-haul (LH) operations versus short-haul (SH) operations, and focuses on the LH sector. This is consistent with the way the results are presented in the RIA summary and lends itself to this type of breakdown for reasons discussed in the RIA. Specifically, the 11th hour of daily driving, the recovery provision, and the split sleeper-berth provision are used almost exclusively by long-haul and regional operations. However, the majority of cost-saving benefits from today's rule accrues to SH operators because the new regulatory regime positively impacts large portions of the SH sector. Additionally, such a break-

out is consistent with how results were presented in the RIA to the 2003 rule.

Focus on Long-Haul Operations

The small business impact analysis considers firm impacts on long-haul truckload carriers in seven size categories, which are shown below with estimates of the number of independent firms falling into each:[6] [7]

- 1 tractor (32,800 firms)
- 2–9 tractors (9,800 firms)
- 10–19 tractors (3,500 firms)
- 20–50 tractors (3,500 firms)
- 51–145 tractors (1,800 firms)
- 146–550 tractors (600 firms)
- 550+ tractors (150 firms)

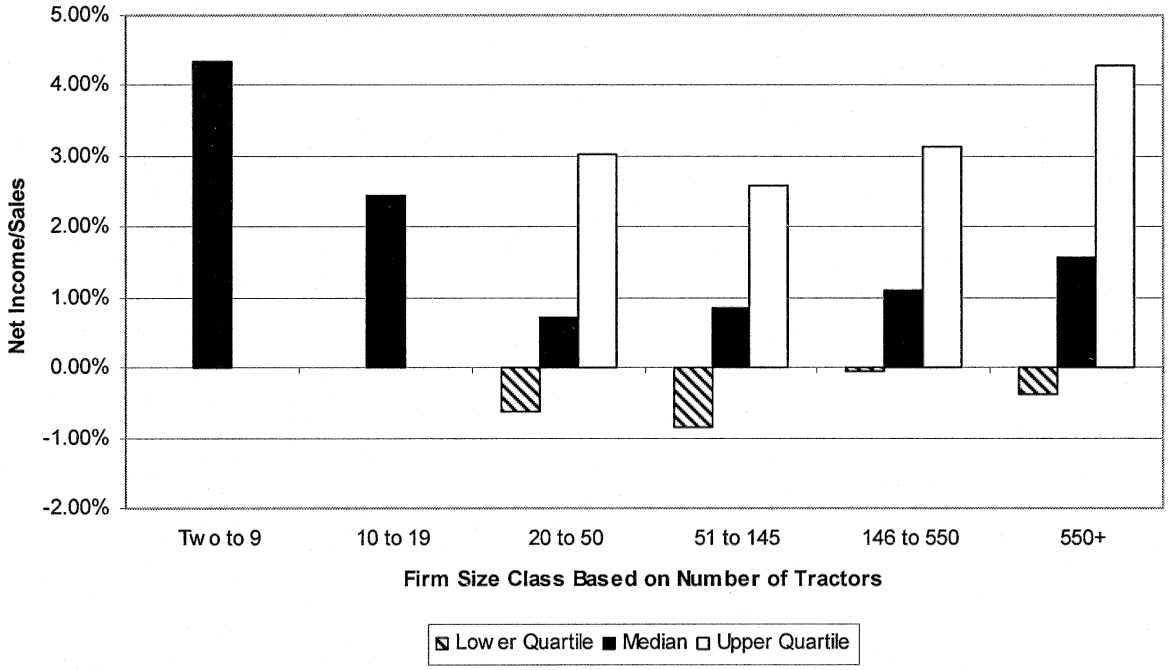
Carriers in the first five of these categories generally qualify as small entities under criteria established by the Small Business Administration (SBA) (i.e., annual revenue of less than $21.5 million) for all North American Industrial Classification System (NAICS) codes falling under the truck transportation sub-sector (NAICS 484). Carriers typically exceed this threshold when they operate more than 145 tractors.[8] The largest two categories encompass those long-haul carriers that do not qualify as small entities under the SBA criteria. The specific size categories enumerated above are intended to reflect natural groupings or breakpoints in terms of firm behaviors and economies of scale.

For representative carriers in each size category, the study estimated the financial impact of each alternative regulatory option in terms of the change in net income (in 2004 dollars) to the carrier,[9] as well as a change in their profits as a fraction of operating revenues. These estimates were developed based on a pro forma financial model of firms of different sizes confronted by changes in productivity, wages, and prices. Figure 21 summarizes the baseline profitability of carriers in the various size categories.

The small business impact analysis conducted here used two industry-specific data sources in developing the firm-level data inputs to the general pro forma model. Annual TTS Blue Book financial data was used as the basis for determining the impact of the change in hours of service regulations on a variety of firm sizes. However, the Blue Book data only includes firms with revenues greater than $3 million per year (approximately 20 tractors). For firm sizes less than this, data from the Risk Management Association (RMA) were used for firms with $0 to $1 million (assumed to represent firms with 2–9 tractors) and $1 to $3 million (assumed to represent firms with 10–19 tractors).

The remainder of this summary is divided into three sections. The first provides an overview of the results of the impact analysis; the second organizes the results by regulatory option; and the third organizes the results by different size categories.

Figure 21. Baseline Profitability of Representative Carriers



[6] Impacts on the private fleets are not expected to be significant. In the case of private fleets, firm impacts generally will be relatively small because trucking comprises only a small portion of firm activities. Furthermore, the options have only slight, and positive, effects on SH costs.

[7] See Chapter 3 and Appendix A of the RIA for the 2003 Rule (contained in the docket) for more details on these estimates.

[8] Based on analysis of data from the TTS Blue Book. This implies total revenue (*i.e.*, from trucking plus other value-added services) averaging approximately $145,000 per tractor across all firm sizes.

[9] Representative carriers for the four largest size categories were selected on the basis of having the median value in the category for profitability (as measured by the ratio of net income to total revenue).

Summary of Results

The impacts to carriers of the three HOS alternative regulatory options are compared relative to a baseline, which consists of the current operating environment (the 2003 rule). As such, all three alternative policy options result in reduced profits on most carriers, given that their provisions are more restrictive than under the 2003 rule. However, the severity of the impacts is directly related to the magnitude of the drop in labor productivities considered for the three options. For instance, the financial impacts under Option 2 (today's rule) are the least adverse, compared with those estimated under the other alternative options (3 and 4). For additional perspective, however, carrier profitability under the options is also shown under the state-of-the-world that existed before the 2003 rules came into effect. This state is referred to as the ''Pre-2003 Situation.'' Comparing the impacts of the new options to this situation may be more realistic in some cases since it is unclear if all carriers have had enough time to adjust to the 2003 HOS rule.

With regard to the specific impacts of each Alternative Option, Option 2 (with a 0.042 percent drop in labor productivity industry-wide, as described in the RIA summary, and a 0.1 percent drop for the for-hire sector, which was analyzed in detail) shows the least severe adverse impacts. As seen in Figure 22, profitability as a share of revenue is projected to decrease by a tenth of one percent or less, relative to Option 1 (2003 rule). These very minor impacts should be reduced slightly as prices adjust.

Option 3 (with a 7.12 percent drop in labor productivity) has the most severe impacts on carriers, and could eliminate net income in the short term for some industry size categories. Results for Option 3 are found in Figure 23. Profitability as a share of revenue is projected to decrease between 1.35 and 2.56 percent across most size classes. The biggest impact of 2.56 percent is felt by the 20–50 size class before prices adjust.

Option 4 (with a 4.61 drop in productivity) shows impacts that are in-between the two extremes. Results for Option 4 are found in Figure 24. Profitability as a share of revenue is projected to decrease between 0.89 and 1.58 percent across most size classes. The results in terms of profit impacts relative to revenues under Option 2 seem to suggest very small impacts for firms across the wide range of size categories examined, including both large and small entities. The threshold for impacts considered to be of moderate size is generally taken to be one percent of revenues, and the average impacts of Option 2 (today's rule) fall far below that magnitude. It should also be noted that even though Option 2 would result in slightly lower profitability than Option 1, carriers would generally earn higher net revenues than they were under the pre-2003 rules, only a short time ago.

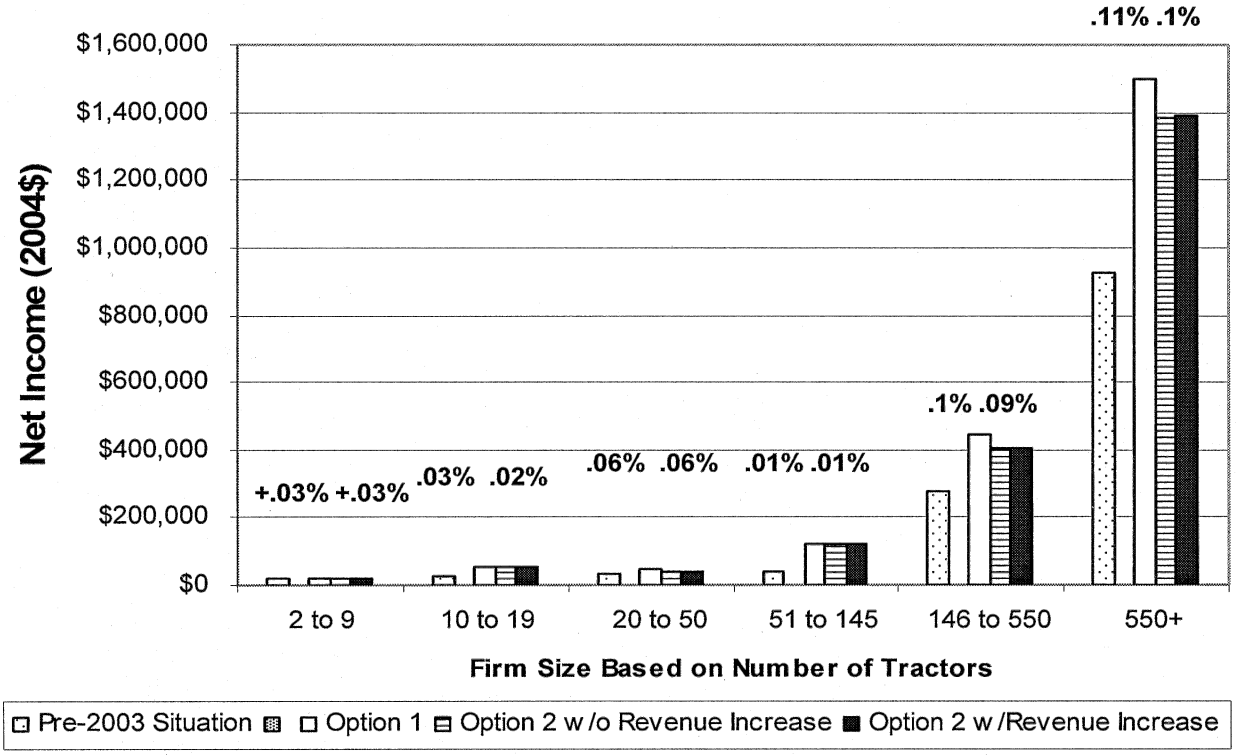
Variability in impacts within each size category, however, means larger impacts for some small entities are possible. The carriers that are currently taking advantage of the split break periods to an above-average degree, for example, will tend to lose more under the options that do not permit its use. Even for these relatively few carriers, however, the average impacts are likely to be well below 1 percent.

Results by Option

Option 2 adversely impacts the net income earned by carriers in almost every size category (with the exception being a very small improvement for the 2–9 category) as shown in Figure 22, although these adverse impacts are very small in magnitude across the entire range of small firms. Figures 23 and 24 show the impacts for different size categories for Options 3 and 4, respectively. Both options result in lower net incomes than for Option 2 (and consequently, lower than in the baseline) in all size categories.

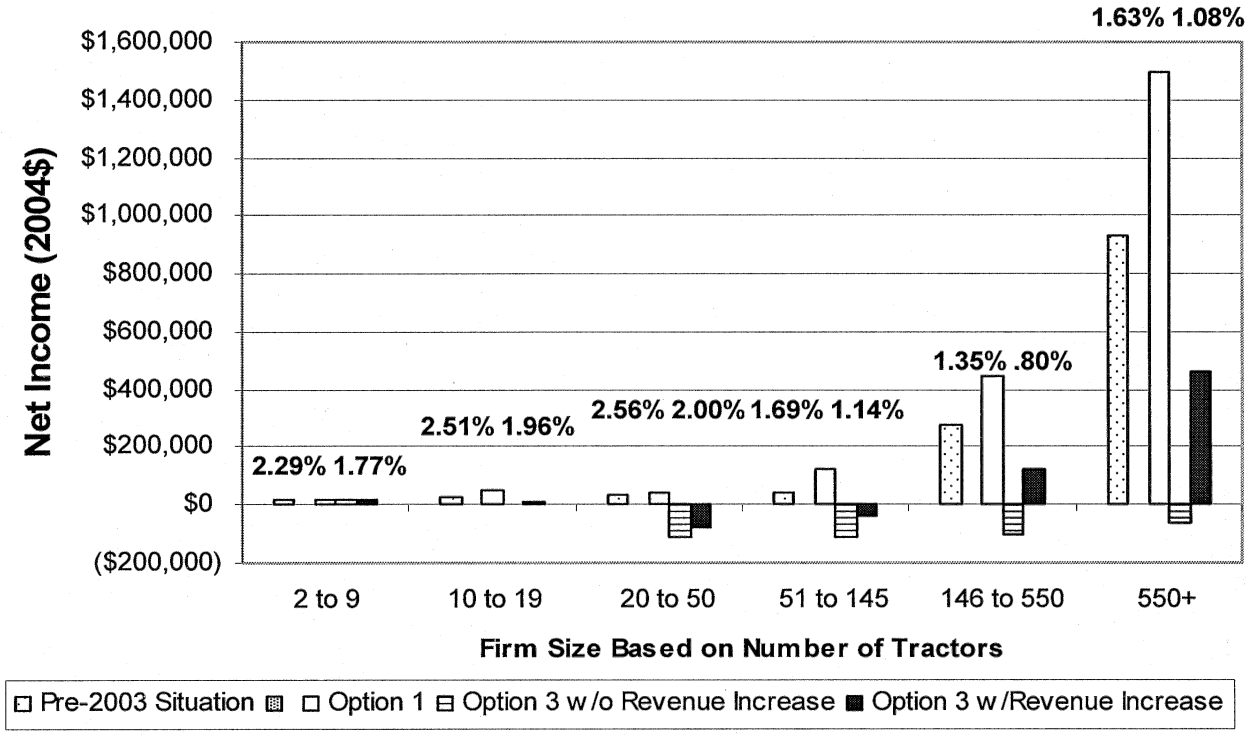
Figures 22 through 24 show the impacts on each size category for two alternatives over the baseline. ''Without Revenue Increase'' implies carriers bear the increased costs due to the rule change without being able to pass the cost increases through to their customers through trucking rate hikes (*i.e.*, zero pass-through). This scenario would be true in the very short run. In the longer run, however, carriers are expected to be able to increase their rates in line with industry-wide increases in costs. This scenario is modeled as ''With Revenue Increase'' which assumes that carriers are able to increase their rates, under the assumption of constant market demand, in order to completely offset the industry-wide average cost increase estimated for the rule options (*i.e.*, complete pass-through). These two extremes of the pass-through assumption were modeled in order to provide a range for the level of impacts associated with the new options and to distinguish between short- and long-term impacts. In addition to showing impacts on net income, the figures indicate the drop in profit as a percentage of operating revenue for each alternative relative to Option 1. Those relative changes are shown above each bar in all three Figures.

Figure 22. Option 2: Change in Median Firm Net Income Relative to Baseline



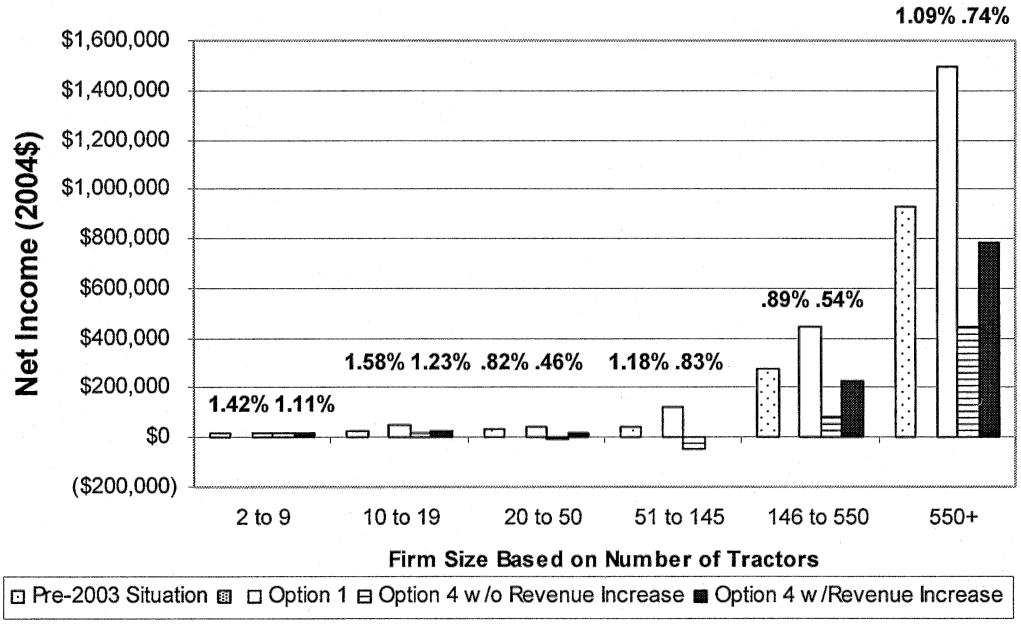
Note 1. Reduction in profit relative to total revenue is indicated over the bars.
Note 2. Profit reduction calculated relative to Option 1 baseline.

Figure 23. Option 3: Change in Median Firm Net Income Relative to Baseline



Note 1. Reduction in profit relative to total revenue is indicated over the bars.
Note 2. Profit reduction calculated relative to Option 1 baseline.

Figure 24. Option 4: Change in Median Firm Net Income Relative to Baseline



Note 1. Reduction in profit relative to total revenue is indicated over the bars.
Note 2. Profit reduction calculated relative to Option 1 baseline.

Differential Impacts on Small Carriers: Results by Size Categories

This section describes impacts on carriers for the smaller size categories. The discussion is divided into four parts: one for owner operators; one for firms with 2–9 tractors; one for firms with 10–19 tractors and the last for the larger size categories. As expected, the percentage changes in net income indicate that the impacts are less in the longer run when carriers can increase their revenue by passing the industry-wide cost increases on to their customers.

Impacts on the profitability of certain firm sizes appear to be greater than the impacts on others. This pattern is closely tied to the differences in baseline profitability levels: those size categories with lower rates of profit in the baseline are naturally somewhat more vulnerable to a similar change in productivity.

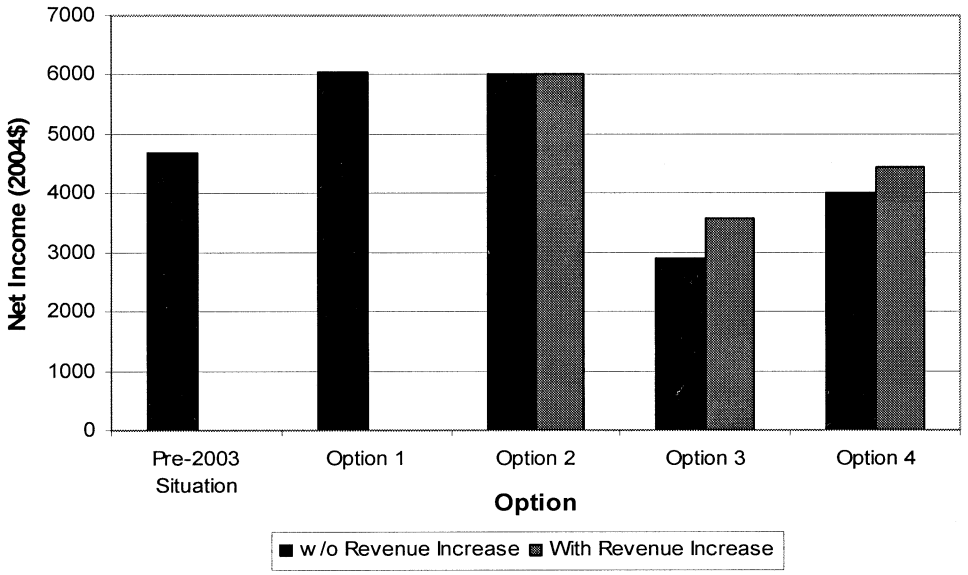
Owner Operators with One Tractor

The smallest size category, one tractor, is examined in order to evaluate impacts on individual owner/operators. Figure 25 shows the change in net income for these owner/operators under each option. These impacts are presented relative to Option 1. The pre-2003 situation is shown as well.

Owner/operators with one tractor would earn virtually the same under Option 2 as Option 1, and less under the other two options. Net income is actually higher under Option 2 than in the pre-2003 situation. Owner-operators that had not had sufficient time to adjust to the 2003 rule may therefore experience an improvement in their situations.

Note that the ''net income'' measured by this study for owner/operators is slightly different in meaning than that for firms in other size categories due to treatment of wages. For owner/operators, net income is the same as take-home pay (analogous to wages). The owner/operator ''takes home'' any residual after paying all other expenses. In contrast, the net income of larger firms subtracts out wages along with other expenses. Due to this difference, the net income calculated for owner/operators is not directly comparable to that calculated for other firm sizes, and it tends to be higher when stated as a percent of revenue.

Figure 25. Change in Net Income for Owner Operators (One Tractor/Trailer)



Note. Net income for owner operators includes wages. See text for details.

Firms With 2–9 Tractors

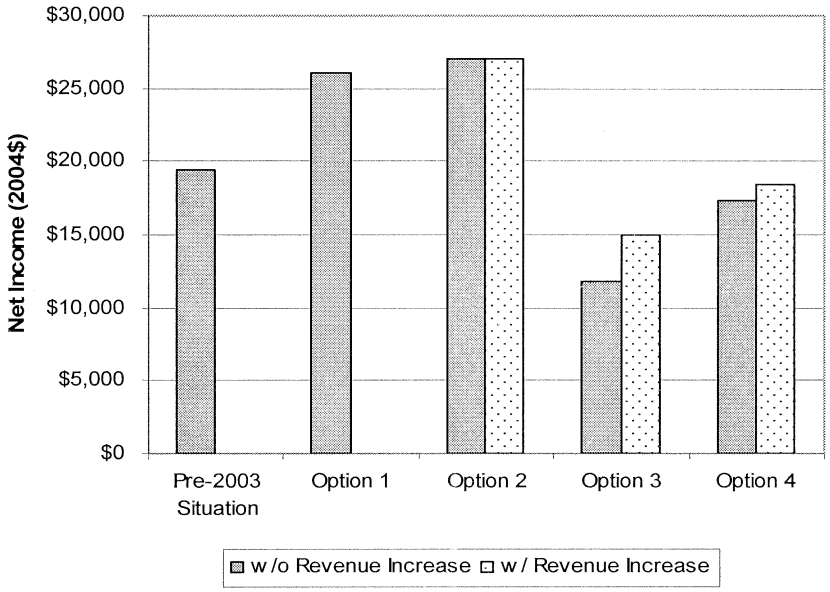
Firms operating between 2 and 9 tractors, like others toward the smaller end of the size distribution, may have less flexibility to respond to a change in the hours of service rules. Whereas larger firms can hire or lay off drivers in order to optimize their operations relative to any of the options, firms with 2–9 tractors are too small to do this in optimal fashion, at least in the near term.[10] As discussed above, firms must hire additional drivers in order to maintain their current business under all three options. Firms in the 2–9 tractor category, however, do not have enough current business to justify hiring another full-time driver. They would, optimally, hire a fraction of a driver in response to the new options. Assuming this is not possible, these firms must instead sacrifice some of their business, at least in the near term.[11]

As shown in Figure 26, carriers in this size category are expected to gain to an insignificant degree under Option 2, most likely due to slight changes in driver wages. They would be adversely impacted under Options 3 and 4 relative to Option 1, because of their inability to meet existing orders and the loss of the corresponding revenues. Near-term impacts (''without revenue increase''—*i.e.*, before prices for trucking services adjust to the cost increases) are higher than the long-run impacts (''with revenue increase'').

[10] To a lesser extent this also is true for firms in the 10–19 tractor size category. Firms with 10–19 tractors have enough flexibility, however, that their impacts are similar to (but smaller than) those of firms in larger size categories.

[11] In the longer term, firms should be able to adjust their operations to a greater extent in order to fill capacity, so the impacts on these firms should tend to diminish over time.

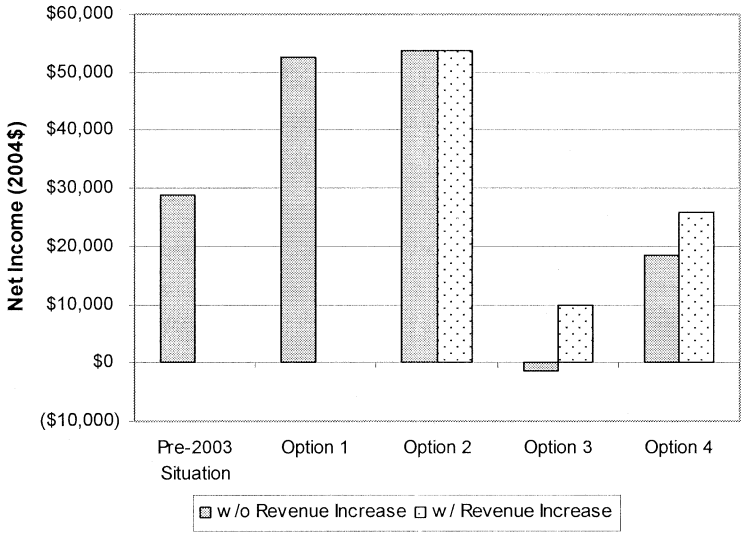
Figure 26. Net Income Per Firm: 2-9 Tractors



Firms With 10–19 Tractors

Impacts for the 10–19 tractor size category differ somewhat from the 2–9 size category. Again, as shown in Figure 27, there is almost no impact under Option 2. Due to their lower baseline profitability, the percentage drop in net income for this size category under Options 3 and 4 appears to be greater than the 2–9 size category.

Figure 27. Net Income Per Firm: 10-19 Tractors



Other Size Categories (20–50 Tractors, 51–145 Tractors, 146–550 Tractors, 550+ Tractors)

Figures 28 through 31 summarize the expected change in profitability for firms in the remaining four size categories. These impacts appear less severe if carriers are assumed to have an opportunity to increase their rates to offset the higher costs of the new rules. Moreover, though the carriers are generally less well off under Option 2 than under Option 1 (except carriers in the 51–145 size category, where they are virtually the same), many are likely to be better off than they were under the pre-2003 rules.

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Figure 28. Net Income Per Firm: 20-50 Tractors

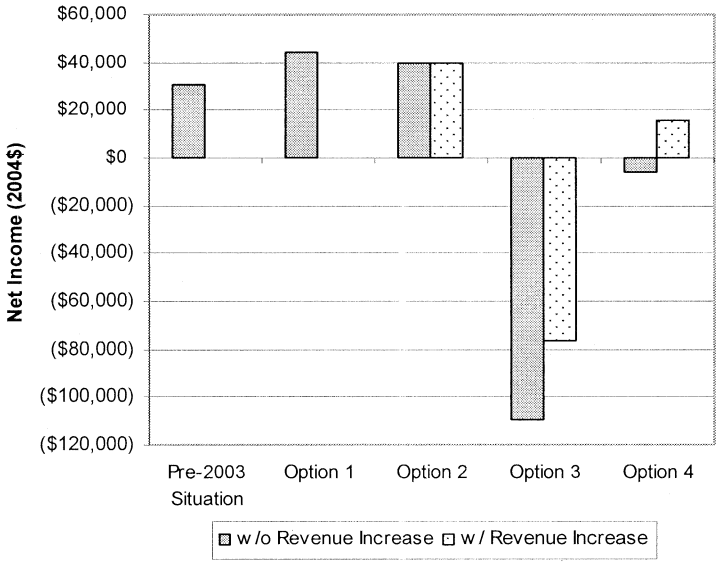


Figure 29. Net Income Per Firm: 51-145 Tractors

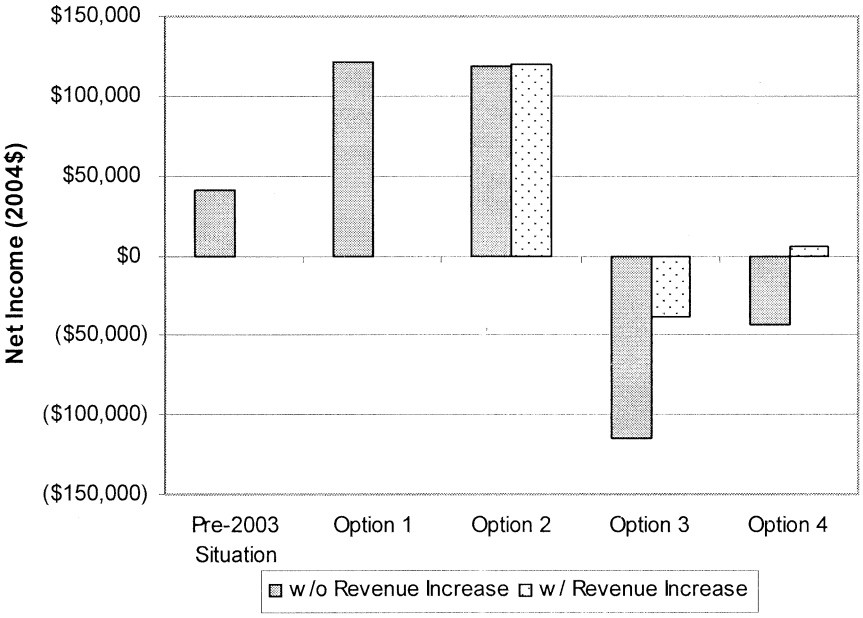


Figure 30. Net Income Per Firm: 146-550 Tractors

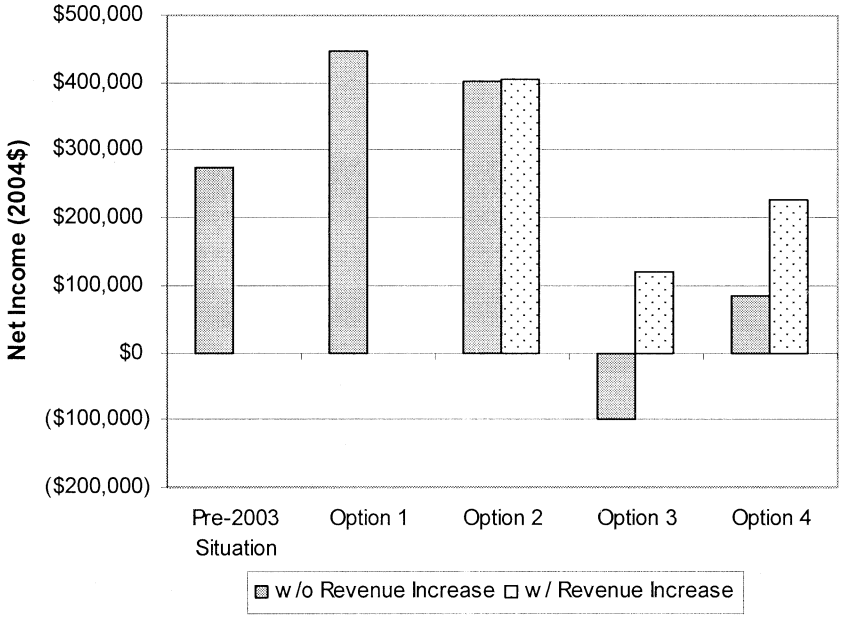
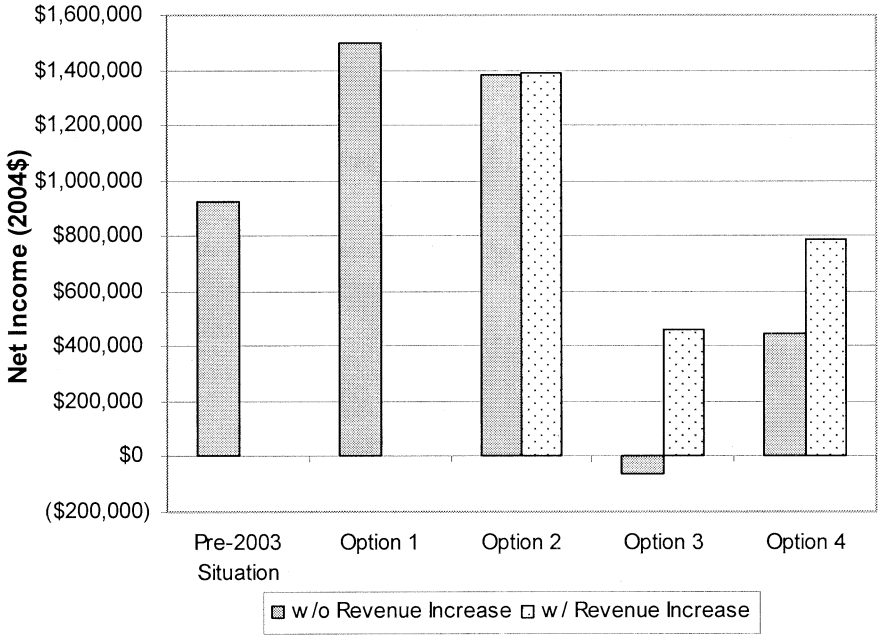


Figure 31. Net Income Per Firm: 550+ Tractors



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Conclusions

As discussed earlier in this section, Option 2 (today's rule) will have minimal effects on the net income levels of typical entities in each of the size categories of small entities examined. Specifically, for small firms in each size group (i.e., 2–9 tractors, 10–19 tractors, etc.), adverse financial impacts are estimated to be 0.1 percent or less compared to Option 1 (the 2003 rule). And when compared to the pre-2003 rule, many of these carriers will earn higher net revenues. Therefore, the FMCSA Administrator, in compliance with the Regulatory Flexibility Act (5 U.S.C. 601–612), has considered the economic impacts of these requirements on small entities and certifies that this final rule does not have a significant economic impact on a substantial number of small entities.

K.3. Unfunded Mandates Reform Act of 1995

The Unfunded Mandates Reform Act of 1995 requires each agency to assess the effects of its regulatory actions on

State, local, and tribal governments and the private sector. Any agency promulgating a final rule resulting in a Federal mandate requiring expenditure by a State, local or tribal government or by the private sector of $120.7 million [12] or more in any one year must prepare a written statement incorporating various assessments, estimates, and descriptions that are delineated in the Act. In light of the fact that today's rule would not cost State, local, or tribal governments, or motor carriers, more than $120.7 million in a given year, FMCSA is not required to prepare a statement addressing each of the elements outlined in the Unfunded Mandates Reform Act of 1995.

K.4. National Environmental Policy Act

FMCSA has prepared an environmental assessment (EA) in accordance with the National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321, *et seq.*, as amended), the FMCSA's NEPA Implementing Procedures and Policy for Considering Environmental Impacts (FMCSA Order 5610.1),[13] the Council on Environmental Quality Regulations (CEQ) regulations implementing NEPA (40 CFR parts 1500–1508), the DOT Order 5610.C (September 18, 1979, as amended on July 13, 1982 and July 30, 1985), entitled ''Procedures for Considering Environmental Impacts,'' and other pertinent environmental regulations, Executive Orders, statutes, and laws for consideration of environmental impacts of FMCSA actions. The Agency relies on all of the authorities noted above to ensure that it actively incorporates environmental considerations into informed decision-making on all of its actions, including rulemaking.

In its EA, FMCSA evaluated three alternatives to a baseline (No Action Alternative) and estimated the impacts relative to that baseline. The options include:

- No Action Alternative (Option 1): Continue to Implement 2003 HOS Rule.
- Alternative 1 (Option 2): Proposed Action or Today's rule, as described in this preamble.
- Alternative 2 (Option 3): No more than 10 hours of driving within each 14-hour on duty period, elimination of the split sleeper berth option, and a requirement of 58 consecutive hours off duty before restarting one's 60/70 hour clock within each seven or eight-day duty period.
- Alternative 3 (Option 4): Same as Option 3, but with a requirement of 44 consecutive hours off duty before restarting one's 60/70 hour on duty clock within each seven or eight-day duty period.

Each option is discussed in more detail in the EA that accompanies today's rule.

As background for the ''No Action Alternative,'' if FMCSA did not adopt a new rule before September 30, 2005, when the provisions enacted by Sec. 7(f) of the Surface Transportation Extension Act of 2004, Part V, expire, the 2003 HOS rule would still remain in effect at the State level for a considerable period of time (see Environmental Assessment, Section 2.1) due to the Motor Carrier Safety Assistance Program (MCSAP). Under MCSAP, States that accept funds (i.e., all of the States) have three years to adopt regulations ''compatible'' with the Federal Motor Carrier Safety Regulations. ''Compatible'' means ''identical'' for State regulations that apply to interstate motor carriers. About 60% of the States would retain State rules identical to FMCSA's 2003 HOS rule; they would not be required to change those rules for three full years after the new Federal regulatory situation took effect. Since these States are scattered randomly throughout the country, State HOS rules identical to FMCSA's 2003 HOS rule would probably remain applicable to most long-haul truckers most of the time for a considerable period, perhaps for years. FMCSA has therefore concluded that the ''no-action'' alternative really amounts to retention of the 2003 HOS rule.

FMCSA regulations for implementing NEPA and CEQ NEPA regulations require a comparison of the potential impacts of each Alternative. Figure 32 summarizes the impacts for each Alternative across each of the impact areas. Most impacts are evaluated in terms of the percent change from the status quo (No Action Alternative). ''Minor'' is defined here as a 0 to 1 percent change from the status quo (0 ±1 percent), while ''Moderate'' is defined as a ±10 percent or greater change. Note that these impacts are measured as a change from the No Action Alternative. As shown in Figure 32, none of the Alternatives would have a significant adverse impact on the human environment, and all of the Alternatives would have beneficial impacts in some impact areas. None of the Alternatives stands out as environmentally preferable, when compared to the other Alternatives. For details of the findings of this analysis, please see the EA performed for this rulemaking located in the docket.

FIGURE 32.—COMPARISON OF ALTERNATIVES

Impact area	No action	Alt 1	Alt 2	Alt 3
Air Pollutant—NAAQS	No Change	Minor Benefit	Minor Benefit (0.16% decrease).	Minor Benefit (0.12% decrease).
Air Pollutant—Air Toxics	No Change	Minor impact	Minor impact (0.16% increase).	Minor impact (0.10% increase).
Air Pollutant—Climate Change	No Change	Minor decrease in CO_2.	Minor decrease in CO_2.	Minor decrease in CO_2.
Public Health	No Change	Minor Benefit	Minor Benefit	Minor Benefit.
Noise	No Change	No Impact	No Impact	No Impact.
HM Transportation	No Change	Minor Benefit	Minor Benefit	Minor Benefit.
Solid Waste Disposal	No Change	Minor Benefit	Minor Benefit	Minor Benefit.
Safety	No Change	Minor Benefit	Minor Benefit	Minor Benefit.
Transportation Energy Consumption	No Change	No benefit	Minor Benefit (0.27% decrease).	Minor Benefit (0.18% decrease).
Land Consumption	No Change	Minor Induced Impact Impact (5.3 acres).	Minor Induced (1,574 acres).	Minor Induced Impact (1,019 acres).
Section 4(f)	No Change	No Impact	No Impact	No Impact.

[12] USDOT policy requires an unfunded mandates analysis for rules requiring an expenditure of $120.7 million or more, which is $100 million in 1995 dollars inflated to 2003 dollars.

[13] FMCSA's environmental procedures were published on March 1, 2004 (69 FR 9680), FMCSA Order 5610.1, National Environmental Policy Act Implementing Procedures and Policy for Considering Environmental Impacts, and effective on March 30, 2004.

FIGURE 32.—COMPARISON OF ALTERNATIVES—Continued

Impact area	No action	Alt 1	Alt 2	Alt 3
Endangered Species	No Change	No Impact	No Impact	No Impact.
Wetlands	No Change	No Impact	No Impact	No Impact.
Historic Properties	No Change	No Impact	No Impact	No Impact.

As shown in the Environmental Assessment that accompanies today's rule, none of the alternatives considered would have a significant adverse impact on the human environment. Subsequently, FMCSA has determined that today's rule will not significantly affect the quality of the human environment and that a comprehensive Environmental Impact Statement is not required. The EA for today's rule, as well as the Agency's finding of no significant impact (FONSI), are contained in the docket.

K.5. Paperwork Reduction Act

Under the Paperwork Reduction Act of 1995 (PRA) (44 U.S.C. 3501 *et seq.*), Federal agencies must obtain approval from OMB for each collection of information they conduct, sponsor, or require through regulations. FMCSA has determined that this final rule will affect a currently approved information clearance for OMB Control Number 2126–0001, titled ''Hours of Service of Drivers Regulation.'' OMB approved this information collection on April 29, 2003, at a revised total of 160,376,492 burden hours, with an expiration date of April 30, 2006. The PRA requires agencies to provide a specific, objectively supported estimate of burden that will be imposed by the information collection. See 5 CFR 1320.8.

The paperwork burden imposed by FMCSA's record-of-duty-status (RODS) requirement is set forth at 49 CFR 395.8.

The Agency estimates that the revisions to Part 395 in this final rule will eliminate the RODS paperwork burden for at least 239,400 commercial drivers previously required to complete and maintain the RODS, or what is commonly referred to as a ''logbook.''

Specifically, today's final rule eliminates the split sleeper-berth provision, which the Agency estimated would result in the hiring of 600 additional drivers by the long-haul and regional sector of the industry in order to provide the same level of transportation service as that generated prior to today's final rule. All of these new drivers would be required to file RODS, as they all would operate in the regional and long-haul sector. However, this increase is more than offset by the new short-haul regulatory regime implemented in today's rule, which provides significant paperwork relief to portions of the short-haul industry. The RIA prepared for today's final rule estimated that at least 240,000 commercial drivers operating in the short-haul sector would be relieved of the logbook filing required. As such, the Agency estimates that at least 239,400 commercial drivers, or roughly six percent of the drivers previously required to file RODS, would be relieved of the logbook filing requirement as a result of today's rule. As a result of these changes, the total RODS burden will be reduced by approximately 7 million hours annually.

A supporting statement reflecting this assessment has been submitted to OMB. You may submit comments on this information collection burden (OMB Control Number 2126–0001) directly to OMB. OMB must receive your comments by October 24, 2005. You must mail or hand deliver your comments to: Attention: Desk Officer for the Department of Transportation, Docket Library, Office of Information and Regulatory Affairs, Office of Management and Budget, Room 10102, 725 17th Street, NW., Washington, DC 20503.

K.6. Executive Order 13211 (Energy Supply, Distribution, or Use)

We have analyzed this action under Executive Order 13211, Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use. As a part of the environmental assessment, the FMCSA analyzed the three alternatives discussed earlier in today's final rule. The FMCSA found none of these effects to be significant.

In accordance with Executive Order 13211, the Agency prepared a Statement of Energy Effects for this final rule. A copy of this statement is in the Appendix to the environmental assessment.

K.7. Executive Order 12898 (Environmental Justice)

The FMCSA evaluated the environmental effects of the Proposed Action and alternatives in accordance with Executive Order 12898 and determined that there were no environmental justice issues associated with revising the hours of service regulations. Environmental justice issues would be raised if there were ''disproportionate'' and ''high and adverse impact'' on minority or low income populations. The FMCSA determined through the analyses documented in the Environmental Assessment in the docket prepared for this final rule that there were no high and adverse impacts associated with any of the alternatives. In addition, FMCSA analyzed the demographic makeup of the trucking industry potentially affected by the alternatives and determined that there was no disproportionate impact on minority or low-income populations. Low-income and minority populations historically have been and generally continue to be underrepresented in the trucking occupation. Given this level of low-income and minority representation and particularly in view of the previously referenced conclusion that there were no disproportionate and high or adverse impacts on any population sector associated with any of the alternatives considered in this rule, we ratify our preliminary conclusion in the NPRM that there are no environmental justice issues associated with revising the hours-of-service regulations. The Environmental Assessment provides a detailed analysis that was used to reach this conclusion.

K.8. Executive Order 13045 (Protection of Children)

Executive Order 13045, ''Protection of Children from Environmental Health Risks and Safety Risks'' (April 23, 1997, 62 FR 19885), requires that agencies issuing ''economically significant'' rules that also concern an environmental health or safety risk that an Agency has reason to state may disproportionately affect children, must include an evaluation of the environmental health and safety effects of the regulation on children. Section 5 of Executive Order 13045 directs an Agency to submit for a ''covered regulatory action'' an evaluation of its environmental health or safety effects on children.

The FMCSA evaluated the projected effects of this final rule and determined that there would be no environmental health risks or safety risks to children. This rule does not substantially impact

the total amount of freight being transported nationally and thus does not significantly impact overall air quality due to fuel emissions. This rule will, however, reduce the safety risk posed by tired, drowsy, or fatigued drivers of CMVs. These safety risk improvements would accrue to children and adults equally.

K.9. Executive Order 12988 (Civil Justice Reform)

This action meets applicable standards in sections 3(a) and 3(b)(2) of Executive Order 12988, Civil Justice Reform, to minimize litigation, eliminate ambiguity, and reduce burden.

K.10. Executive Order 12630 (Taking of Private Property)

This rule will not effect a taking of private property or otherwise have taking implications under Executive Order 12630, Governmental Actions and Interference with Constitutionally Protected Property Rights.

K.11. Executive Order 13132 (Federalism)

This action has been analyzed in accordance with the principles and criteria contained in Executive Order 13132. The FMCSA has determined this rule does not have a substantial direct effect on States, nor would it limit the policymaking discretion of the States. Nothing in this document preempts any State law or regulation. A State that fails to adopt the new amendments in this final rule within three years of the effective date of this rule, will be deemed to have incompatible regulations and will not be eligible for Basic Program nor Incentive Funds in accordance with 49 CFR 350.335(b).

K.12. Executive Order 12372 (Intergovernmental Review)

Catalog of Federal Domestic Assistance Program Number or 20.217, Motor Carrier Safety. The regulations implementing Executive Order 12372 regarding intergovernmental consultation on Federal programs and activities do not apply to this program.

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List of Subjects

49 CFR Part 385

Administrative practice and procedure, Highway safety, Motor carriers, Motor vehicle safety, Reporting and recordkeeping requirements.

49 CFR Part 390

Highway safety, Intermodal transportation, Motor carriers, Motor vehicle safety, Reporting and recordkeeping requirements.

49 CFR Part 395

Highway safety, Motor carriers, Reporting and recordkeeping requirements.

n In consideration of the foregoing, FMCSA amends 49 CFR, chapter III, parts 385, 390, and 395 as set forth below:

PART 385—SAFETY FITNESS PROCEDURES

n 1. The authority citation for part 385 continues to read as follows:

Authority: 49 U.S.C. 113, 504, 521(b), 5105(e), 5109, 5113, 13901–13905, 31136, 31144, 31148, and 31502; Sec. 350 of Pub. L. 107–87; and 49 CFR 1.73.

n 2. Amend appendix B to part 385 as follows:

n a. Revise section II.(c) as follows;

n b. Amend section VII as follows:

(i) Revise the citations and text for §§ 395.1(h)(1)(i) through (h)(1)(iv) and 395.3(a)(1) through 395.3(b)(2) as follows; and

(ii) Revise the citations and text for §§ 395.1(h)(2)(i) through (h)(2)(iv), 395.1(o), and 395.3(c)(1) through 395.5(b)(2) as follows:

Appendix B to Part 385 Explanation of Safety Rating Process

* * * * *

II. Converting CR Information Into a Safety Rating

* * * * *

(c) Critical regulations are those identified as such where noncompliance relates to management and/or operational controls. These are indicative of breakdowns in a carrier's management controls. An example of a critical regulation is § 395.3(a)(1), requiring or permitting a property-carrying commercial motor vehicle driver to drive more than 11 hours.

* * * * *

VII. List of Acute and Critical Regulations.

* * * * *

§ 395.1(h)(1)(i) Requiring or permitting a property-carrying commercial motor vehicle driver to drive more than 15 hours (Driving in Alaska) (critical).

§ 395.1(h)(1)(ii) Requiring or permitting a property-carrying commercial motor vehicle driver to drive after having been on duty 20 hours (Driving in Alaska) (critical).

§ 395.1(h)(1)(iii) Requiring or permitting a property-carrying commercial motor vehicle driver to drive after having been on duty more than 70 hours in 7 consecutive days (Driving in Alaska) (critical).

§ 395.1(h)(1)(iv) Requiring or permitting a property-carrying commercial motor vehicle driver to drive after having been on duty more than 80 hours in 8 consecutive days (Driving in Alaska) (critical).

§ 395.1(h)(2)(i) Requiring or permitting a passenger-carrying commercial motor vehicle driver to drive more than 15 hours (Driving in Alaska) (critical).

§ 395.1(h)(2)(ii) Requiring or permitting a passenger-carrying commercial motor vehicle driver to drive after having been on duty 20 hours (Driving in Alaska) (critical).

§ 395.1(h)(2)(iii) Requiring or permitting a passenger-carrying commercial motor vehicle driver to drive after having been on duty more than 70 hours in 7 consecutive days (Driving in Alaska) (critical).

§ 395.1(h)(2)(iv) Requiring or permitting a passenger-carrying commercial motor vehicle driver to drive after having been on duty more than 80 hours in 8 consecutive days (Driving in Alaska) (critical).

§ 395.1(o) Requiring or permitting a property-carrying commercial motor vehicle driver to drive after having been on duty 16 consecutive hours (critical).

§ 395.3(a)(1) Requiring or permitting a property-carrying commercial motor vehicle driver to drive more than 11 hours (critical).

§ 395.3(a)(2) Requiring or permitting a property-carrying commercial motor vehicle driver to drive after the end of the 14th hour after coming on duty (critical).

§ 395.3(b)(1) Requiring or permitting a property-carrying commercial motor vehicle driver to drive after having been on duty more than 60 hours in 7 consecutive days (critical).

§ 395.3(b)(2) Requiring or permitting a property-carrying commercial motor vehicle driver to drive after having been on duty more than 70 hours in 8 consecutive days (critical).

§ 395.3(c)(1) Requiring or permitting a property-carrying commercial motor vehicle driver to restart a period of 7 consecutive days without taking an off-duty period of 34 or more consecutive hours (critical).

§ 395.3(c)(2) Requiring or permitting a property-carrying commercial motor vehicle driver to restart a period of 8 consecutive days without taking an off-duty period of 34 or more consecutive hours (critical).

§ 395.5(a)(1) Requiring or permitting a passenger-carrying commercial motor vehicle driver to drive more than 10 hours (critical).

§ 395.5(a)(2) Requiring or permitting a passenger-carrying commercial motor vehicle driver to drive after having been on duty 15 hours (critical).

§ 395.5(b)(1) Requiring or permitting a passenger-carrying commercial motor vehicle driver to drive after having been on duty more than 60 hours in 7 consecutive days (critical).

§ 395.5(b)(2) Requiring or permitting a passenger-carrying commercial motor vehicle driver to drive after having been on duty more than 70 hours in 8 consecutive days (critical).

* * * * *

PART 390—FEDERAL MOTOR CARRIER SAFETY REGULATIONS; GENERAL

n 3. The authority citation for part 390 is revised to read as follows:

Authority: 49 U.S.C. 508, 13301, 13902, 31133, 31136, 31502, 31504, and sec. 204, Pub. L. 104–88, 109 Stat. 803, 941 (49 U.S.C. 701 note); sec. 114, Pub. L. 103–311, 108 Stat. 1673, 1677; sec. 217, Pub. L. 106–159, 113 Stat. 1748, 1767; and 49 CFR 1.73.

n 4. Revise paragraphs (b) and (c) of § 390.23 to read as follows:

§ 390.23 Relief from regulations.

* * * * *

(b) Upon termination of direct assistance to the regional or local emergency relief effort, the motor carrier or driver is subject to the requirements of parts 390 through 399 of this chapter, with the following exception: A driver may return empty to the motor carrier's terminal or the driver's normal work reporting location without complying with parts 390 through 399 of this chapter. However, a driver who informs the motor carrier that he or she needs immediate rest must be permitted at least 10 consecutive hours off duty before the driver is required to return to such terminal or location. Having returned to the terminal or other location, the driver must be relieved of all duty and responsibilities. Direct assistance terminates when a driver or commercial motor vehicle is used in interstate commerce to transport cargo not destined for the emergency relief effort, or when the motor carrier dispatches such driver or commercial motor vehicle to another location to begin operations in commerce.

(c) When the driver has been relieved of all duty and responsibilities upon termination of direct assistance to a regional or local emergency relief effort, no motor carrier shall permit or require any driver used by it to drive nor shall any such driver drive in commerce until:

(1) The driver has met the requirements of §§ 395.3(a) and 395.5(a) of this chapter; and

(2) The driver has had at least 34 consecutive hours off-duty when:

(i) The driver has been on duty for more than 60 hours in any 7 consecutive days at the time the driver is relieved of all duty if the employing motor carrier does not operate every day in the week, or

(ii) The driver has been on duty for more than 70 hours in any 8 consecutive days at the time the driver is relieved of all duty if the employing motor carrier operates every day in the week.

PART 395—HOURS OF SERVICE OF DRIVERS

n 5. The authority citation for part 395 continues to read as follows:

Authority: 49 U.S.C. 504, 14122, 31133, 31136, and 31502; sec. 113, Pub. L. 103–311, 108 Stat. 1673, 1676; and 49 CFR 1.73.

n 6. Add § 395.0 to read as follows:

§ 395.0 Rescission.

Any regulations on hours of service of drivers in effect before April 28, 2003, which were amended or replaced by the final rule adopted on April 28, 2003 [69 FR 22456] are rescinded and not in effect.

n 7. Section 395.1 is amended by revising paragraphs (a)(1), (b)(1), (e), (g), (h), (j), (k), and (o) to read as follows:

§ 395.1 Scope of rules in this part.

* * * * *

(a) *General.* (1) The rules in this part apply to all motor carriers and drivers, except as provided in paragraphs (b) through (o) of this section.

* * * * *

(b) *Adverse driving conditions.* (1) Except as provided in paragraph (h)(2) of this section, a driver who encounters adverse driving conditions, as defined in § 395.2, and cannot, because of those conditions, safely complete the run within the maximum driving time permitted by §§ 395.3(a) or 395.5(a) may drive and be permitted or required to drive a commercial motor vehicle for not more than 2 additional hours in order to complete that run or to reach a place offering safety for the occupants of the commercial motor vehicle and security for the commercial motor vehicle and its cargo. However, that driver may not drive or be permitted to drive—

(i) For more than 13 hours in the aggregate following 10 consecutive hours off duty for drivers of property-carrying commercial motor vehicles;

(ii) After the end of the 14th hour since coming on duty following 10 consecutive hours off duty for drivers of property-carrying commercial motor vehicles;

(iii) For more than 12 hours in the aggregate following 8 consecutive hours off duty for drivers of passenger-carrying commercial motor vehicles; or

(iv) After he/she has been on duty 15 hours following 8 consecutive hours off duty for drivers of passenger-carrying commercial motor vehicles.

* * * * *

(e) *Short-haul operations*—(1) *100 air-mile radius driver.* A driver is exempt from the requirements of § 395.8 if:

(i) The driver operates within a 100 air-mile radius of the normal work reporting location;

(ii) The driver, except a driver-salesperson, returns to the work reporting location and is released from work within 12 consecutive hours;

(iii)(A) A property-carrying commercial motor vehicle driver has at least 10 consecutive hours off duty separating each 12 hours on duty;

(B) A passenger-carrying commercial motor vehicle driver has at least 8 consecutive hours off duty separating each 12 hours on duty;

(iv)(A) A property-carrying commercial motor vehicle driver does not exceed 11 hours maximum driving time following 10 consecutive hours off duty; or

(B) A passenger-carrying commercial motor vehicle driver does not exceed 10 hours maximum driving time following 8 consecutive hours off duty; and

(v) The motor carrier that employs the driver maintains and retains for a period of 6 months accurate and true time records showing:

(A) The time the driver reports for duty each day;

(B) The total number of hours the driver is on duty each day;

(C) The time the driver is released from duty each day; and

(D) The total time for the preceding 7 days in accordance with § 395.8(j)(2) for drivers used for the first time or intermittently.

(2) *Operators of property-carrying commercial motor vehicles not requiring a commercial driver's license.* Except as provided in this paragraph, a driver is exempt from the requirements of § 395.3 and § 395.8 and ineligible to use the provisions of § 395.1(e)(1), (g) and (o) if:

(i) The driver operates a property-carrying commercial motor vehicle for which a commercial driver's license is not required under part 383 of this subchapter;

(ii) The driver operates within a 150 air-mile radius of the location where the driver reports to and is released from work, *i.e.*, the normal work reporting location;

(iii) The driver returns to the normal work reporting location at the end of each duty tour;

(iv) The driver has at least 10 consecutive hours off duty separating each on-duty period;

(v) The driver does not drive more than 11 hours following at least 10 consecutive hours off duty;

(vi) The driver does not drive:

(A) After the 14th hour after coming on duty on 5 days of any period of 7 consecutive days; and

(B) After the 16th hour after coming on duty on 2 days of any period of 7 consecutive days;

(vii) The driver does not drive:

(A) After having been on duty for 60 hours in 7 consecutive days if the employing motor carrier does not operate commercial motor vehicles every day of the week;

(B) After having been on duty for 70 hours in 8 consecutive days if the employing motor carrier operates commercial motor vehicles every day of the week;

(viii) Any period of 7 or 8 consecutive days may end with the beginning of any off-duty period of 34 or more consecutive hours.

(ix) The motor carrier that employs the driver maintains and retains for a period of 6 months accurate and true time records showing:

(A) The time the driver reports for duty each day;

(B) The total number of hours the driver is on duty each day;

(C) The time the driver is released from duty each day;

(D) The total time for the preceding 7 days in accordance with § 395.8(j)(2) for drivers used for the first time or intermittently.

* * * * *

(g) *Sleeper berths*—(1) *Property-carrying commercial motor vehicle*—(i) *In General.* A driver who operates a property-carrying commercial motor vehicle equipped with a sleeper berth, as defined in §§ 395.2 and 393.76 of this subchapter, (A) Must, before driving, accumulate

(*1*) At least 10 consecutive hours off duty;

(*2*) At least 10 consecutive hours of sleeper-berth time;

(*3*) A combination of consecutive sleeper-berth and off-duty time amounting to at least 10 hours; or

(*4*) The equivalent of at least 10 consecutive hours off duty if the driver does not comply with paragraph (g)(1)(i)(A)(*1*), (*2*), or (*3*) of this section;

(B) May not drive more than 11 hours following one of the 10-hour off-duty periods specified in paragraph (g)(1)(i)(A)(*1*) through (*4*) of this section; and

(C) May not drive after the 14th hour after coming on duty following one of

the 10-hour off-duty periods specified in paragraph (g)(1)(i)(A)(*1*) through (*4*) of this section; and

(D) Must exclude from the calculation of the 14-hour limit any sleeper berth period of at least 8 but less than 10 consecutive hours.

(ii) *Specific requirements.*—The following rules apply in determining compliance with paragraph (g)(1)(i) of this section:

(A) The term ''equivalent of at least 10 consecutive hours off duty'' means a period of (*1*) At least 8 but less than 10 consecutive hours in a sleeper berth, and

(*2*) A separate period of at least 2 but less than 10 consecutive hours either in the sleeper berth or off duty, or any combination thereof.

(B) Calculation of the 11-hour driving limit includes all driving time; compliance must be re-calculated from the end of the first of the two periods used to comply with paragraph (g)(1)(ii)(A) of this section.

(C) Calculation of the 14-hour limit includes all time except any sleeper-berth period of at least 8 but less than 10 consecutive hours; compliance must be re-calculated from the end of the first of the two periods used to comply with the requirements of paragraph (g)(1)(ii)(A) of this section.

(2) *Specially trained driver of a specially constructed oil well servicing commercial motor vehicle at a natural gas or oil well location.* A specially trained driver who operates a commercial motor vehicle specially constructed to service natural gas or oil wells that is equipped with a sleeper berth, as defined in §§ 395.2 and 393.76 of this subchapter, or who is off duty at a natural gas or oil well location, may accumulate the equivalent of 10 consecutive hours off duty time by taking a combination of at least 10 consecutive hours of off-duty time, sleeper-berth time, or time in other sleeping accommodations at a natural gas or oil well location; or by taking two periods of rest in a sleeper berth, or other sleeping accommodation at a natural gas or oil well location, providing:

(i) Neither rest period is shorter than 2 hours;

(ii) The driving time in the period immediately before and after each rest period, when added together, does not exceed 11 hours;

(iii) The driver does not drive after the 14th hour after coming on duty following 10 hours off duty, where the 14th hour is calculated:

(A) By excluding any sleeper berth or other sleeping accommodation period of at least 2 hours which, when added to a subsequent sleeper berth or other sleeping accommodation period, totals at least 10 hours, and

(B) By including all on-duty time, all off-duty time not spent in the sleeper berth or other sleeping accommodations, all such periods of less than 2 hours, and any period not described in paragraph (g)(2)(iii)(A) of this section; and

(iv) The driver may not return to driving subject to the normal limits under § 395.3 without taking at least 10 consecutive hours off duty, at least 10 consecutive hours in the sleeper berth or other sleeping accommodations, or a combination of at least 10 consecutive hours off duty, sleeper berth time, or time in other sleeping accommodations.

(3) Passenger-carrying commercial motor vehicles. A driver who is driving a passenger-carrying commercial motor vehicle that is equipped with a sleeper berth, as defined in §§ 395.2 and 393.76 of this subchapter, may accumulate the equivalent of 8 consecutive hours of off-duty time by taking a combination of at least 8 consecutive hours off-duty and sleeper berth time; or by taking two periods of rest in the sleeper berth, providing:

* * * * *

(h) *State of Alaska*—(1) *Property-carrying commercial motor vehicle.* The provisions of § 395.3(a) and (b) do not apply to any driver who is driving a commercial motor vehicle in the State of Alaska. A driver who is driving a property-carrying commercial motor vehicle in the State of Alaska must not drive or be required or permitted to drive—

(i) More than 15 hours following 10 consecutive hours off duty; or

(ii) After being on duty for 20 hours or more following 10 consecutive hours off duty.

(iii) After having been on duty for 70 hours in any period of 7 consecutive days, if the motor carrier for which the driver drives does not operate every day in the week; or

(iv) After having been on duty for 80 hours in any period of 8 consecutive days, if the motor carrier for which the driver drives operates every day in the week.

(2) *Passenger-carrying commercial motor vehicle.* The provisions of § 395.5 do not apply to any driver who is driving a passenger-carrying commercial motor vehicle in the State of Alaska. A driver who is driving a passenger-carrying commercial motor vehicle in the State of Alaska must not drive or be required or permitted to drive—

(i) More than 15 hours following 8 consecutive hours off duty;

(ii) After being on duty for 20 hours or more following 8 consecutive hours off duty;

(iii) After having been on duty for 70 hours in any period of 7 consecutive days, if the motor carrier for which the driver drives does not operate every day in the week; or

(iv) After having been on duty for 80 hours in any period of 8 consecutive days, if the motor carrier for which the driver drives operates every day in the week.

(3) A driver who is driving a commercial motor vehicle in the State of Alaska and who encounters adverse driving conditions (as defined in § 395.2) may drive and be permitted or required to drive a commercial motor vehicle for the period of time needed to complete the run.

(i) After a property-carrying commercial motor vehicle driver completes the run, that driver must be off duty for at least 10 consecutive hours before he/she drives again; and

(ii) After a passenger-carrying commercial motor vehicle driver completes the run, that driver must be off duty for at least 8 consecutive hours before he/she drives again.

* * * * *

(j) *Travel time*—(1) When a property-carrying commercial motor vehicle driver at the direction of the motor carrier is traveling, but not driving or assuming any other responsibility to the carrier, such time must be counted as on-duty time unless the driver is afforded at least 10 consecutive hours off duty when arriving at destination, in which case he/she must be considered off duty for the entire period.

(2) When a passenger-carrying commercial motor vehicle driver at the direction of the motor carrier is traveling, but not driving or assuming any other responsibility to the carrier, such time must be counted as on-duty time unless the driver is afforded at least 8 consecutive hours off duty when arriving at destination, in which case he/she must be considered off duty for the entire period.

(k) *Agricultural operations.* The provisions of this part shall not apply to drivers transporting agricultural commodities or farm supplies for agricultural purposes in a State if such transportation:

(1) Is limited to an area within a 100 air-mile radius from the source of the commodities or the distribution point for the farm supplies, and

(2) Is conducted during the planting and harvesting seasons within such State, as determined by the State.

* * * * *

(o) *Property-carrying driver.* A property-carrying driver is exempt from the requirements of § 395.3(a)(2) if:

(1) The driver has returned to the driver's normal work reporting location and the carrier released the driver from duty at that location for the previous five duty tours the driver has worked;

(2) The driver has returned to the normal work reporting location and the carrier releases the driver from duty within 16 hours after coming on duty following 10 consecutive hours off duty; and

(3) The driver has not taken this exemption within the previous 6 consecutive days, except when the driver has begun a new 7- or 8-consecutive day period with the beginning of any off-duty period of 34 or more consecutive hours as allowed by § 395.3(c).

n 8. Section 395.3 is revised to read as follows:

§ 395.3 Maximum driving time for property-carrying vehicles.

Subject to the exceptions and exemptions in § 395.1:

(a) No motor carrier shall permit or require any driver used by it to drive a property-carrying commercial motor vehicle, nor shall any such driver drive a property-carrying commercial motor vehicle:

(1) More than 11 cumulative hours following 10 consecutive hours off duty; or

(2) For any period after the end of the 14th hour after coming on duty following 10 consecutive hours off duty, except when a property-carrying driver complies with the provisions of § 395.1(o) or § 395.1(e)(2).

(b) No motor carrier shall permit or require a driver of a property-carrying commercial motor vehicle to drive, nor shall any driver drive a property-carrying commercial motor vehicle, regardless of the number of motor carriers using the driver's services, for any period after—

(1) Having been on duty 60 hours in any period of 7 consecutive days if the employing motor carrier does not operate commercial motor vehicles every day of the week; or

(2) Having been on duty 70 hours in any period of 8 consecutive days if the employing motor carrier operates commercial motor vehicles every day of the week.

(c)(1) Any period of 7 consecutive days may end with the beginning of any off-duty period of 34 or more consecutive hours; or

(2) Any period of 8 consecutive days may end with the beginning of any off-duty period of 34 or more consecutive hours.

n 9. Section 395.5 is revised to read as follows:

§ 395.5 Maximum driving time for passenger-carrying vehicles.

Subject to the exceptions and exemptions in § 395.1:

(a) No motor carrier shall permit or require any driver used by it to drive a passenger-carrying commercial motor vehicle, nor shall any such driver drive a passenger-carrying commercial motor vehicle:

(1) More than 10 hours following 8 consecutive hours off duty; or

(2) For any period after having been on duty 15 hours following 8 consecutive hours off duty.

(b) No motor carrier shall permit or require a driver of a passenger-carrying commercial motor vehicle to drive, nor shall any driver drive a passenger-carrying commercial motor vehicle, regardless of the number of motor carriers using the driver's services, for any period after—

(1) Having been on duty 60 hours in any 7 consecutive days if the employing motor carrier does not operate commercial motor vehicles every day of the week; or

(2) Having been on duty 70 hours in any period of 8 consecutive days if the employing motor carrier operates commercial motor vehicles every day of the week.

n 10. Section 395.13 paragraphs (c)(1)(ii) and (d)(2) are revised to read as follows:

§ 395.13 Drivers declared out of service.

* * * * *

(c) * * *

(1) * * *

(i) * * *

(ii) Require a driver who has been declared out of service for failure to prepare a record of duty status to operate a commercial motor vehicle until that driver has been off duty for the appropriate number of consecutive hours required by this part and is in compliance with this section. The appropriate consecutive hours off-duty may include sleeper berth time.

* * * * *

(d) * * *

(1) * * *

(2) No driver who has been declared out of service, for failing to prepare a record of duty status, shall operate a commercial motor vehicle until the driver has been off duty for the appropriate number of consecutive hours required by this part and is in compliance with this section.

n 11. Section 395.15(j)(2)(ii) is revised to read as follows:

§ 395.15 Automatic on-board recording devices.

* * * * *

(j) * * *

(2) * * *

(i) * * *

(ii) The motor carrier has required or permitted a driver to establish, or the driver has established, a pattern of exceeding the hours of service limitations of this part;

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Issued on: August 16, 2005.

Annette M. Sandberg,

Administrator.

[FR Doc. 05–16498 Filed 8–19–05; 12:00 pm]

BILLING CODE 4910–EX–P