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INDUSTRIAL ENERGY CONSERVATION

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HEARINGS

BEFORE THE

SUBCOMMITTEE ON ENERGY AND POWER

OF THE

COMMITTEE ON

INTERSTATE AND FOREIGN COMMERCE

HOUSE OF REPRESENTATIVES

NINETY-FIFTH CONGRESS

FIRST SESSION

ON

H.R. 8985

A BILL TO AMEND THE ENERGY POLICY AND CONSERVATION
ACT TO PROVIDE FOR THE ESTABLISHMENT OF ENERGY
EFFICIENCY STANDARDS FOR ELECTRIC MOTORS AND PUMPS,
AND FOR OTHER PURPOSES

SEPTEMBER 27 AND 29, 1977

Serial No. 95-85

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Committee on Interstate and Foreign Commerce



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INDUSTRIAL ENERGY CONSERVATION

TUESDAY, SEPTEMBER 27, 1977

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENERGY AND POWER,
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Washington, D.C.

The subcommittee met at 2:15 p.m., pursuant to notice, in room 2322, Rayburn House Office Building, Hon. John D. Dingell (chairman) presiding.

Mr. DINGELL. The subcommittee will come to order.

This afternoon we begin 2 days of hearing on industrial energy conservation, a subject which I believe has received too little attention within the executive branch.

Back in March, the administration was talking seriously about mandatory conservation targets for industry. There was also discussion of efficiency standards for industrial equipment. I understand that, at one point, a draft of the national energy bill contained provisions establishing energy efficiency standards for industrial equipment. But Treasury, OMB, and Commerce reportedly objected, so they were dropped.

However, I understand that the administration has reconsidered that view and now fully supports legislation to improve industrial equipment efficiency as well as legislation to improve the industrial energy reporting program. In particular, the administration supports the Metzenbaum and Kennedy amendments in the Senate version of the energy bill. I am pleased to learn of this new position and commend Secretary Schlesinger and our old friend Mr. O'Leary for their efforts in achieving this support.

The omission of proposals to improve industrial equipment efficiency was particularly glaring given the fact that industrial and commercial uses of electric motors, pumps, and compressors account for 4 million barrels of oil equivalent per day. That is just about 25 percent of our oil use.

I think a significant portion of this energy can be saved. I do not want it to be said that industry has not been trying to save energy. On the contrary, they have. But I believe that more can be done than to leave it solely to the influence of price increases of fuels, particularly in industries where energy is not a major cost factor.

A report prepared for the Federal Energy Administration recommended mandatory labeling of electric motors. I introduced a bill, H.R. 8985, which requires the Department of Energy to establish test procedures, labeling rules, and energy efficiency standards for electric motors and pumps. Similar provisions are included in the conservation bill recently passed by the Senate.

Another reason for the Government's inability to provide tough industrial conservation measures has been a woeful lack of solid information. Although the Energy Policy and Conservation Act of 1975 established a reporting program to provide Congress with just such information, the reports have been completely inadequate for purposes of identifying particular measures for conservation.

This system of reporting has resulted in little useful energy data for the FEA or the Congress. In part, this program has been a failure because of the use of third-party reporting by trade associations. For the most part, such associations have their own reporting forms, small staffs, and in some cases their bylaws preclude their maintaining company specific data. The data received is often garbled. There has also been a failure on the part of FEA to fully interpret EPCA and utilize all authority thereunder and to make such associations overcome these problems or disapprove reporting by them. The FEA has no inclination to take such actions to date. We will ask why.

The Kennedy amendment is designed to eliminate reporting by trade associations. The Subcommittee on Oversight and Investigations has been examining this program, and its distinguished chairman, and my very dear friend, the Honorable John E. Moss, will begin our hearings with an overview of the subject and the findings of his subcommittee's investigation.

Before doing so, I wish to observe that FEA's testimony was not submitted to our subcommittee within the time frame established in our letter and pursuant to the rules of the committee. In fact, as of 11:45 a.m., the statement was still not provided to the subcommittee office.

The ERDA statement was cleared by OMB and provided yesterday, although OMB in some curious fashion sought to have it changed today. It is the hope of the Chair that that situation will not occur again.

[Testimony resumes on p. 22.]

[The text of H.R. 8985 follows:]

95TH CONGRESS
1ST SESSION

H. R. 8985

IN THE HOUSE OF REPRESENTATIVES

SEPTEMBER 8, 1977

Mr. DINGELL introduced the following bill; which was referred to the Committee on Interstate and Foreign Commerce

A BILL

To amend the Energy Policy and Conservation Act to provide for the establishment of energy efficiency standards for electric motors and pumps, and for other purposes.

- 1 *Be it enacted by the Senate and House of Representa-*
- 2 *tives of the United States of America in Congress assembled,*
- 3 That title III of the Energy Policy and Conservation Act,
- 4 relating to improving energy efficiency, is amended by re-
- 5 designating parts C, D, and E as parts D, E, and F, re-
- 6 spectively, and by inserting after part B the following new
- 7 part:

1 "PART C—CERTAIN INDUSTRIAL EQUIPMENT

2 "DEFINITIONS

3 "SEC. 340. For purposes of this part—

4 "(1) The term 'electric motor or pump' means
5 any electric motor or pump or a type—

6 "(A) which in operation consumes, or is
7 designed to consume, energy;

8 "(B) which to any significant extent, is distrib-
9 uted in commerce for industrial or commercial use;
10 and

11 "(C) which is not a 'covered product' as
12 defined in section 321 (a) (2), other than a compo-
13 nent of a covered product with respect to which
14 there is in effect a determination under section
15 341 (c) ;

16 without regard to whether such motor or pump is
17 in fact distributed in commerce for industrial or
18 commercial use.

19 "(2) The term 'covered equipment' means one of
20 the following types of industrial equipment:

21 "(A) electric motors; and

22 "(B) pumps.

23 "(3) The term 'energy efficiency' means the ratio
24 of the useful output of services from an article of covered
25 equipment to the energy used by such article, deter-

1 mined in accordance with test procedures under section
2 343.

3 “(4) The term ‘energy use’ means the quantity
4 of energy directly consumed by an article of covered
5 equipment at point of use, determined in accordance with
6 test procedures under section 343.

7 “(5) The term ‘energy efficiency standard’ means a
8 performance standard prescribed under section 345
9 which sets forth a minimum level of energy efficiency
10 for a type (or class) of covered equipment.

11 “(6) The term ‘manufacturer’ means any person
12 who manufactures covered equipment.

13 “(7) The terms ‘energy’, ‘manufacture’, ‘import’,
14 ‘importation’, ‘distribute in commerce’, ‘distribution in
15 commerce’, and ‘commerce’ have the same meaning as
16 is given such terms in section 321.

17 “REQUIREMENTS FOR ELECTRIC MOTORS AND PUMPS

18 “SEC. 341. (a) Not later than 3 years after the date
19 of the enactment of this section, the Administrator shall
20 prescribe, by rule, for electric motors and pumps (or classes
21 thereof) —

22 “(1) test procedures, in accordance with section
23 343,

24 “(2) labeling requirements, in accordance with
25 section 344, and

1 “(3) energy efficiency standards, in accordance
2 with section 345.

3 “(b) The Administrator may, by rule, establish classes
4 of electric motors and pumps, taking into account the size,
5 function, type of energy consumed, method of manufac-
6 ture, energy efficiency, methods and procedures, if any, for
7 determining energy efficiency, and other factors which he
8 determines appropriate.

9 “(c) The Administrator may, by rule, include within
10 the meaning of electric motors or pumps, as the case may
11 be, any class of electric motors or pumps which are com-
12 ponent parts of consumer products, if he determines that
13 a significant portion of such class is manufactured and sold
14 in interstate commerce other than as component parts for
15 consumer products.

16 “(d) The Administrator may, by rule, exclude from the
17 application of any of the requirements of subsection (a), any
18 class of electric motors or pumps, if he determines that—

19 “(A) significant energy savings will not be likely
20 to result from the imposition of such requirements, or

21 “(B) a test procedure which meets the require-
22 ments of section 343 cannot be developed.

23 “STUDY OF OTHER INDUSTRIAL EQUIPMENT

24 “SEC. 342. (a) Not later than 3 years after the date of
25 the enactment of this part, the Administrator shall—

1 “(1) conduct a study of the practicability and
2 effects of requiring equipment described in subsection
3 (b) to be included as covered equipment for purposes
4 of—

5 “(A) test procedure requirements under sec-
6 tion 343,

7 “(B) labeling requirements under section 344,
8 and

9 “(C) energy efficiency standards under section
10 345; and

11 “(2) submit a report to the Congress on the results
12 of such study, together with his recommendations for
13 legislation under which all or a portion of such equip-
14 ment would be subject to such standards and require-
15 ments.

16 In conducting the study under paragraph (1), the Adminis-
17 trator shall provide an opportunity for interested persons (in-
18 cluding manufacturers and users of such covered equipment)
19 to present written data, comments, and views and, if and to
20 the extent the Administrator deems appropriate, to present
21 oral views.

22 “(b) The types of equipment which are described in
23 this subsection are the following: motors (other than elec-
24 tric motors), compressors, fans and blowers, refrigeration
25 equipment, air-conditioning equipment, electric lighting

1 equipment (including bulbs, fluorescent tubes, or other com-
2 ponent parts thereof), electric arc equipment, ovens, fur-
3 naces, and kilns, evaporators and dryers, and such other
4 equipment as the Administrator deems appropriate to be
5 included in the study under subsection (a) (1).

6

"TEST PROCEDURES

7 "SEC. 343. (a) A test procedure prescribed in accord-
8 ance with this section shall be reasonably designed to pro-
9 duce test results which reflect energy efficiency, energy use
10 and estimated operating costs of a type of industrial equip-
11 ment (or class thereof) during a representative average
12 use cycle (as determined by the Administrator), and shall
13 not be unduly burdensome to conduct.

14 "(b) If the test procedure is a procedure for determin-
15 ing estimated annual operating costs, such procedure shall
16 provide that such costs shall be calculated from measurements
17 of energy use in a representative average-use cycle (as de-
18 termined by the Administrator), and from representative
19 average unit costs of the energy needed to operate such
20 equipment during such cycle. The Administrator shall pro-
21 vide information to manufacturers respecting representative
22 average unit costs of energy.

23

"LABELING REQUIREMENTS

24 "SEC. 344. (a) A labeling rule prescribed in accord-
25 ance with this section shall require that each article of

1 covered equipment which is in the type (or class) of indus-
2 trial equipment to which such rule applies, discloses, by
3 label or other method determined appropriate by the Admin-
4 istrator, the energy efficiency of such article, determined in
5 accordance with test procedures under section 343. Such rule
6 may also require that such disclosure include the estimated
7 operating costs and energy use, determined in accordance
8 with test procedures under section 343.

9 “(b) A rule prescribed in accordance with this section
10 may include such requirements as the Administrator deter-
11 mines are likely to assist purchasers in making purchasing
12 decisions, including—

13 “(1) requirements and directions for display of any
14 label,

15 “(2) requirements for including on any label, or
16 separately attaching to, or shipping with, the covered
17 equipment, such additional information relating to
18 energy efficiency, energy use, and other measures of
19 energy consumption, including instructions for the main-
20 tenance, use, or repair of the covered product, as the
21 Administrator determines necessary to provide adequate
22 information to purchasers, and

23 “(3) requirements that printed matter which is
24 displayed or distributed at the point of sale of such
25 equipment shall disclose such information as may be

1 required under this section to be disclosed on the label
2 of such equipment.

3 “(d) Before prescribing any labeling rules for a type
4 (or class) of covered equipment, the Administrator shall
5 consult with, and obtain the written views of, the Federal
6 Trade Commission with respect to such rules. The Federal
7 Trade Commission shall promptly provide such written views
8 upon the request of the Administrator.

9 “(e) When requested by the Administrator, the manu-
10 facturer of industrial equipment to which a rule under this
11 section applies shall supply at his expense a reasonable num-
12 ber of articles of such covered equipment to any laboratory
13 or testing facility designated by the Administrator, or permit
14 representatives of such laboratory or facility to test such
15 equipment at the site where it is located, for purposes of
16 ascertaining whether the information set out on the label, or
17 otherwise required to be disclosed, as required under this
18 section, is accurate. Any reasonable charge levied by the
19 laboratory or facility for such testing shall be borne by the
20 United States.

21 “(f) A labeling rule under this section shall not apply
22 to any article of covered equipment the manufacture of
23 which was completed before the effective date of such rule.

24 “(g) Until such time as labeling rules under this section
25 take effect with respect to a type (or class) of covered equip-

1 ment, this section shall not affect any authority of the
2 Commission under the Federal Trade Commission Act to
3 require labeling with respect to energy consumption of such
4 type (or class) of covered equipment.

5 "ENERGY EFFICIENCY STANDARDS

6 "SEC. 345. (a) Energy efficiency standards for a type
7 (or class) of covered equipment prescribed in accordance
8 with this section shall be designed to achieve the maximum
9 improvement in energy efficiency which the Administrator
10 determines is technologically feasible and economically jus-
11 tified. Such standards may be phased in over a period not
12 to exceed 5 years through the use of interim standards.

13 "(b) In determining whether a standard is economically
14 justified under subsection (a), the Administrator shall con-
15 sider, after receiving any views and comments furnished with
16 respect to the proposed standard—

17 "(1) the economic impact of the standard on the
18 manufacturers and on the purchasers of the covered
19 equipment subject to such standard,

20 "(2) the savings in operating costs throughout the
21 estimated average life of the type (or class) of covered
22 equipment subject to such standard which is likely to
23 result from the imposition of such standard,

24 "(3) the total energy savings likely to result di-
25 rectly from the imposition of the standard,

1 “(4) any increase in the initial charge for, and the
2 expenses of maintenance, repair, or use, of such covered
3 equipment which is likely to result from the imposition
4 of the standard,

5 “(5) any lessening of the utility or the performance
6 of the covered equipment likely to result from the
7 imposition of the standard,

8 “(6) the impact of any lessening of competition
9 determined in writing by the Attorney General to be
10 likely to result from the imposition of the standard, and

11 “(7) any other factors the Administrator considers
12 relevant.

13 For purposes of paragraph (6), the Attorney General shall,
14 not later than 120 days after the publication of a proposed
15 rule prescribing an energy efficiency standard, make an esti-
16 mate of the impact, if any, from any lessening of competition
17 which would be likely to result from such standard and trans-
18 mit such determination in writing to the Administrator,
19 together with an analysis of the nature and extent of such
20 impact. Any such estimate and analysis shall be published in
21 the Federal Register.

22 “(c) A rule pursuant to subsection (a) may exempt
23 from its requirements manufacturers of covered equipment—

24 “(1) who are small businesses, as determined by the
25 Administrator after consultation with the Small Business
26 Administration, and

4 “(d) An energy efficiency standard prescribed under
5 this section shall include test procedures prescribed in ac-
6 cordance with section 343, and may include any requirement
7 which the Administrator determines is necessary to assure
8 that each article of covered equipment to which such stand-
9 ard applies meets the required minimum level of energy
10 efficiency specified in such standard.

13 "SEC. 346. (a) Except to the extent otherwise pro-
14 vided, rules under this part shall be prescribed in accordance
15 with section 553 of title 5, United States Code, except that
16 interested persons shall be afforded an opportunity to pre-
17 sent written and oral data, views, and arguments with
18 respect to any proposed rule.

21 “(1) The Administrator shall, by means of conferences
22 or other informal procedures, afford any interested person
23 an opportunity to question—

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1 “(B) employees of the United States who have
2 made written or oral presentations,
3 with respect to disputed issues of material fact. Such op-
4 portunity shall be afforded to the extent the Administrator
5 determines that questioning pursuant to such procedures is
6 likely to result in a more timely and effective resolution of
7 such issues. A transcript shall be kept of any oral presenta-
8 tion made under this part.

9 “(2) The Administrator shall (A) publish an advance
10 notice of proposed rulemaking which specifies the type (or
11 class) of covered equipment to which the rule will apply,
12 and (B) invite interested persons to submit, within 45 days
13 after the date of publication of such advance notice, written
14 presentations of data, views, and arguments relevant to the
15 establishing of such an energy efficiency standard.

16 “(3) A proposed rule which prescribes an energy
17 efficiency standard for a type (or class) of covered equip-
18 ment may not be published earlier than 60 days after the
19 date of publication of advance notice of proposed rulemaking
20 for such type (or class). The Administrator shall determine
21 the maximum improvement in energy efficiency which is
22 technologically feasible for each type (or class) of covered
23 equipment in prescribing such standard and if such standard
24 is not designed to achieve such efficiency, the Administrator
25 shall state in the proposed rule the reasons therefor. After the

1 publication of such proposed rulemaking, the Administrator
2 shall afford interested persons, during a period of not less
3 than 45 days, an opportunity to present oral and written
4 comments (including an opportunity to question those who
5 make such presentations, as provided in paragraph (1)) on
6 matters relating to such proposed rule, including—

7 “(A) whether the standard to be prescribed is eco-
8 nomically justified (taking into account those factors
9 which the Administrator must consider under section
10 345);

11 “(B) whether the standard will achieve the maxi-
12 mum improvement in energy efficiency which is techno-
13 logically feasible; and

14 “(C) if the standard will not achieve such improve-
15 ment, whether the reasons for not achieving such im-
16 provement are adequate.

17 “(4) A rule prescribing an energy efficiency standard
18 for a type (or class) of covered equipment may not be pub-
19 lished earlier than 60 days after the date of publication of the
20 proposed rule under this section for such type (or class),
21 except that such rule shall be published as soon as practicable
22 after publication of the advanced notice. Such rule shall take
23 effect not earlier than 180 days after the date of its publica-
24 tion in the Federal Register. Such rule (or any amendment
25 thereto) shall not apply to any covered equipment the

1 manufacture of which was completed before the effective
2 date of the rule or amendment as the case may be.

3 “(c) (1) It shall be unlawful for any manufacturer to
4 distribute in commerce any new covered equipment which
5 is not in conformity with a rule promulgated under this part.
6 For purposes of this paragraph, the term ‘new covered equip-
7 ment’ means covered equipment the title to which has not
8 passed to a purchaser who buys such equipment for pur-
9 poses other than (A) reselling such equipment, or (B)
10 leasing such equipment for a period in excess of one year.

11 “(2) Effective 90 days after a test procedure ap-
12 plicable to a type (or class) of covered equipment is pre-
13 scribed under this part, no manufacturer, distributor, or re-
14 tailer, may make any representation—

15 “(A) in writing (including a representation on a
16 label), or

17 “(B) in any broadcast advertisement,
18 respecting the energy consumption of such equipment or cost
19 of energy consumed by such equipment, unless such equip-
20 ment has been tested in accordance with such test procedure
21 and such representation fairly discloses the results of such
22 testing.

23 “(d) Any person who violates subsection (c) shall be
24 subject to a civil penalty of not more than \$1,000 for each
25 violation. Such penalties shall be assessed by the Admin-

1 istrator. Civil penalties assessed under this part may be
2 compromised by the Administrator, taking into account the
3 nature and degree of the violation and the impact of the
4 penalty upon a particular respondent.

5 “(e) The United States district courts shall have juris-
6 diction to restrain (1) any violation of subsection (c) and
7 (2) any person from distributing in commerce any covered
8 equipment which does not comply with an applicable rule
9 under this part. Any such action may be brought by the
10 Administrator in any United States district court for a dis-
11 trict wherein any act, omission, or transaction constituting
12 the violation occurred, or in such court for the district
13 wherein the defendant is found or transacts business. In any
14 action under this section process may be served on a defend-
15 ant in any other district in which the defendant resides or
16 may be found.

17 “(f) The requirements of this part with respect to stand-
18 ards or labeling shall not apply to an article of covered
19 equipment if—

20 (1) such article is manufactured, sold, or held for
21 sale for export from the United States (or such article
22 was imported for export), unless such article is in fact
23 distributed in commerce for use in the United States, and
24 “(2) such article when distributed in commerce, or
25 any container in which it is enclosed when so distributed,

1 bears a stamp or label stating that such article is in-
2 tended for export.

3 “(g) Any article of covered equipment offered for
4 importation in violation of subsection (c) shall be refused
5 admission into the customs territory of the United States
6 under rules issued by the Secretary of the Treasury, except
7 that the Secretary of the Treasury may, by such rules,
8 authorize the importation of such covered equipment on
9 such terms and conditions (including the furnishing of a
10 bond) as may appear to him appropriate to insure that such
11 covered equipment will not be in violation of subsection (c)
12 or will be exported from or abandoned to the United States.
13 The Secretary of the Treasury shall prescribe rules to im-
14 plement this section within 180 days after the date of the
15 enactment of this Act.

16 “(h) For purposes of carrying out his responsibilities
17 under this section, the Administrator may require, under
18 authority otherwise available to him, each manufacturer of
19 covered equipment to submit such information or reports of
20 any kind or nature directly to the Administrator with respect
21 to energy efficiency of such covered equipment, and with
22 respect to the economic impact of any proposed energy ef-
23 ficiency standard, as the Administrator determines may be
24 necessary to establish test procedures and energy efficiency
25 standards for such equipment and to insure compliance with

1 the requirements of this part. The provisions of section 11
2 (d) of the Energy Supply and Environmental Coordination
3 Act of 1974 shall apply with respect to information obtained
4 under this subsection to the same extent and in the same
5 manner as it applies with respect to energy information ob-
6 tained under section 11 of such Act.

7 “(i) The National Bureau of Standards shall provide, to
8 the maximum extent practicable, whatever assistance may be
9 requested by the Administrator to carry out his responsibili-
10 ties under this part, including developing and recommending
11 test procedures to the Administrator.

12 “(j) (1) Any person who will be adversely affected
13 by a rule prescribed under this part when it is effective may,
14 at any time before the 60th day of the date such rule is
15 prescribed, file a petition with the United States court of
16 appeals for the circuit wherein such person resides or has his
17 principal place of business, for judicial review thereof. A
18 copy of the petition should be forthwith transmitted by the
19 clerk of the court to the Administrator. Upon receipt of such
20 petition, the Administrator shall file in the court the written
21 submissions to, and transcript of, the proceedings on which
22 the rule was based, as provided in section 2112 of title 28,
23 United States Code.

24 “(2) Upon the filing of the petition referred to in para-
25 graph (1), the court shall have jurisdiction to review the

1 rule in accordance with chapter 7 of title 5, United States
2 Code, and to grant appropriate relief as provided in such
3 chapter.

4 “(3) The judgment of the court affirming or setting
5 aside, in whole or in part, any such rule shall be final, sub-
6 ject to review by the Supreme Court of the United States
7 upon certiorari or certification as provided in section 1254
8 of title 28, United States Code.

9 “(4) The remedies provided for in this subsection shall
10 be in addition to, and not in substitution for, any other
11 remedies provided by law.

12 “REPORT TO CONGRESS

13 “SEC. 347. The Administrator shall submit to the Con-
14 gress, within 2 years after the date of enactment of this
15 section, a report on improvements in energy efficiency of
16 industrial equipment. The report shall include information
17 developed pursuant to section 343 (b), information on the
18 energy conservation potential and achievement with respect
19 to industrial equipment, and any recommendations for addi-
20 tional legislation.

21 “AUTHORIZATION OF APPROPRIATIONS

22 “SEC. 348. There are hereby authorized to be appropri-
23 ated to carry out the purposes of this part—

24 “(a) with respect to electric motors and pumps,
25 \$3,000,000 for fiscal year 1978; and

1 “(b) with respect to all other types of industrial
2 equipment, \$4,000,000 for fiscal year 1978.”.

3 SEC. 2. The table of contents for the Energy Policy and
4 Conservation Act is amended—

5 (1) by striking out “PART C” and “PART D” in the
6 items relating to parts C and D of title III of such
7 Act and inserting in lieu thereof “PART D” and “PART E”,
8 respectively, and

9 (2) by inserting after the item relating to section
10 339 the following:

 “PART C—CERTAIN INDUSTRIAL EQUIPMENT

“Sec. 340. Definitions.

“Sec. 341. Requirements for electric motors and pumps.

“Sec. 342. Study of other industrial equipment.

“Sec. 343. Test procedures.

“Sec. 344. Labeling requirements.

“Sec. 345. Energy efficiency standards.

“Sec. 346. Administrative procedure, enforcement, and judicial review.

“Sec. 347. Report to Congress.

“Sec. 348. Authorization of appropriations.”

Mr. DINGELL. Before the Chair recognizes my dear friend, Mr. Moss, the Chair will recognize briefly Mr. Brown, senior Republican member of the committee.

Mr. BROWN. Thank you.

I would just like to reflect for a moment on the degree of Congress success with efforts such as those we are to undertake today. Over 2½ years ago, the appliance industry, in cooperation with the Department of Commerce, had established a voluntary program for improving the energy efficiency of household appliances. Nevertheless, the Congress in its wisdom decided that this program was not progressing rapidly enough and enacted mandatory standards for the industry for energy efficiency and labeling requirements.

In the 2½ years since, the program has been a bureaucratic mess, has cost the appliance industry and hence the consumer, \$190 million and has resulted in a 2-year delay in improving appliance energy efficiency. Now, for some reason, we want to do the same thing for electric motors and pumps, even though the industry as well has instituted voluntary standards.

Even more important is the fact that no matter what we think of the success or necessity of the appliance program, the technical complexities of this area are much greater and any standards program is, therefore, much more threatened with the prospect of administrative failure.

Motors and pumps, unlike appliances, are not end products, but are component parts of other products or are used in conjunction with other devices to form the integrated systems and processes of our assembly lines and factories. There are nearly 750,000 possible permutations of a.c. polyphase and single-phase motors.

The same motor may be used in thousands of different industrial systems with hundreds of different energy usage levels depending on the mechanical devices to which it is connected and how it is used.

Thus, it is clear that there would have to be literally hundreds of separate standards. In 2 years of the appliance program, FEA could not manage to complete one single test procedure for one category of appliances.

Further, unlike appliances, which are off-the-shelf items, many motors and pumps are custom made to buyer specification.

Finally, it will be almost impossible to measure the cost-effectiveness of the standards. Some motors have almost continuous use; others are used in a stop-and-start cycle, and still others are used even less. Since there is no "typical" use cycle, it is not impossible to determine cost-effectiveness.

The only reason for instituting such standards is if they will result in a significant energy savings. The burden of proving that should be on the proponents of the program and I eagerly await their description of how they would deal with the many problems I have described.

These hearings will also involve the amendments recently made by the Senate to the industrial conservation reporting program mandated by the Energy Policy and Conservation Act of 1975. These so-called Kennedy-Johnston amendments—I guess they are now the Metzenbaum-Kennedy—would modify this ongoing program in several major respects.

First, the alternative of utilizing trade associations as the vehicle for aggregating energy conservation data would be eliminated and individual corporation reports to be submitted directly to FEA would be required.

Second, there is to be a demonstration program of the feasibility of establishing standards for various energy generation involving steam and a study of the so-called second law of thermodynamics.

Third, it limits the protection from exposure to competitors that information submitted to the Government has.

I have very serious problems with these proposed changes and I would hope that the witnesses would address these amendments very carefully.

First, I see no reason to act prematurely and change a program that has barely begun to function. The administration has not even tried to use existing authority contained in section 376(g) of the act to obtain the kind of information that they might need if they find that the association-collected information that they are receiving is not adequate, as I understand it.

Second, there are no indications as to the cost of the far-reaching demonstration program mandated under the Senate amendments and no specific authorization is provided. I would like to have recommendation in that area.

Third, one of the basic problems with this program is protecting the information that one company supplies to the Government from access by that company's competitors. Present law, under the Freedom of Information Act, is barely adequate at all for this purpose and the changes proposed in the Senate amendments, where by an entirely new statutory standard of "significant competitive damage" is added to existing law, will create a kind of situation where much information relating to basic processes of our American industry will be readily available to competitors. These changes will create substantial amounts of litigation rather than a smooth process whereby useful information can be utilized by the Government and energy policy decisions made.

Finally, while the approach of the amendment on the so-called second law of thermodynamics may have some validity, the parameters of any study that Congress authorized needs to be drawn very carefully so that a true measure is made of the savings possible under several different means of measuring energy conservation.

Thank you, Mr. Chairman.

Mr. DINGELL. The Chair thanks the gentleman.

We recognize now for our first witness a distinguished Member of the House, a very dear friend of mine, a Member who has had a significant record of accomplishment in the field of energy and in the field of consumer protection, conservation, a man I have sat next to on this committee with pride and pleasure for over 20 years. I am delighted to have you here before us, Mr. Moss. You are most welcome.

STATEMENT OF HON. JOHN E. MOSS, A REPRESENTATIVE IN
CONGRESS FROM THE STATE OF CALIFORNIA

Mr. Moss. Mr. Chairman, I would fully reciprocate. I might add that it has been a pleasure serving with each member of this subcommittee because it is a very hard-working subcommittee and it has a notable record of achievement and it has brought to the full committee and to the floor of the House very, very significant legislation. I trust that it will continue doing so and, of course, the legislation before you is typical of the significant legislation the subcommittee addresses itself to.

Industrial energy conservation is vitally important. The industrial sector of our economy consumes 40 percent of our oil requirements—more than any other sector, including the automobile. As a consequence, I welcome the opportunity to share with you the findings of the Subcommittee on Oversight and Investigations and they are tentative, with respect to this important energy issue.

The administration's proposed national energy plan calls for a reduction of less than 1 percent in projected industrial energy use in 1985. We can and must do better. Recent studies estimate that a full 25-percent reduction in industrial energy consumption can be achieved within the next 8 years through the introduction of cost effective energy savings measures.

That translates to a savings of 4.5 million barrels of oil per day, or one-half of our present requirements for imported oil. Our failure to achieve the achievable will only aggravate our already precarious oil import situation and lend support to those who seek to raise the price of domestic oil, natural gas, coal, and uranium to OPEC dictated levels. They do so in the face of massive evidence, showing that high energy prices are not a panacea for increasing supply or reducing energy demand.

The Congress, to its credit, took the lead in industrial energy conservation when it passed the Energy Policy and Conservation Act in 1975. EPCA sought to accomplish two things:

First. To set energy-saving goals for the Nation's 10 most energy consumptive industries which account for 23 percent of the industrial energy use;

Second. To provide the Congress and other policymakers with reliable information on industrial energy conservation for use in considering additional industrial energy saving measures such as selective tax credits, penalties, or mandatory energy efficiency standards.

The current program does not impose mandatory standards. Instead, it identifies specific areas within the industrial sector where meaningful energy savings can be achieved. Had the 1975 act worked as intended, the resulting information would have been of individuals assistance to the Congress and the Executive in formulating a national energy plan. But the program is not working. This is due to failures on the part of FEA and because of deficiencies in the underlying statute.

Rather than taking the time to assess blame, I would like to review what needs to be done and to highlight the inadequacies of the present program.

As the first step toward industrial energy conservation, we must be able to identify those specific industrial areas where significant energy savings can best be achieved.

The new Department of Energy should continue, therefore, the work of the FEA to establish energy savings targets with the following modifications:

First. The present target date of 1980 should be replaced with a 1985 target date. Use of a 1985 date coincides with the goals set by the administration's proposed national energy plan. The present 1972 to 1980 target period is unworkable because of the lack of reliable 1972 energy use data for certain industries.

Second. Present FEA targets are set in terms of improved energy efficiency per unit of output and as such do not make sufficient allowance for conversion from oil or natural gas to coal, which generally results in a loss of energy efficiency per Btu. The current program thus should be modified to encourage increased coal use and to measure the effectiveness of the national energy plan in terms of increased coal usage.

Third. The current industrial conservation program classifies industries on the basis of the two-digit standard industrial classification—SIC—manufacturing code. For example, the fabricated metal products industry produces over 1,000 types of widely varied products ranging from food and beverage cans to bath tubs, prefabricated buildings, small arms ammunition, nuts and bolts, and automobile stampings, among other things.

Given the heterogeneous nature of American industry, as defined in terms of the two-digit SIC classification, it is essential that the present law be amended to grant the Department of Energy the latitude to set goals and to collect data on the basis of narrower, more homogeneous industrial groupings.

The setting of industrial energy and coal use targets is meaningless unless the affected industries are required to report their energy consumption. Our experience of the past few years under EPCA demonstrates the need to eliminate the statutory exemption which permits individual corporations to avoid having to directly report such information to the FEA if they are members of a trade association with an approved reporting system.

The exemption provision has worked to destroy the integrity of the program. It has encouraged the FEA to grant exemptions almost automatically, to the extent that the data that is being collected from the 373 companies that are allowed to report through trade associations is not compatible with that which is being received from the 138 companies which report directly to the FEA. As a consequence, those entrusted with administering this program are not in a position to determine the degree to which various industries are meeting the FEA targets.

The industrial conservation program which we established 2 years ago is thus almost totally devoid of meaning in the fight against industrial energy waste. The problems with the current program can be addressed only through a combination of corrective legislation and vigorous congressional oversight.

The Senate-passed Kennedy proposal currently before the subcommittee will correct some of the more overt deficiencies in the current EPCA voluntary programs. I heartily support the Senate's move to expand coverage under the present program to all industrial users of 1 trillion or more Btu's rather than limiting the program to the top 50 energy users within the 10 leading energy intensive industries as at present. It makes no sense to continue to exempt the 51st largest chemical company which uses 12 times more energy than the largest textile company.

I would further urge, however, that the program be modified to establish 1985 target dates, the establishment of coal use targets and the adoption of a more flexible system for classifying industries included in the program.

Industry-by-industry energy targets as currently provided for in EPCA should not be mandatory, however. Such targets cannot be established with sufficient certitude to be effective and reasonable. To cite two examples: A shift in consumer preference to fine, as opposed to bulky fabrics, would increase energy use per unit of output in the textile industry. A decline in production within a given industry would similarly lead to a reduction in energy efficiency since it takes a fixed minimum amount of energy to operate equipment regardless of whether it is operating at full capacity. Individual corporations or industries could thus fail to meet their target goals for reasons beyond their control.

That is not to say, however, that certain mandatory measures should not be adopted. Such measures should be adopted, not on the basis of a complete industrial process, such as the manufacture of paper, but rather on the basis of specific stages or functions within the overall industrial process, such as steam raising or material heating, which along with several other industrial processes consume 80 percent of the energy used by industry.

Rendering such standards in this broad, across-the-board fashion does not require the indepth knowledge called for in establishing individual industrial targets, yet it can be done with sufficient precision to satisfy the requirements of the regulatory process.

It is clear that a comparatively small number of industrial processes and related equipment account for over 50 percent of the energy consumed by industry. According to the Federal Energy Administration these include such things as kilns; reheat furnaces; rolling, drying, and pressing equipment employed by the paper industry; and catalytic reforming and cracking equipment. If economically reasonable and technologically feasible improvements can be made in these narrow categories of equipment, this subcommittee should consider empowering the Secretary of Energy to establish minimum Federal energy efficiency standards for such energy intensive industrial processes and equipment.

This is fundamentally fair. I see no reason why purchasers of industrial equipment should stand on a different footing than purchasers of home appliances or automobiles.

Chairman Dingell's H.R. 8985 to establish energy efficiency standards for electric motors and pumps, which consume approximately two-thirds of all electricity used by the industry, could be an excel-

lent first step toward instituting a program of mandatory industrial energy conservation along these lines. The Senate-passed Kennedy proposal, also before you, would correct a number of deficiencies in the present EPCA program. Together, these proposals will aid in establishing a National Energy Plan whose cornerstone is, in fact, conservation.

I want to thank you and the members of your subcommittee for according me this opportunity to say these few words and if you have any questions, I will do my best to answer them.

I might say that we will have a report shortly in preparation. I hope it will be out before the subcommittee moves much further on this issue.

Mr. DINGELL. I think that would be most helpful and, Mr. Moss, I just want to tell you it is a great pleasure for us to have you before the subcommittee. You are a most valuable member of our parent committee. You have been one of the most powerful and persuasive members of that body for many years. It is a great pleasure to the present occupant of the Chair. It is a real privilege to have you before us.

The Chair recognizes my colleague for questions.

The Chair recognizes Mr. Sharp.

Mr. SHARP. No questions.

Mr. DINGELL. Mr. BROWN.

Mr. BROWN. Mr. Chairman, I do have one question for Mr. Moss, because of his expertness in the Freedom of Information Act, of which he was one of the authors, as I recall.

Mr. DINGELL. The principal author, as I recall.

Mr. BROWN. How do you suggest that Congress and the executive branch insure that proprietary and trade security information be protected from release to the competitors under the Freedom of Information Act, which, I understand, would and has made available some of the statistics which have been given to the FEA?

Mr. Moss. If it classified as proprietary under title XVIII, trade secrets, it is exempt—specifically exempt—in the Freedom of Information Act. Therefore, I would assume that any instances reported to you have been erroneously reported. I took great care in drafting that law to insure that bona fide trade secret information was adequately protected.

Mr. BROWN. Well, the legislation does provide for some protection in this area, but in April of last year, I guess, there was a release again of not only the Btu's used but the percentage of electricity used of quite a variety of industries and I know, for instance, in the primary metals area, Alcoa, Kaiser Aluminum, and Consolidated Aluminum Corp.'s, just to pick three out, were listed with varying percentages of electric use.

Now, what occurs to me is that one industry, in assessing its competitive relationship with other industries in that field, particularly where the field is quite limited, might very well benefit from that kind of information either in terms of its present or future pricing practices, and in a competitive field in order to grasp more of the market, or be able to assess in effect the modernization of the competitor's plant, or perhaps even what areas he was concentrating in, in terms of his production.

My question really is, are these freedom of information protections adequate or is it possible that people in one industry, one company of an industry, can learn a great deal out of some of the information that would be submitted, certainly if that information gets any more specific, so as to be able to compete against another industry in such a way as to perhaps move toward domination of the market?

Mr. MOSS. I can respond to that in two steps. First, the act itself is U.S.C. 796. The Administrator may not disclose any information obtained under this part which is a trade secret or other matters described in section 555(2)(b)(4) of title V; 555(2)(b)(4) is the Freedom of Information Act and is the specific section.

Title V, United States Code, is disclosure of which may cause significant damage. That is under the EPCA provision. The Freedom of Information, we don't have that here—I don't have it because I wasn't anticipating a question on the Freedom of Information Act—do you have it?

Mr. FINNEGAN. No, sir.

Mr. MOSS. It is title V. I would say that the illustration you have used goes a long way to exposing the fallacy of trying to protect a great part of the information which is normally available to any industrious seeker of information.

An aluminum company rarely locates without having an identifiable block of power available to it. Frequently plants are built or they are expanded to insure that there will be an amount of power that is reserved for them, or they won't go into an area that is in a power shortage situation. They want plenty of power and they want it as cheap as possible; preferably hydro. But I don't think there is any way that this kind of information in the final analysis can be protected, but if it is classified as a trade secret, it is protected under the Freedom of Information Act as strongly as you can provide by law, because nothing can be clearer than the language of that.

Mr. BROWN. I guess the language says this section does not apply to matters that are, and it lists several different things, and No. 4 is trade secrets and commercial or financial information obtained from a person privileged or confidential.

But, of course, the example I cite about three aluminum companies and other industries in the field was one where a subordinate administrator made the decision it was in effect competitive information that would be harmful to the company in its competitive relationship and then a higher level administrator released the information, and the reason I am curious about it is because I have in my district at Wright Patterson Air Force Base a division of the intelligence community which occupies quite a sizable complex and a lot of people in reading trade publications of our friends around the world, and from those trade publications develop some assessment of where they are headed in the technological area, particularly with reference to defense. It is called Foreign Technology Division of the Air Force.

This is exactly the kind of information that they would like to know about the Russians, the Chinese, and others, so as to be able to make sophisticated sense with their slide rules and so forth, not by a single piece of information but the aggregation of several pieces of information over a period of years or months, an assessment of what is happening in that particular area of technology. It is very interesting.

I would assume that companies who seem to have some desires sometimes to know what their competitors are doing might want to get the same information. The more information you can get the better off you are, particularly the big guys that want to gobble up.

Mr. DINGELL. We will try and procure the information with regard to the question he has asked earlier from FEA, if it be the wish of the gentleman. If he will identify the participants, I will see that the staff looks into that.

Mr. BROWN. The participants, I think, are identified in the story. I gather the gentleman is saying that the trade secrets protect to some degree and that there is going to be language that says something about competitive, significant competitive effect, but that becomes a whole new body of law, I guess, that we have to develop by court suits and all the other things, and that again big companies are much better able to take care of than the small companies.

Mr. DINGELL. The Chair observes the time of the gentleman from Ohio has expired.

The Chair recognizes now the gentleman from New York, Mr. Ottinger.

Mr. OTTINGER. Thank you, Mr. Chairman.

I would like to share your words of praise for the gentleman from California and the help he has been to the full committee and to this subcommittee. I think this is another instance of it.

I was the author of the amendment which was adopted in EPCA which provided for reporting with respect to the 50 largest energy users, and I trust that by your testimony you would not want to preclude the FEA from establishing nonmandatory targets for industry. A provision which I had originally proposed called for a much broader reporting, as indeed does Senator Kennedy's amendment. It requires the industries to report publicly why, if they did not meet the targets that were set by the FEA, why they were unable to meet the targets, to take account of the kind of example which you gave us, where failure to meet targets was due to some situation beyond their control, loss of business or change in the demand for their product.

I still feel very strongly it could be useful on a much broader basis to have the industry set targets and try to achieve them and try to report to us on what their problems are so we can increase our knowledge of the difficulties and the opportunities to achieve conservation in the industrial sector.

Am I correct that you would favor establishing nonmandatory industrial targets of reporting to FEA?

Mr. MOSS. Yes, I think I would.

Mr. OTTINGER. I have not yet seen the Kennedy provision but I would very much like to see that continue at the same time we do.

Mr. MOSS. I think you have it before you now. I mean, it has been referred to the committee.

Mr. OTTINGER. I have not yet had an opportunity to look at it. I take it it broadens the categories that must report, setting the standard on the basis of a trillion Btu's; is that correct?

Mr. MOSS. I think the broadening of the numbers, the increase in the numbers is going to give you much more reliable and meaningful data than the present reporting base, which is really too small.

Mr. OTTINGER. I felt at the time it was the best we could get.

I think it is a case where we all look at what we have done in the past and realize we could probably do a little better the last time; we couldn't get it past the committee.

Mr. MOSS. I know we did.

Mr. OTTINGER. Thank you, Mr. Chairman.

Mr. DINGELL. The Chair observes there is a vote on at this particular minute. I am not quite sure what it is. Maybe if it meets the approval of my colleagues we can pursue the questions a bit further. Maybe we could release Mr. Moss.

I believe Mr. Moore was here ahead of Mr. Moorhead. I am sorry, please forgive me.

The Chair recognizes Mr. Moore.

Mr. MOORE. Thank you, Mr. Chairman. I likewise want to welcome the distinguished chairman of the Subcommittee on Oversight. I had the pleasure of serving on that committee for a year and I was indeed educated on that subcommittee during that time.

I would like to simply ask does the subcommittee have information that a price response to the high cost of energy won't take all or a great deal of what we are trying to seek in standards of efficiency that won't come about anyway. That is a question we asked when we had our very brief discussion on this markup and I noticed on page 5, the distinguished gentleman from California comments that we get about this having legislation and mandatory standards and congressional oversight. I am wondering do you have any information or studies to show essentially supply and demand of energy?

Mr. MOSS. We have and we will supply them to you. As you know we get quite a few reports together in the process of getting a report together on this—

Mr. MOORE. Is it your conclusion, based on your testimony today, that the price response of supply and demand will not satisfy the situation or will satisfy a part of or none of it?

Mr. DINGELL. I have got here before me a response to a communication from FEA that I think may be of interest to all of us. The subcommittee requested them to give us answers to this question.

To what extent is price of a motor critical to encouraging increased energy efficiency?

Price is a most important consideration in attempts to encourage increased energy efficiency. It appears that companies which charge a premium price for their high efficiency motors have not had favorable sales experience for these models, despite the attractive paybacks associated with the high efficiency models. Purchase patterns generally indicate the following order of importance for various motor characteristics.

First, cost, reliability, availability, service warranty, durability, efficiency.

No comment is made here at all really with regard to the placement in the first six items of the cost of operation in connection with these kinds of questions.

The Chair does thank the gentleman for yielding.

Mr. MOORE. I am not sure that is exactly what I am getting at.

Mr. MOSS. I think the problem is that it is difficult to give you a precise "yes" or "no" answer, that you do have a price response built in. The elasticity factor is estimated to be .1 on a 10-percent price increase, so there isn't a great deal of response. We know, for example, that we have had about a 700 percent increase in the price

of gasoline. I don't think that in itself has driven the American user to seek more efficient automobiles. I think that the things that has done more to bring more efficient automobiles into being was the action by this committee in 1975 when it passed the Energy Price and Conservation Act. I think it was legislation rather than economics that brought about the change there, and I think that you can anticipate that will be the instance time and time again.

Mr. MOORE. We had testimony before on the energy bill in general, from various citizens, who indicated that they thought there would be a price response and that in every case, including the automobile, eventually people would get to that point where they would buy the most efficient machine, motor, pump, whatever, but they felt the problem was trying to establish national energy goals, that that price response might take time and, therefore, was necessary perhaps for the Government to step in and force something before economics would dictate it at a later time.

Mr. MOSS. I subscribe to that view and I think our study would support that view.

Mr. MOORE. I thank the gentleman.

Mr. DINGELL. The Chair thanks the gentleman.

The Chair recognizes the gentleman from California, Mr. Moorhead.

The Chair observes that we had better go to vote. We have probably got 5 minutes on a record vote.

Mr. MOSS, it is always a privilege to have you before us. You have added greatly to us.

Mr. MOSS. It is a pleasure to be with you.

Mr. DINGELL. I enjoy working with your subcommittee, which has been of immense help to us in procuring help from some agencies, even though it has not been as helpful as it might have been.

Mr. MOSS. We always try.

Mr. DINGELL. The committee will be in recess for about 15 minutes.
[Brief recess.]

Mr. DINGELL. The subcommittee will come to order.

Our next witnesses are a panel from the Administration: Our old friend the Honorable John F. O'Leary, Administrator, FEA, Mr. Orcutt P. Drury, Acting Director of the Office of Energy Programs of the Department of Commerce, and Dr. Melvin H. Chiogioji, Assistant Director, Office of Conservation, Energy Research and Development Administration.

Gentlemen and ladies, we welcome you all. If you will each identify yourselves for the purpose of the record, we will be glad to receive your statements.

Mr. O'LEARY. I am John F. O'Leary, Administrator of FEA. I am accompanied by Tina Hobson of FEA.

Mr. DRURY. Mr. Chairman, I am Phil Drury, the Department of Commerce.

Mr. CHIOGIOJI. Mr. Chairman, I am Melvin Chiogioji with ERDA.

Mr. DINGELL. Welcome.

I guess we will hear Mr. O'Leary first, then either Dr. Chiogioji or Mr. Drury.

STATEMENT OF HON. JOHN F. O'LEARY, ADMINISTRATOR, FEDERAL ENERGY ADMINISTRATION, ACCOMPANIED BY TINA C. HOBSON

Mr. O'LEARY. Mr. Chairman, thank you.

I appreciate the opportunity to comment on those provisions of H.R. 5037, as passed by the Senate, and H.R. 8985, which address the vitally important matter of energy conservation within the industrial sector of our economy.

In order to be as brief as possible I would like to summarize the prepared statement I have submitted for the record.

Mr. DINGELL. Without objection, your full statement will appear in the record and we will recognize you for summary.

Mr. O'LEARY. Further, Mr. Chairman, I would like to apologize for the lateness of arrival of that statement up here today. We did get into the usual last-minute confusion.

Mr. DINGELL. With OMB?

Mr. O'LEARY. Within our own ranks, Mr. Chairman. To a degree OMB had compounded that. But I really think the fault is mine. I just insisted on a course of action in the development of the administration's position which I believed at the time was consistent with the course we had taken in NEA and, finally, I found that the course I was pursuing was inconsistent with NEA. So I think really I am the fellow who is at fault.

Mr. DINGELL. You deserve the respect of all of us. It is rare we find somebody that takes blame for their actions.

Mr. BROWN. Maybe you were right.

Mr. O'LEARY. Thank you, Mr. Chairman.

Both H.R. 5037 and H.R. 8985 would require the Administrator of the FEA to develop and promulgate rules for energy efficiency test procedures, labeling and/or standards for specified energy-intensive equipment used in commerce and industry. The FEA would be required to conduct appropriate technical and economic evaluations in determining these rules and to assess the energy conservation impact of taking the actions required or authorized by the legislation. The energy used by equipment specified in the proposed legislation accounts for approximately 25 percent of the Nation's energy consumption. The items included also use over 60 percent of the electricity consumed in the United States.

Based on the limited studies which have been accomplished it is evident that a significant potential exists for energy efficiency improvements to the equipment specified in the proposed legislation. Estimates of the potential for energy savings through improved equipment efficiencies range up to 250,000 barrels of oil equivalent per day by 1985. Studies accomplished to data on energy intensive equipment indicate that:

Reliable and comparable data on energy efficiencies are generally unavailable or difficult to obtain.

Published data often varies significantly from actual test data.

There are significant differences in efficiency from one equipment manufacturer to another.

Despite rapid paybacks for more energy efficient items, equipment efficiencies have remained a relatively unimportant factor in purchasing decisions.

Because of the factors which inhibit purchase of energy-efficient equipment, the significant amounts of energy involved, and the tremendous importance to the Nation of reducing our energy consumption growth rate, we in the FEA are convinced that there is a need for focusing both Government and industrial resources on accelerating the evolution toward more energy efficient equipment. Equipment manufacturers should disclose energy efficiency information on their products, so that purchasers can be fully informed about the life cycle costs associated with the alternatives.

New equipment being bought each day for use in the Nation's industrial plants is often on line for 10, 20, or more years. Therefore, the energy efficiency of that equipment has long-term ramifications. This contributes to our position of support for labeling requirements and test procedures.

With regard to industrial equipment efficiency standards, FEA has previously expressed reservations about a mandate that standards be established for electric motors and pumps. There are factors which lead readily to such reservations. One is the potential difficulty of arriving at a standard which is both administratively feasible and applicable to a sufficiently wide cross section of an equipment's use conditions and characteristics. Second, there is concern that the existence of a minimum standard might tend to keep manufacturers toward models which meet only the minimum.

On the other hand, we believe the conservation imperative demands a strong resolve to overcome such difficulties. On balance, it is our conclusion that the concept of standards for electric pumps and motors should be supported, if modified to provide discretionary authority to establish mandatory efficiency standards. This support underscores the importance which we assign to steps which must precede standards; namely, feasibility evaluation, test procedures, and labeling.

Specifically, FEA proposes that, after promulgation of test procedures, the Administrator have discretionary authority to establish minimum efficiency standards for selected classes of electric motors and pumps. The appropriate classes would, of course, be determined by the evaluations and studies conducted immediately following enactment of the legislation.

I will now turn to the provisions of H.R. 5037 which concern the industrial energy reporting requirements contained in the Energy Policy and Conservation Act (EPCA).

Under EPCA, identified corporations are permitted to report energy use directly to FEA or through an "exempted" trade association or other third-party program. While associations have developed thorough and conscientious reporting programs, deficiencies in the current program related to energy definitions make measurement of progress toward FEA energy-efficiency targets difficult. As a result, the process of combining company data into a consolidated report may often result in misleading conclusions.

In March, I recognized that these deficiencies, which can be corrected under our existing authorities, would require special attention. The potential inaccuracy of the current program demands these minimum improvements or abandonment of the program as a federally sponsored initiative.

Even with such improvements, several significant problems remain: Not all major energy using companies are treated equally under existing legislation.

Companies can report through one or more trade associations or other third-party representatives.

Plant data is not maintained in a consistent form for purposes of aggregation or auditing.

Disaggregated data—by recognizable basic industry sectors—is not currently reported.

The changes to EPCA incorporated in H.R. 5037, by responding to each of these problems, would allow FEA to establish a more effective program. In comparison to the current program being implemented under EPCA, the provisions of H.R. 5037 would:

Increase the scope of the program to include all companies using at least 1 trillion Btu's annually. The number of reporting companies will increase from 474 to more than 900. In addition, companies using over a trillion Btu's in the 20 manufacturing industrial areas will be required to report.

Require direct reports from all companies rather than allowing the third-party reporting option exercised by about 375 of the reporting companies. We believe that the need to objectively display to Congress and the public actual conservation and energy efficiency achievement of industry can best be done through direct reporting. Reporting required by H.R. 5037 is expected to include 75 to 98 percent of the energy used by the five largest energy consumptive industries—chemicals, primary metals, petroleum and coal, stone, clay and glass, and paper products.

Require each reporting company to establish and maintain plant reports. We support this provision as an opportunity to assure common definitions of energy efficiency at the plant level. Such plant level reports would also assist in any auditing program which would be necessary to test data accuracy.

Allow FEA discretion to require companies to report by recognizable basic industry sectors according to standard industrial classification (SIC) codes. The current law established energy efficiency improvement targets at the two-digit SIC code level. Aggregated data to the two-digit level does not always have great value in measuring energy efficiency for generally recognizable industries.

In addition, H.R. 5037 provides an opportunity to assess the plant level industrial process which accounts for approximately 40 percent of the Nation's industrial energy consumption—steam raising through direct combustion of fuels. Industrial steam raising represents 16 percent of the total annual national energy consumption. Meaningful measurements and reductions may be possible and we are prepared to implement the required demonstration program within the 18 months provided.

Mr. BROWN. Is this the second law of thermodynamics?

Mr. O'LEARY. A little bit of that, Mr. Brown.

There is also sufficient potential for improving the efficiency of fuel utilization in many tasks, other than steam raising, to warrant further study as provided for in H.R. 5037.

Many companies would prefer that all energy consumption data remain confidential or be screened through trade association programs.

An FEA appeal decision has determined that total corporate annual energy consumption is public information. We support this finding and believe that aggregated data submitted on direct company reporting forms should not be considered confidential. However, we believe that plant-by-plant data should remain confidential to safeguard competitive positions in the industry.

One important component in promoting energy conservation is a fair, responsive, and equitable reporting system that can be used in making sound, economic, and energy efficient program and policy decisions. Perhaps the strongest reason for direct reporting is the potential for an increased commitment on the part of the chief executive officer who would be personally accountable for the continuing effort to improve energy efficiency. Our target documents indicate that the 10 most energy consumptive manufacturing industries can save an average of 1.25 million BOE per day—roughly \$10 million a day in energy costs—with economically feasible, known energy conservation technology.

Under H.R. 5037, we and the involved industry have a cooperative and mutually supporting opportunity, to (1) focus on energy problems/definitions at the plant level, (2) measure energy efficiency according to recognized industry sectors—SIC disaggregated codes—and (3) identify energy use by company to promote corporate responsibility in the national energy conservation effort.

My letter to you dated April 18, 1977, outlined our approach in reviewing the industrial reporting program. At that time, H.R. 5037 was not under consideration. A preliminary analysis of consolidated data under the current program confirms the deficiencies outlined in this testimony. We believe, therefore, the provisions of H.R. 5037 are necessary to establish an accountable and responsive reporting system that will benefit both industry and the public.

That concludes my statement. I would be pleased to respond to any questions you may have.

[Mr. O'Leary's prepared statement follows:]

STATEMENT OF HON. JOHN F. O'LEARY, ADMINISTRATOR, FEDERAL ENERGY ADMINISTRATION

Mr. Chairman and members of the subcommittee, I appreciate the opportunity to comment on title II, subtitle D, part A of H.R. 5037 (which incorporated S. 2057), and on H.R. 8985, which address the vitally important matter of energy conservation within the industrial sector of our economy.

Both H.R. 5037 and H.R. 8985 would require the Administrator of the FEA to develop and promulgate rules for energy efficiency test procedures, labeling and/or standards for specified energy-intensive equipment used in commerce and industry. The FEA would be required to conduct appropriate technical and economic evaluations in determining these rules, and to assess the energy conservation impact of taking the actions required or authorized by the legislation.

The energy used by equipment specified in the proposed legislation accounts for approximately 25 percent of the Nation's energy consumption. The items included also use over 60 percent of the electricity consumed in the U.S. The Federal Energy Administration has undertaken some initial studies to determine "targets of opportunity" for energy conservation in this area. A few reports were developed as a result of these initiatives, including:

Energy Efficiency and Electric Motors, completed in August of 1976 by Arthur D. Little, Inc.

An Assessment of the Potential for Energy Conservation Through Improved Industrial Boilers, completed in October of 1976 by KVB, Incorporated.

Based on work which has been accomplished, it is evident that a significant potential exists for energy efficiency improvements to the equipment specified in the proposed legislation. Estimates of the potential for energy savings through improved equipment efficiencies range up to 250,000 barrels of oil equivalent per day by 1985. Studies accomplished to date on energy intensive equipment indicate that:

Reliable and comparable data on energy efficiencies are generally unavailable or difficult to obtain.

Published data often varies significantly from actual test data.

There are significant differences in efficiency from one equipment manufacturer to another.

Despite rapid paybacks for more energy efficient items, equipment efficiencies have remained a relatively unimportant factor in purchasing decisions.

Because of the factors which inhibit purchase of energy efficient equipment, the significant amounts of energy involved, and the tremendous importance to the Nation of reducing our energy consumption growth rate, we in the FEA are convinced that there is a need for focusing both Government and industrial resources on accelerating the evolution toward more energy efficient equipment. Equipment manufacturers should disclose energy efficiency information on their products, so that purchasers can be fully informed about the life cycle costs associated with the alternatives. Efforts by trade associations and manufacturers to provide this information, while supported by excellent intentions, are often characterized by intra-industry disagreement and the lack of a sense of urgency. Legislation such as that being proposed should force more serious attention to getting the job accomplished as quickly as possible.

New equipment being bought each day for use in the Nation's industrial plants is often on line for ten, twenty or more years. Therefore, the energy efficiency of that equipment has long-term ramifications. This contributes to our position of support for labeling requirements and test procedures.

With regard to industrial equipment efficiency standards, FEA has previously expressed reservations about a mandate that standards be established for electric motors and pumps. There are factors which lead readily to such reservations. One is the potential difficulty of arriving at a standard which is both administratively feasible and applicable to a sufficiently wide cross section of an equipment's use conditions and characteristics. Second, there is concern that the existence of a minimum standard might tend to key manufacturers toward models which meet only the minimum.

On the other hand, we believe the conservation imperative demands a strong resolve to overcome such difficulties, regarding which we have previously testified before the Senate Energy and Natural Resources Committee. On balance, it is our conclusion that the concept of standards for electric pumps and motors should be supported, if modified to provide discretionary authority to establish mandatory efficiency standards. This support underscores the importance which we assign to steps which must precede standards; namely, feasibility evaluations, test procedures, and labeling. Specifically, FEA proposes that, after promulgation of test procedures, the Administrator have discretionary authority to establish minimum efficiency standards for selected classes of electric motors and pumps. The appropriate classes would, of course, be determined by the evaluations and studies conducted immediately following enactment of the legislation.

I will now turn to the provisions of H.R. 5037 which would replace sections 373, 375, and 376 of the Energy Policy and Conservation Act (EPCA).

Three years ago, the Department of Commerce (DOC) and FEA jointly initiated a voluntary industrial energy reporting program through trade associations. In 1975, title III of the Energy Policy and Conservation Act (EPCA) required FEA to establish a program to monitor progress toward meeting industrial energy efficiency improvement targets. Identified corporations were permitted to report energy use directly to FEA or through an "exempted" trade association or other third party program. While associations have developed thorough and conscientious reporting programs, deficiencies in the current program make difficult the measurement of progress toward FEA energy efficiency targets.

One of the major deficiencies of the current program is that it does not prescribe consistent definitions to be used in developing and reporting energy use and efficiency data. This has resulted in: variations in the reporting periods and base year; inconsistencies in the type of energy use reported and conversion factors used; differing interpretations of the SIC definitions; and nonstandard

measures of industrial output. Further deficiencies include the lack of information showing product mix changes, capacity utilization and operational adjustments such as temperature variations.

The process of combining these elements into a consolidated report may often result in misleading conclusions.

In March I recognized that these deficiencies, which can be corrected under our existing authorities, would require special attention. The potential inaccuracy of the current program demands these minimum improvements or abandonment as a Federally sponsored initiative.

Even with such improvements, several significant problems remain:

Not all major energy using companies are treated equally under existing legislation.

Companies can report through one or more trade associations or other third-party representatives.

Plant data are not maintained in a consistent form for purposes of aggregation or auditing.

Disaggregated data—by recognizable basic industry sectors—are not currently reported.

The changes to EPCA incorporated in H.R. 5037, by responding to each of these problems, would allow FEA to establish a more effective program. In comparison to the current program being implemented under EPCA, the provisions of H.R. 5037 would:

Increase the scope of the program to include all companies using at least 1 trillion Btu's annually.—The number of reporting companies will increase from 474 to more than 900. In addition, companies using over a trillion Btu's in the 20 manufacturing industrial areas will be required to report.

At present, no more than 50 companies in each of the 10 most energy consumptive industries are required to report. This arbitrary reporting requirement has not affected industry evenly. For instance, there are approximately 146 companies in the chemicals and allied products industries which use a trillion or more Btu's annually. Only 50 of these, consuming a total of over 2,200 trillion Btu's, are currently required to report. The remaining 96 companies not required to report consume over 500 trillion Btu's. On the other hand, the textile industry includes only 49 companies, which consume a trillion or more Btu's annually. These 49 companies report a total energy consumption of 174 trillion Btu's. Furthermore, a number of companies in the second 10 industries use considerably more energy than many companies currently required to report—such as those in the electrical and electronic equipment industry (General Telephone and Electronic Company).

Require direct reports from all companies rather than allowing the third party reporting option exercised by about 375 of the reporting companies. Over 1,200 companies in the 10 most energy consumptive industries are currently reporting through voluntary programs that meet the exemption criteria.

While the current voluntary reporting program probably aggregates more total energy and does involve more companies than the proposed H.R. 5037, we believe that the need to objectively display to Congress and the public actual conservation and energy efficiency achievement of industry can best be done through direct reporting. Reporting required by H.R. 5037 is expected to include 75 to 98 percent of the energy used by the five largest energy consumptive industries—chemicals, primary metals, petroleum and coal, stone, clay and glass, and paper products.

Require each reporting company to establish and maintain plant reports. These reports are required to be retained at least 5 years, and made available to the Government. We support this provision because it provides an opportunity to assure common definitions of energy efficiency at the plant level. Such plant level reports would also assist in any auditing program which would be necessary to test data accuracy. We have already invited industry to submit plant level forms which they feel would be acceptable as a basis for the development of an improved reporting system. We are not thinking of a complex reporting format, but rather a simple industry-wide form similar to that already developed by Carborundum submitted with this testimony.

Allow FEA discretion to require companies to report by recognizable basic industry sectors according to Standard Industrial Classification (SIC) codes. The current law established energy efficiency improvement targets at the two-digit SIC code level. Aggregated data to the two-digit level does not always have great value in measuring energy efficiency for generally recognizable industries. For

instance, the aggregation of the primary metal industries' data combines energy information on aluminum, steel, and copper. Such data is currently used to measure progress toward the total industry two-digit SIC 33 net energy efficiency target of 9 percent.

By providing FEA flexibility to modify the reporting requirements through H.R. 5037, we understand the intent of Congress is to permit energy efficiency measurements toward existing disaggregated targets such as 12.8 percent for the aluminum industry, 9.1 for the steel industry and —28 for the copper industry.

Another example of the current problem which could be solved within the framework of H.R. 5037 is that of the food industry. SIC 20, Food and Kindred Products, includes 47 component parts. We need to know the energy use of the meat, bread, sugar, or corn milling industries rather than the Btu consumption generally defined by SIC 20. While the SIC 20 target is 12 percent, the significant component goals range from 6 percent for coffee to 20 percent for raw cane sugar. To further complicate the issue, food companies currently report through 11 associations, and in some cases a single company will report through as many as three associations. Some of these associations conform to the four-digit SIC classifications, while others report on a two-digit level. Therefore, meaningful comparisons within SIC 20 are impossible.

In addition, H.R. 5037 provides an opportunity to assess the plant level industrial process which accounts for approximately 40 percent of the Nation's industrial energy consumption—steam raising through direct combustion of fuels. Industrial steam raising represents 16 percent of the total annual national energy consumption. Meaningful measurements and reductions may be possible and we are prepared to implement the required demonstration program within the 18 months provided.

There is also sufficient potential for improving the efficiency of fuel utilization in many tasks, other than steam raising, to warrant a study of the relevance of the concept of measuring energy efficiency as the ratio of the minimum available work necessary for accomplishing a given task to the available work in the fuel used. Under the provision of H.R. 5037 such a study would be completed within 12 months. It would be feasible in that time period to identify those industrial processes for which such a measurement is practical and relevant.

PROPRIETARY DATA PROBLEMS

The potential problem of determining proprietary data is the subject of continuous discussion between the Government and industry. Industry representatives may believe that H.R. 5037, based on previous experiences, will increase the supply and cost of misinformation rather than actually clarifying industrial energy use. This is the basis for company concern over freedom of information requests for company specific data. Many companies would prefer that all energy consumption data remain confidential or be screened through trade association programs. An FEA appeal decision has determined that *total* corporate annual energy consumption is public information. We support this finding and believe that aggregated data submitted on direct company reporting forms should not be considered confidential. However, we believe that plant-by-plant data should remain confidential to safeguard competitive positions in the industry. We believe, therefore, that we can work cooperatively with the industry to achieve our conservation goals without jeopardizing their competitive posture.

Of the 100 companies currently electing to report directly to FEA on the mandatory form, only two have requested that their information be considered confidential. These two companies report under SIC 34, Fabricated Metals. Since 12 other companies in the same direct-reporting category did not request confidentiality, they apparently believe the information provided does not impact on their ability to effectively compete. This division of opinion is particularly interesting since the mandatory report is more detailed in requirements than the voluntary format.

One important component in promoting energy conservation is a fair, responsive and equitable reporting system that can be used in making sound, economic and energy efficient program and policy decisions. Perhaps the strongest reason for direct reporting is the potential for an increased commitment on the part of the chief executive officer who would be personally accountable for the continuing effort to improve energy efficiency. Our target documents indicate that the 10 most energy consumptive manufacturing industries can save an average of 1.25 million BOE per day (roughly \$10 million a day in energy costs) with economically feasible, known energy conservation technology.

Another reason for direct reporting is that companies are not measured by targets. In other words, the information we receive on a disaggregated basis under H.R. 5037 will be added together in terms of SIC classification codes. We will then have an opportunity to see how much energy efficiency is being obtained by specific industry sectors as defined by SIC classifications. But many companies such as General Foods, Procter and Gamble, Ralston Purina and ITT Continental cover anywhere from two to eight component goals within a two-digit classification. One company even reports across 5 two-digit SIC codes. Company specific energy efficiency improvements are not possible to evaluate under the current system except through direct FEA reports or through extensive and expensive association auditing programs.

Under H.R. 5037, we and the involved industry have a cooperative and mutually supporting opportunity, to (1) focus on energy problems/definitions at the plant level (2) measure energy efficiency according to recognized industry sectors (SIC disaggregated codes) and (3) identify energy use by company to promote corporate responsibility in the national energy conservation effort.

RECOMMENDATION

My letter to you dated April 18, 1977, outlined our approach in reviewing the industrial reporting program. At that time, H.R. 5037 was not under consideration. A preliminary analysis of consolidated data under the current program confirms the deficiencies outlined in this testimony. We believe, therefore, that H.R. 5037 revisions are necessary to establish an accountable and responsive reporting system that will benefit both industry and the public.

I would like to assure the committee that we will improve the current program in full cooperation with the impacted industries. Before making such improvements, we intend to hold a series of public workshops and hearings to ensure a responsible and beneficial reporting program.

That concludes my statement. I would be pleased to respond to any questions you may have, or we are prepared to submit the responses in writing, as you prefer.

Mr. DINGELL. Mr. O'Leary, the Chair thanks you for your assistance to us today.

I think we will now hear next from our next witness, Dr. Chiogioji. Would you be next?

STATEMENT OF MELVIN H. CHIOGIOJI, ASSISTANT DIRECTOR, DIVISION OF BUILDINGS AND COMMUNITY SYSTEMS, OFFICE OF CONSERVATION, ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

Mr. CHIOGIOJI. Thank you very much, Mr. Chairman.

Mr. Chairman and members of the committee, I appreciate the opportunity to appear before this committee to discuss H.R. 8985, a bill to amend the Energy Policy and Conservation Act to provide for the establishment of energy efficiency standards for electric motors and pumps and for other purposes and H.R. 5037—formerly S. 2037—relating to energy efficiency of industrial equipment.

H.R. 5037 relates both to energy efficiency in industrial equipment and a section to amend the industrial energy reporting provisions of the Energy Policy and Conservation Act, but I will concentrate my remarks today primarily to the industrial energy efficiency portion and defer comments on the industrial reporting process to the Federal Energy Administration.

Industry, as you are well aware, is the largest consumer of energy in this country, using approximately 40 percent of the total energy used. Of industrial energy consumption, we estimate that more than 50

percent is consumed by the equipments covered by the legislation. It is very difficult, however, to make a precise estimate because these equipments are, in many cases, engendered as part of an industrial process.

Very little research has been published to determine what can be done to improve the efficiency of specific industrial equipment. A start has been made by the FEA in two studies; namely, a study on energy efficiency and electric motors prepared by Arthur D. Little in August 1976, and a study on the potential for energy conservation through improved industrial boilers, by KVB Engineering in October 1976.

ERDA has been working on a number of specific industrial equipment:

A development and demonstration project by Exxon on boiler fuel controls.

A study by Varigas on powered handtools.

A number of R.D. & D. projects on high temperature waste heat recuperators by Airresearch, Midland-Deschamp, IGT, and Terratek.

A study by Princeton Combustion Lab on pump efficiency.

Development and demonstration projects directed to covered equipments which are integral to industrial processes.

Based on past research we conclude that there is a significant potential for energy conservation and energy efficiency improvement in electric motors which are economically justified. Arthur D. Little, for example, has stated that the potential exists to conserve 31.8 billion kilowatthours between now and 1985 through increased electric motor efficiency. Their studies have shown that the greatest savings would occur in the 5 to 20 horsepower range of integral horsepower alternating current inductance motors which consume approximately 75 percent of the total industrial and commercial motor electrical consumption. Table 1 provides an estimate of the current efficiencies which can be achieved in integral polyphase motors.

[The material follows:]

TABLE 1.—INDUSTRIAL SECTOR ENERGY SAVING POTENTIAL, INTEGRAL HP AC-POLYPHASE MOTORS

Motor size category (horsepower)	Average kilowatt	Kilowatt savings per 1,000 hours of use (hours per year)	Percent of total
1 to 5.....	2	2,315	25.5
5.1 to 20.....	12	3,942	43.4
21 to 50.....	32	1,872	20.6
51 to 125.....	60	748	8.2
126 to 200.....	120	211	2.3
201 to 500.....	260		
Over 500.....	1,500		
Total.....		9,088	100.0

Mr. CHIOGIOJI. Motor inefficiencies have two dimensions. One is largely concerned with the power losses that occur within the motor itself, and a second category relates to the motor being more reactive—low power factor—than it need be. The latter characteristic causes some additional power losses to occur in the power generation and distribution system, and typically requires that this system be significantly larger and more costly than it need be.

The first category of losses is essentially uncorrectable. Although for fractional and low horsepower motors, the use of electrical or silicon steel within the motor rather than the normal carbon steel can result in significant energy savings; the second—power factor—can be corrected by additional investment in components—capacitors—added to the motor externally. However, these corrections are often not made.

Published motor efficiency data for a given size and type of motor are highly variable between manufacturers and often even between different models of the same manufacturer. The variations are caused in part because current specifications allow many alternative efficiency test methods of varying overall precision and opportunity for error.

Additionally, there are no specifications or rules on the correlation between test and published data. Manufacturers can choose to be either conservative, precise, or perhaps even cavalier about the data they publish. In addition, manufacturers often produce two or more lines of motors of varying price and efficiencies, and the distinction between their various product lines is often obscure.

The accuracy of currently published efficiency data can thus be suspect. Knowledgeable people readily admit that substantial actual variability exists between comparable motors. Large purchasers may often do request and receive test certifications. However, such procedures apply only to a small fraction of integral horsepower motor sales. The average purchaser must rely on published data.

Historically, motors have been purchased with little consideration being given to characteristics other than enclosure requirements, price, and supply. The industrial and commercial end user is largely unaware of efficiency variations in commercially available motors. His purchasing habits reflect these attitudes as well as the desire to purchase the highest quality motor at the lowest possible price.

Motors are typically purchased by nontechnical personnel from approved vendor lists which are compiled from past experience on price, reliability, and ready supply. The purchasing agent purchases the lowest priced, approved motor that has the desired horsepower rating, design type, and enclosure.

About 50 percent of all motors sold are purchased by original equipment manufacturers—OEM; that is, manufacturers of pumps, blowers, machine tools, and other equipment supplied to end users complete with motors. An OEM is in many cases not very interested in efficiency because he is interested in low first cost and in higher reliability machiner. Additionally, the end user almost always will accept purchased equipment without questioning the characteristics of its motors. There is some evidence that these viewpoints and habits are gradually changing; however, there is a great deal of inertia in the existing system.

Changes wholly in response to changing economic pressures will be slow. However, some industries now include at least embryonic motor efficiency consideration in their energy management screening procedures, and this trend is on the rise. Thus, the stage may be set for accelerated realization of these economies. What may be needed is Government-encouraged changes in close cooperation with the professional and trade associations to make increased motor efficiency feasible, visible, and economically attractive.

There are some potential difficulties in arriving at a standard which is both administratively feasible and applicable to a sufficiently wide cross section of an equipment's use conditions and characteristics. It is our opinion, however, that if the provisions of H.R. 8985 and H.R. 5037 provide sufficient latitude for discretionary authority for establishment of efficiency standards, we would support it.

We do have, however, some comments and suggestions on the legislation.

- A major effort must be made to obtain data necessary to establish meaningful and reliable standards. No standards should be established for equipment classes where data does not provide the basis necessary for establishment of a standard.
- We question the time frame for establishment of standards; for example, 3 years as required in H.R. 9885. If this is done, standards may be set that have no established basis. Rather, we suggest that standards be established in a step-by-step procedure leading from test procedures through labeling to standards. A process by which all interested parties have access to the standardmaking process must be established to insure equity.
- We agree that manufacturers should be required to supply articles for testing and that the Federal Trade Commission should be consulted on labeling.

Since much more is known about pumps and motors, an initial focus in this area is sound.

In summary, the legislation should provide flexibility in the establishment and application of equipment efficiency standards and if it does, we would support such legislation.

Mr. Chairman, I am prepared to answer any questions which you may have.

Mr. DINGELL. Doctor, thank you.

STATEMENT OF ORCUTT P. DRURY, ACTING DIRECTOR, OFFICE OF ENERGY PROGRAMS, DEPARTMENT OF COMMERCE

Mr. DRURY. Mr. Chairman, I am pleased to appear before this committee in response to your letter of invitation of September 21. My office has responsibility for day-to-day operation of the voluntary industrial energy program under Federal Energy Administration policy direction and guidance.

You have copies of my written testimony, but if you have no objection, I would prefer that my oral statement be even more brief.

Mr. DINGELL. Without objection then, we will insert your full statement in the record, and we will recognize you for such comments as you choose to make.

Mr. DRURY. Thank you, Mr. Chairman.

The voluntary program as it functions in the Department of Commerce, and its people, are transferring to the new Department of Energy. The administration supports the Senate amendments and the Department defers to the testimony you have heard from Mr. O'Leary as far as answers to your questions in your letter of invitation are concerned.

I would just like to say from a historical point of view that we initiated the voluntary program with industry's help before FEA was officially activated. Since FEA has existed, we have been responsible by interagency agreement for the day-to-day management of the program but under the policy direction and guidance of FEA.

In that voluntary mode industry has been very cooperative and demonstrated considerable initiative. I have here with me for your use, for whatever the committee might like to make of it, a copy of each of the five semiannual reports we have published during that time. The most recent report shows an overall 8.2-percent improvement from 50 industry groups representing just over 3,000 firms. As we in Commerce turn our past role over to the new Department of Energy, I wish to express a strong voice of appreciation for the cooperation and help industry has given us.

I would be pleased to attempt to answer any questions that you may have.

[Mr. Drury's prepared statement follows:]

STATEMENT OF ORCUTT P. DRURY, ACTING DIRECTOR, OFFICE OF ENERGY PROGRAMS, U.S. DEPARTMENT OF COMMERCE

Mr. Chairman: I am Orcutt P. Drury, Acting Director of the Office of Energy Programs. I am pleased to appear before this Committee in response to your letter of invitation of September 21. My office has responsibility for day-to-day operation of the Voluntary Industrial Energy Conservation Program under Federal Energy Administration policy direction and guidance.

I will first give you my views on voluntary energy conservation efforts—from a historical perspective based on my experience since November 1974—then I will refer to the questions contained in your letter of invitation. On most of the questions, the Department of Commerce defers to the Federal Energy Administration. In that regard, the voluntary energy conservation programs conducted by my office together with personnel and other resources are transferring to the new Department of Energy. My view is that voluntary energy conservation efforts should be fostered throughout all sectors of society. The question today pertains to the industrial sector.

You have asked industry representatives to testify, to show with specific examples, how the information compiled at the association level under our present program helps to identify areas for improved energy conservation.

It is the kind of voluntary effort you will hear about from those industry representatives that we have striven to stimulate from within the Department of Commerce.

Energy conservation efforts by industry save money. There is useful correspondence between profit maximization and national purpose in this instance. Throughout industry, numbers of career personnel have been dedicated to the energy conservation effort. A serious, long-term effort in industry is underway and growing.

Prior to the passage of the Energy Policy and Conservation Act in December 1975, we encouraged a large number of major industry groups to establish energy management information systems which could be used to save energy and money—with a progress report to government as an important byproduct. On this basis, the associations were asked to select the units of measure which best suited their operations.

Here is a set of two and a half years of semiannual reports compiled under that voluntary approach. That approach encourages experimentation and innovation; it calls for the application of creative effort towards conservation goals.

So my primary message today as the Commerce Department turns this program over to DOE is that industry deserves a strong word of appreciation for the cooperation we have enjoyed under the voluntary program.

And now with regard to the questions in your letter of invitation:

Your first question asks for the role of the Department of Commerce in the voluntary reporting program.

As I have stated, we have responsibility for day-to-day management of Voluntary Industrial Energy Conservation under FEA guidance.

The results of the program are, we believe, very good.

The most recent report shows an overall 8.2 percent improvement in energy savings per unit of output for 1976 over 1972 based on reports from 50 groups representing 3,037 firms.

In response to part (a) of your second question—deficiencies in the present reporting program—I would identify two problems that should and can be corrected.

First, the target documentation by which industry goals were established are not in every industry commensurate with the methodology by which progress reports are actually compiled. This is an “apples and oranges” deficiency that is correctable. In those industries where the problem exists, measurement consistency can be attained by redoing the target documentation, the reporting procedures or a combination of each.

Second we have not yet conducted a formal verification of the data submitted, however, we have worked with FEA to establish a test verification procedure. Additionally, industry representatives are fully willing to cooperate with us in verifying their reporting procedures.

In response to parts (b) and (c) of your second question and to your third question, the Administration favors the new approach of the Senate amendments, and the Department defers on these questions to the testimony of the Federal Energy Administration which you have already heard.

I will be pleased to attempt to answer any further questions you may have.

Mr. DINGELL. Mr. Drury, we thank you for your very helpful testimony.

Without objection, the documents which you have alluded to will be received and the staff will review them to decide which portions shall be inserted in the record.

[The documents referred to may be found in the subcommittee files.]

Mr. DINGELL. Gentlemen, ladies, we thank you all for your assistance to us.

The Chair would like to make a few brief inquiries from Mr. O’Leary with regard to the reporting sections which have been something of a concern to me and which remain undiminished by the legislation now before us.

Let me read from the appropriate part of the statute, and I am referring to 42 U.S.C. 6345, section 375(a) and the basic statute to which I refer I am sure you understand is EPCA, and the language reads as follows:

Such report shall contain such information as the Administrator determines is necessary to measure progress toward meeting the energy efficiency improvement target set for the industry of which such corporation is a part; except that the Administrator shall not require such report if such corporation in industry has an adequate voluntary reporting program as defined by section 376.

Section 376 goes on to deal with what constitutes an adequate reporting provision.

There are essentially two requirements. The first is that if you find that you have an adequate voluntary reporting program as defined in section 376(g) you can allow the reporting in aggregate.

(g) says as follows:

The Administrator shall exempt a corporation from the requirements of Section 375(a) if such corporation is in an industry which has an adequate voluntary reporting program as determined by the Administrator annually after notice and an opportunity for interested persons to comment. An industry’s voluntary reporting program shall be determined adequate only if (a) each corporation within

such industry which is identified under Section 373 fully participates in the program, (b) all information deemed necessary by the Administrator for purposes of evaluating the program made by such industry in achieving the industry energy efficiency improvement under Section 374 is provided the Administrator and (c), the reports made to persons associated with the program are retained for a reasonable period of time and are available to the Administrator.

Then there is some additional language.

If the Administrator determines that an industry's voluntary reporting program is not adequate solely on the basis that any corporation is not participating, he should exempt from the requirements of 375(a) only those corporations which continue to participate in the program.

You have under this section broad powers. The first is to ascertain whether or not there is an adequate reporting program. Am I correct?

Mr. O'LEARY. That is correct, Mr. Chairman.

Mr. DINGELL. Have you ever found that any industry with its trade association did not have an adequate—

Mr. O'LEARY. I think we have never made a formal finding of inadequacy. Mrs. Hobson?

Mrs. HOBSON. No, we have not. All have been deemed adequate who applied.

Mr. DINGELL. Does this lead me to the rather remarkable conclusion that all are in full conformity with the statute?

Mr. O'LEARY. Mr. Chairman, that is a very subjective measure. Let me back into that question by asking ourselves what are the things that we would like to do under H.R. 5037 that we are supporting, that we regard first of all ourselves as not doing under EPCA and secondly not able to do by EPCA.

These are the points here that I think we ought to reflect on. First of all, can we obtain a consistent definition of terms? We are not doing that now. We think that we can. I want to explain in that context—

Mr. DINGELL. I happen to think that the particular statute we are dealing with is not adequate. But it does strike me that we have not done everything we could or should have.

Mr. O'LEARY. That is right, Mr. Chairman. I had to make a choice in March when I reviewed this program whether to completely derail what I regarded then as an inadequate piece of staff work on the part of FEA with some 2 years of history behind it which was only beginning or let that run for a brief period of time and then build on it in successive years.

I chose at that point to permit the organization to go ahead with what it had developed on the provision that they advise the industry groups that they were working with that we would be moving toward disaggregated data and greater standardization of reporting.

So I would say there are a good many things that H.R. 5037 will do that EPCA would do as well and that we have not done.

There are some very significant things that H.R. 5037 would do that EPCA under at least our legal interpretation would not do.

Mr. DINGELL. It might be that at the comfort of your leisure you might identify those to us. I think it would be useful to us.

Mr. O'LEARY. I can very briefly do that, Mr. Chairman.

Mr. DINGELL. If you can give it to us now.

Mr. O'LEARY. The first is the consistent definition of terms, the point that I just made. We are not doing that. We could do it. The new bill does it.

Disaggregated reporting. We are not doing that. It is questionable that we can do that under EPCA. The new bill would give us that authority.

Mr. BROWN. Why is it questionable under EPCA?

Mr. O'LEARY. I am going on the basis of a preliminary legal interpretation, Mr. Brown. I would be glad to give a memorandum of law on that.

Mr. BROWN. Legal interpretation by whom?

Mr. O'LEARY. Our legal counsel.

Mr. BROWN. This is an internal judgment?

Mr. O'LEARY. Internal judgment by our General Counsel. I would be glad to give a memorandum concerning this point to you. And other points as well.

Mr. DINGELL. In any event there is a question inside FEA as to whether you can carry this matter forward.

Mr. O'LEARY. Yes. The next one has to do with the disaggregated targets. We are not doing that. Counsel tells me that we may not do it under EPCA, under his interpretation of EPCA. Again, I will be pleased to supply his reasoning.

Mr. DINGELL. I think that would be helpful. Without objection, they will be inserted in the record.

[The following letter was received for the record:]

FEDERAL ENERGY ADMINISTRATION,
October 5, 1977.

Hon. JOHN D. DINGELL,
Chairman, Subcommittee on Energy and Power, Committee on Interstate and Foreign Commerce, House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: In answer to the request by the Subcommittee on September 27, 1977, and as promised by John O'Leary, we are providing our views with regard to present and potential authorities concerning disaggregated reporting and targets under the industrial energy conservation program. In particular, we wish to address two questions raised by the Industrial Reporting Legislative Issues Matrix presented to the Subcommittee. The questions are:

- (1) Whether disaggregated reporting could be done under the Energy Policy and Conservation Act (EPCA) and
- (2) Whether disaggregated targets could be established under H.R. 5037.

DISAGGREGATED REPORTING

While sections 375 (a) and (b) of the EPCA contemplate aggregated reporting, the authority of the Administrator under section 375(a) to determine what information is "necessary to measure progress" and section 376(b)'s broad information gathering authority, coupled with the authority to gather information under section 13(b) of the Federal Energy Administration Act of 1974 and section 11 of the Energy Supply and Environmental Coordination Act of 1974, enables the Administrator to institute disaggregated reporting under current law.

DISAGGREGATED TARGETS

While H.R. 5037 removes any possible impediments to disaggregated reporting, it does not explicitly provide for the establishment of disaggregated targets toward which progress would be measured. If the establishment of disaggregated targets is the intent of Congress, it would be desirable for the legislation to make explicit the authority to establish such targets. It should be noted that while section 374(a) of the EPCA requires a single target for each identified industry, component goals have been developed under the EPCA as part of the basis and justification for the prescribed targets.

Sincerely,

ERIC J. FYGI,
Acting General Counsel.

Mr. BROWN. Mr. Chairman, will they come before we get a report on this hearing?

Mr. DINGELL. I assume they will come with all speed.

Mr. O'LEARY. They will come within 2 days, Mr Chairman.

Mr. DINGELL. We have always had excellent cooperation from Mr. O'Leary.

Mr. O'LEARY. Mandatory direct reporting, EPCA now, no. EPCA possible, no. The new bill, yes.

Standard plant level reporting form, EPCA now, no. EPCA possible, no. The new bill, yes.

Extending targets to all 20 manufacturing industries, we are not now doing that. We probably could be doing that under EPCA. The new bill of course would make that possible.

Mr. OTTINGER. Excuse me, if I might. I thought there were——

Mr. DINGELL. The Chair will yield to the gentleman.

Mr. OTTINGER. I thought there were 50 industries reporting.

Mr. O'LEARY. Mr. Ottinger, my understanding is that there are 20 manufacturing industries, not 50.

Mr. OTTINGER. The bill provided——

Mr. DRURY. If I may help on that, I testified that there were 50 industry groups reporting. That is at the trade association level. Mr. O'Leary was talking about the standard industrial classification at the two-digit level as prescribed by law.

Mr. OTTINGER. Maybe counsel can help us out here. The legislation required the reporting of the 50 largest energy users in each of 10 industries. This refers to——

Mr. O'LEARY. This refers to the number of manufacturing industries. I am saying that there are 20 we would like to reach.

Mr. OTTINGER. So you increase from 10 to 20 industries and increase the number of companies——

Mr. O'LEARY. Now we get to that point. Extending reporting to all companies using one trillion Btu's. Under EPCA, we do not do that now. EPCA does not permit that as we interpret it. We would be able to do that under the new legislation.

Measurements of industrial steam raising, we don't do it. We are advised that we cannot do it under EPCA. It would be done under the demonstrations called for in 375(g) of the new legislation.

The survey of second law applicability, we are not doing it. We are advised that we could not be doing it, although I think there is a question of that. We probably could do it under the mandatory reporting of the other authorities that we have. However it would not be systemic to this particular data system. We are given specific authority in 375(h) of the new legislation.

Mr. Chairman, I would be more than pleased to provide this summary chart to you with regard to what we can do and haven't done.

Mr. DINGELL. I think it would be most helpful if you could. I think the members would appreciate it.

Mr. O'LEARY. I would like the chart not to be made a matter of record for 2 more days, pending final determination by the general counsel.

Mr. DINGELL. We will not then accept it for the record at this time. We will receive word from you with regard to counsel.

The Chair thanks you.

I have a couple of other questions.

[The chart referred to follows:]

INDUSTRIAL REPORTING LEGISLATIVE ISSUES MATRIX

[What is being done under EPCA? What could be done under EPCA? What could be done under Kennedy bill?]

Legislation	Consistent definition of terms	Disaggregated reporting	Disaggregated targets	Mandatory direct reporting	Standard plant level reporting form	Extending targets to all 20 manufac- turing in- dustries	Extending to reporting to all compan- ies using 1 trillion Btu's	Measurement of indus- trial steam raising	Survey of 2d law applicability
EPCA (now)	No	No	No	No (some elective)	No	No	No	No	No
EPCA (possible)	Yes	Questionable	No	No (only mandatory if all 3d party pro- grams declared inadequate)	No	Yes	No	No	No
H.R. 5037	Yes	Yes	Yes (implied)	Yes	Yes	Yes	Yes	Demonstration 375(g)	Survey 375(h)

Mr. DINGELL. The gentleman from Ohio is recognized on his own time.

Mr. BROWN. Thank you, Mr. Chairman.

I am fascinated by how things become law and why. I am curious. On page 8 of your testimony you are referring to this whole business of using the second law of thermodynamics technology, to get reports from plants around the country about the efficiency of their steam generating systems and other systems. Is that right?

Mr. O'LEARY. This is a demonstration only.

Mr. BROWN. What would be involved in dollars and cents in that demonstration program?

Mr. O'LEARY. Let me give you a little example of what we have found in conjunction with some work that FEA has sponsored with Auburn University in Auburn, Ala. In that particular case we have supported a number of workshops that are aimed precisely at this point; that is in improving the efficiency of boilers through improved boiler management rather than plant reconfigurations.

We find on going back through the reporting of those workshops that we are getting, routinely, improvements of 18, 22, 23 percent in the overall efficiency of steam raising on these boilers.

It would seem to me that, given the enormous amount of energy that goes into steam raising in this country and the fairly clear evidence that this workshop experience gives us, there is a large target there. What I understand will be provided by the proposed legislation is the authority in FEA or its successor to make a survey with regard to how close to theoretical maximum efficiency actual steam raising practices are.

Mr. BROWN. How would they do that?

Mr. O'LEARY. They do it by relatively routine measurements.

Mr. BROWN. Done with what?

Mr. O'LEARY. Mr. Chairman, you would have to get someone who is a noneconomist to answer that one. I think we probably have one right here.

Mr. BROWN. Is it a technical device?

Mr. CHIOGIOJI. You can measure it through spectrometers as far as combustion is concerned. Primarily as far as steam raising is concerned most of your very large boilers are fairly efficient. However you can install various types of devices for improved combustion to make sure there is not so much excess air plus maintenance procedures.

Mr. BROWN. What technical devices have been developed in this area? Many?

Mr. CHIOGIOJI. Not many, no. Just automatic controls.

Mr. BROWN. I was under the impression that one of the former FEA employees is a consultant to a firm that operates in this field. Is that correct?

Mr. CHIOGIOJI. That is correct.

Mr. BROWN. Who is that?

Mr. CHIOGIOJI. Are you talking about the second law work?

Mr. BROWN. Yes.

Mr. CHIOGIOJI. Is that Mr. Sant?

Mr. BROWN. Yes.

Mr. CHIOGIOJI. Yes. He is with Thermo Electron Corp.

Mr. BROWN. What was he at FEA?

Mr. CHIOGIOJI. He was an Assistant Administrator.

Mr. BROWN. Of what?

Mr. CHIOGIOJI. Of the FEA.

Mr. BROWN. In what area?

Mr. CHIOGIOJI. Conservation.

Mr. BROWN. He has a consultant relationship with the company; doesn't he?

Mr. CHIOGIOJI. Yes, with Thermo Electron.

Mr. BROWN. He testified, as I recall, before the Joint Economic Committee or rather the Energy Subcommittee of the Joint Economic Committee, one of their officers, on this particular area. Not Sant, now, but a company official.

Mr. CHIOGIOJI. Mr. George Hatsopoulos, you mean?

Mr. BROWN. Yes.

Mr. CHIOGIOJI. Yes.

Mr. BROWN. How did they develop their process?

Mr. CHIOGIOJI. I am not really familiar with their entire process.

Mr. BROWN. But would this process that they have be used if we mandated this?

Mr. CHIOGIOJI. Not necessarily. I really wouldn't know how the thing would be operated.

Mr. BROWN. Is that what they do?

Mr. CHIOGIOJI. I do not know. I am not certain what they are doing.

Mr. BROWN. Does anybody know?

Mr. O'LEARY. Yes, Mr. Chairman. There are a group of people at MIT led by Professor Gyftopoulos, who is professor of physics at MIT. They have been looking at overall efficiency from the standpoint of second law thermodynamics in steam raising and particularly the use of both internal steam raising functions and external use of waste heat.

In the discussions that I had with them I guess initially about 3 years ago, the results were startling. We had tended, I believe, to view as conventional efficiencies of the overall steam cycle in the 18- to 22-percent range. Their conclusions were that the overall efficiencies were probably closer to the 4- to 8- percent range.

Since then my understanding is that they have formed a corporation. They sell a service in which they advise industrial accounts as to how to get a larger amount of the inherent energy in the fuels that are utilized in steam raising, and are now inefficiently used in steam raising and wasted to a large extent, in the industrial process.

Mr. BROWN. As I understand it, that is precisely the purpose of the Kennedy amendment, to mandate through the Federal Government authority the use of that or some similar process. Is that correct?

Mr. O'LEARY. No; I don't think so. My understanding is that what we are looking at here is a survey to find out with more certitude than we have at the moment what the theoretical versus actual—or I should say, Mr. Brown, actual versus theoretical—efficiencies are and then to do a demonstration.

Mr. BROWN. But it started, did it not, when it was originally introduced as a mandated program, to use a technology which this company is kind of in the lead of? I would like to know further where that company got the funds, not the company, perhaps, but where the funds came from for this system to be developed. Didn't they come from ERDA?

Mr. CHIOGIOJI. No; it didn't, Mr. Brown. It came from a Ford Foundation grant which Mr. Gyftopoulos got, early on, even before the FEA was even started.

Mr. BROWN. Even ERDA. That was the question.

Mr. CHIOGIOJI. Even ERDA, Both.

Mr. BROWN. They received no Federal assistance?

Mr. CHIOGIOJI. Not that I know of.

Mr. O'LEARY. No; I think that we have provided, FEA has provided—

Mr. BROWN. Would you check for me on that to be sure? Because I don't like the picture of Federal funds going to somebody who starts a corporation and hires a former FEA conservation official and gets a Senator from that State to put legislation in that mandates that that system then should be used and then modifies to say that it is only a demonstration project. There is something about that that really kind of bothers me. Maybe it is all OK.

Mr. O'LEARY. I will be glad to provide a history of that. But I think you will find—

Mr. BROWN. Would you, please?

Mr. O'LEARY. I think you will find this to be the case, Mr. Brown, that Thermo Electron Corp.—

Mr. BROWN. Of which Mr. Gyftopoulos—

Mr. O'LEARY. Gyftopoulos.

Mr. BROWN. Is now the president?

Mr. CHIOGIOJI. No; Mr. Hatsopoulos is the president. Mr. Gyftopoulos is just a consultant.

Mr. BROWN. I got lost in the names. Dr. Chiogioji, some of these names—

Mr. CHIOGIOJI. Yes; mine is pretty rough too.

Mr. BROWN. For a guy named "Brown."

Mr. O'LEARY. I think you will find that the corporation was founded well before the FEA grant. The FEA grant was based upon, as I understand it, a review of the merits of what they were doing in cogeneration—waste heat management.

Mr. BROWN. Who did the grant go to?

Mr. O'LEARY. It went to the corporation.

Mr. BROWN. And now you are testifying that we mandate a demonstration project—

Mr. O'LEARY. Which is not at all unusual.

Mr. BROWN. To use their process.

Mr. O'LEARY. Which is to look at a law of thermodynamics which was discovered, first enunciated—

Mr. CHIOGIOJI. The second law was enunciated in the 1830's.

Mr. O'LEARY. In the 1830's.

Mr. BROWN. I understand that. But we are talking about a process now, aren't we? And we are going to use a demonstration project which this company that got an FEA grant is in the van of. I am bothered by it.

Mr. DINGELL. If the gentleman permits, I observe that his time has expired.

Mr. BROWN. Give me the relationship of Mr. Sant to the company too.

Mr. DINGELL. The Chair will recognize now Mr. Ottinger.

The Chair observes that Mr. Gyftopoulos will be here to testify on Thursday.

The gentleman will be recognized at that time. He can ask those questions directly to the people involved.

Mr. BROWN. But I do get the information provided that I requested, Mr. Chairman?

Mr. DINGELL. The information requested I am sure will be submitted. If the gentleman doesn't get it, we will see that he does.

Mr. O'LEARY. Mr. Chairman, just to clean the record up, I will provide data with regard to the FEA contract, which I understand ran to cogeneration and not to second law considerations, and what little we know about the personnel matter alluded to.

Mr. DINGELL. If there is anything you would like to add, Dr. Chiogioji, we would be grateful.

Mr. CHIOGIOJI. I certainly will do that, Mr. Chairman.

[The following letter was received for the record:]

FEDERAL ENERGY ADMINISTRATION,
Washington, D.C., September 29, 1977.

Hon. JOHN D. DINGELL,
Chairman, Subcommittee on Energy and Power, Committee on Interstate and Foreign Commerce, House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: During yesterday's hearings on H.R. 5037 and H.R. 8985, part of the information requested by the Subcommittee concerned the relationship between the Federal Energy Administration (FEA) and the Thermo Electron Corporation (TEC). Three areas might be of interest to Subcommittee members.

CONTRACT WITH TEC ON COGENERATION

Purpose: To evaluate the feasibility of increased industrial in-plant electrical generation in the paper, chemicals and petroleum refining industries.

Start date: June 30, 1975.

Amount: \$222,800.

Completion date: June 1976.

This procurement was made on the basis of competitive bids. The Technical Evaluation Committee was composed of three people from the Office of Conservation and Environment in FEA, and one individual from the staff of the Federal Power Commission. Six proposals were received. Enclosed is a copy of TEC's final report.

POSITION OF ROGER SANT IN FEA

Roger Sant, a former FEA Assistant Administrator for Conservation and Environment, is presently a consultant to TEC. His resignation from FEA was effective May 15, 1976.

TECHNICAL SOURCES CONTRIBUTING TO H.R. 5037

The Second Law of Thermodynamics was applied to the availability of energy in fuels to do useful work by J. W. Gibbs in 1875, by Dr. Joseph H. Keenan, Professor Emeritus, Massachusetts Institute of Technology (MIT) in 1932 and Manson Benedict, also of MIT, in 1949.

Elias P. Gyftopoulos, Professor of Nuclear Engineering at MIT and consultant to TEC, contributed to the enclosed paper "A National Policy for Industrial Energy Conservation" dated April 25, 1977. He is also a co-author of *Potential Fuel Effectiveness In Industry*, a 1974 report on Second Law applicability to industrial processes. FEA was not involved, either financially or as a consultant, in producing either of these publications. Sections 375 (g) and (h) of H.R. 5037 apply the technical concepts outlined in these references to the industrial reporting system.

Sincerely,

JOHN F. O'LEARY,
Administrator.

Mr. DINGELL. The Chair recognizes Mr. Ottinger for 5 minutes.

Mr. OTTINGER. Thank you, Mr. Chairman.

I would just like to observe that if we were to bar from Federal assistance any company which employed a member of the Government, I think we would do away with about 90 percent of our contracting.

Mr. DINGELL. It would certainly wipe out the Defense Establishment.

Mr. BROWN. Might be a good thing.

Mr. OTTINGER. In connection with this steam-raising study of the second law of thermodynamics, does that include consideration of cogeneration, use of the steam for production of electricity for the individual plant?

Mr. O'LEARY. Yes, it would. One of the things that you would be concerned with here is the use of waste heat for other applications, including the development of electricity from that waste heat.

Mr. OTTINGER. I hope that appears in the legislative history because it gives us an opportunity for savings.

I noted in your statement, Mr. O'Leary—I don't seem to be able to find it—you mentioned the idea of life cycle costing for industrial equipment. I wonder whether it would be advisable for us to make a provision for some kind of labeling which would show life cycle costing. At the present time there is a strong indication that equipment is being purchased on a first-cost basis.

Mr. O'LEARY. Mr. Chairman, I think that is true. But I think we have to reflect on Mr. Brown's observation that a given piece of equipment is subject to a broad variety of service and what would be a wise investment from the standpoint of both fiscal and the whole life cycle cost on a high first-cost piece of equipment that was used intensively might be a poor investment for something that was used intermittently or in a standby capacity. So I really think that labeling may be beyond us. At least our understanding of the problem would now at this point preclude my recommending that we go for life cycle labeling at this time.

Mr. OTTINGER. We might at least encourage information along those lines to be supplied to the extent possible. We are doing something like that with automobiles that are also used quite differently.

Mr. O'LEARY. I think we are providing the raw material to procurement officers in the labeling that would flow from enactment of this particular piece of legislation for them to make their own life cycle conclusions.

Mr. OTTINGER. I would hope somebody would take a look at the feasibility of that. Maybe FEA and ERDA together. I don't know how difficult it is. I don't know that anybody at this point knows off the top of their head how difficult it would be. But it might be something which is very useful.

Mr. O'LEARY. We will certainly take a look at that.

Mr. OTTINGER. Under the two bills here, H.R. 8985 and S. 2057, under the reporting provisions, I don't know whether those are the two that affect it or not, is there a requirement that there be plant-by-plant target set by FEA or only reporting?

Mr. O'LEARY. It is reporting, Mr. Ottinger.

Mr. OTTINGER. What would be your attitude toward establishment of a target?

Mr. O'LEARY. I tell you, I have a great deal of difficulty with that. I will tell you why. If you take a look at a given plant today and 5 years ago you will find that their flow chart probably has changed significantly.

If you take a look at that plant today versus its neighboring plant producing an identical line of equipment you will probably find that there are very significant changes from one to the other. When we think of dealing with some 5,000, 10,000 industrial plants around the United States and having to —

Mr. OTTINGER. I understand we are talking about 900.

Mr. O'LEARY. No; we are dealing with reporting requirements here on 900 firms.

Mrs. HOBSON. Companies.

Mr. O'LEARY. Companies. Some of these companies will have dozens of plants. When we think of the sheer complexity of our going in, in the event that this target responsibility were given to us, the FEA or its successor, and doing any sort of a respectable audit, I don't think that is where we ought to be at this point in time, Representative Ottinger.

Mr. OTTINGER. Is it possible to establish on either a company or industry basis on the basis, of the knowledge you have what ought to be a target for their savings?

Mr. O'LEARY. We have on the basis of the mandate of EPCA put forward industry targets. These range from relatively modest for some industries that are energy intensive and have had to attend to this sort of a problem—for example, the primary metal industry has had to look at this very carefully over time—and therefore the savings tend to be on the lower end of the scale, to other industries where energy has not constituted a high percentage of their costs and there is substantial room for improvement. We have established what I would regard, on the basis of what we know about this problem at the moment, as sort of preliminary targets.

I think we need to improve our current target documents. We need to understand additional possibilities for improvement through the review of disaggregated data, on a selected company-by-company basis, in conjunction with the R. & D. programs that ERDA is bringing to this whole system, particularly on the basis of the work that ERDA has initiated in the last year.

I think between these two elements close, careful, disaggregated reporting and auditing on a selective basis, together with the programs that are now going forward in ERDA, we can bring forward substantially better targets than those which are now the product of the existing law.

Mr. OTTINGER. Do you set the targets by industry?

Mr. O'LEARY. It is actually by industrial category. My understanding is that we have 10 of those. This is by two-digit SIC category.

If we were to go down to the disaggregated target that we propose it would take us down to 131 discrete targets.

Let me go through a tree here. We have for example in SIC category 33, which is primary metals, one target and that target is 9 percent. But let us look at what is in that. The steel industry is in that. The aluminum industry is in that—iron foundries, copper. Indeed there are 13 separate and quite disparate industries that range, as far as the target goes, from a minus 28 for copper to a plus 20 for iron foundries in terms of potential energy savings.

Each of these would be picked up in this disaggregated 131 summary that I have given you. I think if we move in this direction that is a big enough bite now, Representative Ottinger. And if we were to over-bite to get this on a firm or a plant basis, I am afraid it would choke us.

Mr. OTTINGER. Do the industries that presently have to report, do they have to relate what they are doing to the target you establish?

Mr. O'LEARY. One of the weaknesses in the present system is we do not receive systematically the disaggregated data. The report is given to us in two-digit form by and large—there are some exceptions to this—by the industry association. Of course we are unable to get really very far behind these data. I am afraid that at the moment it is not a disciplined system. There has been an enormous amount of cooperation of some industries and in industries where this has been given close attention by senior executive officers there has been excellent progress.

On the other hand in other industries—and it is so easy to duck it, Mr. Ottinger, as a result of the reporting systems we have established—it hasn't become a matter of management concern. It hasn't been pulled to the top and I am afraid that performance is something less than it could be.

Mr. OTTINGER. Under the disaggregated system if we pass the legislation, do you expect you will be able to get that?

Mr. O'LEARY. I think at that point in time this will be brought to high priority as far as management goals. When that occurs, when management begins to put this at the top of their list or close to the top of their list of things that their subordinates will do, I think we will find a great deal of progress in an area that has not been characterized by a lack of progress thus far, Mr. Ottinger. There has been respectable progress in this. There can be a good deal more and that is what we want.

Mr. DINGELL. The time of the gentleman has expired.

The Chair recognizes the gentleman from Louisiana, Mr. Moore.

Mr. MOORE. Thank you, Mr. Chairman.

Mr. O'Leary, you and I had the pleasure of having lunch some months ago prior to the April message of the President on energy. I believe we discussed this business about industrial mandatory standards of efficiency. If I remember our discussion, your point was that there was progress being made, as you just stated, and it would be administratively very difficult for your energy agency to carry out, as you mention on page 3 of your testimony and that we are facing a tremendous amount of cost and there would be great difficulty in adaptation to various industrial uses for equipment, as you also alluded to today.

Mr. O'LEARY. I think, Mr. Moore, I also gave you essentially the same example in the course of our discussion that I just gave the committee. I developed that on the basis of some work that was done for the Ford Foundation by the National Industrial Conference Board when they took a fairly rigorous look at a number of industries both from the standpoint of current technology, what happens in a steel mill today versus another steel mill today, versus the first steel mill 10 years ago.

From that I drew the example that I gave you then and give the committee now, that it is really difficult to go in on a firm-by-firm, plant-by-plant basis and run their business for them.

Mr. MOORE. My question is then, with all these given factors, why the change? Why do we come in today and now want mandatory standards, realizing all these problems?

Mr. LEARY. What we are supporting here is permissive authority in the Administrator of FEA to apply mandatory standards, particularly to two pieces of equipment, pumps and electric motors.

We would also like—and I think it is no secret since I have come to Government that I have been unsatisfied with the aggregated data that we have been receiving—to get the authorization to get deeper into the reporting chain so that instead of becoming, as it has the potential of becoming, Mr. Moore, a public relations-oriented effort on the part of some industry reporting systems, it becomes a real energy audit effort.

I think those are not inconsistent with the view I have taken in the testimony earlier to your questions before the committee or in my discussion with you.

Mr. MOORE. So we are confining it to mandatory standards on two pieces of equipment, or the possibility of mandatory standards. Can you give us a figure of what that is going to cost for your agency to study, to implement, and to administer?

Mr. O'LEARY. I can give you a tentative figure. It represents no more than an estimate, that has been put together by staff, that I have not reviewed, Mr. Moore. It has not gone through the normal internal hard-look budgetary look in FEA nor has it been cleared by OMB.

Mr. MOORE. In terms of people or dollars?

Mr. O'LEARY. In terms of people, we have the people in place.

Mr. MOORE. They are not doing anything else?

Mr. O'LEARY. No, we intend in DOE through reallocation of resources to exercise the discipline upon ourselves to achieve these program objectives within the overall staffing limitation.

Mr. MOORE. But you also promised us on the authorization bill for FEA when I asked you a question that you expected a savings by not finding new jobs for these people but essentially through attrition eliminate them.

Mr. O'LEARY. I would hope that that is the case. But what I am saying I have said consistently before the authorization committees, that we are exercising self-discipline. Although in the case of our supplemental we had received authorization from OMB for an increase of 278 positions for the agency, we are not requesting those positions.

We intend to achieve what those jobs would achieve for us by internal reallocation of resources.

Mr. MOORE. But in any event, whether you are using personnel that you were going to eliminate or what have you, it is going to take additional people and additional dollars to do this function, over what you could eliminate.

Mr. O'LEARY. I would imagine these numbers are not far away. We would look upon this in the range in 1979 of about 48 man-years to discharge the functions that we are discussing here today for equipment efficiency, labeling and standards, and a budgetary cost, which we would of course require, about \$5.5 million.

Mr. OTTINGER. Would the gentleman yield 1 minute?

Mr. MOORE. Not just yet. I would be glad to when I finish the line of questions I am on. Have you done any kind of analysis to see how that compares with what we expect industry to accomplish anyway? In other words, is it worth the expenditure? Do you have any studies to show that?

Mr. O'LEARY. Mr. Moore, we do not have a clear relationship of these dollar expenditures to the energy saving that would flow from the equipment efficiency labeling standards. The reason for that is that we are not fully conversant with what can be achieved. We have made an estimate that I presented to you in testimony this morning.

But there is a potential of some 250,000 barrels a day arising from the subject matter that we are discussing here in the mid-1980's. If we can achieve half of that 250,000 barrels a day in savings, that would in my judgment warrant the expenditure, during these years of \$5.5 million.

Mr. MOORE. My question, is how much of that will be accomplished any way by industry trying to produce more energy-efficient equipment and consumers and industry demanding more energy-efficient equipment?

Mr. O'LEARY. The fact of the matter is in the work that has been done in this area, Mr. Moore, as has been put before you by Congressman Moss, it appears to us that first-cost considerations outweigh life-cycle cost considerations in procurement. That is true not only in industrial practice but it has been true for many years in Government practice although there is beginning to be a swing away from that now, a very painful swing, I might add.

Mr. MOORE. That is my point. Everybody is pointing out that times are changing. I think the doctor to your left has. This gentleman has. You have too.

I am wondering have we not studied sufficiently the matter of what the simple marketplace is going to do in terms of future equipment before we launch off into another reporting procedure that I am sure industry is going to love with more people in Government writing reports and handing out regulations.

Mr. O'LEARY. There will not be more people in Government as a result of this.

Mr. MOORE. There is no way you can do the job unless you have a lot of fat in your agency, which may be there and I suspect may be in every agency. I wonder how you can launch off into a new program of energy standards on two pieces of industrial equipment and see that it is carried out with the existing people. I don't believe that.

Mr. O'LEARY. We do have one very significant example before us of nonresponsiveness to price changes in the energy area that is well-documented, I think now to everyone's satisfaction. That is with industrial and private procurement of automobiles where it seems that a clear case has been made——

Mr. MOORE. What is the date of that study? When did that study end?

Mr. O'LEARY. I can't cite the study for you.

Mr. MOORE. Police departments are buying smaller energy-efficiency automobiles. My wife just did. I don't accept that.

Mr. O'LEARY. I think if you take a look at the overall sales and by leases which gives you a general approximation—and I would be pleased to do this for you, Mr. Moore—for the first half of 1977, leased vehicles and outright sales, you will find a very strong run to large automobiles in the industrial sector.

Mr. MOORE. My time is about to run out.

Mr. DINGELL. The time of the gentleman has run out.

The gentleman may have an additional comment.

Mr. MOORE. I thank the chairman. If you could, I would appreciate your sending something to the committee to give us an indication that you have done some study or you have not done some study on the relation of what we are about to launch off into with this new program as compared to what the marketplace could or could not do without this program.

Mr. DINGELL. The Chair recognizes counsel.

Mr. O'LEARY. Mr. Chairman, may I make an additional comment that I think is useful? Mr. Moore, I will be pleased to document this for you as well, there are apparently extremely efficient electric motors that are in the range of 5 horsepower to 25 horsepower but apparently are not being bought because the first cost tends to be high. Whether that high first cost from the standpoint of a life cycle investment is unwarranted from the standpoint of an industry, I don't know.

But I can say—and we will be glad to provide some evidence to support this statement—that there is much more efficient equipment, at least in the electric motor front right now, than the norm that is being bought by industry and that by a substantial margin.

Mr. MOORE. With a comparable lifespan, comparable reliability?

Mr. O'LEARY. I would say in all likelihood they are comparable in those respects. But they are more expensive. I think it would be instructive—and I will ask the staff to do this—to take a look at those products and you can see the average cost and average efficiency of what is being sold in some class—and I will try to get a representative class—and the marginal, most efficient, and the position of the class that it occupies, to shed some more light.

Mr. MOORE. I operate in the dark ages in Government, obviously. I believe we ought to know why we are going somewhere, where we are going.

Mr. O'LEARY. We are responding to an initiative, Mr. Moore, that originated in the Congress.

Mr. MOORE. Thank you.

Mr. DINGELL. The Chair recognizes counsel.

Mr. FINNEGAN. Thank you, Mr. Chairman.

There was a statement by the Machinery and Allied Products Institute. They stated, "Where equipment acquisitions are involved and energy is a significant cost of operation based on past or anticipated experience, purchasing personnel routinely factor in energy efficiency along with other expected costs."

The emphasis is on "significant cost of operation." What about those situations where energy is not a significant cost?

Mr. O'LEARY. I think increasingly, Mr. Finnegan, that is representative of what is going on in industry because management is beginning to say to subordinates within corporations that energy costs are a substantial part of our doing business and we can save a lot of money. This makes good sense, to look at life cycle costing.

Life cycle costing is a concept that is about 4 years old. It was within the last 3 or 4 years that industry began to offer courses in life cycle costing in engineering schools. I don't think it goes back substantially beyond that.

Mr. DINGELL. If counsel would yield, there are also problems whether a particular engine will be cost-effective given the fact that it is used only a little bit as opposed to the fact that it is used over a large period of time on almost a continuous basis. Obviously there the cost efficiency of the savings might be strikingly different as between two motors depending on their use.

Mr. O'LEARY. Indeed, Mr. Chairman, if you have a very inefficient motor that is significantly cheaper and is used as a standby or only for intermittent service, it probably is prudent to buy that inefficient motor if you can save a lot of money in the process.

On the other hand the converse is quite obviously true. I really don't think that we are at the point now where this optimality has entered into procurement practice. All over the United States there is still an enormous concern with first cost. There is also an inertial tendency to stick with a piece of machinery, a piece of equipment, that you have experience with. Labeling, it seems to me, is a first step in beginning to bring more light to that procurement exercise.

I don't think it is an invasion of the system if you find sensible targets. I want to stress that it seems to me we don't really want to go into mandating in this area. We want to find targets where it is worthwhile from the standpoint of the Government's expenditure of money in the testing programs and from the standpoint of the industrial savings to be achieved.

If we can find these useful cost-effective targets I don't think it is an invasion of the system to go in and mandate standards.

The very same ground has been covered by the Congress with regard to appliance labeling. At one point it was regarded as OK to simply go in and label. We are now moving into an era where, in all likelihood, you will provide authority for mandating standards.

I think that, given the significance of energy, these are not inappropriate functions of Government.

Mr. BROWN. Would you yield to make an observable distinction? In appliances, the end product, the motor, goes into a process. It may not even go into an appliance. It may go into something else. But if you are making air conditioners for Arizona and making them for Maine, you may want to put different kinds of motors in those products.

Which motor is the motor that ought to be mandated by the Federal Government for that appliance? To say that this is a suitable motor for an air conditioner that is going to be used in Arizona where it runs all the time versus one that is going to be used in Maine, where it may run half a month a year.

Mr. DINGELL. I don't think it is going to be labeled that way. You are going to label it according to the work output per input of watts or amps or volts, or whatever your measurement may be, so you can make a judgment as to what comes out the far end in relation to what comes in the other end.

I don't think Mr. Brown and I are necessarily in disagreement. If I am in error, he may correct me.

Mr. BROWN. I only correct you to this point. In real life, I am in the newspaper business. We have motors that are involved in all kinds of

individual processes. The motor sits there, with a mechanism on it that in some instances may run all the time and in other instances may only be used in a way that has heavy resistance against it.

How does the Federal Government tell me which of those motors is the right one?

Mr. CHIOGIONI. We don't.

Mr. O'LEARY. Mr. Brown, I am not sure that we ever can.

Mr. BROWN. I can't, either. That is why I am concerned about it.

Mr. O'LEARY. That is one of the reasons I think we should not be required to label all motors or to impose mandatory standards on all motors.

Mr. BROWN. With all due respect, Mr. Chairman, I made a little speech this morning to a group of Federal executives and said that the Congress has abdicated a great deal of its responsibility recently, by just saying that we want this done and then we will turn it over to the Administrator to do it.

As the chairman knows from our discussions on this subject, we have got a lot of efforts—FEA was one of them—where the Congress wanted to enact legislation that said that every one of the regulations, rules, and orders that you put out should be approved by the Congress before it would take effect. It would sit 60 days for us to look over because we didn't want any more OSHA situations where we say to the OSHA Administrator, "go ahead and write the rules"—or the Clean Air Act which came out of this committee to the HEW Administrator, "you write the rules" and we discovered later that they outlawed coal—by citing what we wanted as the end product but saying to them, "you go ahead and make the determination."

The seat belt, the interlock seat belt—at least we are looking at the air bag now in the Congress—

Mr. DINGELL. Not with much enthusiasm.

Mr. BROWN. Before it is imposed by an administrative fiat in order to accomplish automobile safety and that is the whole point. As I see it, we just say to you, "You go ahead and set the standards on motors." And you are telling me that after we give that approval, you will then decide which motors, what standards, how to label it, and all that other stuff and then at that point, the objections will hit the fan.

Then we will go back and say, "Gee whiz, we didn't have that in mind, John. Why did you make a stupid mistake like that?" I am just trying to find out ahead of time what we have in mind. I must say that I don't have a great deal of confidence in our ability to make that judgment in advance. But I don't have a great deal of confidence in your ability to make the judgment after we give you the authority. That is what worries me.

Why don't we use the process whereby you tell us first what ought to be done and then we will give you the authority to do it if we think it is desirable? I am worried about how we make these judgments and who is going to make them.

Mr. O'LEARY. I think at the very least, Mr. Brown, we will make a good start here in doing some labeling and some measurement on these broadly used small industrial-size motors. I don't think it will be damaging the system.

Probably by the time we finish this, the mandating, the labeling we are going through on appliances, we will have had sufficient experiences with the shortfalls and shortcomings and potential pitfalls in going forward with this sort of a program. We hope to do it sensibly.

You asked why we are doing this, Mr. Brown. We are doing this because we have to find ways to save energy.

Mr. BROWN. In appliances, we are going to save that much of the whole energy package.

Mr. O'LEARY. 250,000 barrels a day is quite substantial.

Mr. BROWN. But at what cost? Nobody has quantified that. The cost is going to be borne by the taxpayers because we are going to have a lot of these FEA employees who either aren't doing anything now or are going to be hired in later. I have never gotten that quite straightened out in my mind.

And we are going to make industry spend a lot of money which you know is going to be passed on, right on to the consumer. Every appliance is going to go up that many more cents to pay for doing this.

Is all that worthwhile? The President's bill, by all the taxes we put in it, is going to cost about \$138 to save a barrel of oil out at the end of the process in 1985. I just want to be sure that we know what we are doing.

Mr. MOORE. If the counsel will yield so the gentleman from Ohio can yield, I would simply say that I am also concerned about how much of that is going to be done anyway without the necessity of Federal spending and regulating, writing, and reporting.

Mr. DINGELL. The Chair recognizes counsel again.

Mr. FINNEGAN. Thank you, Mr. Chairman.

Mr. O'Leary, in answer to the questions asked by the chairman, prior to the hearing you provided a list of the largest producers of electric motors, Baldor Electric Co., Gould Electric Co., GE, Marathon Electric Co., Reliance Electric Co., Westinghouse, and U.S. Electrical Motors Division.

What percentage of the dollar volume do they manufacture?

Mr. O'LEARY. My understanding is the list we supplied you is 80 to 90 percent. I think the inverse of that is how many small businesses are involved in motor manufacturing. My understanding is 5 to 10 percent.

Mr. FINNEGAN. Are there adequate provisions in the bill to protect small business against economic hardship that may occur?

Mr. O'LEARY. There are explicit provisions in the bill that are aimed at preventing any harm to small businesses.

Mr. FINNEGAN. You have no amendments or provisions to add?

Mr. O'LEARY. I have none, Mr. Finnegan, at this time.

Mr. FINNEGAN. In the case of trade association reports, one of the problems has been the verification. You propose that the FEA propose an exemption for voluntary reporting programs requiring the associations to maintain data for 2 years. I understand that position was eventually dropped.

When the chairman asked you about this last March, you responded that the provision would have jeopardized maximum participation in voluntary programs. Is this still your view?

Mr. O'LEARY. Mr. Finnegan, some of this has escaped me. Mrs. Hobson is closer to it than I am.

Mr. FINNEGAN. You did indicate in your questions that you are going to update the responses to the chairman's questions.

Mr. O'LEARY. Can we do that for the record then?

Mr. DINGELL. I think that would be appropriate.

I have a question relating to this aggregation of information. Let's take an industry that I know just a little about. Let's take the ferrous metals industry. The reporting trade association for that is the Iron and Steel Institute?

Mr. O'LEARY. The ferrous metals would be a four-digit SIC classification. We would be receiving two-digit SIC reporting from trade associations that represented not simply the iron and steel industry but primary metals.

Mr. DINGELL. So they would be reporting to you then on primary metals, which would be aluminum, copper, iron, steel, alloys of steel. What else?

Mr. O'LEARY. Steel plants, aluminum, iron foundries, nonferrous foundries, steel foundries, other primary nonferrous, nonferrous processing, miscellaneous metal products, secondary nonferrous smelting and refining, primary zinc, and primary lead.

Mr. DINGELL. How about things like blast furnaces and so forth?

Mr. O'LEARY. They would be in the steel plant category in all likelihood.

Mr. DINGELL. It is pretty obvious that the reporting, let's say, of a steel plant would be significantly different from the reporting of a brass foundry or even an iron foundry.

Mr. O'LEARY. Indeed.

Mr. DINGELL. For example, they generate their own natural gas in steel plants.

Mr. O'LEARY. Or unnatural gas as the case may be, Mr. Chairman.

Mr. DINGELL. In their coke ovens or in their blast furnaces. All that gas is reclaimable and often is reclaimed with the result that they are highly efficient in their energy use. With an iron foundry they probably use electric conduction.

Mr. O'LEARY. Many.

Mr. DINGELL. Because of EPA requirements some might use coke but not many.

Mr. O'LEARY. They are using gas.

Mr. DINGELL. Some of them are using gas. Totally different criteria in terms of use and that sort of thing, is it not?

Mr. O'LEARY. Further, Mr. Chairman, let's say you went to a foundry and asked that foundry to make a saving of x percent. At least the first few foundries could do that by substituting a substantial amount of scrap in their charge. They would have a predigested material going in, and you would get something totally meaningless in terms of real energy savings but which would be quite significant statistically for that firm.

Mr. DINGELL. The same thing would be true in an open-hearth furnace. If they use a lot of scrap, the heat rate goes down and energy conservation goes up. So when you aggregate all these reportings, you have got apples and oranges mixed up, and all you can say is that you have got fruit salad coming out your end of information. Is that right?

Mr. O'LEARY. That is right, Mr. Chairman.

Mr. DINGELL. Thank you.

Thank you, Counsel.

Mr. FINNEGAN. What verifications of trade association data have been performed by FEA thus far?

Mr. O'LEARY. Mrs. Hobson will answer that, Mr. Finnegan.

Mrs. HOBSON. We have not verified association data. We have just begun, in cooperation with the Department of Commerce, some minimum selective verification trips. We have proposed a program where we take a random sample of companies within three industries to get a better feel for definition problems and reporting problems.

Mr. FINNEGAN. How long will that program take?

Mrs. HOBSON. About a month. We will review data for just three companies and one association for each industry—like an iron, steel, and aluminum association and one company in each. It is just a quick look to see what the dimensions of the problem are.

Mr. FINNEGAN. Has the Commerce Department done any verification?

Mr. DRURY. No; we have not done any separate verification. We have visited some of the companies and some of the trade associations, not as a formal audit or verification but to see their procedures and talk with them on it.

Mr. FINNEGAN. Has there been any thought to having the data of an association independently audited?

Mrs. HOBSON. At the time that we published the proposed exemption criteria in the Federal Register, there were provisions for independent auditing. Industry groups objected to that because they thought independent audits would be too expensive and would drive those companies not required to report out of the programs. Therefore, that element was dropped as part of the final exemption process.

Mr. FINNEGAN. But if FEA does it, what is the cost going to be?

Mrs. HOBSON. If FEA audits?

Mr. FINNEGAN. Tries to verify data.

Mrs. HOBSON. From our direct reports or from the association reports?

Mr. FINNEGAN. From the association reports.

Mrs. HOBSON. We practically have to set up an IRS because we have to go through two levels, first to each exempted association which issues reporting guidelines, and then to each individual company required to report, in order to get a good feel for the data.

Mr. FINNEGAN. So that the associations themselves oppose an independent audit. But for the Federal Government to do it, it would be almost impossible.

Mrs. HOBSON. That is right. Extremely expensive with lots of bureaucrats.

Mr. FINNEGAN. Thus, there will be no audit of any of the association data.

Mrs. HOBSON. We are initiating a sample verification, not a real audit, but a verification to look at the program problems basically. That will take us about a month with our internal staff. We have no further plans at this time although we are taking a look at selective audit needs.

Mr. DRURY. Mr. Finnegan, the companies are very happy for us to come in. We have talked with different ones and different trade associations. They would appreciate someone authoritatively saying, "Hey, your data is good, your procedures are all right." But they have objected, as Mrs. Hobson has said, to bearing the cost of that themselves.

Mr. FINNEGAN. What does it cost if the Federal Government comes in? What does it cost for the Commerce Department?

Mr. DRURY. If we pay for an independent audit—and I say “we” loosely because I would provide some of the people and Mrs. Hobson would provide the rest of the people—

Mr. FINNEGAN. What would that cost?

Mrs. HOBSON. The cost of what we are doing now is the salaries and the travel funds. The travel funds are \$5,000. Remember this sample verification includes only 9 companies that we will visit—out of a possible 474 companies. That is not really an acceptable verification program. But we want to get a better feel for the dimensions of current reporting deficiencies. About 10 staff people will be involved. I could quickly estimate the cost of the salaries of the people.

Mr. O'LEARY. \$500,000. Ten staff people is \$500,000.

Mrs. HOBSON. \$500,000 for support for a minimum effort.

Mr. FINNEGAN. Isn't verification easier with direct reporting?

Mrs. HOBSON. Yes, indeed it would be because we now have 100 companies reporting directly. Many of those reports are excellent. Only two have said their reports are proprietary. We can pick up a phone and call then if we think a decimal point is in the wrong place.

We are able to look at things like capacity utilization, product changes and so forth. So it is easier to do that, and as Mr. Drury says, and companies have been extremely cooperative.

Mr. DRURY. If we were to try to encompass all the companies that are reported in the program as it has grown so far, we are dealing with slightly over 3,000 companies. So going to 3,000 companies and their plants would take quite a bit.

But on a sample basis there is a willingness for us to come into any of those areas.

Mr. FINNEGAN. Is that a satisfactory approach?

Mr. O'LEARY. It will have to be, Mr. Finnegan. We can't afford to go to all the firms.

Mr. BROWN. I think the next follow-up question is, when you make it mandatory for some, and you set the standards, what happens with the others?

Mr. O'LEARY. You have got a large enough chunk. That is a good question.

Mr. BROWN. Thanks.

Mr. O'LEARY. It runs to an equity problem that is inherent in this sort of thing. What you are trying to do is get a large enough sample of industries so that you are accounting for most of the energy that is consumed.

You will recall for example that the House passed a surtax, an energy users' tax, that applies to only some 1,400 firms. That is something approaching 90 percent of the entire consumption of oil in the country. There are thousands and tens of thousands of other firms that are not reached by that. It does raise some equity problem.

Mr. BROWN. My reaction is that you tell me you have got a voluntary program that is working with everybody sort of whistling his own tune based on what he is doing and we want to substitute for it a mandatory program for some where the Government whistles the tune and we don't know whether people are going to march or not.

Mr. O'LEARY. Mr. Brown, I would have to say that we have a voluntary program. But we have no idea at all whether it is working. The fact is we simply don't have enough feel for the data to know whether it is working or not.

Mr. BROWN. Your report was a little more optimistic last July. But that was before Mr. Kennedy and Mr. Metzenbaum put in legislation.

And you just got through saying that there is no way you can monitor it all to be sure it is right. I find that sort of an argument in a circle.

Mr. O'LEARY. No, I say that there is no way in which we can go into or should go into some 3,000 firms around the country and put a group of compliance auditors in there and see how they are doing. I think there are much better ways in which we can handle this reporting program to do audits on a random sample basis and to assure that there is more internal consistency in the reporting and that it is not a public relations drive, but is, in fact, an energy conservation program.

At the moment we cannot really differentiate between those aspects of the reporting system which are public relations inspired and those which are honest savings of energy.

This is no condemnation of the program. It is a start. It is quite evident in looking at the large numbers and the economy that we are getting more bang for the buck this year than we were in 1972.

I judge the savings now per dollar of GNP, real GNP of 1972 today, as being in the range of 8 percent of the industrial sector, 7 to 8 percent. I think that shows real progress. It is responding in part to the voluntary programs which are sort of like a United Fund drive. They are a matter of civic pride. However I think we can do better with that if we discipline it.

Consequently I would like to see disaggregated reporting so that we aren't in the position of having to combine apples and oranges.

Mr. BROWN. The figure I have, Mr. Chairman, for the chemical industry in 1976 was that 108 companies reported voluntarily to their trade association. Under existing statutes only 43 of those are presently required to report. Under the Kennedy-Metzenbaum statute only 68 would be required to report, which in fact is a loss of 40 companies. Where is the progress?

Mr. O'LEARY. I would have to see the data that you have.

Mr. BROWN. That is all there is to it. Those are the only facts that I have. If under the Kennedy-Metzenbaum proposal if only 68 would be required to report, 40 of those would just say, "Well, why bother?"

Mrs. HOBSON. You are discussing chemical and allied products?

Mr. BROWN. Yes.

Mrs. HOBSON. We had some 832 companies report a use of 1 trillion Btu's or more under our first corporate identification request. Of those, 146 were chemical companies (SIC 28). We will pick up between 75 and 98 percent of the energy used, under the Kennedy bill, through direct reporting of the top five industries (SIC 33, 28, 29, 32 and 26) according to our calculations, based on the information we have.

Mr. BROWN. To throw in "and allied products," I don't know whether that is oil companies or others. I am talking about chemical companies only. That is the information that I have. If it is inaccurate—

Mrs. HOBSON. The chemical and allied products industry includes fertilizer—

Mr. BROWN. Maybe you have a different definition.

Mrs. HOBSON. Chemicals, fertilizers and drugs are only part of eight components which include 146 companies using a trillion or more Btu's. We do find that within the group, SIC-28, we will be picking up over 85 percent of the total energy use.

Mr. DINGELL. Let's say you have got a chemical fertilizer plant. They burn natural gas like crazy to make fertilizer. You have got chlorine and sodium hydrochloride and lye manufacturers who work on the basis of salt brine that they pump out of the subsurface. In like fashion you have got penicillin manufacturing, sulfur manufacturing. You have got manufacturers of cold cream. They all have totally different energy uses and structures and opportunities for savings and they are all showing up on one sheet. How do you make a judgment out of that kind of a mix?

Mr. O'LEARY. Mr. Chairman, that belongs to that particular SIC category 28, which is chemical and allied products. We have industrial and organic chemicals, plastics and synthetics, drugs, soaps, cosmetics, paints, varnishes and lacquers, industrial and organic chemicals.

Mr. BROWN. Do they all report together?

Mrs. HOBSON. Yes.

Mr. O'LEARY. They all report under SIC 28.

Mr. BROWN. Do they aggregate all of the associations together? I was under the impression that they report as separate associations within that two-number listing.

Mrs. HOBSON. One company I believe reports directly. That is J. M. Huber Corp. The Huber report may aggregate information from more than one of these areas. Otherwise in terms of SIC 28 I can give you a list of reporting associations.

We have the Fertilizer Institute, the Pharmaceutical Manufacturer's Association—there is only one company that reports through PMA in terms of required reporting—the Manufacturing Chemists—

Mr. BROWN. I think you misunderstood my question, Mrs. Hobson. Do these come in as separate reports under these individual trade associations? Or do they come in all under the 28 number and they are all aggregates of 28? I was under the impression that they came in as separate trade association reports.

Mr. O'LEARY. The significant numbers here, there are basically there trade associations that pick up eight industrial classifications.

Mr. DINGELL. And they would not all necessarily break the classification down in the same fashion.

Mr. O'LEARY. That is a further problem.

Mr. BROWN, this is a fault of the two-number system.

Mr. BROWN. I understand there are people who say you should use a four-number system.

Mrs. HOBSON. The law required data aggregation to the two-digit level. We did recommend at the time that it go to four digits.

Mr. BROWN. And I understand that some of the industrial people—

Mr. O'LEARY. Some of the industrial people would genuinely like to see what is happening in their sector of industry.

Mr. BROWN. Why don't we go to four-digit reporting?

Mr. O'LEARY. First of all on the summary chart before you we have a legal question.

Mr. BROWN. Why don't we simply amend the law?

Mr. O'LEARY. Second we are fairly sure under the existing law that we cannot establish disaggregated targets.

Mr. BROWN. If they reported the four digits you could aggregate it into three digits and set a target, could you not?

So why don't we just simply change the law to four digits and let it go at that?

Mr. O'LEARY. That would be helpful with regard to that one element of the problem before you, the third one on the chart that has been distributed—disaggregated targets. I think what you have to ask yourself is do you want to do all the things that H.R. 5037 will permit that are not now permitted or are questionable under existing law?

In our judgment H.R. 5037 is a logical next step in this business.

Mr. DINGELL. The Chair observes that there is a quorum call on the floor which will shortly be followed by a series of votes on the suspensions. I am advised there are something like 14 suspensions that will be considered. I think when we finish this quorum we won't be coming back.

Does the gentleman from Ohio have any further questions?

Mr. BROWN. No, Mr. Chairman.

I may submit some for the record, if I may.

Mr. DINGELL. I think that would be entirely proper.

Counsel and the Chair may have a couple.

I would like to thank you all for being here today. We appreciate your courtesy.

The committee will stand in recess until Thursday at 10 a.m., in room 2123.

[Whereupon, at 4:55 p.m., the subcommittee adjourned, to reconvene at 10 a.m. Thursday, September 29, 1977.]

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INDUSTRIAL ENERGY CONSERVATION

THURSDAY, SEPTEMBER 29, 1977

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENERGY AND POWER,
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to notice, in room 2123, Rayburn House Office Building, Hon. John D. Dingell, chairman, presiding.

Mr. DINGELL. The subcommittee will come to order. The subcommittee continues its hearings on the subject of legal equipment deficiency in the field of industrial energy conservation.

The subcommittee will hear this morning an equipment manufacturer's panel composed of Mr. B. H. Falk, president, National Electric Manufacturers Association, Mr. Ronald Clarke, vice president of marketing, Baldor Electric Co., Mr. John Hanson, president, Electric Motor Division, Gould, Inc., Mr. Leonard Sence, vice president, Hydraulic Institute, Mr. N. A. Weil, director of corporate technology, Ingersoll-Rand Co., and Mr. Randolph Houlton, manager, advanced applications operations, General Electric Corp.

Gentlemen, we thank you all for your assistance to us. We welcome you to the committee. If you will each, for purposes of the record, identify yourself to our reporter starting on your left and my right, we will recognize you in the same order.

Mr. WEIL. Nicholas A. Weil, director of corporate technology, Ingersoll-Rand Co.

Mr. HANSON. John Hanson, president, general manager, Electric Motor Division, Gould, Inc.

Mr. DINGELL. Gentlemen, we thank you for being here.

Mr. SENCE. Leonard Sence, vice president, Hydraulic Institute, also manager of marketing sales, Allis-Chalmers.

Mr. HOULTON. Randolph L. Houlton, manager, advanced applications operations, General Electric Corp., Bridgeport, Conn.

Mr. FALK. Bernard H. Falk, president of National Electric Manufacturers Association.

Mr. CLARKE. Ron Clarke, Baldor Electric Co., vice president of marketing.

Mr. DINGELL. We will start with Mr. Weil.

**STATEMENT OF N. A. WEIL, DIRECTOR OF CORPORATE TECHNOLOGY,
INGERSOLL-RAND CO.**

Mr. WEIL. My name is Nicholas Weil from Ingersoll-Rand Co. We consider it a privilege to testify here today on H.R. 8985 and hope that our testimony will help the House Subcommittee on Energy and Power to arrive at sound conclusions on the proposed legislation concerning labeling and standards of energy efficiency of, among other machines, pumps and compressors.

Ingersoll-Rand Company (I-R) is a large manufacturer of compressors and pumps. We manufacture and market virtually all types of compressors in common industrial use today: Reciprocating (piston type) compressors from one-half horsepower sizes up to 600 hp; screw type compressors from 50 to 600 hp, and centrifugal-type compressors from 350 to 30,000 hp. Likewise, we manufacture reciprocating pumps also from a few hp to around 600 hp levels, and centrifugal, axial, or mixed flow pumps from one-fourth hp to power levels as high as 30,000 hp.

We consider the proposed legislation to be unnecessary and potentially counterproductive for at least three basic reasons discussed sequentially below:

(1) Legislation is unnecessary because intensive development work on pumps and compressors has already perfected them to a state where further significant improvements in their efficiency cannot be achieved, even with large developmental investments.

The earliest form of the air compressor was the piston type reciprocating compressor. Over a period of 50 to 60 years it was gradually improved to where 10 years ago its efficiency had leveled off at around 19.7 hp/100 cfm for large units in the 600 hp range. The heightened consciousness of energy costs, occasioned by the Arab oil embargo, caused Ingersoll-Rand to reexamine whether further gains in the efficiency of reciprocating air compressors could be attained.

This proved costly, and difficult to come by. Nonetheless, a 2-year development effort yielded an improvement in efficiency by about 3 percent from 19.7 hp/100 cfm to 19.0 hp/100 cfm.

Mr. DINGELL. I note with some distress those two lights and buzzers mean there is a vote going on on the floor. We are going to have to shut down for a couple of minutes and run over and come back. I express my apologies to all of the panel members. If you will forgive us we will go over and vote and return quickly. It should be 10 or 15 minutes.

The subcommittee will be in recess for about 10 minutes.

[Brief recess.]

Mr. DINGELL. The subcommittee will come to order. The Chair apologizes to our panel. We look forward to about an hour to an hour and a half of tranquility before the next vote, so gentlemen, if you will proceed. We will hear from Dr. Weil and we will hear your statements as you were proceeding.

Mr. WEIL. Thank you.

Further gains will be difficult or impossible. The theoretical efficiency of the two-stage air compressor is 15.3/100 cfm. This figure, called the "reversible adiabatic" efficiency, corresponds to a machine which

has utterly no internal losses. But such losses are unavoidable in any machine because of internal friction, heat transfer and aerodynamic losses (breathing and windage losses). For reciprocating (piston type) air compressors the present level of power consumption breaks down into 15.3 hp/100 cfm as the power required for compression, and 3.7 hp/100 cfm as the power lost internally in the operation of the machine. If further improvements in efficiency were possible, industry would surely invest the development funds necessary to achieve such higher efficiencies. But, the fact is, that the piston-type compressor has pretty well reached the ultimate possible in its efficiency; neither large development expenditures, nor legislation, will help to improve its present efficiency.

(2) Legislation is unnecessary because the marketplace is already energy aware, selecting the most efficient pumps and compressors available. These market forces unquestionably will continue to exert an increasing influence favoring the most energy efficient pumps and compressors as the cost of energy rises.

Industrial pumps and compressors are purchased by the customer to perform a specific duty. Pumps and compressors are quite similar in nature; both are intended to deliver a given quantity of fluid at a given pressure. The only essential difference between them is that pumps are used to deliver a liquid (incompressible fluid), whereas compressors operate on gases (compressible fluid).

Once an industrial customer defines his requirements in terms of flow rate and output pressure, he will generally choose the product characterized by the lowest operating cost. Styling, convenience, or prestige value, which frequently lead to energy wasteful choices in consumer products, have no bearing and do not influence the choice of industrial machinery.

If other things, such as the first cost (price), the expected life, and maintenance and repair costs, are equal between two products, then the operating cost is directly related to the energy consumed. For a given amount of work delivered, the machine (pump or compressor) which consumes the smallest amount of energy during its operation will also have the greatest efficiency. It follows that the most efficient machine, which also minimizes the amount of energy consumed to discharge a given task, will be selectively favored by the marketplace.

The value of energy savings can be readily illustrated. Assuming that power costs an industrial user $2\frac{1}{2}$ cents per kilowatt-hour, then for each horsepower saved this translates into a value of \$160 a year. For a 10-year life customarily assumed for industrial installations, the equivalent value of 1 horsepower saved is \$1,600, neglecting interest. The value that the marketplace places on such horsepower saved at current energy prices, regardless of whether the equipment in question is a pump or a compressor, is around \$1,000 per horsepower.

If one now considers a 10,000 horsepower pump which is 2 percent more efficient than a competitive unit—with all other items, such as a first cost, maintenance, repair, and life being the same—then this pump with an overall efficiency improvement of 2 percent over its operating range could command a premium of \$200,000 in its sale price.

(3) Legislation may be counterproductive because the specific selection of pumps and compressors is influenced by a vast array of factors which can dictate the use of a lower peak efficiency machine to minimize total energy consumption. These factors include the

pressure levels required to be delivered. the corrosive or erosive nature of the fluid being pumped, the required service life, safety, reliability, and the conditions of use—intermittent, fluctuating, or steady load applications.

Mandating uniform standards for this multitude of applications does not appear feasible, and might be counterproductive (by way of forcing less fuel efficient products to be used inadvertently for certain applications).

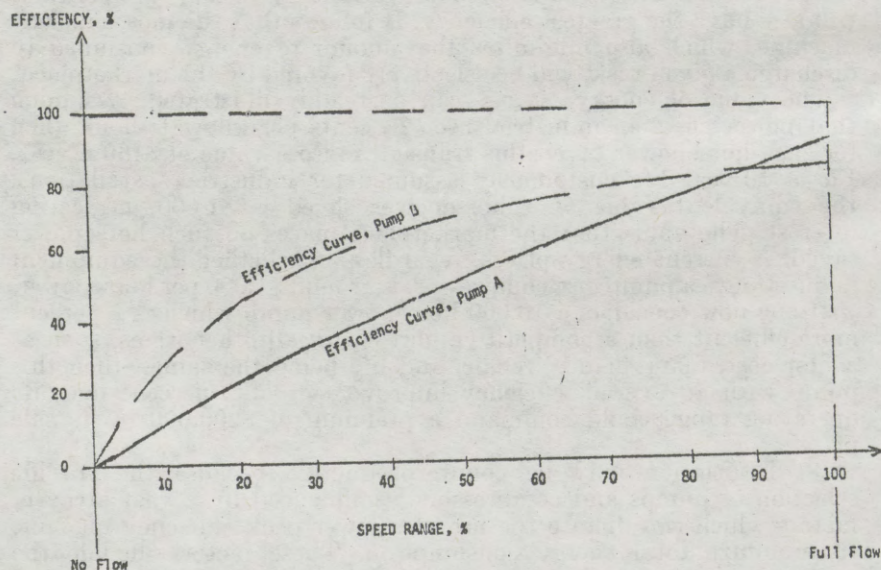
Pictured in exhibit 1, attached to the testimony, are the efficiency curves of two pumps, pump A and pump B, having substantially the same flow—gallons per minute pumped—and head—pressure. If the service is one where the pump operates most of the time at or near its maximum rated speed—full flow—then clearly pump A is the better choice, simply because it operates most of the time at its maximum efficiency, that is, at full load. If, on the other hand, the service conditions fluctuate between no flow and full flow, pump B will be the better choice because it has better overall efficiency when averaged out over the entire operating speed range. But note that its maximum efficiency is lower than pump A.

The economics of marketplace will select the right choice for each application. Thus, if peak efficiency is mandated for a given size, in many applications, specifically using pump B, energy would be wasted. Contrariwise, if overall efficiency is mandated, in other applications, energy would be wasted.

In summary, we sincerely do not believe that the picture unfolded above can be significantly influenced, changed, or improved by legislation, no matter how praiseworthy the objectives of such legislation may be. We, therefore, respectfully counsel that any consideration of legislation toward mandating the energy efficiency of pumps or compressors for industrial use be dropped as being unnecessary at best, and potentially harmful at worst.

Mr. Chairman, that is the conclusion of my testimony.

[The exhibit referred to follows:]



Mr. DINGELL. Thank you, Doctor.
Our next witness is Mr. Hanson.

**STATEMENT OF JOHN NILS HANSON, PRESIDENT AND GENERAL
MANAGER, ELECTRIC MOTOR DIVISION, GOULD, INC.**

Mr. HANSON. Mr. Chairman, I am John Nils Hanson, president and general manager of the Electric Motor Division of Gould, Inc. Gould, Inc., Electric Motor Division, a St. Louis-based manufacturer of high efficiency electric motors, welcomes the opportunity to provide comments on H.R. 8985, a bill to establish labeling rules and efficiency standards for industrial equipment. Due to the time constraints, my oral statement responds generally to the questions you have posed, while our written statement provides more specific and detailed response.

Gould, Inc., is a multiple division corporation with primary interests in the electrical products business and total sales exceeding \$1.6 billion. The company ranks well within the top half of the Fortune 500 largest industrial firms. Gould's research and development expenditures, which will exceed \$67 million in 1977, emphasize product development keyed to the needs of the marketplace. The electrical motor division has spent a considerable amount of money and effort in the development of improved efficiency products and in January 1976 introduced a line of high efficiency electric motors.

We strongly advocate the concept of improved energy efficiency for all industrial products where the economics of the present and future support it. We consider Gould the leader in developing and offering energy efficient product lines including energy efficient electric motors which were introduced in January 1976. The high efficiency motor line consists of three-phase motors in the horsepower range of 1 to 25 horsepower, providing reductions in energy losses of 19 to 29 percent compared to "standard" three-phase electric motors. These motors carry a price premium of approximately 25 percent due to the increased material required to obtain the efficiency improvements. At the same time their energy efficiencies are sufficiently greater than industry averages to assure a sound economical payback for many applications where the motors have proper utilization and electric energy costs exceed a few cents per kilowatt-hour.

Gould's experience in developing and supplying energy efficient motors convinces us that the imposition of mandatory efficiency standards for electric motors is impractical, creates excessive administrative costs, financially burdens manufacturers and users alike, and in fact is unworkable. The following fundamental and vital facts must be considered regarding the imposition of mandatory motor performance standards:

1. Mandatory efficiency standards for all electric motors would be all but impossible to administer. There are well over 2,000 basic motors and literally thousands of applications to consider in developing, implementing, and administering a standard. The costs alone—of standard setting, certification, enforcement, recordkeeping, and Government personnel requirements—will be prohibitive.

Furthermore, the technical considerations necessary for efficiency standards to result in energy savings require that the specific end use application of each and every motor be considered and understood. The actual operating load of a motor more often than not differs from the rated horsepower output of the motor. A motor operating at 50 percent rated load can exhibit a decrease in energy efficiency in the order of 10 percent and an increase in load current of 25 percent over a properly applied motor. With standards based in part on horsepower rating the results would be standards that in effect cause energy inefficiency. Setting mandatory efficiency standards for classes of motors ignores the basic fact that similar horsepower category motors do not have identical characteristics. Indeed, motors of the same horsepower category have diverse performance features that must be considered; for example, different starting torques, different operating torques, and different duty cycles.

2. Establishing across-the-board mandatory efficiency standards for all electric motors would freeze efficiencies at the set values and over the years would, in fact, result in wasted energy as marketplace motivation to improve motor efficiencies would be nonexistent.

More immediately, if H.R. 8985 is enacted into law in its current form, the electric motor industry would be faced with a chaotic situation. A 5-year period would ensue before promulgation of final mandatory efficiency standards. During that period, the Administrator of the FEA would determine which motors and manufacturers would ultimately be subject to the mandatory standards. Until this determination is made and the standards are established, the product lines, long-range planning, and capital allocation of the entire motor industry would be stagnated.

3. Mandatory standards would place severe financial handicaps on—or even force out of business—the small motor manufacturers who would be required to make major capital investments for design changes and retooling. While some form of relief or exemption could be granted to these manufacturers, market forces will require them, in any event, to produce motors with efficiencies meeting the mandatory standards. In many cases, these small manufacturers deal in markets where energy efficient products are inappropriate.

4. In many applications, the use of electric motors meeting a mandated high efficiency standard will result in increased not decreased energy consumption. Indeed, in certain applications high efficiency motors do not operate long enough to recover in energy savings even the amount of energy used to produce the additional materials required to make these motors more efficient.

Adequate labeling of electric motors is a positive step which we feel will lead to the increased utilization of energy efficient motors in the marketplace. Labeling motors with energy efficiency ratings will provide motor users with additional information to make purchasing decisions based on energy efficiency. With the accelerated use of energy efficient motors, significantly increased energy savings can be realized.

While supporting the concept of labeling of electric motors in section 344 of the bill, we strongly urge that careful consideration be given to the method used to label electric motors. It is possible to identify the

motor efficiency on the motor nameplate or by other acceptable identifying means. However, it is important to recognize that the value of efficiency only applies at the nameplate or rating horsepower. At other loads imposed on the motor these values change. In addition, the definitions and meanings of these markings must be developed to recognize the normal manufacturing variations in the production of electric motors. The National Electrical Manufacturers Association has recently developed a nameplate marking standard for the integral horsepower motors to improve the identifying of motor efficiency on the nameplate. While this system promises to lead to significant savings, it has not been in use long enough to measure its results in the marketplace in terms of selection and application of electric motors.

In addition, the National Electrical Manufacturers Association is developing an engineering document entitled "Statistical Methods for Motor Efficiency Data." This document will provide means and recommendations for a statistical analysis of motor performance, in order to provide uniformity in the method of statistical determination of motor efficiency and thereby improve the comparability of data available to the user.

Gould supports the concept of adequate test procedures—section 343 of the bill—for determining the energy performance of electric motors. Based on our experience, however, we believe that appropriate test procedures already exist and these procedures are adequately defined by present Institute of Electrical and Electronic Engineers test codes 112-A and 114, respectively, for polyphase motors and single phase motors. These test codes were developed by an IEEE body representing a broad spectrum of technical personnel from industry, users, academia, and government.

To develop application test procedures based on application and duty cycle of electric motors, as currently set forth in section 343 of this bill, is not practical due to the wide variation of the application of motors. A typical duty cycle does not represent the energy utilization of the motor on any specific application. The energy utilization of the motor can best be determined by the user, based on the motor efficiency determined in accordance with the above test codes, the specific load, duty cycle, and power costs. For the specific applications, Gould, Inc. has developed application and energy payback guides to assist the user in making an energy conservation analysis. Copies of these guides are included in the written testimony.

Gould strongly opposes mandatory electric motor efficiency standards since such standards are impractical, costly, and unworkable. We do favor testing and labeling procedures which require the provision of meaningful information so that the user of electric motors can make proper decisions regarding energy efficiency. The test procedures defined in section 343 and labeling requirements in section 344 are confusing, and do not provide the motor user with adequate or appropriate information.

Therefore, we recommend that electric motors be excluded from the purview of sections 341, 343, 344, and 345 of H.R. 8985. We further recommend that electric motors be included to fall within section 342 of the bill. This will permit the logical and systematic development of workable test procedures and labeling requirements

for electric motors. This will allow a thorough study of the feasibility and necessity of mandatory efficiency motor standards taking into account the projected result of the motor testing and labeling program.

Mr. Chairman, this concludes my statement and I would be pleased to respond to any questions you may have.

[Testimony resumes on p. 96.]

[Mr. Hanson's prepared statement follows:]

WRITTEN
TESTIMONY
OF
JOHN NILS HANSON
PRESIDENT AND GENERAL MANAGER
OF
GOULD INC.
ELECTRIC MOTOR DIVISION

REGARDING
H.R.8985 ENERGY EFFICIENT STANDARDS
FOR
ELECTRIC MOTORS, PUMPS AND OTHER PURPOSES

SUBMITTED
TO
HOUSE OF REPRESENTATIVES
SUB-COMMITTEE ON ENERGY AND POWER

The Electric Motor Division of Gould Inc., is a St. Louis based manufacturer of high efficiency electric motors. This division welcomes the opportunity to comment on the House Bill H.R. 8985 and respond to the questions enclosed with the September 15, 1977 letter of the Sub-Committee on Energy and Power.

Oral testimony was presented by Mr. John Nils Hanson, President and General Manager of Electric Motor Division of Gould Inc. This statement supplements that oral testimony.

The following comments have been developed in response to the questions by the House Sub-Committee on Energy and Power:

1. In commenting on the August 12, 1977 memorandum of Mr. Rich Cooper of the Office of Energy Policy and Planning, I see no provisions in H.R.8985 or S2057 that would encourage R. & D. in the private or public sector relating to electric motors. There is considerable R. & D. activity in the motor industry to improve electric motor efficiencies. This activity has been stimulated by the increasing cost of electric power and the long term economic advantages of higher efficiency motors. However, it is not anticipated that any major break through in technology will occur to accelerate these improvements in performance. The improvements in motor efficiency are more likely to occur by the use of additional material, i.e. steel, copper and aluminum in the design and production of the motors. Therefore, the economic forces of energy costs and motor prices tend to be a driving force in this change. Means to accelerate this trend would increase the effective utilization of higher efficiency motors. The imposition of mandatory electric motor standards would be counter productive to this effort. There would be a great deal of uncertainty during the 5 year period required to establish mandatory standard requirements, so that Product Planning, R. & D., and Capital equipment expenditures for higher efficiency electric motors would be delayed pending the establishment of these standards, and the classes of motors covered.

Other methods should be explored to accelerate the use of energy efficient motors, and to foster the development of higher efficiency motors as the state of the art is improved. These methods include:

- Education of the user in the selection and application of electric motors, with particular emphasis on the shift from a first cost philosophy to a life cycle cost philosophy. This will permit the user to select the most energy efficient motor for his application based on duty cycle, operating time, energy costs, and first cost.
- Increasing electric power costs emphasizes the requirement to shift to life cycle costing, and the use of energy efficient motors.
- Appropriate tax incentives would be effective in accelerating the utilization of energy efficient motors.

The Electric Motor Division of Gould Inc. has spent a major portion of it's R. & D. budget for the last three years on the development of energy efficient motors. This effort will continue to match the need for higher efficiency motors in the marketplace. However, a delay by the imposition of mandatory standards would seriously impede this program.

3 (a) & (b)

The FEA report "Energy Efficient Electric Motors" outlines the amount of energy used by electric motors. We do not know of any data that differs from the FEA report, in fact, we consider this report a significant positive step in analyzing the energy utilization of electric motors.

When examining the energy consumed by electric motors, it should be recognized that the electric motor operates as a device to convert electrical energy to mechanical (rotational) energy to perform a function such as driving a pump, or fan. Assuming, the output to the driven device is constant, the only portion of the energy input that represent energy consumption by the electric motor is the energy losses in the motor. This imposes limitations on the amount of energy that can be conserved by electric motors. The data shown in table ES-5 of the FEA report showing a potential saving of 35 Billion KW H/year by 1990 in the industrial and commercial sector is consistent with this limitation.

3 (c)

The range in efficiency for standard three phase motors

is from 76% at 1 horsepower to 89% at 25 horsepower, to 92% at 125 horsepower. Hence the losses in the motors range from

24% at 1 HP
11% at 25 HP
8% at 125 HP

Therefore the potential for improvement in efficiency is higher for motors 25 HP and smaller. This is consistent with the FEA Report. The data for Gould energy efficient motors is as follows:

<u>Horsepower</u>	<u>Efficiency</u>	<u>Losses</u>
1	82	18
25	91.4	8.6

This is indicative of the energy efficiency improvements that can be made for specific types of electric motors.

Exhibits V and VI show the efficiency and power factor performance comparison of the Gould E Plus motors and the motor industry averages. The exhibits also show the trend in efficiency and power factor with horsepower.

3 (d)

The basic technology to develop higher efficiency motors is known, and is not proprietary. The efficiency improvements are obtained by the increased use of "active" materials, and/or more expensive materials including:

Steel
Copper
Aluminum

The additional materials result in an increased cost for the higher efficiency motors. The degree to which the efficiency can be increased, and the related costs increased depends on the inter-relationship of the cost of energy, the improved efficiency of the motor, the energy conserved as a result of the improved efficiency, and the motor price, when analyzed on a life cycle cost basis.

3 (e)

In reference to the statement in the Energy User News of March 14, 1977, the first paragraph of the statement

is correct in stating that power factor decreases as the load on the motor is decreased. Also, the load at which an electric motor operates on a specific application should be examined to determine the most effective size of the motor to use for that application. A motor operating at loads below it's rated output will be operating at a reduced power factor and efficiency performance. The proper sizing of the motor to the driven load represents good application engineering judgement, and we encourage more attention be paid to the proper selection and application of electric motors.

In regard to the second paragraph of the Energy User News article, I do not agree with this comment and again state that motors should be selected for applications so as to make maximum utilization of the electric motor, whether it is a high efficiency motor, a standard motor or special purpose motor. The same prudent engineering and economic philosophy should be practiced in the selection and application of other devices. The mandating of energy efficiency standards will not correct the misapplication of electric motors or other devices.

Technical and energy efficiency information such as Gould Bulletins (copies attached) on Energy Efficient E Plus Motors help the user to select the most energy effective motor for his particular application, and provide guide lines for energy conservation calculations.

3 (f)

In regard to data available on types and classes of electric motors as I discussed in my oral testimony there are well over 2,000 basic motors and literally thousands of applications to consider in developing, implementing and administering energy efficiency standards.

3 (g)

The list of major manufacturers of integral electric motors in the March 14, 1977 edition of Energy User News appears to cover most manufacturers. However, there are some manufacturers not included on that list such as:

Reuland Electric
Imperial Electric
Sterling Systems

3 (h) & (i)

We have no information available by which we could estimate the percentage of the market share for each of these manufacturers. However, we are concerned over the economic impact that Senate Bill S2057 and House Bill H.R.8985 will have on all electric motor manufacturers and in particular the small motor manufacturers who could be forced out of business due to the major capital investments required by design changes and retooling. Although these Bills provide some form of relief or exemption to the small manufacturers, market forces will require them in any event to produce motors meeting the mandatory standards, and therefore force them to make the necessary capital investments.

3 (j)

The economic impact of mandatory standards on all manufacturers of electric motors can be substantial. If the mandatory standards are such to require substantial retooling and capital investment, they could impact the smaller manufacturers more severely. The rule prescribed under section 345 (c) exempting small business from a mandatory efficiency standard will not be effective. Although, they may be exempt by law, the user pressures in the marketplace will force the small motor manufacturer to provide motors that are competitive in performance in accordance with the mandatory standard.

3 (k)

Reliable data is available in the marketplace describing the performance and application of electric motors. The attached Gould bulletins are data available to motor users by Gould Inc. The Bulletins provide power factor and efficiency data, dimensional data, application selection, and the method of calculating the energy payback on high efficiency motors. Exhibit IV is a guide developed by Gould to assist motor users in specifying energy efficient motors.

5. Gould Inc., Electric Motor Division, manufactures a wide range of single and three phase motors, and d.c. motors from 1/2 hp to 600 hp. The price ranges of these motors are shown in our published catalog, and range from \$23.75 to \$4,800.00 depending on many factors such as size, enclosure, special features,

volume, etc. Gould is not a major producer of electric motors over this product range. The details of the volume of Gould Electric Motor Products, is considered sensitive competitive information, and not available for public disclosure.

6. The Gould product line of energy efficient E Plus motors are labeled with both efficiency and power factor at the nameplate rated horsepower. Exhibit I is an example of the identification label provided on each of these motors. In addition printed information is available listing the motor performance at loads other than rated horsepower. This data includes performance at fractional loads of $\frac{1}{2}$, $\frac{3}{4}$, 1 and $1\frac{1}{2}$ times the rated nameplate horsepower. The efficiency of each of our motors has been determined by careful and precise dynamometer tests in accordance with the Institute of Electrical and Electronic Engineers (IEEE) test code #112A, Test Procedure for Polyphase Induction Motors and Generators, Method B.

In addition, a semi-automated dynamometer test stand is used to test each energy efficient motor on the production line. A record is made of each motor tested under this program with the information permanently recorded as shown on Exhibit II. This test information includes the power factor and efficiency of the specific motor tested. Each motor must pass a test limit which includes minimum values of power factor and efficiency, the motor is certified to meet Gould Inc. E Plus published standard, and a certification label is affixed to the motor. (See Exhibit III) A statistical data record is maintained for each motor tested. This data is available to the customer or user upon request.

7. Gould Inc., Electric Motor Division, participates in NEMA particularly in the Motor and Generator section. We have representatives on the various technical committees in this section including Fractional Horsepower A.C. Motors, Integral Horsepower A.C. Motors and D.C. Motors.

15. In regard to the energy consumed by electric motors, in our opinion the FEA Report "Energy Efficient Electric Motors" fairly represents the amount of electrical energy used by the commercial and industry sectors. We have no information relating to other industrial equipment.
16. NEMA has recently developed a nameplate marking standard for integral horsepower motors. This program has not been in use long enough to determine it's effectiveness in terms of selection and application of integral horsepower motors.
17. As discussed in the previous question relating to labeling programs, a more uniform method to define the energy efficiency of a motor at it's rated nameplate horsepower has recently been issued by NEMA. It is important to recognize the variation that can occur from motor to motor due to manufacturing variations. One of the objectives of the NEMA standard is to clarify this point.

The question relating to testing accuracies is incorrectly stated since inaccuracies in testing and variation of quality of product are not necessarily related to each other. The quality of testing depends on the type of equipment and precision of the equipment used. The test procedures to be used for testing polyphase motors are described in IEEE test code #112A, Test Procedure for Polyphase Induction Motors and Generators.

GOULD**E-plus Motor**

PART	6-338427-01		FR	F213T		TYPE	SCE		
H P	7.5		CODE	J	HERTZ	60	PH	3	
RPM	1750		VOLTS	230/460					
			MAX FL AMPS	19/9.5					
TIME	CONT.	AMB	40	C	SF	1.00	FORM	MMA	
INSUL CLASS	B	NEMA DESIGN	B	SERIAL CODE		BRG. DRIVE END	307	BRG. OPP. DRIVE END	206
CAT NO.	E320	EFF	88.5	%	PF	87.0	SN-89606		

Gould Inc., Electric Motor Division
St. Louis, Missouri 63166

MADE IN
U.S.A.
34355001

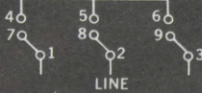
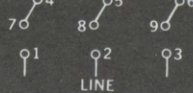
LOW VOLTAGE CONN**HIGH VOLTAGE CONN**

EXHIBIT I

Channel Number	Performance Values	Time
Efficiency	088.50	12:11
Power Factor	087.10	12:11
Horsepower	075.30	12:11
Torque	225.20	12:11
RPM	175.60	12:11
Watts	635.60	12:11
Current (amps)	17.880	12:11
Volts	18.420	12:11
	18.700	12:11
	229.80	12:11
	230.00	12:11
	230.00	12:11

EXHIBIT II

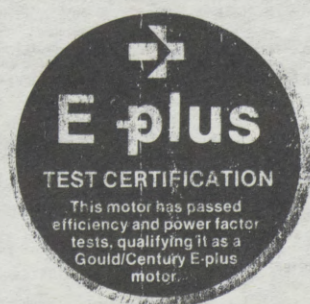


EXHIBIT III



ENERGY-EFFICIENT MOTOR SPECIFICATION DRIpproof AND TOTALLY-ENCLOSED FAN-COOLED

PRICES AND DATA SUBJECT TO CHANGE WITHOUT NOTICE.

1. SCOPE

This specification covers 3 phase, dripproof, totally-enclosed, 1 to 25 Hp, 1800 RPM, 60 Hz, squirrel cage induction motors in integral horsepower NEMA frames.

2. GENERAL

- 2.1 Motors will be rated 200, 230/460 or 575 volt.
- 2.2 Unless otherwise specified, motors will be suitable for operation in either direction of rotation.
- 2.3 Motors will be built in accordance with current NEMA standards (MG-1), except as noted in these specifications.
- 2.4 Motors will be NEMA Design B unless otherwise noted.

3. INSULATION SYSTEM

- 3.1 Insulation system employed will have been tested by the manufacturer and will be Class B or F.
- 3.2 Temperature rise will be in accordance with NEMA limits for the Class of Insulation, Service Factor and Enclosure specified.
- 3.3 Unless noted otherwise, motors will be rated for 40° C ambient operation.

4. ENERGY EFFICIENCY

- 4.1 Motors will have a power factor rating at full load and rated voltage of at least 85%. If a motor draws less than 1000 watts at full load, it is excluded from the 85% P.F. requirement.
- 4.2 The apparent efficiency (P. F. x Eff.) will meet or exceed the values in Table 1 when the motors are tested in accordance with IEEE Test Procedure 112A, method B.

TABLE 1

HP	Apparent Efficiency
1	66.9%
1½	69.7
2	70.6
3	71.9
5	73.4
7.5	74.4
10	75.0
15	75.9
20	76.5
25	76.8

5. MECHANICAL

- 5.1 Motors will be built in NEMA standard T-Frame sizes.
- 5.2 Dripproof and totally-enclosed motor frames will be of rugged construction and material will be steel, aluminum or cast iron.
- 5.3 End bracket will be of cast iron or aluminum construction and aluminum must have steel inserts in the bearing cavity.
- 5.4 Bearings will be anti-friction type and bearing housings will be equipped with plugged provision for relubrication.
- 5.5 Bearings will be rated for minimum L-10 life of 20,000 hrs. assuming bearing load to be calculated with a NEMA minimum V-Belt pulley, so located that the center line of the belt load will be located at the end of the NEMA standard shaft extension.

6. NOISE LEVELS

- 6.1 Sound power levels for all motors will be no greater than the guidelines recommended by NEMA (MG1-12.49).

7. TESTS AND TEST DATA

- 7.1 Motors will be 100% production tested & O.C. checked, to assure compliance with this specification.
- 7.2 The insulation system will be tested by procedure outlined in NEMA MG1-12.03.
- 7.3 A load test will be performed on each motor to assure compliance with the energy-efficiency section of this specification.
- 7.4 Typical test data on each motor will be available if requested.

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ENERGY-EFFICIENT MOTOR SPECIFICATION SEVERE DUTY

PRICES AND DATA SUBJECT TO CHANGE WITHOUT NOTICE.

1. SCOPE

This specification covers 3 phase, severe duty, 1 to 25 HP, 1800 RPM, 60 HZ, squirrel cage induction motors in integral horsepower NEMA frames.

2. GENERAL

2.1 Standard motors will be rated 460 volt only (3 lead). 230/460, 200, 575 volt are available options.

2.2 Motors will be rated for 1.15 service factor.

2.3 Unless otherwise specified, motors will be suitable for operation in either direction of rotation.

2.4 Motors will be built in accordance with current NEMA standards (MG-1), except as noted in these specifications.

2.5 Motors will be NEMA Design B unless otherwise noted.

3. INSULATION SYSTEM

3.1 Motors will have an epoxy insulation system for use in high moisture and corrosive atmospheres. Insulation will be Class F. A fungus proof varnish will be applied to the windings as additional protection.

3.2 Temperature rise will be in accordance with NEMA limits for the Class of Insulation, Service Factor and Enclosure specified.

3.3 Unless noted otherwise, motors will be rated for 40° C ambient operation.

4. ENERGY EFFICIENCY

4.1 Motors will have a power factor rating at full load and rated voltage of at least 85%. If a motor draws less than 1000 watts at full load, it is excluded from the 85% P.F. requirement.

4.2 The apparent efficiency (P.F. x Eff.) will meet or exceed the values in Table 1 when the motors are tested in accordance with IEEE Test Procedure 112A, Method B.

TABLE I

HP	Apparent Efficiency
1	66.9%
1½	69.7
2	70.6
3	71.9
5	73.4
7.5	74.4
10	75.0
15	75.9
20	76.5
25	76.8

5. MECHANICAL

5.1 Motors will be built in NEMA Standard T-Frame sizes.

5.2 Motors will be of cast iron construction (frame, end brackets, terminal box and fan cover).

5.3 External fan will be bronze or plastic to resist corrosion.

5.4 The rotor will be coated with red oxide zinc chromate primer to resist corrosion of the air gap.

5.5 External hardware will be coated or plated to resist corrosion or be of corrosion resistant material. Hex head hardware is preferred.

5.6 The terminal box will contain provision for grounding the motor and will comply with NEMA standards for minimum volume.

5.7 Motor will be re-greaseable and furnished with non-corroding grease plugs.

5.8 Bearings will be anti-friction type, double shielded. A bearing loading spring will be supplied.

Continued

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Telephone (314) 342-2500

E-30, PAGE 13
August 31, 1977
Supersedes E-30, Page 13
Dated December 15, 1976



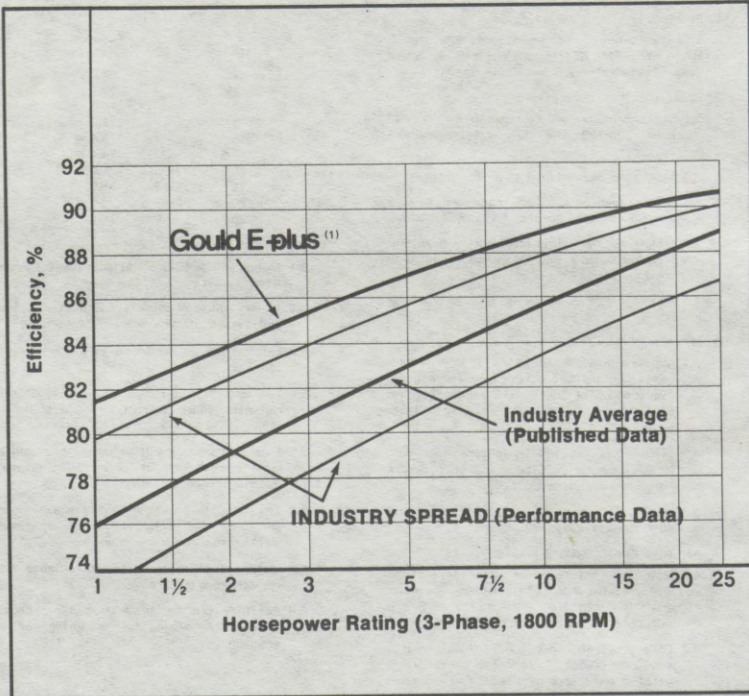
EXHIBIT V

E-plus

EFFICIENCY COMPARISON

GOULD E-PLUS - INDUSTRY AVERAGE

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(1) All values are nominal and may vary slightly with individual machines

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 Dated November 17, 1975



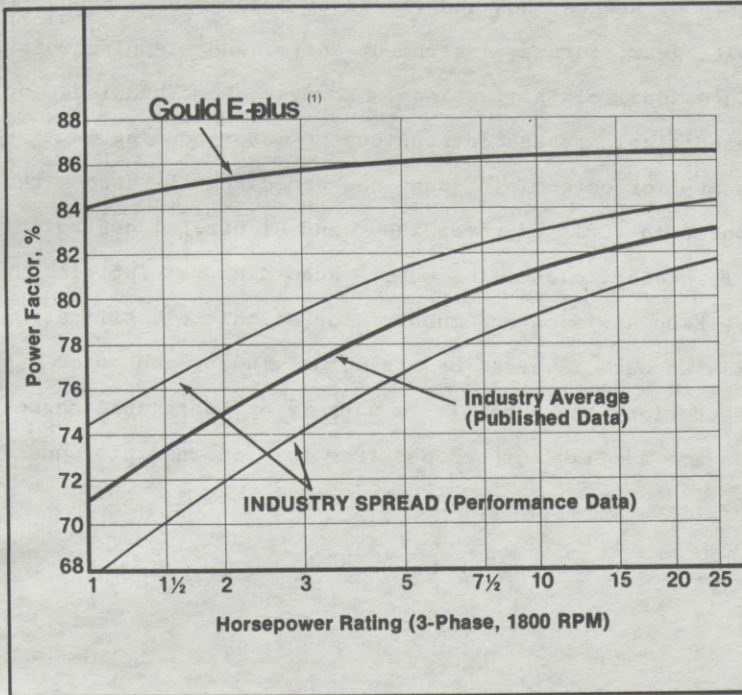
EXHIBIT VI

E-plus

POWER FACTOR COMPARISON

GOULD E-PLUS - INDUSTRY AVERAGE

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(1) All values are nominal and may vary slightly with individual machines.

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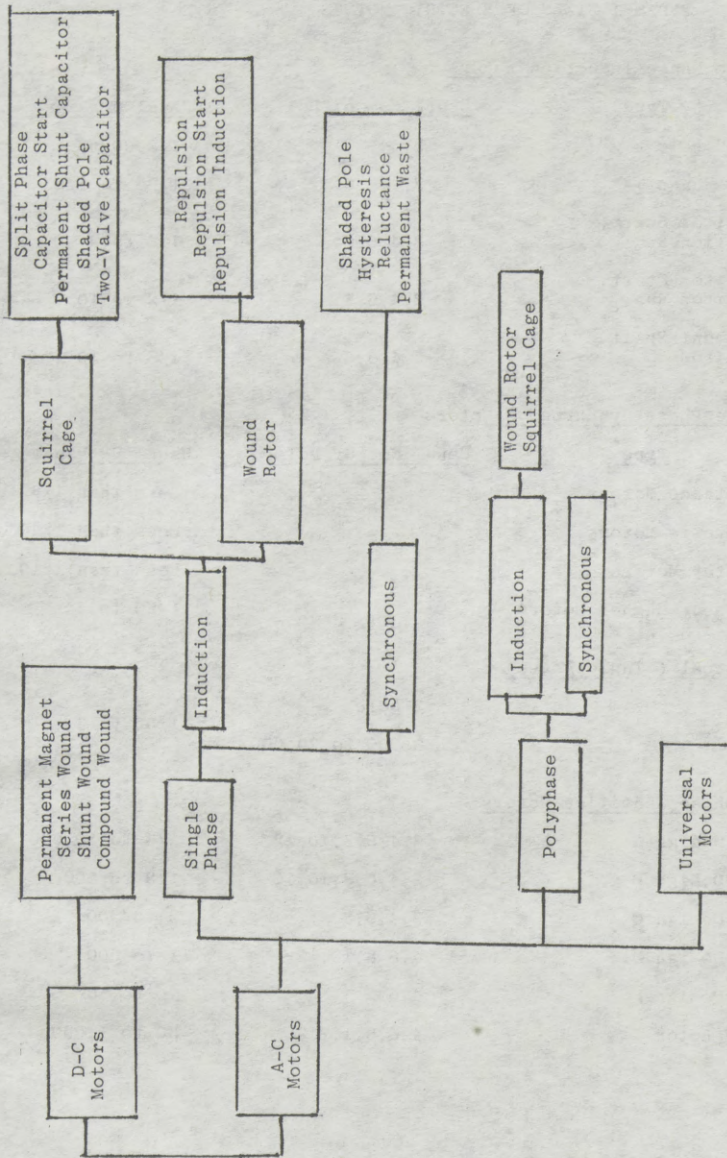
E-30, PAGE 27
 August 31, 1977
 Supersedes E-30, Page 27
 Dated November 17, 1975

THE ELECTRIC MOTOR FAMILY

There are two types of electric motor classifications: by function or application, and by electrical configuration.

In the functional method, motors are given names that indicate or suggest how and where the motor can be used. For example, gear, torque, instrument servo, and stepping motors are functional classifications. However, some knowledge of the electrical arrangement inside the motor housing is necessary for determining what can and cannot be done with the motor in terms of power input and electrical control.

This chart classifies motors according to electrical type. Each division and subdivision of this classification is created out of variations in motor winding and rotor configuration. As a result, a variety of operating characteristics are available to choose from for fitting into specific needs.



THE ELECTRIC MOTOR FAMILY

TYPES & SIZES OF ELECTRIC MOTORS

I. Single Phase Induction Motors

<u>Type</u>	<u>Usual No. of Poles</u>	<u>Usual HP Range</u>
Shaded Pole	2, 4, 6	1/2000 to 1/8
Split Phase	2, 4, 6	1/25 to 1/2
Capacitor Start, Induction Run	2,4,6,8	1/8 to 5
Capacitor Start, Capacitor Run	2,4,6,8	1/2 to 10
Permanent-Split Capacitor	2,4,6,8	1/8 to 10

II. Single Phase Synchronous Motors

<u>Type</u>	<u>Usual No. Of Poles</u>	<u>Usual HP Range</u>
Reluctance Motors		Less than 1/8
Hysteresis Motors		Less than 1/20
Inductor Motors		Less than 1/100
Permanent Magnet Motors		1/20 to 5

III. Universal (Single Phase)

2 pole	1/50 to 3
3,000 to 20,000 rpm	

IV. Polyphase Induction Motors

NEMA Design A	2,4,6,8,10,12	1/8 to 10,000
NEMA Design B	2,4,6,8,10,12	1/8 to 500
NEMA Design C	2,4,6,8	2 to 500
NEMA Design D	4,6,8,10,12	1 to 500
NEMA Design F	4,6	10 to 50
Wound Rotor	4,6,8,10,12	30 to 1,000

V. Polyphase Synchronous Motors

<u>Type</u>	<u>Usual No. Of Poles</u>	<u>Usual HP Range</u>
Reluctance	2,4,6	1/8 to 3
Permanent Magnet	2,4,6	1/8 to 10
Wound Field	4,6,8,10,12 14,16, & up	50 to 10,000 & up

VI. D. C. Motors

<u>Type</u>	<u>Usual No. of Poles</u>	<u>Usual HP Range</u>
Permanent Magnet	2	1/16 to 5
Series Wound	2,4,6,8	1/16 to 1,000 & up
Shunt Wound	2,4,6,8	1/16 to 1,000 & up
Compound Wound	2,4,6,8	1/2 to 1,000 & up

VII. The above list is compounded by:

Types of Enclosures
 Types of Duty Cycle
 Special Applications (Typical Types)
 Hermetic Motors
 Oil Field Motors
 Crane & Hoist Motors
 Valve Motors
 Traction Motors
 Torque Motors
 Low Speed Motors (more than 12 poles)
 Servo Motors
 Multi-speed Motors
 Tapped Winding
 One Winding two speed
 Two Winding two speed
 Two Winding four speed
 Variable torque
 Constant torque
 Constant Horsepower

Mr. DINGELL. Thank you very much, Mr. Hanson.
Our next witness is Mr. Sence.

STATEMENT OF LEONARD SENCE, VICE PRESIDENT, THE HYDRAULIC INSTITUTE, ACCOMPANIED BY JACK CULLETON, PRESIDENT, AND WILLIAM KRUTZSCH

Mr. SENCE. My name is Leonard Sence. I am here today representing, as its vice president, the Hydraulic Institute and its 70 member companies.

Mr. DINGELL. One administrative matter, Mr. Hanson. You submitted to us a number of appendixes to your statements including your personal biography. Without objection, the staff will review those, and include in the record those portions which are relevant and are important to the testimony.

Mr. SENCE. With me is Jack Culleton, the institute president, and William Krutzsch from the technical staff of one of our member companies.

The Hydraulic Institute is the major national trade association for firms engaged in the manufacture in the United States of centrifugal, rotary, and reciprocating pumps for industrial class service.

Since Hydraulic Institute member firms and the entire pump industry stand to be substantially affected by the legislation proposed in House bill 8985, we appreciate this opportunity to apprise the subcommittee of our views with regard to proposed mandated energy standards and labeling requirements for industrial pumping equipment.

The U.S. pump industry produced approximately \$2.9 billion of pump units and parts in 1976. Of this total, about \$575 million was exported. The total employees are about 63,900, with a payroll of nearly \$775 million per year.

Products of our member companies range from very small fractional horsepower units to huge pumping units, such as those in the A. D. Edmonston pumping station of the California Aqueduct where each of the 14 pumping units requires an 80,000 horsepower driver. Pump capacities range from a few gallons per hour to several hundred thousand gallons per minute. Pump inlet pressures range from high vacuum conditions to thousands of pounds per square inch pressure. Liquid temperatures vary from the cryogenic range to many times the boiling point of water. Duty cycles vary from nonoperational units, such as fire pumps, to continuous operating units in water systems, pipelines, and process applications. Metals of construction vary from cast iron to many varieties of stainless steel, to titanium and other exotic materials and alloys.

Such a wide variety of operating conditions and of materials requires an extremely large number and wide variety of pump sizes, types, and construction. With this variety of pumping conditions, each pump manufacturer and user many times must decide whether the pump to be used should be: More efficient or more reliable; more efficient or more safe; more efficient or have longer life; more efficient or meet unique operating conditions; more efficient or more serviceable.

In short, pump designs which maximize only efficiency may not satisfy many operational requirements of industry. Only optimum

efficiency pumps will be the lowest in energy consumption. As one example, a controlled slurry pump designed for maximum hydraulic efficiency would not be at all reliable and have a very limited life. It would not have an extended life with high efficiency.

At this point I would like to comment we would be happy to respond with other examples of this type of phenomena.

No directive can change the many thousands of different operating requirements which require optimum efficiency rather than maximum efficiency.

A common practice which has historically been observed among buyers for energy intensive pump applications, and which has spread rapidly to other industrial sectors because of recent rapid increases in energy cost, is the evaluation of competing bids for pumps and drivers on the basis of purchase cost plus power cost anticipated during the projected operational life of the equipment. It is not uncommon for such power cost to equal 100 or more times the first cost of the pump. Under these circumstances, if the manufacturer can improve the efficiency of his pump by 1 percent, its selling price may be doubled, and still remain competitive. This practice has long provided, and is now intensifying, the most powerful incentive possible (competitive survival) for improving pump efficiency, and it has done so through the economic force of our free enterprise system, without Government standards, or enforcement agencies.

American pump manufacturers have furnished to the world pumps with higher efficiencies that are unmatched.

At this point I would like to say that we have talked with three member companies who have conducted studies along this line and have found that efficiencies of American pumps far exceed those of pumps produced in other parts of the world.

Substantial further improvements in pump efficiencies have been developed in recent years, or are in the process of being developed. A listing of a number of these developments are included in the detailed statement. Any possible incremental improvement in pump efficiency as a result of mandated directives would be very minimal or nil.

Little incremental improvements in optimum efficiency of industrial pumps can be achieved by redesign that might result from this bill. However, the greatest improvements in pump system efficiency and energy savings can be achieved by the purchaser and user if the pump is closely matched to the actual operating conditions so that the pump operates at or near optimum efficiency and if the pump is properly maintained. This is a function of the pump buyer and user, which cannot be controlled by the pump manufacturer.

At this point I would like to stop and say we have with us today examples of the type of labeling that is going on in the industry and has gone on for over 50 years. The type of literature in front of me is the type of literature that lies between the buying public and the manufacturer. All efficiency information is contained in books such as these published by the hundreds of pump manufacturers in the United States today. It is a very complex labeling procedure in the form of performance curves. Examples of those could be submitted.

Mandated energy standards and labeling requirements do not impact on this opportunity.

The U.S. pump industry has responded quickly to the need for making available products stressing energy conservation. Additional product lines are being developed and older products are being up-graded.

The free enterprise system is working and it should be allowed to continue without mandated programs. These programs in our opinion will cause unnecessary cost penalties which will make U.S. produced products uncompetitive in the world markets.

In addition, there is reasonable doubt that these mandated programs will achieve more energy conservation than the current programs which are in place. In fact, some evidence points to a counter-productive result occurring from the proposed labeling legislation.

Gentlemen, we respectfully request that pumps be deleted from the proposed legislation.

That concludes my statement.

[Mr. Sence's prepared statement follows:]

STATEMENT OF INSTITUTE OPERATIONS

ORIGIN

The Hydraulic Institute came into being on April 18-19, 1917 when sixteen manufacturers of industrial pumps met and formed The Hydraulic Society.

When the Society was formed, in 1917, the pump industry was faced with an urgent need to solve a number of engineering problems brought about by the production needs of World War I. Today, while the activity of its membership has grown manifold, engineering is still the basic interest. The most important manifestations of this interest appear in the development of standards, in engineering conferences, in sponsorship of cooperative research projects and in cooperation with other engineering organizations.

In 1933 the Society was reorganized and the name changed to the Hydraulic Institute.

PURPOSE AND AIM

The purpose and aims of the Institute are, perhaps, best expressed in the following quotations from Article II, Objects, of the By-Laws of the Institute:

The Objects of the Institute are: To promote and further the interest of manufacturers of pumps, as well as the interests of the public in such matters as are involved in manufacturing, engineering, safety, transportation and other problems of the industry, and to this end, among other things:

- (a) To develop and publish standards for pump.
- (b) To collect and disseminate information of value to its members and to the public.
- (c) To appear for its members before governmental departments and agencies and other bodies in regard to matters affecting the industry.
- (d) To promote a spirit of cooperation among its members for the improved production, proper use and increased distribution of pumps.
- (e) To increase the amount and to improve the quality of pump service to the public.
- (f) To support educational and research activities.
- (g) To promote the business interests of its members but not to engage in business of the kind ordinarily carried on for profit or to perform particular services for its members or individual persons as distinguished from activities to improve the business conditions and lawful interests of all of its members.

Of parallel interest is the following quotation from article III, membership, of the By-Laws of the Institute:

Corporations, firms and individuals engaged in the manufacture of pumps for sale in the open market shall be eligible to apply for membership in the Institute.

COMMENTS ON QUESTIONS FOR WITNESSES

(Attachment to Congressman Dingell's Letter of Sept. 18, 1977)

Question No. 1

(a) Any research and development program should be assessed on its individual merits. Many R. & D. programs tend to duplicate work already done hence careful search must be made prior to any such work being authorized. Many new and improved products are now on the market which are a result of the requirement for energy efficient systems. New products are being developed.

(b) No new federal conservation R. & D. programs are needed. At the time, private enterprise efforts are developing, many new energy efficient products and systems.

(c) Heavy amounts of R. & D. work is being conducted by private industry today. During the year 1976, a Hydraulic Institute study indicates that approximately \$20,000,000 was spent for Pump Research and Development. It has been directed to optimizing pump efficiency and systems for industrial applications.

Question No. 2

We are not familiar with the background of this question.

Question No. 3

(a) The question of energy conserved by mechanical equipment must be measured against an established and agreed-to base. Since no base is established, it is impractical to state an answer. In pumps, however, the amount of energy consumed is but a fraction of the energy applied, as pumps convert mechanical energy to hydraulic energy.

(b) The potential for energy saving by proper use and application of now currently available pumps is fairly high. It has been estimated as much as 5 to 10 percent of current power consumed.

This does not require new attention on design and development, but requires higher control of the installed equipment.

Improved maintenance.

Use of repair parts equivalent to original equipment.

Improved process control.

Careful operation.

Since industrial pumps are nearly always applied to industrial systems and pumps are wearing process equipment, it follows that the efficiency of this equipment starts to decline as it is applied to these rigorous environments. A prime objective in many applications is not initial maximum efficiency rather continued "long life" high efficiency.

(c) The potential for increased efficiency for pumps is measurable; however, the potential for improved optimum efficiency is very low.

(d) The current levels of horsepower evaluation of as much as \$1,500 per horsepower provides a very high incentive for optimum efficiency pumps.

(e) Not applicable to pumps (first paragraph).

In some cases, motors may be less efficient than pumps.

It makes excellent engineering "sense" to couple an optimum efficient driver to an optimum efficient pump. The pump may be 90 percent efficient or 30 percent efficient and yet be an optimum design.

Industrial pump manufacturers have since the turn of the century published efficiency performance standard curves for pumps. These curves are in nearly all cases used in the buying selection of this equipment. The proper selection and application of industrial pumps is at best a complex exercise with evaluation of many variables. Optimum efficiency is one. The overall system efficiency is of more importance than pump efficiency.

In making a decision regarding the selection of a pump for a given industrial application, much technical information is available to the purchaser from the technical literature published by the suppliers. Information is always available regarding efficiency versus capacity discharge pressure and speed. The use of optimum efficiency evaluation is not a waste of time as it has been used for nearly a century. Also, efficiency information is normally available as it may change with viscosity, and varying inlet conditions. In short, a labeling program for pumps would be very unreasonable since much more comprehensive information is already available and is supplied by the manufacturer.

(f) Energy labeling is not required for industrial pumps. All manufacturers publish efficiency curves for essentially all the hundreds of classes, hundreds of sizes, and hundreds of types of industrial pumps produced today.

(g) Not applicable for pump.

(h) Not applicable for pump.

(i) The Hydraulic Institute does not have information of this type. One large manufacturer estimates that 90 percent of its sales are distributed by small business enterprises.

(j) No.

(k) Comparative efficiency data on essentially all industrial pumps are available.

(l) Efficiency on operating equipment could be improved by the installation of components which are equal to those originally supplied the equipment.

Question No. 4

The energy studies seem to compare installed equipment to expected energy efficient products. These studies should compare currently available industrial products.

Question No. 5

Corporate information.

Question No. 6

Essentially all industrial pumps have published efficiency curves available.

These pumps are usually tested under accepted test standards written by ASME, Hydraulic Institute, and now by the International Standards Organization, the internationally accepted standards writing body.

In some classes of equipment, 100 percent of the industries production is tested. In some cases, only a small percentage is tested.

Question No. 7

The Hydraulic Institute does write and update accepted test standards.

Questions 8 through 17 are developed primarily for electric motors.

PUMPING INDUSTRY SUMMARY FACTS

The Hydraulic Institute member companies are individually engaged to a varying extent in a broad mix of products, applications, and markets; certain summary facts about the pumping industry as a whole merit the subcommittee's attention.

(a) Industrial class pumps are, for the most part, sold to technically sophisticated users and are generally tendered against buyers' detailed engineering specifications.

(b) In recent years, due mainly to the rapid increase in energy costs, users are to a very significant extent evaluating bids and making purchase decisions on the basis of overall equipment life cycle costs, which, of course, include efficiency evaluations as important determinants.

(c) As a result of the above, pump manufacturers have continually improved product efficiency as a matter of economic reality and in response to the ever-present competitive pressures.

(d) The pumping industry has moved rapidly to develop many new products with higher optimum efficiency, and these new products are now on the market. Other new products are under development by the industry.

PUMPING INDUSTRY PAST HISTORY AND CURRENT STATUS

The members of the pumping industry have always been conscious of design techniques that would improve energy efficiency. Unfortunately, most of these improvements usually require a higher first cost such as using multistage impellers rather than single-stage impellers, and other similar adjustments. Although the products were made available by the pump industry, the free market did not buy these designs because energy used to be plentiful and inexpensive.

Now the situation has changed. Energy is no longer plentiful and inexpensive. Industrial pump buyers are now making buying evaluations based on life cycle costing which includes a consideration of first cost and operating costs. Inefficient pump products are losing because of their higher operating costs. Manufacturers of pump products are introducing many new designs which offer higher operating efficiencies than older designs. A list of some of them appear in this document. Sales literature describing some products is also attached.

FREE ENTERPRISE INCENTIVES

A common practice which has historically been observed among buyers for energy intensive pump applications, and which has spread rapidly to other industrial sectors because of recent, rapid increases in energy cost, is the evaluation of competing bids for pumps and drivers on the basis of purchase cost + power cost anticipated during the projected operational life of the equipment. It is not uncommon for such power cost to equal 100 or more times the first cost of the pump. Under these circumstances, if the manufacturer can improve the efficiency of his pump by 1 percent, he can double its selling price and remain competitive. This practice has long provided, and is now intensifying, the most powerful incentive possible (competitive survival) for improving pump efficiency, and it has done so through the economic force of our free enterprise system, without any necessity for legislation government standards, or enforcement agencies.

DESIGN CONSIDERATIONS FOR EXTENDED ENERGY CONSERVATION

Serious concern must be expressed over the possibility that minimum efficiency standards, if arbitrarily escalated beyond the already high levels which have been achieved by the evolutionary optimization of efficiency without undue sacrifice of other design objectives, may have an effect over the operating life of the equipment which would be exactly the opposite of that intended. This possibility arises because the pump engineer can often exercise choices between design features, (1) efficiency slightly lower when the pump is new than the highest possibly attainable, but subject to minimum degradation with normal usage, or (2) efficiencies which start out very high but deteriorate rapidly after the pump goes through regular services. Long term evaluations by users interested in minimizing lifetime energy costs have tended to favor development of pumps in the former category, and have thereby forced, solely through economic pressure, adoption of pump designs which truly represent the wisest approach to energy conservation.

Industrial pumps

[All dollars in millions]

I. Total sales:	
1975: ¹	
Pump units.....	\$1, 940
Pump parts.....	² 720
Total.....	2, 660
1976: ¹	
Pump units.....	2, 095
Pump parts.....	² 793
Total.....	2, 888
1977: ¹	
Pump units.....	2, 285
Pump parts.....	² 896
Total.....	3, 181
II. Total employers in pump industry:	
1976 ³	61, 900
1977 ⁴	63, 900
Pump manufacturing facilities (1976).....	559
III. Total exports:	
1974 ¹	410
1975 ¹	514
1976 ¹	600
1977 ¹	670

¹ Estimated by Bureau of Domestic Commerce (BDC).² Two-thirds of parts for both pumps and compressors (U.S. Ind. Outlook 1977).³ Ed McDonald, U.S. Department of Commerce, manufacturing analyst for pumps and pumping equipment.⁴ Department of Commerce report (M75-AS-1).

Mr. SHARP [presiding]. Mr. Houlton.

STATEMENT OF RANDOLPH L. HOULTON, MANAGER, ADVANCE APPLICATION OPERATION, MOTORS AND DRIVES BUSINESS DIVISION, GENERAL ELECTRIC CO.

Mr. HOULTON. Mr. Chairman and members of the subcommittee, I am Randolph L. Houlton, an engineer associated with that portion of the General Electric Co. that designs and manufactures most of the company's motors for industrial service. I welcome the opportunity to discuss with you some aspects of the subject bill.

We are convinced that energy conservation is everyone's responsibility and that it will continue to be so in the foreseeable future. We concur with the intent of this bill; that it is the national interest for the Energy Department to be empowered and funded to study patterns of energy usage in industry and to determine areas in which Government action is required to encourage or advance the development and use of more efficient industrial components. With regard to the electric motors as used in industry and commerce, we feel that an excellent beginning has been made in the Arthur D. Little report, done for the FEA and published last year.

We feel that the proposed legislation, as regards electric motors, would be improved if it restricted itself to further studies as is the case with "Other Industrial Equipment" as described in section 342 and following. It should refrain from preauthorizing specific regulatory action in advance of the studies on motors. The field of designing, selecting and applying electric motors is a dynamic and complex one and any requisite regulatory actions would be enhanced if they were submitted to further public hearings and further legislation at the conclusion of administrative studies. The remaining remarks and the attached addenda are intended to illustrate this opinion.

The FEA study reports that unlike pollution avoidance, energy conservation results in significant economic returns to the users of industrial components. Hence the study concludes that the most effective means of implementing energy conservation methods is to create a "market pull" for electric motors which will result in energy conservation. It is noted that the selection and application of the appropriate motor requires a thorough knowledge of the application or industry process to which it is to be applied and that regulatory standards on motor efficiencies would be complex to the point of being unadministerable. This conclusion is restated in the July 26 testimony of FEA's Mr. C. W. Fisher to the Senate Subcommittee on Energy Conservation and Regulation.

The primary industrial users of motors are in the process industries: Chemicals, primary metals, paper, food, and petroleum. These industries are composed of large companies with competent engineering staffs, highly motivated toward conserving energy with accompanying cost reductions. The proper approach to energy conservation is complex but they are equal to it.

As an example, let's consider a large fan and its drive and control as applied to a boiler, a blast furnace, and the like. Today's typical fan is driven by a constant speed, highly efficient motor with the flow of air

being controlled by adjustable vanes or inlet dampers. Recently one of the large fan manufacturers has announced a new design in which the primary control of air flow is by means of a General Electric adjustable speed drive rather than by air throttling means. In this system, the motor and control are specially designed for variable speed operation resulting in increasing full speed operating losses by two percent. However, the actual operating point efficiency has been increased to 25 percent to 80 percent (depending on the boiler operating level) by system engineering applied by the combination of the fan manufacture, the motor manufacture, and the user.

As a similar example, let's consider the simple pump as used in industry. Again, the traditional approach has been to use a constant speed drive and to control flow through a throttling valve in the piping. In response to the increasing energy costs there is a dramatic opportunity to eliminate the throttling losses by using an adjustable speed drive to control flow. The somewhat higher motor losses are totally swamped out by a 36 percent decrease in overall energy consumption resultant from elimination of throttling losses. This value was calculated by one of our user customers in what he determined to be a typical application.

In these two cases, and many others, a great deal must be known about the industrial process and the specific motor used to optimize energy savings. The motor efficiency is only part of the equation. Regulations that established a floor under permitted motor efficiency at full speed-full load, or even confined themselves to labeling of this value, would prove to be useless at best and is more likely to be counterproductive. More comprehensive regulations which seek to deal with each of the many application cases would be complex to the point of being unadministerable, as stated by Mr. Fisher in his testimony.

There are many cases where higher efficiency, constant speed motors would be useful in conserving energy. The FEA study targets 1 to 125 horsepower, AC motors as incorporating nearly all of these cases. This is on the basis that in these sizes, the cheap energy of prior years has made small size, light weight, and low first cost be the primary selection criterion. Specially designed, premium efficiency motors in these sizes have always been available but there has previously been little demand for them.

In response to increasing energy costs and in advance of the appreciable market demand which is now beginning to build, our company has within the last four months announced the availability of three new lines of specially designed, premium efficiency motors. Information in the trade press indicates that other manufacturers are doing the same. These new, energy conserving products are being promoted in the market together with information on how to evaluate and apply them.

It should be noted here that there are many simple applications when a premium efficiency motor is not the proper selection. Such motors require more materials than a more standard motor. The FEA study reports that approximately 1,000 hours of energy savings through use of a premium efficiency motor would be required to replace energy required to produce the added material. For applications

requiring infrequent operation, such as activators for valves, gates, and doors, the energy balance would never go positive. For cyclic drives as used on materials handling and machine tools, the premium efficiency motors would simply not have the proper characteristics to perform the work to be done. Here again, regulations relating to motor efficiency would have to be very complex to cover all cases.

The FEA study makes the point that due to a history of cheap energy, the information on motor efficiency provided for users is inadequate and often confusing. I will leave it to Mr. Falk of NEMA to communicate what industry has been doing in this realm. I would like to note, however, that earlier this month, it was my privilege to present a paper to the Institute of Electrical and Electronic Engineers on the subject of motor efficiency and the use of the new, NEMA standards. The conference was attended by 582 technical people, with well over half of them being engineers of user companies who design plants and purchase industrial components. Over one-third of the papers presented dealt with energy conservation. The session in which I participated was primarily dedicated to energy conservation through proper selection and application of electric motors. This type of industry attention is being replicated in technical sessions throughout the Nation. So you see that economic forces and market pull are at work, the types of factors which the FEA study says are needed and will be the most effective in conserving energy.

In conclusion, we believe it is productive to fund and empower the Energy Department to conduct further studies on how to conserve energy in industry. With regard to the electric motors in particular, we strongly believe that current enactment of legislation which pre-judges the outcome of such studies by establishing the resultant regulations is ill advised and highly likely to be counterproductive.

This concludes my oral testimony.

Mr. DINGELL. The Chair observes you had a number of addendums and appendices to your comments and statements. Without objection, the staff will be instructed to review these for possible insertion at a proper place in the record.

[The documents referred to may be found in the subcommittee files.]

[The response to the subcommittee questionnaire follows:]

QUESTIONS FOR WITNESSES RE H.R. 8985 AND S. 2057

RESPONSE FROM RANDOLPH L. HOULTON, MOTORS AND DRIVES BUSINESS DIVISION,
GENERAL ELECTRIC COMPANY, RELATING ONLY TO ELECTRIC MOTOR PORTION

1. On August 12, 1977 memorandum (copy enclosed) from Mr. Rich Cooper of the Office of Energy Policy and Planning to Mr. Al Alm states:

In general, the conservation initiatives in the National Energy Plan (NEP) and the National Energy Act (NEA) increase the prospects for widespread use of energy conserving equipment, but do not reduce the need for Federal conservation R. & D. No general conclusions can validly be drawn with respect to particular Federal conservation R. & D. programs from the fact that the NEP and NEA are designed to stimulate increased demand for conservation. The value of each particular Federal conservation R. & D. program should be assessed on its individual merits.

(a) Do you agree with these comments?

We concur that each Federal R. & D. program should be assessed on its individual merits.

More particularly regarding the design and manufacture of electric motors, that will provide energy conservation when applied to industrial processes, our Company invests millions of dollars each year in seeking new or improved materials, designs, manufacturing approaches, and application methods on these products. The proportion of this relating to higher efficiency drives and motors has increased rapidly over the last several years with the advent of more costly electrical power.

(b) What is your estimate of the size and direction of the conservation R. & D. that is needed in the case of motors, pumps, and other industrial equipment listed in the bills?

We have not attempted to assess the size of R. & D. programs on an industry-wide basis. In terms of the direction of these programs, it would seem wise to concentrate maximum efforts in those areas where there is maximum potential for energy conservation. As is indicated in answers to subsequent questions, the efficiency of electric motors is already much higher than that of their driven machines. Also, there are much greater gains available through changes to the process systems in which the motors are applied.

(c) To what extent is such R&D being conducted today by industry and the Federal Government and to what extent should such R&D be promptly increased by both? Please provide dollar estimates of current and future efforts, including a timetable for such future efforts.

For our Company, this is addressed in the answer to (a) above. We have little doubt but what the rest of the industry is equally motivated by the anticipated increase in energy conservation by our user customers.

We know of no Federal Government R&D addressed to increasing the efficiency of motors and drives. We believe that industry should fund work where there is a short term prospect of translating the results into products. There is likely to be long term fundamental research work, applicable to the total industry which would be supported by Government R&D funds. At this time we have no program outline or timetable.

3. Both H.R. 8985 and S. 2057 provide for the promulgation by FEA of energy efficiency standards for electric motors and pumps.

(a) How much energy, (in BTU's and barrels of oil per year) do you estimate is conserved* annually by (i) electric motors and (ii) pumps? Please state the basis for each estimate.

*Believe "conserved" is meant to be "consumed".

Electric motors convert 1,081 billion kW-hr. per year into mechanical energy, equivalent to 1,850 million barrels of oil. As to the energy "consumed" by the electric motor in losses, we estimate 101 billion kW-hr. equivalent to 173 million barrels of oil.

For source, see reference after part (b) answer.

(b) How much energy (in BTU's and barrels of oil per year) do you estimate can be saved by 1985 through the use of more efficient (i) electric motors and (ii) pumps?

Maximum annual savings in 1985 in the Industrial and Commercial segments for increased efficiencies of 1 to 125 horsepower motors, the principal and almost exclusive savings area, are estimated at 32 billion kW-hr. or 55 million gallons of oil and accumulated savings through 1985 at 147 billion kW-hr. or 232 million gallons of oil. It should be noted that added savings are available through improved practices of applying motors; e.g., use of adjustable speed drives.

Source of above: FEA Conservation Paper #8 (A. D. Little report).

(c) What is the potential for increased efficiency of electric motors (i) above 25 horsepower and (ii) at 25 horsepower, or less?

With today's state-of-the-art, depending on motor size and type:

Above 25 HP—0.2 to 6.0%

1 to 25 HP—9.0 to 12.0%

(d) To what extent is price of the motor critical to encouraging increased energy efficiency?

Product price levels are quite significantly in determining any purchase. Investment decisions in industry are normally made on the basis of 1 to 3 year payback. Added prices for premium efficiency motors, required by the added material requirements, are usually at a level such that a 1 to 3 year payback is available on the incremental price for those applications where the motor operates at or near rated load most of the time.

(e) In a March 14, 1977 article in the *Energy User News*, one manufacturer said: Power factor falls off rapidly at less than full load. One has to examine efficiency and power factor at the horsepower one runs the motor rather than at the motor's rated horsepower.

Also, much of the equipment—pumps, compressors, air conditioners, etc.—are less efficient than the motors. What's the sense of coupling a 90 percent efficient motor to a 70 percent efficient pump?

Do you agree with these comments and conclude that setting energy efficiency standards, etc., is a waste of time? Please explain.

With regard to the first statement, we concur. This is one reason why purchasing a motor on the basis of a simple comparison of nameplate data of alternative motors is not wise. The most significant savings in energy are available by combining a knowledge of the motor, the driven machine, and the process to which they are applied. Examples of this are given in my testimony to the Subcommittee.

With regard to the fact that electric motors already have higher efficiencies than their driven machines, this is not expected to reduce the interest in conserving energy in the motor portion of the combination of equipments. It does point out the need to go beyond the motor to the total process system to find the greatest source of energy conservation. Useful standards will be complex and comprehensive and simplistic standards are likely to be counter-productive.

(f) What data is available on the types and classes of motors and pumps distributed in commerce for industrial or commercial use and on which types or classes would be required to be subject to energy labeling, standards, etc.? How many different models of such equipment would fall into such classes or types?

Individual manufacturers publish handbook listings which include all types of motors available.

The best available appraisal of which among all motors might be subjected to efficiency standards is contained in the FEA Conservation Paper No. 958 (A. D. Little report). The targeted motors are AC, general purpose, squirrel cage, rated 1 to 125 horsepower with various speeds, voltages, service factors, insulation systems, and enclosures depending on their application. The combinations and permutations total 25,000 designs, but this number changes from time to time by programs such as the current motor metric conversion efforts. Each manufacturer has individual model numbers which cover part or all of these designs. Also there are several model numbers for a given design to cover customer specified modifications of connection boxes, shafts, and the like. Hence there are likely to be 500,000 motor model numbers covered by the FEA targeted motors.

(g) The March 14, 1977 edition of *Energy User News* lists (page 9) the major manufacturers of "Integral Electric Motors". Do you agree that this list represents the "major" manufacturers of all electric motors manufactured and distributed in commerce for industrial or commercial use? Please explain.

The list includes only half of the 29 motor manufacturers who are listed as members of NEMA. For example, Westinghouse is omitted.

(h) What is your estimate of the percentage of the market that these manufacturers account for (dollar volume)?

This data is not available to me.

(i) To what extent are such electric motors and pumps manufactured and distributed in commerce by small businesses and what impact could be expected on such firms by enactment of either bill?

The extent is not known by us. The impact of the bill on the small manufacturer relative to testing and labeling would be major. The testing to provide reliable data requires sophisticated equipment. The cost of load testing a single, small motor is estimated to equal the cost of manufacture.

The cost to a manufacturer of designing and manufacturing a line of motors to new minimum efficiency standards that are high enough to be meaningful would also be high due to the requisite design effort and the investment in retooling.

(j) Are there adequate and effective provisions in both bills to lessen any adverse economic impact on such small businesses and to insure competition?

Provisions in H.R. 8985, Sect. 345, Para. C and in S. 2057 Sect. 377, Para. K(1) may lessen the impact on small business by giving them a competitive advantage over larger manufacturers. On the other hand, exempting small business from developing premium efficiency motors and from testing and labeling all motors for efficiency may hurt them. Reducing energy consumption is economically attractive to users, so they may refuse to purchase motors on which efficiency data is not available.

(k) To what extent are reliable and comparative data on energy efficiencies of electric motors and pumps available to the purchasers thereof in understandable form?

While such data has always been available on inquiry to the manufacturer, manufacturers have not always based their answers on the same test methods or nomenclature so discussion and comparison of data has been difficult for the motor applier. The new NEMA standards and the industry communication program will largely remove these difficulties.

(l) Do you construe the legislation as only applying to new motors, pumps, etc., and not to rebuilt equipment? Should it apply to rebuilt motors, etc.? Please explain.

As regards electric motors, we interpret the proposed legislation to be primarily applicable to new or replacement units. It would be possible to test and label rebuilt motors but many small service shops who do this work are not equipped with adequate test equipment. Application of these standards to motor rebuilds would serve to put the small motor repair shops at a disadvantage compared to rebuilds by the original motor manufacturer.

5. (a) What types of industrial equipment, as defined in the bills does your company manufacture and distribute in commerce for industrial and commercial use?

(b) What volumes of each type of equipment do you manufacture and distribute?

(c) What is the price range of such equipment and the energy efficiency thereof? I do not have this information available to me.

6. (a) Are any of your products labelled with energy efficiency information?

Some small motors for the automotive industry are labelled with efficiency information in accordance with customer specifications. On a large percentage of large motors, efficiency data is specified by the customer and is provided on the motor drawings.

(b) Under what test procedures are they labelled?

Such motors, and many others, are tested for efficiency by IEEE Standard 112A.

(c) Are all products tested before being labelled? If not, what percentage are tested?

Each motor is not tested. Tests are conducted on each new design and for each change in design method. In addition, special tests are conducted on individual motors when specified by the customer.

7. Do you participate in any trade organizations responsible for developing test procedures to measure energy efficiency? If so, what is the organization and what is the extent of your participation?

Yes. For electric motors, the Company has heavy participation in the trade association NEMA, and many of our employees are also on IEEE, IEC, and ANSI Committees that consider and develop such standards.

15. For other industrial equipment listed in the bills, please provide your best estimates of the energy consumed by such equipment, along with the source of your estimates.

I do not have this information available to me.

16. What voluntary labeling programs are presently operating?

(a) What types of equipment are covered?

(b) What trade organizations are involved?

(c) What forms do the labels take?

(d) What share of the market participates in the program?

(e) What has their effectiveness been?

Currently our Company motors are labeled only under conditions described under question 6 above.

The Company is now doing the background work required to initiate use of the new NEMA standards on motors. This work constitutes an intensive program of testing and statistical analysis of motor efficiencies as a basis to provide meaningful information to the motor applier as well as to determine more effective means of designing, manufacturing, and testing motors having higher efficiency. A copy of the proposed label is attached.

17. It has been claimed that the labeling of electric motors has been hampered by the following problems:

(a) Labels are cryptic and difficult to understand,

(b) Manufacturers disagree on what is the correct measure of energy efficiency,

(c) Testing is inaccurate due to wide variations in quality of products off the same assembly line.

Do you agree or disagree with these criticisms? Please explain.

It is agreed that past methods of communicating efficiency have been lacking in effectiveness due to lack of comprehensive standards as a context in which to communicate. The new NEMA standards, as agreed to and adopted by the industry, are expected to correct this.

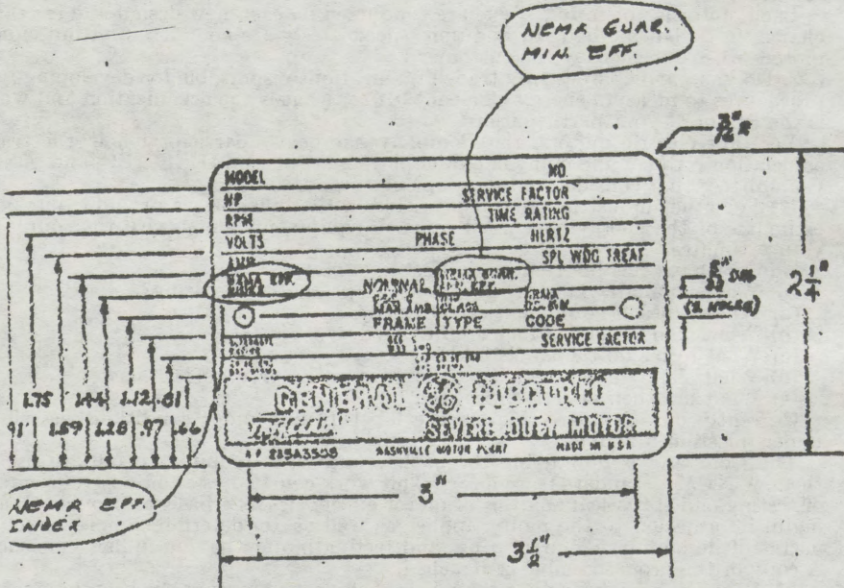
As to "cryptic labels" on the nameplate, we have the following comments. Current NEMA standard MG1-10.37 lists 12 items of information as minimum information to be contained on the nameplate. The addition of efficiency index constitutes a 13th item. By necessity this information must be abbreviated due to nameplate size and must be backed up by supporting data from NEMA standards or from the manufacturer. In any event, this back-up information must be available to the motor applier far in advance of his receiving the motor. The nameplate serves as a verification that the purchaser received what he ordered.

Relative to testing inaccuracies, the NEMA "preferred method" for efficiency testing of 1 to 500 horsepower motors is IEEE standard 112A method B, dynamometer testing, which is also an ANSI standard. This is the most accurate method in use today, exceeding the IEC standards in use in Europe and JEC standards in use in Japan. Both NEMA and IEEE have current activity to further improve the test method.

GENERAL ELECTRIC MOTOR NAMEPLATE

Including Information On

- NEMA EFFICIENCY INDEX
- NEMA GUARANTEED MINIMUM EFFICIENCY



Mr. DINGELL. The next witness is Mr. Bernard Falk.

STATEMENT OF BERNARD H. FALK, PRESIDENT, NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION

Mr. FALK. Thank you, Mr. Chairman. I am Bernard H. Falk, president of the National Electrical Manufacturers Association. NEMA is the major national trade association for companies engaged in the manufacture of products used in the transmission, distribution, and utilization of electrical energy. Its membership, of close to 600 firms, embraces a broad spectrum of products covering over 70 different branches of the electrical industry. Today's statement is being made on behalf of NEMA's motor and generator section.

Let me begin by stating that the subject of electric motor efficiency has been receiving substantive attention within our association for the past few years. Illustrative of this is the work of our motor and generator section's energy management committee. An example I will refer to are two publications which have been entered in the record dealing with energy management guides for selection and use of single-phase motors and polyphase motors.

These publications help the end user make knowledgeable judgments in the selection, application, and maintenance of these motors. Developed with the cooperation of the FEA, you will note that it bears a foreword of "endorsement" by the FEA and states, in part, "This cooperation between NEMA and FEA has produced documents which complement one another in assisting the motor end user. We (FEA) expect this kind of cooperation between the private sector and the Government to continue and to contribute to the implementation of further energy conservation programs related to electric motors." These publications went to press just a couple of months ago, and we have already received requests for almost 25,000 copies, even before our press releases and promotion were underway.

NEMA has established standards for nameplate marking of efficiencies and also standards on calculation and correction of power factors, an extremely important additional aspect affecting energy consumption. Currently underway is the complex technical task of standardizing the statistical methods for determining efficiency of a given motor design for a population of motors. Test codes, which are developed separately by IEEE, have recently been revised and strengthened. This industry's efforts in regard to standardization and provision of energy management information to the user have been responsive and productive, as evidenced by the increasing promotion and usage of higher efficiency motors.

Having mentioned the Federal Energy Administration, I think it is pertinent to note FEA's concerns with regard to mandatory minimum efficiency standards for electric motors. In its testimony before the Senate Subcommittee on Energy Conservation and Regulation in July, the FEA cited a number of factors that must be taken into consideration with regard to mandatory minimum efficiency standards. These included economic considerations, the tendency of a standard to produce a common denominator of efficiency, the effects on small business and administrative feasibility, the latter referred to the great diversity of manufactured products to which mandatory standards

would necessarily apply. After reviewing the possible applicability of these criteria to electric motors, the FEA expressed the view in its written statement:

In view of these considerations, we believe that mandatory standards should not be considered at this time. We do feel, however, that the Congress should consider some activity in this area of industry equipment efficiencies, and we would support the provisions providing authority for conducting professional studies on test procedure requirements and label requirements.

NEMA concurs with the FEA recommendations with regard to motor efficiency standards and accordingly recommends that section 341 of H.R. 8985 not include electric motors, and that section 342 be amended to include electric motors.

I would like to call the committee's attention to the report prepared for the FEA by the Arthur D. Little Co., titled "Energy Efficiency and Electric Motors." I quote from page ES20 of the summary of that report, the four recommendations which are made and the response of the motor industry to these recommendations, as follows:

1. Insist that all 1 to 125 horsepower polyphase motors be tested on a statistically valid quality control schedule to IEEE-112A, test method B, to verify published efficiency.

Industry action: NEMA has developed a bulletin which defines a statistically valid analysis of efficiency test data. This bulletin is currently undergoing a letter ballot vote within NEMA.

2. Mandate that published efficiency data bear a specified and consistent relationship to test results, and include allowable manufacturing tolerance variations.

Industry action: NEMA has developed a standard which does establish a specified and constant relationship between minimum efficiency and average efficiency of a population of motors, taking into account allowable manufacturing and test variations.

3. Recommendation: Demand that motor nameplate data include efficiency and power factor data.

Industry action: NEMA has adopted a standard for indicating the motor efficiency on the nameplate in accordance with paragraph (2) above. This labeling program is in effect. In addition, information has been included in the standards to permit the user to determine power factor from nameplate data, as well as a method for correction of power factor to reduce losses in the power supply system.

4. Recommendation: Insist that more comprehensive and comparative motor selection, application, and economic justification data-covering efficiency be made available to the buying public.

Industry action: I again call the committee's attention to the two bulletins which NEMA has published earlier this year: MG 10-1977, and MG 11-1977, "Energy Management Guide for Selection and Use of Single-Phase and Polyphase Motors."

In support of the NEMA position that authority not be established for Federal regulations covering efficiency standards, labeling, and testing requirements for motors, we offer the following comments:

1. Electric motors are among the most efficient, available means for energy conversion. This is the primary reason for their wide usage today.

2. Even for NEMA design A, B, and C motors, in the range of 1-125 horsepower, one manufacturer has estimated there are 25,000 design combinations of motor size, speed, and enclosure which could each require establishment of a separate efficiency standard. In addition to the vast number of designs, there is the additional factor of virtually an infinite number of applications, many of which could require special consideration of efficiency characteristics. Considering the industry as a whole, it is not inconceivable to envision hundreds of thousands of different models for which standards would need to be promulgated.

3. While many user applications would benefit from increased equipment efficiencies, there are also many situations where this requirement would be counterproductive. Applications with infrequent operation and/or requiring special performance characteristics, could incur both economic and performance disadvantages by requiring a specified efficiency level for equipment. Consider the widely varying requirements for such applications as:

- (a) A motor for a fire pump, where performance characteristics are of overriding importance and it is infrequently, if ever, used.
- (b) Garage door opener.
- (c) Large industrial punch press.
- (d) Conveyor system.

4. Proper matching of components within a system is important. The optimum system efficiency can only be obtained by proper sizing and loading of system components.

5. Establishment of minimum efficiency standards might be counterproductive by removing the incentive for further efficiency improvements available from new technology developments.

6. Industrial equipment users are becoming increasingly sensitive to economics in the selection and use of equipment. The cost of electrical power is now such that an efficiency improvement offers sufficient economic advantage to justify increased investment. The user is demanding the means and products necessary to achieve a reduction in electric power consumption, and this basic economic operating principle will insure the availability and use of industrial equipment with increased efficiencies.

We believe that between the economies of energy conservation, the forces of competition, the technical proficiency of the industry user, and the clear national interest in energy conservation, substantive progress has been and will continue to be made in the industrial market in regard to energy conservation. The objective of the subject legislation will probably occur in less time through the interplay of competitive forces between manufacturers created by economic pressures from the users to conserve energy. The framework for use of improved efficiency motors, by establishing standards for nameplate marking of efficiencies, and standards for calculating correction requirements for power factors, has been set in place.

Thank you very much.

Mr. DINGELL. Thank you very much. You did, I believe, make available to the committee a number of different appendixes to your statement. Without objection, as in the case of all of our other panel members, those will be reviewed by the staff for possible insertion in the record.

[The documents referred to may be found in the subcommittee files.]

Mr. FALK. There was an appendix inadvertently left out. A publication entitled "American National Standards Institute, Procedures for Management and Coordination of American National Standards." We will attach it to the record.

Mr. DINGELL. That is very helpful. We will certainly carry forward the intention as announced by the Chair.

Our last witness is Mr. Clarke.

**STATEMENT OF RONALD B. CLARKE, VICE PRESIDENT,
MARKETING, BALDOR ELECTRIC CO.**

Mr. CLARKE. Mr. Chairman and members of the committee, thank you for the opportunity to be here. I am Ron Clarke, vice president of Baldor Electric Co. of Fort Smith Ark. We specialize in manufacturing industrial electric motors ranging from 1/50 hp through 250 hp. We are members of the National Electrical Manufacturers Association and have been in business since 1902.

We support the need to develop energy conservation measures throughout the industry. In fact, our company has been very active in this field and we were honored to receive the first merit award given to a motor manufacturer by the Federal Energy Administration for our innovative program of labeling Baldor products with efficiency data.

We see three forces currently at work in the marketplace that we believe are now leading to the development, manufacture, and use of more energy-efficient motors without Government regulations.

First, our trade organization, the National Electrical Manufacturers Association (NEMA), has been active in establishing a set of standards for the manufacture and use of electric motors that are stronger than any other standards organization in the world has been able to develop. NEMA is 51 years old and has the membership and respect to foster the adoption of additional standards and guidelines relating to the manufacture and use of more energy efficient motors. No matter how efficient the motor we produce as a manufacturer, a portion of that energy efficiency can be lost because of poor application engineering.

NEMA recently established an Energy Management Committee that is developing improved testing methods. It has also printed and distributed handbooks prepared in cooperation with the FEA, to assist end users in making knowledgeable judgments in the selection, application, and maintenance of motors with energy conservation being the primary target.

In addition, NEMA recently adopted a standard calling for the labeling of efficiency data on the nameplate of motors, and while our company objected to their choice of a code letter rather than an actual numerical value, we believe this action is positive evidence of NEMA's efforts.

Our company believes NEMA is capable of and recognizes their responsibility to establish minimum efficiencies for the entire range of electric motors. At present they may be hesitant to take this action, but through the encouragement of member manufacturers and the Federal Energy Administration, we believe this can be done.

The second force now at work in the marketplace is the rapidly increasing user interest in the purchase and use of more efficient motors. Our company has advertised motor efficiency since early 1974. Initially, it seemed our efforts were falling on deaf ears. However, we were pleased in May of 1974, and on several occasions since, to receive readership awards from trade magazines directed to the industrial plant engineering field. This was one of the earlier indications we had of the interest among end users in high efficiency motors. As you know, many of the larger companies of the United States have established high staff positions concerned specifically with energy management. Our company on almost a daily basis, receives mail and phone calls from major U.S. companies requesting information on high efficiency electric motors. These requests have been from such major corporations as Kodak, Firestone, Uniroyal, and others. Also many smaller companies have informal programs. Electric motor efficiency has become a popular topic among industry trade publications.

The third group are the manufacturers such as Baldor. For example, we have pioneered such efforts as labeling of motor efficiency on the motor, before the NEMA standard was adopted, and distribution of technical data concerning efficiency.

Also, we have improved the efficiency of several of our older products. Westinghouse Electric and the Century Division of Gould have introduced special lines of motors having higher efficiency than the industry average. Among these manufacturers, large sums of money have been invested in advertising, sales promotion, and technical literature for distribution to industrial users of electric motors. For example, we have ourselves distributed more than 40,000 copies of data books showing efficiencies of our standard products. We see many indications that these investments are paying off in terms of heightened interest among the end users of electric motors.

Contrary to the recent publicity about the development of a revolutionary new high efficiency motor on the west coast, there is no unusual technology involved in producing more efficient electric motors. All good industrial motor manufacturers have the ability and know-how to make more efficient motors. Specifically, more and better quality active materials in the motor are needed. Past marketing pressures have resulted in many manufacturers reducing the material in and thereby the efficiencies of their motors while trying to achieve lower selling prices. We have resisted that trend at Baldor, and have continued to produce motors with above average efficiencies. Industry rumors and simple logic suggest that other industrial electric motor manufacturers will be offering higher efficiency motors in the near future.

In summary, we believe NEMA, the electric motor manufacturers, and the end users of industrial electric motors are capable of achieving your target of reducing energy consumption through the use of higher efficiency electric motors. We believe these natural market forces will lead to this target within the next 1 to 2 years.

However, if after a reasonable length of time, NEMA, members of our industry and end users of industrial electric motors are not successful in adopting the use of more efficient electric motors, the

Government possibly should establish regulations toward this end.

In the meantime, we believe these groups should have the opportunity to reach these goals. The Government, through such activities as the Federal Energy Administration's study on electric motor efficiency and the activities of the new Department of Energy, should continue to encourage NEMA, the manufacturers, and the end users through educational efforts.

Thank you.

[The responses to the subcommittee questionnaire follow:]

RESPONSE TO SUBCOMMITTEE QUESTIONNAIRE

Question 1. (A) In general we agree with the statement of Mr. Cooper. However, the value of each particular Federal conservation R & D program should be assessed on its individual merits.

(B) We believe adequate research and product development is presently going on in the electric motor industry to satisfy the need for more energy efficient electric motors.

(C) The electric motor industry is approximately \$2.5 to \$3 billion. Our best estimate of the amount of money being spent for research and product development is on the order of one to three percent of industry sales. Basically, to make electric motors more efficient, no new technology is required at this time. The technology and the materials are available to all motor manufacturers.

Question 3. (A) The Federal Energy Administration Study, conducted by the Arthur D. Little Company, projected savings of over 58 million barrels of oil per year by 1990 if more efficient motors are adopted.

(B) Please refer to Question 3 (A) above.

(C) The potential for increased efficiency of electric motors in the range of 1 through 125 HP is quite good as was determined by the FEA study. We believe this study is an accurate statement of the opportunity. Perhaps the potential for efficiency increase above 25 HP is somewhat less than below 25 HP, but in both cases more efficient motor designs are definitely possible compared to the typical motors of today.

(D) Our Company sells a more efficient motor at regular motor prices. We estimate our material cost may be 5 percent higher than some of our competitors because of the extra material required to make our motors more efficient. Two of our competitors have taken the approach of making a more efficient motor but at a 15-25 percent price premium over the sales price of a normal efficiency motor. In our opinion, this large differential is not justified. From what we've been able to learn, the premium priced high efficiency motors have not been very well received because of the relatively large premium cost.

(E) As stated in the FEA Study, the power factor does fall off rapidly at less than full load. It is correct that one has to examine efficiency and power factor at the horsepower the motor is operated.

Power factor of the motor, and an entire plant, can be corrected on the installation. In other words, each installation has its unique power factor because of the motors in operation and the extent of loading. And a poor plant power factor can be corrected by the installation of capacitors.

However, the efficiency of a motor cannot be changed after the motor is built. Therefore, the end-user has no opportunity to improve the efficiency of an installation without replacing motors.

While it is true that most other industrial equipment is not as efficient as the electric motor, there are savings opportunities in electric motors. The electric motor is the prime energy consumer of most systems. For ultimate energy conservation both motors and the equipment they drive should be designed for—and applied for—highest optimum efficiency.

(F) From the standpoint of electric motors, considerable research was conducted by the FEA in their study of motor efficiency and it does contain extensive data on the sizes and consumption of motors and motor driven equipment.

(G) We are not familiar with the article.

(H) Refer to G above.

(I) From the standpoint of motors, on the assumption that the small business level is defined as 300 employees or less, there are no integral horsepower electric motor manufacturers that small to our knowledge.

(J) Please refer to the preceding answer.

(K) Our Company has distributed large quantities of data booklets (our Engineering Data Section 503) charting the performance and energy efficiency of all our standard motors. We conservatively estimate we have distributed over 40,000 copies since we began publishing the data. Other than efficiency data on Baldor motors and the two premium priced high efficiency lines now on the market, we believe it is difficult to obtain efficiency data on motors. In our opinion, the data that is available is in an understandable form.

(L) We do construe the legislation as applying only to new motors, as it is not feasible to improve the efficiency of most old motors by rewinding.

Question 5. (A) We manufacture industrial type electric motors in the range of 1/50 thru 250 HP.

(B) Our sale of industrial electric motors for the year 1977 will be approximately \$80,000,000.

(C) The price range of electric motors we manufacture is \$50 through \$5,000. The energy efficiency data for each motor is listed in our Data Section 503, copy enclosed.

Question 7. We are members of the National Electrical Manufacturers' Association and have regular participation in their Standards programs and meetings.

Question 15. The FEA Study of electric motors includes the best data we've found regarding the consumption of electric motor energy by various classes of industrial products. The Study indicates pumps, compressors and blowers consume the largest amount of the power.

Question 16. (A) We have voluntarily labeled our standard motors since 1976. A sample of our label is attached.

(B) NEMA has since established a Standard calling for the labeling of efficiency data on electric motors.

(C) The energy efficiency of the motor is noted on the permanent metal nameplate of the motor.

(D) At this point in time, we estimate 20-25 percent of the market is participating in the labeling program and we predict a much greater percentage will be before the end of 1977.

(E) The efforts of our Company, Westinghouse and Gould have greatly increased the end-users' awareness of motor efficiency and interest in motor efficiency.

Question 17. (A) Our Company began labeling of electric motors before the NEMA Standard was adopted. In our opinion, motors should be labeled with a numerical value that is readily understandable by any qualified person without having to refer to a code sheet. The NEMA program offers an option of using a code letter or a numerical value. Obviously, if the code letter is used, end-users of motors will need a code sheet to determine the efficiency of a motor.

(B) NEMA Standards call for efficiency tests to be conducted according to IEEE Publication #112A.

(C) The Energy Management Committee of NEMA is presently conducting a study to determine the variation in efficiency of motors of the same design off the same production line over a period of time.

Mr. DINGELL. Thank you very much, sir

The Chair would like to direct several questions, first with regard to NEMA standards. Gentlemen, can you inform me whether they are mandatory or whether they are permissive?

Mr. FALK. They are voluntary.

Mr. DINGELL. So if a manufacturer does not want to help he does not have to put them on, right?

Mr. FALK. Correct.

Mr. DINGELL. Which of your companies put these standards on the electrical equipment manufactured by your companies.

Mr. HANSON. We do.

Mr. DINGELL. You follow the standards. You do, Mr. Hanson?

Mr. HANSON. We provide both efficiency and power factor on the labels of our high efficient motors. There is a copy in our written testimony of that label.

Mr. DINGELL. On the whole of your line?

Mr. HANSON. On our energy efficient motors.

Mr. DINGELL. What about your other motors?

Mr. HANSON. We provide the end user with a total documentation performance of the motor. Not just the labeling but in fact efficiencies and power factors over a wide range of load characteristics and other performance characteristics that meet a specific need and specifications.

Mr. DINGELL. Why not label them?

Mr. HANSON. Because typically in the case of specials we are trying to address ourselves to a whole series of operating characteristics and specifications. We have not gone to the effort of changing the labeling as yet. I would suspect that within the next year we will have all that labeling changed.

Mr. DINGELL. You do label your high efficiency motors?

Mr. HANSON. Correct.

Mr. DINGELL. But you do not label your low efficiency motors?

Mr. HANSON. We do not label our special motors which are designed specifically for end use applications to a customer. When a customer comes in and asks for a specific motor to do a specific job.

Mr. DINGELL. Are those considered low efficiency motors?

Mr. HANSON. No, they are just special motors. Designed for specific applications.

Mr. HOULTON. General Electric has not instituted labeling yet and the reason we have not is we have to develop the data to make sure the labeling we put on the nameplates is accurate.

Mr. DINGELL. I think that makes good sense. How long will it take to do it and do you intend to do it or not?

Mr. HOULTON. I can't speak for the company as to how long it will take, so I can't answer the question.

Mr. DINGELL. Give us your best personal estimate and advise us what will be the policy of your company as to making this requirement for the labeling.

Mr. HOULTON. My best personal estimate is 6 months to complete the testing. In terms of the labeling policy of the company, I can't state that here but I can advise it subsequently.

Mr. DINGELL. Does the company have in place a policy that you will, on conclusion of the testing, place labeling upon motors?

Mr. HOULTON. The company has not stated a policy.

[The following information was supplied for the record:]

Starting in October of this year, the General Electric Company will mark the nameplates of all standard line, premium efficiency motors in accordance with the new NEMA standards on efficiency.

Within twelve months the Company will have completed its testing program and 100 percent of the motors to which the NEMA standards apply will be so labeled.

Mr. DINGELL. Have you started the testing?

Mr. HOULTON. Yes; we have. I might add, Mr. Chairman, if I may, that there was a NEMA meeting yesterday, in which our company was represented, to generate an industry testing program to make absolutely sure our testing methods and our approach to labeling would coincide across the industry to make sure it is unambiguous.

Mr. DINGELL. Do any of the others of our panel have labeling? I believe, Mr. Clarke, you made it clear you do have labeling. Do you follow the NEMA labeling plan?

Mr. CLARKE. Our process does agree with NEMA standards. We started labeling before the standards.

Mr. DINGELL. You specifically said in your statement—I read down here at page 2 you say:

In addition NEMA recently adopted a standard calling for the labeling of efficiency data on the nameplate of motors, and while our company objected to their choice of a code letter rather than an actual numerical value, we believe this action is positive evidence of NEMA's efforts.

Mr. CLARKE. That is correct.

Mr. DINGELL. So you do not follow the NEMA code, do you?

Mr. CLARKE. We stamp actual numerical value which we think is more useful by the average user rather than going to the code letter.

Mr. DINGELL. I happen to think you're right. I don't quarrel with you.

Mr. CLARKE. NEMA has provided in a standard now the opportunity to stamp a numerical value instead of a letter value if that is what the manufacturer wants to do. We think that is the right approach, to stamp a numerical value.

Mr. DINGELL. As I hear that, Mr. Falk is here for NEMA, can you tell us how long it will take you to achieve standards where you go to numerical value as opposed to letter value?

Mr. FALK. Standards that have been approved and published, which were included as an appendix to my statement, indicate the manufacturer has an option. He can put on the label a coded letter or he can put the actual number on the label. If I understand the testimony of the gentleman from Baldor and the gentlemen from Gould, those two have taken the option of putting the number on the label.

Mr. DINGELL. What does the letter tell me that the number does not?

Mr. FALK. The letter refers to a table which gives you a minimum efficiency within the code reference as well as a nominal efficiency and then gives you some explanatory data as to the significance of this. The number is the nominal efficiency.

Mr. DINGELL. You are indicating to me then that the approach may or may not comply with this. The members are not bound to comply on the labeling and nonmembers are not compelled to comply at all, are they?

Mr. FALK. There is no distinction between members and nonmembers. It is a voluntary standard. Anybody can see fit to comply or not.

Mr. DINGELL. Would you give us some appreciation of what the level of compliance happens to be within the industry?

Mr. FALK. I don't know.

Mr. DINGELL. Is it high?

Mr. FALK. I don't know.

[The following information was received for the record:]

"Excluding the new portion directed to efficiency, NEMA labeling standards define a minimum of 12 items of information to be included on the nameplate. All General Electric motors conform to these standards. Since this information is the basis on which customers make decisions, provision of the data is a necessary part of being in business."

Mr. DINGELL. Could you help us gather some information as to what the level of compliance is. Do you have a reporting system which brings back to you evidence of what the compliance happens to be?

Mr. FALK. No, we do not. If your question relates to what the level of compliance has been to NEMA standards, historically through the years my general reaction is that that level has been high.

Mr. DINGELL. You say your general reaction. What is that general reaction based on?

Mr. FALK. For one thing, in terms of the order that we get for NEMA standard publications. You may recall I indicated 75 different product groups in NEMA.

Mr. DINGELL. Wouldn't I be fair in being advised that the NEMA standard publications are popular but that does not have any application to what goes on in the nameplates or whether anybody complies with them.

Mr. FALK. I concur with that. That is why I have to give a generalized answer, but I think it is fair to say our members are spending good funds and the talents of their best people in developing these standards and I don't believe they are doing it as an academic exercise. The motor and generator industry has been writing standards even with regard to NEMA's predecessor back to 1908.

Mr. DINGELL. Do you have difficulty identifying the particular levels of success that might have been achieved?

Mr. FALK. We have not conducted any surveys. I could only say that as an executive in the industry when I speak to other people in the industry, not only our motor manufacturers, the NEMA motors and generator standards are often held up as one in which the industry has done an excellent job.

Mr. DINGELL. This places it in the realm of solid speculation, does it not?

Mr. FALK. We are in the realm of speculation until such time as it is necessary to obtain such data. We do not have such data now. I think the Chair would want us to obtain such data, and I think we can run a survey.

Mr. DINGELL. How long would a survey take?

Mr. FALK. At the present time we could run a survey of our membership which is about 30 companies. I would think we could get an answer back within 2 weeks of compliance—

Mr. DINGELL. Your membership is 30 out of approximately how many companies?

Mr. FALK. I have seen estimates of anywhere from 100 to 200 companies. I would say in our judgment the membership in NEMA in terms of productive representation is on the order of close to 90 percent of the industry.

Mr. DINGELL. Ninety percent of the production?

Mr. FALK. Yes.

Mr. DINGELL. I think a survey of this kind should be made available and we would much appreciate it. I am loathe to advise you to run out and spend NEMA's money to achieve any particular result, but I am curious who is doing what and we don't appear to have gathered much solid information on this last point.

I am not out to put something down the industry's throats that they can't live with, or that is intolerable or does not benefit the consumer, but I would like to know what is going on and I am not sure anybody here has full appreciation.

I believe, Mr. Hanson, you have indicated your company does contemplate going into labeling. Am I right?

Mr. HANSON. We label high efficiency standard motors now with both efficient and power factors and will, as we design nameplates, have similar information on all of our products.

Mr. DINGELL. Could you make available to us some copies of those so we could have a look at them together with perhaps some explanatory matters as to what this all means in connection with your labeling system?

Mr. HANSON. I think there is material in the written testimony including a label.

Mr. DINGELL. Dr. Weil, does your company do any labeling on yours?

Mr. WEIL. No, we do not, but we provide the user with complete information, technical information, on the efficiency levels of the equipment that he purchases. And this, in fact, has been alluded to by Mr. Sence. The books you see in front of him are provided to the user and they will contain information on the efficiency throughout the operating range of the equipment in question, pumps or compressors.

Mr. DINGELL. That information is provided when, prior to purchase or is it provided as part of an operating manual?

Mr. WEIL. Prior to purchase.

Mr. DINGELL. Gentleman, I guess my time has expired.

The Chair recognizes the gentleman from Ohio, Mr. Brown.

Mr. BROWN. Thank you, Mr. Chairman.

Mr. Falk, did NEMA standards for labeling and test procedure programs develop before or after the Arthur D. Little study that was done for FEA?

Mr. FALK. They achieved official recognition with NEMA after the study was published. The study came out a little more than a year ago. The official approval within NEMA which goes through many channels came in March of this year, but the work effort involved started before the study was completed.

Mr. BROWN. In other words, you thought of it before FEA?

Mr. FALK. Back about 1974 or 1975 is when the efforts started.

Mr. BROWN. After the oil embargo?

Mr. FALK. Yes.

Mr. BROWN. I would like to ask all panelists to what extent are your products custom built to specification and to what extent are they shelf items? You talked about high efficiency motors, Mr. Hanson, and then you were talking about special motors. I gather what you are talking about is custom orders in terms of special motors and high efficiency motors are shelf items; is that correct?

Mr. HANSON. That is correct. What I am referring to is a high-efficiency motor as a shelf item.

Mr. BROWN. Shelf items have standard labeling in your company?

Mr. HANSON. Correct.

Mr. BROWN. And items which are built at custom request have more elaborate explanations of what standards they meet because that is what the customer wanted?

Mr. HANSON. The actual label on the product has a fairly standard format, but in fact before providing the product to the customer we provide a sample motor along with a wide variety of test data demonstrating its efficiency and its power factor over a wide range of operating conditions so that the user can evaluate its performance in conjunction with his specific application.

Mr. BROWN. I guess I would like for you all to submit this for the record; that is, the question of how many of your products are custom built and how many are to buyer specification and how many are built for shelf use, but my question really is when you have a customer who wants you to build something to specification and FEA does not have a standard for it, when we get this program into effect, what are you going to do?

[The following response was received from the General Electric Co.:]

"Approximately 40 percent of the 1 to 125 horsepower units produced have some form of electrical modification to meet the special requirements of a customer application.

"On the nature of any mandatory standards that are developed, these standards may constitute a constraint that make it impossible to meet the customer requirements. Most of these motors are used in applications where the potential for energy saving through increased motor efficiency is subservient to some other motor characteristic. Some examples are:

Intermittent drives not operating a high percentage of the time.

Adjustable speed drives where energy savings are available through the overall drive or process system that exceed those available from premium efficiency motors.

Cyclic drives where the requisite torque characteristics militate against the design changes required for premium efficiency.

"Any mandatory standards on motor efficiency must either be low enough to permit manufacture of such motors or carefully define and exclude such applications from the standards."

Mr. HANSON. We are probably going to try and sell him a standard product unless we can build him a special product that does not require any special tooling or investment on our part.

Mr. BROWN. Or call FEA to get permission to build it?

Mr. HANSON. If such a thing is necessary.

Mr. DINGELL. Will the gentleman from Ohio yield?

Where is your requirement that they have to get special permission?

Mr. BROWN. The predicate I gave was FEA has not gotten around to accepting a standard for a custom motor that is made on order for the customer. What is the manufacturer going to do?

Mr. DINGELL. First of all, the Chair would like to remind my good friend we don't have a requirement in here there be a standard for every motor or that anybody that is going to build a custom motor gets special permission from FEA to put the thing together.

Mr. BROWN. Mr. Chairman, we are not going to let these people operate their own business without the Federal Government telling them what is good for them; are we? We just start with some of the standards but we want to get into every motor they build eventually, otherwise how will we get all this employment going?

Mr. DINGELL. I think the gentleman speaks for himself. I must observe when my position is interpreted for me by the gentleman from Ohio I have difficulty recognizing it.

Mr. BROWN. Mr. Chairman, let's see what develops over the next few years.

I would like to ask what is your individual assessment, also for the record, of the costs of this program in terms of your individual companies. Could you give me some idea of what the cost will be for your companies? I really want to relate this to the fact that—I suppose that Gould will survive. They are doing a billion two, and they might be able to make it—but I am concerned about the 160 people who do not belong to the NEMA who do 10 percent of the business and I assume are somewhat smaller than your general membership. The 30; what will be their prospects?

Mr. HANSON. Mr. Brown, we have estimated that should retooling be required to meet efficiency standards, just the 1- to 25-horsepower range could run anywhere from half a million to a million dollars per company regardless of volume of product sold.

Mr. BROWN. Which may be part of the reason a lot of the smaller companies have not gone to standards and testing procedures because that is a substantial investment for a small company, is it not?

Mr. FALK. Yes; it is. I think the difficulty I have in responding to your question is you are not telling me what the standards will contain and what levels and what regulations—

Mr. BROWN. We don't know. The Administrator is going to make that decision. We don't care here because we passed this off to the Administrator and let some bureaucrat make the decision. That is the way we do business. We do this in most industries. We passed the Clean Air Act and then we left the Administrator out in the cold. We passed the principle, they work out the details.

Mr. FALK. I concur, sir.

Mr. BROWN. Could you estimate for me based on your experience with other Federal agencies?

Mr. FALK. I can only tell you with regard to OSHA, with regard to consumer products safety agency, with regard to the DPA. I cannot give you precise numbers and how much of it may be based on emotion and how much of it may be based on actual figures. I can tell you as I judge the business community within our association and their concerns about inflation and about competitiveness, and about effective regulation by Government, it is a great disappointment and they register continuing complaints about the cost of Government regulation.

Mr. BROWN. Let me ask you with what agencies is the industry currently working and to what extent? I am talking about these regulations, not the other things I mentioned. The reason I asked the question is I am curious as to whether there are presently Federal bureaucrats, employees with the expertise in this area or whatever to train them or hire them away from the industry or establish a program for having them understand the details of the industry, or worse yet, whether the program will be launched without sufficient knowledge of the technology and the administration by people who do not understand the industry?

Mr. FALK. The motor and generator sections of NEMA on the subject matter, with I believe the Federal Energy Administration, which will now be part of the Department of Energy, and to some degree the Department of Commerce.

Mr. BROWN. I asked about the position of the electric motor and the pump industry with respect to such industries in other nations

and what is our share of the world market? In other words, the impact of the additional cost. To what extent will we be, by this program, doing to this industry what has happened to the steel industry in becoming noncompetitive in world markets?

Mr. FALK. Let me preface my remarks by telling you another hat that I wear is that of being the chairman of the industry sector advisory committee on electrical goods to the special trade representative, Mr. Strauss. And one of the great concerns that we are running into that are taking place in the negotiating rooms in Geneva right now are the objections of the other nations to all these regulations that the United States is developing within this country and so there are certain tradeoffs that we have to give back and we are very much concerned about the tradeoffs that industry such as this industry will be going under in order to obtain for compliance with our own standards.

Now, I don't have the exact data. I will tell you the motor and generator industry represents a plus in terms of exports versus imports. Our exports do exceed our imports. But that trend line is narrowing.

Mr. BROWN. Could you give me a percentage?

Mr. FALK. I don't have it offhand, sir.

Mr. BROWN. In other words, the impact of this would be that you could not sell the product in this country so we might limit ourselves to this Nation keeping out foreigners who don't want to sell in this country, but they would sell to other nations.

Mr. FALK. Yes; but a negative impact in terms of our ability to export would be the fact that if the mainline in this country requires certain additional cost to be incurred as a result of this legislation—let's say West Germany or Japan or England does not have such requirements, the U.S. manufacturer then has to either go to a second line or try to be competitive overseas while he is incurring these additional costs in this country.

Mr. DINGELL. The time of the gentleman has expired.

The Chair recognizes the gentleman from Indiana, Mr. Sharp.

Mr. SHARP. Thank you, Mr. Chairman.

I want to ask Mr. Falk about the NEMA standards that have recently been established. Can you tell me—and maybe you did mention it in your testimony, I don't recall—how many different standards you actually have established so far and roughly what percent of all of the motors sold would you guess they cover?

Mr. FALK. That book you have before you is one of the NEMA standards publications on motors and generators. These cover the standards established by the Association for Motors and Generators. I believe a second part of your question; namely, in terms of coverage and adoption is something that I cannot readily answer. We will have an answer for you within 2 weeks.

Mr. SHARP. I am asking in terms of not how many are using that standard, but in terms really of how many different kinds of motors on the market, what percentage of them might have had a standard developed already by you?

Mr. FALK. I would say a very, very high percentage of the motors on the market today are covered by NEMA standards. There are obviously a lot of special purpose types that will come up, custom made, but certainly fractional horsepower motors. It has to be in the high nineties in terms of percentage.

Mr. SHARP. Can you tell me whether you think these standards are going to have to be revised in the near future as more technical information comes in or is it your impression that you have something that can survive for 5 or 10 or 15 years?

Mr. FALK. The motor and generator industry annually submits to American National Standards Institute a series of revisions to their standards. These are very much living documents subject to change, and as technology and the marketplace change accordingly. Our association has a policy of forcing a review of existing standards every few years.

Mr. SHARP. The reason I asked is if FEA were to get into this same business, if they are really to keep up with the marketplace they could not just go through round one of these kinds of standards. They would have to be continually in the business of trying to update that set of regulations. Is that correct?

Mr. FALK. I concur heartily with you. I think one of the areas that is often overlooked by many of us is that you grant initial authority to an agency, they do it once and then walk away from it. I refer you specifically to the experience of OSHA who, upon establishment of the law, took national consensus standards generally generated by American National Standards Institute and because of the 6(b) requirements, section 6(b) of that law, the effort and expense involved in trying to revise its standards has resulted in a situation where the OSHA requirements have become rather static.

For example, in our industry there have been two major revisions to the national electric code since the 1971 code which was adopted and established by OSHA as its requirement. OSHA cannot find the means within the law apparently to go through the laborious amendment procedure so we have a rather ridiculous situation of a certain city that might have a 1978 electrical code but a plant in that city that is covered by OSHA sitting with a 1971 electrical code.

To make a long answer to a short specific question, the amendment process I think in our experience has been laborious and sometimes totally ineffective, at least from the Government end.

Mr. SHARP. The reason I asked is from a management point of view, from the Government's point of view this is not anything that is—it is not just a problem of initially how do we cover all of these kinds of categories and classifications, but the minute we get done with having done that we should be—if we are going to try to be rational about it—be back in the business immediately trying to revise.

I would assume industrial people would have to be at that point coming and saying we need you to revise the standard or if it is a minimum standard I guess it might not be the compelling need.

Mr. FALK. I agree with your observation, sir.

Mr. SHARP. Let me ask you this. I believe you mentioned in your testimony, obviously not only the companies that are manufacturing are concerned with your standard, but I presume that large purchasers of motors might well look to your standards and ask a given manufacturer whether or not they meet those standards. Is that happening, likely to happen, or do you make an effort to have that happen?

Mr. FALK. The only effort we make is to bring the standards to the attention of all interested parties. What judgments they make in terms of applicability and usage is left, we believe, and should be left to the marketplace.

Mr. HANSON. I can tell you as a manufacturer, in most cases if we don't meet the NEMA standards we in fact cannot deal with any of the major customers in the marketplace. It is a prerequisite for doing business in general.

Mr. SHARP. That is what I wanted to know. In other words, major manufacturers or purchasers are not ignorant of this process. They are very much aware of it and are putting demands on you.

Mr. HANSON. Yes.

Mr. SENCE. Speaking for the pump industry, the Hydraulic Institute has been in the business of publishing standards on a regular updated basis. We are in our 14th edition recognizing newer international standards which are coming into play through ISO and this is something we cannot ignore, that the world is setting standards through the ISO and are moving rapidly.

Myself and many of our associates are heavily involved in ISO standards written at world levels. This is what is going to be required in the world for the United States to effectively export. We must meet world standards. We cannot set local individual national programs and then go to the world bargaining table and develop new international standards without those being essentially the same. Addressing one other thought, the Hydraulic Institute manufacturers, to sell effectively in the marketplace in the field of effective standards, which is particularly important to us today, we must meet Hydraulic Institute's test procedures.

One other test standard has been written by the American Society of Mechanical Engineers, but the preponderance of production in the United States meets Hydraulic Institute test standards. Therefore, well in advance or at the buying decision technical information is provided to the buyer in accordance with Hydraulic Institute test procedures so he gets a broad array of test data prior to making a buying decision. Efficiency is included in that test data.

To put a label on a pump showing its complete efficiency capability would be such a big nameplate it would be larger than the pump, so therefore we must publish it in technical data and essentially all buying decisions utilize that test data and their buying or purchasing agents use it in their buying decisions.

Mr. DINGELL. Do all manufacturers publish technical data with pumps and electric motors so that a buyer can have this information to him at the time of purchase?

Mr. SENCE. In the field of pumps, as an example, this is one document from which you can select specialized as well as off-the-shelf equipment. Essentially, major pump manufacturers publish performance data including efficiency in a published way and on special equipment that test data or expected performance is provided at the time of buying decisions from supplier A, B, and C, and they would supply technical data and based on that the engineering departments and purchasing agents would utilize that in their buying decisions. It would be totally impractical to buy a large pump without having that information available well before you would ever purchase the equipment.

Mr. DINGELL. Is that same situation applicable also with regard to the electric motor industry, all manufacturers do publish information on the efficiency of their products and all products?

Mr. HANSON. I know it is true of all large manufacturers. I would not be in a position to say it was true of the hundred to two hundred total manufacturers that we talked about earlier, but it certainly is true of all the major manufacturers.

Mr. WEIL. Mr. Chairman, I would like to add something to this. There has been little discussion of compressors but the same thing holds absolutely true of compressors, not only of pumps. On compressors we provide advance information to the prospective customer on the entire range of efficiencies involved in specially designed large units. The customer's selection is almost always governed by the efficiency submitted by the vendor. On top of that, when you install the equipment, you will be held responsible for the performance; that is, the efficiency that you have guaranteed to the purchaser.

Mr. DINGELL. Thank you very much.

The Chair recognizes the gentleman from Louisiana, Mr. Moore.

Mr. MOORE. Thank you, Mr. Chairman.

Gentlemen, I have a basic question about the needs for Government imposition of standards. I would like to ask, do you see a demand in the marketplace that you can measure of people desiring more energy efficient pumps and motors that you manufacture?

Mr. HOULTON. Responding for General Electric, on the large motors above the 125 horsepower rating there has always been this demand. These are large capital purchases and the engineers always discuss it. On the 1 to 125 horsepower there has not been this demand for increased efficiency. There has been a lot of effort in the recent past by FEA and by the companies to cultivate this appetite and yes, we are beginning to see major interests in efficiency data and the proper product applications to increase efficiency.

Mr. MOORE. You said a moment ago in the 1 to 125 you had not seen any. This is what year, what time in history can you say you start seeing now an interest in energy efficient motors and pumps?

Mr. HOULTON. Beginning in 1974 and increasing since then.

Mr. MOORE. Do any of the other gentlemen care to comment?

Mr. SENCE. Speaking on behalf of pumps we are seeing considerably more interest in efficiency in all sizes of pumps, particularly in the process industry in the municipal work and in many other industries. However, this is not necessarily new. Looking back as long as 50 years ago in 1927—included in my written or detailed statement is a document printed by our company in August 1927, outlining the importance of efficiency in the method of capitalizing bids for the entire life of the product. So this business of utilizing efficiency in pump selection has been with us for over 50 years. Therefore, this kind of technical data has essentially been available to the users for over 50 years, but there is an increased use of this information in selected equipment in the industrial field today.

Mr. MOORE. Would any of the other gentlemen disagree with these statements?

Mr. WEIL. I don't think any of us would tend to disagree with that, but I would like to add to Mr. Sence's comments that with the increasing cost of energy every manufacturer is striving to maximize the efficiency of the equipment and, therefore, minimize its energy consumption.

Mr. MOORE. Now, do any of you have any studies—FEA has said they do not and I don't think anybody testified on these hearings yet who said they do—but do any of you have any studies that can measure quantitatively for us this increased demand in the marketplace for more energy efficient equipment?

Mr. HANSON. I think the best measure we would have is the continued increases not just in inquiries, but in contracted arrangements for motor procurement that specifies energy efficiency and power factors, specific motor lines resulting from intensive informational sessions, seminars and actual technical presentations with major users particularly in process industries where the heavy use of electrical power exists.

Mr. MOORE. This goes to your general history of operations in the business, that you are seeing more interest in this area.

Mr. HANSON. Yes; over the last two to 2½ years.

Mr. MOORE. Let me ask you this question. I would like to ask if you have any studies or could you give me an opinion based on what you know from the business, would Government mandated standards necessarily cause us to save any more energy than we are going to do in the long run by supply and demand in the marketplace looking for efficient equipment?

Mr. HANSON. It is my personal opinion that mandated standards would slow the process down rather than accelerate it. I believe that some form of incentive, such as a tax incentive, could provide that kind of acceleration; but the problem is technologically so complex that I think we would in fact result in stagnation while we waited for standards to be set in terms of the investment of new capabilities and improved technology.

Furthermore, having been involved with the early implementation of the original safety and health legislation as a member of the Department of Labor in 1971, I feel that the kinds of standards that are required here are technologically as complex, if not more complex, than those associated with that legislation. And I think to go into the kind of job that could be interpreted by this legislation would take a comparable level of cost and have a comparable impact on industry in my opinion as OSHA had.

Mr. MOORE. Do any other gentlemen care to comment on that? I sort of like that answer.

Mr. CLARKE. Just yesterday I was in a major rubber company plant and they have about 222 30-horsepower motors operating. They are in the process of studying competitive motors for efficiency. They developed the test material to do this. They are over a period of time replacing the older motors even though they are satisfactory as far as doing the job. In this case the power cost is about 2 cents per kilowatt hour. When you compare that with 13 and 14 cents power in New York, I think economic factors are going to lead to this change.

Mr. MOORE. In the case you just described if the people that are talking about trading in these good motors for more efficient ones for the long haul suddenly heard that Congress in its wisdom and FEA in its more infinite wisdom were about to come out in the future

with new standards required in these engines, would you think that would cause them to trade out the engines they have now or wait until they got information from the Government as to what kind of engines they should have?

Mr. CLARKE. In my opinion, because there is no definition of a high efficiency motor, I would think they would want to wait.

Mr. MOORE. Which bears out the statement made, you are slowing down progress in the interim.

Mr. CLARKE. Yes; and this company is only one of many that are getting into this type of evaluation.

Mr. MOORE. Does anybody else have a comment?

Mr. SENCE. We are seeing horsepower evaluations by major users in the range of \$1,500 per horsepower on an evaluated basis. My colleague from Ingersoll-Rand is looking at \$1,000 per horsepower. It is not unlikely that in some countries—as an example, one particular country that I know of is basing their energy costs on \$28 a barrel for crude—so there they are projecting energy costs considerably higher than the \$1,500. As a result this is the impact or press to buy and improve equipment simply on the free enterprise system of saying that if it is going to cost me more money to operate it, I will buy a more highly efficient pump or highly efficient rotating equipment because I can pay for it in energy savings. The mechanics are in place. They have been in place for 50 years. They are impacting strongly in this field.

Mr. MOORE. Do you think Congress needs to at this point amend the law of supply and demand?

Mr. SENCE. Absolutely not.

Mr. DINGELL. The Chair thanks the gentleman.

The gentleman from Texas, Mr. Gammage.

Mr. GAMMAGE. No questions.

Mr. DINGELL. Gentlemen, you have been here quite a while. You have given us most helpful testimony. We thank you for your testimony, your cooperation and your patience. Thank you, gentlemen.

[The following letter was received for the record:]

GENERAL ELECTRIC,
MOTORS AND DRIVES BUSINESS DIVISION,
Bridgeport, Conn., October 11, 1977.

Mr. W. F. McMANUS,
Washington, D. C.

As a consequence of the 9/29/77 House Subcommittee hearing on H.R. 8985 and S. 2057, we believe we are to respond to a number of questions with answers due this week. Not knowing the proper routine for submitting this data, we are sending it to you in hopes you can help.

The questions, together with specific answers and relevant comments, are as follows:

SOURCE OF DATA

In the interests of accumulating information in minimum time, the following answers cover practices in that portion of our Company that manufactures the vast majority of the 1 to 125 HP, AC motors for industrial use. It does not seek to cover the all industrial motors manufactured by our Company.

Question No. 1. Since NEMA Standards are voluntary rather than mandatory, what assurance do we have that manufacturers will ever adopt the NEMA labeling approach on efficiency? What portion of your products currently use the NEMA labeling system?

Answer. Excluding the new portion directed to efficiency, NEMA labeling standards define a minimum of 12 items of information to be included on the nameplate. *All of our motors conform to these standards.* Since this information is the basis on which customers make decisions, provision of this data is a necessary part of being in business.

Question No. 2. To what degree do you provide efficiency data for customers?

Answer. This data is available in published information on all standard motor designs. It is available for special motor designs on request.

Question No. 3. To what degree do you now include efficiency on the motor nameplate?

Answer. The following answers must be considered in the context that the NEMA standards on efficiency are new and contain an inherent guarantee of efficiency. Hence their adoption must be preceded by a careful testing program.

(a) Starting this month, 100 percent of our new line of motors designed for premium efficiency will include standard efficiency data on the nameplate in accordance with the new NEMA standards.

(b) None of our motors will include efficiency labeling systems that deviate from the NEMA standards.

Question No. 4. What are your future plans for use of the new NEMA standards on labeling motor efficiency?

Answer. *Within 12 months* our Company will have completed its testing programs and *100 percent of the motors* to which these standards apply *will be so labeled.*

Question No. 5. What portion of your production is specially designed to customer requirements where a mandatory efficiency standard may constitute a constraint from meeting these requirements.

Answer. Approximately 42 percent of the units produced have *some form of electrical modification* to meet the special requirements of a customer application. Depending on the nature of any mandatory standards that are developed, these standards may constitute a constraint that make it impossible to meet the customer requirements. Most of these motors are used in applications where the potential for energy saving through increased motor efficiency is subservient to some other motor characteristic. Some examples are:

Intermittent drives not operating a high percentage of the time.

Adjustable speed drives where energy savings are available through the overall drive or process system that exceed those available from premium efficiency motors.

Cyclic drives where the requisite torque characteristics militate against the design changes required for premium efficiency.

Any mandatory standards on motor efficiency must either *be low enough* to permit manufacture of such motors *or carefully define and exclude* such applications from the standards.

Question No. 6. To what extent would U.S. mandatory standards on motor efficiency inhibit your capability to serve export markets?

Answer. Since the majority of these motors are sold to OEM's, we do not know the ultimate destination of them. We estimate that 3 to 5 percent of this type of motors are for export use. Hence this is the portion which may be affected by specially developed U.S. standards.

R. L. HOULTON.

Mr. DINGELL. Our next panel is a panel on industrial reporting programs. Mr. Elias Gyftopoulos, professor of engineering, Massachusetts Institute of Technology; Mr. Hoyt Clark, corporate energy director, Monsanto Co., on behalf of Manufacturing Chemists Association; Mr. Allen Sheldon, vice president, Environment and Energy Resources Company of America on behalf of Aluminum Association, Inc.

Gentlemen, we are very delighted to have you with us. Would you come forward.

Gentlemen, commencing on your left, if you please, would you each identify yourself for purposes of the record to help our reporter.

Mr. GYFTOPOULOS. Elias Gyftopoulos, professor of engineering at Massachusetts Institute of Technology.

Mr. CLARK. Hoyt Clark, with Monsanto Co., corporate energy director.

Mr. SEITZ. Raymond J. Seitz, director, energy conservation, Pfizer.

Mr. SHELDON. Allen Sheldon, vice president, Environment and Energy Resources, Aluminum Co. of America.

Mr. DINGELL. Gentlemen, we will recognize first Dr. Gyftopoulos.

**STATEMENT OF ELIAS P. GYFTOPOULOS, FORD PROFESSOR OF
ENGINEERING, MASSACHUSETTS INSTITUTE OF TECHNOLOGY**

Mr. GYFTOPOULOS. Thank you, Mr. Chairman. I am a professor of engineering at MIT, which is my primary affiliation but, in addition, I have other responsibilities. I am director of Thermo Electron Corp., a company in Waltham, Mass., and president of the National Energy Council of the Nation of Greece.

Mr. Chairman, in my written testimony which I have submitted for the record, I have discussed the changes in replacement costs of energy and capital equipment that make investments in energy efficiency profitable, the potential savings over the next decade and methods of measuring efficiency.

Here I will concentrate on the methods of measuring efficiency because I believe that use of wrong methods may create false impressions and may decelerate the achievement of cost-effective investments in energy efficiency.

The Federal Energy Administration evaluates efficiency by means of energy per ton of product. This yardstick has an obvious simplicity and universality in that it applies to all manufacturing without consideration of process details. It has, however, serious disadvantages:

1. The data collected by FEA are averages over all manufacturers of the same standard two-digit classification. As such, they do not reveal whether progress is being made by all reporting plants that participate in the FEA program. It is well known that some enlightened companies are pursuing excellent energy conservation programs, and perhaps they are masking the inefficiencies of many poor performers.

2. Substantial differences in manufacturing processes exist. Even if the FEA data were disaggregated, it is practically impossible to make comparisons of effectiveness of fuel utilization either of a plant with another of the same type or between plants of dissimilar products.

For example, the energy per ton of tissue paper from an integrated paper mill is different from that of a nonintegrated mill. It is also different from the energy per ton of kraft paper and from the energy per ton of steel ingots. So we cannot really say whether energy is used efficiently in any of these plants.

3. Targets for improvement are arbitrary and lack objectivity because they are based on a particular year in the past. Energy per ton of product varies from year to year because of variations in production versus available capacity and because of variations in stockpiles.

Neither of these factors are directly related to cost-effective technology for improvement of efficiency, technology which is the key to reducing energy consumption without affecting our economy and well-being.

4. For certain industries the goal of reducing energy per ton of product may be counterproductive. For example, a new product may require more energy per ton but may replace and last longer than others that are more energy wasteful. Are we to qualify the manufacturer of this new product inefficient if, in fact, he is using the most efficient technology available?

5. Finally, no incentives and disincentives for energy can be established and monitored by using the FEA approach because the responsibility for energy savings is collective for each industry classification and Congress cannot give incentives to trade associations.

Another yardstick that is often used by engineers is the ratio of energy out of a process or machinery over the energy into that process or machinery. This is the so-called first-law efficiency. In some applications, such as generation of electricity from raw fuel, this efficiency is a sufficiently accurate description of how effectively energy is used and of the ultimate margin for improvement.

In most applications, however, the first-law efficiency is grossly misleading because it is neither accurate nor indicative of the opportunity to save energy. We can illustrate this point by considering two examples.

The first is an idealized boiler for low-temperature steam in which all of the input energy goes into the water to make steam. If such a boiler were practical, its first-law efficiency would be 100 percent and we might be tempted to conclude that it cannot be improved. But to raise low-temperature steam, we can use low-temperature waste heat rather than raw fuel and thus save a lot of fuel. This profitable change in input energy is intuitively understandable and yet not apparent from the first-law efficiency result.

The second example is to use the same idealized boiler in combination with a turbogenerator and produce both electricity and low-temperature steam—that is, in a cogeneration process. Here the output energy is that of the electricity and the steam. If we divide it by the energy of the fuel input, we will find a result less than 100 percent and we might be tempted to conclude that cogeneration reduces the efficiency. But many people know that cogeneration saves energy.

Finally, if we were to evaluate the first-law energy efficiency of industry as a whole, we would find it to be about three-quarters, the number reported in the national energy plan. This result is grossly misleading. If we were to make correct use of the rules of thermodynamics, the average energy efficiency of manufacturing is a mere 13 percent, about the same as that of any other sector of the economy.

The 13-percent result for manufacturing processes is, of course, based on the so-called second-law efficiency. Experts know this is an objective measure of efficiency that can be used in all processes and that reveals the true causes of inefficiency. It allows the setting of realistic goals, comparisons between different processes and evaluations of cost-effectiveness.

This yardstick has shortcomings as well, especially when applied to complete processes such as the transformation of wood into paper, but its advantages far outweigh its shortcomings.

As with other general methods, the shortcomings of the second-law efficiency can be eliminated by restricting its application initially to

specific processes, such as steam raising, and then extending it further as experience accumulates. This restriction is somewhat analogous to using miles per gallon to measure progress in energy efficiency of private automobiles and not in the entire transportation sector.

If FEA were to develop a procedure for collecting second-law efficiency data from individual manufacturing plants, I believe that many benefits would accrue: (1) Many plant managers would realize that the energy efficiency of manufacturing processes is very low—for example, that the efficiency of low-pressure process steam boilers is more like 20 percent rather than 80 percent, as claimed; (2) process designers would recognize more vividly that substantial energy savings can be achieved not only by the obvious improvements in process equipment itself but by the combination of processes, such as by cogeneration; and (3) corporate managements would appreciate that cost-effective energy savings could be larger and could be achieved faster than heretofore believed.

For these reasons, I would enthusiastically recommend that FEA be instructed to develop procedures for collecting second-law efficiency data as described in title IV, part A, of S. 2057, which passed the Senate on September 13, 1977. Thank you, Mr. Chairman.

[Mr. Gyftopoulos' prepared statement follows:]

STATEMENT OF ELIAS P. GYFTOPOULOS, FORD PROFESSOR OF ENGINEERING,
MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.

I am especially happy to have the opportunity to testify before the Subcommittee on Energy and Power of the House of Representatives on industrial energy conservation measures (H.P. 8985). Energy savings through increased end-use energy efficiency in manufacturing can make an important contribution to the energy problem and the economic well being of the nation. My testimony includes comments on the factors that make conservation possible, the magnitude of the energy and dollar savings over the next decade, and a yardstick for measuring progress in more efficient use of industrial energy.

Though opportunities exist for reducing energy demand by avoiding unnecessary and thoughtless energy waste, my remarks relate only to the special type of energy conservation that results from the use of more efficient processes in manufacturing. I believe that this type of conservation has the largest potential for reducing both energy and capital demands without changes in lifestyles, without decreases in production, and without curtailment of our economic growth.

ECONOMIC FACTORS

Perusing the statistical abstracts of the Bureau of Census, we observe an important disparity that has developed over the past several years between fuel and capital equipment costs. In terms of constant dollars, replacement costs of industrial energy have almost doubled (see figure 1), whereas replacement costs of capital equipment and labor have remained almost constant. The rapid increase in replacement costs of energy are primarily due to the fact that all new sources of hydrocarbons, such as Alaskan oil, deep domestic and offshore oil wells, and gasified and liquified coal require much more capital per unit of energy capacity than the sources we developed in the past and are rapidly exhausting.

Most estimates for the foreseeable future indicate that the disparity between the relative costs of energy and of capital equipment will continue and, in all likelihood, will become larger as hydrocarbons become scarcer. As a result, we see that an economic opportunity exists for replacing energy by capital equipment so as to increase the energy productivity of manufacturing processes, namely to increase the end-use energy efficiency in manufacturing.

TECHNICAL FACTORS

It is important to recognize that U.S. industry consumes about 40 percent of the nation's energy, more than any other sector of the economy, but operates at an average thermodynamic or second-law efficiency of only 13 percent, whereas, on the same basis, the electrical utility industry converts fuel to electricity at an efficiency of about 32 percent. This fact is not widely appreciated even by engineers themselves because of incomplete use of thermodynamic principles for the calculation of process efficiency. As pointed out in many recent publications, including one commissioned by the American Physical Society, when the rules of thermodynamics are used correctly, energy efficiency in manufacturing is not much better than that of any other sector of the economy.

The low value of energy efficiency in manufacturing represents great technical opportunities for substantial fuel savings. In the long term, such opportunities would require development of entirely new processes.

In the short term, many analyses, including my own, have shown that the amount of fuel that can be saved in manufacturing is larger than that of all the other sectors of the economy combined. By 1985, the saving could be equivalent to 4.5 million barrels of oil per day, an amount approaching that consumed by all automobiles today. This saving can be achieved by investments in well known and well proven technology to improve efficiency. The investments, however, are about \$50 billion less than those required to develop equivalent new fuel supplies such as Alaskan oil and natural gas, nuclear reactors, and off-shore petroleum. Energy savings through increased efficiency in manufacturing is a kind of "domestic energy source" that enhances our economy, creates more jobs, decreases our dependence on foreign and unreliable energy suppliers, and reduces environmental pollution.

About two-thirds of the energy savings in manufacturing can be achieved by either recycling waste energy, or putting waste energy to good use, or both. These two energy-saving methods could reduce our energy needs by the equivalent of 3 million barrels of oil per day without affecting our lifestyles, an amount twice as large as that we will get from Alaska, and much larger than that expected from the automobile efficiency standards.

A specific example of waste energy recycling is the capturing of hot gases from a high temperature furnace to preheat the air used on the stock processed in the furnace.

Specific examples of waste energy utilization are either the capturing of waste energy from an electricity generating unit to produce steam for an industrial process, or the capturing of waste heat from a cement kiln to generate electricity. These two examples are technically referred to as processes of cogeneration, the concurrent generation of electricity and steam or heat.

Cogeneration is a method of saving energy that can be used in many large manufacturing installations because all such installations require both electricity and steam or heat for their products.

By 1985, about 400 billion kilowatt-hours of electricity could be cogenerated in manufacturing plants. This electricity consumes half as much fuel as the electricity generated in central power stations, and costs about 33 percent less.

Despite these benefits and many warnings of energy difficulties ahead, and though it clearly serves the best interests of industry and the nation, industry is not saving fuel at a rate as fast as the circumstances require. For example, though it is economical and energy-efficient to cogenerate electricity and process steam in many industrial plants, the method has not been widely adopted.

Several factors contribute to the sluggishness of industry to become more energy efficient. For example, historically, manufacturers were not in the energy business and are uncertain whether they should enter it now. Again, as President Carter said, "The price industry pays for much of the energy it consumes is not the marginal cost of energy, but rather a "rolled in" average cost . . ." (see Figure 1).

The Federal Energy Administration is monitoring a voluntary program of energy conservation in industry. I believe, however, that the program is deficient, especially because of the method used to evaluate progress.

METHODS OF EVALUATION OF ENERGY EFFICIENCY

The Federal Energy Administration evaluates efficiency by means of energy per ton of product. This yardstick has an obvious simplicity and universality in that it bypasses all details of manufacturing processes. It has, however, many shortcomings that make it impractical for national policy. Some of the shortcomings are as follows.

The data collected by FEA are averages over all manufacturers of the same standard two-digit classification. As such, they cannot be used to judge whether progress is being made by all reporting plants that participate in the program. It is well known that some enlightened companies are pursuing excellent energy conservation programs, and perhaps they are masking the inefficiencies of poor performers.

Substantial differences in manufacturing processes exist. Even if the FEA data were disaggregated, it is practically impossible to make comparisons of effectiveness of fuel utilization either of a plant with another of the same type, or between plants of dissimilar products. For example, not only is the energy per ton of tissue paper different from plant to plant but it is also different from the energy per ton of Kraft paper and from the energy per ton of steel ingots.

Targets for improvement are arbitrary and lack objectivity because they are based on a particular year in the past. Energy per ton of product varies from year to year because of variations in production versus available capacity and because of variations in stockpiles. Neither of these factors are directly related to cost-effective technology for improvement of efficiency.

For certain industries, the goal of reducing energy per ton of product may be counterproductive. For example, new products may require more energy per ton but may replace and last longer than others that are more energy wasteful.

Finally, no incentives and disincentives for energy efficiency can be established and monitored because the responsibility for energy savings is collective for each industry classification.

Another yardstick that is often used by engineers is the ratio of energy out of a process or machinery over the energy into that process or machinery. This is the so-called first-law efficiency. In some applications such as generation of electricity from raw fuel, this efficiency is a sufficiently accurate description of how effectively energy is used, and of the ultimate margin for improvement.

In most applications, however, the first-law efficiency is grossly misleading because it is neither accurate nor indicative of the opportunity to save energy. We can illustrate this point by considering two examples. The first is an idealized boiler for low-temperature steam in which all the input energy goes into the water to make steam. If such a boiler were practical, its first-law efficiency would be 100 percent, and we might be tempted to conclude that it cannot be improved. But to raise low-temperature steam we can use low-temperature waste heat rather than raw fuel and thus save a lot of fuel. This profitable change in input energy is intuitively understandable and yet not apparent from the first-law efficiency result.

The second example is to use the same idealized boiler in combination with a turbo-generator and produce both electricity and low-temperature steam, i.e., in a cogeneration process. Here the output energy is that of the electricity and the steam. If we divide it by the energy of the fuel input we will find a result less than 100 percent and we might be tempted to conclude that cogeneration reduces the efficiency. But many people know that cogeneration saves energy!

Finally, if we were to evaluate the first-law energy efficiency of industry as a whole, we would find it to be about three quarters, the number reported in the National Energy Plan. This result is grossly misleading because as I already stated, the average energy efficiency of manufacturing is a mere 13 percent.

The 13 percent result for manufacturing processes is, of course, based on the so-called second-law efficiency. Experts know that this is an objective measure of efficiency that can be used in all processes, that gives an absolute value of the margin for improvement, and that reveals the true causes of inefficiency. This yardstick has shortcomings as well, especially when applied to complete processes such as the transformation of wood into paper, but its advantages far outweigh its shortcomings.

As with other general methods, the shortcomings of the second-law efficiency can be eliminated by restricting its application to specific processes, such as steam raising, and then extending it further as experience accumulates. This restriction is somewhat analogous to using miles per gallon to measure progress in energy efficiency of private automobiles and not in the entire transportation sector.

If FEA were to develop a procedure for collecting second-law efficiency data from individual manufacturing plants, I believe that many benefits would accrue: (1) many plant managers would realize that the energy efficiency of manufacturing processes is very low; for example, the efficiency of process steam boilers is more like 20 percent rather than 80 percent (as claimed); (2) process designers would recognize more vividly that substantial energy savings are achieved not only by the obvious improvements in process equipment itself but by the combination of processes, such as by cogeneration; and (3) corporate managements would appreciate that cost-effective energy savings could be larger and could be achieved faster than heretofore believed.

For these reasons, I would enthusiastically recommend that FEA be instructed to develop procedures for collecting second-law efficiency data as described in Title IV, Part A of S. 2057 which passed the Senate on September 13, 1977.

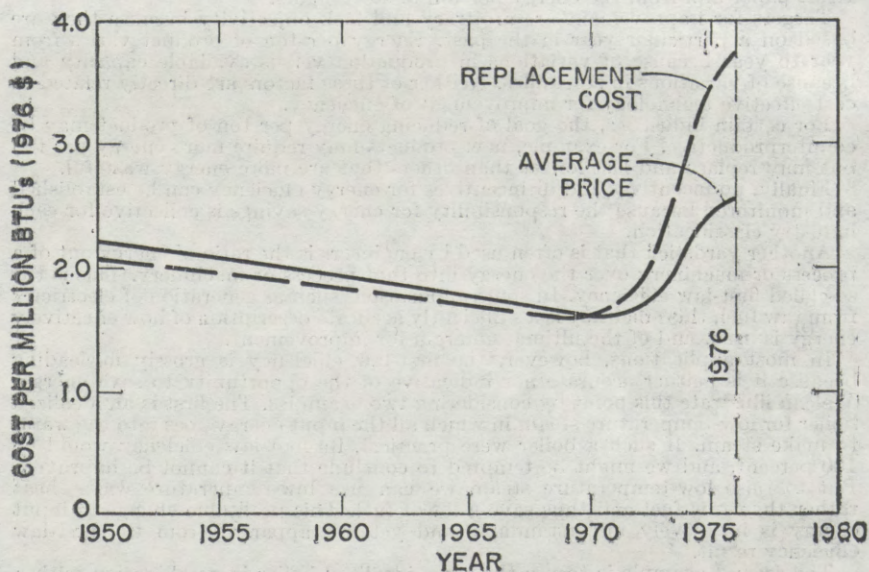


FIGURE 1.—Aggregate cost in constant dollars of industrial energy from 1950 to 1976 (weighted according to usage of coal, oil, gas and electricity in industry).

Mr. DINGELL. Thank you.

Our next witness is Dr. Clark.

STATEMENT OF HOYT C. CLARK, DIRECTOR, CORPORATE ENERGY CONSERVATION PROGRAM, MONSANTO CO., ON BEHALF OF MANUFACTURING CHEMISTS ASSOCIATION, ACCOMPANIED BY RAY SEITZ, DIRECTOR, ENERGY CONSERVATION, PFIZER, INC.

Mr. CLARK. Mr. Chairman and subcommittee members, my name is Hoyt C. Clark. I am director of Monsanto Co.'s corporate energy conservation program. I appear today representing the Manufacturing Chemists Association—MCA—a nonprofit trade association of 193 companies who produce more than 90 percent of our country's basic industrial chemicals. With me is Mr. Ray Seitz, director of energy conservation for Pfizer, Inc.

The chemical industry is the most energy-consuming industry in the Nation. The industry has expressed its concern for this fact through the early establishment—in 1974—of an MCA energy conservation committee, through which 108 of our member companies now report their energy efficiency improvement progress.

We are convinced the MCA program is extremely effective and feel that obtaining the involvement of 108 companies is a significant achievement. Forty-three of the companies are among the 50 most energy-consuming companies in our industry and required by statute to participate. Sixty-eight of our participating companies consume more than 1 trillion Btu's per year and would be required to participate by the proposed Senate bill S. 2057.

For overall industry this Senate bill would mandate participation of approximately 1,000 companies. The present voluntary program has approximately 3,000 companies already participating.

The reason for this heavy participation in MCA's program is widespread acceptance of its reporting procedure. Each company measures the production level, in pounds, of each product or group of products at each of its plantsites and the total energy used by the plant in producing those products. This is compared to the energy that would have been used in 1972 to produce that same quantity of products. The percentage improvement in energy consumption per pounds of product, or energy rate, is then calculated for the plant.

Each manufacturer aggregates the data for his plants into his company's energy rate reduction. The data from individual manufacturers is aggregated by MCA and the overall industry results are reported.

There is no necessity for MCA to verify and substantiate individual company results data because the economic pressures for improving energy efficiencies are so great.

As with all energy efficiency calculations the MCA report calculations are impacted by factors beyond the control of industry or government. A decided decrease in the efficiency number resulted from sudden decreases in capacity utilization during the 1974-75 recession.

We verified the trend of this impact but found it impossible to define its absolute effect on results numbers. However, knowledge of this trend caused member companies to develop techniques for improving energy efficiency at reduced production rates.

In terms of overall accomplishment the chemical industry, working through the MCA program, achieved an even 9.9-percent energy rate reduction during 1976 compared to 1972. This is significant progress but many of the conservation actions of the past 2 years are not yet reflected in this number because of the investment leadtime for many projects. I can illustrate the effect of this leadtime as experienced within my own company.

We expend considerable effort on energy efficiency of new production facilities. New facilities, approved in 1976, are scheduled to achieve a 27-percent energy rate reduction compared with the facilities now in operation producing those same products. We will obtain the benefit of these projects as they come on stream over the next several years.

The investment commitment for conservation has been heavy, with slightly over \$100 million being committed since our effort began. We will obtain the benefit of these projects and this investment as they come on stream over the next several years.

I would like to comment specifically on some provisions of S. 2057, sections 373, 375 and 376, the National Energy Conservation Policy Act, as passed by the Senate Energy Committee on September 13, 1977. The major changes sought via S. 2057 are to increase the number of industrial companies now mandated to report on conservation programs, to increase the detail in which they report, to test the improvement that might be attained by use of the second law of thermodynamics as a basis for steam-raising standards and then to use the second law for overall reporting purposes versus the first law of thermodynamics, which is now being used, if evaluation shows it to be more meaningful.

Our assessment of these amendments shows the present reporting system has attracted the participation of a great many more companies than are required to participate by the present law or which would be required by the changes proposed in S. 2057.

It is a management-type report that enables the Federal Government, general public, and other companies to evaluate conservation performances. It achieves these ends with an efficient use of manpower in the reporting procedure and without problems on confidentiality of data.

The Government has the right to audit individual company data, and the chemical industry's conservation performance since 1972 has amply demonstrated the voluntary program to be an effective one.

It is our belief that increased emphasis or a change in the detail of Government reporting programs will not enhance industrial energy efficiency improvements.

The effort to implement a more detailed and complex reporting system would simply inhibit conservation results by diverting manpower from project implementation now in progress to the considerable effort required to establish and operate a more detailed reporting system.

Thus we recommend continued use of the present program of voluntary targets and progress reporting system.

We would recommend the passage of the amendment No. 812 by Senator Johnston directing the administration to complete, within 12 months, a study of the relevance of the second law of thermodynamics as a basis for energy efficiency measurement.

To comment briefly on this second law application, the chemical industry has, of course, recognized and applied the second law of thermodynamics for years. The techniques of cogenerators, topping turbines, bottoming engines, and so forth, for extracting useful energy from fuel are not new ideas. These are concepts that are widely incorporated in current industrial engineering practices. They would have been in even wider use today had it not been for the artificially low regulated fuel prices which have existed in the United States.

It is, however, our initial opinion that use of the second law for overall conservation efficiency reporting is no panacea and could be quite misleading to anyone following reports on industrial conservation achievements. Thus we feel it would be a serious error to mandate use of second law efficiency standards and reporting for industrial energy applications at this time, ignoring the problems created by this change in approach.

As to the provisions to provide more detail than now provided by the voluntary system, such is possible but the cost-benefit ratio deteriorates rapidly. We continue to believe it important to keep our engineers working on achieving conservation rather than occupied with reporting on it in new ways.

In closing, to repeat our recommendation, we believe the subcommittee should adopt the proposal for a 12-month evaluation of the relevance of using the proposed second law efficiency calculation method but that you should reject at this time any revisions to the existing program of voluntary targets and results reporting.

We thank you for this opportunity to appear and would be pleased to respond to any questions.

[Testimony resumes on p. 146.]

[The Manufacturing Chemists Association prepared statement and attachment follow:]

STATEMENT OF HOYT CLARK, MANUFACTURING CHEMISTS ASSOCIATION

Mr. Chairman and Subcommittee members, my name is Hoyt Clark, and I serve as Corporate Energy Director of Monsanto Chemical Company. I appear today representing the Manufacturing Chemists Association (MCA), a nonprofit trade association having 193 United States company members representing more than 90 percent of the production capacity of basic industrial chemicals within this country. With me is Mr. Thomas A. Gamble, Coordinator of Energy and Utilities with the Engineering Department of Hercules Incorporated.

1. Conservation necessary

The chemical industry is identified as the most energy-consumptive industry in the nation. Intensive measures to conserve energy have been a paramount concern to chemical manufacturers since long before the 1973 oil embargo and a competitive necessity both domestically and internationally. We have expressed our concern by instituting conservation programs in our member companies and creating an energy conservation program in MCA for a reliable reporting system, that indicates energy efficiency improvement progress, provides for an exchange of energy conservation information, and improves energy conservation awareness. This activity began in 1974 before energy conservation reporting became a statutory requirement.

2. Voluntary reporting

The accomplishments of this program are significant. Currently, 108 member companies are voluntarily reporting energy use and conservation through MCA. This represents 43 of the 50 most energy-intensive chemical companies, and 68 that consume more than 1 trillion BTU/yr. We understand that the other seven of the top 50 are reporting through other trade associations. As you can see, MCA's voluntary program has attracted 65 companies that would not be required to report under existing statutes and 40 that would not be required to report directly to the Department of Energy under S. 2057.

It is estimated that a total of 950 companies using 1 trillion BTU's of energy per year would be required to report directly to the Agency under the provisions of S. 2057. By comparing that estimate with the more than 3,000 industrial companies presently reporting through FEA approved voluntary programs, S. 2057 would appear a significant step backwards.

The concept of a voluntary energy conservation program was developed originally as a result of cooperation between industry and federal agencies. The objective was to find a meaningful yet easily administratable program which would adapt to monitoring widely divergent uses of energy in industry. What evolved was a simple, highly effective approach which meets the present reporting requirements of the Energy Policy and Conservation Act (EPCA). A manufacturer measures the energy consumed per unit of production at each manufacturing site. The total production volume, in pounds of chemicals, is the unit of production used in this calculation. This consumption per unit is compared to similar figures for the base year 1972, and the percent reduction—the progress in conservation efficiency—is then determined. The data from individual manu-

facturers is aggregated and reported for the entire industry. This report allows individual companies to measure their performance against the industry-wide achievement.

As individual companies develop conservation programs and techniques, they are shared with other reporting participants and the federal government through seminars, regional workshops, published manuals and monographs. An awareness of our conservation achievements and goals is useful for solving individual company conservation problems, and is an integral part of the trade association program.

3. Industrial conservation

Industry's conservation has been effective compared with the economy as a whole. Energy consumption by industry for 1976, while producing more goods, was nearly $1\frac{1}{2}$ quadrillion BTU's lower than it was in 1972. This performance, the result of good business practice stimulated by higher fuel costs, and the energy conservation reporting program, amounted to 8.2 percent reduction for the industrial sector over a four-year period. The rest of the economy, cushioned from the price impact by government controls, did not reduce consumption, but actually increased consumption by 3 quadrillion BTU's. Until every segment of the economy gets accurate price signals for fuel, their energy efficiency will not improve.

MCA does not have a verification program, nor do we see the need for one. Energy conservation is an economic necessity for survival. Member companies have reported that were it not for major improvements in energy efficiency, some of their plants would have been forced to shut down.

Refinement of reporting techniques and disaggregation into smaller reporting units is of doubtful value in improving or modifying industrial energy efficiency. This follows because energy efficiency calculations are affected by many factors not subject to control by government or industry. A general correlation for the efficiency of SIC 28 operations with varying capacity utilization was developed by MCA during the 1974-75 recession. While the trend toward lower efficiency in low capacity output was confirmed, interpretation of an absolute basis was not possible because many variables in the system defied definition. However, knowledge of the general trend assisted member companies in developing techniques for increasing energy efficiency at reduced rates of capacity utilization. The 1972-76 chemical industry improvement of 9.9 percent energy efficiency was accomplished at a somewhat lower rate of capacity utilization (80 percent in 1976 vs. 83.3 percent in 1972). This represents significant progress through enterprise and initiative which national policies should encourage.

Although these conservation improvements are substantial, and even more are expected by 1980, the greatest accomplishments should derive from installation of new facilities specifically designed for anticipated higher fuel costs. An immediate effect is not apparent because long investment lead times make responses to higher fuel costs three to five years longer. For example, one company has scheduled energy conservation expenditures of \$100,000,000 over the three-year period of 1976, 1977 and 1978. Capital projects authorized during 1976 are estimated as 27 percent more efficient than comparable facilities now in operation. Another company compared design practices in the United States and West Germany to fuel costs, and discovered that U.S. plants were designed for comparable efficiency if fuel costs were equalized. In anticipation that U.S. fuel costs will trend toward international parity through House-passed legislation or deregulation, the U.S. industry is improving energy efficiency of U.S. facilities to internationally competitive levels. Increased emphasis on government reporting would detract from current industry efforts by directing production manpower to nonproductive reporting schemes.

4. Disadvantages of S. 2057

A series of energy conservation amendments have been added to the Senate-passed bill S. 2057 (sections 373, 375, 376) which effectively destroy the current voluntary program. It adds significantly to the complexity and detail of industry's reporting burden. A new reporting concept, related to application of the second law of thermodynamics in calculating steam raising efficiency, has been added. While all three laws of thermodynamics are used in industry design and plant operations, required introduction of second law concepts to reporting of energy efficiency only adds theoretical parameters without practical application. For instance, efficiency measured in terms of the second law depends upon theoretically available energy, which in turn varies with geographical locations, chemistry of the process being measured, and the chemistry of the fuel used.

Industry should and does consider theoretically available energy in design and operation of industrial facilities. Heat recovery at the upper level is limited by safety consideration, product quality and the ability of materials on construction to withstand high temperatures. Heat recovery at the lower level is limited by ambient temperature of the facility location and economics of recovery facilities which utilize the Rankine cycle.

The chemical industry has been making practical application of the second law of thermodynamics for years. The techniques of co-generation, topping turbines, bottoming engines, etc., for extracting useful energy from fuel are not new, but indeed are concepts that are widely incorporated in current industrial practices. They would have been used more widely had it not been for artificially low fuel prices in the United States. It would be a serious error to apply the theory of second law efficiency standards to all process and steam raising operations, ignoring logistics and other related problems. The indiscriminate reallocation of capital to construction of facilities for total high level and low level heat recovery would be prohibitive. Even if the capital could be raised, the increased energy expenditures to ship fuel, raw materials, and finished products from a centrally-located, integrated facility to areas of production and consumption would minimize potential savings.

Of course, it is possible to provide more detail and formalize a thermodynamic model for energy conservation reporting, but the cost/benefit ratio deteriorates rapidly with increased input. In the case of thermodynamics and heat transfer, the gap between theoretical and practical is substantial. Moreover, the amount of detailed calculation and measurement of physical elements escalates tremendously as we attempt to measure theoretical parameters in a practical situation. This is in contrast to the simplicity of the current reporting system. For this reason alone, we continue to believe that total theoretical heat availability is a valid consideration in plant design, but a poor concept for measuring performance.

SUMMARY

In summary, we emphasize that the benefits of the voluntary energy conservation reporting programs through trade associations justify their continued use. They are carried out at little cost to the government. They create conservation awareness by encouraging energy conservation reporting by many more companies than would be required by S. 2057. The reports give management-type information which enables the federal government, general public and participating companies to evaluate industry's overall conservation progress. This is achieved with efficient use of manpower in the reporting procedure without exposing confidential company data. If federal agencies are concerned that individual company performance requires additional monitoring, FEA already has the authority to audit individual company performance and to standardize the reporting form. In fact, an effort of this type is currently under way. We urge you, therefore, to reject the type of legislation proposed in sections 373, 375, and 376 of S. 2057.

Industry recognizes the degree of energy conservation potentially available in applying the second law of thermodynamics. We apply those concepts within the limits of practical heat recovery to process design, but believe that reporting targets set by second law considerations are complex and unjustified for evaluating the conservation progress of operating facilities. We recommend that a study of relevance of more complex energy conservation reporting programs be undertaken by federal agencies as proposed by Senator Johnson before any changes are implemented for the measurement of industrial energy efficiency.

Thank you for this opportunity to present our views.

THE MCA CHEMICALS AND ALLIED PRODUCTS INDUSTRY VOLUNTARY REPORTING PROGRAM—SIC-28

Section I—Purpose

The purpose of this program, undertaken by the Manufacturing Chemists Association, is to achieve energy conservation and to report the extent of that achievement by that portion of the chemical and allied products industrial sector categorized as SIC-28, represented by the Manufacturing Chemists Association (MCA) as provided under Public Law 94-163, the Energy Policy and Conservation Act, notably Section 376(g) of that Act, which provides for an industry sector voluntary reporting program through a trade association. The mechanics of the program are described below under the caption Definitions and Calculations Procedure. Having been approved by FEA, the program will provide exemption

from the mandatory reporting requirement of Section 375(a) of EPCA of those companies identified under Section 373 of the Act. To the extent feasible and approved by FEA, MCA will utilize the mechanics of the program to report separately member company energy conservation achievements in 2 digit industry SIC sectors identified pursuant to EPCA Section 373 other than SIC 28. In order to encourage the ethic of energy conservation among as many SIC-28 companies as feasible, membership in MCA is not a prerequisite for participating in the MCA SIC-28 reporting program by any company wishing to report within the SIC-28 industry sector.

Section II—Definitions and Calculations Procedure

Those companies in the industry sector identified as SIC-28 who consume significant quantities of energy and who elect to report under this program will furnish energy conservation data to MCA, who, in turn, will consolidate the data and report to FEA the energy conservation achievements of the industry as reflected in the performance of participating companies. It is intended that this procedure will qualify annually, and if necessary will be modified to so qualify under criteria for establishment of voluntary reporting programs published by applicable FEA regulations.

The MCA will report only consolidated data for the industry. Data from individual companies will be promptly returned to the respective reporting company. No record of individual data will be retained thereafter except in company files.

Responsibility for validity and consistency of company data, the interpretation of this Definitions and Calculations Procedure as it translates into the energy conservation objective, rests with the reporting company only. Responsibility for validity of consolidation of data reported by reporting companies rests with the MCA staff.

The reporting frequency to MCA is every six months starting February 28, 1977. The reporting periods are the twelve months ending respectively June 30 or December 31 preceding the reporting month.

A. DEFINITIONS

1. Production—finished product(s)—pounds produced

NOTE.—When used consistently, either Alternate I or Alternate II below is acceptable as a definition and will give valid results for consolidation of conservation data.

Alternate I. Weight in pounds of manufactured chemical(s) produced for sale, export, or consumption outside of the Manufacturing Location. It is intended, under this definition:

(a) To exclude product transferred between departments within a Manufacturing Location.

(b) To include products shipped to other Manufacturing Locations for further processing or warehousing.

(c) To include goods ready for sale whether shipped or not.

Alternate II. Weight in pounds of manufactured chemical(s) as produced, whether used as an intermediate or a raw material for further processing at the same location, or shipped for sale, export, etc., or held in inventory.

2. Energy inputs—energy consumption—energy charged

a. Includes: (1) the HHV (High Heating Value) as BTU of fuels used for their calorific value, such as for steam generation, electricity generation, process heating and cooling, space heating and cooling, stationary engine or turbine drives, incineration, etc.

(2) Purchased non-fuel forms of energy, such as steam at its actual enthalpy value (adjusted for boiler efficiency estimated if not known) or electric power at the approximate national average fuel consumption rate of 10,000 BTU/Kwh.

(3) Energy from sources other than those defined in (1) and (2) above, such as, primarily, fuels recovered from feedstocks as reaction by-products, or steam or electricity generated from exothermic feedstock reactions, which energy physically becomes part of the total energy balance of the Manufacturing Location. These by-product energies should be charged in at appropriate values (HHV for fuels, enthalpy at appropriate efficiency for steam, etc.).

NOTE.—Item 2.a.(3) may appear to be, but is not in fact, an exception to the exclusion of feedstock energy stated in b.(1) below. Its inclusion is *only* to the extent that such energy is released and identified in the operation. commingling, in effect, with energy from fuels and purchased power.

If the by-product energy is generated and then consumed within one process operation and does not affect other Finished Product energy balances, it need not be accounted for, since discontinuance of that operation would not require an increase in purchased energies to compensate for by-product energy no longer available.

If significant investment is made to recover by-product energy from materials which were treated as waste in the Base Period, energy so recovered is a valid contribution to conservation, in which case it is not charged as an energy input, but has the effect of reducing purchased energies required.

b. Excludes: (1) Feedstocks, raw materials, and intermediates purchased or transferred from other Manufacturing Locations. Where energy is produced as by-product from any such feedstock, raw material or intermediate, and used at the Manufacturing Location, it is treated as noted in 2.a.(3) above.

(2) Lubricants, Greases, etc.

(3) Diesel, gasoline, and other fuels as may be used in motor vehicles and transportation equipment generally.

NOTE.—It is recognized that charging purchased electric power at approximately its fuel-consuming energy equivalent, rather than its text-book theoretical value appears inconsistent with the principle of accounting for only those energy conversions over which the reporting company has control. The premise here does not involve the degrees of efficiency attained by condensing-type generating stations in the utility industry. Rather, it recognizes that saving purchased electricity does, in fact, save the fuel equivalent. The amount of purchased electricity used by the chemical industry is large, and the unused heating value of fuel involved in utility-type (condensing) power generation is proportionately large: so that the charging basis is not only justified, but serves to avoid misdirected conclusions in evaluating energy source alternatives.

Other conversion norms are tabulated in Section 4 of the NBS Handbook 115, but are not considered as a part of these definitions.

3. Feedstocks

Materials which are converted, wholly or in part, into products chemically or physically distinct from the feedstocks, which products are intended for sale directly or for further conversion into other saleable products.

4. Manufacturing location

All of the chemical producing and supporting or related production facilities, including any office, research, engineering or other integrally managed units in a given geographic locale.

NOTE.—Whether certain facilities are chemically related, such as metals plants or mining operations integrated with chemical operations, and therefore to be included in this reporting, is discretionary based on company practice. Unit relationships should be maintained consistent from period to period or appropriate adjustments made to the base. Similarly, the number of manufacturing locations any company chooses to regard as separate entities within a geographical area is discretionary, within the limits of the definition of production, and without double-counting of energy inputs or energy reductions. Some companies hold membership in more than one Trade Association and manufacture products that might be optionally reported through one or another such association (e.g., plant food products through MCA or Fertilizer Institute). Those companies should report consistently through only one such association without duplication.

B. CALCULATION PROCEDURES

1. The Base Period for measuring achievement is the calendar year 1972.

2. Each reporting company determines its Base Rate of Energy consumption in BTU per pound of Production for each significant product (or group of products) at each Manufacturing Location for the Base Period. Each of these is called the Base Rate for that product at the location and does not change through time. Total Energy Input to the product divided by the total Pounds Produced for the Base Period determines that Base Rate.

3. For each twelve month reporting period (as defined in opening paragraph) starting with July 1, 1974 through June 30, 1975, current production (in pounds) of each of the products manufactured in the Base Period is determined at each Manufacturing Location. These are totaled for the company and reported on Line (1) of form MCA I.

4. Similarly, Current Reporting Period Energy inputs are determined at each location, but it is not necessary to do this on a product-by-product basis for periods after the Base Period. Energy Inputs on the aggregate at each location

for all products manufactured during the Base Period and on the aggregate for the company are adequate. The company aggregate is reported on Line (II) of form MCA I. There may be energy consumption at a Manufacturing Location which is not normally distributed to products (lighting, heating, air-conditioning of shops, offices, yards, etc.). Accounting procedure for this type input is optional. As suggestions, it may be categorized as "General" and shown separately as a "bottom line" additional to consumption without attendant production, or it may be arbitrarily distributed to products proportionate to metered energy uses.

The intent is that all Energy Inputs, as defined, be accounted for at each Manufacturing Location so that there is a balance around each such location and each company.

Inclusion of General Office, or Headquarters Facilities, is optional by company according to its proximity to a Manufacturing Location. Most companies will not include company headquarters where they are unrelated to any specific Manufacturing Location.

5. Current Production in pounds for each product in the current period, multiplied by the Base Rate energy consumption for that product at that location, establishes the Comparison Base Period Equivalent for each product at each location. The company total is reported on Line (III) of form MCA I.

6. The sum of all the Comparison Base Period Equivalents Inputs for the company, compared to the total Current Period Energy Inputs, establishes company conservation performance. The quantity by which the Current Period Inputs are smaller represents the energy conservation that has been effected on a weighted average, product-mix adjusted basis. The difference divided by the comparison base period equivalent inputs is the decimal equivalent of the percentage reduction. This is Line (VI) of form MCA I.

7. a. As new products, consuming significant energy quantities, are added after the Base Period, the respective energy consumption in BTUs and production in pounds for the first full reporting period of operation are added to the Base Period as an *adjustment*. Each current Period then and thereafter would include the actual values for the new products produced and the energy that would have been used at the Base Rate established in the first full reporting period as described in B-3 above.

Generally, the first full reporting period is to establish the Base Equivalent to the 1972 base for products not existing in 1972 at a given location.

b. Where start-up periods involve non-productive consumption of significant quantities of energy, that quantity may be subtracted, as an adjustment, from total Inputs for that reporting period, suitably flagged and justified as to the reason.

Note.—Without such adjustment, relatively small operations might show unjustifiably high conservation achievement in later years, which would not properly relate to steady-State manufacturing performance.

Similarly, where a new production unit is in operation prior to the first full reporting period, and the first full reporting period is used to establish the Base Period data for that production, the Energy Inputs used prior to that first full reporting period *may* be subtracted as an adjustment, along with the partial current period production, or may be included without Base Period adjustment. Such options should be guided by the significance of the impact on the final results.

c. As alternates of 7.a. above, the Base Period adjustment for new facilities for established products may derive from:

(1) Base rate data accumulated in the first period of operation and deemed to be representative, even though it be less than a full reporting period, or

(2) Base Rate data from production of such product (a) at other locations which the new operation supplants or supplements with improved conservation techniques.

8. Any significant increase in energy consumption caused by EPA, OSHA, or other regulatory causes not in effect in 1972 will require adjustment of the current period to compensate. This is accomplished by identifying the cause and making a simple reduction of the total current period energy inputs by the amount of the total current period energy inputs by the amount of the identified increase. This amount of the reduction is Line (IV), the reduced amount is Line (V) of form MCA I. A percentage reduction from Base Period is calculated using the total inputs reduced by OSHA-type amounts similar to the calculation in 6 above. This is Line (VII) of form MCA I.

9. The total Energy Source BTU quantities, identified as to source (Coal, Natural Gas, Electricity, etc.) are listed separately as a company BTU total on form MCA II. This information is required for the base year 1972 and the current reporting period.

SEC. C—SAMPLE CALCULATION

[Please do not submit this detail to MCA]

Energy summary	1972 base period			2H 1974-1H 1975 current period		
	Period total—production	Period total—energy inputs	Base rate consumption	Period total—production	Period total—energy inputs	Comparison base period equivalent inputs
Patriot Chemical Co.	(10 ⁶ lbs)	(10 ⁶ lbs)	(10 ⁶ Btu)	(Btu lb)	(10 ⁶ lbs)	(Btu lbs)
Manufacturing Location X:						
Product A.....	200	10,000	50	300	.....	15,000
Product B.....	10,000	30,000	3	12,000	.....	36,000
Product C.....	2,000	20,000	10	3,000	.....	30,000
Product D.....	3,000	60,000	20	6,000	.....	120,000
Total.....	15,200	120,000	.....	21,300	185,000	201,000
Manufacturing Location Y:						
Product A.....	500	20,000	40	800	.....	32,000
Product B.....	15,000	45,000	3	18,000	.....	54,000
Product E.....	5,000	10,000	2	7,000	.....	14,000
Product F.....	500	10,000	20	1,000	.....	20,000
Total.....	21,000	85,000	.....	26,800	98,000	120,000
Adjustments new products:						
Product G. (1973).....	1,000	10,000	10	1,500	.....	15,000
Product H. (1974).....	1,000	5,000	5	1,000	.....	5,000
Total.....	2,000	15,000	.....	2,500	16,000	20,000
Total.....				(I)50,600	(II)299,000	(II)341,000
OSHA and environmental:						
Stack Gas Scrubber—Consumes IMM Btu/T coal burned.....					7,000	
Air condition and ventilate—reduce product vapor in work areas.....					1,000	
Total.....					(IV)8,000	
Total less environmental.....					(V)291,000	

Note: Company—Net:

$$\frac{\text{III}-\text{II}}{\text{III}} \times 100 = 12.3 \text{ percent saving (VI)}$$

Conservation percent

$$\frac{\text{III}-\text{V}}{\text{III}} \times 100 = 14.7 \text{ percent saving, without OSHA and environmental (VII)}$$

(COMPANY)

ENERGY CONSERVATION REPORT FOR COMMERCE/FEA

SIC _____: TOP 50? YES ____ NO ____

FOR TWELVE MONTH REPORTING PERIOD _____ 197_ TO _____ 197_

Current Period Total Production _____ X 10⁶ LBS (I)Current Period Total Energy Inputs _____ X 10⁶ BTU (II)Comparison 1972 Base Period
Energy Consumption _____ X 10⁶ BTU (III)Current Period Total Energy Consumed
To Meet OSHA & Environmental
Requirements Not In Effect In 1972 _____ X 10⁶ BTU (IV)Total Energy Inputs Less OSHA
& Environmental _____ X 10⁶ BTU (V)Percent Reduction In Energy
Consumption Rate With OSHA
& Environmental Energy Included _____ % (VI)

$$\frac{\text{III} - \text{II}}{\text{III}} \times 100\% = \text{VI}$$

Percent Reduction In Energy
Consumption Rate Without OSHA
& Environmental Energy Included _____ % (VII)

$$\frac{\text{III} - \text{V}}{\text{III}} \times 100\% = \text{VII}$$

COMMENTS:_____
SUBMITTED BY_____
Telephone No._____
Date

(COMPANY) _____

SIC _____

ENERGY SOURCES BY TYPE

FOR TWELVE MONTH REPORTING PERIOD _____, 197 ____ to _____, 197 ____.

	1972	REPORTING PERIOD
NATURAL GAS	_____ x 10 ⁶	_____ x 10 ⁶
DISTILLATE FUEL OIL	_____ x 10 ⁶	_____ x 10 ⁶
RESIDUAL FUEL OIL	_____ x 10 ⁶	_____ x 10 ⁶
COAL	_____ x 10 ⁶	_____ x 10 ⁶
ELECTRIC POWER (PURCHASED)	_____ x 10 ⁶	_____ x 10 ⁶
STEAM	_____ x 10 ⁶	_____ x 10 ⁶
PROPANE	_____ x 10 ⁶	_____ x 10 ⁶
LPG	_____ x 10 ⁶	_____ x 10 ⁶
COKE	_____ x 10 ⁶	_____ x 10 ⁶
OTHER GAS	_____ x 10 ⁶	_____ x 10 ⁶
OTHER LIQUIDS	_____ x 10 ⁶	_____ x 10 ⁶
OTHER SOLIDS	_____ x 10 ⁶	_____ x 10 ⁶
TOTAL	_____ x 10 ⁶	_____ x 10 ⁶

COMMENTS: (Particularly if total reporting period energy on this form does not equal "Current Period Total Energy Inputs" on Form I)

SUBMITTED BY _____

Telephone No. _____

FORM MCA II 7/77

Date _____

Mr. DINGELL. Thank you very much, Mr. Clark. We appreciate your comments, which I have been going over rather carefully as you have been going through them.

The Chair recognizes now Mr. Sheldon. Mr. Sheldon, we are pleased you are with us.

STATEMENT OF ALLEN C. SHELDON, VICE PRESIDENT, ENVIRONMENT AND ENERGY RESOURCES, ALUMINUM COMPANY OF AMERICA, ON BEHALF OF ALUMINUM ASSOCIATION, INC.

Mr. SHELDON. Mr. Chairman and members of the subcommittee, my name is Allen C. Sheldon. I am vice president, Environment and Energy Resources for Aluminum Company of America. I am speaking today on behalf of the aluminum industry as chairman of the Aluminum Association's Committee on Energy.

The Aluminum Association has 84 members, representing all domestic primary aluminum ingot producers and 85 percent of the shipments of U.S. semifabricated—mill—products. The aluminum industry is one of the basic U.S. industries supporting the industrial economy of our country. Its members manufacture aluminum products in 43 States.

The aluminum industry depends on energy to produce and manufacture its products. Because we are energy-dependent, the industry has always been concerned about using energy efficiently. For example, the industry has reduced requirements for electricity to produce 1 pound of aluminum from 12 kWh per pound since World War II to 8 kWh per pound today. In the newest facilities it is less than 6.5 kWh per pound, an almost 50-percent reduction—on, I might add, a completely voluntary basis. A process in pilot commercial operation in Anderson County, Tex., is producing aluminum using less than 5 kWh per pound of metal.

The properties of aluminum make it a material of choice for many energy-saving applications. Substitution of lightweight aluminum for heavier material in automobiles, buses, trucks, and other vehicles produces substantial net energy savings. Aluminum is widely used for energy-saving weatherization applications, such as storm doors and windows, insulated siding and foil backing for ceiling and wall insulation. After it has served a useful product life aluminum can be recycled to molten metal for less than 5 percent of the energy required to produce it from ore.

In 1974 the aluminum industry voluntarily made a commitment to the Federal Energy Administration and the Department of Commerce to reduce energy use per unit of output by 10 percent by 1980 compared with the base year 1972. Through the first half of 1977 the Aluminum Association reported achieving an energy efficiency gain of 8.5 percent.

This energy conservation gain has been made voluntarily. As an industry, we are proud of our conservation accomplishments. We share the Government's concern to conserve energy, for the energy crisis is very real to industry and a plan must be formulated to deal with it.

Since June of 1974 we have cooperated fully with the Federal Energy Administration and other Government agencies and departments on energy matters by sharing our knowledge and information. We have also actively solicited the cooperation of other industries in the development of voluntary conservation programs.

Our industry established a comprehensive voluntary reporting program after developing methods for collecting data on energy consumption and conservation prior to Government regulations or legislation requiring it. An extensive series of meetings was needed to resolve the complex technical problems involved.

According to our experience an energy use reporting system is evolutionary. No new system can anticipate all of the difficulties that may develop.

The aluminum industry developed a methodology for calculating improvements in energy conservation that has been widely recognized as the model for the national industrial conservation program. We have developed a considerable body of expertise and experience in the technical aspects of energy and fuel use reporting.

FEA verified the system used by the Aluminum Association. They reviewed the procedures followed and were satisfied that the association was aggregating reported data correctly. FEA has the authority and indeed has been advised that it is welcome to visit corporate headquarters to review the data aggregating processes there.

Further, under the FEA criteria for establishment of voluntary reporting programs, individual companies can be required to certify to FEA that the data submitted to the Aluminum Association is correct. This is the same system used for data-gathering purposes by other agencies of Government, such as the Census Bureau. Congress and the executive branch make wide use of data developed this way and do not have any questions concerning its validity.

A copy of the methodology appearing in voluntary industrial energy conservation progress report 3, published by the Department of Commerce and the Federal Energy Administration, is attached as exhibit A.

Our testimony today will concern itself with the provisions of part A of S. 2057, concerning industrial energy reporting. In our opinion there is no need for passage of new legislation in this area. Provisions of existing law, Public Law 94-163, contain the necessary authority for the Federal Energy Administration to resolve problems it is having in implementing the law.

The provisions of title III, part D, of Public Law 94-163, which your subcommittee so carefully developed, does an excellent job in requiring appropriate data to measure progress against conservation goals developed for various industries.

If some industries have technical difficulties in developing new data systems, the problems should be addressed by experts in Government and industry who have been through the trials of developing a sound reporting system. S. 2057 will not solve the reporting and data aggregating problems.

In an industry where you do have problems that cannot be solved on an industrywide basis, FEA can require companies involved to report directly under previous law. Conversely, where an industry reporting system is effective, you should not want to disallow it.

It is our understanding that some of the concerns deal with questions of varying units of output and methodology for aggregating data. We submit that these concerns could be taken care of under the existing law.

To our knowledge the largest percentage of industrial energy use is being reported in an adequate manner. It is our understanding that the percentage of industrial energy use which apparently is not being reported adequately at this time is minor and relates primarily to industries where new systems must be developed.

The proposed legislation will not do anything to solve apparent concerns about the existing data and would replace a fine piece of legislation before it has had an opportunity to be properly implemented. We believe this can be done if industry and FEA are left to work on the problems together.

Members of the Aluminum Association consuming over 95 percent of the energy used by the industry are conducting internal energy audits to identify areas of potential energy conservation and are encouraging other companies to do likewise.

In addition to the 15 companies identified as using more than 1 trillion Btu's annually, 21 companies using less than that are reporting this energy and fuel use to the Aluminum Association. If voluntary industry reporting programs are eliminated, participation by these companies would be lost.

Participation in our program has expanded from 13 to 36 companies. Energy and fuel use reports submitted to the Aluminum Association account for well over 95 percent of the energy used in the aluminum industry.

The energy and fuel use data is collected and aggregated by the various industries and furnished to the Government free. It would be very costly for the Government to perform these functions.

Our industry and others, we are sure, are very serious about energy conservation. The high cost of energy today provides a strong economic incentive to conserve. The aluminum industry is a leader in industry-wide energy conservation programs.

In addition to our reporting program, we have conducted four workshops to assist member companies in energy conservation. Two of the most recent workshops have been devoted to the subjects of combustion and flame management, including heat recuperation systems and furnace operations to reduce energy waste. Over 200 technical people from our industry, as well as Government representatives, attended these workshops.

In addition, sets of the technical papers are made available to those who were not able to attend. These have been very helpful to our industry, and we distribute them to others for applications where they feel our technology is suitable. I would like to present a copy of the papers from the most recent workshop to the committee. If you would like additional copies we will be happy to supply them.

S. 2057 requires a demonstration program to determine the feasibility of establishing mandatory reporting, voluntary targets, standards or other options for steam raising. We believe that it is premature to conduct a demonstration program prior to conducting a study. A study should be completed and reviewed by Congress and hearings conducted with industry prior to implementing a demonstration program.

We strongly feel that EPCA, Public Law 94-163, if properly implemented by FEA, eliminates the need for S. 2057.

Thank you for the opportunity to express our views on the industrial energy reporting aspects of S. 2057. We will be pleased to work with your subcommittee in resolving any concerns about the adequacy of Public Law 94-163.

[Exhibit A to Mr. Sheldon's prepared statement follows:]

EXHIBIT A

The percent improvement for 1975 is the net effect of process-by-process improvement as reflected in the following table:

	1972	1st half 1975	2d half 1975
Process (Btu's 10 ¹²):			
Bauxite.....	0.3	0.2	0.1
Alumina.....	(r) 122.0	54.6	51.3
Hot metal.....	633.1	308.5	285.3
Hold, cast, and melt.....	58.7	23.3	24.8
Fabrication.....	121.2	43.7	45.7
Total.....	(r) .935.3	430.3	407.3

Note: The percent improvement for each process is determined as follows:

Step 1. $\frac{1972 \text{ Btu's}}{1972 \text{ lbs}} = 1972 \text{ Btu/lb.}$

Step 2. 1972 Btu/lb times 1975 lbs equals 1975 Btu's at 1972 efficiencies.

Step 3. 1975 Btu's at 1972 efficiencies minus 1975 Btu's equal 1975 Btu's saved as a result of new conservation efforts.

Step 4. 1975 Btu's saved divided by 1975 Btu's at 1971 efficiencies equals percent improvement.

Source: Voluntary Industrial Energy Conservation, Progress Report 3, published by: Department of Commerce and Federal Energy Administration.

[The following letter was received for the record:]

THE ALUMINUM ASSOCIATION, INC.,
Washington, D.C., September 28, 1977.

Mr. JOHN D. DINGELL,
Chairman, Congress of the United States, House of Representatives, Subcommittee on Energy and Power, Committee on Interstate and Foreign Commerce, Washington, D.C.

DEAR CHAIRMAN DINGELL: The Aluminum Association's responses to the questions asked in your letter of September 20, 1977, follows. They appear in the same order as presented and are identified likewise.

A. Thirty-six companies reported their energy and fuel use to the Aluminum Association for the first half of 1977. Eleven of these companies were identified as among the 50 most energy consumptive corporations in the primary metals industry, SIC Code 33.

B. A total of 15 companies that are members of the Aluminum Association use more than 1 trillion BTU's per year and would be required to report directly to the Government if the Senate Bill were adopted. All of these companies are currently reporting to the Aluminum Association, and their energy and fuel use is included in the data reported by us to the Department of Commerce and Federal Energy Administration.

C. Energy and fuel use data compiled by the Aluminum Association is broken down into the five major processes in the aluminum industry, namely; bauxite, alumina, hot metal, holding, casting and melting, and fabrication. Individual companies can compare their energy use in each of these processes with the industry average to determine the relative energy efficiency of their operations. If a company is operating above the industry average for a process, it would do its utmost to improve its energy conservation program. In effect, this is an intra-industry competition which is an effective means for self-improvement in energy or other areas.

D. A copy of the energy fuel use reporting form of the Aluminum Association is attached.

E. Attached is a copy of page 19 of the Aluminum Association publication entitled, *Energy And The Aluminum Industry*. A reduction in energy savings is shown for 1975, a period of reduced demand for aluminum. This clearly shows a relationship between utilization of plant capacity and energy efficiency.

F. Energy and fuel use reports submitted to the Aluminum Association by individual companies are reviewed by the Vice President, Economic Affairs. On the basis of other statistical information available to him in meeting other responsibilities, he is able to determine whether errors of any magnitude appear in a company report. In such instances, appropriate questions are raised with the submitter and a recheck made to determine whether a typographical, clerical, or mathematical error was made in aggregating data within the company. FEA verified the system used by the Aluminum Association. They reviewed the procedures followed and were satisfied that the Association was aggregating the data correctly. FEA has the authority and indeed has been advised that they are welcome to visit corporate headquarters to review the data aggregating processes there. Further, the individual companies can be required to certify to FEA that the data submitted to the Aluminum Association is correct. This is the same system used for data gathering purposes by other agencies of Government such as the Census Bureau. Congress and the Executive Branch make wide use of data developed in this way and do not have any questions concerning its validity.

G. As a trade association, the Aluminum Association does not "require" companies to report in any particular way. In order for a company to report its energy and fuel use however, it is necessary for the company to obtain data from its individual plants.

H. The units of output used in the Aluminum Association reporting system varies with the individual processes. For example, the number of pounds of aluminum produced in the smelter is used in determining the energy use per pound in that operation. Likewise, the number of pounds of alumina produced is used in determining the energy use per pound of alumina, etc. In order for a system to produce accurate information on the energy efficiency in an industry, it is necessary to break it down to appropriate units in each industry so meaningful numbers are obtained. Using the methodology developed by the Aluminum Association, energy efficiency can be calculated. There is no reason that the same units of output need to be used by all industries. The units of output must be those peculiar to each industry. Appropriate methodology exists to allow computation of energy efficiency improvements by our system.

1. (a) Yes. (b) We do not have any estimate of the size and direction of conservation R & D needed for motors, pumps, and other industrial equipment listed in the bills.

(c) We do not have any data on the extent to which R & D is being conducted in industries on these particular items.

2. (a) Our testimony clearly states that Senate Bill S. 2057 is unnecessary. Necessary authority exists in Public Law 94-163 to require direct reporting where is is needed to resolve specific problems. The voluntary conservation program has been successful as demonstrated in the latest progress report No. 5 of the Department of Commerce and Federal Energy Administration.

(b) There has been a great deal of cooperation between industry and Government in the energy conservation area through the voluntary program. This has come about primarily because industries have been working through their trade associations to encourage greater participation by other members. If the industry reporting systems are eliminated, it would be reasonable to expect that there would be a lessening of the enthusiasm which has been so helpful in enlisting greater support from other members within the association through the conservation program. Other negative impacts include publication of a company's energy efficiency gains which may show one company doing better than another when, in fact, they have not done so. They may have spent less and have been much less efficiently run previously from an energy standpoint so that there is greater opportunity to conserve with minimal expenditures.

3.-17. We do not have any information on these questions so are unable to respond.

Respectfully submitted.

M. B. MEYER,
Vice President, Government Relations.

Attachments.

THE ALUMINUM ASSOCIATION, INC., ENERGY AND FUEL USAGE SURVEY INSTRUCTIONS

WHAT TO REPORT

A separate form should be used for each of the following industry processes in which your company is engaged: (1) U.S. Bauxite mining; (2) U.S. Alumina production (for aluminum); (3) Hot Metal production; (4) Metal Holding, Casting, Melting operations; (5) Mill Product Fabrication; (6) Other Fabrication (SIC 34 Fabricated Metal Products of Aluminum).

Companies which manufacture the following related products for use in aluminum production should also fill out a separate form showing the energy and fuel used for each self-manufactured product: (7) Caustic; (8) Petroleum Coke; (9) Anodes and Cathodes; and (10) Fluoride and/or Cryolite.

Those companies identified in SIC 28 or 33 listings by the government for non-aluminum items should also submit separate forms for: (11) Other SIC 28, and (12) Other SIC 33.

Each process should include all energy used in that process. Exclude fuels consumed by a purchased business service such as non-company common carriers.

PRODUCTION VOLUME

Report total production of the products involved in each process area. Hot Metal production should agree with official data reported monthly to the Aluminum Association. Mill Product production should exceed gross shipment data reported to the Bureau of The Census. Holding, Casting, Melting volume should represent total metal cast (plus output of molten metal to third parties). Other Fabrication requires a report of the aluminum weight of products made, such as cans, pans and windows; however, exclude aluminum weight of general painting and anodizing work.

BAUXITE AND ALUMINA

Exclude bauxite or alumina for chemicals or other non-aluminum metal uses in these first two processes. These should be reported in Other 28.

HOT METAL PRODUCTION

Report all energy used in hot metal production up to holding and casting of ingot, pigs, sows, etc. For each appropriate fuel, exclude the amount your company used to generate electricity; lines 711-715 take care of it.

METAL HOLDING, CASTING, MELTING

Include energy usage for all holding furnaces, casting operations and melting activities, wherever located—at the smelter, in fabricating plants, etc. This would include holding furnaces immediately prior to any continuous casting operation for sheet or billet or rod. Include all remelt operations. Exclude soaking, annealing or heat treatment or mill products. Exclude energy content of purchased alloying ingredients.

MILL PRODUCT FABRICATION

Report energy usage for all mill product operations beyond the ingot-casting stage. Include soaking, annealing and heat treatment energy usage. Exclude energy content of purchased materials, such as packaging materials, plastics or adhesives, paints or coatings, wire or cable insulation or coverings, etc. Mill products include:

Sheet, Plate, Foil, Extrusions, Drawn Tube, Welded Tube, Rod and Bar, Wire, ACSR and Cable, Ins. and Covered Wire and Cable, Forgings and Impacts, Powder and Paste.

OTHER FABRICATION (SIC 34)

Report energy usage for other operations connected with making and shipping aluminum ingot and mill products, such as painting, laminating, etc. where they are separate operations. Also report energy usage for all aluminum end-product operations in which you are involved that fall within the scope of SIC 34: Fabricated Metal Products. This should cover any captive product business such as windows, cans, pans, etc.

HOW TO REPORT ELECTRICITY

On the form, electricity usage is separated by the major fuel types for purchased electricity (Elec-Purch), and for self-generation (Elec-Gen). To help in organizing the information for entry on the form, you may use this worksheet table to arrive at the KWH for each fuel type.

	Generated	Purchased	
	thousand kWh	thousand kWh	Percent
Electricity fuel pattern:			
1. Hydropower.....			
2. Natural gas.....			
3. Coal.....			
4. Oil.....			
5. Nuclear.....			
Total electricity.....			100

Standard conversion factors shown should be used for purchased electricity and for self-generated hydropower. For self-generation using other fuels, please determine the conversion factor you actually experienced and insert it in the "Factor" column.

(811) CAUSTIC; (821) ANODES AND CATHODES; (851) CRYOLITE AND (852) FLUORIDES

Please show only consumption of these products whether purchased or made for your own use. This information is needed for other analyses.

CONFIDENTIALITY

Information submitted on this form is solely for use by our Statistical Department in compiling industry figures. It will be held in strict confidence and individual reports will be destroyed upon completion of industry data.

Return one copy for each process to:

Statistical Dept.,
The Aluminum Association,
818 Connecticut Avenue, N.W.,
Washington, D.C. 20006

INFORMATION SUBMITTED ON THIS FORM IS SOLELY FOR USE BY OUR STATISTICAL DEPARTMENT IN COMPIING INDUSTRY FIGURES. IT WILL BE HELD IN STRICT CONFIDENCE AND INDIVIDUAL REPORTS WILL BE DESTROYED UPON COMPLETION OF INDUSTRY DATA.				Energy and Fuel Usage Survey Process :		REPORT PERIOD 1st H 1977 DUE DATE 77 August 1
EN-1 (777)			Production Volume		Pounds	
ITEM	FUEL	UNITS	QUANTITY	FACTOR	MILLION BTU's	
201	Natural Gas	Mill. cu.ft.		x 1,027		
202	Propane	Gallons		x .092		
209	Other LPG	Gallons		x .102		
301	Distillate (#2, #4)	Gallons		x .139		
302	Residual (#5, #6)	42.Gal.Bbls.		x: 6.287		
303	Lube & Roll Oils	Gallons		x .139		
304	Gasoline	Gallons		x .128		
305	Kerosene	Gallons		x .135		
306	Petroleum Coke	Short Tons		x 30.060		
309	Other Oils (fuel)	Gallons		x .139		
401	Lignite	Short Tons		x 12.7		
402	Bituminous Coal	Short Tons		x 24.0		
403	Anthr. & Met. Coal	Short Tons		x 24.0		
404	Pitch	Short Tons		x 30.060		
409	Other Coal	Short Tons		x 24.0		
600	Steam (Purchased)	Mill. lbs.		x 970.0		
701	Elec-Purch-Hydro	Thou. kwh		x 3.413		
702	Elec-Purch-Lignite	Thou. kwh		x 10.5		
703	Elec-Purch-Coal	Thou. kwh		x 10.5		
704	Elec-Purch-Gas	Thou. kwh		x 10.5		
705	Elec-Purch-Oil	Thou. kwh		x 10.5		
706	Elec-Purch-Nuclear	Thou. kwh		x 10.5		
711	Elec-Gen-Hydro	Thou. kwh		x 3.413		
712	Elec-Gen-Lignite	Thou. kwh		x		
713	Elec-Gen-Coal	Thou. kwh		x		
714	Elec-Gen-Gas	Thou. kwh		x		
715	Elec-Gen-Oil	Thou. kwh		x		
811	Caustic	Short Tons		TOTAL		
821	Anodes/Cathodes	Short Tons				
851	Cryolite	Short Tons				
852	Fluorides	Short Tons				
			BTU/POUND			
COMPANY			NAME OF PERSON TO BE CONTACTED		DATE	

ALUMINUM INDUSTRY PROGRESS UNDER THE VOLUNTARY INDUSTRIAL ENERGY CONSERVATION PROGRAM

Savings
10%

8%

6%

4%

2%

1972

1974

1976

1978

1980

The aluminum industry has voluntarily committed to the Department of Commerce and the Federal Energy Administration a 10 percent improvement in energy efficiency by 1980, with 1972 as the base year. With the exception of the industry recession year of 1975, the industry has exhibited steady progress toward that goal, with the latest figures showing more than 7 percent savings. The cumulative savings since the start of the program has been equivalent to more than 27.2 million barrels of oil. These figures do not include the additional energy saved through increased recycling of Aluminum.

Mr. GAMMAGE [presiding]. Thank you, Mr. Sheldon.

I would like to welcome all of you gentlemen here today and particularly Mr. Clark, with whom I have some association back in the district. He was formerly with the Monsanto facility back in my district.

The chairman has returned and I will ask my questions in a minute.

Mr. DINGELL. The gentleman from Texas is recognized. The Chair thanks him for presiding.

Mr. GAMMAGE. Thank you, Mr. Chairman. I notice both Mr. Sheldon and Mr. Clark in their testimony stated that the number of companies or firms that would be participating under the mandatory language of this legislation would be substantially less than those that are voluntarily participating under current law. Would either of you like to comment on that?

Mr. CLARK. Certainly from our viewpoint, the voluntary program has as one of the strong pluses extensive participation. Presently there are 40 additional companies participating in the MCA program that would not be required to report by the proposed Senate bill.

Mr. GAMMAGE. You mentioned that there are approximately 3,000 companies.

Mr. CLARK. In overall industry there would be a difference of some 2,000 companies.

Mr. GAMMAGE. There would be only about 1,000 mandated under this legislation. Also, you alluded during your testimony to the question of confidentiality of information. Could there conceivably be a loss of proprietary data such as test data, product quality or in-house-developed technology through the requirement mandated here to report to FEA or the Department of Energy as opposed to the trade associations?

Mr. CLARK. Yes. In spite of the protections built into the public information law, there have been specific instances where this has been noted. Confidentiality of data—here I am quoting one of our member companies, who had a deal relating to licensing going with a country outside the United States, and the data they were after they were able to get through the Government and the whole thing fell through. So there has been experience directly related to the confidentiality problem.

I think here is where the voluntary program can be of major interest to the small company as well as the large one.

Mr. GAMMAGE. I think all three of you gentlemen alluded either directly or indirectly to the mandating language of employing the second law of thermodynamics as a basis for energy efficiency measurement. I would like to get a little elaboration on that from the three of you apart from your direct testimony. Would you like to speak to that, Doctor?

Mr. GYFTOPOULOS. The simplest way I can answer your question that whenever we use a fuel to perform a task in our society, we have to account both for the amount of the energy of the fuel and the quality of the fuel of that energy.

The second law of thermodynamics essentially takes into account both quantity and quality of energy and therefore gives you a more objective criterion as to how well you are doing as well as how far you are from where you want to get.

Mr. GAMMAGE. Mr. Clark suggested in his testimony that the use of the second law be placed under a study for about a 12-month period before a decision is made as to whether or not to employ it in the mandatory language of this bill.

Mr. GYFTOPOULOS. I would agree with Mr. Clark on this point because, in spite of the fact that especially chemical engineers are very well versed in the rules of thermodynamics, there is a large number of engineers that are not as experienced in its usage and, therefore, it is not an easy task all of a sudden to introduce a new way of thinking into their operations. For that reason, I agree with the suggestion that the matter become a subject of study.

Mr. GAMMAGE. Mr. Clark.

Mr. CLARK. First let me say I am not a thermodynamics expert. But I can speak to this point that, as I understand Dr. Gyftopoulos' comments—one of his comments—one benefit attributable to the second law was the application of air preheaters on furnaces. And, as I recall, he quoted some benefits and cost benefits and fuel savings from this.

I might quote a recent news release from our company relating to a specific project that I think is a good example of where our industry has recognized the importance of the second law as well as the first and so on. This one hits close to your home, a plant in your district, which just is in process of starting up a \$20 million project that is

installing air preheaters on ethylene cracking furnaces. This is a saving of some 4 billion cubic feet of gas.

The news release calculated this out to heating 200,000 homes during the winter, the point being that industry is applying all of the laws of thermodynamics.

This project was cost-justified based on present cost projections, and the value of eliciting efficiency standards based on the second law thus becomes a serious question to us. Yet we don't fully understand the proposal about overall reporting and we would therefore advocate the study.

Mr. GAMMAGE. You are doing it because it is good market economics. Mr. Sheldon.

Mr. SHELDON. I would like to make some additional comments. We do a lot of steam raising in converting bauxite or removing aluminum oxide from the bauxite ore. These plants are located in Texas, Louisiana, and Arkansas. Many were built by the aluminum company. All of them without exception raise steam to a higher temperature than you need in the process.

We take the steam through a back pressure turbine, generate electricity, we use the electricity, then we take off the steam at whatever pressure we need in our process. That is cogeneration in its most beautiful form, really. We have been doing that, as far as I can find out, literally forever—since we have been producing aluminum, because it was a logical way to do.

In our plant in Point Comfort, which you may be aware of, where we have circular engines to produce electricity, since 1947 we have used heat recovery boilers on exhaust from those engines to produce steam.

In the other steam-raising applications in our company, most of which are for space heating—Davenport, Iowa, for example, an Iowa-Illinois powerplant—they give us low-pressure steam for our space heating and process uses.

Another of our very large plants, in Warwick, Ind., where we have our own powerplant, we produce hot water with low-pressure steam and use that hot water throughout the process.

So what I am saying: As I made a review of all of our different boiler applications, those boilers producing over 50,000 pounds of steam an hour—and we don't have any under 80 other than package boilers, which are quite small—we have about everything possible on them, and what we worry about is that we are going to operate below the dew point, where we get severe tube corrosion.

I think you will find this to be pretty broadly true in most industries because economics are such that we have got to do it. This is not something new. We have been doing this from the beginning because the boilers that we are using are old boilers. We have not installed any new boilers in the last 20 years.

Mr. GAMMAGE. Thank you, Mr. Clark. I am vaguely familiar with the efforts of the Monsanto Co., and I think it should be particularly interesting to the gentlemen on the committee present that the 200,000 homes that could be heated by the saving from that one facility in Chocolate Bayou, Tex., would be those located in the Midwest, from October through the spring. It might warm a few of you folks up this winter, Mr. Chairman. I have no more questions.

Mr. DINGELL. The Chair thanks the gentleman. The Chair recognizes the gentleman from Ohio, Mr. Brown.

Mr. BROWN. Thank you, Mr. Chairman. In view of my concern about Mr. Gyftopoulos' corporation, I want to ask a couple of questions for the record. How many contracts have you had in the last 4 years with the Federal Government, Dr. Gyftopoulos?

Mr. GYFTOPOULOS. You mean Thermo Electron Corp., or personally myself?

Mr. BROWN. Both.

Mr. GYFTOPOULOS. At the Massachusetts Institute of Technology, I did not have any contracts. The research department of Thermo Electron has an activity which represents about 15 percent of the business, on the order of \$8 million to \$10 million and I don't remember the exact fraction that is from the Federal Government but it is less than one-half. Let me put it that way.

Mr. BROWN. Could you submit that for the record and also for the whole company and also outline what activities the company performs for those contracts?

Mr. GYFTOPOULOS. I will be happy to.

[The following material was supplied for the record:]

SUMMARY OF FEDERAL GOVERNMENT CONTRACTS, THERMO ELECTRON CORP., 4-YR PERIOD: JULY 1973-JUNE 1977¹

Contract title	Support agency	Contract No.	Start date	Amount
Study of advanced thermionic conversion concepts.	NASA (Lewis).	NAS3-20959	June 20, 1977	\$275,016
Case study venture analysis.	ERDA	EX-77-C-01-2685	June 1, 1977	388,916
Analysis of N-nitroso compounds in factory environment.	HEW-NIOSH	210-77-0100	May 12, 1977	172,000
Development of chloride extraction processes for metal recovery.	ERDA	EC-77-C-02-4532	May 9, 1977	99,000
Advanced thermionic technology.	ERDA	EU-76-C-02-3056	July 1, 1975	5,474,493
Development of diesel-rankine compound engine for truck application.	ERDA	EY-76-C-02-2832	Nov. 25, 1975	686,414
High-efficiency thermionic-converter studies.	NASA (Lewis).	NAS-3-20202	July 1, 1976	342,845
Implant power generating for industrial conservation.	ERDA	E(11-1)-2866	Apr. 26, 1976	90,000
Isolation and purification of suspect N-nitroso from drinking water.	EPA	68-03-2400	Mar. 24, 1976	80,000
Improved energy effectiveness in paper and steel industry.	ERDA	E(11-1)-2831	Mar. 17, 1976	23,643
N-nitroso derivatives of pesticides and other chemicals	NSF	AEN-75-20802	Jan. 2, 1976	404,500
Solar energy for process steam generation.	ERDA	E(11-1)-2732	July 1, 1975	72,527
High-efficiency thermionic-converter studies.	NASA (Lewis).	NAS3-19866	do	418,402
Evaluation of temporary assist pumping devices.	HEW-NIH	N01-HV-5-3008	June 15, 1975	803,311
Not available.	Classified	11994-(011110)-75	Dec. 4, 1974	13,083
Alternative blood pump studies.	HEW-NIH	N01-HV-5-2909	Aug. 8, 1977	831,681
Not available.	Classified	12063	Oct. 1, 1974	54,940
Design study on compounding the internal combustion engine for autos.	EPA	68-03-2129(E11-1)-2690	July 11, 1974	385,294
Improved energy effectiveness in selected industries.	NSF	OEP74-22046-A01	July 10, 1974	90,500
Development and application of methods of N-nitroso compounds.	HEW-NCI	N01-CP-45623	June 28, 1974	268,888
Not available.	Classified	11511	Dec. 14, 1973	51,886
Diesel engine with organic rankine cycle utilizing reject heat.	NSF	AER-73-03286-A01	Dec. 3, 1973	603,100
Study of solid waste as fuel.	EPA	68-03-0355	Nov. 21, 1973	78,091
Unilateral and bilateral cardiac assist devices.	HEW-NIH	N01-HV-4-2910	Aug. 3, 1973	2,104,012
Left ventricular assist pumping.	HEW-NIH	N01HV-3-2946	July 1, 1975	1,310,020
Pathophysiology related to heart implants.	HEW-NIH	N01-HL-73-2945	Nov. 30, 1973	138,041
Left ventricular assist devices.	HEW-NIH	N01-HL-2948	do	159,030
Materials development—flocking material.	HEW-NIH	N01-HV-73-2915	Aug. 8, 1977	748,790
Rankine cycle engine development.	EPA	68-01-0409	Apr. 26, 1974	3,330,444
Fabrication of heart devices.	HEW-NIH	N01-HV-1-2065	Apr. 21, 1974	2,108,973
Right ventricular assist device.	HEW-NIH	NH1-NH11-69-2182	Nov. 30, 1974	1,228,470
Total.				22,836,310

¹ See below:

Thermo Electron Corp. (4-yr period July 1973-June 1977):

Cumulative sales.	\$218,066,000
Revenue from Federal Government contracts.	22,836,310

Mr. BROWN. On the 25th of April 1977, you published a paper entitled "Policy for Industrial Energy Conservation." For whom was that paper prepared?

Mr. GYFTOPOULOS. For anybody that would care to either listen to us or spend the time to read the paper.

Mr. BROWN. Did you present it to anyone in the Federal Government?

Mr. GYFTOPOULOS. Yes.

Mr. BROWN. Who?

Mr. GYFTOPOULOS. To anybody that was willing to devote some time and listen to our story.

Mr. BROWN. Who was it?

Mr. GYFTOPOULOS. Several Members of Congress, members of the staffs of Congressmen and Senators, and the President's staff that was working on the energy plan with whom we were in contact prior to the announcement of the President's energy message.

Mr. BROWN. Did any of your coauthors have any relationship with the Thermo Electron Corp.?

Mr. GYFTOPOULOS. There were four authors of that report. The president of the company, George Hatsopoulos, was one of the authors; Thomas Widmer, vice-president of engineering of Thermo Electron, was the third; and Roger Sant, who used to be with the Federal Energy Administration, was the fourth author.

Mr. BROWN. Does he have a relationship with the corporation?

Mr. GYFTOPOULOS. Roger Sant is associated but not in any important way.

Mr. BROWN. Could you tell me how?

Mr. GYFTOPOULOS. Mr. Brown, I don't know exactly what his relation is but I will be very happy to provide you with the information. I don't know at this moment the exact association.

[The following information was supplied for the record.]

In response to Mr. Brown's question, Mr. Roger Sant is a part-time consultant for Thermo Electron.

Mr. BROWN. On page 3 of your testimony you describe several methods of energy savings in manufacturing. What sort of equipment would be necessary to test for this or to accomplish it and do any of the divisions of Thermo Electron manufacture these devices?

Mr. GYFTOPOULOS. Yes, sir; Thermo Electron is a company that is devoted to the manufacture of industrial processing equipment, and one source of pride of the company is that, even prior to the energy crisis, the oil embargo, they started looking into possibilities of improving energy utilization in this equipment, making it more efficient. So, we are engaged in heat processing equipment, through our furnace division in Detroit, we have a license from the Peter Brotherhood Corp. in England to sell in this country waste heat recovery equipment for low-temperature heat, and we are involved in the manufacture of heat recovery equipment for papermaking through our papermaking equipment division in Worcester, Mass.

Mr. BROWN. What other companies manufacture similar devices and systems? Could you provide that for us?

Mr. GYFTOPOULOS. There are many companies which are much larger than Thermo Electron with regard to the simultaneous generation of electricity and steam. For example, where you approach the problem from the point of view of combining electricity generation with the raising of process steam, all the big companies are involved.

General Electric manufactures turbines that can be used as stopping devices. There are other companies that manufacture heat processing equipment. Our involvement in cogeneration is for waste heat recovery, which is a small fraction of what can be done in terms of cogeneration. Then there is the Solar Co. in California. There are other companies in Connecticut that manufacture low-temperature waste heat recovery turbines.

Mr. BROWN. If you could supply this I would appreciate it.
[The following material was received for the record:]

PRINCIPAL COMPETITORS FOR ENERGY CONSERVATION EQUIPMENT

Geneneral Electric Co.	Ross Engineering
1 River Road	Machinery Division
Schenectady, NY 12305	Midland-Ross Corp.
Westinghouse Electric Corp.	New Brunswick, NJ
P.O. Box 9175	Smith Environmental Corp.
Lester, PA 19113	P.O. Box 3696
Solar Div. of International Harvester	South El Monte, CA
2200 Pacific Highway	Republic Steel Corporation
P.O. Box 80966, San Diego CA	P.O. Box 6778
Trane Co.	Cleveland, OH
3600 Pammel Creek Rd.	Surface Combustion
LaCrosse, WI	A Division of Midland-Ross Corp.
Turbodyne Corp.	2375 Dorr Street
2515 University Ave. S.E.	Toledo, OH
Minneapolis MN	Lindberg Co.
DeLaval Turbine, Inc.	Solar Basics Industries
852 Nottingham Way	2450 West Hubbard Street
Trenton, NJ	Chicago, IL 60612
Elliot Co.	American Shack Company, Inc.
900 N. Fourth St.	P.O. Box 11066
Jeannette, PA	Pittsburgh, PA
Terry Corp.	North American Manufacturing Co.
P.O. Box 1200	4455 E. 71st Street
Hartford, CT	Cleveland, OH
Coppus Engineering Corp.	The Electric Furnace Co.
341 Park Avenue	Salem, OH
Worcester MA	Harrison Radiator Division
Ross Pulp and Paper Division	General Motors
Midland-Ross Corp.	Lockport, NY
304 St. Patrick Street	Selas Corporation of America
LaSalle, Quebec	Dresher, PA
Canada	Pyronics, Inc.
Huyck Drying Products	An Alco Standard Corporate Partner
Division of Huyck Corp.	17700 Miles Avenue
P.O. Box 217	Cleveland, OH
Greenville, TN	Mortan Construction Co.
Ross Engineering Division	15 Belmont Street
Midland-Ross Corp.	Worcester, MA
Dayton, OH	Jensen Inc.
Beloit Corporation	24115 Industrial Park Drive
Beloit, WI	Farmington, MI
Ross Engineering	Dispatch Oven Company
Machinery Division	Division of Dispatch Industries, Inc.
Midland-Ross Corp.	P.O. Box 1320
New Brunswick, NJ	Minneapolis, MN
Overly, Inc.	Trane Thermal Co.
P.O. Box 568	Brook Road
Neenah, WI	Conshohocken, PA
Tech Systems, Inc.	Thermal Transfer
830 Prospect Road	Division of Kleinewefers Corporation
De Pere, WI	1100 Rico Road
	Monroeville, PA

Mr. BROWN. I would like to ask another question and then go on to another witness. Do either the Ford Motor Co. or Ford Foundation or members of the Ford family own any stock in Thermo Electron Corp.? Are you aware of that?

Mr. GYFTOPOULOS. You said too much. The Ford Foundation sponsored a study which I directed several years ago on the possibilities of saving energy in manufacturing. This study resulted in the publication of one of the reports of the Ford Foundation, "Potential Fuel Effectiveness in Industry."

Mr. BROWN. The question was——

Mr. GYFTOPOULOS. You said, "Ford Foundation." That is what I answered.

Mr. BROWN. Does the Ford Foundation, Ford Motor Co., or members of the Ford family own any stock in Thermo Electron Corp.?

Mr. GYFTOPOULOS. I am coming to that, sir. I answered first the question about the Ford Foundation which does not own any stock. The Ford Motor Co. owns stock in Thermo Electron because several years ago it had sponsored a program for the development of an external combustion engine for use in automobiles. The engine was using inorganic material as a working fluid.

The engine progressed satisfactorily, but by the time it had accomplished its goal—namely, that of reducing pollution—the energy crisis came. It turned out that in order to achieve the goal of reducing pollution, you had to use much more fuel, so the Ford Motor Co. lost interest in the further development of that engine, but they still own some stock in the company.

Mr. BROWN. I may have some other, written questions that I will want to ask you if I might. And I would ask, Mr. Chairman, that the record might be left open so that I could present those questions.

Mr. DINGELL. The Chair advises that the record will remain open for a reasonable period of time in order that the questions may be included in the record as needed.

Mr. BROWN. On Tuesday, Mr. Sheldon, the FEA testified that they were limited under existing law as to what would be in the area of industrial energy conservation reporting. Mr. O'Leary testified that a memo was in the process then of being prepared for the legal side of FEA to advise him they were limited in certain ways.

As a representative of an association that has participated in a program from the beginning, would you comment on FEA's testimony as follows: The question of whether disaggregated reporting would be possible in the EPCA authority.

Mr. SHELDON. It is our belief that it is entirely the way the numbers are presently put together, and it was our experience in the early days of working with FEA that if the people within FEA and the people in industry are truly desirous of getting together and working out a solution, it was very possible.

Mr. BROWN. How about disaggregated reports that are targets? Do they have authority to request this information?

Mr. SHELDON. We believe they do; yes.

I might add that the reporting that many of us are doing is much more disaggregated than just two digit. We report by process. Other companies are reporting almost on a four-digit basis now.

Mr. BROWN. For publicly available records that FEA could get?

Mr. SHELDON. We are reporting to FEA those numbers——

Mr. BROWN. So they have them?

Mr. SHELDON. They have them.

Mr. BROWN. There was a lot of chitchat about how they did not have it. Everything was put together——

Mr. SHELDON. I believe this might be true for a couple of industries, but I think, of the 10 industries involved, 3 are fully complying in all respects in FEA's words, the words of people that were sitting here.

Mr. BROWN. But the impression was left that, for instance, ferrous metals were all aggregated together, and that is not correct; is that right?

Mr. SHELDON. Different companies in the industry give different reporting, and all I can speak of are the industries I am acquainted with. They are reporting on a disaggregated basis.

Mr. BROWN. Mandatory direct reporting.

Mr. SHELDON. We, of course, don't believe this is necessary, but one of the provisions of Public Law 94-163 was that there would be direct mandatory reporting. The bill is definitely for direct mandatory reporting. But this subcommittee wisely put in a provision 376(g) that if reporting was being done in an adequate manner as the word of the law "adequate," it would be unnecessary for those companies adequately reporting through a third party to report directly, and the definition of "adequate" is left by the law to FEA. They define what is adequate and what is not.

Mr. BROWN. So if it is inadequate, they can go behind it and get it?

Mr. SHELDON. All they have to do is enforce or change the definition.

Mr. BROWN. Standard plant level reporting.

Mr. SHELDON. There is no way an industry made up of a number of plants such as all the industries involved that I know of in the 10 can aggregate data without starting at the plant level. We have plant level reports in our headquarters. We told FEA, as I said in my testimony, "You can come out and audit any time. It is available. We will take you back from the corporate level to the plant."

Mr. BROWN. They have the authority to get it if the company wanted to withhold it.

Mr. SHELDON. They have the authority, and they told us all the way along, like a club over our head, that: "We can come out and look at your data any time we want to."

Mr. BROWN. This survey of second law thermodynamics applicability——

Mr. SHELDON. It is our opinion, as the two gentlemen on my left have both stated, that a study should be made in this matter before any demonstration plan or project is entered into by the Government. We think it could be very wasteful.

Mr. BROWN. The question is: Do they have the authority to undertake such a survey?

Mr. SHELDON. I would like to suggest to you, sir, that FEA must have thought they had the authority because on January 31, 1975, they received a report from Battelle Institute in Columbus, Ohio, on this very matter and, in the abstract of this report, it says:

A computer model is developed to perform the necessary calculations the model performs, the customary energy balances based on the first law of thermodynamics. More importantly, availability losses are calculated according to the second law of thermodynamics. The model is general and can be applied to an entire industrial process or to any of the unit operations which are employed within the process.

I have to raise a question of why, if this is such a good idea, FEA made no use of this report which they had Battelle do for them, and it is a report that is quite thick.

Mr. BROWN. I ask unanimous consent that that material from which he was reading be submitted for the record.

Mr. DINGELL. The Chair has no objection to it. I am not sure we want reports that thick in the record.

Mr. SHELDON. We can give you the abstract of it.

Mr. DINGELL. The abstract I don't have objection to. Without objection, it is ordered.

[The following material was received for the record:]

DRAFT FINAL REPORT ON EVALUATION OF THE THEORETICAL POTENTIAL FOR ENERGY CONSERVATION IN SEVEN BASIC INDUSTRIES TO FEDERAL ENERGY ADMINISTRATION

(By E. H. Hall, W. T. Hanna, L. D. Reed, J. Varga Jr., D. N. Williams, B. E. Johnson, W. J. Mueller, E. J. Bradbury, and W. J. Frederick)

"The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies of the U.S. Government."

ABSTRACT

The objectives of this study are to determine the minimum theoretical energy requirements in seven basic industries through a thermodynamic analysis of the processes employed in each industry. The study includes the steel, copper, aluminum, glass, synthetic rubber, selected plastics, and paper industries. Results of the calculations for these seven industries include the minimum theoretical energy, the efficiency of selected unit processes, and the effect of certain process changes on the energy use.

A computer model was developed to perform the necessary calculations. The model performs the customary energy balances based on the first law of thermodynamics. More importantly, availability losses are calculated according to the second law of thermodynamics. The model is general and can be applied to an entire industrial process or to any of the unit operations which are employed within the process. The results identify where large energy or availability losses occur. The model can be operated in an interactive mode so that the net fuel savings which could be expected to result from changes in operating conditions and procedures can be computed and displayed in real time. The model is a powerful tool for identifying those operations in which significant fuel savings can be realized through straightforward modifications. On the other hand, the model will also show where the potential for energy conservation is limited by the irreversibilities inherent in the basic processes employed. In the latter case, different, more reversible, processes would have to be employed to further reduce energy consumption. Such a definition of the nature of the various availability losses is invaluable in directing the attention of process engineers to those operations which offer the greatest potential for overall fuel savings.

Mr. DINGELL. The time of the gentleman has expired. The Chair observes we have a vote on the floor. We will therefore adjourn the hearing pending the call of the Chair.

[The following statement was received for the record:]

STATEMENT OF THE MACHINERY AND ALLIED PRODUCTS INSTITUTE

INTRODUCTION

The Machinery and Allied Products Institute is pleased to have this opportunity to comment to the House Interstate and Foreign Commerce Subcommittee on Energy and Power concerning H.R. 8985 and the related provisions of S. 2057

to regulate the energy efficiency of industrial equipment. We request that this Statement be entered in the record of the public hearings to be held by your Subcommittee on Tuesday, September 27.

Before proceeding in detail with our comments, we should like to emphasize one central point: American business, including industrial equipment manufacturers, is already regulated to an extreme. Enactment of the type of statutory requirement proposed with respect to energy efficiency of industrial equipment would create a regulatory nightmare, not only for affected business but for government as well.

As the Subcommittee knows, S. 2057 has been passed by the Senate, including provisions for the setting of industrial energy efficiency standards, but H.R. 8444, the House-passed omnibus energy bill, does not contain comparable provisions. We assume that the purpose of introducing H.R. 8985 on September 8 with hearings to follow on the bill on September 27 is to establish a record of proceedings in the House on the subject for purposes of the upcoming House-Senate conference on energy legislation.

To summarize our thoughts on H.R. 8985, we of course do not oppose energy efficiency in industrial or any other form of equipment. Also, we are fully aware of the need for cooperation in the national energy conservation effort by all sectors of the economy. Still, we cannot at this time accept any such program as is described in H.R. 8985 or in Part A of Title IV of S. 2057 for the following reasons:

1. The industrial sector of the economy already is participating vigorously and effectively in the national energy conservation effort on a voluntary basis, and will increasingly do so.

2. Contrary to some assertions, energy efficiency is fast becoming an important competitive factor in purchasing decisions involving industrial equipment, without government requirements that this happen. Also, FEA has recently testified in opposition to mandatory energy efficiency standards for industrial equipment.

3. The new program of controls here in question would cause government to intrude in a costly and unnecessary way in industrial equipment markets.

4. The envisioned program is not consistent with the rest of the energy conservation program being developed by Congress.

5. Inadequate consideration was given to relevant provisions of S. 2057 in the Senate, and we question whether enough time can be given to the subject in the House of Representatives without carrying the matter over to the next Session.

Our more detailed comments on the proposal in issue are set forth following a summary of its major provisions.

H.R. 8985 AND RELATED SENATE-APPROVED LEGISLATION, IN BRIEF

Both H.R. 8985 and Part A of Title IV of S. 2057 would amend Title III of the Energy Policy and Conservation Act (EPCA), and the new authorities conferred by the legislation would be administered by the Federal Energy Administration (FEA).

Summary of H.R. 8985

Electric motors and pumps.—Under this bill, within three years of enactment, FEA would have to prescribe for electric motors and pumps, or classes thereof, (1) test procedures, (2) labeling requirements, and (3) energy efficiency standards. In that connection, FEA would be authorized to establish classes of electric motors and pumps, taking into account the size; function; type of energy consumed; method of manufacture; energy efficiency; methods and procedures, if any, for determining energy efficiency; and other factors determined to be appropriate.

Under some circumstances, FEA could include within the meaning of electric motors or pumps any class of such equipment which is a component part of consumer products. Also, FEA could exclude from the efficiency standards and other requirements any class of electric motors or pumps where significant energy savings would not be likely to result from the requirements or a test procedure meeting statutory specifications could not be developed.

Other industrial equipment.—As to other industrial equipment, within three years of enactment, FEA would have to conduct a study of the practicability and effects of requiring that specified types of industrial equipment be included in the program for purposes of test procedures, labeling requirements, and energy efficiency standards. The types of equipment in question are motors (other than electric motors); compressors; fans and blowers; refrigeration equipment; air conditioning equipment; electric lighting equipment; electric arc equipment; ovens; furnaces, kilns, evaporators, and dryers; and such other equipment as FEA deems appropriate.

After the study, FEA would submit a report to the Congress on its findings, together with recommendations for legislation under which all or some of the equipment would be subject to energy efficiency standards and related requirements.

Energy efficiency standards.—As to the energy efficiency standards to be issued by FEA for industrial equipment, they would have to be designed to achieve the maximum improvement in energy efficiency which FEA deems is technologically feasible and economically justified. Those standards would have to be phased in over a period not to exceed five years through the use of interim standards. In determining the economic justification for a standard, FEA would be required by law to consider such matters as the following:

1. The economic impact of the standard on manufacturers and purchasers of the equipment;
2. Savings in operating costs likely to result from the standard throughout the estimated average life of the equipment;
3. The total energy savings likely to result directly from the imposition of the standard;
4. Any likely increase in the initial charge for, and the expenses of maintenance, repair, or use of, the equipment so regulated;
5. Any likely lessening of the utility or the performance of the equipment due to the standard;
6. The impact of any likely lessening of competition because of the standard, as determined by the Attorney General; and
7. Any other factors FEA considers relevant.

FEA would be authorized to grant exemptions from its industrial equipment energy efficiency standards in certain cases of small businesses determined to face serious economic hardship because of the requirements.

Other sections.—Other sections of H.R. 8985 deal with such matters as definitions; test procedures; labeling requirements; administrative procedure; enforcement; judicial review; an FEA report to Congress on progress with the program; and an authorization of appropriations.

S. 2057 and H.R. 8985 compared

In principle, H.R. 8985 and Part A of Title IV of S. 2057 are alike. One key difference is in the application of energy efficiency standards to industrial equipment other than electric motors and pumps.

As already noted, H.R. 8985 would require that FEA conduct a feasibility study to determine whether other equipment should be covered by such standards, to be followed by a report to Congress with recommendations for legislation to extend the program to other types of equipment. In contrast, under the related provisions of S. 2057, FEA would be given authority at the outset to cover other types of industrial equipment if that is deemed appropriate.

COMMENTS ON THE PROPOSAL

Based on our own observations and the energy policy discussions which have taken place thus far in the current Congress, we have concluded that national energy conservation goals might better be attained through less rather than more government control. The approach of S. 2057 and H.R. 8985 in regard to industrial equipment, in contrast, is to force conservation by government program and mandate. We find this objectionable for the reasons summarized earlier and described in more detail below.

Voluntary energy conservation

At the outset, we should repeat that the industrial sector of the economy is participating vigorously and effectively in the national energy conservation effort. Since the Arab oil embargo of 1973-74, many companies have instituted affirmative policies of energy conservation; appointed staff officers to coordinate corporate energy policies and assure compliance; and have implemented many programs to curb waste and increase energy efficiency. In case after case, companies have recorded dramatic improvements in their energy performance without adversely affecting operations or employment.

Moreover, these companies have undertaken these programs to improve energy efficiency on a voluntary basis. Aside from the cooperation which they might otherwise be expected to give toward achieving important national goals, companies have acted to conserve because it is in their interest to control the spiraling

costs of fuels and energy-intensive goods and activities. Also, the consequences of energy supply interruptions are quite clear to corporate managers now—if they were not already clear before—and energy efficiency has become a priority matter for that reason, too. Documentation of the important role being played by industry in energy conservation is available from both the FEA and the Department of Commerce.

Further as to the corporate interest in energy conservation, it should be apparent that market forces already are operating in a way that is conducive to conservation, and we believe that producers and users of industrial equipment are moving as quickly as conditions will permit to economize in this area. Government could accelerate this movement, in our opinion, by taking affirmative actions to disengage itself from energy markets. As we see it, rising fuel costs will do much to spur energy conservation and development without any government effort at all. We have no such expectation of the mandatory programs now being examined by the Subcommittee.

Energy efficiency and purchasing

In testimony to a Senate Energy and Natural Resources Subcommittee, an official of FEA evidently conveyed to that Subcommittee the impression that equipment energy efficiencies have remained a relatively noncompetitive factor in purchasing decisions. A part of the problem was said to be a lack of awareness of equipment efficiencies and their differences, and FEA reported unsatisfactory experience in trying to institute a voluntary labeling program. Accordingly, although FEA cast its support for a government program of mandatory testing and labeling, it significantly withheld endorsement of the further requirement eventually approved by the Senate for mandatory energy efficiency standards.

In our opinion, it is misleading to state in general terms that energy is not a competitive factor in equipment purchase decisions. Also, we do not necessarily agree that labeling is a major factor in energy efficiency awareness in the case of industrial equipment. Where equipment acquisitions are involved and energy is a significant cost of operation based on past or anticipated experience, purchasing personnel routinely factor in energy efficiency labeling with other expected costs of and returns to capital.¹ Moreover, in most equipment acquisitions of any magnitude, purchasing personnel have access to information on energy consumption and efficiency whether it is displayed on a label or not.

Obviously, we do not contend that energy efficiency is a major factor in purchasing decisions to the point of overshadowing design, technology, service, and other considerations. That may or may not be the case, and the legislation here in issue certainly would not alter the importance of energy efficiency vis-a-vis other equipment purchase considerations. One thing that would elevate the importance of energy in the purchase equation is a still-higher price for fuel. A higher price is virtually certain to come about in the case of the increasingly scarce conventional energy resources, irrespective of whether or not FEA gets the proposed new authority to regulate the energy efficiency of industrial equipment.

A costly and unnecessary program

It goes without saying that H.R. 8985 and its Senate counterpart would be costly, and we firmly believe that it would create an unnecessary government program as well. To take the last point first, we already have indicated that market forces alone, without government "help," have induced special efforts toward industrial energy conservation and that more of the same is in prospect. If conventional fuels are indeed growing scarce, then the usual market forces will operate to produce still more conservation; conversion, where feasible, to more abundant fuels which become price-competitive at higher levels; and more commitment to energy research, development, and supply generally. Nearly all persons interested in energy policy now seem to agree that the cost of fuels in this country must sooner or later rise to reflect their replacement values. If it is inevitable that increases will come about and that they will "compel" more conservation, industrial and otherwise, why institute a costly government control program concurrently for the same purpose?

Further as to the "need" for mandatory industrial energy efficiency standards, they are, at the very least, premature. Only two years ago in the Energy Policy

¹ Of course, energy efficiency comparisons may be impossible in the case of custom-made or sole-source equipment.

and Conservation Act (EPCA), Congress required that there be reporting to government by the most energy-consumptive companies on their progress toward achieving government-designated energy efficiency targets by 1980. The reporting arrangements, targets, etc., have just recently been implemented by FEA, the Department of Commerce, and affected major corporate energy users after lengthy studies and related administrative proceedings. Furthermore, the Senate has just voted a substantial enlargement of this program. One wonders whether it would not be both sensible and fair to ascertain progress in industrial energy efficiency under this new EPCA monitoring system before superimposing on the business community yet another costly and unnecessary system of mandatory controls.

We observed earlier that H.R. 8985 and its companion legislation in the Senate would be costly for both government and industry. Our concern in that regard is reinforced by testimony given by FEA to the cognizant Senate Subcommittee, opposing the imposition of industrial energy efficiency standards. In particular on this point, FEA advised that (1) the existence of a standard might tend to narrow the field of production models; (2) some small businesses might not be able to tolerate the cost of retooling; and (3) the diversity of manufactured products might create an excessive administrative burden. The Senate Committee on Energy and Natural Resources chose to discount these assertions, thinking that the problems would not arise if sufficient discretion were given to FEA under the standard-setting program. We are not optimistic about the result.

Further on cost considerations, one need go no further in exploring the cost implications of this legislation than to examine the chore which would be given to FEA. For example, just for an initial task, FEA undoubtedly would have to classify the equipment to be regulated according to size, function, type of energy consumer, method of manufacture, energy efficiency, methods and procedures for determining energy efficiency, and other factors appropriate for the purpose of establishing test procedures, labeling rules, and energy efficiency standards. This classification job alone—without more—would involve a significant number of government and industry personnel in the construction of an elaborate data base. In turn, the classification task would be followed by consulting and other studies, administrative proceedings, etc., associated with the setting of standards and rules themselves. One need only consider the experience of the Environmental Protection Agency (EPA) in issuing noise emission standards under the Noise Control Act of 1972 to know that a large and costly government program would be in store.

As to Part A of Title IV of S. 2057, the Senate Committee on Energy and Natural Resources notes very candidly in its regulatory impact evaluation, "This Part will generate a significant amount of federal rulemaking activity and paperwork." At a time when government paperwork has grown unwieldy—as, perhaps, has government itself—the proposals in question seem especially objectionable.

Consistency of the approach

In our opinion, to mandate energy efficiency is inconsistent with the approach to energy conservation taken in other parts of the omnibus energy legislation now under study. For example, the centerpiece of the national energy plan advanced by the Carter Administration and now being evaluated by Congress is the proposed "Energy Tax Act of 1977." One characteristic of that Act is that it would induce more conservation by making certain fuels and fuel uses more costly through the addition of various excise taxes. Although "undesirable" energy uses would become more expensive, they would not be prohibited. In contrast, the programs now before the Subcommittee would eliminate the element of choice altogether by regulating fuel-inefficient goods out of the marketplace.

Although the coercive approach might be right in other times and other circumstances, it implies a degree of government control and involvement of a much higher magnitude than otherwise reflected in H.R. 8444. We think that requirements for energy efficiency are out of character with the rest of the energy legislation soon to go to conference, and that they are excessive under present conditions.

Inadequate congressional consideration

In our judgment, required standards for industrial energy efficiency should be rejected now irrespective of one's persuasions about energy policy if only because they have not been discussed adequately in public hearings. For example, no hearings were held on this subject on the House side during the development of H.R. 8444, the House-passed omnibus energy bill. H.R. 8985 and the considera-

tion hastily being given to its subject matter at this time strike us as procedural "window dressing" in anticipation of the House-Senate conference on energy conservation legislation. We think this topic should be studied exhaustively for feasibility before it is finally voted up or down by the Congress.

On the Senate side, although the Senate Energy and Natural Resources Subcommittee on Energy Conservation and Regulation gave some time to this subject, it did so briefly in late July. When those hearings were held, public attention in the area of energy policy was almost necessarily focused on actions then being taken by the House Ad Hoc Committee on Energy on H.R. 8444 preceding floor debate. Consequently, there was little testimony, and the public record as it stands on the Senate side is neither representative nor complete on the important matters dealt with in the relevant portion of S. 2057. Indeed, the bill as passed by the Senate is deficient as a result.

Given the congressional calendar and the urgency which has been assigned to omnibus energy legislation, we believe that the incompletely studies concept of mandatory industrial equipment energy efficiency standards should be put aside for now. If the need for such a program exists, Congress can respond to that need in its next Session and give the subject the attention it deserves.

To sum up, no clear and convincing case has been made for H.R. 9885 or its Senate companion legislation, and we believe that they are not appropriate or necessary under current circumstances. We urge that the most careful consideration be given to these proposals by those who must act on them, and we trust that the views set forth herein will be of some use for that purpose.

[Whereupon, at 1:30 p.m., the hearings were adjourned.]

