Y4
.In 8/4
89-40
GOVERNMENT
Storage
1019
89Y4
.In8/4
89-40

Part 1

NORTHEAST POWER FAILURE—NOVEMBER 9, 10, 1965

HEARINGS

BEFORE THE

SPECIAL SUBCOMMITTEE TO INVESTIGATE POWER FAILURES

OF THE

COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE

HOUSE OF REPRESENTATIVES

EIGHTY-NINTH CONGRESS

FIRST AND SECOND SESSIONS

ON

INVESTIGATION OF NORTHEAST POWER FAILURE

DECEMBER 15, 1965; FEBRUARY 24, 25, 1966

Printed for the use of the Committee on Interstate and Foreign Commerce

Serial No. 89–40

KSU LIBRARIES
A11900 806941

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1966

AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE

OREN HARRIS, Arkansas, *Chairman* [1]

HARLEY O. STAGGERS, West Virginia [2]
WALTER ROGERS, Texas
SAMUEL N. FRIEDEL, Maryland
TORBERT H. MACDONALD, Massachusetts
JOHN JARMAN, Oklahoma
LEO W. O'BRIEN, New York
JOHN E. MOSS, California
JOHN D. DINGELL, Michigan
PAUL G. ROGERS, Florida
HORACE R. KORNEGAY, North Carolina
LIONEL VAN DEERLIN, California
J. J. PICKLE, Texas
FRED B. ROONEY, Pennsylvania
JOHN M. MURPHY, New York
DAVID E. SATTERFIELD III, Virginia
DANIEL J. RONAN, Illinois
J. OLIVA HUOT, New Hampshire
JAMES A. MACKAY, Georgia
JOHN J. GILLIGAN, Ohio
CHARLES P. FARNSLEY, Kentucky
JOHN BELL WILLIAMS, Mississippi
BROCK ADAMS, Washington [3]

WILLIAM L. SPRINGER, Illinois
J. ARTHUR YOUNGER, California
SAMUEL L. DEVINE, Ohio
ANCHER NELSEN, Minnesota
HASTINGS KEITH, Massachusetts
WILLARD S. CURTIN, Pennsylvania
GLENN CUNNINGHAM, Nebraska
JAMES T. BROYHILL, North Carolina
JAMES HARVEY, Michigan
ALBERT W. WATSON, South Carolina
TIM LEE CARTER, Kentucky

W. E. WILLIAMSON, *Clerk*
KENNETH J. PAINTER, *Assistant Clerk*

Professional Staff

ANDREW STEVENSON
KURT BORCHARDT
JAMES M. MENGER, Jr.
WILLIAM J. DIXON

SPECIAL SUBCOMMITTEE TO INVESTIGATE POWER FAILURES

WALTER ROGERS, Texas, *Chairman*

FRED B. ROONEY, Pennsylvania
JOHN M. MURPHY, New York
JAMES T. BROYHILL, North Carolina
JAMES HARVEY, Michigan

JOHN KERWIN, *Special Counsel*

---

[1] Resigned as chairman of committee Jan. 12, 1966.
[2] Elected chairman of committee Jan. 13, 1966.
[3] Appointed member of committee Mar. 8, 1966.

CONTENTS

KANSAS STATE UNIVERSITY LIBRARY
OCT 25 1966
MANHATTAN, KANSAS

INVESTIGATION OF NORTHEAST POWER FAILURE

WEDNESDAY, DECEMBER 15, 1965

HOUSE OF REPRESENTATIVES, SPECIAL SUBCOMMITTEE
TO INVESTIGATE ELECTRIC POWER FAILURE OF THE
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to call, in room 2123, Rayburn House Office Building, Hon. Walter Rogers (chairman of the subcommittee) presiding.

Mr. ROGERS of Texas. The Special Subcommittee To Investigate Electric Power Failure will come to order for the consideration of pending business.

We are opening our investigation into the power failure which last November blacked out the Northeastern sector of the United States. We are hearing today from the Federal Power Commission. This is a special subcommittee of the House Committe on Interstate and Foreign Commerce which Chairman Oren Harris appointed last November pursuant to the authorization contained in House Resolution 35. This resolution was adopted last February 10, providing for this committee to make investigations and studies into the adequacy of electric energy resources for defense and the needs of an expanding economy, and into the adequacy, the promotion, the regulation, and the safety of facilities for the generation, transmission, and distribution of electric energy.

Chairman Harris appointed this five-man committee and designated me as the chairman for the purpose of determining the cause of the power failure and to undertake to find a remedy to prevent such a recurrence in the future. I think it would be appropriate if, without objection, we include at this point the announcement in this regard which was made by Chairman Oren Harris. This also includes the request of the Speaker of the House that this special subcommittee be established.

(The announcement follows:)

ANNOUNCEMENT OF INVESTIGATION OF ELECTRIC POWER FAILURE,
NOVEMBER 16, 1965

Congressman Oren Harris (D., Ark.), Chairman, House Committee on Interstate and Foreign Commerce, announced today that on request of the Speaker of the House, the Hon. John W. McCormack, he is establishing a Special Subcommittee of the Commerce Committee to investigate the sudden and unrealistic power failure which recently blacked out the Northeastern sector of the United States.

He has designated the Hon. Walter Rogers (D., Texas) to head up the investigation and named to served with him the Hon. Fred B. Rooney (D., Pa.), the

Hon. John M. Murphy (D., N.Y.), the Hon. James T. Broyhill, (R., N.C.) and the Hon. James Harvey (R., Mich.).

The mystery that shrouds this unheralded, sudden, and drastic event which brought darkness and serious difficulties to millions of consumers requires a careful and thorough investigation by the committee.

This unexplained failure of electric power over such an extensive area involves several private and public utility companies and innumerable generating facilities throughout the area.

I am directing the subcommittee to determine the cause of the power failure and just who or what was responsible for the wide scale darkness cast on millions of consumers. The committee will thoroughly study and investigate whether or not it is the system under a general policy, or carelessness on the part of any company or companies, or if there was just insufficient electric power throughout the area. If determined to be the latter—why should the entire northeast section of the country be so suddenly cast into darkness?

The Federal Power Commission appropriately is inquiring into this event which brought near catastrophe by a failure which was thought to be impossible. No doubt an interim report will be forthcoming. However, a matter of this enormity also requires prompt attention by the Congress.

In addition to determining the cause and who, if anyone, is responsible, the subcommittee will undertake to find a remedy to prevent such an occurrence in the future—a recurrence on even a broader scale throughout the United States would indeed be fraught with danger. It may be that additional legislation will be necessary.

In view of the necessity of getting such a study underway, and the importance of the problem in this technological and highly scientific age, I am calling a meeting of the special subcommittee on Monday, November 29, 1965, in Washington, D.C., for the purpose of organizing the investigation and obtaining such staff with expertise in this field as necessary for this responsibility.

Mr. ROGERS of Texas. Let the Chair say further that it is my hope that we will be able to get into the entire electric picture in this country because I think it is definitely of great importance not only to the health and safety of this Nation and the civilian economy, but vitally important to the development of this country.

I think this situation in the Northeast pointed this up very vididly.

Chairman Swidler, we are pleased to have you here this morning, and I note you have your associates with you whom you may wish also to introduce for the record. I assume that you will discuss the findings of the Commission pursuant to the investigation which we know that you have made at the direction of the President. I would think, however, that such discussion would not be limited to the Northeast failure but also take in some of the other incidents which we have had previous to this failure and the one just several days ago, or perhaps I should say the two, that occurred down in Texas.

Let me make this further observation, Mr. Chairman. I want to compliment you and the Federal Power Commission on the manner in which you undertook this investigation in the first instance and the excellent report that you were able to file.

Of course there are many questions left unanswered, but I am sure that this is due primarily to the fact that the information is not readily available and there was such a limited time in which you could do it. I think it is an excellent report, and I think it would be well for everyone to acquaint themselves fully with it.

This morning you are scheduled as the first witness representing the Federal Power Commission. Perhaps the Chair would recognize you now to introduce your colleagues who are with you, Mr. Chairman.

STATEMENT OF HON. JOSEPH C. SWIDLER, CHAIRMAN FEDERAL POWER COMMISSION; ACCOMPANIED BY DAVID S. BLACK, VICE CHAIRMAN; CHARLES R. ROSS, COMMISSIONER; LAWRENCE J. O'CONNOR, COMMISSIONER; CARL E. BAGGE, COMMISSIONER; AND F. STEWART BROWN, CHIEF, BUREAU OF POWER

Mr. SWIDLER. Mr. Chairman, Chairman Harris, members of the committee. The full Commission is here today. On my left, Vice Chairman Black and Commissioner Bagge, and on my right, Commissioner Ross and Commissioner O'Connor.

I want to thank you, Mr. Chairman, for your kind opening statement.

I am glad to respond to your invitation to discuss the power failure which occurred in the Northeast on November 9 and 10, 1965. This incident, which has left a deep impression on the minds of the American people, has raised a general question of the reliability of power service throughout the country. It is, of course, the broad national perspective in which this committee and the Congress are interested. I shall, therefore, attempt to discuss this power failure and other recent interruptions of power service in various parts of the country as aspects of the overall question of the national interest in encouraging the highest practicable degree of reliability of electric power supply, and from your opening statement, Mr. Rogers, this is apparently the way you want me to proceed.

Mr. ROGERS of Texas. Yes, sir.

Mr. SWIDLER. I am sure that you all know that on the evening of November 9, within hours after the blackout first occurred, the President requested the Federal Power Commission to undertake a complete investigation and submit a report to him. The investigation was initiated the same evening and the report to which you have referred was submitted to the President on December 6.

Each member of this committee has been supplied with a copy. The Commission's investigation is continuing, with the aid and assistance of representatives of all segments of the electric power industry. Undoubtedly the Commission will be issuing further reports from time to time as its investigation develops.

Mr. Chairman, I know that the report is rather bulky. It contains a great deal of basic information and I am going to try to avoid repetition. I shall be referring to some of the exhibits in the report and it may be that you would want to put a part or all of it in the record of this proceeding.

Mr. ROGERS of Texas. I think, Mr. Chairman, that appropriate parts of it, if not the entire report, will be included in the record at the appropriate time.

(The report referred to will be found in the subcommittee files.)

Mr. SWIDLER. Very good.

Without undue repetition of the facts set out in the report, I shall summarize the outstanding features of the Northeast blackout, as a background for consideration of the policy implications of the problem of electric service reliability.

The Northeast power failure was not the first which has occurred, by any means. On the contrary there have been occasional service

outages on every power system from the birth of the industry. The record of the industry is, nevertheless, one of constantly improving performance. As the industry has grown, service has improved, but there has also been a constantly increasing reliance upon electric power service which now has become an indispensable element of almost every economic activity.

In 1940, electricity accounted for only 12 percent of our Nation's energy; in 1960 it accounted for 20 percent; and by 1980 it is expected to account for 30 percent. The industry is producing over a trillion kilowatt hours a year, over 5 times the 1940 production.

Beyond mere numbers is the fact that because of its convenience and versatility, electricity is used for the most vital equipment in our metropolitan centers, the elevators, the subways, the electronic equipment, and the illumination, which are essential to metropolitan life. Electricity has also become an adjunct of other fuel supply systems, and without it many oil, gas, and coal powered facilities cannot function, and most gasoline pumps cannot operate. Without electricity a city goes dead.

What distinguished the Northeast power failure was that it affected the most heavily urbanized region of the country, that it involved a cascading of trouble from one area to another until 30 million people were affected, and that service was interrupted for extended periods, as much as 14 hours in some sections of New York City. A feature which was particularly troublesome to the public was that it was not associated with any storm or other natural disaster and that the failure developed out of the operation of the power systems themselves.

The triggering moment of the Northeast blackout was 11 seconds after 5:16 p.m. e.s.t. on November 9. As I go through these various power outages I am going to ask Mr. F. Stewart Brown, Chief of the Bureau of Power of the Commission, to indicate locations on the Federal Power Commission's transmission map, which has been placed before you.

At the triggering moment the first of five 230-kilovolt lines, which extend to cities in Ontario from the Beck hydroelectric complex of the Hydro-Electric Power Commission of Ontario on the Niagara River, was opened by the action of a relay designed as backup protection; that is to say, the line was electrically disconnected. The loss of this line caused the remaining four lines to open in rapid succession, all within less than 2.7 seconds.

The Beck hydroelectric complex was also interconnected across the Niagara River into the United States. The main plant of Ontario Hydro at Niagara, the Sir Adam Beck Plant No. 2, which was then generating about 1,280 megawatts, or 1,280,000 kilowatts, continued to function. Of this amount, some 1,060 megawatts had been flowing northeast in the direction of Toronto over the lines which tripped out. In addition, there was a flow of power from the United States over the same lines in the order of approximately 470 megawatts. When these lines failed, the power reversal was therefore on the order of 1,500 megawatts.

The Hydro-Electric Power Commission of Ontario functions as a part of an interconnected group of companies which are known as the CANUSE interconnection after the initials of the group name,

Canada-United States Eastern Interconnection. This group is in turn interconnected with the PJM pool (serving Pennsylvania, New Jersey, Maryland, and the District of Columbia) and with a larger interconnected group of companies known as the Interconnected Systems Group which now covers almost all the remainder of the United States east of the Rockies. The power failure was confined to the CANUSE area and indeed covered most of it. The affected companies are shown on exhibit No. I–E of the December 6 report.

The power reversal of 1,500 megawatts created an enormous surge of power into the United States, which exceeded the capability of the transmission systems in various sections of the CANUSE area. As a result, the automatic circuit breakers operated to disconnect the lines, and the systems at the center of the CANUSE area broke up into four parts electrically isolated from each other and from systems to the south.

In addition, systems at the periphery of CANUSE, the Michigan systems together with the western portion of the Ontario system, and the systems in Maine and a part of New Hampshire, were separated from the interconnected group and continued to function.

This breakup of the CANUSE grid into four affected areas happened within 4 seconds of the initial tripout in Canada. The first area was the Ontario system which was isolated from New York although a portion of it remained interconnected with the Michian companies. The Ontario system itself was divided into three parts. The second area was a portion of upstate New York near the hydroelectric plant of the Power Authority of the State of New York (PASNY) at Massena on the St. Lawrence River, which was able throughout the crisis to continue service to adjacent loads, principally industrial.

Third was the area of western New York near Niagara and the Pennsylvania border, which blacked out as a result of the shutdown of generators by automatic protective devices reacting to the power surge. The remaining area included most of New England, downstate New York and most of the Hudson and Mohawk Valleys. In this last area, which we may call the eastern region, the impact of the power surge remained in doubt for several minutes.

The eastern region as a whole had been importing power from Niagara prior to the disturbance. After the initial breakup of the CANUSE systems it found itself with a deficit in generation in relation to its load. In addition to the loss of the power it had been importing at the outset of the disturbance this region had imposed upon it the loads in upstate New York where generators had tripped out. The generators in this area which were providing spinning reserve—that is, they were on the line but not generating at full capacity—attempted to respond to carry the added load but they were unable to increase their output quickly enough and as a result frequency dropped and the generators were cut off one by one to prevent damage to the units. Some sections in New England were able to isolate themselves in time to avoid shutdown. These pockets of generation, which were principally in Connecticut, carried not inconsiderable loads, aggregating about 500 megawatts, and this capacity proved extremely useful later in helping to restore service in the rest of the eastern region area.

The story is told in much greater detail in the December 6 report.

I have condensed it here in order to permit focusing on the implications with which I am sure this committee is primarily concerned.

As I have said, two of the troublesome features of the power failure are the manner in which it was triggered and the cascading of the failure from one area to another. The relay that tripped the line from Beck to Toronto which was the first to go out, was set in 1963 at a level that was compatible with loads that were then being carried but which have since been increased. However, the relay operated not because the line was overloaded in the sense that it could not safely carry a larger load, but rather because the relay had been set to sense possible short circuits at considerable distances, serving in this respect as backup protection for other relays along the line. Thus, the very effort to provide an extra measure of protection for one type of hazard in itself led to another when the line was later loaded beyond the capacity level for which the relay had been set.

As to the chain of consequences which occurred within seconds and minutes as a result of the power reversal, one can only say that none of the CANUSE systems affected was designed to withstand a power surge of this magnitude. It had never been envisioned that all five of the lines to Toronto might trip out while the Beck generators continued to function. If any of the engineers of the companies contemplated such an incident, it is not reflected in any of the system stability studies which were carried on by the parties.

As I believe you know, new stability studies are being carried on now under the sponsorship of the Federal Power Commission. The criteria of these studies are being established with the advice of a panel of technical experts called together by the Federal Power Commission.

I should now like to mention the problems which confronted the key operating personnel of the companies in southern New York and New England in the critical moments—some 4 to 12 minutes—between the onset of the disturbance at 5:16 p.m. and the collapse of service. In each system or power pool there is a dispatching or control room with operators on duty day and night. The control room of a large system is a very impressive facility.

There is a picture of one control room at page 16 in this report.

An important part of any large power system is the elaborate network of communication equipment the principal purpose of which is to make available, in the control room, instant knowledge of what is happening on the system. There are numerous panels, gages, meters, dials, and lights, in addition to a battery of telephones.

The decision as to what action to take in an emergency is in the hands of the chief system operator on duty at the time. Protective equipment may disconnect lines or shut down generators in a way which the system operator cannot influence, but he has some options and choices and, as we shall see, they can be crucial.

When it became apparent that the so-called eastern region (southern New York and New England) was suffereing a serious deficit in generation, there were at least three choices presented to the system operators. One was to disconnect their own systems from the shortage area and thus isolate themselves from the trouble, provided they had enough generation to carry their own loads. This would, of

course, have increased the immediate problem of the other systems by reducing the size of the pool remaining available to make up the power deficit. Mutual assistance in times of trouble is of course one of the primary reasons why power systems interconnect and the operators in interconnected systems are trained in the tradition of helping each other, a tradition which has helped pull their systems through many an emergency in the past. They were understandably reluctant to pull the disconnecting switches.

A second option was that of shedding load, that is to say, to cut off power service to some of their own distribution operations. This is a fairly easy choice to make where it is possible to disconnect large industrial plants whose requirements may make the difference between load balance and shortage, loads such as the great aluminum complexes in the Tennessee Valley and in the Northwest.

There are few such large power-using industries in the eastern region, and none in New York City. Load shedding of the magnitude which would have been effective would have meant, in New York City, for example, turning off the power at least temporarily for many thousands of customers in order to keep the remainder of the system in operation. Thus, it was not an easy decision either.

The third alternative was to attempt to hold both the interties and the local loads in the hope that the generators on the line would increase their output quickly enough to bring the system into balance and prevent any service disruption, or in the hope that the trouble wherever it might have been (and the system operators were not aware at the time of the nature of the trouble) would soon correct itself.

It is evident from the studies made by the Commission that despite the panoply of dials and lights some of the system operators were working in the dark. Some systems acted quickly enough to save some or all their service areas, but others first waited too long, and then attempted both load shedding and disconnection. In several control rooms operating personnel could not believe what their meters indicated.

Thus, at Boston one operator was trying to adjust the frequency meter, which had correctly changed scale, when his system blacked out. To illustrate: the meter may read from, say, 59 to 61 cycles when operating on one scale and the same dial would indicate from perhaps 55 to 65 cycles when a red light went on, so that the operator had to know which scale it was on. The operator couldn't believe that it had moved to the larger scale, and while he was checking his meters, his system collapsed.

In New York, and in most of the rest of the Northeast, effective action was not taken in time to prevent a service breakdown.

I do not mean by anything that I have said to imply any criticism of the system operators. They faced a very difficult task under trying conditions. It is now apparent that the information available to them and their preparation for it was not adequate to enable them to make quick and informed decisions. The Commission's December 6 report (pp. 16–17) sums up the situation generally in what it says about one system:

> Whether because of lack of clarity in the control room instrumentation or for other reasons, the system operator did not make an immediate, clear-cut decision in this emergency. Availability of clear indications of system frequency together

with standing instructions setting a minimum frequency at which the operator should open ties which were draining power from his system or shed some of his system's loads might have prevented the collapse of the Consolidated Edison system.

Had the blackout been momentary, as are most service failures, or had service been restored in major metropolitan areas in a few minutes or perhaps even within an hour, I doubt that the impact on the public imagination would have been nearly so great. It was the delay in restoring service, and the consequent extension of the blackout to several or many hours, and in New York throughout the night, that has caused so much concern and alarm. Workers isolated in the dark in offices many floors above the street, the breakdown of public transportation which kept workers from their families, the more than one-half million people stranded in the New York subways, the men and women who were immured for hours in elevators stalled in their shafts—for all of them it was an unforgettable experience which the rest of the Nation shared vicariously. It therefore becomes important to consider the problems of restoration of service after a power failure.

Again New York City serves as the best illustration, because here the problems of restoration were the greatest. I believe it illustrates practically every problem with which a power system can be confronted in an emergency of this kind. In the first place, it is very big and size alone presents a problem. The service area of Consolidated Edison is divided into 42 separate districts (called "networks" by the company).

Each district is served from a single substation, and some of the substations serve several districts. The entire system could not be energized simultaneously even if 42 crews were available. Where substations service several districts, they can only be put on one at a time as generation is tailored to the starting load.

One of the biggest problems Consolidated Edison had to face was in the startup of its steamplants. In order to start a steamplant electricity is needed to run the pumps for the boiler feed-water, the coal pulverizing equipment, and other auxiliaries. This requires either outside power or an auxiliary power supply at the station. Consolidated Edison had no auxiliary power supply equipment. It had never assumed or planned for simultaneous loss of its generating stations and disconnection from the CANUSE and PJM systems.

It was therefore impossible to start some of the steamplants, except in a series extending from the Greenwood substation which was supplied from the PJM pool and from the Arthur Kill Plant on Staten Island (which stayed in operation throughout the night and, incidentally, kept Staten Island and a portion of Brooklyn in service) and later to start at the other end of the system when power was brought in from the north over interconnections.

I might add also that the restoration problems were complicated because three major generation units, including the company's largest, were seriously damaged by the shutdown. A special problem arose for Consolidated Edison as the operator of the world's largest network of underground transmission lines because such lines have relatively slow startup characteristics.

Finally, unlike the CANUSE system in general which has some 25 percent hydro capacity, Consolidated Edison has no hydroplants. It

has been granted a license for a pumped storage plant on the Hudson River, but the plant has not yet been constructed. Hydro capacity is very nearly self-starting at all times and usually needs no auxiliary power to restart. Also, it picks up load very quickly and thus is much more valuable as spinning reserve than large steam units which can come on the line only in stages. In the latter, more steam becomes available only as additional fuel is drawn in.

Considering the foregoing problems, coupled with the additional difficulties in transporting crews and materials through a city whose life had been disrupted, one can envision the enormous magnitude of the restoration challenge. The other systems involved were able to restore service in periods varying from a few minutes to a few hours depending on the various factors I have mentioned relating to system startup problems. For Consolidated Edison it took longer.

One of the causes for the cascading of the power failure was the problem of system instability.

Mr. Chairman, if this committee is going to conduct investigations in depth of the power reliability problem, you will be hearing a great deal about system stability. This is a very complex and technical concept, and I might also say a very dull one to nonengineers, and I am not equipped to explain it with precision, but I think I can give you a layman's understanding of what the engineers mean. At any rate, I shall venture where the engineers fear to tread.

As you know, power service in this country is almost universally by alternating current, at a frequency of 60 cycles per second. When we speak of alternating current we are talking about the pulsing of the current back and forth. The series of pulsations transmits energy at the speed of light, 186,000 miles per second. A frequency of 60 cycles per second means that there are 60 plus and minus pulses per second or 3,600 complete cycles per minute. These pulses are created at the generating station by the revolutions of the generator's magnetic poles. The magic number for generator revolutions is, therefore, 3,600 per minute. It is possible to have slower speeds by rearrangement of the poles but the generators must pulse together.

When all the interconnected generators are operating in this coordinated way they are said to be operating in synchronism or in parallel and the system is said to be stable. If loads are suddenly increased or decreased the speed of generators will change momentarily until they adjust to the new loading. Where the load variations are small in relationship to the size of the interconnected system the effect upon frequency is so small as to be negligible. In an interconnected system, the generators will respond to load surges and in effect attempt to assist in restoring stability anywhere on the system within the limits of capacity and of intervening interconnections.

When these surges are of unusually large magnitude in relation to the strength of the system, a great strain may be placed on the network to keep the frequency of generators in various areas of the interconnected network in synchronism and thus keep the system in a stable operating condition. When the load change is well beyond the generating capacity of the interconnected system, considering spinning reserve capacity and transmission line limitations, the drop in frequency will be so marked as to threaten the generating units

with serious damage and in such cases automatic equipment will take them off the line.

The public awareness of the problem of system outage has been heightened by two other outages of substantial proportions which have occurred since November 9. The first took place in an area centering in El Paso, Tex., on December 2. The city of El Paso was without service as were portions of Mexico across the international boundary.

The El Paso system has responsibility for part of the service across the international line. The outage spread to Las Cruces, Alamogordo, and Deming, N. Mex.; to Van Horn, Tex.; and to other points including the White Sands Missile Test Center. The outage of the entire plant was caused by the failure of an alternate regulator to control the pressure at which natural gas used for boiler fuel entered the boilers of the Newman station of the El Paso Electric Co. There are two such regulators which are intended to be used interchangeably. Either one is adequate.

When one regulator was taken out of service, the fuel supply was switched to the alternate regulator which had not been used or cleaned for months. This alternate regulator proved to be clogged with accumulated deposits of oily liquids from the natural gasline.

The El Paso Electric Co. had designed its system so that it could lose the output of its largest generating unit with only a limited loss of service to its consumers based on a manual load shedding program. Unfortunately, both of its largest units were tied into the single clogged regulator which caused a drop in capacity beyond the ability of the system to take.

When the entire Newman plant went out, two other units were tripped out manually to prevent damage due to overloading and the tieline to New Mexico Public Service Co. opened, because of system instability. Service was completely restored in little more than 2 hours, in part through the assistance of interconnections with other systems. Here we have an illustration of the reverse of the problem in New York City and in this Northeast power failure in general, since the El Paso system disturbance was initiated by a fault in the fuel supply to the generating plant, rather than in the transmission system.

December 6, the day that I presented to the President the report on the Northeast power failure, another power failure took place, this one on the system of the Gulf States Utilities Co. It was caused by a short circuit in the supervisory remote controls, which served to open the circuit breakers, thereby disconnecting a transmission line in Texas near the Louisiana boundary and isolating the Sabine generating station from part of its load.

Automatic equipment properly reduced generation around the particular isolated plant, and part of the load which was dropped was picked up by the Nelson generating station in Louisiana through the remaining transmission system. Some Texas load was shed when the system frequency dropped below 56 cycles per second, but service was completely restored within 26 minutes, by connecting the darkened portion of the Gulf States system to the system of Houston Lighting & Power Co.

One recent outage, which took place almost a year ago, on January 28, 1965, has many points in common with the Northeast blackout.

It covered most of Iowa and parts of five other States in the Midwest. It affected a larger area than the Northeast outage but only approximately 2 million people. Service was completely restored within 2½ hours. The Midwest outage was triggered by a loose connection in a protective relay circuit at the Army Corps of Engineers' Fort Randall powerplant, in South Dakota. The relay connection accidentally separated during maintenance and as a result the Fort Randall generating station bus was isolated, dropping six generators (for a total of 240 megawatts of generation) off the line. This loss of generating capacity threw an abnormal load on other sources of supply, and caused the same general type of frequency variations and flow reversals that occurred in the Northeast.

It may be a natural question to ask in light of these system disturbances whether power pools make good sense or whether it would be better to revert to isolated plants or systems. The answer, I believe, is that a power pool planned and operated on a unitary basis provides better and more reliable service than separate systems and that it makes possible far lower cost.

Power pools have been developed in this country, and throughout the world, for the soundest reasons of service improvement as well as cost reduction. They are vital to low-cost energy supply and are equally vital, in my judgment, to the quality of service which this country needs and demands. Isolated electric systems are unthinkable in a modern industrial economy. A suspension bridge in the Northwest collapsed some years ago because of a problem of harmonic vibration, which is a form of instability. We did not stop building bridges. We learned from that experience and now we build better bridges.

The lesson of the Northeast power failure is that we must strengthen our power grids so that they can hold together and continue service in any foreseeable emergency.

In the Commission's report to the President we pointed out that the Canuse system is not a true power pool because it has not been planned as a unit and is not fully integrated. On the contrary, it consists of many entities (and one small pool within the interconnection) which have planned and built their systems independently and have not yet even established a central staff for coordination of system planning.

As we explain in the report, the Canuse interconnection is in a transitional stage from isolated systems to an integrated power pool. We point out several incidents of load surges in other parts of the country of the same general order of magnitude as that which occurred at Niagara. They were accommodated within the power pools and interconnected networks with no widespread service breakdowns and with voltage variations so small as hardly to cause a flicker of lights.

On November 9 a sudden and heavy demand was placed on the Consolidated Edison system by its interconnections with consequences which it could not handle and which resulted in the breakdown of service. On other occasions, however, when it has had trouble within its own system, its interconnections have enabled it to continue service without a pause.

Even today the interconnections are essential to continuity of service while generators are being repaired. Imagine, if you can, the plight

of a major metropolitan center which was not heavily interconnected if it should have generator troubles beyond its capacity to handle. Restoring service over overhead transmission lines is a relatively simple matter, requiring minutes or days at the most, as compared with repairing major items of generating equipment, a task which may take many months.

Power pooling also greatly increases flexibility in the location of generating stations. For one example, power networks permit generating plants to be located at a distance from heavily populated areas and thus to minimize the growing air pollution problem of our metropolitan areas. Also, with the enhanced ability to use large plants and to locate them with relative flexibility, power pools enable utilities to take advantage of the economies of scale in the construction and operation of steamplants and in the purchase and transportation of fuel for these plants. This is especially true for nuclear powerplants where smaller systems otherwise could not utilize this new source of power because of the relatively high cost of constructing and operating small nuclear plants as contrasted with large ones.

I hope I have made clear, Mr. Chairman, the distinction between equipment outage and service outage. Equipment outages are to be expected occasionally in the operation of any mechanical equipment under severe service conditions. A service outage results not because equipment has failed or an operator has committed an error, at least not necessarily, but because in overall system design insufficient account has been taken of the possibility of such failures and errors.

I do not mean to say service outages cannot be reduced—I think they can and should be—but only that in system planning it is customary to make severe assumptions as to foreseeable equipment outages and to plan on enough reserve capability to continue service despite such outages. The basic theory of a power pool is that by spreading the risks among a large number of units and by providing a number of transmission lines to each load area, the usefulness of these reserves can be enhanced and their costs reduced to a minimum.

Before I discuss the question of what this Nation has a right to expect from the electric power industry, perhaps I should say a word about the nature of the industry itself. It is an industry of enormous size and complexity. So far as I am aware, the National Power Survey, which the Commission published last year in two volumes, was the first effort at a comprehensive description of the nature of the industry and how it functions. The industry consists of 3,600 separate units divided into 4 ownership segments: Federal systems, which sell only at wholesale or to large industries; cooperative systems, which are generating an increasing share of their aggregate requirements but which still purchase the major share of their wholesale needs from Federal agencies and private companies; municipal and other public systems, some 2,000 in number, which also generate only a part of their aggregate requirements and buy the rest from Federal and private systems; and, finally, some 400 or 500 private or investor-owned systems which account for some 75 or 80 percent of the totals for the industry, whether measured in terms of revenue, capacity, investment, or number of customers. The 100 largest private systems account for almost 90 percent of the generation of the private segment of the industry, and even this is a very large number.

The Nation's pluralistic power supply system has served the country well. The competition by example between the segments of an inherently monopolistic industry on the whole has been a healthy stimulus for better performance by all. Nevertheless this Nation's uniquely diverse and segmented system of power supply raises special problems in attaining the high degree of coordination needed in order to achieve the most reliable service at the lowest cost consistent with such service.

In effect there are in this country's complex of power supply problems some 3,600 separate centers of decision. Each entity makes its own decisions as to whether, when, and how to install capacity or to interconnect with its neighbors subject, of course, to adequacy of legal authority and the ability to raise money.

Interconnection policy varies widely from company to company and from area to area. Some of the companies are very large and in themselves constitute substantial power pools. Some individual companies operate systems as large as the entire electric systems of several industrialized countries. Some companies are partners in highly developed power pools which plan system additions on a unitary basis with a view to the best possible service and lowest cost for all members of the pool. In other cases there is a dearth of joint planning. Characteristically, in such cases interconnections are light and are used primarily for emergencies or for the occasional exchange of economy energy.

With this enormous institutional complication and a staggering number of entities there is a wide range in management effectiveness. Some entities are technologically alert and highly effective; others are less advanced. I believe that the power pools tend to elevate management standards on the technological level because each profits from the resources and experience of the others.

On the other hand, in a power pool (or even, perhaps especially, in a group of loosely interconnected systems) each system is married to the others and a system weakness in one may work injury to all.

The one clear lesson of the blackout is that there is a profound national interest in this Nation's system of electric power supply. I believe it is a credit to the initiative, technological mastery and public spirit of the managements of these 3,600 systems that we can say that in this country we have on the whole what is probably the most advanced and most reliable power system in the world.

The question is not whether they are providing good service. I believe they are providing 99.99-plus percent service, and that power system managements are universally concerned with improving that service from day to day and year to year. The question is whether in this country, which has made itself dependent to such a high degree upon continuity of power supply, the present standards are sufficiently high, and whether there is anything which the Congress can usefully do without impairing management initiative to assure an even higher degree of dependability and reliability of service.

The role of the Federal Government comes into sharper focus when we realize that the overriding technological facts of the industry mean that each company depends not only on itself but on its brothers over whom it may not have any control.

60-577—66——2

In this context I think it is apparent that State lines have little bearing on the question of the national interest. The exended power outage in New York City happened to originate from an out-of-State source, but it would present the same hazard to the national interest if the interconnections were all within the State of New York.

As an aid to the committee in considering the possibility of contributing to the improvement of power supply in this country by legislative means, it may be helpful to summarize the present reach of the Federal Power Act.

Title I of the act provides only for the licensing of all major hydroelectric plants, except those built by the Federal Government. Titles II and III apply generally to the nonpublic sectors of the industry engaged in interstate commerce, other than those engaged exclusively in retail distribution operations, and provides for extensive economic regulation of the private sector of the industry both with respect to rates and systems of accounts.

There is, however, no licensing system, and no approval is required for generating or transmission facilities. Congress has made no express grant of authority with respect to reliability of service, and the Commission has never undertaken to assert jurisdiction in this field.

With respect to the development of power pools, the Commission's authority on its own initiative is limited to the encouragement of voluntary pooling among the companies for the purpose of assuring an abundant and economical supply of electric energy. This authority the Commission in the last few years has attempted to implement through its national power survey program in cooperation with the various segments of the industry.

It is apparent that if the Congress should desire that the Federal Power Commission be an effective instrument in helping to improve the quality and the reliability of service throughout the country, additional legislation will be necessary. I might add that to undertake any effective program the Commission would need additional funds and staff.

The Commission is discussing among its members various legislative possibilities in the light of the interest of the President and of the Commerce Committees of both Houses. It is giving to this subject the careful scrutiny which its importance deserves, and does not yet have any specific legislative proposal to put before you.

Inasmuch, Mr. Chairman, as this is probably my last opportunity as Chairman of the Commission to present my own views on possible legislation to this committee, I shall do so at this time. With greatest deference to the committee, I would suggest that legislation to meet the problems in this field be drafted around the following considerations:

(1) There is a great and paramount national interest in continuity and reliability of bulk power supply. I contrast this with the distribution of power in the distribution systems. All of the interruptions that I have discussed involve bulk power system disturbances.

(2) Virtually the entire industry is interconnected across State lines and the question of reliability of bulk power supply is beyond

the reach of State agencies. In any case, there is a national interest in the reliability of service in centers of population, industry, and defense installations, irrespective of whether the power is transmitted across State lines.

(3) The electric power industry, including all of the four segments, constitutes a great reservoir of management talent, initiative, and competence. Any legislation should leave upon the shoulders of management the primary responsibility for reliability of power supply.

(4) There would appear to be scope, without undermining the responsibility of utility managements, to confer upon the Federal Power Commission a role in prescribing minimum standards for system design and operation and for intersystem coordination, and for assuring adherence to such standards. Such a role I believe could be established in a way which would stimulate and encourage management and elevate the goals of the industry.

(5) The long-term interest of the United States is in strengthening of the power networks and in the full coordination of the emerging pools for bulk power supply. Congress should consider ways to facilitate the formation and operation of fully coordinated power pools, and to encourage participation by all segments of the industry.

(6) The national interest in reliability of bulk power supply does not depend on the nature of the entity which happens to own the facilities. Therefore, any legislation designed to assure reliability of bulk power supply should cover all entities in the various segments of the industry which are involved in such supply.

This does not necessarily mean that these entities would all be subject to economic regulation. I would assume that the scope of legislation with respect to bulk power supply would be drafted with reliability of service as the controlling criterion.

I am deeply appreciative of this opportunity to appear before you. I am accompanied here by members of the staff who are more familiar with the technical aspects of the power outage problem than I am. Members of the Commission, any of us will be glad to answer any questions which you may wish to address to us.

Mr. ROGERS of Texas. Thank you, Mr. Chairman, for a very straightforward and a very concise statement, considering the items involved and the very complexity of them.

Before we proceed with the questioning, do any of the other members of the Commission have any statements they would like to make?

Mr. O'CONNOR. Yes, Mr. Chairman.

Mr. ROGERS of Texas. Commissioner O'Connor.

Mr. O'CONNOR. I would like to say, that while I generally concur with the statements that Chairman Swidler made, I take exception to recommendations (2) and (4). At this time I haven't had enough familiarity with the reports, which are still in the process of assembling the data, to determine whether I would feel that legislation of the order proposed in items (2) and (4) would be in the best interest of the country.

Mr. ROGERS of Texas. Thank you, Commissioner O'Connor.

Do any of the other members care to make a statement at this time?

If not, we will proceed with the questions and the Chair would point out that we have present with us this morning the distinguished chairman of the full Committee on Interstate and Foreign Commerce, an ex officio member of all subzcommittees. The Chair recognizes him first for questioning. Mr. Harris.

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

Chairman Swidler, I want to join in complimenting you and the Commission for your very fine statements on this highly technical and complicated problem.

Mr. SWIDLER. Thank you, Mr. Chairman.

Mr. HARRIS. I assume this is a statement which the entire Commission subscribes to until you get to the last two pages, the six numbered paragraphs?

Mr. SWIDLER. That is right, sir.

Mr. HARRIS. And to further clarify the statement of Mr. O'Connor a moment ago, did I understand that your statement on page 28, at the bottom of the page, and the succeeding pages was intended to be your own views?

Mr. SWIDLER. Yes, sir.

Mr. HARRIS. And not the views of the Commission in a formal recommendation?

Mr. SWIDLER. Yes, sir. This is a statement of my own views and not necessarily the way the other members of the Commission would phrase their own position.

Mr. HARRIS. That is the way I had interpreted it because you did say that in view of your situation, which I can very well understand, you said that you would, "present my own views on possible legislation."

Mr. SWIDLER. Yes, sir.

Mr. HARRIS. Personally, I am glad to have your views for the record of this committee and for its future consideration.

In view of the statement, let me at this time also compliment you on the outstanding service that you have performed and the leadership that you have provided as Chairman of the Federal Power Commission during these years that you have labored as a member of that most important Commission of our Federal Government.

Mr. SWIDLER. Thank you very much.

Mr. HARRIS. I know it has been a challenging experience for you. It is so with all members of this great Commission, and I know it is not only complicated but highly controversial in respect to many of the issues that come before you. Without indicating that I would share the same views on everything that was accomplished and decided there, and I am sure you do not even as Chairman and the others as members of the Commission, because, like it is in so many other cases under our system, compromise often is necessary in order to perform service, I should like to say I am sure that there are many who feel as I do; they regret to see you leave the Commission, in view of your long experience in this field, and what you have accomplished with your service there and the familiarity with the problems that you have.

Of course we assure you that you carry with you our best wishes in your future endeavors.

Mr. SWIDLER. I want to say not only for myself but, I am sure, for the entire Commission, that we are very grateful for your appraisal of the work that we have done.

Mr. HARRIS. This points up, I think, in a vivid way probably more so than I have observed in a long time, the complete dependence of the American people on the electric power industry. I think it should point up in the minds of everybody the necessity of resolving some of the highly controversial phases of the industry that have been quite apparent throughout my service in the Congress of the United States.

I do not know of any industry where there has been greater competitive realization not only from a personal viewpoint and actual experience of individuals, but from a policy matter insofar as this country is concerned. It is entirely possible we are about to reach the point that, regardless of the bitterness that has gone on, the infighting on policy matters between certain parties in the industry itself, the American people are going to be more interested in the service performed as such than they are with some feud that is going on between certain individuals. I think we have done a commendable thing over the years in bringing service to the people in this country even within this scope of competitive controversy that has gone on so long.

I don't know whether it is best to have a national grid system or not. I assume you feel very strongly that a national grid system is necessary and we have long since reached that stage where we should have it.

Am I correctly construing your views?

Mr. SWIDLER. Mr. Chairman, when you speak of a national grid system, you are using a term which is variously understood. I for one have not recommended and do not now recommend that the Federal Government, for example, build an overriding system of transmission lines which would tie in the various sections of the country. That is the sense in which the term "national grid" is sometimes used.

Mr. HARRIS. I did not so intend in my question.

Mr. SWIDLER. Yes. I just wanted to be sure that my answer was clear. I do strongly believe in the benefits of interconnection and power pooling. In order to intertie across regional lines, I think first it is necessary that the individual systems be strengthened so that in effect the pools grow from within and then interconnect with each other.

I think that there should be, and there has indeed been through the years, a growth and development of these power pools. They have become more numerous. They have become larger. They have become more closely integrated.

But it is a development that has taken place like Topsy. There are enormous variations from company to company, from region to region, from one interconnected group of companies to another. Some of the interconnections are on a highly integrated basis so that within each pool the companies have virtually the same standards as though all of the members of the pool were under common ownership—as though it were all one company. In others the interconnections have not been carried out with the same effort to achieve that concept of unitary operation and unitary design.

I think that these pools should be fostered to the extent that they are economically justified; and that this is not a matter of a priori decision that a pool is always the right thing or that any interconnection which may be proposed should be built, but rather a matter of analyzing the power supply problem in each area with a view to strengthening the systems, improving reliability of service, and reducing the cost of service. I think that this will lead to a great development of power pools and to tying many of the pools together.

Mr. HARRIS. Hasn't the Federal Power Commission proposed, encouraged, urged, and recommended interconnected systems for the last many years, even long before you or any of you came to the Commission?

Mr. SWIDLER. The Federal Power Commission has been operating under a statute which gives the authority to encourage voluntary interconnections, and until 4 years ago that authority was employed only to make studies of the desirability of particular interconnecting lines and not really system studies.

In the last 4 years we have tried to operate on a broader basis and encourage all of the elements of the industry to work together in building and strengthening their power pools.

Mr. HARRIS. If I remember correctly, even back in the early days of the Commission, or certainly soon thereafter, within a relatively short time there came the general policy of encouragement which has been rather consistent through these years, though there has been naturally some shifting of thinking in the Commission from time to time, but basically I think that has been the general trend.

Mr. SWIDLER. Yes, sir.

Mr. HARRIS. Isn't that based on the fact that by interconnecting power pools you can get a much higher load factor that can be utilized in all of the power areas or power productive facilities?

Mr. SWIDLER. It is based on that as one of the principal factors, but there are many benefits to power pooling and all of them have to be evaluated. I mentioned some others. By power pooling it is possible to use more efficient units in an industry where costs go down with scale. It is possible to have greater flexibility in the timing and staggering of these units. It is possible to locate the units where you have greater advantages in fuel supply or in water supply for steam purposes, and it is also possible greatly to reduce the possibilities of outage by the spreading of the risk among the parties in a whole network, provided it is built with a view to enabling each part of the pool to contribute to the solution of emergencies in other parts, so that, while improvement in load factor was perhaps the first of the advantages to be recognized, now the industry sees many, many advantages, and power pooling—the word is used rather loosely—power interconnections, I should say, are far advanced. There are few companies operating today in complete isolation.

Mr. HARRIS. You presented then the other side of the coin when you said that, "each system is married to the others and a system weakness in one may work injury to all"?

Mr. SWIDLER. Yes, sir.

Mr. HARRIS. It seems to me that there is the crux of this inquiry and study.

Mr. SWIDLER. That is a part.

Mr. HARRIS. It seems to me that this presents a problem with which this committee along with your Commission and those in the industry have to come to grips and try to find out what should be done because obviously if you are going to have innumerable weak systems along with the others without some way of overcoming it, I would question the trend of interconnecting all of these systems together.

As a matter of fact, I thought from what I had been told that when one part of a system becomes overloaded, that system then can automatically, with whatever devices or equipment there is on it, go out without knocking out every other system that is interconnected with it. If that can't be done, we are going to subject ourselves to a system that is going to be questionable, No. 1. No. 2, it is going to produce fear in the minds of people, having people living under stress and strain throughout, and then even more important, we are going to be subjected to sabotage in a case of emergency where this country gets involved.

I think those are the problems that are going to have to be dealt with, together with whatever arrangement we have with Canada, as an example, with different lines going across there, if one could knock one of them out, knock them all out, and then knock those five out because they are across the boundaries of the country into another country, and then knock out a system that is serving—what was it? Seventy million people?

Mr. SWIDLER. 30 million, sir.

Mr. HARRIS. 30 million people. That is a lot of people at that.

Mr. SWIDLER. Yes, sir.

Mr. HARRIS. So it seems to me that these questions, as the Chairman said a moment ago, are very important and we are going to have to look beyond the problems that you presented here and the work that your Commission did in trying to smoke this matter out and find out where the trouble was. That is another thing I could not understand. I thought that just by looking at boards and so forth, when it happens, you immediately locate where the trouble is. I know in some utilities that is true. I have seen then. Here we went for days and days before we could ever find out where the trouble developed.

Mr. Rogers said you couldn't see the board—I guess that is right—when all the power went out and the lights went off. I guess they forgot their flashlights.

Mr. SWIDLER. Some did have to use temporary light.

Mr. HARRIS. It raised many questions, and I do have many things in my mind in more detail, but I am sure the other members of the committee want to ask you about some of these. I just wanted to point up some of the things I had in my mind about it and from what little I know about it, it is very involved with highly technical problems, and I am sure the committee does want to go into it in depth.

The American people are entitled to a development of this problem and it is going to take some time to do it, in my judgment. I want to thank you and the other members of the Commission for your devoted attention to the problem and your efforts. I know the committee will appreciate all the assistance that the Commission is going to give in this study.

Thank you, Mr. Chairman.

Mr. ROGERS of Texas. The Chair recognizes the gentleman from North Carolina, Mr. Broyhill.

Mr. BROYHILL. Thank you, Mr. Chairman.

Mr. Chairman, I am very interested in your report this morning and was also interested in reading the report that you submitted to the President on December 6. It is interesting reading and it certainly helped me in coming up with a better understanding of some of the reasons behind the power failure. One thing that impressed me this morning, in your statement, was that, among others, you stated that the operating personnel did not have the proper procedures or instructions to deal with a problem of this magnitude, and also that there was not sufficient planning, I think you said, for simultaneous loss of generating stations as well as at any time that there is disconnection from other systems.

This seems to be a rather serious—I don't want to call it a charge, but at least a statement that these various systems or companies or whoever was providing the transmission of the power did not have these procedures in effect.

I wonder if the Commission is doing anything at this time to see that proper procedures are put into effect and are written and carried out.

Do you have any authority to do this and if you do not, what are you doing?

Mr. SWIDLER. Mr. Broyhill, if I may comment first on the problem of these companies, this was of course the largest blackout in history, and I think none of the companies would claim to have been prepared for it. I think that it has added a new dimension to their thinking and to their preparations for the future, and I am sure that every company in the Canuse interconnection is reviewing its own training procedures and its own operating instructions to reassure itself that this could not happen again. It sometimes takes a shock like this to awaken people. So far as our own activities are concerned, we are working with all of the companies in the area and we have brought together representatives of these companies and a panel of experts who are developing new and more stringent criteria for these stability evaluations, and those will be, and I believe they are now being, carried on with the use of the computer facilities of one of the major equipment manufacturers. So far as a repetition of this precise pattern is concerned, I think that the wheels are in motion which would prevent that, but this not to say that trouble could not come in some other unexpected way.

We are working with the companies in the area, with, of course, what little manpower and what little authority we have, but we are getting a great deal of voluntary cooperation.

The question is whether this situation, where we are doing the best we can under our limitations, working without authority, and without an ample staff, and working in only one area, is an adequate long-term solution, to a national problem. I have suggested, Mr. Broyhill, my own view that it is not, and that the Commission could properly be given authority to prescribe some minimum standards and to assure adherence to those standards.

I don't think that this would interfere with the assumption of management responsibility. On the contrary, it seems to me that we ought to examine their stability studies. We have never seen them before, Mr. Broyhill. They are not required to be filed with us and they weren't filed with us. We should know what assumptions they are making in their stability studies and we should have the resources to evaluate such assumptions.

We should be able to establish, as I say, minimum criteria. We should know what they are doing. I don't want to try to spell out the details. What I am trying to convey to you is that pursuant to the President's request we have conducted this investigation and are making recommendations, and under such authority as we have we are doing whatever we can, but to my mind, in the nature of things, this cannot be enough with present limitations of legislation, manpower, and money.

Mr. BROYHILL. You do say that the companies are voluntarily cooperating 100 percent?

Mr. SWIDLER. I think in the Canuse area we are receiving complete cooperation, and this includes the cooperation of the Ontario Hydro-Electric Commission which has a member on the panel and also of the National Energy Board of Canada, which is roughly the counterpart of the Federal Power Commission, and which is also represented by an observer at the sessions of this group.

Mr. BROYHILL. Getting back to the question that was developed by Chairman Harris, I just want to ask for information this one final question and let some others have some time here.

In regard to a national power pool, would you visualize that this would develop by Federal planning or planned by the FPC, by issuing orders to the various entities, or would you visualize that it would develop internally, that is, with the managements of each of these groups making their own decisions with the advice of the Commission?

Mr. SWIDLER. I don't have language which perhaps would answer your question with precision, but I think that the plans should be developed under the scrutiny of the Federal Power Commission. I don't think that this Commission should take over the planning responsibilities of the industry as a whole. This isn't to say that we shouldn't be in a position perhaps to jog this company or that one, but the great reservoirs of technical ability, the great reservoirs of scientific knowledge, of knowledge of system operations, are in these companies and we could not possibly duplicate it. We shouldn't try. Our role should be rather that of an overseeing agency, of setting standards and assuring compliance, and of scrutinizing what these companies are doing, of setting goals, of trying to bring the parties within the industry together, but I don't visualize, Mr. Broyhill, that we would establish in the Federal Power Commission a design and planning organization and say that we will take on the planning functions for the industry; no, sir.

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

Mr. ROGERS of Texas. Mr. Rooney.

Mr. ROONEY. I too would like to compliment the distinguished Chairman of the FPC and the members of the Commission for a very

exhaustive and complete study of the Northeast power failure. The week after I was appointed by the chairman of our committee to investigate the cause or causes of this blackout I visited Europe and I took it upon myself in the five countries that I visited to discuss with the top power officials in those countries the similar problem—could it or could it not occur in Europe.

I would like to ask the distinguished Chairman whether or not you think an overall integrated grid system not only within the United States, but an integrated system which would include the entire north and central part of this continent, the overall integration of all of the countries involved, would eliminate power failure?

Mr. SWIDLER. Mr. Rooney, you can get complete integration by nationalization or perhaps some equivalent of it, but I think you do it only at a price. There are, as you know, national power systems in most of the countries of the world, and the thought doesn't shock me in principle, but from my own observations, on the whole they are in no better shape than we are. On the contrary, I think that our system of pluralistic power supply has many advantages. It has some disadvantages, and I think that the challenge is to reap the advantages and to plan so as to avoid the disadvantages. You have now 3,600 separate systems, some with strong management, some with weak, in many cases feuding among themselves, and this is not the aspect of our pluralistic system which adds strength to this country. I think that the real challenge is to get the same or a greater degree of effectiveness from our pluralistic power economy while avoiding some of the defects.

This I think is the first challenge. I wouldn't think that you would want to consider a more radical approach until you have tried a system of bringing all of the bulk power supply agencies of the country into good working relations with each other through some kind of overseeing arrangement.

Mr. ROONEY. Mr. Chairman, are you familiar with the Union for the Coordination of the Production and Transmission of Electricity in Europe?

Mr. SWIDLER. Union?

Mr. ROONEY. For the Production and Transmission of Electricity in Europe.

Mr. SWIDLER. Is this one of the agencies——

Mr. ROONEY. UCPTE.

Mr. SWIDLER. Yes.

Mr. ROONEY. On the European Continent eight countries are involved in this network with three other countries assisting as associate members and the countries involved here are Austria, Belgium, France, Italy, Luxembourg, Netherlands, Switzerland, and West Germany.

I have visited, as I said before, five of the countries and of the five countries that I visited they said because of their power pool in Europe this could not possibly happen in any one of those five countries that I visited along with the rest of the European Continent, that this type of power blackout could not occur in Europe, and here we are in the United States where we have all of the facilities, all of the money, and it has occurred here.

Why has it occurred here and why can it not occur over there? Don't you think their system is far superior with their interconnections than the one we have in the United States?

Mr. SWIDLER. I think that the uncoordinated and unsupervised decisionmaking by 3,600 separate enterprises is a great source of weakness in this country; yes, sir.

Mr. ROONEY. Do you not think it is a great source of weakness in Europe where you have 11 countries involved with a certain amount of economic, social, and political problems, and yet they pool all their resources as far as their electricity and power supply?

Why can't it be done here in the United States, in the North American Continent?

Mr. SWIDLER. I think this is a problem for this committee and I have suggested in general terms some measures which look in that direction, Mr. Rooney.

Mr. ROONEY. No further questions.

Mr. ROGERS of Texas. Mr. Harvey?

Mr. ROSS. Mr. Chairman, I would just like to add a comment.

Mr. ROGERS of Texas. Yes, Mr. Ross.

Mr. ROSS. I am not prepared to say at this time that this could not have happened in Europe and at least at this preliminary stage I am not prepared to say that our industry is that badly off.

Mr. ROONEY. Let me say this: Since 1946 and the inception of the UCPTE grid system in Europe it has never occurred, a blackout of this magnitude.

Mr. ROGERS of Texas. Mr. Harvey?

Mr. HARVEY. Thank you, Mr. Chairman.

Chairman Swidler, I would like to refer to your report to the President, if you don't mind, because I have had a chance to sit down and read that over and there are a few points there I would like to ask you questions about.

First of all, let me say I think in the very short time that the Commission had that it is a very excellent report and you should be congratulated because I am sure it must have entailed just tremendous effort on the part of the Commission to put together this very comprehensive report in that short a period of time.

Mr. SWIDLER. Thank you.

Mr. HARVEY. But it did raise several questions in my mind. I would refer you first to page 3 of the report and right at the opening a very basic statement is made with reference to Ontario Hydro-Electric's Back Plant and the Niagara plant of the Power Authority of the State of New York. In that first paragraph you say:

> Combined, these developments constitute the largest concentration of generating capacity in one locality in North America.

My question is, Isn't this large concentration of generating capacity referred to here vulnerable to enemy attack? Couldn't a small amount of sabotage in this same area, for example, cripple the same affected area that suffered this?

Mr. SWIDLER. I am not an expert on the military aspects, although it is obvious, Mr. Harvey, that one of the things we must all keep in mind is the defense consequences of what we do or do not do.

Mr. HARVEY. I think we are conscious of that here in this investigation, too.

Mr. SWIDLER. I am sure you are.

Mr. HARVEY. I feel certain of that.

Mr. SWIDLER. Yes, sir. So far as the vulnerability is concerned, this complex is spread out over an area. It is not a pinpoint. Now, it is true that there are some kinds of defense emergencies in which you could visualize a loss of perhaps all that capacity. I think that this indicates one of the things perhaps that needs to be considered in system planning. Without interconnections you don't solve the problem; you are in worse shape locally if the plant goes out.

To go back to so many little plants dotted all over, that this would not constitute a problem would, I think, be a reversal of what is going on everywhere in the world.

It is hardly thinkable. You don't improve your posture by eliminating the interconnections.

Mr. HARVEY. No, I am not talking about that. I think you would agree with me that this massive concentration here of generating capacity is vulnerable. There is no question about it.

Mr. SWIDLER. I think you have to have a network, Mr. Harvey, that can face even that kind of contingency and be strong enough to withstand the consequences.

Mr. HARVEY. Now I would like to skip over to page 6.

Mr. O'CONNOR. Mr. Harvey, may I interject one point?

Mr. SWIDLER. Yes.

Mr. O'CONNOR. It seems to me that the mass of concentration is at that point because the natural place for it to be is at Niagara Falls. You reduce your total generation and reduce your economics materially, but that massive generation takes advantage of a natural resource at that point, which isn't put there by man.

Mr. HARVEY. No, I am well aware of the geographic reason for locating it there, but I don't think that changes one bit its vulnerability as far as sabotage or as far as our defense considerations are concerned. That is why I question the statement in the report. That this was the largest location I believe of power, in North America.

I want to skip to page 6, if I may, Chairman Swidler. In the second paragraph on page 6 you describe there how after the one line went out that the other four lines going north to Ontario could not carry the load, and as I read that I couldn't help but ask myself the question why couldn't the remaining four lines carry the increased load, as it seems to me that some human here had failed to anticipate other emergencies, because certainly a tornado, an airplane crash, sabotage, a mechanical failure, a bolt of lightning, all sorts of things could have happened to knock out one of these transmission lines, and the very simple fact that this one line went out immediately triggered all the other lines going out. It just seems to me that somebody here failed to anticipate these, so I couldn't help but ask the question why couldn't the other four lines carry the load.

Mr. SWIDLER. They all had a similar relay system. The lines had a capacity perhaps double the amount at which they went out if they had been operated up to the limits of the capacity of the copper or the aluminum and the insulators and so forth. The problem was not in the capacity of the line, but in the tripping of a relay in accordance with its setting. That relay setting was made not to protect this line from being overloaded at that point, but with reference to short circuits that might occur to the north and as a backup for circuit breakers on the line further up.

Mr. HARVEY. But the load has been increased considerably since the relay setting has been made. I don't know how long.

Mr. SWIDLER. Yes, I understood it had and I think that the Ontario Hydro-Electric Commission recognizes that those relay settings should be reviewed.

Mr. HARVEY. My point is this: In my opinion they were not prepared to meet this emergency caused by this reason, but it seems to me they were equally unprepared to meet an emergency caused by a bolt of lightning, a tornado, a plane crash, or any other thing that would have knocked out one of those lines, it seems to me there are many other emergency situations that could have happened that could have brought about exactly the same chain of events that occurred here that they were unprepared to meet.

Mr. SWIDLER. I see your logic, but, of course, they were focusing on an emergency which might be caused by a short circuit farther north. It is true that they took other risks in order to avoid that one, which they thought was the most serious.

Mr. HARVEY. Now I would like to skip to page 7 and maybe you can explain to me. I am a lawyer, not an engineer, but for the life of me I can't understand this language here. The first full paragraph on page 7 starts:

> The backup relay which triggered the blackout was set in 1963 to operate at pproximately 375 mw. The load-carrying capacity of each of the lines is considerably above 375 mw, but it was necessary to set each backup relay to operate at a power level well below the capacity of the line because its function was to detect faults beyond the next switching point from the Beck Plant on the Ontario Hydro system.

I don't have any idea what that means. What are these faults they are talking about?

Mr. SWIDLER. I am a lawyer, too. I was about to tell you that I had completely exhausted my own expertise in trying to explain system stability, so that perhaps you would like a technical explanation from Mr. Brown. I have tried to give you a layman's explanation. Because of voltage drop or some other technical consideration the backup relay at Beck had to be set at a lower level in order to detect a fault on the line at some distance. Would you like to have Mr. Brown attempt to give you the technical reasons for that? This is the best I can do.

Mr. HARVEY. All right. If he can do it very simply. I don't want to take too much time.

Mr. ROGERS of Texas. Will you identify yourself, Mr. Brown?

Mr. BROWN. F. Stewart Brown, Chief, Bureau of Power.

Perhaps I can just begin by saying that these lines are protected by breakers, oil circuit breakers. They are actuated by relays.

Mr. HARVEY. A circuit breaker is just like we have in our house? If we get too much load on there it is going to cut the line out, is that right, so we don't get any power?

Mr. BROWN. That is correct. It cuts out the line from its energy source so that the power that is going through the lines is cut off. If you don't do this you will undoubtedly run the risk of burning out your equipment, so it is essential that cut-outs be provided everywhere in the system.

Mr. HARVEY. Why were these set so low—375 megawatts? What are these faults they were trying to detect, and so forth?

Mr. BROWN. The faults are short-circuits, short-circuits either from a phase—one of the phases of the three-phase transmission line—to ground or a fault from phase to phase. Either one of these is a serious condition.

Mr. HARVEY. Then I find that inconsistent with this next statement here on page 8. Do you have the report in front of you there?

Turn the page over. On page 8 the first sentence says this:

> Ontario Hydro officials have informed us that the personnel operating the Ontario Hydro system were not aware that the relay was set to operate at the 375 megawatt level.

Well, why didn't the operators know that the settings were this figure? That is my question right there. My next question is: Would they have continued to increase the load being carried without regard to the cutout level of 375 megawatts until the disaster occurred from that cutout?

It seems to me this is a very sloppy practice, and I couldn't think that somebody failed to say it in the report. It should be said.

Mr. BROWN. I can tell you now, Mr. Harvey, that of course the practice has been changed. The relays have been reset. My latest information is that they are now set for a lesser length of protection along the line, specifically, 125 percent of the line length from the Beck Plant versus nearly 200 percent of line length which they were protecting originally, so that the reach of the relays as they are now operating is less, but they will not trip at a load of 356 or 375 megawatts. These relays are now set, I believe, at 500 megawatts or higher.

Mr. HARVEY. Now I would just like to skip if I may. I just have another question, Mr. Chairman.

Mr. ROGERS of Texas. Go right ahead.

Mr. HARVEY. Chairman Swidler, I will skip to page 9 and maybe either you or Mr. Brown can answer. I am not sure. Here again we see there in the second column about the middle of the page that—

> The generators at the Beck Plant were not designed with relays to trip them out under these circumstances. While at PASNY's St. Lawrence plant the break of the transmission lines to the loads in Canada had been considered to be a reasonable contingency and provision was made for its occurrence, at Niagara the contingency of the five lines to the north being lost simultaneously was unanticipated.

It seems to me that is a ridiculous conclusion. I couldn't buy that for one minute. As I mentioned, all these other things that could have happened here, it seems to me that it could just as well have been anticipated that these five lines would have been lost. There is one thing I didn't understand about that. Here in the paragraph above, at St. Lawrence we speak of an automatic device which is our governing device, so to speak, on these generators which they have at the St. Lawrence Plant, but which they don't have at the Beck Plant, apparently.

Mr. SWIDLER. They did have it at the Beck Plant, Mr. Harvey, but it was a slower operating device and the problem was that the lines kicked out and this power surge came within a time period which was shorter than the time for which the relays at the Beck Plant were set, so that the Beck Plant continued to operate although it could not transmit any power to the north and the power had to come south and create this surge.

Mr. HARVEY. There are obviously safety devices that could have prevented it, are there not?

Mr. Ross. Mr. Harvey, I believe the story on that is that the automatic trip-out that was installed at St. Lawrence was installed after a fault or an occurrence that happened 4 or 5 years ago and as a result of that experience they wired it so that a portion of generation would trip out when they lost those lines.

This was a different type of protective device. It was designed particularly as a result of the very experience which they did not have at the plant at Beck.

Mr. HARVEY. Are these governing devices installed only after a bad experience? Are they totally uncommon in the industry? That is my question. It seemed to me this would not have happened had these devices been present. That is what I gather from the report.

Mr. SWIDLER. That is right, Mr. Harvey, and I think this is the major point that I tried to make in my testimony, which was that we needed greater uniformity of criteria and we needed an overall view of the possible impact of one system upon another. As long as each company runs its own show, the other members of the pool, although they have a stake in what happens, are not in position to control it and have no real voice in it.

We are now together reviewing these criteria to be sure that they are making assumptions postulating the worst credible conditions which could occur and doing it together and each looking at the systems of the others and putting the whole network on the computing boards of this equipment manufacturer. This was not done before, Mr. Harvey. This is the lesson of the blackout. It was not done before.

Mr. ROGERS of Texas. Would the gentleman yield to the Chairman?

Mr. HARVEY. Yes.

Mr. ROGERS of Texas. Mr. Chairman, who sets these criteria for these circuit breakers and relays in Canada where your report reflects this trouble began?

Mr. SWIDLER. In a loose interconnection such as this I believe each company for itself, sir.

Mr. ROGERS of Texas. Is this a Canadian private company?

Mr. SWIDLER. No, sir. This is the system that is owned by the Province of Ontario. It is the Ontario Hydro-Electric Power Commission.

Mr. ROGERS of Texas. Do they have any provisions having the effect of statutory law as to the relays, the circuit breakers, and the safety devices that would be required?

Mr. SWIDLER. The Ontario Hydro-Electric Commission is one of the great operating public utilities of the world. It is a very large concern with a great history of contribution to the development of Ontario. I think that what happened here is testimony to the need for joint planning rather than, in my judgment, a matter for individual criticism.

Mr. ROGERS of Texas. I wasn't criticizing them. I was just wondering by what authority they did or did not provide certain safety devices. Does the law of Canada require them as a matter of law to provide certain relays or circuit breakers?

Mr. SWIDLER. I believe that their closest counterpart in this country would be the TVA, and they have broad operating authority and

broad managerial flexibility, and I am sure that the nature of the equipment that they use is a matter for management decision.

Mr. ROGERS of Texas. But the source of the trouble, as we find it in this report, would not be in whole or in part under the jurisdiction of the Federal Power Commission, would it, Mr. Swidler?

Mr. SWIDLER. No, it would not be under our jurisdiction at all. I must add, however, that we are receiving the most cordial and unlimited cooperation.

Mr. ROGERS of Texas. Thank you, Mr. Harvey.

Mr. HARVEY. I just have one other question.

Mr. O'CONNOR. Mr. Chairman, I would like to clarify something by asking Mr. Brown a question. Mr. Harvey said that a stroke of lightning or sabotage on one of these lines would accomplish the same thing. It is my understanding that with a stroke of lightning or a sudden fault like that, generation would have been taken off a portion of this line and it wouldn't have had to go to the others. Am I wrong about that?

Mr. BROWN. I think there is no system at the Beck Plant for cutting out generation simultaneously with the loss of a line.

Mr. Ross. Isn't it true with a lightning stroke on that line, the breaker would have opened and reclosed in terms of something less than a second so that you would not have had a cascading effect from one line over to another based purely on a lightning stroke?

Mr. BROWN. Yes. The system is equipped with rapid reclosing of breakers. If a lightning stroke occurs which causes temporary grounding, a breaker will open almost instantaneously—say—in about 4 cycles. There are 60 cycles to a second, so that is a very fast opening; usually the breakers will reclose in a total time of about 20 cycles, or about a third of a second. This is so rapid that you do not lose synchronism of your generating equipment with other units on the line, so as Commissioner Ross indicated, for a lightning stroke which does not damage equipment and inject a permanent short, a rapid reclosing probably would be successful.

Mr. HARVEY. May I ask a question, Mr. Brown, about the other causes I just mentioned; sabotage, for example, on one line, or the jet crash into that one line, or some other factor that would be longer than the instance you are talking about?

Mr. BROWN. I think the answer to that is that it would then be what we might call a permanent short, one that could not be cleared during a recycling or a quick reclosing.

Mr. HARVEY. And they did not anticipate that, I gather.

Mr. BROWN. It would have been similar to this.

Mr. Ross. Mr. Harvey, I think this is an important point: No. 1, there was a relay in existence on the two lines that connect the United States and Canada. Unfortunately, the relay was not set up to protect against this surge of power. No. 2, the aim of system design, as I understand it, is to try to isolate a fault as soon as possible in as small an area as you can, so it will not affect other areas. In fact, this is what the system did try to do. It isolated the PJM interconnection going south into Pennsylvania. The two single-circuit, 345-kilovolt lines that connect basically to New York City did open. In other words, this is exactly what the system was designed to do, and this is

what actually happened. The power surge that we had from Canada was not the primary reason for the outage in New York City. During this period of instability the 345-kilovolt lines and these other interconnections separated, disconnected, as you will. Then what happened was, unfortunately, that the spinning reserve available to the area in north-central New York was not sufficient to carry the load, but the system instability actually was separated as the planners more or less assumed.

My point is that this impact from Canada was not the primary reason for the outage.

Mr. ROGERS of Texas. Will the gentleman yield?

Mr. HARVEY. Yes.

Mr. ROGERS of Texas. Mr. Ross, what do you mean by spinning reserves?

Mr. Ross. As Chairman Swidler pointed out, you had a deficit of generation to supply the load in north-central New York State. The systems were trying to hang together. The New England Electric system and the Con Ed system were trying to supply this deficit. Had they had more spinning reserve, more reserve that could come on the line immediately, the whole thing might have been averted.

Mr. SWIDLER. Spinning reserve, Mr. Chairman, if I may amplify that explanation, is unused capacity in a generator that is already on the line and revolving, but not carrying all the load it is capable of. Sometimes it may not be carrying any load. The interesting thing, which was pointed out in the report to the President, is that the eastern region had enough spinning reserve to make up their deficit. They lacked, I think, about 1,100 megawatts of capacity and they had 1,200 megawatts or more of spinning reserve, but the trouble was that this reserve could not respond quickly enough. Had it been hydro, or even had a large part of it been hydro, there probably would never have been this cascading of failure.

Mr. ROGERS of Texas. Why couldn't it respond quickly enough?

Mr. SWIDLER. Because in steamplants you have to feed in more fuel. You have to put in more steam. In hydro plants your gates open and your power output almost instantly expands to any desired level. In a steamplant it is more gradual. A very large part of the spinning reserve on Consolidated Edison's own system was in itself one big unit; it had either 250 or 300 megawatts of spinning reserve in that unit. At the time that the system went down this unit had speeded up only to the point where it was carrying an additional 100 megawatts of load, so there alone about 150 megawatts or more of spinning reserve went totally unused.

Mr. ROGERS of Texas. Mr. Swidler, if you would let me interrupt you at that particular point, actually we shouldn't call it a spinning reserve because it was not available at the time it was needed, is that right? I mean it was possible to get it, but it wasn't available on a split second.

Mr. SWIDLER. One of the great lessons here is that there must be greater sophistication in evaluating spinning reserves. You can't call everything spinning reserve and figure that you are safe when your spinning reserves match the amount of the possible deficit unless you know that the timing factor will enable you to put it on the line when

the deficit occurs. Some hydro there would have saved the day, but New York City did not have it.

Mr. HARVEY. Mr. Chairman, I only have one other thought and I would like to refer, Chairman Swidler, to page 16 where it shows exhibit—I think that is I–Q——

Mr. SWIDLER. Yes, sir.

Mr. HARVEY. Which is the 65th Street control center of the Consolidated Edison plant, and shows the operations room there. After the upstate generators had been knocked out, there wasn't enough power, as I gather, in the metropolitan areas to suffice.

The one method of saving some of the area would have been, as they say in the report here, to cut off some of the service, and your report there points out that it was the job of one man to pay attention to the dials, as in exhibit I–Q here, and decide what to do. I couldn't help but think this would seem to be the perfect spot for the application of computers to make this decision.

Is that uncommon in the industry? Has thought been given to that?

Mr. SWIDLER. There has been a lot of thought given to it and some of these decisions are computerized, but there is a lot of debate and a good deal to be said on both sides because if you pick a point of separation you may be separating systems and creating a cascading problem which could be avoided if you just knew enough to hold together a little longer. I am not qualified to answer the question in any greater detail.

Mr. HARVEY. We don't want to be critical of those who had to make the decisions because hindsight is a wondeful thing. Nevertheless, doesn't the report show that humans under the tests that were imposed here did not make the proper decision? Let's say they did not make the decision which would have reserved power. The computer would have made those decisions.

Mr. SWIDLER. I have no doubt that there will now be an intensive scrutiny of their implementation of that control. There will be, and I know that there is being made, a review of the instructions to dispatchers, and I have no doubt they will also consider the degree to which computerization would be helpful.

Mr. HARVEY. Thank you very much, Chairman Swidler and members of the Commission. I would like to say once again I think this a tremendous report considering the very brief time in which you had to put it together.

Mr. SWIDLER. Thank you.

Mr. ROGERS of Texas. The Chair will now recognize Mr. Staggers of West Virginia to make a statement. Mr. Staggers.

Mr. STAGGERS. Thank you, Mr. Chairman.

I would like to commend Mr. Harris for having made this hearing possible and also our chairman of the subcommittee, Mr. Rogers, for chairing the hearing. I would like to congratulate you, Mr. Swidler, for your competent and understandable report and for the courage that you have exhibited in your suggestions here.

I would like to say that I personally, and I am sure the committee does, wish you well in private life. I think with the knowledge and the courage that you have exemplified here today that you have helped

the committee considerably. I was interested in the statements of Chief Engineer Brown here of some of the steps that have probably been taken to correct some of these things.

I am very much interested also in the statement of Mr. O'Connor in his disagreement with you, and I am sure that the committee later would like to hear his views, to know what they might be.

I think the whole hearing, so far as I have listened to it, points up the need for this committee or for Congress to take a deeper and a closer look at the problem to determine whether legislation should be coming out of the Congress and, if so, what kind of legislation.

Again, I want to congratulate you and wish you well.

Mr. SWIDLER. Thank you very much, Mr. Staggers.

Mr. ROGERS of Texas. Thank you, Mr. Staggers.

Mr. Ross. Mr. Chairman.

Mr. ROGERS of Texas. Mr. Ross.

Mr. Ross. As it has been indicated this morning, the Commission presently has underway certain studies and I am sure that we would appreciate an opportunity to return as these studies progress to give you our information and our own thoughts on this whole subject matter.

Mr. ROGERS of Texas. Yes. Commissioner Ross, the subcommittee will hope to get those at the appropriate time and I think that at this moment the subcommittee should recess until 2 p.m. this afternoon, at which time we will continue the questions and determine whether or not it will be necessary to meet tomorrow, so the subcommittee will stand in recess until 2 p.m.

(Whereupon, at 12:10 p.m., the committee was recessed, to be reconvened at 2 p.m. the same day.)

AFTER RECESS

(The subcommittee reconvened at 2 p.m., Hon. Walter Rogers, chairman of the subcommittee, presiding.)

Mr. ROGERS of Texas. The special subcommittee will come to order for further proceedings.

Mr. Swidler, there are quite a number of questions, of course, that I have in mind, but I think that really the first one that I ought to start off with is this. I don't know whether you are prepared to answer it or whether you could get prepared to answer it. With relation to the blackout in this country, how much of Canada was blacked out?

Mr. SWIDLER. A large part of Ontario was blacked out. A part of the system near Detroit stayed in service. If you look at page 3——

Mr. ROGERS of Texas. Yes, sir; I have it here.

Mr. SWIDLER (continuing). Of the report, it shows the area in Ontario, and, as indicated there, it is a large area and the blackout period was within the range of 15 minutes to 3 hours.

Mr. ROGERS of Texas. Then according to this scale, what happened in Canada was one of the lesser of the blackout situations insofar as length of time is concerned?

Mr. SWIDLER. I think that Canada had fewer problem of restoration of service than we had in some of our more concentrated areas, areas where there were underground systems and where there was a dearth of hydropower.

Mr. ROGERS of Texas. Yes. That is what I am coming to, Mr. Chairman. The areas in most of New York State, Massachusetts, Connecticut, and Rhode Island are shown to have been blacked out from 3 to 8 hours and a substantial part of New York City was blacked out from 8 to 13 hours. Is it your statement from your findings that the Canadian situation was quickly adjusted because they had access to more hydropower than did the New York or New England area?

Mr. SWIDLER. This was one of the reasons. Each area had its own problems of restoring service, but, as I mentioned, the problems in New York City were the greatest because they had so many difficulties. They had lost three big units. They had all this underground network and there is a real problem in energizing underground transmission lines.

They had 42 sections that they had to energize separately. They had no hydropower. It was a complex of all these things.

Mr. ROGERS of Texas. The power that they were using in the first instance in New York City was basically hydropower, was it not?

Mr. SWIDLER. They were importing a substantial amount of hydropower from the Niagara area.

Mr. ROGERS of Texas. That was coming from the Niagara area?

Mr. SWIDLER. Niagara and St. Lawrence.

Mr. ROGERS of Texas. The separate areas in Canada, were they intertied?

Mr. SWIDLER. They were intertied originally, but they separated into three separate segments of their own. Some of their own transmission lines opened up within Canada. We have treated Ontario as a single area for purposes of this report, and of course we don't have the same responsibility there and have not gone into their problems in the same detail, but we understand their system broke into three separate pieces.

Mr. ROGERS of Texas. And each one of those separate pieces was to a certain degree self-sufficient?

Mr. SWIDLER. I think that is right.

Mr. ROGERS of Texas. Why couldn't that be done in this country?

Mr. SWIDLER. I think, Mr. Rogers, the impression that we had hoped that this report would give and that my testimony would give is that, while the blackout was triggered by this incident at Niagara, the whole train of events need not have happened; I can't tell you why the whole train of consequences ensued as it did.

You can imagine slightly different arrangements, somewhat different decisions, that would have led to a wholly different result. It was a series of mischances that resulted in this wide enlargement of the area of failure and in the long period of restoration of service. I don't think such a combination of things should happen again.

Mr. ROGERS of Texas. I know, but what we are trying to do is find out what the situation is so that we can absolutely prevent it.

Now, Mr. Chairman, with regard to Canada, would you say that the ability to restore service in Canada so quickly as compared with the time required to restore it in this country was due solely to the availability of hydropower?

Mr. SWIDLER. No, sir; not solely. That was one of the things. Not all of the bad things that could have happened did happen. I think I

mentioned to you that in the CONVEX system about a half million kilowatts of load continued to function.

If you will look at this map, you will see that in many of these areas in the United States the outages were only momentary to 15 minutes, and that there were other areas where our history was the same as that in Canada. The outage was only 15 minutes to 3 hours.

Mr. ROGERS of Texas. Why were those out only 15 minutes?

Mr. SWIDLER. Well, if they were able to keep some generation with which to get started, that would help. For example, in Rochester they had their own little hydroplants.

Mr. ROGERS of Texas. In what?

Mr. SWIDLER. Rochester had its own little hydros.

In other areas they didn't have the same problem of underground. They had radial feeders from a few central locations, instead of having to sectionalize a whole metropolitan area as was done in New York City, so I think you get a great many variations, but I understand your viewpoint. You are trying to look at it in the large, and I think I can say looking at it in the large that in the first place these systems ought to be so strong that they would never fail, and in the second place they ought to have procedures available so that if they did fail, they would be put back together in a hurry. I think you have to work on both.

We need a higher development of failure analysis techniques to be sure that everything is tested, that every component is tested in relationship to every other; and then we need to plan on the worst. Suppose something does fail—how can you restore service? It is this double system of safeguards that I think needs to be instituted. This is not an original approach. This is what the industry now attempts, but in a way that is not, to my mind, adequately coordinated or adequately uniform.

Mr. ROGERS of Texas. What other factor besides hydro was highly controlling in getting the Canadian situation corrected quicker than the situation in the United States?

Mr. SWIDLER. The fact that there wasn't much underground.

Mr. ROGERS of Texas. There was not?

Mr. SWIDLER. No underground transmission. That was another factor.

Mr. ROGERS of Texas. Would another factor be the smaller load required in that general area?

Mr. SWIDLER. No, the loads in Ontario are very heavy.

Mr. ROGERS of Texas. Is that in the blacked out area?

Mr. SWIDLER. Yes, the loads in Ontario are very heavy, but there wasn't any single metropolitan center with the load density of New York City or Boston.

Mr. ROGERS of Texas. Are those requirements of heavy load by industry in Ontario?

Mr. SWIDLER. Yes, Ontario has quite a development of high electricity using industry.

Mr. ROGERS of Texas. The type of industry that load shedding would help in getting it restarted?

Mr. SWIDLER. I believe so. In the Toronto area I am told they do have a lot of such loads.

Mr. ROGERS of Texas. Mr. Swidler, the faulty situation originated, according to this report, in Canada.

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. As I asked you this morning, the Federal Power Commission does not have jurisdiction over that in whole or in part?

Mr. SWIDLER. No, sir.

Mr. ROGERS of Texas. The FBI would have no jurisdiction over that operation in whole or in part as far as you know, would it?

Mr. SWIDLER. No, sir.

Mr. ROGERS of Texas. In other words, it was in a foreign country and could have been accomplished by a saboteur as easily as it was accomplished by what you feel in your report was an accident?

Mr. SWIDLER. I don't know whether this could have been accomplished by a saboteur or not, but I do know that there are many effective examples of international cooperation.

Mr. Rooney mentioned one in Europe, and I don't think the fact that the pool is an international one is a barrier as long as both countries work together. I think we do have a history of close and cordial working relationships.

Mr. ROGERS of Texas. I understand that, and I am certainly not reflecting on it. I am merely talking about the possibilities.

Now, an individual could have broken that circuit just the same as that automatic circuit, could he, or she, not?

Mr. SWIDLER. Well, an individual could have broken the circuit breaker either there or in New York City or in Texas.

Mr. ROGERS of Texas. Yes, but if he had broken it there, and the same result had occurred, and these other lines had gone out, the result in the eastern part of the United States would have been the same, wouldn't it?

Mr. SWIDLER. It is apparent that in a power pool everybody may be in the same boat and the kilowatt hours are not respecters of boundaries.

Mr. ROGERS of Texas. Of course that is another thing that I am coming to.

When you speak of a power pool, are you speaking of complete interdependence?

Mr. SWIDLER. I use it more loosely than that to cover interconnected systems.

Mr. ROGERS of Texas. Take, for instance, if you had this power pool or intertie between operations in this country and operations in Canada, and this country had no jurisdiction over the particular situation or the particular point at which a break like this could have occurred, it would be a very dangerous situation from a defensive standpoint under any circumstances; wouldn't it?

Mr. SWIDLER. Mr. Rogers, I am not clear why there would be more likelihood of sabotage in Canada than here.

Mr. ROGERS of Texas. Well, the point is not that there might be more likelihood of sabotage in Canada than there might be here, but my point is we would have no authority or no jurisdiction to use any defensive measures insofar as safeguarding the particular situation or the particular area that would be the focal point from which this sort of thing could start.

Mr. SWIDLER. As I mentioned, I think that we ought to have a double line of defense. We ought to make our systems invulnerable, but, on the other hand, I think we ought to plan so that in case of trouble that we can make the best of it and isolate our systems, or do whatever else may be necessary, to prtoect ourselves.

Mr. ROGERS of Texas. Actually that is what occurred in this situation except it took about from, say, 3 to 15 hours to get it corrected.

Mr. SWIDLER. These things were not done quickly enough to prevent a breakdown of service.

Mr. ROGERS of Texas. In other words, these areas were completely isolated in whole or in part during this period of time, during the period of time it required to get them back into electric service that would meet the requirements of the people in that area?

Mr. SWIDLER. You are talking about Canada now?

Mr. ROGERS of Texas. No; I am talking about the areas in the United States. In other words, if one area had no service for 3 hours then it was actually isolated insofar as many, many things in ordinary operations of everyday life were concerned. It was completely isolated the same as if it had been surrounded by a moat; was it not?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. With regard to the interties in Canada, is it the Beck Station?

Mr. SWIDLER. Yes, sir; Adam Beck.

Mr. ROGERS of Texas. That is located in Canada; is it not?

Mr. SWIDLER. Yes, sir, on the Canadian side of the Niagara River.

Mr. ROGERS of Texas. And completely under their jurisdiction. Are there any of those producing that same amount of electricity or generation of power on our side?

Mr. SWIDLER. There is a plant on our side. The Moses plant on the other side of the river develops our share of the Niagara power. We each have a plant at Niagara.

Mr. ROGERS of Texas. Is the plant that is on the other side of the river under our jurisdiction, under the jurisdiction of the United States, or is it on Canadian soil?

Mr. SWIDLER. No, it belongs to the Power Authority of the State of New York, or PASNY, from the initials.

Mr. ROGERS of Texas. I understand that. Is it policed completely by citizens of the United States?

Mr. SWIDLER. So far as I know it is, yes. By employees of the State of New York.

Mr. ROGERS of Texas. You say so far as you know. Would it be policed otherwise and you not know it?

Mr. SWIDLER. I don't know what their employment policy is. They may be permitted to hire someone who isn't a citizen. I think that the U.S. Government hires some people who aren't citizens. But the people who operat the Moses plant are all employees of the State of New York.

Mr. ROGERS of Texas. Yes, I understand, but what I am thinking about is this: Is the location of the facility itself on foreign soil, which is held by us?

Mr. SWIDLER. No, sir, it is in the United States.

Mr. ROGERS of Texas. It is on American soil.

Mr. SWIDLER. Yes, sir, United States.

Mr. ROGERS of Texas. And of course would be subject to the jurisdiction of the United States?

Mr. SWIDLER. Yes, sir, and it was built under Federal Power Commission license.

Mr. ROGERS of Texas. Yes, sir.

Is power produced in that plant sold in Canada and transmitted through Canada the same as the power that was being transmitted from the Beck plant into New York?

Mr. SWIDLER. You mean does the New York State Power Authority find a market for its power in Canada?

Mr. ROGERS of Texas. Yes, the Canada, through this plant.

Mr. SWIDLER. No, sir, I think the markets of the New York State Power Authority are in the State of New York and to some extent the neighboring States. It sells some of its power in Vermont, I think. There are interchange arrangements with Ontario Hydro. I don't think they sell any firm blocks of power to Canada, but there are interchanges.

Mr. ROGERS of Texas. What I mean is this: Is Canada dependent upon power being produced in the United States, or is it self-sufficient in its power requirements and power needs?

Mr. SWIDLER. I think that the report discloses that at the moment, Ontario is in a pinch and is importing power from the United States.

Mr. ROGERS of Texas. Importing power from the United States?

Mr. SWIDLER. Yes. I think its construction program will make it self-sufficient in the near future. It is adding a great deal of capacity, but at the moment it is a net importer.

Mr. ROGERS of Texas. Did you want to ask a question, Mr. Rooney? The Chair yields to Mr. Rooney.

Mr. ROONEY. What is the percentage of hydroelectric versus thermal in this whole area that has been involved in the blackout?

Mr. SWIDLER. Roughly about a quarter hydroelectric and three-quarters thermal.

Mr. ROONEY. Three-quarters thermal and one-quarter hydroelectric?

Mr. SWIDLER. Yes, sir.

Mr. ROONEY. One other question. When the United States exports power to Canada, is this on a reciprocal basis, or are they charged for it, and vice versa?

Mr. SWIDLER. I don't know. I presume that there are dollar settlements.

In 1964 the net transfers by PASNY to Ontario Hydro at Niagara were 6 million kilowatt-hours, which is a very small amount; and in that same period it received from Ontario 37 million kilowatt-hours at Niagara and 113 million kilowatt-hours at St. Lawrence, so that in 1964 the United States was a net importer. More recently, because of difficulties it has had with some of the units in its large Lakeview plant near Toronto, Canada has been a net importer.

Mr. ROONEY. Why would the thermal power be 75 percent and the hydroelectric power be 25 percent with relation to the Niagara Falls area?

Doesn't most of the power produced in that area come from the falls and why wouldn't it be much higher than 25 percent?

Mr. SWIDLER. It is much higher. I am talking about CANUSE area as a whole. It is much higher in the Niagara area.

Mr. ROONEY. And if it were just reversed, if it were 75 percent hydroelectric power and 25 percent thermal power, this situation couldn't have occurred as drastically as it did; is that correct?

Mr. SWIDLER. I think that is right, Mr. Rooney.

Mr. ROGERS of Texas. Mr. Chairman, now with regard to the hydropower, that hydropower all comes from the Niagara areas?

Mr. SWIDLER. No, sir. I think most of it does, either from Niagara or the St. Lawrence development, but as I mentioned, Rochester has some hydro, and I know that there are hydroplants in Massachusetts and Connecticut. Niagara Mohawk has some hydro. There are hydroplants distributed throughout the area.

Mr. ROGERS of Texas. Percentagewise, how much of that hydro is located in our country as compared to the production in Canada?

Mr. ROSS. I would say that the percent of hydro in the Ontario Hydro system is much higher than ours because of the Sir Adam Beck plant. They have the Massena plant and they have some new development coming along the lines on streams that flow into the Hudson Bay and I would project that it would be much higher than our percentage.

Mr. SWIDLER. That's right. The disproportionate amount of hydro is on the Canadian side.

Mr. ROGERS of Texas. Mr. Chairman, with the situation as it presently stands, this country could be sorely put quickly if the hydro power of Niagara should instantaneously fall into hands unfriendly to us; could it not?

Mr. SWIDLER. You mean on both sides of the river?

Mr. ROGERS of Texas. Well, just on the Canadian side?

Mr. SWIDLER. No, I think that the exchanges are rather modest. The numbers that I mentioned are very small in relation to the total consumption on the American side, and I wouldn't think that the loss of that interconnection would be fatal, although I think that the joint pool is stronger because of Canadian participation.

Mr. ROGERS of Texas. You think that this interconnection should be continued in the future as it has in the past, knowing what we do today about this situation?

Mr. SWIDLER. I think it should be strengthened, Mr. Rogers.

Mr. ROGERS of Texas. When you say strengthened, you mean the joint pool as between the United States and Canada? How would you strengthen it?

Mr. SWIDLER. This panel is now working on new stability criteria. I think we will find that additional links will be necessary, that there will be a need for heavier interconnections. I think they will need to review together all of their relay settings. They may need to improve their communications and instrumentation. They may want to computerize some of their operations. They certainly will want to have a refinement of startup procedures and emergency procedures.

When they have done all that, they will have a pool that is not going to get into trouble.

Mr. ROGERS of Texas. Do you think then that something should be worked out to make the same rules and regulations apply on both sides of the border?

Mr. SWIDLER. I think that if we find the Ontario people don't do their share, we might need to exercise persuasion by diplomatic negotiation, but I don't know any reason, Mr. Rogers, to assume that we will not get entire cooperation on the Canadian side.

Mr. ROGERS of Texas. Now, Mr. Swidler, of course you didn't know of any reason why you could assume that this blackout would occur, because it had been stated by private, public, and political figures that this couldn't happen. To my certain knowledge I have had this said to me many time, and it did happen.

Mr. SWIDLER. But what happened, Mr. Rogers, was not only on the Canadian side.

Mr. ROGERS of Texas. I understand that, but the point I am getting at is this, Mr. Chairman. Don't you think that it is high time that this country take a long look at this situation from the standpoint, well, let's say, of solely defense and not be interdependent or even semidependent upon what might happen in a foreign country, whether it be Canada or some other foreign country?

Mr. SWIDLER. I think maybe you are getting beyond my depth. I had always assumed that our friendship with Canada and our reciprocal trust and working relationships with Canada were a foundation stone of our national policy.

Mr. ROGERS of Texas. I certainly wouldn't reflect on them Mr. Chairman, and I am not intending to. What I am talking about is being realistic about what our needs are and what needs to be done. As I understood you this morning, this whole operation over there is under the Power Authority of the Province of Ontario. As I understand it, that is a public body, is it not?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. And this operation there on the river is a public operation?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. And of course that is completely and wholly without the jurisdiction or control of anyone in this country, whether it be the Federal Power Commission, or the President of the United States, or anyone else; isn't it, Mr. Chairman?

Mr. SWIDLER. That is true, but, on the other hand, we cooperate in many ways and very effectively through joint agencies. The International Joint Commission is one example. Mr. Ross sits as a member of it. I know in the whole world no better opportunity for close and cordial working relationships than between the United States and Canada, so that I don't personally see that this is an element of weakness. If it should become so, I am sure that the Congress will——

Mr. ROGERS of Texas. I don't want to look at it as a question of weakness. I want to look on it as a question of being realistic. I can remember many, many years the friendly and very helpful coordination between this Government and Cuba, and I don't think that exists today. I think the situation with regard to sugar can very well be applied to electric energy, and I don't think this country ought to take the chance. I think it is too great.

However, what I am getting at actually is this. In this situation, do you feel that, if we continue to operate with Canada as we have in the past, a joint commission on power authority or joint commission

to control the generation and distribution or transmission of power from these sources would be in order?

Mr. SWIDLER. There certainly should be a joint agency, Mr. Rogers, I agree with you. I am not sure how formal this needs to be, and I think this would take some exploring. There is in Canada an agency which, as I mentioned, is more or less a counterpart of the Federal Power Commission, the National Energy Board of Canada. Whether either or both of us would need legislation in order to coordinate our activities I am not sure, but I think that there should be joint action, effective joint action, yes, sir.

Mr. ROGERS of Texas. Mr. Chairman, with regard to the relay that went out, that had nothing to do with the operations in this country at all, and the circuit breaker that caused the original flipover that triggered all the rest of it had nothing to do with anything in this country, did it?

Mr. SWIDLER. No, sir, it did not.

Mr. ROGERS of Texas. Let us say that that was a defective relay or a defective circuit breaker that caused this trouble or there were some other defective relays and circuit breakers which continued this sequences of events.

Mr. SWIDLER. It was a poor setting for the relays. Actually the relay functioned in accordance with its setting.

Mr. ROGERS of Texas. Were there any defective relays or circuit breakers in this country that had they been operating correctly would have prevented a portion of this blackout?

Mr. SWIDLER. I don't know that I can answer that question for sure, but for one thing, in restoring service at one station they found that one circuit breaker wouldn't work because the compressed air that was required was exhausted and they had no auxiliary equipment with which to restore pressure. I think the matter of housekeeping on equipment is not all on one side; that all of us need to check up on our housekeeping.

Mr. ROGERS of Texas. Now, Mr. Chairman, are there any regulations, safety or otherwise, requiring these relays and these circuit breakers to be inspected or checked out at certain intervals to be sure they are working?

Mr. SWIDLER. No, sir.

Mr. ROGERS of Texas. You mean under your jurisdiction, or on the State basis?

Mr. SWIDLER. So far as I am aware there is no requirement at all and certainly none under our jurisdiction.

Mr. ROGERS of Texas. How often are these inspected or looked over and tested?

Mr. SWIDLER. I think that varies from company to company, Mr. Rogers.

Mr. ROGERS of Texas. In other words, it is a matter for the company to determine?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. Has there been any controversy, Mr. Chairman, with regard to the money expended to do this being used as a part of the rate base?

Mr. SWIDLER. No, sir. I think now everyone recognizes that the quality of service and reliability of services comes first. Whether

there has been any cutting of corners in order to save money, I don't know, but I think that the primary problem is one of visualizing the contingencies rather than an unwillingness to prepare for them once they are visualized.

Mr. ROGERS of Texas. Your jurisdiction does go to ratemaking and accountkeeping, does it not?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. And it does go to licensing of hydroprojects on streams other than Federal projects?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. You do not license those because of the fact that they are Federal. Has the discussion ever come up or the issue ever come up, Mr. Chairman, with any of the private utilities concerning the use of sizable sums of money to do research in this particular area or in having certain stipulated times at which these different safety factors are inspected and those charges not allowed as a part of the rate base?

Mr. SWIDLER. No. The Federal Power Commission, at least so far as I am aware, has never disallowed or even questioned expenditures for research and development or expenditures for protective equipment, or communications equipment, or other equipment that the companies involved deemed necessary in order to protect reliability of service.

Mr. ROGERS of Texas. Then you feel that this would be a proper charge to be used as a part of the rate base?

Mr. SWIDLER. I certainly do, and this Commission in the last few years has been strongly encouraging the electric power industry to devote more of its money and more of its attention to research and development.

About 2 or 2½ years ago I had the privilege of speaking to the Edison Electric Institute at a convention in Denver and the theme of my talk was that this industry needed more research and that it should gear itself for a faster pace of technological improvement.

Since that time there has been a pickup in the research activity of the industry. I doubt that it has yet reached the level which is required if it is to take advantage of all the technological opportunities which are available.

Mr. ROGERS of Texas. Mr. Chairman, when we are speaking of electric energy we are actually speaking of two primary sources, are we not, hydro and steam?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. There has been a lot of talk about nuclear energy. Nuclear energy is nothing more than the use of nucelar material as a fuel to produce steam to translate into electrical energy, so actually your basic situation insofar as energy is concerned is either hydro or steam?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. And you have various methods of creating that steam. Is it any speedier to do it with nuclear energy than it is with, we will say, gas, or oil, or coal, or whatever fuel you want to burn?

Mr. SWIDLER. I don't know. This is something we hear quite a bit about. We made a point of noting in our report the fact that the two nuclear plants in the area just happened not to be in service then. It

would have been an instructive thing if they had been in service and we could have had a little experience as to the pickup potential of the nuclear plants, but we didn't.

Mr. Ross points out that it is customary to baseload the nuclear plants, in which case if one were on the line it wouldn't have any excess capacity, anyway.

Mr. ROGERS of Texas. That is a question. Wasn't there one nuclear plant in operation?

Mr. SWIDLER. No, sir.

Mr. ROGERS of Texas. Were there just two? I was thinking there were three.

Mr. SWIDLER. There were just two in operation and they both happened to be down.

Mr. ROGERS of Texas. Both were down?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. So you have no yardstick at all with regard to that?

Mr. SWIDLER. No, sir. I am talking about two palnts in the affected area.

Mr. ROGERS of Texas. In the affected area, that is correct, because that is the only only place you could get information?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. With regard to the difference between hydro and steam, hydro of course picks up faster. There is also a difference in the cost of producing that power, is there not, Mr. Chairman?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. And hydro is much cheaper than steam-produced power, is it not?

Mr. SWIDLER. Well, they tend to balance out in overall cost because when a company is trying to decide what its next increment of capacity will be it will pick the cheapest one that will fit into its system, be it hydro or steam. Now, where you have a great block of untapped hydro such as existed on the Niagara and the St. Lawrence, there you can bring in something that has remained untapped because of its very size. You can bring in these great blocks of hydropower which are much cheaper than the prevailing cost of steam power, but by and large when hydro is added it is because that is the cheapest increment and when steam is added it is because that happens to be cheaper, considering not only the operating cost, but the capital charges.

Mr. ROGERS of Texas. With respect to the hydro power that was imported into New York, how far did that have to be carried?

Mr. SWIDLER. The distance from Niagara to New York City is about 400 miles.

Mr. ROGERS of Texas. Was that power transported or transmitted from Niagara to the city of New York?

Mr. SWIDLER. A good deal of it reached the city of New York, yes, sir.

Mr. ROGERS of Texas. Was that alternating or direct?

Mr. SWIDLER. It is all alternating.

Mr. ROGERS of Texas. All alternating and it carried 400 miles into New York?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. What would be the comparison of the cost of that power from the hydroplant to the production of steampower in New York City in the plants that Con Ed had there to be operated?

Mr. SWIDLER. I think I would want to refresh myself on the figures. I think that Con Ed's lowest cost of steam generation now is in the order of 6 mills or more. I don't know what this hydrocost is delivered. I would guess something on the same order.

Mr. ROGERS of Texas. Off the record.

(Discussion off the record.)

Mr. SWIDLER. There is a very serious relationship between the triumph of the Gemini 6 and 7 spacecraft and our subject. In the aerospace industry the problems of computerization, and the failure analysis techniques have been carried to a greater stage of development and refinement than they have elsewhere. I think that the electric power industry has a lot to learn from the aerospace industry on how to eliminate as much as possible of equipment faults and how to include in its planning all of the devices and all of the management techniques for preventing breakdowns and failures.

Mr. ROGERS of Texas. Now, Mr. Chairman, back to the other subject: How far under present conditions can alternating current be transmitted under an economic feasibility yardstick?

Mr. SWIDLER. Probably you know, Mr. Rogers, that the distance that you can transmit is in large measure a function of the size of the block and the voltage at which you transmit. Where there is a large bulk movement as from the Pacific Northwest down to southern California, they are building a combination of alternating current and direct current transmission lines which will move power in combination a thousand miles, roughly. These lines are being built.

Mr. ROGERS of Texas. Yes; I understand.

Mr. SWIDLER. These lines will be 500 kilovolts for the alternating current and there are some such lines in existence. You can't afford to transfer a block of 100,000 kilowatts for a thousand miles, but perhaps you can transport a million kilowatts for a thousand miles.

Mr. ROGERS of Texas. I am speaking of alternating current.

Mr. SWIDLER. I am speaking of alternating current.

Mr. ROGERS of Texas. We are talking about alternating current and direct.

Mr. SWIDLER. This is a combination of alternating and direct. I would say if your block of power is big enough and if you use heavy enough transmission lines, 500 to 1,000 miles is a possibility where there is enough price difference between the receiving end and the originating end to pay for the transmission.

Mr. ROGERS of Texas. How far can you transport direct energy?

Mr. SWIDLER. Direct current?

Mr. ROGERS of Texas. Yes.

Mr. SWIDLER. Perhaps I ought to refer that question to the engineers, but I will say, Chairman Rogers, that the Russians are planning to make use of hydro sites 2,000 miles away from their load centers and they are planning to transmit it. Under modern technology you can move it as far as you need where the cost difference is great enough, if you have a great power river like the Lena or Yenisey in eastern Siberia and great markets in western Siberia, and you can move it, as they are there, a couple of thousand miles. We don't happen to have

conditions like those. We are a smaller country and within this country we have widely dispersed energy resources, so that point-to-point transmission of large blocks of power is not as necessary as it in some other countries.

Mr. ROGERS of Texas. But it is possible to do this?

Mr. SWIDLER. It is possible; yes, sir.

Mr. ROGERS of Texas. If you wanted to.

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. Would the hydropower from Niagara into New York, in your opinion, be cheaper than steam power produced nearer the load center?

Mr. SWIDLER. They must have calculated it as cheaper or I presume they wouldn't have bought it, Mr. Rogers.

Mr. ROGERS of Texas. Would Con Edison have profited by using hydropower from the Niagara area rather than the steam plant power from the sources near New York City?

Mr. SWIDLER. There is only so much power at Niagara and I think they have bought all that they can, so that for their additional requirements they must look elsewhere. We must keep in mind in talking about New York City, that it has special problems of power supply because it is in a peninsula. It is not easy to enter. It is not easy to get fuel in. It is so congested that plants within the city are a nuisance because of the air pollution problem and plants outside the city create problems of transmission and of entry into the New York City area.

It is inherently difficult. When Con Edison wanted to put up a nuclear plant there were a great many objections from people who thought that this was a poor area for a nuclear plant. A lot of people think it is a poor area for a steam plant because of the air pollution problem. Its pumped storage plant didn't suit a lot of local people either so that Con Ed has more than its share of problems in trying to figure out how to get additional increments of power.

Mr. ROGERS of Texas. I am sure it does. Was there any evidence, Mr. Chairman, that any of the steam plants were not being utilized to the extent that they could be used for auxiliary purposes very quickly if something went wrong with this long haul?

Mr. SWIDLER. Oh, yes. I think our report demonstrates that if they had had auxiliaries at some of their steamplants they could have gotten back into production earlier. If they had auxiliaries at their steamplants they wouldn't have damaged these three units. They were damaged because of the lack of auxiliary power supply.

Mr. ROGERS of Texas. An auxiliary is not much of an auxiliary if you can't start it unless the main source of power is available to do it with, is it, because if it is an auxiliary to the main power source you won't need it unless its main source goes off and if the main source goes off you can't start the auxiliary.

Mr. SWIDLER. Consolidated Edison Co. could visualize either that it might lose all of its interconnections, or that it might lose some, or all of its own steamplants, but it did not visualize losing both. It was always assumed that there would be a power supply with which to start the steamplants, either from other steamplants of the company or from the interconnected network. When they lost both their own steamplants and their interconnections at the same time, this was beyond what they had counted on.

There was just one exception. They had one line that stayed in service and one steamplant, the Arthur Kill steamplant, that stayed in service, and these were indeed very useful in getting the rest of the system started.

Mr. ROGERS of Texas. Yes, I can understand that. I appreciate that, but it is a pretty poor explanation to people who are stuck in elevators or a subway for 4 or 5 hours, and they are the ones, of course, that have been complaining most bitterly about this, and I can understand why.

Mr. SWIDLER. I understand that Consolidated Edison has ordered a large number of auxiliary generators. That particular error will not be repeated.

Mr. ROGERS of Texas. In the rate structure situation will Consolidated Edison stand to make more money, or more profit, out of hauling that current from Niagara into New York City than it would operating the steamplants in your opinion?

Mr. SWIDLER. I assume that their overall calculations indicated that Niagara power was cheaper, as I said, or they wouldn't have bought it.

Mr. ROGERS of Texas. What I am really asking, Mr. Chairman, is this: It is my understanding that when that is purchased it is translated into a reduction of cost to the consumer because of the public utility rate fixing structure. Simply because they get power cheaper at Niagara than they would in the steamplant in New York actually results in benefit to the ultimate consumer. Is that correct?

Mr. SWIDLER. Yes. If they save money it should benefit the consumer.

Mr. ROGERS of Texas. In other words, this is all taken into consideration in fixing the rate structure, as I understand it.

Mr. SWIDLER. Yes, sir.

As you know, this Commission does not have jurisdiction over Consolidated Edison Co.'s distribution and I can't really speak as to the details of that. It is under the jurisdiction of the New York Public Service Commission.

Mr. ROGERS of Texas. I understand. What I actually should say is that if it was under the jurisdiction of the Federal Power Commission it would be taken into consideration, because you do in other cases of this particular kind.

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. Now, with regard to the power intertie or pooling—and I think you explained it very clearly this morning—the difference between a general national intertie which has been quite controversial in the news for some time, and power pooling, for instance, most of the electric systems east of the Mississippi River are more or less in power pools that are interconnected in a giant overall pool, are they not?

Mr. SWIDLER. Yes, giant overall interconnection.

I would not call it a pool. If you are making a distinction, I would call it an interconnection.

Mr. ROGERS of Texas. These pools are interdependent on the north pool for their source of power? Mr. SWIDLER. Yes, there is a degree of interdependence within the Interconnected Systems Group.

There are some individual pools of great strength. There are also other systems which are only loosely interconnected. I think you would find quite a variety of conditions throughout that area.

Mr. ROGERS of Texas.How many areas east of the Mississippi would you say would not be in a power pool?

Mr. SWIDLER. If I can define terms a little bit.

Mr. ROGERS of Texas. Yes, sir, I wish you would.

Mr. SWIDLER. Of course many, many companies operate systems which are internally substantial pools in themselves. For example, the TVA system is something approaching 20 million kilowatts of capacity. It is roughly comparable to the whole Canuse network. The American Electric Power System is another illustration of a group of companies under a single holding company sponsorship which operate, as I understand it, as a unit. Now, there are a number of those.

One of the groups in New England has operated on pool principles. This is CONVEX. They did better than most of their neighbors in this power failure. PJM, the Pennsylvania, Jersey, Maryland interconnection, which includes the District of Columbia, is operated on pool principles.

I am not undertaking to say that these people are really fully integrated, but I think they are working on it. At least this is their goal. They do have a central staff, and they do approach their problems from an overall unitary point of view.

Now, there are many other companies that are linked into these pools and among them. These linkages vary considerably in their adequacy.

Now, that does not necessarily mean that they are a hazard, provided that they operate in such a way as not to permit cascading, provided they are prepared, if something beyond their ability to take happens, to make the best of it, rather than the worst of it.

But I think there is a great deal to be done to improve these linkages so that the systems will be invulnerable.

Mr. ROGERS of Texas. You mean invulnerable from internal situations, or invulnerable from one of the other systems? In other words, if they were interdependent on each other, you could very well have a repeat of what happened in the northeast area, could you not?

Mr. SWIDLER. By invulnerable I mean electrically invulnerable, irrespective of ownerships, so whatever happened on any interconnection would not impair their service.

This should be a test of management.

Mr. ROGERS of Texas. Now that would require a great deal of self-sufficiency within each one of the operating agencies, would it not?

Mr. SWIDLER. No, sir. It requires self-sufficiency within the pools.

Mr. ROGERS of Texas. Self-sufficiency within the pools?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. How large a pool do you have in mind?

Mr. SWIDLER. It makes no difference how large the pool is. It could be a very large one. The TVA system in itself is 80,000 square miles, which is, as I say, roughly the size of the CANUSE area. I venture that the AEP system is roughly that size. The pool in the Pacific Northwest is twice that size.

Mr. ROGERS of Texas. As I understand you, the CANUSE system is not a power pool.

Mr. SWIDLER. No, sir; it is not. What I say is that you can apply pooling principles in an area at least that size, or much larger.

Mr. ROGERS of Texas. And the CANUSE area would be a group of smaller pools? Would that be correct?

Mr. SWIDLER. No, sir; it could be a single pool.

Mr. ROGERS of Texas. You say it could be?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. Now, what is the difference between it and what you are describing insofar as TVA is concerned, or other power pools?

Mr. SWIDLER. What is the difference now?

Mr. ROGERS of Texas. Yes.

Mr. SWIDLER. The difference now is that you have 28 or 30 companies, each making its own decision on where it puts powerplants, where it puts transmission lines, what size, how it maintains them, what instructions to give to its operators, when it tests its relays, what conditions to simulate when it makes tests of its system, whether to build one kind of capacity or another. All of this is a matter that each of these managements decides for itself.

Mr. ROGERS of Texas. Now, in order to work it out on a power pool basis, your jurisdiction at the present time insofar as the Federal Power Commission is concerned has to do with the promoting of voluntary power pools, does it not?

Mr. SWIDLER. That is right, sir.

Mr. ROGERS of Texas. With stress on the word "voluntary"?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. If the companies or groups do not want to do this, there is no way in the world to force them to do it?

Mr. SWIDLER. That is right.

Mr. ROGERS of Texas. Do I understand you to mean that you are thinking about requesting the Congress for power to force power pools where voluntary pooling is not entered into?

Mr. SWIDLER. One thing that I have clearly recommended is that, where companies are interconnected, the Commission should be able to review the terms of the interconnection, so that where the interconnection creates a hazard to reliability of service, the Commission should set standards, and implement those standards in order to assure a high degree of reliability.

My recommendations did not cover the question whether the Commission should have authority to require a company to interconnect if it was not already interconnected, but it does go to the question of standards for interconnections and for pooling.

Mr. ROGERS of Texas. Now, in carrying this out, Mr. Swidler, would you also feel that the Federal Power Commission ought to have the additional authority insofar as facilities and adequacy of service is concerned?

Mr. SWIDLER. You mean to require the additional facilities?

Mr. ROGERS of Texas. Yes.

Mr. SWIDLER. I think we ought to have the authority to set standards which in turn might require the additional facilities.

Mr. ROGERS of Texas. Standards that would go as far as to require a public utility, whether privately or publicly owned, to measure up insofar as depth of facilities were concerned with regard to auxiliary?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. And otherwise?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. Then, Mr. Swidler, if you did this——

Mr. SWIDLER. Set minimum standards.

Mr. ROGERS of Texas. Yes, I understand.

Then if you did this, would you not extend or necessarily get into the rate structures of the local utilities, such, for instance, as Con Edison?

Mr. SWIDLER. This might result in imposing additional cost which would in turn be reflected in the rate structure.

I think this is a question that needs to be faced, that some of these protective facilities will cost money, and will have a rate impact.

My own experience and my own guess, if you like—it is no more than an informed guess—is that the economies of pooling will pay for the additional investment required for reliability of service.

But I don't think that this is the test. The first test is the one of reliability. If that requires a small rate increase, so be it.

As I say, the industry has a long way to go to take full advantage of the economies of interconnection and pool integration. I think as they proceed with this program they will save more money through the economic factor than the cost of shoring up their interconnections and strengthening them.

Mr. ROGERS of Texas. You think it would make good sense to sacrifice economy for reliability in the overall application?

Mr. SWIDLER. Yes, sir. I think where there is a conflict, reliability should come first.

Mr. ROGERS of Texas. Now, Mr. Swidler, suppose you had the power to force interties, would it be your position that because of your power to force an intertie that that automatically gave the Federal Power Commission jurisdiction over the connecting companies, even though one might be only the receiving company and not the delivering company?

Mr. SWIDLER. So far as distribution is concerned, we do not have and do not seek jurisdiction over entities which are engaged purely in distribution operations.

But if a company is a part of the pool in the sense that its facilities constitute a part of the generation and transmission complex, then I think it should be covered.

Mr. ROGERS of Texas. Even though it might be wholly intrastate insofar as its operations are concerned, other than the interties?

Mr. SWIDLER. When you say "other than the interties," you have excluded the whole basis of jurisdiction. The point is that with these interties it is not intrastate so far as bulk power supply is concerned.

Mr. ROGERS of Texas. That is the point. If you have the power to force the company into interties, then you have the power to force that company into your jurisdiction whether they want to come or not.

Mr. SWIDLER. If you are talking about the authority of the Commission to order a company which is not engaged in interstate commerce

now, and which is not in any way subject to our jurisdiction at present, to become part of the pool, this, I think, is pretty speculative.

I have not reached that in my own recommendations, and I am not sure that it would be profitable to speculate on where we might go from there.

I don't think that there are many such situations. By and large, the major elements of the industry are all now operating in interstate commerce.

Mr. ROGERS of Texas. Do you think, Mr. Chairman, that some of these operating companies are hesitant to get into interties or interconnections for power pools for fear of Federal Power Commission jurisdiction?

Mr. SWIDLER. I understand that. I think the most useful thing Congress could do would be to remove any inducement to these companies to stay out of these pools, and to enact legislation which would persuade them that they should join these pools, and participate in the benefits and add their strength to the strength of the pools.

I think we have a ridiculous situation in which companies, for fear of their own Government, deny to their customers the benefits of interconnections in interstate commerce.

Mr. ROGERS of Texas. Mr. Swidler, do I understand you to mean that you feel like any legislation that will force an intertie would at the same time exempt that company from coming under the jurisdiction of the Federal Power Commission solely because it complied with the intertie requirements?

Mr. SWIDLER. No, sir. I think these companies ought to come under the Federal Power Commission jurisdiction.

I do not see anything wrong with it, Mr. Rogers. It seems to me that this agency is required by law to act responsibly. We are subject to your jurisdiction every minute. We act only within the confines of our act. It seems to me that it is not in the interest of good legislation to create incentives for exemptions.

Mr. ROGERS of Texas. Mr. Swidler, going back for just one moment, and then I will quit. With regard to this situation that occurred in the Northeast, is there in your knowledge at the present time safety devices that had they been employed and used in that situation by both the originating group and by the others who got caught in this cascade, that this would have probably been prevented?

Mr. SWIDLER. I don't think there is any question, Mr. Rogers, that with the benefit of hindsight, and not a bit different equipment than they have now, this would have been prevented.

Mr. ROGERS of Texas. Without any different equipment than they have right now?

Mr. SWIDLER. In its massive impact.

Mr. ROGERS of Texas. What I am thinking about is this, Mr. Swidler. Are you speaking of human error? Do you think human error had a large part in this?

Mr. SWIDLER. When you say "human error," this sounds like criticism. With the benefit of hindsight, we are omniscient. You don't expect people to be omniscient about things that have never happened before.

I don't say this critically, but I do say that with the existing equipment, if these companies had known what was coming, this would not

have happened, because the first thing that would have been done would be, I assume, that Con Ed would have cut itself off, or it would have sloughed off a great deal of its load. Then it could have restored that part of it quite easily.

There are many points at which the situation cold have been saved.

Mr. ROGERS of Texas. As one witness testified before this committee, hindsight is always 20–20, and I appreciate that.

The fact of the matter is this, and what I am getting at, to give you an example, as I understand it, the situation in the Northeast was triggered by a tremendous surge of power that knocked out these circuit breakers because the systems could not take it.

The situation in El Paso was caused because the source of energy which created the steam was cut off. In other words, gas. There was a defective valve, according to the report. I don't know whether this is true or not, I haven't examined it, but that is the report.

Now, isn't there some way, or isn't there some safety device, like a side track on a railroad, where this power, this upsurge of power created by the loss of this line or one of these five lines, could not have been sidetracked and dumped?

Mr. Ross. Mr. Chairman, there was a series of relays which were set on the 230 kilovolts interconnection between Canada and the United States, at Niagara Falls. This relay unfortunately was not set to separate the United States and Canada at the moment of the initial surge of power.

It was a time delay relay, so the surge of power was allowed to go through and affect the rest of the United States. Had the relay been set differently, it would have cut off, just as the relays operated at St. Lawrence. In other words, you could have isolated the occurrence.

With a different setting, knowing what we know now, we could have set those relays to have avoided any surge coming into the United States.

Mr. HARRIS. That is what I wanted to ask. Is there a known method of an automatic circuit breaker that would act on its own, even on a relay. I guess that is what you call reversing it?

Mr. SWIDLER. There are very fast acting electronic devices which I think might have helped.

I really don't know enough to tell you what improvements they can or should make, but I think that there are many that they could.

Mr. HARRIS. Do we know enough now to know that there are automatic devices that would trigger and cut it off, should it happen to overload?

Mr. SWIDLER. The answer to that is yes.

Mr. HARRIS. Then this situation could be prevented in the future if those devices were put in their proper places?

Mr. SWIDLER. Yes, sir.

The big problem is that when you rely on automatic devices, they may be triggered by something that you didn't intend to trigger them. You may create a problem of service that didn't exist before.

Mr. HARRIS. You mean they might trigger off when they shouldn't?

Mr. SWIDLER. That is right.

Mr. HARRIS. It would be a lot better for them to be off a minute or two or three than to be without service for 14 hours.

Mr. SWIDLER. That is right.

A lot of people don't appreciate that despite the triggering of the relays that cut off the lines, the situation would not have been very bad if the Beck generating plant had gone off at the same time.

But it was the fact that the power continued to be generated at the Beck plant and reversed its flow and went south instead of north that created this massive surge. Had the plant gone off the line at the same time as the relays tripped the lines to Toronto, the problem would not have been very serious.

Mr. ROGERS of Texas. We would have a similar situation of putting 4 inches of water in a 2-inch pipe?

Mr. SWIDLER. Exactly.

Mr. ROGERS of Texas. It just would not go, and we would cut it off.

Why is it that Long Island and northeast Pennsylvania both continued to operate?

Mr. SWIDLER. Long Island is served by the Long Island Lighting Co. It went out. It came back a little sooner because it didn't have the complicated restoration job. But it did go off.

Mr. ROGERS of Texas. What do you mean, complicated restoration job?

Mr. SWIDLER. I mentioned all the problems of restoring service in New York City. Long Island does not present all those complications.

Mr. ROGERS of Texas. Do they have gas-fired turbines there?

Mr. SWIDLER. They had a little generation going which they used to pick up the rest.

Mr. ROGERS of Texas. What is that?

Mr. SWIDLER. They kept a little generation going. They had a gas turbine, and they used that to pick up the rest of the load.

Mr. ROGERS of Texas. Is a gas turbine easier to operate than a coal situation?

Mr. SWIDLER. Yes, sir.

Mr. ROGERS of Texas. Why is that? Because you get the heat so much quicker?

Mr. SWIDLER. I think so.

Mr. ROGERS of Texas. What is the relationship of oil?

Mr. SWIDLER. Oil is used mostly in thermal plants. It has to go through the furnace, much like coal. I think that the response there is very much as it is in the coal-fired plant.

Mr. ROGERS of Texas. Thank you very much, Mr. Chairman.

Mr. Harris, do you have some questions?

Mr. HARRIS. I wanted to ask this question. I do not recall anything in your statement as to what caused the line in Canada to disconnect.

Mr. SWIDLER. The first line?

Mr. HARRIS. Yes.

Mr. SWIDLER. The original triggering?

Mr. HARRIS. Yes. You just said it triggered the thing off. It opened.

I notice in your report on page 53 it is mentioned. I wanted to ask you about that, talking about—

The line opened at the Beck hydroelectric plant of the Hydro-Electric Power Commission of Ontario by relay action, following a tap change of load control at St. Lawrence plant in the tie with PASNY.

Mr. SWIDLER. That is Power Authority of the State of New York.

Mr. HARRIS. As I look on the map, the St. Lawrence plant is way down the river, No. 1, quite a long way from the Niagara plant.

No. 2, what do they mean by a tap change, and why would a tap change at the St. Lawrence plant have anything to do with what happened all this distance away?

Is there any explanation of this to you by other people?

Mr. SWIDLER. May I ask Mr. Brown to answer that question?

Mr. HARRIS. I imagine it is a highly technical thing. I probably would not understand it anyway, but nevertheless, we can get it in the record.

Mr. BROWN. There is a phase shifting transformer at St. Lawrence on the transmission line between the Ontario plant and the St. Lawrence-Moses plant. This phase shifting transformer is regulated manually in order to change the amount of power that is flowing from one country to the other.

One change on the phase shifting transformer produces a change in load, as I recall, of about 20 megawatts.

The purpose in having this reference in the report was to reflect our search for some kind of an incident that occurred on the system in the way of an additional surge at that time that might have accounted for the difference between the 356 megawatts which were read on the record of the line that tripped at Beck, with the setting on the relay which was said to be 375 megawatts.

People were wondering what happened to that extra load. Why did it trip when it was set for 375 megawatts and the load measured 356 megawatts? So, interrogations were made of Ontario as to whether there were any incidents, or any surges on the system that maybe would have caused some additional rise in the power.

So their engineer said, "Well, I recall that our man at the plant reported that he was changing taps at the St. Lawrence phase shifting transformer at that time."

He offered this as a possible explanation for a small surge which would make up this difference.

Probably the real answer is that the accuracy of the relay settings is just not that close, and also that the reading of the gages, or the charts, which show the megawatt flows may not be quite that close.

Mr. HARRIS. What is a tap?

Mr. BROWN. A tap is a terminal on the transformer. A transformer is usually thought of as a device for changing the voltage. But this one is not designed for changing voltage. It is designed for advancing the phase angle of power and advancing the phase angle causes an increase in the flow of power.

It is a way of controlling the direction and magnitude of the flow of power.

Mr. SWIDLER. You will notice, Chairman Harris, that in this summary paragraph you read it says "following a tap change." It does not say "due to." It may have been the tap change, or it may have been, as Mr. Brown says, simply a surge caused some other way, or it may be that the relay reacted at 356 instead of 375. Maybe it did not have that additional tolerance.

Mr. HARRIS. Did the position of the setting have anything to do with it?

Mr. SWIDLER. That just locates it at the particular place for the benefit of engineers.

Mr. BROWN. There are 10 opportunities for adjusting the phase angle on the transformer.

Mr. HARVEY. I just want to ask one question. Do I understand correctly one overriding conclusion is that the relay was set too low? Is that correct? In other words, the load had been increased substantially since the setting had been made, so that if we get the benefit of hindsight the relay should have been much higher than 356 megawatts?

Mr. SWIDLER. That is right, and it has since been reset higher.

Mr. HARRIS. Is there any reason why that relay should not be set higher, or do they have to set it according to the demand?

Mr. BROWN. The relay was set low in the beginning because it was intended to reach way out on the system to look at the possibility of a fault or a short. When you look about 200 percent of the first line distance, you necessarily have to keep the setting on the relay fairly low, or otherwise it wouldn't do you any good.

They are having to sacrifice looking out that far on the line now. I think I said this morning that they had the relay set to look out 125 percent of line distance. They have raised the setting to 500 megawatts.

Mr. HARRIS. This business of tap changing is not very important in connection with this?

Mr. BROWN. No, sir.

Mr. HARRIS. They really don't know why it did go out. I guess?

Mr. SWIDLER. They know they were dangerously close. That much we know. The flow of power is never entirely smooth. When you are operating at a 356 level, it takes only a minor surge, and one that they would expect to occur in normal operation, to bring it to the 375 level.

The Ontario people don't claim that 356 is safe with a 375 setting.

Mr. HARRIS. Thank you very much, gentlemen.

Thank you, Mr. Chairman.

Mr. ROGERS of Texas. Mr. Broyhill?

Mr. BROYHILL. Mr. Chairman, you have given considerable testimony today on whether or not the power companies or power systems are going to enter into an interconnection agreement purely on a voluntary basis, and also, as stated on page 28 of your testimony, the Commission's authority on its own initiative is limited to the voluntary pooling among the companies for the purpose of assuring abundant and economical supply of electrical energy.

There was a bill introduced in the past session, I believe H.R. 6485, which I understand was introduced at the request of the Federal Power Commission, that would permit the Federal Power Commission on its own motion to require these interconnections. Is that correct?

Mr. SWIDLER. Yes, sir.

Mr. BROYHILL. And the Federal Power Commission does wholeheartedly support this proposal?

Mr. SWIDLER. Yes, sir. We have had that recommendation in for many years, and had it been adopted it would have provided us with a measure of authority in this situation.

I don't think that as the situation has unfolded this would now be adequate. I think now that the Congress is looking at the broad pic-

ture, it would probably want to look at the legislative situation in the same broad way.

Mr. BROYHILL. Do you have any power at the present time to order interconnection, either on complaint of a State commission or complaint of any party who wishes to have a connection with another system?

Mr. SWIDLER. Yes, sir; we have authority on complaint to order an interconnection.

We now have some proceedings before us involving——

Mr. BROYHILL. Who are the companies or systems——

Mr. SWIDLER. Yes, sir; we have issued such an order in the *Shrewsbury* case, recently affirmed in the court of appeals. We have several other proceedings now pending before us.

Mr. BROYHILL. All the interconnections have not been on a voluntary basis. You have used your authority to require interconnection?

Mr. SWIDLER. That is right. But so far we have used our authority only to order interconnection to pick up a wholesale customer.

This has been the nature of the problem before us. We have not considered that we had authority to order interconnections from the point of view of reliability or strengthening the systems, but only to require that company A serve company B which may be a cooperative or municipality. It has been in a different context.

Mr. BROYHILL. To what extent has the Federal Power Commission become involved in these voluntary agreements? Are you involved in them from the very beginning, when discussions start between the companies?

Mr. SWIDLER. No, we are not. Sometimes when a new interconnection is being planned I will receive a courtesy call from the president of one of the companies who will say he does not want me to read this in the newspaper, that he would like me to know about it, and he will give me this information 24 hours in advance.

That is usually as early as we know about it.

Mr. BROYHILL. Usually when these interconnections are planned there is a considerable planning period in advance to finance this?

Mr. SWIDLER. Yes, there is a substantial leadtime. This would be a very useful period to review these plans for adequacy and reliability.

Mr. BROYHILL. I have no other questions.

Mr. ROGERS of Texas. If you will yield to me at that point, Mr. Chairman, any power that you have exercised forcing an interconnection, has that resulted in bringing under FPC jurisdiction a company that otherwise would not have been?

Mr. SWIDLER. No, sir. We can now order interconnections only with respect to companies that are already operating as a "public utility" as defined in the Federal Power Act.

Mr. HARVEY. The diagram shows the lower part of the Michigan Peninsula as a part of the system, but they were not affected. Do you know why? Is it because of some protective device they have?

Mr. SWIDLER. It was because Ontario broke apart that they were protected. The western part of the Ontario system was isolated from the rest of the trouble area.

Mr. Ross. They felt the same surge, and Detroit Edison, and Consumers Power came to the aid of Western Ontario. The Ontario system broke apart around London, I think.

Mr. HARVEY. Those are all the questions I have.

Mr. O'CONNOR. Mr. Chairman, to correct something, I have supported the Commission's legislation on the compulsory interconnection, on the theory that this involved wholesale sales, similar to the *Shrewsbury* case, or for sales to a REA cooperative, or something like that. I would not at the present time want to go on record as supporting compulsory interconnection of pools. It is limited to wholesale sales.

Mr. ROGERS of Texas. There is one question I think ought to be contained in this record. It is the question of once the system goes out, what percentage or what is the ratio of the amount of power needed to put that back into operation, as to the amount that is required to keep it in operation once you get it started?

Mr. SWIDLER. There is an additional amount that is required to get it going, to attain incandescence in bulbs, to overcome inertia in motors. I can't give you a ratio, but perhaps Mr. Brown can.

Mr. BROWN. When a steam powerplant is in full operation, the amount of power required by the auxiliary motors to make the plant function throughout will vary, but it is in the range of 5, 6, or 7 percent of the total output of the plant.

Mr. ROGERS of Texas. How does that compare with the amount that is required to keep that in operation?

Mr. BROWN. The starting requirements probably would be somewhat less, because you would be working against less pressures on the pumps, and so on.

Mr. ROGERS of Texas. Now, I was advised by several sources of electrical engineers that it took about twice the amount of power to start a motor as it did to keep it going.

Mr. BROWN. Yes, I guess I didn't follow your question. You are talking about synchronizing the generation source and picking up the load in the city that is on the line?

Mr. ROGERS of Texas. Yes.

Mr. BROWN. Yes, you have a starting requirement there which results from many electric motors being connected, such as for refrigerators that have been out of service, where the refrigerators have warmed up, and other systems, such as heating systems that are waiting for the electricity to come on, so you have many more motors ready to start the instant power is put back on the line, plus the fact that most of these motors are induction-type motors, which take a sudden surge of power to start that is much higher than required after they gain normal speed.

So there are several things that multiply the load at the start.

Mr. ROGERS of Texas. Do I understand, Mr. Brown, that if New York could have been sectionalized that they could have gotten back into service quicker?

Mr. BROWN. Well, they are sectionalized, Mr. Chairman. The New York City load is sectionalized into 42 different major sections.

Mr. ROGERS of Texas. This power or service was returned to those in 42 different steps?

Mr. BROWN. One at a time.

Mr. ROGERS of Texas. Had it not been for this sectionalizing, there might be greater trouble than there was?

Mr. BROWN. Yes.

Mr. ROGERS of Texas. Now, another thing, Mr. Swidler, with regard to the value of electric power in this country, I notice in this statement you referred to the fact that there is hardly anything that the individual does that he does not depend on almost daily for electric service, and once that is cut off, whether it is hospitalization or anything else, he is in jeopardy.

Did the Commission go into the situation from the standpoint of the defense structure, and that general area, too?

Mr. SWIDLER. In connection with this investigation?

Mr. ROGERS of Texas. Yes, sir.

Mr. SWIDLER. We are in touch with the Office of Emergency Planning, and with the Office of the Assistant Secretary of Defense.

I think that we need to coordinate our work with them, to be sure that we take account of their problems and their viewpoints. I can't say that we have arrived at close working arrangements as yet, but we are in touch.

Mr. ROGERS of Texas. That has not been completely worked out yet?

Mr. SWIDLER. No, sir. I think there is room for a great deal more coordination on the civilian and the military problems.

Mr. ROGERS of Texas. The defense structure was not affected, and I presume if it had been affected, it would have been classified information and would not have been put out, anyway.

Mr. SWIDLER. I think our report covers that situation.

Mr. ROGERS of Texas. With regard to the communications media, there were wire communications media which stayed in operation completely through this. How do you account for that?

Mr. SWIDLER. The telephone companies all have auxiliary equipment. They have batteries, and they also have auxiliary generators which replenish the batteries after a few minutes.

When you get a widespread power outage, then the adequacy of this alternate power supply is tested, and by and large it came through very well.

But I think this also, as I say, provides an opportunity for the telephone network to test adequacy of their secondary reliance on alternate methods of power supply.

The amount of power required for the telephone network is fairly small, and the telephone companies do have available auxiliary power service.

Mr. ROGERS of Texas. Mr. Chairman, one final question. Do you feel that the measures which have been taken since this blackout in the Northeast and the other blackouts throughout the country are of such nature as to be of sufficient permanency to solve this problem so that this will not happen again?

Mr. SWIDLER. No, sir. We are working primarily with the companies in the Northeast on specific studies. We are working with them to the best of our ability, with our limited staff resources. In the rest of the country we are continuing with our voluntary program under our national power survey activity.

This is not, in my judgment, a complete answer, either. I am not quite sure yet what degree of cooperation we will get at that level. So that I don't think I can tell you, Mr. Chairman, that without legislation this problem can be solved.

In fact, I would like, and I am glad you provided me the opportunity, to express my judgment that without new legislation the problem cannot be solved if the question is how to assure this country of the highest practicable degree of reliability of power service.

Mr. ROGERS of Texas. Thank you, Mr. Chairman.

Let the Chair say this now to the other Commissioners, that if any of you feel you want to be heard, the Chair will certainly recognize you for any statement you want to make, or any clarification you want to make on the testimony which has been given, and permit you to be asked questions and give answers on any subject.

So, if any of you do have this desire, I wish you would advise us.

Mr. Ross. As I indicated this morning, I think we are in the process of learning additional information that should be very helpful to this committee. I know that I, myself, and I think the others, would like an opportunity to come back at a later time.

I only have one statement I would like to make at the present time, and this is in relation to some of your questions regarding our interdependence with Canada.

It seems to me that as the Northeast becomes more firmly integrated, any amount of power that we might possibly export or import from Canada will be such a small, infinitesimal fraction of the whole that I cannot conceive that our system designers cannot design our system so that whatever happened to Canada, despite the previous experience, would not have an effect in the United States.

I think our utility systems can be designed, as TVA did when it lost a large block of power, to withstand the loss of large amounts of generation in as great quantity as any we can conceivably at this point see coming from Canada.

I think our interrelationship with the power systems of Canada is a problem that our engineers and the utility systems of the two countries can work out very practically and very effectively.

Mr. ROGERS of Texas. Yes.

Mr. Ross, I certainly did not want to leave the impression by my questions that we should break any relations with Canada, because as the chairman has so ably pointed out, they have been long and very good.

My position is simply this, that although we ought to continue those relations, we ought really to shore up our side of the situation so that under any kind of circumstances we can be completely self-sufficient.

Mr. O'CONNOR. As I think Mr. Ross said earlier this morning, I would like to say from my standpoint that I do not consider this the Commission's final report on this Northeast power failure.

Some of these matters in relation to defense, communications, and our own further investigation and analysis certainly should be covered in one complete report.

Mr. ROGERS of Texas. In that respect, Mr. O'Connor, let the Chair say this. It is my hope, as I said this morning, that we go into this matter completely and thoroughly. What we are after is facts on which we can base a policy in this country that will withstand almost any challenge or any threat.

I hope, and I am expecting, that all the different segments of our economy associated with this particular industry will be most helpful. I look forward to it very much.

Mr. Black, did you have anything to say?

Mr. BLACK. I don't, Mr. Chairman. I have nothing to add at all. I subscribe to the Chairman's statement and his responses to your questions.

Mr. ROGERS of Texas. Mr. Bagge?

Mr. BAGGE. I have nothing to add to the Chairman's statement.

Mr. ROGERS of Texas. Thank you very much, gentlemen, for your presentation.

Let the Chair say this. Tomorrow the subcommittee will meet in executive session to formulate a program or plan for further hearings in this matter, which we hope will be complete.

The subcommittee stands adjourned until 10 o'clock in the morning.

(Whereupon, at 3:50 p.m., the subcommittee adjourned, to reconvene in executive session at 10 a.m., Thursday, December 16, 1965.)

INVESTIGATION OF NORTHEAST POWER FAILURE

THURSDAY, FEBRUARY 24, 1966

HOUSE OF REPRESENTATIVES,
SPECIAL SUBCOMMITTEE TO INVESTIGATE
ELECTRIC POWER FAILURES, OF THE
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to call, in room 2123, Rayburn House Office Building, Hon. Walter Rogers of Texas (chairman of the subcommittee) presiding.

Mr. ROGERS of Texas. The Special Subcommittee To Investigate Electric Power Failures will come to order for the consideration of pending business. The subcommittee has scheduled several witnesses from the Government departments in order to complete the information desired from the Government agencies on this particular question and associated facets of it.

This morning we are scheduled to hear Mr. Thomas F. Rogers, Deputy Director of Defense Research and Engineering, of the Department of Defense.

Mr. Rogers, the Chair will recognize you at this time and you may bring to the witness table with you any associates you might desire.

STATEMENT OF THOMAS F. ROGERS, DEPUTY DIRECTOR, DEFENSE RESEARCH AND ENGINEERING, DEPARTMENT OF DEFENSE; ACCOMPANIED BY CAPT. EDWARD W. GENDRON, U.S. NAVY, STAFF ASSISTANT

Mr. T. ROGERS. Thank you, Mr. Chairman. This is Captain Gendron of my staff.

Mr. ROGERS of Texas. You may proceed, Mr. Rogers.

Mr. T. ROGERS. Mr. Chairman, I do have a prepared opening statement which with your permission I should now like to read.

Mr. ROGERS of Texas. You may proceed.

Mr. T. ROGERS. Mr. Chairman and members of this special subcommittee, thank you for the privilege of allowing me to appear before you today to describe the influence which last November's major power failure in the Northeast section of the United States had upon Department of Defense installations and systems.

The Secretary of Defense has assigned to his Director of Defense Research and Engineering the responsibility for planning, directing, and supervising the execution of technical support for the National Military Command System (NMCS) to insure its technical excellence and its proper functioning with its related worldwide command and

control systems. In addition, he assigned to the Director the responsibility for acquisition and continued improvement of an operating command system which meets the requirements of the Joint Chiefs of Staff.

I am Deputy to the Director, Dr. John S. Foster, Jr. My title is that of Deputy Director, Defense Research and Engineering, for Electronics and Information Systems; support of the NMCS is included among my specific responsibilities. My prior professional experience was concentrated in research, development, and engineering associated with strategic communications and air defense systems.

As I mentioned previously, Capt. Edward W. Gendron, USN, my military staff assistant, will assist me.

At the outset, Mr. Chairman and members of the special subcommittee—and this is the most important element of my testimony—let me state that there was no loss in vital military capability here in Washington, or of any unified or specified command, or of any service to accomplish its assigned mission during the period of power failure.

Beyond this, however, in order to appreciate the influence of the so-called Northeast power blackout upon operations within the Department of Defense, it is important to have in mind an outline of the means at the disposal of the Department of Defense to discharge its responsibilities.

The circumstances of today's world require that our military forces be able to execute a selective, deliberate, and controlled response to any attack upon us. This is our strategry of "strategic deterrence"—a strategy which includes the ability really to respond with the "assured destruction" of any enemy, however powerful, under any foreseeable circumstances. It is clear that such a strategy must adjust to rapidly changing international political situations, and requires positive, close, and continuous command and control of all of our military forces.

The line of authority for the command and control of these forces flows from the President to the Secretary of Defense, thence, through the Joint Chiefs of Staff, to our unified and specified commanders who have their headquarters distributed around the world.

Under these commanders are arrayed the Army, Navy, and Air Force components in charge of such major tactical commands as the 7th Army in Germany, the 7th Fleet in the South China Sea, the 3d Air Force in the United Kingdom, etc. Along this line of authority, from the President downward, other Government agencies may influence, when appropriate, ultimate detailed military decisions.

The system which supports the national command authorities in the exercise of command and control is the aforementioned national military command system. It consists, among other elements of a very large and diverse global communications network, and appropriate methods of data processing and display; its Center is located in the Pentagon.

The strategic deterrent forces available to the President are our strategic nuclear weapons missile forces (including the widely distributed Minuteman and Titan forces, and the globally deployed Polaris-equipped nuclear submarine fleet) and our nuclear weapon delivery aircraft, both Air Force and Navy.

The defensive forces and systems include our ballistic missile early warning system, our manned bomber warning net and its associated

interceptor aircraft, surface-to-air missile systems, our continental Army forces, antisubmarine warfare task forces, and other antisubmarine warfare systems.

As you might well expect, Mr. Chairman, as a matter of consistent routine all of these forces are exercised exhaustively to measure, and to insure, their readiness. These exercises include inspections of emergency procedures—some periodic and planned, some unannounced but generated within an organization—and some executed during unannounced and randomly timed visits.

The emergency plans exercised vary from rehearsal of basic war plan execution to the demonstration of the readiness of the forces when faced with the loss of certain operational capabilities caused by simulated enemy action, storm damage, sabotage, or electrical power loss.

In order to make sure that the forces available can cope with all foreseeable emergency situations, continuity of the military ability to defend and attack has always been a major organizational planning and engineering consideration.

The continuity of key functions of the National Military Command Center is assured by the employment of multiple, alternate command centers. These alternate command centers are both fixed and mobile; we maintain a protected underground command center at a remote location, airborne command posts on alert, and a command post at sea at all times. These alternate command centers are maintained in a constant state of readines with fully briefed operations teams and with independent power and communications facilities sufficient to assume the key functions of the National Military Command Center at any time.

They possess the communications equipment, and are practiced in the procedures, necessary to reach the national command authorities at any time. For example, the Pentagon Center insures continuity of its vital operations both through the availability of independent auxiliary power systems, and the interconnecting communications facilities of the suporting military departments.

The Army can make available auxiliary diesel power to provide emergency power to the Center as well as to their own war room. The Air Force also has auxiliary diesel units which provide emergency power to their Command Post and Communications Center and certain critical communications facilities of the National Military Command Center.

Each of the alternates to this Center has comparable emergency power and communications provisions in addition to the greater inherent survivability given them by their dispersion, hardness, or mobility.

In addition to the steps taken to insure survival of the national military command system elements, every military command itself has a plan for continuity of operations in order to preserve its capability to exercise command and control under as many contingencies as can be foreseen.

The primary means through which command and control is exercised is electrical communications and, of all the activities associated with command and control, communications is the most sensitive to power failure. Military communications fall into two broad group-

ings: (1) Vital, highly survivable secure communications of which—even under extreme duress—only a relatively few low-capacity circuits are required; and (2) communications for the normal day-to-day business of supporting our forces in readiness for which a large number of relatively high-capacity circuits is required.

The former—the vital circuits—are designed throughout to operate in an emergency and any public power outage will have no impact on their performance. Many of our normal communications circuits do depend, to some degree, upon public power. This array of circuits is designed, for the most part, however, to resist catastrophic failure during emergencies—that is, they are expected to degrade gradually, and in limited areas, rather than failing generally all at once.

Mr. Chairman, now let me illustrate how the Department of Defense protects its forces against communications failure:

First. Adequate alternation power sources.

Military facilities normally use commercial power wherever it has the reliability and stability required for the equipment it serves. In addition, however, an alternate or standby power source is provided which has sufficient capacity to accommodate the minimum essential operating electrical load of the facility, including that required to provide for vital operations. In all installations which provide direct support to operating forces, communications is, of course, defined as a vital operation.

Second. Redundancy.

Multiple redundant communications circuits are provided to serve critical operational functions. This permits not only transmission rerouting in any emergency through the selection of alternate circuits but also provides fundamentally different modes of communications, that is, cables versus radio, so that any single cause of failure would not normally be expected to affect the two different modes to the same degree.

Third. Alternate routing.

The Department of Defense operates large message switching networks. Therein, we sort the messages in order of importance, route them to the next switching center, and then forward them to their destinations. This routing can take place over numerous alternate routes depending on priorities, traffic load, and circuit availability.

Fourth. Circuit preemption.

Priority procedures have been arrived at which permit the prompt reassignment of less important circuits to serve critical needs in any emergency, that is, transmissions of a certain priority can "bump" others of less importance on certain circuits. Also, all military long lines have a priority assigned for their restoration after any failure.

Fifth. Constant circuit monitoring.

Most military long lines within the United States are a part of the defense communications system. We maintain elaborate communications monitoring and control of this system. The Defense Communications Agency operates a central control facility supplement by technical control facilities in all its large stations here and abroad.

Sixth. Mobile equipment.

We have military land-based mobile communications equipment available which could be used at critical points if the need arose. (They were not needed during the Northeast failure.)

As you can see, Mr. Chairman, our communications engineers take very deliberate and detailed measures to insure continuity of communications in the face of enemy attack, or any other occurrences which could jeopardize our basic military posture.

These measures, coupled with the multiplicity, the extraordinarily wide dispersion, the hardening, the mobility, and the diversity of the weapons systems themselves, afford the United States a deterrent force of unprecedented and basic survivability under the consistent control of our national command authorities.

Analogous steps have been taken to insure both the continuity of adequate warning of attack and of the ability to command and control our defensive forces.

For instance, radar detection and ground-air communications nets have available alternate power sources for use in any emergency. In addition, they are designed from the outset to have sufficient overlap and redundant capacity to permit adequate overall sky surveillance and air weapon direction even when an appreciable fraction of the total number of individual equipments or sites is inoperable for any reason.

All of the above measures result in our ability to react, flexibly, to almost any conceivable contingency in whatever manner the President directs. Of course, we continue to improve our command and control systems to be even more responsive, and our weapon systems to be even more effective, and to be sure that they are not excessively costly for the country to operate and maintain.

We accomplish this by taking advantage of improved technology, more detailed and careful understanding of the results of planned tests and actual operations—and such accidental mishaps as the recent power failure.

With this background, then, let me outline the immediate response of the Department to the Northeast power failure.

The Nation's vital military resources were completely inventoried within a very few minutes after the power failure and it was positively determined that there was no impairment of any unified or specified command to perform its mission.

Neither was there any impairment of the ability of the national command authorities to exercise command and control of our forces. Maintenance of full capability of our deterrent-assured destruction force was promptly verified, as was our defense against any air, land, or sea attack, the continued positive command and control of our nuclear forces, and our ability to maintain contact with vital points internal to the United States and abroad—including our embassies and allies.

We were immediately aware of the loss of power in the Northeast area and the general extent of the loss. We were able to determine, in a very short time, that the power loss was not the result of an overt enemy attack. We were able to determine that there was no military emergency. We so informed the President and the Secretary of Defense, and offered appropriate reassurances to the public.

Of course, as you know, not all of our equipments and facilities operated without interruption during the immediate blackout and subsequent restoral periods. We did lose circuits—but we did not

lose vital communications. We did lose some navigational aids at a few military airfields—but no military aircraft were diverted. We did lose the use of a very few military radars—but no important gap in sky coverage resulted.

I would recall at this point, Mr. Chairman, an important observation made before your subcommittee by the then Chairman of the Federal Power Commission, Mr. Joseph C. Swidler, on last December 15 when he remarked, and I quote in part:

> I hope I have made clear, Mr. Chairman, the distinction between equipment outage and service outage. * * * A service outage results not because equipment has failed or an operator has committed an error, at least not necessarily, but because in overall system design insufficient account has been taken of the possibility of such failures and errors. * * * in system planning it is customary to make severe assumptions as to foreseeable equipment outages and to plan on enough reserve capability to continue service despite such outages.

It is upon this most basic principle—that most severe assumptions must be made regarding equipment outages and plans made to assure operations in the face of such outages—that our defense command, control, and weapon systems are designed, installed, operated, and exercised.

And it is for this reason that even a massive public power failure, such as occurred last November has such a negligible effect upon our overall military posture.

For instance, of the more than 350 emergency backup power sources in the affected area, all but 6 were able to be brought promptly onto the line.

And, of particular note, Mr. Chairman, is the fact that no military personnel on duty were, to my knowledge, killed or seriously injured as a consequence of this widespread emergency.

Soon after ascertaining that there was no impairment to our vital structure, and that there was no military emergency, the Department of Defense was able to offer assistance to the Governors and mayors in the affected area, and did so.

I might observe, rather wryly, Mr. Chairman, that "It is an ill wind that blows no good." The period of power failure inadvertently presented an occasion—a unique occasion, I certainly trust—for the Department of Defense to observe the efficacy of certain of its emergency procedures on a truly major scale.

Many valuable lessons were learned thereby. First, and most important, the basic soundness of past communications system engineering and current emergency contingency plans were verified.

However, we have had pointed out to us some areas where improvements should be made.

For instance, the power failure did disclose that some commercial facilities providing communications service to the Department of Defense did not have adequate emergency power, and this was the cause of considerable inconvenience and some concern.

The organizations involved are well aware of this concern, and I am informed that they are taking vigorous steps to rectify the situation. Also, we are not completely satisfied with the information exchange between civil and military communications control centers in connection with the process of circuit restoral. Then too, we see the need for even more vigorous and extensive testing of emergency procedures and for more intensive training of emergency power operators.

Finally, we need to study the possible effects of any similar, or more extensive or longer power failures of this nature in the future. The Department of Defense is now making these studies.

It does not now appear, however, that the deficiencies we observed warrant any major unexpected expenditures. Nor are than any radical changes of Department of Defense organization or procedures indicated.

We are now participating in broad studies of the many aspects of this general matter with all interested agencies. One of the most important to the Department of Defense is that on communications being directed by the Director of Telecommunications Management.

In conclusion, Mr. Chairman, let me repeat my sense of appreciation for this opportunity to recount to this special subcommittee the experience of the Department of Defense during the Northeast power failure. As arresting and grave an experience as it was for so many millions of our citizens, I trust that it is reassuring to you to know that the military posture of the United States was not degraded by a power failure of even this magnitude, and that our basic military emergency planning was verified.

Thank you, Mr. Chairman.

Mr. ROGERS of Texas. Thank you, Mr. Rogers. The Chair recognizes the gentleman from Pennsylvania, Mr. Rooney, for some questions.

Mr. ROONEY. I have no questions, Mr. Chairman. I would like, however, to compliment Mr. Rogers on his comprehensive statement this morning. It certainly is reassuring to all Americans to know that the vital defense of our country was not affected by this terrible catastrophe of the power failure that occurred in the Northeast part of the United States.

Mr. ROGERS of Texas. The gentleman from North Carolina, Mr. Broyhill.

Mr. BROYHILL. Thank you, Mr. Chairman. I just want to comment briefly that not having lived through this power failure, myself, and having to observe it from a distance, it is reassuring to know from your testimony today that the power failure did not in any way affect the communications network of the Department of Defense. I am certain that this testimony is very valuable to reassure the American people of this fact.

I note that you do recognize that there are some steps to be taken to improve upon your communications network and the procedures and policies that will be followed. I trust that you are taking all these steps to put new policies and practices into effect.

Mr. T. ROGERS. Yes, Mr. Broyhill. Immediately subsequent to the failure of the power, certain steps were taken—immediate obvious steps—being sure that, for instance, in the future all of the emergency procedures, all of the tests take into full account such a widespread, such a massive power failure.

We began immediately to probe in detail all of the forces, all of the commands, as to what had transpired, to be sure that, promptly, while the experience was still fresh in the minds of these people, we had details given to us of what did happen. We have had many reports submitted.

We have many studies underway now within the Department of Defense that are looking into not only what happened but the implications that this might have for the future.

Mr. BROYHILL. You mentioned in your testimony that the power failure did disclose that some of the commercial facilities providing communications services did not have adequate emergency power.

You also indicate that these commercial organizations involved are well aware of this problem. Is this an area in which you can provide adequate emergency power which would be operated and controlled by the Department of Defense?

Mr. T. ROGERS. Mr. Broyhill, I do not believe that it is necessary for the Department of Defense to provide this power. The circuits which did fail were circuits of varying degrees of importance, most of them of lesser importance. What we suffered was an inconvenience. The power that would be needed and the alternate routing procedures and facilities that would be needed I suggest should be the responsibility of the common carries and the public utilities that serve them.

Mr. BROYHILL. I am glad to understand that they are taking these procedures.

Now on your vital circuits, the circuits that we do depend upon.

Mr. T. ROGERS. We do have our own alternate power sources, our own procedures, our own guarding, our own security.

Mr. BROYHILL. Thank you, Mr. Chairman.

Mr. ROGERS of Texas. The gentleman from New York, Mr. Murphy.

Mr. MURPHY. Mr. Rogers, about 20 minutes after the power failure occurred I called the Pentagon command post and questioned the officer in charge as to the status of the communications and the effect on our radar systems and was assured then at that time that they were geared to the emergency and therefore could meet any contingency.

I notice on page 9 of your statement that you state that we did lose the use of a very few military radars but no more gap in sky coverage resulted.

Were these navigational radars and control radars for aircraft or were they detecting radars?

Mr. T. ROGERS. We would consider them as air defense radars, detection radars, but some of the radars, along with their associated computational and display facilities, are shared with the FAA and could be used for navigation.

But primarily these are part of the Air Defense surveillance network.

Mr. MURPHY. You might not answer this if it has any security implications. You say that no important gap in sky coverage resulted. Is this because of overlapping of detection radars?

Mr. T. ROGERS. Yes. And as you know, the way that the defense net is arrayed is such that, at any reasonable altitude, you will have more than two radars looking at the same part of the sky, and you have the radars arrayed in rows so to speak, or envelopes, proceeding outward toward the country's borders. They must be arrayed in this way not only because of concern for enemy attack but also because all equipment, of course, have to be turned off at times for maintenance and for repair.

The entire network is laid out so that you can turn off a sensible fraction of these facilities, or lose a sensible fraction, and still not allow enough opening or enough gap to permit any major penetration.

Mr. MURPHY. Would any of these complementary radars use the same source of power?

Mr. T. ROGERS. Some of them did use commercial power but they were quite widely separated one from another. There were very few of them that failed and they were quite widely separated. They do depend upon public power. They did turn to emergency power.

Mr. MURPHY. Let us say in these concentric rings backing each other, do you have the same source of power affecting let us say one power unit of detection equipment then?

Mr. T. ROGERS. Not to a very great extent, no. Now I must be careful to answer completely from this point of view because here we had a situation in the Northeast where, you might say, there was "one" source of power that served throughout the whole Northeast.

In that one sense it was a single source of power. We have individual networks, individual companies serving the radars.

There can obviously be several radars that could be tied back to the one source. But in all cases—I should make this point—in all cases these vital air defense radars do have alternate sources or they do have backup sources.

Mr. MURPHY. They do have alternate sources on site that are controlled by another site, by the Air Force or antiaircraft artillery?

Mr. T. ROGERS. Yes.

Mr. MURPHY. They are capable of operating in an emergency period?

Mr. T. ROGERS. Yes.

Mr. MURPHY. For how long?

Mr. T. ROGERS. Many, many days—weeks.

Mr. MURPHY. Do you have a procedure on how they go on emergency or auxiliary power for a specified period of time?

Mr. T. ROGERS. Yes, these are tested frequently, usually at regular, periodic, intervals but at other times on a periodic occasion. At times they will go on to emergency power.

Mr. MURPHY. Do you use the international telephone and telegraph oversea communications facility for any defense purposes?

Mr. T. ROGERS. Yes, we do.

Mr. MURPHY. Can you—did you experience any difficulty with their services during that period?

Mr. T. ROGERS. If I may, may I respond apart from the particular company involved? May I respond that we did suffer degredation of message service—of message traffic on international lines.

Mr. ROGERS of Texas. Mr. Murphy, I think the chairman of the full committee wants you to yield to him if you would.

Mr. Staggers.

Mr. T. ROGERS. Have I responded, Mr. Murphy, adequately to that question?

The CHAIRMAN. This is off the record, if I may.

(Discussion off the record.)

Mr. ROGERS of Texas. Mr. Murphy, you may proceed.

Mr. MURPHY. I understood that private companies do have their own auxiliary source of power to operate in an emergency such as oc-

curred but from my investigation of that facility I understand that their auxiliary power went out after 2 hours of operation. I am wondering if the Defense Department has surveyed the various civilian companies or private companies that provide these communications services to them to insure that their auxiliary power is adequate, and secondly that their procedures of testing for going on this auxiliary power are also adequate?

Mr. T. ROGERS. I certainly believe that we have pointed out to the companies, I know this to be an absolute fact, not just any one company but to several of them, the circumstances that gave us concern. The Department of Defense stands ready at any time and does in fact ofttimes with the common carriers, stand ready to give them information at our disposal, experience at our disposal, knowledge of equipments, and techniques that might help them to better their service. By and large, we expect that this is the responsibility of the common carriers themselves and the public power companies.

Now it is a delicate matter, as I trust you will understand, for the Government to go too far into the details of how any private firm or organization would conduct its business. We want to be sure that we get the service that we pay for and that we need. On the other hand, we want them to take the responsibility for providing us the service for which we have contracted.

Now, having said all that, I am quite sure that our technical and our operational people in the Department of Defense have discussed many of the details of what happened and how it could be avoided or minimized in the future.

Mr. MURPHY. You state on page 9 that no military aircraft had any problems as far as takeoffs and landings, and fulfilling their flight plans. Did you provide any haven for any civilian aircraft in the vicinity?

Mr. T. ROGERS. There were one or two incidents. I know of one incident in particular where I believe it was a Northeastern airliner that did land at the L. G. Hanscom Field which, in addition to being a municipal field is also a military airbase, close to Boston. Captain Gendron reminded me that there were 10 light aircraft in the Westover area that also were assisted.

Mr. MURPHY. Mr. Rogers, in your testimony you stated that you assured the President that there was no sabotage connected with the power failure at a very early period of time. Yet it took the New York State Public Service Commission and the Federal Communications Commission almost a week to make that assurance.

Mr. T. ROGERS. That is not exactly what I said, Mr. Murphy. I said that we were able to determine very, very promptly that the failure was not caused by overt enemy attack.

I agree with you, we were not sure for some time that this was not the result of sabotage; but that is an entirely different thing.

Mr. MURPHY. Thank you, Mr. Rogers.

Mr. ROGERS of Texas. Mr. Harvey.

Mr. HARVEY. Mr Rogers, Captain Gendron, your statement is very, very reassuring and the questions I have are very general questions. On page 3 of the report to the President by the Federal Power Commission, which I am sure you have looked at, they make a very general

statement, after describing Ontario's Adam Beck plant and the Niagara plant as follows:

> Combined, these developments constitute the largest concentration of generation capacity in one locality in North America.

Of course, I appreciate that these facilities are located there for geographic reasons, obviously because of Niagara Falls. Has the Defense Department, however, considered that massive concentration of power in one area of the United States and given thought to it?

Mr. T. ROGERS. To the best of my personal knowledge, Mr. Harvey, which is limited in this area, I do not know of any particular consideration. I would suggest, however, that questions of this type are being given consideration in the very broad studies being made by, or under the aegis of, the Office of Emergency Planning, the Director of Telecommunications Management, et cetera. We are looking, as I mentioned in my testimony, at the matter of to what extent a very much more widespread, or a very much longer duration, power outage might deleteriously influence our posture.

I can say this, that on the basis of asking "Supposing the power had gone out not in the Northeast but other parts of the country, or even over the entire United States, would this have in any important way affected our vital posture?"

The answer is "No, definitely not."

Mr. HARVEY. The very massiveness of the concentration at this particular location, however, makes it more vulnerable does it not, not only to power failure such as this but more vulnerable to enemy attack or more vulnerable to sabotage or other factors? In other words, if this had happened anywhere else in the country it would not have affected nearly as big an area, would it?

Mr. T. ROGERS. That may very well be so.

Mr. HARVEY. If it had happened in the Northwest, Southwest or Midwest for that matter, you would not have affected perhaps more than a portion of a State, you would not have affected the large areas that you did here in the Northeast.

Mr. T. ROGERS. I would like to distinguish between the influence which a massive power failure might have on the country as a whole and the influence which it has upon our vital deterrent forces. These forces are distributed throughout the country, to a very good first approximation, independent of the public power system. They are arrayed with very, very basic strategic considerations in mind, and they have to operate independent of the public power.

On the other hand, of course, such a large public power failure does have a deleterious influence on many other aspects of defense operations.

Mr. HARVEY. The other thing that struck me as I read the report to the President was that this sequence of events could have happened not only in the manner in which it did happen as we all know but it could have happened for many other reasons.

It could have happened by a stroke of lightning or then it could have happened by a plane striking one of these lines, or it could have happened under many, many conditions which could have knocked out one of these lines and in turn pushed all the power over onto the other lines. Has the Defense Department considered that?

Mr. T. ROGERS. Our plans, by and large, Mr. Harvey, are drawn up to be responsive to, to be able to accommodate, failures of this kind regardless of the cause. It makes little difference, in the last analysis after all, to the Strategic Air Command why there is a power failure; it could be for any of the causes you have given, or the ones that did happen, or sabotage or a massive attack.

We must and do draw up our plans to accommodate these circumstances, regardless of the cause. Now the concentration of competence and talent in the country to deal with the particular cause or similar causes of public power failure probably is not to be found in the Department of Defense. We would turn to the Federal Power Commission and the public utilities for such advice and experience as they might have.

Mr. HARVEY. Thank you very much, Mr. Rogers.

Mr. ROGERS of Texas. Mr. Staggers, chairman of the full committee.

The CHAIRMAN. I have just one observation.

I think that you have answered in my mind that under the present circumstances there was no security danger from this power failure but that there could have been under the other circumstances probably but this did serve a useful purpose.

Perhaps in all the harm that was done and the fear that was caused in the northeast probably some good came out of it so far as the Department of Defense is concerned for the future.

Mr. T. ROGERS. That is a correct statement, realizing the impact to the people involved, you are quite right, Mr. Staggers. This was a very powerful investigative tool for us and we have taken and are now taking full advantage of it.

The CHAIRMAN. I heard Mr. Swidler's testimony and have read part of the investigation that they conducted. I am sure this does not have to do with your responsibility because your responsibility is national defense but I gathered from it that it had to do with a little instrument that had not been upgraded or there had not been enough attention paid to it in Canada that touched this whole thing off.

Mr. T. ROGERS. That is our understanding.

The CHAIRMAN. Out of this investigation there was a general concensus there was a lack of instruction and planning of all the operators throughout the entire system, that if they had planned and been instructed up to date that this could have been avoided throughout a great deal of the system and that there will be an upgrading and training and instruction to all operators as to what to do in an emergency.

This is my interpretation from reading the report that was made to the President.

Is this your interpretation?

Mr. T. ROGERS. My understanding is as you have described it; it was one particular component that failed. This was the proximate cause of the failure. But my own personal view, of course I am not a power engineer, but my personal view from reading all of the testimony is that what must be addressed is the whole system problem. This is the conclusion that I think one can draw from reading the reports.

I would defer to the Federal Power Commission in this sense but that is the general lesson I believe I would drawn from this: that one

must look at the organizations, the standards, and the proper relationships of the operating procedures of the whole system.

The CHAIRMAN. That is my understanding from reading the report, that it was a system failure. Thank you very much, Mr. Chairman.

Mr. ROGERS of Texas. Thank you, Mr. Chairman.

Mr. Rogers, your statement, of course, is excellent. I am very happy to have that information. But your expertise, as reflected by your statement, is in the field of electronics, as applied to the defense of this Nation, is this not so?

Mr. T. ROGERS. That is right.

Mr. ROGERS of Texas. Are you prepared, Mr. Rogers, to address yourself to any of the other associated problems that might arise out of the power failure as they might affect the defense of this Nation?

Mr. T. ROGERS. Yes, sir.

Mr. ROGERS of Texas. Now with regard to your own particular responsibilities and specific duties, your statement would lead me to conclude that insofar as the communications system and the firepower that is dependent upon electric energy are concerned, that there was no difficulty at all or no reduction in ability to perform 100 percent.

Mr. T. ROGERS. That is right.

Mr. ROGERS of Texas. Now are there other matters of primary importance in the defense structure that are dependent on electrical energy other than these two that might have been affected by this sort of situation?

Mr. T. ROGERS. Well, while I emphasized communications because, as I pointed out in my statement, this is the most sensitive area and part of our overall command system, we do depend, of course, on power in some way or other in all of our so-called bases, camps and stations, our hospitals, our airfields, all of the normal day-to-day business of training our forces, what we call "our force in readiness posture." All of these things do depend upon, in the first instance, public power, and a great many of them—probably if you were to inventory the total facilities of the Defense Department you would find a very, very large fraction wholly dependent upon public power.

Now the loss of certain operations came about from the simple fact that we have priorities in the Defense Department. We must be positive that our vital needs are met first, and then our very, very important, and then our important, and so forth.

Under these circumstances you are bound to find many, many of our installations and people affected by failure of public power. At the present time we are going back over these plans in the light of the experience of the power failure and asking ourselves once again, "Have we the proper priority system for these facilities underneath this vital structure? Have we the proper amount of emergency power available? Do we have the proper alternate procedures throughout the Defense Departments?"

Mr. ROGERS of Texas. With regard to the communications side of the picture it would not be too difficult or relatively speaking too expensive to provide support and backup facilities in order to insure an absolute continuity in your communications system, would it, Mr. Rogers?

Mr. T. ROGERS. No. Well, I won't say it has not been expensive but we do have this now, Mr. Chairman, so far as our vital circuits are concerned. We do have this.

Mr. ROGERS of Texas. As far as that is concerned—that operation and let us say the firepower operation insofar as missiles and that sort of thing are concerned that might depend for electric energy—this could be done. Whether it is or not may not even be a proper question. I realize those are certain classified areas in which we may not go in public session, but the Defense Department itself could maintain separate, distinct, adequate facilities to meet these requirements could they not?

Mr. T. ROGERS. It does.

Mr. ROGERS of Texas. And in your opinion, according to your statement, it has ample support and backup facilities to prevent any break in this continuity?

Mr. T. ROGERS. Yes, to meet all of our vital concerns in the light of any foreseeable contingency.

Again, in my testimony, I am trying to distinguish carefully between the adequate, the completely adequate, protection of the vital key functions, everything we need to be alert and responsive, and greater totality of everything we need to stay on a normal day-to-day business.

Mr. ROGERS of Texas. Actually the Department of Defense is not dependent upon outside sources for public power for fulfilling the needs in this particular area?

Mr. T. ROGERS. Not for vital functions. On the other hand we do look to private industry to supply us service of this type at a cost and in a manner that would probably prove difficult for us within the Government to match.

Mr. ROGERS of Texas. Yes. Of course this would certainly be a reasonable and sensible approach to the problem. It would simply provide you with an additional or supplemental source for transmission facilities if you needed it. So why not use it, it is there. But my point is that you are not dependent upon it in the vital areas that you outlined in your statement.

Mr. T. ROGERS. That is absolutely correct.

Mr. ROGERS of Texas. Now with regard to the other area that you were addressing yourself to, the facilities in the defense structures that need electric energy, what percentage of those—if this is a proper question—would be dependent upon public power or outside sources of power, outside of the Government?

Mr. T. ROGERS. I have not a quantitative answer to that, but my first reaction would be to say the vast majority of our installations within the Continental United States are dependent for most of their operations upon public power.

Mr. ROGERS of Texas. We could assume, of course, there was no break in the defense structure insofar as the Northeast power blackout was concerned. That of course is a conclusion based upon exactly what happened. Now let us assume that this had been the forerunner of an attack what would be the answer then with regard to interference with the defense structure?

Mr. T. ROGERS. It would be no different.

Mr. ROGERS of Texas. It would be no different?

Mr. T. ROGERS. No.

Mr. ROGERS of Texas. You are speaking of communications and informational service and firepower?

Mr. T. ROGERS. Yes. If I understand your question and your assumption to be that of "Supposing that this power failure were caused by an overt attack would our response have been any different, would our needs be any different?"

I don't believe they would.

Mr. ROGERS of Texas. You don't then think they would have been?

Mr. T. ROGERS. No, I don't.

Mr. ROGERS of Texas. Does this extend to the defense structure proper and your airfields, your installations, your camps?

Mr. T. ROGERS. Yes. Well, again now, under an attack such as you would assume, there is a whole rank—ordering of things then that suddenly becomes what you have to pay attention to, your priorities change. Then, perhaps, there would be certain installations, certain facilities that could be set aside temporarily, that would just in the nature of things have to be set aside temporarily.

Mr. ROGERS of Texas. One of the things I have in mind is this. A blackout of this kind, assuming there was some kind of attack, could certainly trigger a conflict between the immediate movements of civilians and military, if you follow me. Let us say, for want of a better word, panic that would be created by such a situation, that would create many problems.

Mr. T. ROGERS. Oh, yes.

Mr. ROGERS of Texas. The source of this problem would be to a great extent not only the attack but would also be the blackout whereas if there was available electric energy, much of the conflict as between the civilian and the military could be avoided.

Now what attention has been paid by the Department to this particular facet?

Mr. T. ROGERS. I might say—well—two or three things to that, Mr. Chairman. The first thing I would say is that I am not the best man that you could have before you to answer such questions as these. Certainly, the people in the Office of Civil Defense, certainly many other agencies, the Office of Emergency Planning, for instance, the Director of Telecommunications Management, all of these men and others in the Department of the Interior, the Federal Bureau of Investigation, many of these other Government organizations are responsible for and concerned with elements of response to such a broad question as this.

I can say that we do have now going on in the Department of Defense, in the light of these circumstances, studies addressed to the question of what would be the problems associated with and the preparation we would have to make for a prolonged or a much wider power shortage.

If such a power shortage were to last a week or months, then many, many things that present no difficulty over a period of hours or days would become much more important.

Mr. ROGERS of Texas. Then, Mr. Rogers, with relation to your statement which is directed to the Northeast power blackout, I am sure the Department of Defense has primary interest in all blackouts and I am satisfied that proper investigation has been made of all of them. For instance, the El Paso situation in Texas and others that have occurred. Would your statement with regard to the Northeast power blackout

be more or less the same if you were addressing yourself to any of these other blackouts?

Mr. T. ROGERS. Yes, it would, Mr. Chairman.

Mr. ROGERS of Texas. I have one further question, one further thought. I notice that you refer in your statement to this accidental breakdown in the Northeast power situation. I understand that you concluded very promptly that there was no overt enemy attack, am I right, almost within minutes, and that you have since gone into the matter further in regard to the possibility of sabotage and have reached the same conclusion in that respect that was reached by the Federal Power Commission?

Mr. T. ROGERS. I am not at this moment prepared to respond to that question. I am not sure of my facts. However, I would not want that to be understood to mean that I do have any information that would lead me to believe that sabotage was responsible, but I am just not positive.

Mr. ROGERS of Texas. My next question has to do with reaching a determination that no sabotage was involved. It is my understanding that this occurred in a foreign country of course, at least that is the information that the subcommittee has at this time. I am wondering if you have any information as to the extent of the investigation or the exploration of these facilities and their operation in making the determination and whether or not any effort was made to determine the affiliation of the employees of the Adam Beck plant or the organization that would have had access to this source of this trouble?

Mr. T. ROGERS. To my knowledge the Department of Defense has not made such investigation. I would assume that such investigations were made promptly and in detail. This responsibility I understand to be one of the Department of the Interior, the Federal Bureau of Investigation——

Mr. ROGERS of Texas. You mean the Department of Justice?

Mr. T. ROGERS. Excuse me, just a minute. I am in error.

My understanding is that the Department of the Interior specifically was assigned responsibility for the development and preparation of national emergency plans, and preparedness programs. You see, there is a very definite difference in the responsibility which the Department of Defense has prior to, and then subsequent to, an attack or prior to, and subsequent to, the declaration by the President of a national emergency.

It is my understanding that it is not the responsibility of the Department of Defense to determine to what extent there was sabotage, if any, under the circumstances.

Mr. ROGERS of Texas. Yes, I can understand that, Mr. Rogers. What I was driving at is this, whether or not the Department of Defense is addressing itself in the overall defense structure of this Nation to knowing for sure, either through the FBI, the Department of the Interior, or the Central Intelligence Agency, that there is a complete and thorough understanding of the affiliations of all employees in these different plants located in a foreign country where a source of trouble like this can originate.

Mr. T. ROGERS. I might make two responses to that, Mr. Chairman. Within the United States there is drawn up by the Department of

Defense, or at least under its direction, a list of key facilities, and they number in the thousands or tens of thousands, and then the Department of Defense and other agencies do take very, very definite steps to help these people ascertain the appropriate characteristics of their employees, to help with—to help them with certain security and emergency procedures and so on.

Now, insofar as our forces abroad are concerned I think the only answer that one can make there is that we must be properly responsive to the sovereignty of the countries in which we find our forces and, on a case-to-case basis, we will do different things.

But to a very good first approximation, and I have been concerned with the design of defense and communications systems abroad, to a very, very good first approximation the same rules apply there that apply here. Where our vital concerns might be affected we will take whatever steps are required to protect them.

Captain Gendron has brought to my attention that the Internal Security Act of 1950, as amended, does make it unlawful for a member of a Communist or Communist-action organization to work in a defense facility and directs the Secretary of Defense to inspect such defense facilities. This is the defense facility list.

Mr. ROGERS of Texas. Is the Adam Beck plant located in Canada in that defense facility list? I understand we can control that in this country and do. My concern has to do with what access do we have to information as to who is manning these plants in other nations where this trouble started?

Mr. T. ROGERS. I can only suggest that this is beyond my area of competence, Mr. Chairman.

Mr. ROGERS of Texas. I understand. I was just wondering if you had the information on it. Mr. Rogers, do you know of any other areas where the source of electric energy may be located outside of this country, where a similar situation could take place which took place in the Northeast?

Mr. T. ROGERS. This is highly speculative. I would not be surprised if occurrences similar in nature could take place in any fairly advanced area where there was not a fully coordinated and standardized power system.

Mr. ROGERS of Texas. What I am getting at is where the source of the trouble would be located beyond the borders of this country. For instance, is there much danger in the general area of Detroit? Do we get any of the power from Canada in that general area?

Mr. T. ROGERS. Yes, and in the Northwest.

Mr. ROGERS of Texas. I should no think you would have much trouble with the Northwest on account of Bonneville, would we? We have ample power there which is all located within the United States.

I think perhaps the El Paso situation was the reverse of the Northeast situation. I think Juarez blacked out because they were getting their power from our side of the border, not us from Mexico.

Mr. T. ROGERS. Perhaps I have not stressed that our vital forces, Mr. Chairman, are globally distributed. We have major elements of our deterrent forces located in many parts of the world. By and large the same basic rules generally apply. We do try to take advantage of the services offered by the appropriate public utilities. But our vital posture must be protected against any contingency.

Mr. ROGERS of Texas. It is your opinion, Mr. Rogers, that in any place this might occur along the Canadian border, the position of the Defense Department would be the same as it was in the Northeast, that is, unaffected both as to the source of power and as to the continuity of transmission?

Mr. T. ROGERS. That is correct.

Mr. ROGERS of Texas. I doubt if the question would be appropriate or fit with regard to the Mexican border as except as to the power dam on the Rio Grande which of course does not affect any major installations.

Thank you very much, Mr. Rogers, and Captain Gendron. Are there any further questions? Thank you very much, gentlemen, for your presentation. It has been most helpful.

Mr. T. ROGERS. Thank you, Mr. Chairman.

Mr. ROGERS of Texas. Now our next witness this morning is Mr. John W. McConnell, Assistant Director of Civil Defense (Plans and Operations), accompanied by Mr. Charles Shafer and Mr. Charles Wartman.

Mr. McConnell, if you will come forward the Chair will recognize you.

Mr. MCCONNELL. I have with me from my staff Mr. Charles Shafer and Mr. Charles Wartman on my left.

Mr. ROGERS of Texas. You may proceed.

Mr. MCCONNELL. Mr. Chairman, I have a prepared statement which I will read if you desire.

STATEMENT OF JOHN W. McCONNELL, ASSISTANT DIRECTOR OF CIVIL DEFENSE (PLANS AND OPERATIONS), DEPARTMENT OF THE ARMY

Mr. MCCONNELL. Chairman Rogers, gentlemen, the Office of Civil Defense, Department of the Army, appreciates the invitation to appear before this distinguished subcommittee in order to report on the effectiveness of the civil defense organization and systems during the Northeast power failure of November 9, 1965.

The civil defense organization, contrary to popular belief, is not a special entity apart from day-to-day government that emerges in time of crisis to direct and control emergency operations. Rather, civil defense is simply government in emergency—comprising the regular police, rescue, medical, engineering, and other emergency services of government—directed by the mayor or the Governor. The role of civil defense in peacetime is to arrange for special training and assistance for the emergency services, so that they will be able to provide the best service to the people in a nuclear attack upon the Nation.

The prime function of civil defense in peacetime is to arrange for fallout protection for the general public, and to coordinate advanced preparation of the essential elements and services that would be needed by the Governors, the mayors, and their top staffs for directing survival and recovery actions at State and local levels of government. These essential elements at the local level include: (1) emergency operating centers with fallout protection which will permit centralized analysis, direction, and control of survival and recovery; (2) a reliable

system for receiving warning information from the Federal Government and for disseminating it to the general public; (3) fallout protected communications facilities required for direction, control, and warning; and (4) emergency power for these civil defense systems in case commercial power fails.

I have emphasized these elements because all of them were in use during the Northeast power failure. At the national level, the Director of Civil Defense has been delegated the necessary legislative and executive authority and responsibility to develop a nationwide shelter system and a warning and communications system to assist the Nation to survive an enemy attack. The Director of Civil Defense works, as necessary or appropriate, through other agencies by contractural or other agreements, as well as with State and local leaders. These functions include but are not limited to the development and execution of:

1. A fallout shelter program, which I mentioned previously;
2. All functions pertaining to communications, including a warning network, reporting on radiation monitoring, instructions to shelters, and communications between authorities;
3. Protection and emergency operational capability of State and local government agencies in keeping with plans for the continuity of government; and
4. Programs for making financial contributions to the States (including personnel and administrative expenses) for civil defense purposes.

The Office of Civil Defense does not have direct line of command and control below the OCD regional level. At State and local levels, the OCD program objectives are accomplished by technical guidance and assistance as well as Federal financial assistance.

Working through normal government channels we are assisting every State, county, and community to develop a capability for protection from the effects of radioactive fallout. In achieving a feasible system to limit damage as a collateral accomplishment, a community also attains a respectable and highly effective capability to cope with lesser disasters. This was true in the Northeast power failure and it has been the case in most recent natural disasters such as the severe upper Mississippi floods of 1965, the Good Friday tornadoes of last year, Hurricanes Betsy, Carla, and Dora, and the Alaskan earthquake of 1964.

The power failure began at approximately 5:16 p.m., E.S.T., on November 9, 1965, coinciding with the period of peak population movement in the most densely populated portion of our Nation. State and local governments in the affected area quickly assumed full emergency operational posture.

State activities were geenrally the same in the States most seriously affected by the power outage; namely, Connecticut, Rhode Island, Massachusetts, New York, and Vermont. These States all activated and manned their State emergency operating centers; alerted the State National Guard and placed them on standby status; established communications with lower and higher echelons of government; maintained contact with the Governor or Governor's office; established contact with the news media, radio, television, and newspapers, and in some cases made public information releases.

66-577—66——6

The States of New Jersey, and New Hampshire also activated their State emergency operating centers and checked the emergency communications capability of the State portion of the national warning system (NAWAS). The State of Maine had no problem with the power outage and, therefore, did not alert their civil defense organization.

At the local level, civil defense preparations resulted in three things being done, generally, throughout the blackout area: emergency operating centers were activated and emergency communications manned; communications equipment and auxiliary generators were made available to public service agencies; and regular police and fire services were augmented with trained volunteers.

There were some calls to emergency operating centers for specialized needs. Requests for equipment that were transmitted to the EOC's were provided from supplies immediately available to the local civil defense office such as emergency generators. For example, in New York City trucks delivered 78 emergency civil defense generators to hospitals, fire, and police stations. One such unit provided illumination for the mayor's disaster committee which was meeting at city hall. (In most areas, as you know, the power was out for relatively short periods of time. The longest period was about 14 hours, with partial restoration occurring in about 9 hours.)

Response of civil defense augmentation forces was significant in some cities throughout the area. Auxiliary police, in particular, were used to augment regular personnel. Auxiliary police, other civil defense volunteers, and National Guardsmen in New York City evacuated thousands of passengers from stranded subway and commuter trains. Civil defense trained radio operators were used in many areas.

In general, city and State governments quickly assumed full emergency operational posture but the emergency did not reach a point where central coordination of government effort was required. Response of augmentation personnel was excellent but requests for equipment were limited, generally, to standby civil defense equipment.

At national level, upon notice of the power failure, I activated our operations room in the Pentagon at 5:45 p.m. By priority long-distance call to our region 1 director, our Regional Operating Center at Harvard, Mass., was also activated at 6 p.m. Our national warning system, which has 97 warning points in the Northeastern States as well as an extension into Canada, remained operational throughout the power failure. This 24-hour-per-day landline, voice communications system provided a ready source of information that indicated the general extent of the power failure and the subsequent progress of power restoration. This system, which is leased from the telephone company, is independent of commercial power, and can operate up to 14 days from emergency generators at the key centers of the telephone company. During the power failure, the national warning system was also used extensively by State and local governments for their direction and control activities.

The national warning system was used at 5:40 p.m., eastern standard time, on November 9, 1965, to assure the warning points in the Northeastern States that there was no defense emergency and that the warning system was normal. Upon notification of the power failure,

one of our three national warning centers which is just outside Washington, immediately checked with our National Warning Center at Colorado Springs and the National Military Command Center to verify that the situation was normal. After verification, the following special announcement was made to the warning points in the Northeastern and Middle Atlantic States:

The warning system is normal. Power failures are reported throughout the Northeast. Appropriate announcements will be transmitted over this system should the situation warrant.

News accounts recorded some apprehension on the part of the public on the nature of the emergency. But apprehension is several miles removed from panic. There was no panic. Credit for this is due largely to the manner in which reporters covered the story and the way it was broadcast by radio newsmen. This general tone of reassurance to the public was reinforced by several civil defense directors, including Allan R. Zenowitz, director of the Massachusetts Civil Defense Agency.

After receiving the message from the OCD National Three Warning Center that "the warning system is normal," State Director Zenowitz informed Governor Volpe that the power failure was not due to enemy attack or sabotage; and he gave the following message to radio stations:

The Massachusetts Civil Defense Agency was informed by the National Warning System within a minute after the blackout happened that it was due to a massive power failure, and was not from sabotage or enemy attack. The rapidity by which the National Warning System clarified the situation is direct proof of the efficiency of the warning system to respond in any type of disaster.

The Vermont State civil defense director is quoted as making the same assumption after receiving the National Warning System message. The Rutland Vermont Daily Herald reported:

He said he knew right away from communications from Washington that the failure was a mechanical one. We heard from Washington that everything (Civil Defense Systems) was operational so I know it was a mechanical failure that caused the lights to go out.

Another factor attributed to reassuring the public in the affected area was the ability of certain regular commercial AM stations to sustain broadcast operations through the use of emergency generators. Of the 174 commercial AM stations in the general area, 64 stations were disabled for the duration of the power failure, 65 resumed operations within 1 hour with emergency power, and the others were off the air for more than an hour or experienced no local power failure. As part of our overall support program to the emergency broadcast system, we have assisted selected stations under our "Broadcast Station Protection Program," to assure capability for postattack programing of Presidential and high priority civil defense information to the general public. The support provides an austere, fallout protected studio, an emergency generator and two-way radio communications with the State or local emergency operating centers.

Fifty-five AM stations in the general area affected by the power failure had been or were scheduled to be furnished emergency generating equipment as a part of OCD's broadcast station protection program. Of these 55 AM stations, 43 experienced electric power outage.

Thirty-one of the 43 stations that experienced power outage returned to the air by using equipment previously furnished under OCD's broadcast station protection program. The other 12 of the 43 stations were off the air for the duration of the power failure because their emergency generators had not yet been completely installed. Many of the 31 stations that returned to the air were high-powered 50 kilowatt stations. I might say at this point that when our broadcast station protection program is completed, it will include 658 key commercial AM stations.

Our limited studies as well as the December 6, 1965, report of the Federal Power Commission and the January 6, 1966, report of the Federal Communications Commission emphasize: (1) the need for standby electric generating equipment as a matter of course for all elements of the community that must sustain essential emergency functions, and (2) the present inadequacy of standby equipment in many communities.

Incidentally, an automatic reaction to improve the situation as a result of this experience has taken place around the country. For instance, just a few days ago I was notified by the New York State Civil Defense director, Gen. Manuel J. Asensio, that in New York State, as a direct result of the November 9, 1965, Northeast power failure, Onondaga County Civil Defense, in conjunction with three local radio stations, has established a local emergency radio network designed to permit rapid dissemination of civil defense information during any local emergency. Each station is equipped with emergency power generators and has provided private-line connections to the county emergency operating center. The State civil defense commission has established a similar network using the facilities MUZAK, AM and FM broadcasting station, and New York Telephone Co. This system is reported to have the capability of bringing emergency messages from the Governor to all MUZAK installations between Albany and Buffalo and entering 10 a.m. radio stations scattered throughout the State. Expansion of these facilities for greater coverage is in prospect.

Therefore, we are continuing our support program to assist State and local governments with matching funds for the procurement of electric generators for essential State and local government communications base stations for emergency operating centers, and for other components of government that are considered supporting elements of the emergency operating centers. Also, we are continuing our program to provide standby generators for these 658 key commercial broadcast stations of the emergency broadcast system.

However, we are not supporting the procurement of generators for stockpiling purposes. The reduction in attack warning time brought about by the intercontinental ballistic missile and the resultant need for people to move immediately to shelter, places greater emphasis on the requirement to have emergency equipment in place. The accessibility, movement, and installation of stockpiled equipment during a period of fallout as well as other emergencies is questionable, at best. The limited funds available to the Office of Civil Defense must be applied to those items which will have the greatest probability for emergency use.

We have taken, and are continuing to take, appropriate corrective actions as a result of our experience in the power failure. For example:

1. At our request, the telephone company is making a nationwide survey of the National Warning System terminal equipment to determine warning point locations which require commercial power to activate some elements of the system. Three such warning points were revealed in the Northeastern States by the power failure. Action is being taken to replace the commercialy powered components with components activated by power over telephone circuits as the cases are discovered.

2. We have reemphasized the necessity for routine operational checks and scheduled preventive maintenance on auxiliary generators to our regional directors and to State and local officials.

3. Local civil defense outdoor warning systems, primarily sirens, would have been seriously degraded by the power failure since more than 95 percent of these outdoor warning devices are dependent on commerical power. To provide necessary backup we have assigned priority emphasis to our current work with the FCC for: (a) Developing indoor radio alerting devices, and (b) developing improved procedures for transmitting attack warning over commercial radio broadcast stations. Also, we shall continue to support and encourage, with matching funds, the installation of outdoor warning systems, even though these are dependent upon commercial power, because the likelihood of power availability on a national basis is reasonably high, even in the event of a surprise attack.

Supplementing the major elements of the national civil defense program, which I have mentioned, are less tangible elements of the program which are designed to cause the individual citizen and the family to be more self-reliant. I think these have direct application in emergency caused by loss of commercial power. For example, we offer a 12-hour course in civil defense adult education (personal and family survival) which more than 1 million people have taken. Also, over 2 million people have taken our medical self-help course which is promoted through the Public Health Service.

We are developing for issue through the regular fire departments a training kit to provide instruction and guidance for householders in the basic elements of fire prevention and fire extinguishment, in cooperation with the International Association of Fire Chiefs. This will be of significant value to people who live in isolated areas and to householders under conditions of temporary loss of communications, such as occurred in many communities because of circuit overload during the power failure.

To provide State and local officials an opportunity to practice and exercise centralized management of emergency services, we are extending our emergency operations center simulation program. We will conduct 147 of these simulation exercises through the respective State universities in 43 States during the next fiscal year.

In summary, Mr. Chairman, the civil defense system and organization, as a function of Federal, State and local government, generally performed well during the Northeast power failure. However, this system and organization from a national standpoint is being designed

basically to cope with disaster conditions that would accompany a nuclear war. The capability to deal with peacetime disasters, such as power failures, severe weather, explosions, and so forth, is one of the valuable byproducts of the overall civil defense system. We shall continue to strive for this capability nationwide by assisting directly or indirectly as many as the some 20,000 political subdivisions which so desire.

Mr. Chairman, this completes my statement. Thank you.

Mr. ROGERS of Texas. Thank you, Mr. McConnell.

Mr. Staggers, do you have any questions?

The CHAIRMAN. No, I really have no questions with the exception that I would like to say that I think your statement is very good, Mr. McConnell and very appropriate at this time. I think it is reassuring to the people of the country that you are developing your network and that you see some deficiencies probably that were present and these are to be corrected on a nationwide scale, you are continuing to work on them.

I think you do not deal with the power failure in itself, the cause of it, but only as it affects your agency. This is true, is it not?

Mr. MCCONNELL. Yes, sir, as I said in my statement, as a result of the experience by many of the local governments involving their own activities, and the activities of their supporting services which operate in an emergency, their capability was upgraded I believe.

The CHAIRMAN. Thank you.

Thank, you Mr. Chairman.

Mr. ROGERS of Texas. Mr. Broyhill.

Mr. BROYHILL. No questions.

Mr. ROGERS of Texas. Mr. Harvey.

Mr. HARVEY. I have no questions.

Mr. ROGERS of Texas. Mr. McConnell, as pointed out by Mr. Staggers, most of your activities have to do insofar as power failure is concerned, with communications, as to whether or not the people should even be on the alert for attack or a disaster of any kind.

What I have some difficulty in understanding is how you were able so quickly to convey messages to outlying areas that there was no sabotage in this, that it was the result of an accident?

Mr. MCCONNELL. If you will permit me, Mr. Chairman, I will say the same thing that Mr. Thomas Rogers did. I believe you misunderstood the message which was given which did not specify that it was sabotage or it was an accident.

I would like to quote again the only message that we gave in a short length of time after discovery of the power failure as a result of information available to us, which is basically from the North American Defense Command at Colorado Springs, and I quote:

> The warning system is normal. Power failures reported throughout the Northeast. Appropriate announcements will be transmitted over this system should the situation warrant.

Now this statement was interpreted by the State civil defense director as well as other people as a reassurance of no enemy attack or action or in the extreme case, as no sabotage.

Mr. ROGERS of Texas. They were the ones that put out the information that it was a mechanical failure?

Mr. McConnell. That is right, sir.

Mr. Rogers of Texas. This is the thing that had me guessing, because certainly if the lights go out through mechanical failure the question is who caused the mechanical failure, and how was is caused. That is the thing that everyone seemed to stop at and not go behind. Of course in your offices you would make no investigation of that, would you?

Mr. McConnell. No, sir. I think it would be inappropriate for the Office of Civil Defense to get directly involved in that type of investigation.

Mr. Rogers of Texas. You were alerted at the time and were capable by virtue of your warning system, insofar as your offices were concerned, to notify them if there was any need to put into effect any civil defense program in their general area?

Mr. McConnell. That is correct, sir, by indicating that there was no change in the defense posture of the Nation, so to speak, that the warning system is normal.

Mr. Rogers of Texas. But you would have then had to resort in some instances to radio or television communications and they were available, because your sirens would not blow, due to being tied to commercial power sources?

Mr. McConnell. That is correct, Mr. Chairman.

Mr. Rogers of Texas. Has any other thought been given to providing alternate sources of power for siren systems or warning systems, noise warning systems, especially in the more congested areas?

Mr. McConnell. Yes, indeed, Mr. Chairman. Our research department, which is coordinated and works closely with the research and development department of the Department of Defense is constantly looking at new ways to alert or warn the public. Many devices are being researched at the present time, including pyrotechnics and as I mentioned in my statement an indoor radio-activated alerting device which could be used by the public.

These at a certain level of a civil defense program could be implemented depending on the cost and their relative life saving capability or potential capability to other elements of the program. The installation of auxiliary power to all the sirens in the Nation would be quite an expensive operation if funded wholly by the Federal Government or even 50 percent.

We would have to compare this to other things that we could do with the same amount of money which would have more impact. For instance, the chances of power failure occurring when sirens are needed based on the warning of attack on the United States is probably fairly low. In other words, the sirens still have a pretty high percentage of reliability. There are alternate methods of warning, as you mentioned, in the public news media area—radio, televition, and so forth—whicht does a fairly good job of notifying a lot of people in a short length of time.

Mr. Rogers of Texas. Do you have a separate broadcast facility with availability of wavelength that would make is possible for you to notify people by radio signal transmission that is backed up by a power source not dependent upon commercial power?

Mr. McConnell. At the present time the Office of Civil Defense does not have such capability. We have in the final stages of research

such a system which is being developed and tested at the present time. This would rely upon low frequency transmission of either a teletype or voice message on a regional basis to essential local government installations. This could be used also to broadcast directly through commercial radio stations to the public.

Mr. ROGERS of Texas. Do you have at the present time any mobile generating facilities to be used in connection with commercial radio stations, to back them up in case of a disaster?

Mr. MCCONNELL. Mr. Chairman, we do not have any that are earmarked for that purpose. As I mentioned we are installing emergency generators at a hundred percent Federal cost in the 658 key stations throughout the country, which gives somewhere above 95 percent population coverage because of the strength of those stations.

We also have some emergency generators that are stockpiled with water pumping and other engineering equipment which could be used for any power purpose so desired. As I mentioned in my statement, the probability of noninstalled or portable generating equipment being gotten to the right place at the right time from a stockpile configuration is very problematic.

Mr. ROGERS of Texas. Now, Mr. McConnell, you probably are aware of the fact that there have been several suggestions made concerning the limitations or conditions upon licenses issued by the FCC and one of those conditions would be the requirement that alternate power facilities be available for use in the event of an emergency. What is the position of the Office of Civil Defense on that particular problem?

Mr. MCCONNELL. Mr. Chairman, I think we have no position on the need for such legislation or licensing requirement in that we have found a way to get basic coverage through the limited funds that we are using to provide this power. My personal opinion is that it would be a good thing and that radio stations as well as hospitals and other essential facilities should, as a matter of normal course, install alternate sources of power.

Mr. ROGERS of Texas. Of course this involves the problem of economics, too. I was just wondering if you felt that perhaps a standby should not be something within the confines of the responsibilities of the Office of Civil Defense.

Because we get into a situation where we have a man with a small radio station and then you have a fellow with a large radio station and economics play a major part in this picture. I understand that efforts are being made at the present time and are being worked out to install auxiliary facilities, generating facilities, that will cost a substantial sum of money in all post offices of a certain classification or having a status of so many pieces of mail being handled.

It seems to me that the Office of Civil Defense would be more interested in getting this information out by radio or television quickly than they would by sending it through the mail.

Mr. MCCONNELL. Mr. Chairman, I am not familiar with the Post Office program but I assure you that the Office of Civil Defense is only interested in the minimum requirements to satisfy the elements of our responsibility.

Mr. ROGERS of Texas. Mr. Broyhill?

Mr. BROYHILL. Mr. Chairman, I just want to ask a couple of questions along the line of the questions you have been pursuing here. On

page 9 you state you have a broadcast station protection program and when it is completed it will include 658 key commercial AM stations. When will this program be completed?

Mr. McCONNELL. Unless we advance funding from other sources, in this fiscal year we will still have approximately 68 stations to complete in fiscal year 1967.

Mr. BROYHILL. Is this a voluntary program or mandatory program on the part of the commercial stations?

Mr. McCONNELL. It is voluntary.

Mr. BROYHILL. Do you know the cost of development of this program?

Mr. McCONNELL. We provide 100 percent of the cost of the elements I mentioned, a fallout protected studio for the fallout personnel. Radio connection to the local government operating center and the emergency power.

Mr. BROYHILL. One other question that is not related to this. Throughout the country there are a number of clubs organized in citizens band radio groups. Did you find in this emergency, or have you found in any emergency, that they were of value in establishing communications to certain remote areas?

Mr. McCONNELL. Citizens band radio for the most part is very short ranged. FCC licensing does not permit class D equipment, which represents the bulk of the users, to operate in the kind of emergency that our program is designed for, a civil defense emergency declared by the President.

Therefore, except for the class A portion, we do not watch for, recommend, or promote the citizens band equipment. We have a very close connection and find some reliable value in the RACES program which is an amateur operation and very valuable to local government in many cases.

Mr. BROYHILL. You are saying that the citizens band group or communications network, if it has any value it is on a local basis?

Mr. McCONNELL. Yes, sir.

Mr. BROYHILL. Thank you.

Mr. ROGERS of Texas. Do you have anything, Mr. Harvey?

Mr. HARVEY. No questions.

Mr. ROGERS of Texas. Thank you very much, Mr. McConnell. You have been very helpful.

Mr. McCONNELL. Thank you, Mr. Chairman.

Mr. ROGERS of Texas. The subcommittee will stand in recess until 2 p.m.

(Whereupon, at 12 noon the subcommittee adjourned, to reconvene at 2 p.m. the same day.)

AFTER RECESS

(The subcommittee reconvened at 2 p.m., Hon. Walter Rogers of Texas (chairman of the subcommittee) presiding.)

Mr. ROGERS of Texas. The subcommittee will come to order for consideration of the pending business. I believe our witness this afternoon is Mr. Franklin B. Dryden, Acting Director of the Office of Emergency Planning.

Mr. Dryden, we are glad to have you before the subcommittee and if you will come forward to the witness chair you will be recognized.

STATEMENT OF FRANKLIN B. DRYDEN, ACTING DIRECTOR, OFFICE OF EMERGENCY PLANNING; ACCOMPANIED BY ARNOLD LEWIS, CHIEF OF CONSTRUCTION, PRODUCTION AND POWER RESOURCES OFFICE

Mr. DRYDEN. Thank you, Mr. Chairman.

Mr. Chairman, Mr. Rooney, thank you for the privilege of appearing before this committee.

As an agency charged with responsibility for emergency planning, and for coordinating Federal assistance for the President in case of a disaster or catastrophe, we are keenly interested in your work.

It is significant that members of the OEP staff were on duty and our emergency communications and information system, geared for enemy attack or major disaster, was in operation when the Northeast blackout occurred. This is not unusual. That is what we are trained for.

It was true in case of the Alaska earthquake, west coast floods of 1964, Hurricane Betsy, and numerous other disasters and emergencies.

Shortly following the first flash of the blackout in New York City, our plan for emergencies, including an emergency information center, went into effect. Governor Ellington, then our Director, and I, as Deputy Director, were kept advised by special phone and by car telephone.

Immediate communication was established with our regional director (A. D. O'Connor) in Boston who has responsibility for the Northeastern States which were affected by the blackout.

After confirmation of what had happened, communication was immediately established and maintained with the White House. The Director of OEP was constantly in touch with the President.

On the possibility that sabotage was responsible, or more than an accidental power failure was involved, our emergency operating headquarters were quickly alerted and placed on a full emergency basis. We were also routinely in touch with the Joint Chiefs of Staff. OEP's emergency site is staffed "around the clock" for such emergencies. In addition, our eight regional offices were immediately advised of the situation through our special and protected communication facilities.

Now in more detail, I will outline step by step how our emergency plans and procedures were implemented.

After being alerted to the seriousness of the situation by our regional office at Harvard, Mass., and by news wire services, our Disaster Information Center at national headquarters served as a primary source of public information on the Federal response to this emergency. (Hundreds of calls were received from the press, other media, officials, and citizens from all over the United States, Canada, and Europe.)

Immediately following the power failure, our regional office was fully activated. Constant contact was maintained with the national office of OEP and with many of the Governors of the affected States. Region 1 includes the States of Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, and New Jersey.

Within 80 minutes after the blackout our regional director learned the source of the trouble and reported it to Director Ellington who advised the President.

Contact was also maintained with State and local officials, and with representatives of the electric power industry. The OEP headquarters emergency operating center was activated and telephone comunication was maintained with the affected area. All OEP regional offices are equipped with standby generators for emergency power. Thus, the OEP office at Harvard was capable of operating during the blackout period.

The assistance of the Federal Government was offered but no actions were required of OEP, although State and local civil defense organizations did assist local communities. As the Swidler report pointed out, the national warning system (Nawas) remained operational during the entire period of the power failure. This system, which is operated by the Office of Civil Defense, consists of leased telephone lines, open 24 hours a day, 7 days a week, with the main control point at Norad headquarters in Colorado Springs. It reaches over 700 cities across the country.

Based on what we now know and in preparation for possible future blackouts or emergencies of this nature, OEP in cooperation with other agencies has taken the following actions:

1. Our national office is working with the Federal Power Commission and the Defense Electric Power Administration in developing an information gathering system in cooperation with the electric utility industry for reports to the President through OEP and to various levels of government in the very early stages of disasters or such occurrences as the Northeast power failure. The reports will cover the cause of the trouble, the extent of the disaster, restoration schedules and problems, and possible Government actions. These reports should provide essential facts and conclusions of valuable assistance to us in refining and improving our emergency planning with the electric power industry. When the plan has been perfected with respect to power, it is planned to extend the techniques to cover transportation, communications, and other essential resource areas.

2. OEP has requested the Departments of Commerce, Interior, and Agriculture to conduct a survey among leading industrial concerns in their particular resource jurisdictions to determine the effect of blackout on operations. This survey will include such industries as electrical equipment, petroleum, chemicals, and food processors.

3. OEP, as a result of this experience, has improved its ability to respond to this type of significant incident by installing strategically placed telephones; an automatic staff reporting system; and establishing closer working relationships with other agencies, including DOD, in connection with reporting such instances, and in lessening their impact by producing quick, accurate information to local authorities and to the public. The power failure also emphasizes the need for emergency generators in all essential facilities, including hospitals. In addition, it seeks to highlight the need, in power pools such as Canuse, for a central organization to serve as a source of information and contact whenever difficulties develop.

The inquiry conducted by FFC was attended by OEP; the continuing studies by special technical groups growing out of that inquiry as well as this one will be looked to as a source of essential information and findings which could provide a base for further improving emergency preparedness with the electric power industry. In addition, the surveys undertaken by the Federal agencies at the request of OEP should provide useful information to enable us to further refine the level of emergency preparedness in other essential industries.

United States-Canadian cooperation: I should add at this point that as a result of a 1963 exchange of notes with Canada there is an agreement between the two countries on civil emergency planning and we, therefore, maintain almost daily contact with our Canadian counterparts. Accordingly, we have been in touch with the Canadian Emergency Measures Organization and the Office of the Secretary to the Cabinet on the blackout and the lessons to be learned from it. Our reports and other data have been furnished the Director General of the Canadian Emergency Measures Organization who is preparing a report to his Government on what the Canadians refer to as an emergency of a "character and magnitude never contemplated."

As your committee has been informed, the power failure, according to Canadian officials, was traced to the Ontario Hydro-Generating System along the Niagara River in Canada. As I previously indicated, this was also reported to OEP headquarters by our northeastern regional director shortly after the blackout. It was later confirmed by Chairman Ross Strike of the Hydro-Electric Power Commission of Ontario. This was also reported to Governor Ellington by Chairman Swidler. Your committee is familiar with the technical details as to what happened, so I will not repeat them.

Finally, we would observe that this disaster, like most others, poses unique challenges and problems. Fortunately, there was no need for Federal disaster or financial assistance as has been the case in so many disasters caused by flood, hurricane, and other natural causes during recent years.

Thank you.

Mr. ROGERS of Texas. Thank you, Mr. Dryden, for your statement. The Chair recognizes Mr. Rooney, the gentleman from Pennsylvania for questions.

Mr. ROONEY. Mr. Dryden, I would like to commend you on your excellent statement. I would like to know what the relationship of the Office of Emergency Planning is with the Director of Civil Defense and also with Mr. Rogers' organization who testified this morning.

Do you work with one another?

Mr. DRYDEN. Yes, sir. The Office of Civil Defense is a division of the Department of the Army, of the Department of Defense. We are two separate organizations with two separate responsibilities. We naturally have very close relationships with them because there is an interrelationship of our work.

Mr. ROONEY. You spoke about the possibility that sabotage was responsible for the outage. What did your agency do to investigate this?

Mr. DRYDEN. You will recall that originally there was absolutely no information whatsoever on what had happened. The lights just went out across that area quickly.

Through our emergency operating center we were able to get in touch immediately with the Joint Chiefs of Staff and their monitoring system to determine that to their knowledge there apparently was not sabotage involved.

It was too widespread and there were no indications of uprisings or explosions or other unusual, unnatural acts that would lead us to believe that there was sabotage.

I might add that we, not knowing certainly that there was not, did go on full alert in our agency, which we still think was the right thing to do.

Mr. ROONEY. But your agency did not pinpoint the failure of the power?

Mr. DRYDEN. Not for about an hour.

Mr. ROONEY. You stated about 80 minutes after the blackout your regional director learned the source of trouble. Did your agency conduct this investigation?

Mr. DRYDEN. What happened, Mr. Rooney, in this particular instance, is that within a few minutes the blackout enveloped the Northeast area which all falls within the jurisdiction of our regional director at Harvard, Mass.

He is very much in touch with all the industry people throughout the Northeast, such as Boston Edison and Consolidated Edison, in New York. He was in touch with them all, trying to pinpoint just what had happened. Through one of the companies he did get the message that the blackout had been initiated in this general area.

Mr. ROONEY. Your regional office at Harvard in the case of an overt attack, could it have been wiped out or would it have survived?

Mr. DRYDEN. At the present time if there had been a nuclear detonation in that general area, it very probably would have been wiped out.

I might add at the present time, Mr. Rooney, we are in the planning stage for seven protected facilities for our regional offices; we have one in being at Denton, Tex., at the present time. For the other seven, money has been appropriated by the Congress and plans are now at the stage where we can begin construction in the next few months on some of them.

Mr. ROGERS of Texas. Mr. Harvey.

Mr. HARVEY. I have no questions, Mr. Chairman.

Mr. ROGERS of Texas. Mr. Dryden, the Office of Emergency Planning, does that mean that you come into being after an emergency or do you devote much of your time and energy to making plans to avert emergencies?

Mr. DRYDEN. Mr. Chairman, we like to think that we are devoting full time to planning to handle emergencies except for the times when we are in one. We are in one quite often these days to the tune of 25 or 30 declared disasters by the President each year. But between those we are constantly planning.

Mr. ROGERS of Texas. Does your Office make any basic planning to determine what the needs might be to meet the electric energy requirements of this country and to help lay a predicate and advise the President as to what ought to be done to promote this in order to avert emergencies where you have a blackout?

Mr. DRYDEN. I would say that we are, certainly in the case of electric power today. I would, I think, be remiss to say we were doing

much about it before that. There has been a constant study and constant planning by the electric industry itself over the years to make these grid systems as foolproof as they can be. The hearings brought out there are several schools of thought on whether they have oversafeguarded their systems which may have contributed to the problem that took place at this time.

Mr. ROGERS of Texas. I notice that in the economic affairs office it says "it developed measures to strengthen U.S. resources and for the use and management of its resources to meet the requirements of any national emergency."

Now was there any planning or work done with regard to a possible blackout in the Northeast prior to the time this happened?

Mr. DRYDEN. Mr. Chairman, I have Mr. Arnold Lewis here, my expert on power that I would like to ask to respond to that if he could.

Mr. ROGERS of Texas. Yes. Your name is Arnold Lewis?

Mr. LEWIS. Yes.

Mr. ROGERS of Texas. Your capacity?

Mr. LEWIS. Chief of the Construction, Production, and Power Resources Office in OEP.

Mr. ROGERS of Texas. Fine.

Mr. LEWIS. There are continuing studies on resource availability in event of an emergency, including electric power. In this connection the Defense Electric Power Administration in the Department of the Interior, which has a delegation to perform certain emergency planning functions for electric power, conducted a survey on the vulnerability of distribution systems in the electric power industry. The study included New England and New York and was carried out against a backdrop of nuclear attack assumption.

The Federal Power Commission also has an Executive Order assignment for emergency planning. They prepare studies and reports on availability, capacity, and requirements for electric power generation. They collect current data from the electric industry on a regular basis so that the information sources used for the studies are the latest. OEP is presently engaged in another study on electric power supply demands which would come within the description you have just read to reexamine the likelihood of power availability in an emergency.

So there are continuing studies on power capability and demands for power after a nucler attack going on in our agency with the help of the other agencies.

Mr. ROGERS of Texas. Had there been any anticipation of a possibility of such a thing as the Northeast power blackout from your studies as to electric energy resources and transmission systems?

Mr. LEWIS. No, sir, our study was directed toward the eventuality of nuclear attack, the substance of these studies reflected that there would be enough generating capacity remaining to handle the load of the surviving population.

Mr. ROGERS of Texas. Do I understand by that now that your planning was confined simply to what to do in the event of a nuclear attack?

Mr. LEWIS. Yes, sir.

Mr. ROGERS of Texas. In doing this you would, of course, make studies and research with regard to the amount of available electric

power or energy or any other facilities that you might need to meet such a situation?

Mr. LEWIS. Yes. That was the key study that had been performed, and we assumed therefrom that capability to meet current nonnuclear requirements would be easier to achieve than under a nuclear condition with heavy damage to the generating and transmission facilities.

Mr. ROGERS of Texas. Now in doing this I would presume that you would make a very close and thorough and exhaustive study of the availability of electric energy to the extent that you would know every kilowatt that you would have available for use by this country either as a primary source or as a substitute source?

Mr. LEWIS. Yes. This is always considered in our studies. I might add, and should have stressed earlier, that the Federal Power Commission within its statutory authority, conducted a national power survey on power availability and demand projected through 1980. So that we had studies based on nuclear and nonnuclear assumptions.

Mr. ROGERS of Texas. Now are any studies utilized for the purpose of trying to lay a predicate to avert a possible emergency?

Mr. LEWIS. Yes, to the extent that we can determine any shortages or difficulties and to the extent we can work with industry or encourage them to take corrective action, this would improve our readiness.

Mr. ROGERS of Texas. You are beginning from a different premise. What I am beginning from is a premise of getting this thing worked out in a planning basis so that you don't have an emergency. As I understand you, you are working from the premise you are going to be prepared and when the emergency occurs you are going to be able to meet it.

What I want to do is avoid the emergency in the first place.

Mr. LEWIS. When it comes to the technical aspects of the power industry such as averting an incident as occurred, our agency has not been doing anything on that. We rely on the advice and the competence of the technical agencies in the Government such as FPC.

Mr. ROGERS of Texas. Would not your Office be charged with having full and complete information as to the continuity of the availability of electric energy that might be needed in any area of this country and especially in a thickly congested area?

Mr. LEWIS. Yes, I believe that this information is available to us. We so use it and I must say that up until the incident occurred I don't believe any technical talent had been able to foresee a combination of circumstances or events such as occurred to throw this tremendous load in the area.

Mr. ROGERS of Texas. Let us get to the incidents themselves. It seems that everybody quickly accepted the fact that it was an accident. As I recall, the Federal Power Commission testimony was to the effect that they concluded quite soon after the blackout that there was no sabotage involved, that this was the result of the failure of a switch of some kind in Canada, in Ontario. Now has there been any information available or is there now any information available as to what made that switch fail?

Mr. LEWIS. To my knowledge nothing specific. The immediate cause was the switch trip that created the entire sequence of overloading and cascading.

Mr. ROGERS of Texas. What caused the trip?

Mr. LEWIS. The immediate causes were low settings, plus overload due to repairs in the system. I do not think we know how the settings and repairs are coordinated, or why not.

Mr. ROGERS of Texas. Do you know anybody who does?

Mr. LEWIS. No, sir. At this moment I have not been in touch with anybody who might know. I assume that this will be developed as a result of further studies by the FPC.

Mr. ROGERS of Texas. Let us go a little further. What could have caused that switch to trip?

Mr. LEWIS. I don't believe I can say, sir.

Mr. ROGERS of Texas. Could it not have been by a human element?

Mr. LEWIS. All indications are that it was mechanical although it does not eliminate, I suppose, the possibility of some human element.

Mr. ROGERS of Texas. By mechanical, as I understood the Federal Power Commission, a load could have been put on that particular situation, I don't know the parlance of the game sufficiently to use the right terms, but whatever it was that tripped, that a load could have been put on that circuit to where it would have caused that to trip and apparently they just stopped right there.

What I am interested in, was it a load that caused it to trip. If it was extra load that caused it to trip where did that load come from?

That load could have been started if I understand this thing right by some human action somewhere down the line, maybe many miles from the point where the switch tripped.

Is that right?

Mr. LEWIS. It is a possibility. There is no doubt that a load exceeding the limits or the backup relay caused the trip. If I recall from the FPC report, there was a combination of circumstances which built up to generate this load which I think is pretty well explained in the report without perhaps getting down to the contributing causes for the actual tripping. The FPC studies should provide answers on these causes.

Mr. ROGERS of Texas. Now this shows in this Northeast Power Failure Report by the Federal Power Commission:

> The disturbance was initiated on one of the main transmission lines taking power north from the Beck Station of Ontario Hydro on the Niagara River. * * * at 5:16 p.m. a backup protective relay * * * caused the circuit breaker to disconnect the line.

Now the point I am getting at is, everyone was so quick to assume that there was no sabotage. Of course, it is very good news if there is not sabotage. I would certainly hope that this would be the case but I don't think that we ought to close the door to the possibility of sabotage in a situation of this kind, that if there was no sabotage at that time the sequence of events that happened might put some ideas in the minds of the enemies of this country to where sabotage may be the thing the next time.

What I am thinking about, is, are we doing the proper emergency planning to find out the source of this situation?

Mr. LEWIS. I think that the FPC in its continuing studies will attempt to determine the causes for the tripping. I believe that the

report did not get to that. I think it indicated this was yet to be determined through its studies of operating instructions and procedures, equipment status, stability, et cetera.

Mr. ROGERS of Texas. Now in making these studies of available electric energy which I understand falls on your Office, have you made any investigation at all or do you have access to records in the Canadian Government or legal entities, corporations, whoever might be supplying the power, as to their personnel who man these installations that we depend on?

Mr. LEWIS. We just started work with Canada on the exchange of electric power in emergency. We met in August 1965 to lay the groundwork for joint studies on power availability and exchange in the event of an emergency.

We did not get into any details concerning the exchange of data. This matter undoubtedly would arise in the next few meetings.

Mr. ROGERS of Texas. To what extent are we dependent upon Canada in that particular area where the Adam Beck Plant is located? To what extent are we dependent upon Canadian sources for power?

Mr. LEWIS. I believe the intertie with Ontario hydro is part of the system to meet peakload requirements in our Northeast area and also to provide to Canada what they would need, through this interchange.

Mr. ROGERS of Texas. You say we would be dependent a certain percentage of the time which would probably be governed by the peakload requirement?

Mr. LEWIS. Yes.

Mr. ROGERS of Texas. Actually the times that both of these facilities get in trouble is at peakload times, is it not, insofar as electric energy is concerned? If you did not have these peakload requirements you could save a lot of money, save a lot of trouble, and get away from a lot of emergencies?

Mr. LEWIS. Peakload is inevitable in a power system. I think the purpose of the intertie is to reduce the amount of reserve required for standby, probably the least economical aspect of a system. Also, the interties help reduce the cost for the reserves.

I believe these are some of the functions and purposes of the intertie.

Mr. ROGERS of Texas. To me the meaning of peakload situation is probably different than in the ordinary electric energy talk. Peakload means not only the requirements but it also means the ability of the producing entity to provide the necessary requirements.

Of course, the producing facilities are built to meet what you consider your peakloads insofar as requirements are concerned. One thing that disturbs me is whether or not this country has and can be completely self-sufficient in meeting peakloads in a civilian economy and to have a sufficient backlog or support process to meet what would be a substantially greater peakload in an emergency or military situation.

Mr. LEWIS If you are talking about civilian economy demands, I believe the projections to 1980 indicate these loads will be met. In an emergency with undue growth in demand, we can put into effect, as we did in Korea and World War II, a system of use priorities and curtailments which directed the distribution of energy well away

from unessential uses. If we are considering a nuclear situation, studies thus far seem to indicate that you lose more load, that is more demand, than you do generating capacity, so that the balance would maintain in that kind of situation.

Mr. ROGERS of Texas. But don't you think that your planning and the Office of Emergency Planning ought to address themselves to the proposition of nuclear attack?

Mr. LEWIS. Yes, sir.

Mr. ROGERS of Texas. That ought to be their peakload, should it not and their requirements should be measured by a nuclear attack and what occurs, your needs, immediately after?

Mr. LEWIS. Yes, sir; this is what we have done in that study. The initial demands are quite low compared to peacetime demand because of the loss of population and the location of the consumers.

Mr. ROGERS of Texas. Is the United States at the present time self-sufficient to meet those requirements without calling upon foreign sources for electric energy?

Mr. LEWIS. I would say on an overall basis our study seemed to indicate this. The reason we went to Canada to discuss plans for the exchange of power in emergency is that you may have unusual situations or needs in certain localities, depending on the kind of attack and the effects it has, so that there may be some isolated areas that might be required to seek assistance north of our boundary.

So, we are trying to include in our planning all possible sources of electric power that could be used at the time after a nuclear attack.

Mr. ROGERS of Texas. In Detroit are we tied in pretty close with Canada?

Mr. LEWIS. To my knowledge there is an intertie connection at Detroit, also.

Mr. ROGERS of Texas. You understand, I am not mad at Canada. I don't want people to think I am mad at Canada. I don't want this country to get in trouble simply by not getting mad at Canada. If it is necessary to get mad at Canada to get this country straightened out so that it will not have vulnerability, if that is what is required, I think that is what we ought to do.

Has your Office, yours or Mr. Dryden's, made any recommendation or do you have any recommendations in the making with regard to strengthening our electric energy resources in this country?

Mr. LEWIS. I would say that at this stage of the studies that are underway as a result of the Northeast failure, what we are presently doing is trying to accumulate all the findings of the various investigations. There have been many conducted by individual agencies with resource responsibilities that consume electric power. Of course the key to the stability and strength of the electric power industry is the studies that are being made by the Federal Power Commission.

As their December 6 report indicates, there are many avenues and many areas of further study yet to be consummated which I think would be quite crucial to any recommendations we might care to make.

So we would wait to see what these studies look like.

Mr. ROGERS of Texas. Is the head of the Office of Emergency Planning a member of the National Security Council?

Mr. LEWIS. Yes, sir.

Mr. ROGERS of Texas. As I understand you, this matter is all gathered together, this information is all gathered together, and he is a member. Who is the head of the Office of Emergency Planning?

Mr. DRYDEN. I am the Acting Director.

Mr. ROGERS of Texas. You have a vacant position at the top?

Mr. DRYDEN. Yes, sir.

Mr. ROGERS of Texas. That is right, Mr. Ellington resigned.

But as a member of the National Security Council it is my understanding that recommendations were made to the Security Council and by the Security Council to the President of the United States as to measures which should be taken to provide a means or method of meeting any challenges against this country.

Certainly to my mind that would encompass adequate supplies of electric energy to meet our military needs and certainly the civilian needs.

Mr. DRYDEN. This is tied into this continuing report, Mr. Rogers, that is underway now. I think it will bring out any deficiencies which might show up. With respect to the Canadians, we have this past year I think, more than in the past, developed closer ties with their civil emergency organization.

We have had them down here several times, we have been up there several times, to work in closer coordination with them in all resource areas and try to develop arrangements so that we can help each other at any crucial time. I think that probably before the study is over this matter will be determined as to the cause of that relay switch operating.

Mr. ROGERS of Texas. Don't you think, Mr. Dryden, so long as you have mechanical operation that all of them are subject to human error?

Mr. DRYDEN. They certainly are.

Mr. ROGERS of Texas. It is just one of those things you can't get away from. That if this country is in the least dependent on a foreign country, friendly or unfriendly, that we ought to have access to all information on the people manning the plants?

Mr. DRYDEN. I think that is not unreasonable at all.

Now, Mr. Rogers, the grid system as I understand it, and I am not a technician in this field, was devised and designed and engineered to reduce the likelihood of this kind of failure. There are some schools of thought, as I said before, that feel maybe it was overengineered, that it is so delicate, so finely toned and honed to keep something like this from happening, that the slightest dislocation set it off in an effort to stop it but instead of stopping it, pushed it forward.

Mr. ROGERS of Texas. I think the overrefinement is pointed out by the fact that they had every gadget known to mankind on a huge board to tell where the trouble was but when the lights went out they could not see the board. Maybe we have overrefined the situation too much.

I am a little bit confused that Office of Emergency Planning seems to be primarily dedicated to working with an emergency after it has happened. I am wondering why perhaps more attention should not be paid to averting an emergency rather than all of the work done to work with it after it has occurred.

Mr. DRYDEN. I certainly think your question is well put. I might point out that the philosophy of the Office of Emergency Planning in its inception, as I understand it, was for the purpose of giving the country resources and the ability to recover from nuclear attack. I think this was one of the originating purposes behind it.

Now in the past 18 to 20 months the impetus has not been so great in this area because of the feeling that the possibility of nuclear attack has lessened. People have become more intelligent on this subject. However it is—the possibility of limited war such as we have now has become greater at the same time, and the philosophy and the policies of the Office of Emergency Planning have been changing to meet this different challenge.

I think this in great part would account for the fact that perhaps we were not as capable of meeting this challenge because we had not been developing ourselves in that direction up to that time. This last year we have done a lot of this kind of planning rather than nuclear attack planning.

Mr. ROGERS of Texas. Of course I can appreciate the fact that your office would not be able to avert a nuclear attack. That would be a matter for the Department of Defense. You would have to assume the premise that there was a nuclear attack and the best thing you could do would be to make it less cumbersome upon people.

In that connection it would seem to me that if such a thing should occur, one of the primary things that would be needed would be as much energy available in the unhit areas as possible and the continuity of transmission. And on the other hand I don't think we can confine our thinking simply to a nuclear attack.

Because if this Communist situation across this world is going to be practiced in the United States and surrounding countries as it has in their brush-fire operations for many years back, whether it is Korea, Vietnam, or wherever it is, that we should anticipate that efforts will be made to protect this country from every kind of situation like the Northeast blackout that these people could use.

Mr. DRYDEN. We feel that we are on this course right now.

Mr. ROGERS of Texas. Mr. Murphy, did you have any questions?

Mr. MURPHY. No, Mr. Chairman.

Mr. ROGERS of Texas. Mr. Broyhill?

Mr. BROYHILL. Mr. Chairman, I would like to ask Mr. Dryden this question: On page 3 of your testimony you state that the Office of Emergency Planning is taking certain steps and you enumerate them there.

Were these actions initiated by you or were they initiated by someone else?

Mr. DRYDEN. No, sir; they were initiated by us. We felt this is a part of our responsibility, Mr. Broyhill.

Mr. BROYHILL. Some of these actions cover several other agencies of the Federal Government. Do you have the legal authority to require these other agencies to cooperate with you or is it purely a cooperative effort on their part that they will work with you to coordinate their efforts, to come up with policies and procedures to limit the impact of such a disaster as this?

Mr. DRYDEN. This is not a "Yes" or "No" type of question. Under the Executive orders issued by the President, the Office of Emergency Planning has the responsibility to provide guidance and to coordinate the emergency planning activities of the various departments and agencies in certain fields.

Through this Executive order we work with these agencies and we like to think it is with—we don't direct them to do anything as such—but we work with them and coordinate our efforts so that we don't have duplications, so that we do cover the areas that need to be covered and follow a general monitoring-type of service with them.

Mr. BROYHILL. The Federal Power Commission came in and said they were taking certain steps to set up new procedures. They indicated that the commercial power companies were doing the same. We had two agencies come in here this morning to say they were taking certain steps.

I am just wondering if there was, or is, any coordinating agency here.

Mr. DRYDEN. When you ask about us, we are participating in these. When the President called on Mr. Swidler to develop this study, to call the people in, we were a part of his committee because we were vitally interested in it from the emergency standpoint. Likewise with these other departments.

Where they have been given directions to do something in the area that is within our sphere of responsibility we cooperate with them in that area. Where there are gaps, we urge action.

Mr. BROYHILL. Thank you.

Mr. ROGERS of Texas. Mr. Harvey.

Mr. HARVEY. I just have one question, Mr. Chairman, along the lines of what Mr. Broyhill was asking.

What, Mr. Dryden, can you tell us of the nature of the investigation that Canada has been conducting?

Mr. DRYDEN. Can you answer that, Mr. Lewis?

Mr. LEWIS. I don't think I am familiar with that, sir.

Mr. HARVEY. Does Canada have an Office of Emergency Planning such as we have?

Mr. LEWIS. Yes; they have an emergency organization which is the equivalent of our OEP.

Mr. HARVEY. I gather that your agency has not done any investigating as to the cause of this blackout in Canada whatsoever; is that right?

Mr. DRYDEN. That is right. It was assigned to the FDC by the President.

Mr. HARVEY. Do you know whether any of our agencies have made any investigation in Canada or have they relied solely upon investigations made by the Canadians themselves? Have they investigated the thing jointly or how has this been done?

Mr. LEWIS. I am not sure whether it is jointly, but I know there is a close working relationship between the FPC and Canada, and I know the Canadians came down here on the 15th of November to reveal their findings on the faults in their system. There was a very easy exchange of information and findings.

Mr. HARVEY. What about the personnel? Is it deep enough so that we know the background of the various personnel in the Canadian situation?

Mr. LEWIS. To my knowledge we don't.

Mr. HARVEY. Does this bother you at all that we don't have access to that information or don't know that?

Mr. LEWIS. I would assume that appropriate clearance and security measures are taken by the Canadian people, since energy is a highly sensitive enterprise.

The extent, of course, we just don't know. Then there is always the problem that they would want to know about the background of our people. I guess it would be a rather lengthy exchange of information.

Mr. HARVEY. Would it bother you particularly so far as getting a repetition of the same thing occurring again? From the point of a civil defense measure or just preventing this from happening again should we have more knowledge from that standpoint?

Mr. LEWIS. I think it should be checked into as part of our survey on the cause and what remedial action should be taken to minimize or prevent anything like this from happening.

Mr. HARVEY. I have no further questions.

Mr. ROGERS of Texas. Mr. Dryden, is it my understanding that a thorough exploration of all of the reports of the interested agencies is being made at the present time and that a report or recommendation will be made to the President as to what should be done?

Mr. DRYDEN. That is my understanding.

Mr. ROGERS of Texas. Do you have any idea when that will be available?

Mr. LEWIS. I think much more technical and operational information is to be developed before a report is to be made. There are many areas essential to a determination of our next courses of action which have yet to be explored by FPC, and we have some work yet to do with agencies responsible for essential power using industries.

Mr. ROGERS of Texas. Do you have any information as to whether or not Canada is dependent upon this Nation to any extent for electric energy?

Mr. LEWIS. Just to the extent of these interties they would draw upon us for their needs as we draw on them when we have the need. It is a joint, mutually beneficial arrangement.

Mr. ROGERS of Texas. If someone triggered a switch in this country while Canada was at its peakload and drawing off us, they would have an East Canada blackout?

Mr. LEWIS. They could. My understanding though, is, as a result of this incident, that certainly the U.S. power companies already have taken steps to strengthen the breakers on this side of the river so that a surge of power which could trigger a similar occurrence could be prevented or minimized in its effect upon our systems here. I would expect that Canada also has taken appropriate action. While then it could happen, each one of these actions reduces the effects and minimizes the impact.

Mr. ROGERS of Texas. And have you done any investigation of the El Paso, Tex., blackout?

Mr. LEWIS. We have done no investigations. FPC was directed by the White House to do that. I believe they have completed their studies.

Mr. ROGERS of Texas. Are there any further questions?

Thank you very much, Mr. Dryden. That concludes the testimony this afternoon.

The subcommittee will stand adjourned until 10 o'clock in the morning.

(Whereupon, at 2:55 p.m., the subcommittee adjourned, to reconvene at 10 a.m., Friday, February 25, 1966.)

INVESTIGATION OF NORTHEAST POWER FAILURE

FRIDAY, FEBRUARY 25, 1966

HOUSE OF REPRESENTATIVES,
SPECIAL SUBCOMMITTEE TO INVESTIGATE
ELECTRIC POWER FAILURES OF THE
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to call, in room 2123, Rayburn House Office Building, Hon. Walter Rogers of Texas (chairman of the subcommittee) presiding.

Mr. ROGERS of Texas. The subcommittee will come to order for the further consideration of the matter before the subcommittee.

This morning our first witness is Mr. David Thomas, Deputy Administrator for the Federal Aviation Agency. Mr. Thomas, I apologize for being late but several of us were at the White House and the meeting lasted a little longer than we had anticipated.

You may proceed.

STATEMENT OF DAVID THOMAS, DEPUTY ADMINISTRATOR, FEDERAL AVIATION AGENCY

Mr. THOMAS. Mr. Chairman, I have a prepared statement. If it is agreeable with you, I will read it.

Mr. ROGERS of Texas. You may proceed.

Mr. THOMAS. Mr. Chairman and members of the subcommittee, I am David D. Thomas, Deputy Administrator of FAA. On behalf of myself and Administrator McKee, I want to thank you for the opportunity to appear here and discuss with you the problems created for aviation by electric power failure.

The Federal Aviation Agency is charged with the responsibility of assuring that a safe and efficient air navigation and landing system is available to meet the needs of aviation. On November 9, 1965, a massive power blackout in the Northeastern United States dramatically demonstrated how the level of safety and efficiency could be drastically impaired. I would like to describe what we learned from it, and the steps we are taking to protect the safety and efficiency of these operations from future power failures.

Prior to the November 9 blackout we had, of course, recognized the possibility of localized power failure and the need for a standby power source. There were two ways considered acceptable for providing an auxiliary source of power: (1) installation of an engine generator or (2) a hookup to a second commercial power source. Of the two alternatives, the second commercial power source was considered the most desirable because of the lower maintenance cost, less timelag for

switchover if the primary source failed, and usually lower initial cost. At the same time, it was recognized that most separate sources, if traced back far enough, would prove to be not truly separate, but sometimes would be supplied by the same source as supplied the primary source. A general understanding was reached that if the powerlines to the aviation facility did not share the same pole line, duct, transformer, substation, or other component which could be knocked out by something less than a major catastrophe, the sources could be considered as separate. Based on the premise that two separate commercial sources would not be lost at once, both FAA and many airport operators installed dual commercial power sources at many facilities both on and off airports. At other facilities, engine generators were installed.

The effects of the November 9 blackout on air traffic control, navigation, and landing facilities varied from outages of a few seconds at facilities equipped with automatic standby engine generators, to complete loss of service for periods exceeding 12 hours at facilities relying on dual commercial sources.

The New York and Boston terminals presented the most serious problems.

At John F. Kennedy Airport, the airport surveillance radar was out of service for 12½ hours. The Kennedy instrument landing systems and the runway and taxiway lights were out for 11½ hours. The tower was out. All of these systems were served by dual commercial power.

At LaGuardia the tower, including all communications, was inoperative for over 11 hours. The runway lights were also out. As a makeshift communications system, a radio transmitter/receiver was set on a truck, and an American Airlines DC–6 radio, and a Northeast Airlines aircraft radio were used to land 240 aircraft on a runway with flare pots. All standby power at LaGuardia was dual commercial power.

At Logan Field in Boston the tower and radar were inoperative for 4 hours; the instrument landing systems, for 3 hours. Here some systems were provided standby power by dual commercial source and some were served by engine generators.

Except for those aircraft which were landed at LaGuardia and a few at Logan the aircraft inbound to the Boston and New York areas were diverted to other areas.

Besides airports, the other most critical aviation facilities are those FAA facilities which provide en route traffic control, the Air Route Traffic Control Centers which are equipped with radar and computers. These are not greatly affected because all of those involved—Boston, New York, and Cleveland—had standby generator power. Because these centers remained operative, we were able to guide aircraft safely to airports not affected by the blackout—to Philadelphia, Newark, and Washington, among others.

All aircraft operating during the blackout were landed safely and there are no known significant instances of personal injury or property damage due to aviation mishaps. Clear weather, a moonlit night, the professionalism and ingenuity of pilots and ground personnel, and

the fact that the en route facilities continued to function, all combined to permit what otherwise could have been disaster. However, it should be remembered that while no physical injuries or damage occurred, a considerable amount of delay, inconvenience, and expense resulted for the air carriers and their passengers.

At FAA, our reaction, as it had to be, was immediate. Recognizing that alternate sources of commercial power are not adequate in the massive blackout situation we were experiencing, we immediately surveyed our own facilities to insure that engine generators were located at the most critical spots. In addition, engine generators were shipped on an emergency basis from FAA stock to seven key airports (John F. Kennedy, La Guardia, O'Hare, Miami, Los Angeles, Atlanta, and Seattle) to insure the availability at each of those airports of the control tower and one instrument runway with lights.

Beyond that, we have identified 50 airports across the country as continuous power airports. It is the intent that they be equipped with power generators adequate to power all facilities necessary to provide for landing under instrument conditions on at least one runway. These 50 airports were selected on the basis of activity and location and include every major and the majority of the medium hubs. The airports selected are generally not more than 200 miles apart, so that they provide rather complete coverage for the contiguous United States.

These steps are only the initial ones. In addition we are developing a longer range program which will make our system and the airports throughout the country more self-reliant.

The November 9 blackout taught us valuable lessons and focused our attention on the problem areas. We are confident that the deficiencies we found are correctable.

I will be happy to answer any questions.

Mr. ROGERS of Texas. Thank you, Mr. Thomas, for your statement. Mr. Rooney.

Mr. ROONEY. Mr. Thomas, you gave two alternatives to the problem that the Air Force was confronted with a November 9. First you talked about the installation of an engine generator and second about hookup to a commercial—second commercial power source. You also mentioned that the power source at JFK and LaGuardia were dual power sources, is that right?

Mr. THOMAS. Right.

Mr. ROONEY. What were the two companies?

Mr. THOMAS. I do not know, sir. I believe in the case of JFK they had three sources but I do not know the companies.

Mr. ROONEY. If you have two companies or three companies serving one airport and there is a catastrophe such as the one that occurred on November 9, if one of the companies were to be knocked out would you assume that the other two would be? Because aren't they interpower pools and integrated power pools?

Mr. THOMAS. Sir, it was my intention to leave the impression, and I guess I did not, that in the future we would rely on engine generator power for the major airports that we wanted for safe havens for the aircraft rather than on a second commercial source, because in every

case there were second and third sources available where we had the blackout.

In those cases where we had engine generator power we were able to maintain continuous operation.

Mr. ROONEY. Why does the FAA stock generators when they knew they could anticipate such a catastrophe?

Mr. THOMAS. Why did we stock them?

Mr. ROONEY. Yes.

Mr. THOMAS. Mr. Rooney, we have in our system now around 2,500 generators. We have a large number. We use them. We rely on them. It had been our practice at one time to put in engine generators at most locations. Recently we put in engine generators at only those locations where the second or third source of commercial power was not available; that is, at the more remote sites or unreliable power sites. For this reason we had some excess generators in our warehouse. But fundamentally we have a large number of engine generators installed.

In Alaska we operate almost exclusively on engine generators, as we do in remote parts of the country, en route aids, and facilities which are generally not in large cities and not accessible to sources of commercial power. We have 75 or 80 percent of our remote facilities equipped with engine generators. These operated perfectly.

Mr. ROONEY. For all intents and purposes you are not going to rely on the second commercial power sources for major airports from here on?

Mr. THOMAS. This is correct for the essential facilities we desire to operate a hundred percent of the time.

Mr. ROONEY. I have no further questions.

Mr. ROGERS of Texas. Mr. Thomas, when you refer to the second commercial source, those were the means that you were using at the time of the Northeast blackout?

Mr. THOMAS. Yes, sir.

Mr. ROGERS of Texas. What do you mean by a second commercial source? A different company?

Mr. THOMAS. Not necessarily. It could be the same company but it would be so situated that local disturbances would not affect the power. This could be a second substation of the same company. It could have different lines, different entries into our facilities. It could be the same company. Really, it would not have anything to do with the company but it would not be so that one transformer could be knocked off a powerline and our facility would be in darkness.

Mr. ROGERS of Texas. That is the point. Your second commercial source was actually a dual line, whether it came from the same company or not, in anticipation of some mechanical defect in connection with the airport proper or the nearby vicinity, where this other line would be available to switch over to.

Mr. THOMAS. Yes, sir. This frequently happens. A wind storm or trees will knock down a line, something like this, and the second source being a separate line, will continue. Up until the massive blackout it proved to be very reliable.

That is why we had discontinued engine generators.

Mr. ROGERS of Texas. What you had done was not go back to the source of your power?

Mr. THOMAS. No, sir.

Mr. ROGERS of Texas. This is the situation that caused the failure and the extensive blackouts at the airports was the fact you had not gone back to the source of power. If you had three companies or four companies with separate lines into an airport and the source of the power failed you will still have—you would still be blacked out, would you not?

Mr. THOMAS. Yes, sir.

Mr. ROGERS of Texas. Because all the lines would be dead.

Now in the program that FAA has pursued through the years and that they are following now in helping to build airports throughout this country, what attention has been paid to requirements in building these airports and in the grants made by the U.S. Government to the localities that they again be adequately supplied with electric energy?

Mr. THOMAS. Mr. Chairman, I do not believe that we have made our grants in most cases conditional upon the second source. As a matter of fact, most airports have had the second source but we have considered the second commercial source as being adequate.

Even in our own facilities where we furnish the approach lights, which is an integral part, we have considered the second commercial source as adequate and have not provided engine generator power.

We will consider the engine generators as qualifying under the Federal aid to the airport program for Federal participation in the purchase. We have not at the moment made it mandatory although we are trying to work on some sort of a safe haven grid so that there will always be landing facilities available even though all the 9,000 airports in the United States would not be so equipped.

Mr. ROGERS of Texas. Now there has been some discussion and I think the bill has been introduced with regard to Federal grants for hospitals, making it a requirement to qualify for the grants that the participating agency, local or regional or whatever it is, must show that they have provided a backup or a secondary source of power that is firm in the event their primary source goes out.

Is this the kind of thinking that is in the Federal administration—the Federal Aviation Agency at the present time?

Mr. THOMAS. Not for all the grants, Mr. Chairman. Certainly for the key points. We have, let us say, 2,500 airports which have at one time or another obtained Federal aid. We have about 600 airports that now have scheduled air carrier service. We have about 170 airports, military airports, which do have adequate power supply. That is locally generated power supply.

Our thought was that if we could get a grid, protect it so that we would always have a safe haven, we then would not require the small airports to be so equipped but possibly require the air carrier airports.

Mr. ROGERS of Texas. Now let us take, for instance, the Kennedy Airport at New York. Have you any figures or data as to what it would cost to provide a secondary standby source of power, local and confined to the Kennedy Airport? To take this a little further, if the lights went out and you had 10 lines in there, that you could, whether it be by a gas generator or what, you could switch on that in pretty short order and build up your load where you could carry it?

Mr. THOMAS. Mr. Chairman, in the case of Kennedy, because much to our consternation, and I did spend a great deal of the night down here in our control communications control center, before daylight that morning we had arrangements to ship engine generators out of our stocks to Kennedy and Kennedy is now equipped. It does have engine generators on radar. As a matter of fact, I don't have the price but we had to supply about 11 engine generators, separate ones, on Kennedy to supply the tower, the runway lights, the approach lights, the radar, communications, the instrument landing system, and various components of the instrument landing system.

We supplied engine generators there ranging from 8 to 125 kilowatts. That airport happens to be now equipped. We have moved in in the Northeast on quite a few locations. As a matter of fact we are in pretty good shape. Dulles was already equipped. Our airport at Atlantic City, our National Aviation Facilities Experimental Center was equipped. Andrews was equipped. Washington National was equipped. Philadelphia and Newark stayed on. Boston did not. But we moved in to La Guardia, J.F.K., Boston, and the other airports with generators and we are in fairly good shape in the Northeast on the major airports.

Our guess is that the installation price is around $125,000. I don't think that included the price of the equipment.

Mr. ROGERS of Texas. Are these units that are there now, are they the permanent type or are they just the mobile type.

Mr. THOMAS. They are permanent. When you get to 125 kilowatts, it is a large diesel machine. They do belong to us. They are on a loan basis, the Port Authority of New York will replace them ultimately.

Mr. ROGERS of Texas. Would it not make good sense, say, just for insurance, if you had available in these airports, say a gas-fired turbine generator that can be moved in quickly?

In these other types of generators, as I understand it, it takes some time to get them fired up and get the production of electric energy on the line?

Mr. THOMAS. The ones that we have in every case, and as a matter of fact this is getting to be not good enough, will start in 15 seconds. Some of them take up to 45 seconds.

Mr. ROGERS of Texas. Is that diesel fired?

Mr. THOMAS. Yes, sir. Now this is not good enough. In our places that have computers we have to go into a continuous power supply because if you drop the computer off the line for 8 seconds, most of them will lose the information in it. So, in our big radar and our computer centers we are going into continuous power so there is no drop. We also have a little bit of problem with some of our more delicate equipment with the big generators even if they come in in 2 seconds, as some of them do, coming in with different phases or different frequencies or different voltage which gives a problem for a moment or two.

So our requirements scale from continuous power in the big radar computer locations to just having standby power available that a

man can start, just so he can get it back on at other locations. In most all cases they are automatically started. When the voltage drops on the commercial line an engine generator kicks on automically.

Mr. ROGERS of Texas. You say they kick on automatically. I would presume that this automatic kick-on is caused by electric energy——

Mr. THOMAS. By a battery.

Mr. ROGERS of Texas. By a battery?

Mr. THOMAS. Yes. It is like the emergency lights you see in many public restaurants, when the voltage drops down. The drop actuates a relay to cause the light to go on.

Mr. ROGERS of Texas. Why was not the Kennedy Airport equipped with the necessary facilities at the time as was Dulles and Washington National?

Mr. THOMAS. I guess the only answer I can give you, Mr. Chairman, is that neither we nor the airlines or the port authority had that much brains. We had three sources of commercial power and we felt it was good enough. We just learned a lesson.

Mr. ROGERS of Texas. When Kennedy Airport was built then it just was not anticipated that this could happen?

Mr. THOMAS. We did not think this could happen.

Mr. ROGERS of Texas. Did you have more points of supply to Kennedy than you did to Washington National?

Mr. THOMAS. Yes, sir. I believe there were three there. In the case of Washington National my recollection is that we have two. At Washington National we have had engine generator power for years. When we built Dulles we were very concerned about continuing it as an all-weather, reliable airport and we also put in engine generator power there.

Mr. ROGERS of Texas. Have you made any investigation as to whether or not—as to why facilities of the private power companies which were supplying you and I suppose these were, you were tied up with private power companies at Kennedy?

Mr. THOMAS. Yes, sir.

Mr. ROGERS of Texas. As to why their auxiliary supplies did not function there?

Mr. THOMAS. No; we have not. That is outside of our competence to do so. It has been explored as you know by study groups in the Federal Power Commission so we have not looked into it. We have simply accepted the reports which have been made available to us. We accepted the fact that it did happen. We accepted the fact that if you do have an isolated source of power that most likely engine generators are more reliable—I would like to say in one case we had engine generator trouble during the blackout. We had generators going and the commercial power came on instantaneously and this knocked the engine generator out. It was not all 100-percent perfect but it was 98-percent perfect.

Mr. ROGERS of Texas. You have a great concern as to why the auxiliary power of the private company did not come on but you are permitting us to do that investigation?

Mr. THOMAS. Yes, sir; we have no competence.

Mr. ROGERS of Texas. But it is of peripheral interest to you and if this cannot be adjusted so that it will be taken care of in the future, what are your plans?

Mr. THOMAS. Our plans, Mr. Chairman—we have some facilities that we could lose and we do lose for other reasons than power failures. Failures are not always catastrophic. When an isolated en route navigational aid goes out it is rarely catastrophic. It could fail by tube failure or some other failure.

Nevertheless, at all the places where we have large volumes of traffic or the system is heavily relied upon, such as computers and radars, control towers, we will provide alternate sources of power. In the towers we are going one step further and we are providing for battery-operated transmitters and receivers to maintain communications now.

With the new, solid state designs where they consume very little power there is a practical, another practical backup that does not rely upon—that is not relying upon an engine generator start.

Mr. ROGERS of Texas. Do you have or are you promulgating rules and regulations for the constant and continuing inspection of these backup or auxiliary sources?

Mr. THOMAS. Yes, sir.

Mr. ROGERS of Texas. I was on a train one time that caught fire and they had a whole lot of fire extinguishers on it but there was not any extinguishing material in the fire extinguisher so it did not help very much.

Mr. THOMAS. Mr. Chairman, in the last 3 months I personally have either pulled or arranged to have pulled the commercial power switch at probably 25 of our facilities to make certain that the engine generators were operating.

In these cases we notified the controllers so we did not endanger anyone. I am happy to report in no case was the outage more than a blink of an eye.

Mr. ROGERS of Texas. Do you—you do have facilities so that if something is mechanically wrong it can be quickly repaired in order to bring your local auxiliary units into play?

Mr. THOMAS. In our major facilities we have maintenance men around the clock who are capable of repairing a malfunction. Of course in the wintertime we keep the fluids heated. They are in the buildings and we do test them periodically to see that they are there because the system as you stated is very likely not to work when you need it unless it is exercised.

Mr. ROGERS of Texas. The excuse of the people on the train was that the reason that the fire extinguishers did not work is that they did not have to use them for a long time.

Mr. THOMAS. Well, we pull drills constantly to make certain that our emergency equipment does work.

Mr. ROGERS of Texas. Now at LaGuardia; did you say you do have now at LaGuardia backups too, or auxiliary units?

Mr. THOMAS. LaGuardia required six auxiliary units to be installed. The lights are installed. The towers are installed. The

radar is installed. The ILS complete installation will not be completed until March 7 but on March 7 that will be completely installed. All main facilities are in at LaGuardia now.

Mr. ROGERS of Texas. Now this of course would appear to be, up to this point, a concentration in this generally thickly populated area from Washington which has this?

Mr. THOMAS. Yes.

Mr. ROGERS of Texas. All up in the metropolitan complex, Boston, New York, Newark. Now these are all fields where if something happened like the Northeast blackout, something that could not happen did happen, and there was not any way to get light, that there would be a saturation of these facilities that would be very difficult to knock them all out at one time, where planes coming in would have ample fuel to get to these other fields?

Mr. THOMAS. Yes, sir.

Our plan is that an airplane, generally speaking, and let me say again generally because in some of the areas of the Rocky Mountains this is not quite literally true, but generally speaking, no airplane would be more than 200 miles from a continuous power airport.

By "continuous" we mean one which has its own generating capability, for at least the one runway, at least one instrument landing system and necessary radar and communications.

Mr. ROGERS of Texas. Is your 200-mile situation the extreme or is that the average?

Mr. THOMAS. That is the extreme. What we did, we have divided the communities into what we call hubs. The giant hubs or the major hubs are all those communities that generate at least 1 percent of the traffic in the United States; a place like Chicago generated 21 million passengers last year, which is far more than 1 percent.

J.F.K. had around 16 or 17 million. But in those major hubs in every case it will be provided for. Then we have what we call medium hubs. This generates between a quarter of 1 percent or 1 percent. We have accommodated about half of those. Then we spread geographically so that we could in the Rocky Mountain areas provide a safe haven within about 200 miles flying time.

Mr. ROGERS of Texas. Where do you go out of Chicago? What other place have you equipped?

Mr. THOMAS. In Chicago, Midway and O'Hare.

Mr. ROGERS of Texas. What outside of there?

Mr. THOMAS. The ones that are to be equipped and unfortunately we have a chart which I did not bring, Mr. Chairman, we can furnish one if it would be of help, but if you are looking in the radius around Chicago we would go to Minneapolis, St. Louis, Cleveland, Denver, Pittsburgh, Detroit, Cincinnati.

Mr. ROGERS of Texas. I think it would be helpful if we had one of those charts.

Mr. THOMAS. All right, sir. We will be glad to furnish both the names and the chart if you so desire.

(The chart referred to follows:)

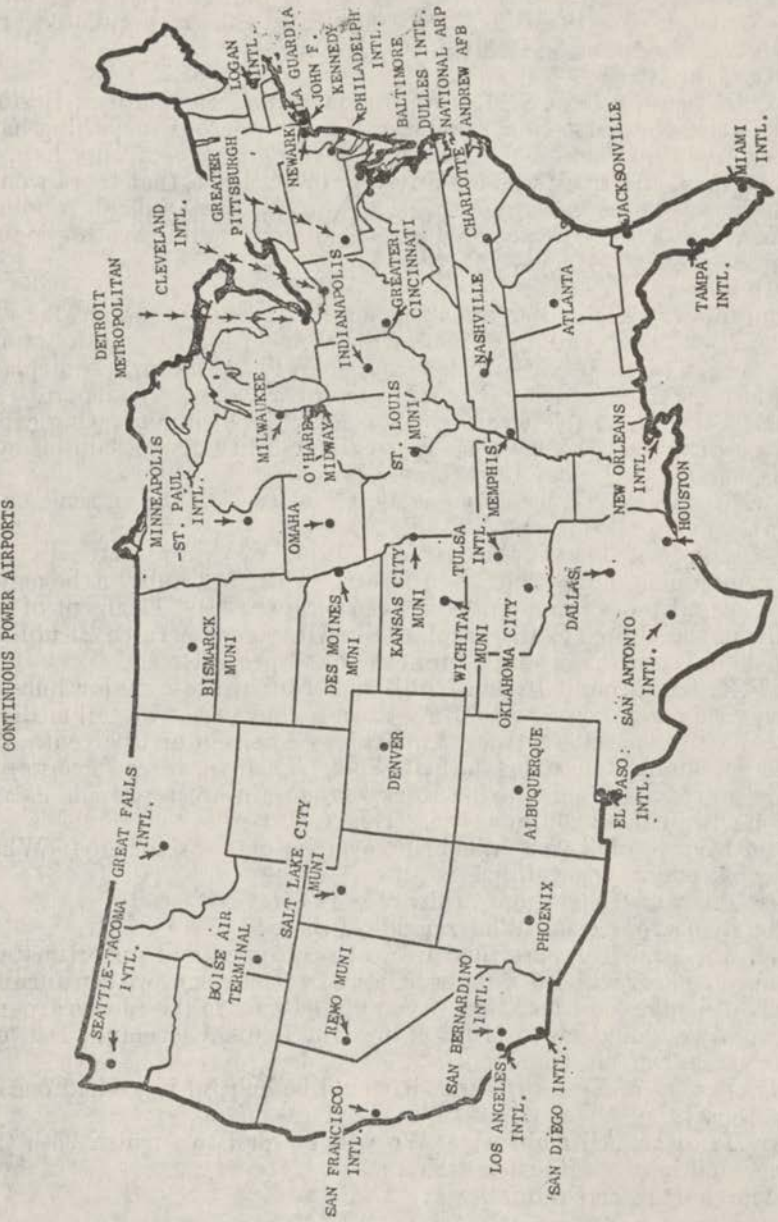
CONTINUOUS POWER AIRPORTS
SEATTLE-TACOMA INTL.
GREAT FALLS INTL.
BOISE AIR TERMINAL
RENO MUNI
SAN FRANCISCO INTL.
SALT LAKE CITY MUNI
SAN BERNARDINO INTL.
LOS ANGELES INTL.
SAN DIEGO INTL.
PHOENIX
DENVER
ALBUQUERQUE
EL PASO
BISMARCK MUNI
MINNEAPOLIS -ST. PAUL INTL.
DES MOINES MUNI
OMAHA
KANSAS CITY MUNI
WICHITA MUNI
OKLAHOMA CITY
TULSA INTL.
DALLAS
SAN ANTONIO INTL.
HOUSTON
DETROIT METROPOLITAN
CLEVELAND INTL.
MILWAUKEE
O'HARE MIDWAY
ST. LOUIS MUNI
MEMPHIS
NEW ORLEANS INTL.
GREATER PITTSBURGH
INDIANAPOLIS
GREATER CINCINNATI
NASHVILLE
ATLANTA
JACKSONVILLE
TAMPA INTL.
MIAMI INTL.
LOGAN INTL.
NEWARK LA GUARDIA
JOHN F. KENNEDY
PHILADELPHIA INTL.
BALTIMORE
DULLES INTL.
NATIONAL ARP
ANDREW AFB
CHARLOTTE

FIGURE 1

Mr. ROGERS of Texas. Have you had this blackout situation to any extent out in California?

Mr. THOMAS. No, sir; we have had power interruptions and shortages almost every place. I do not believe that we have had anything unusual in California. We had two in the El Paso area since the blackout and for a few minutes duration.

Mr. ROGERS of Texas. Yes. Most of those that you have had though have been sort of momentary, relatively speaking?

Mr. THOMAS. Yes, sir. As a matter of fact last week when we had some difficult weather that came through here, also went through New York, a tree fell across the powerline going to our New York center which is our largest center.

The engine generator responded. We do have transformers fail, ice gets on powerlines, this sort of thing. But usually it is minor. We are prepared for it and the alternate source takes over.

Mr. ROGERS of Texas. Now these auxiliary units that you are putting in, do you simply tie those onto the existing lines and if you have a line above ground is that tied onto that or do you put in a new system underground?

Mr. THOMAS. Generally they are not underground. They may be in the larger airports and of course on the airports themselves they are. But they are tied into what we would call our bus-bar facilities themselves and it is a matter of switching over at the junction point that feeds the facilities. They are not part of the same line.

Mr. ROGERS of Texas. Do you feel, Mr. Thomas, that the lessons that have been learned from this Northeast situation insofar as aviation is concerned and the deficiencies that were present have been pretty well cured and can be handled?

Mr. THOMAS. They are being cured. They have not been cured. They are being cured. For example, we do not have continuous power. We are getting on to that in our larger facilities. We are procuring now a program—a complete installation program on our own facilities which will run $3½ million, which we have reprogramed from another program to take care of our most critical location.

We have probably around $30 million worth of engine generators in the system now. So I would not say we are well but we are on our way to being well.

Mr. ROGERS of Texas. It seems rather strange to me that as advanced as we are in so many things, flying around out into space, then on the spur of the moment we end up landing planes in the greatest metropolis in this country by flare pots. It seems rather unusual that man's projective thinking would not encompass such a possibility.

Mr. THOMAS. That is right. It disturbs us a great deal, Mr. Chairman. I think we could all take our hats off to the pilots and controllers. They did a superb job that night. At 9 o'clock that night I would not have given you any odds that we would go through to morning without incident but we did.

Mr. ROGERS of Texas. I think it was tremendous. I think the job that was done was tremendous. Maybe it won't happen again.

Mr. Rooney.

Mr. ROONEY. I have no questions.

Mr. ROGERS of Texas. Thank you very much, Mr. Thomas and we may be calling on you again.

Mr. THOMAS. Thank you, Mr. Chairman.

Mr. ROGERS of Texas. I notice we have with us Judge Loevinger, the Commissioner of the Federal Communications Commission who is scheduled to appear at 2 p.m. this afternoon but we were able to work things along a little faster, so, Judge, if you will come forward and bring with you any assistants that you might want, we will be glad to hear from you.

STATEMENT OF HON. LEE LOEVINGER, COMMISSIONER, FEDERAL COMMUNICATIONS COMMISSION

Commissioner LOEVINGER. Thank you very much, Mr. Rogers. My name is Lee Loevinger. I am delivering this report to this committee as the Defense Commissioner for the Federal Communications Commission. The FCC has delegated to the Defense Commissioner by a regular rule the emergency and defense functions of the Commission.

From time to time various Commissioners act as the Defense Commissioner. Commissioner Bartley has most recently, preceding me, been the Defense Commissioner and he did a wonderful job over a period of years.

I am relatively new in the job. And I am accompanied by Mr. Kenneth Miller, who is the head of our office of emergency communications.

I have no prepared statement, Mr. Rogers. We have recently completed and delivered to you and filed with your committee a report by the FCC on the Northeast Power Failure and its effect on communications.

(The report referred to may be found in the committee files.)

Prior to that we had secured and delivered to you a report of our industry advisory committee.

(The report referred to follows:)

FEDERAL COMMUNICATIONS COMMISSION,
OFFICE OF THE CHAIRMAN,
Washington, D.C., January 13, 1966.

Hon. OREN HARRIS,
Chairman, Interstate and Foreign Commerce Committee, House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: I am pleased to enclose for your information a copy of the Report "Effect on Communications of Northeast Power Failure, November 9–10, 1965" which was prepared for the Commission by a special National Industry Advisory Committee Working Group.

While we have not yet analysed this material, we believe that you and your staff will find it of interest. We have it under active study, and will soon report to you our evaluations and recommendations.

Sincerely,

E. WILLIAM HENRY.

[Public Notice—G78694, Jan. 13, 1966]

REPORT TO FCC ON EFFECT ON COMMUNICATIONS BY NORTHEAST POWER FAILURE

The Federal Communications Commission today made public a detailed report on the impact on communications by the electrical power failure of November 9, 1965, that blacked-out New York City and much of the Northeast. Information obtained from over 1,000 Commission licensees in the 80,000 square mile affected area (New York, Massachusetts, Connecticut, Rhode Island, New Hampshire,

Vermont and several small pockets in Maine, Pennsylvania and New Jersey) indicates:

(1) Within the affected area, 34 radio stations continued broadcasting without any interruption of service and within an hour after the power shutdown, 78 stations (including 13 daytimers) operating with auxiliary emergency power equipment, were able to resume broadcasting. Signals from these stations covered the entire area affected by the blackout. The availability in the hands of the public of transistor radios able to receive information concerning the nature of the emergency may well have prevented a catastrophy of major proportions.

(2) The American Telephone and Telegraph Company, Associated Bell Companies, and the independent telephone companies shifted immediately to standby auxiliary power equipment, and handled emergency business and an extremely heavy load of local and long distance calls without material delay. There was no breakdown of communications affecting the Nation's national defense.

(3) Vital safety and special radio services such as those serving police, fire, marine and aviation continued in operation at all times; amateurs, citizens band and mobile units also played an important role in transmitting messages of importance during the emergency.

While highlighting the ability of our Nation's communications facilities to react promptly and establish a workable communications system to meet an unforeseen emergency, the report concludes that "communications in all forms are vital to the economy and the public well-being" and that "a source of continuous reliable electric power is essential to continued communications operations." The report contains recommendations designed to prevent a recurrence of a problem of this magnitude, including the need for additional auxiliary power supplies, radio links to police, fire, civil defense headquarters and other key officials, the desirability of establishing a control source for the dissemination of emergency information and a campaign to presuade the public that a transistor radio is a necessity in every home.

The report is under active study by the FCC. Particular emphasis is being placed on the establishment by Commission licensees of reliable communication centers to which the public can turn in times of emergency for vital information.

The report was prepared under the direction of Defense Commissioner Lee Loevinger, by a special National Industry Advisory Committee Working Group. The Commission is particularly indebted to Mr. W. Elmer Pothen of the American Telephone and Telegraph Company for the common carrier aspects of the report, to Mr. Granville Klink of Radio Station WTOP for the broadcast material, and to Mr. Joseph M. Kittner for the information relating to safety and special radio services.

A more detailed summary of the power failure effect on Broadcast, Common Carrier and Safety and Special Radio Services follows:

BROADCAST

Broadcast licensees, the radio and television networks, and the press wire services provided the public with vital information for which they have received praise and commendation from Federal, state and local officials and the general public. The report makes clear that radio played a significant, if not the sole role in telling the general public what was happening and what to do in the early hours of the blackout. At the same time it recognized that many broadcasters were unprepared for the predicament in which they found themselves and were at a loss to know what to do.

While the report contains a detailed breakdown of the services provided by all broadcast stations in the area, the most significant facts are as follows:

In the six states that were blacked-out, 34 standard broadcast stations reported no commercial power outage and continued uninterrupted operations.

An additional 48 standard broadcast stations, 18 FM broadcast stations, and 12 TV broadcast stations resumed operations with emergency auxiliary power within 15 minutes of the commercial electric power failure.

Within two hours, an additional 26 standard broadcast stations, 11 FM broadcast stations and four TV broadcast stations had resumed operations with emergency auxiliary power.

The blacked-out area was thus completely covered within two hours with 153 broadcast signals, providing reassuring information and instructions from gov-

ernment officials and public utility officials concerning the commercial power blackout.

Vital services performed by those stations that were able to remain on the air, to resume broadcasting, or by personnel of the broadcasting industry included getting in touch with electric and power officials, telephone company officials, mayors, police and fire departments, the offices of governors, civil defense organizations, water commissioners, school superintendent, Red Cross and other services. Special news roundups were prepared and aired on traffic and travel conditions, ways and means to avoid losses stemming from the power failure, and other public service messages. Many stations, particularly daytimers which had closed down at local sunset, retained their staffs and relayed news to the public by answering telephone inquiries. Remote pickup faciilties were mobilized and dispatched to key locations throughout service areas, relaying back to the station vital information for immediate broadcast (where the station was on the air) or for taping for broadcast later when the station returned to the air.

The radio and television networks and press wire services were active in mobilizing their staffs and quickly gathering vital information concerning the electric power failure. Network program and news organizations either continued from New York City or were switched to other cities unaffected by the power failure. Network television facilities in the blackout area were impaired to the greatest extent, with ABC, NBC and CBS reporting the switch of control of television operations to other cities.

Over the past three years, the broadcast industry, in cooperation with the FCC and other Federal, state, and local authorities, has voluntarily contributed many thousands of dollars and man-hours in the development of new emergency plans, systems, and procedures. As a result, cooperation with authorities during the power failure was outstanding, vital information concerning the facts of the blackout was promptly aired and those with transistor radio receivers received reassuring information within minutes concerning the emergency.

COMMON CARRIER SERVICES

Common carrier service in the blackout area depended upon the availability of emergency or alternative power sources, and the switching or transferring of certain traffic loads to unaffected areas. The telephone companies for many years have equipped central offices and communications centers with emergency power arrangements; and in spite of abnormally heavy loads the telephone companies handled all emergency business and most of the offered regular calls. Long distance service was unimpaired as was local service except for the problems of providing service to equipment which depended upon local power sources for operation of the customers' communication equipment, such as teletypewriters and other printing equipment.

Most of the telegraph company main offices and radio relay points have emergency power systems and a small number of portable power generating units cover smaller offices in limited emergencies. The main Western Union office in New York City, however, was out of service because both of its commercial power sources were lost, although the office was equipped for emergency power protection for a failure of either AC or DC commercial current. The international record common carriers operating in New York City did not have sufficient independent emergency auxiliary power at the time of the failure to provide for normal operations. To meet the problem, emergency generators were sought and some business was rerouted or carried through arrangements with the telephone companies.

Bell Associated companies immediately switched to emergency power. Overseas service was unaffected. In the New York Telephone Company area the system handled double the normal load of dial traffic. Delays in traffic required keeping some lines open at times for priority and essential service. Long distance service was largely unimpaired. Pre-planned emergency procedures were used in New York and 12 regional centers in the U.S. and Canada to control congestion and take advantage of the full capacity of the nationwide network. Vital military agencies and civil government systems had no loss of command, with only short periods of service difficulty. Radio and TV networks that could not be fed from New York were rerouted by AT&T to permit origination of programs in Washington, Chicago and Los Angeles.

Independent operating telephone companies furnished service on a nearly normal basis. While not all offices had emergency equipment permanently

located, the small unattended community dial offices had adequate battery supplies to continue operation until portable generating equipment could be placed in service. There were only a few failures of long distance circuits because of AC power failure on carrier circuits. These were only portions of routes and other facilities were available to handle the offered business.

Large military and other government users of special telephone services had largely unimpaired service that permitted them to execute all essential functions.

Western Union handled traffic with minor delays except for New York City. Major offices of Western Union Telegraph Company equipped with stationary emergency service and smaller offices covered by portable units protected service into and through the central office, but could not prevent its loss to local users since failure of commercial power disabled the equipment on their premises. Restoration of service was completed at Buffalo and Albany, N.Y., immediately; at Syracuse, within nine minutes; and at Boston, in slightly over one hour.

The Defense Department's electronic and electro-mechanical switching centers and trunks continued in operation without interruption. Any disruptions of defense communications were temporary and were restored by rerouting.

The international common carriers suffered a momentary immediate blackout of public service dependent on commercial power. Carriers having emergency power supplies immediately made these operational, but normal public service could not be offered because of the lack of power in the customers' offices. A Defense Department agency supported the carriers by making available mobile generators from reserve and active units. Each carrier established rerouting services with overseas points via their gateways in Washington and San Francisco.

The report concluded that only through the provision of emergency generating equipment can th eservices of domestic and international common carriers continue during a general power failure; and users of the services of these carriers who have communications equipment requiring the use of electric power should consider the provision of alternate power supplies, depending on the need for continuity of operations.

SAFETY AND SPECIAL RADIO SERVICES

The Safety and Special Radio Services include a highly diverse grouping of station licensees, both individual and others. With the limited time in which to collect necessary data, the information available for each service is largely incomplete, and comprehensive data for the whole service is not available. Generally, the replies to the inquiries indicated an alert, serious, and efficient response by these licensees to the emergency. In the Land Transportation services for automobile, bus, rail and trucking licensees, the impact of the emergency was minimal. There was some failure of railroad base stations, but mobile stations replaced the inoperative base stations. In general the communication facilities of the railroads were adequate to continue railroad operation on a limited basis during the emergency.

The larger systems of the industrial service for electric power, water, and gas distribution or those covering a large geographic area are equipped with auxiliary emergency power. Police and fire departments were generally not adversely affected by the power blackout because the nature of their function necessitates auxiliary emergency power at least for limited operation throughout the blackout period. Those without auxiliary power have made plans to use mobile radio facilities to handle communications in an emergency. Ship operations were not adversely affected because all ships generate their own power. Common carrier coast telegraph stations continued to function through the use of emergency power generators. The power failure had but minor effect in the common carrier marine telephone service.

The problem of the aviation services was minimized by the time of day. Scheduled air carrier operations continued and sufficient reliable communications between the aircraft and supporting ground facilities were available. International air operations in the North Atlantic area and to the south that were temporarily unable to communicate with New York used the facilities at Miami, San Juan, Bermuda and Gander. Support land line facilities were seriously affected, but there was no adverse effect on air safety.

Licensees in the amateur service emergency network were alerted and operational, but little emergency traffic was handled. Some citizens radio licensees functioned as auxiliary units for police and fire departments, arranging for emergency transportation and assisting in traffic control.

Our office of emergency communications is a very small part of even our small agency. It has only a few men and a few secretaries in it. For normal emergency planning we think that this is probably adequate. When something like a power failure requires a lot of manpower for quick investigation it means that we simply do not have the manpower within our own organization unless we abandon our normal activities. We do have industry advisory committees composed of representatives of various communications industries. In this case we called upon the industry advisory committee to assist Mr. Miller and his group in making the investigation.

As I say they did get an enormous amount of information which is included in this large report dated January 6, 1966. A large part of this is contained in the appendix. For example, at the back there is a very large group of foldout pages—I have forgotten the number, I think about a hundred of them—which give the elementary data, the specific facts regarding each broadcasting station in the power failure area so that you get the identification of the station, its location, its normal power, the hours of the commercial power outage, the time that the station was actually on the air, whether or not it has emergency power, what its emergency power capacity is, its duration during the emergency, whether it has power for remote control, whether its communications facilities operated during the power failure, an estimate of the adequacy of the communications, the assistance it gave to State and local authorities and its future plans.

As I say this is reported in a purely factual manner so that anyone interested in going back and checking our conclusions can go over the data for himself.

Referring to our report I will not really summarize it but skim through it and note some of the high points. I think the most outstanding point so far as the FCC is concerned is the fact first that communications facilities generally operated remarkably well, and, second, that the lessons of the blackout have resulted in the voluntary initiation by most communications carriers of corrective measures.

In fact they have not even waited for the FCC to pass judgment, to issue orders, or make suggestions but are taking action. We have included as an appendix to our current report dated February 23, 1966, letters from communications carriers, the most recent letters reporting on the action that they have taken since the power failure to insure the continuity of service in the event of another power failure.

We will continue to follow up on this to see that these actions are taken. However, these letters themselves are the most eloquent testimony and I think the most persuasive demonstration of the willingness of the carriers to take action and the effectiveness of the action they have taken.

We have reported on the communications facilities of the FCC itself. We have some 18 monitoring stations scattered throughout the country engaged in very important communications work. All of these have standby power. Only one of them was in the blackout area and it was on its own standby power within 30 seconds so that it was out of operation for only 30 seconds.

In our own offices here the telephone service apparently is reliable. This is, of course, tied into the A.T. & T. lines. One problem we would have would be the signal lights which run off the commercial power. If there were a commercial power failure we would have some difficulty in knowing which lines to use for outgoing calls because of the failure of signal lights in our downtown offices.

We could always go out to our Laurel monitoring station and communicate from there through our FCC systems. We are studying the possibility of doing something about our own power on telephone signal lights here.

With respect to the broadcasting area, again the most outstanding fact I think is that broadcasting is what probably prevented public panic and very likely tragedy. It seems to me that had there been this power failure without the service that was in fact rendered by the broadcasting stations, primarily AM and also some FM, that the public would have been panic striken and that there is simply no telling what would have happened. Almost certainly there would have been tragedies far greater than any that did occur.

One hundred twenty-one standard broadcasting stations continued in operation at various times throughout the area. We do think that there is evidence that a number of stations should have equipment that in fact they do not have and we are drawing to the attention of the broadcasting industry the fact that this is the responsibility of the local station.

The local station has the responsibility for preparing its own emergency operational plans and providing its own emergency equipment. There is a program by the Office of Civil Defense which provides some subsidy for some stations that are part of the national chain in the emergency broadcasting system. Under that plan some of the stations have received Federal help but even those stations that do not have Federal help have, we believe, a responsibility to insure that they are able to serve their communities in time of emergency.

Television generally did not function efficiently during the blackout. I think that realistically we must recognize that in periods when there is likely to be a power shortage or a power failure television is not as useful a communications medium as AM and FM radio.

Generally the power requirements for television broadcasting and to a lesser extent for television reception are considerably higher than they are for AM and FM radio.

Another factor limiting the use of television is the fact that you cannot receive the audio or sound without the video or picture. With the loss of commercial power it becomes very difficult to transmit the video. One station did very ingeniously continue on the air by transmitting a so-called black picture. In effect what this does, however, is to drive the components at maximum power producing complete blackness on the television receiver tube. This ages components very rapidly and therefore is not a recommended procedure.

Consequently we must, I think, continue to rely on AM and FM radio for communications with the public in this kind of emergency.

There is some confusion in the public mind and to a lesser extent in the minds of some of the broadcasters regarding the emergency broadcast system. The EBS was not activated during this emergency.

The EBS is a system for activation only by the President of the United States or his specific delegate. It is intended for use in the event of an actual or a threatened attack upon the United States.

There was no occasion to activate EBS in this emergency and I think it would have been improper to do so. There have been very detailed facilities and procedures arranged to permit the President to communicate with the country in the event of a military emergency. These are, many of them, quite highly classified and I am not prepared to discuss them. But they simply are not involved in this. What is involved however, is this: It is possible to use the stations in any State or locality that are part of EBS on a State network or hookup for peacetime emergencies, weather emergencies, or something of that sort.

For example, in the State of Florida they have established a State FM network to give hurricane warnings.

I understand it has functioned most efficiently and during the last hurricane season it was responsible for preventing a good deal of damage to life and property. The ESSA, Environmental Sciences Service Administration, of the Commerce Department which now includes the Weather Bureau has spoken to us about establishing similar State hookups in a number of the east coast States.

The FCC has indicated its readiness in this—to coopearte in this and we are moving forward with plans to set up State hookups utilizing EBS facilities within each State for nonmilitary emergencies.

One of the things that the FCC can and is doing is to advise its staff and applicants that in consideration of comparative cases for AM and FM licenses it will take into account the proposed acquisition and use of auxiliary power equipment as an element. We have never done this before. I am sure just because nobody ever thought of it. It has been called to our attention and we will do this now.

The situation as to common carriers I think is fairly well known. By and large the telephone companies, both A.T. & T. and the several independent companies, have standby power and performed very well. The one problem that arose was that a great many people rushed to the telephone and tried to call.

Many more than normal calls were made. This resulted in overloading some lines. As a result, the telephone companies were forced to use what is called line load control. What this does is cut out the outgoing calling ability of a certain percentage of the lines.

In other words, in certain homes the person using the telephone cannot call out, he can still receive calls but he can't call out. The way line load control is used is that different lines are subject to this form of control so that for 10 or 15 minutes, say all the homes in one area will be deprived of ability to call out.

Then after 10 or 15 minutes the limitation will be applied to another area so that eventually everybody does have the opportunity to call out. This apparently enabled the telephone company to handle the burden of calls.

One of the problems involved is that many of the facilities of the telephone and telegraph companies and facilities of such organizations as AP and UPI depend not only upon the communications lines but on local power to run the equipment for receiving the communication.

That is, teletypewriters depend not simply on the incoming signal which controls them but also upon the availability of commercial

power at the point of reception, in order to operate. We have been investigating the possibility of providing local auxiliary power in order to keep these facilities operating in places where they are important.

One of the problems is a very technical problem and one on which we have yet no conclusion. That problem is this: These are fairly sensitive instruments and the control, the communication as you can imagine is a relatively slight electronic signal. Consequently the source of power must be quite constant as to power or voltage and as to cycle or frequency. Too great a variation in the electric current driving the instrument causes the instrument to misbehave or not to deliver the communications except in a garbled fashion.

The auxiliary power sources, at least the smaller ones, are not as reliable in their power and in their cycling as the big commercial power stations are. Consequently there is a question as to the degree to which auxiliary emergency power sources can be substituted for commercial power in handling such instruments as teletypewriters and local reception devices.

All I can say is that we do not have conclusions on this. We are having investigations made. We have had reports from the telephone company and some of the other carriers and we will simply have to continue technical work on this so to see what the reliability of auxiliary sources is and what the tolerance of the reception device is so that the two can be combined in order to increase the reliability of service in the event of another power blackout.

The third great category of FCC licenses is the so-called safety and special radio service. This includes the amateur radio services, aviation radio services, citizens radio services, industrial radio services, land transportation radio services, the maritime services, and public safety such as local government, police, fire, and similar services.

Taking the safety and special radio services all together, the FCC has in the six-State area that was affected by this blackout approximately 500,000 licenses.

Now this is just a very large number even to make an inquiry to. Simply to send out one series of letters, becomes a substantial expense. So we do not have a complete survey of these services.

However, here again the industry advisory committees for each of the services have given us a very good sampling and we think we have pretty good information on this.

The most dramatic of the services involved of course was the aviation radio service. You have just heard Mr. Thomas and he has told you considerably more about the aviation situation than I possibly can.

Very briefly, my understanding with respect to aviation is this: By and large the aviation communications service continued to function rather effectively. The airlines have a private company known as Arinc, which provides commercial communication service between the airplanes and the various terminals.

Arinc in the area affected did have auxiliary emergency power. Apparently it found out that the power failure was coming and I understand shifted to auxiliary power before the power failure hit its facilities, and consequently was never off the air at all.

There was some communications failure that limited the use of HF—high frequency—which is used primarily for transoceanic communications. As a result some of the planes that were out over the Atlantic had to shift their point of contact from New York to some of the other stations.

I understand also that because of failure of landing lights and other facilities in the New York area that many of the planes were diverted to other points for landing. However, I am advised that reliable communications between the aircraft in the air and the ground facilities were maintained throughout the period of the power failure so that there was no real communications failure in the aviation service.

Similarly, the railroad telephone circuits by and large really remained open and operative since the railroads had their own power service. In such things as motortruck and maritime, of course the stations are largely aboard either the trucks or ships which have their own power source, so they were almost wholly unaffected.

Police and fire departments were generally not affected since 90 percent of those that we have been able to question are equipped with auxiliary emergency power and continued to function.

A major complaint however of the police and fire departments was what they characterized as the initial unreliability of the telephone systems due to overload. The police and fire departments by and large respond to complaints or messages incoming to them from citizens by telephone. Since the telephone system got overloaded the messages were somewhat delayed and in some cases were missed. As far as I know however, there were no serious situations arising out of this.

To summarize very briefly, the action items that we have derived from our study, of which there are 10, are these:

First, we note that corrective action has been voluntarily initiated by most segments of the communications industry. We have followed up on this and will continue to follow up and many of the reports are presented in this report.

Second, our office of emergency communications is studying the problem of outgoing calls from the FCC office in the event of a blackout.

Third, we are emphasizing to the broadcasters that each broadcasting station should establish its own emergency operating procedures.

Fourth, we are aware that the emergency broadcasting system must be adapted to use in peacetime emergencies. We have in fact a special subcommittee of the national industrial advisory committee at work on this. This was appointed June 30, 1965, and we believe is making good progress.

Fifth, we are aware that completion of detailed State operational plans for the emergency broadcasting system is needed. This is a very slow process since this takes place through the various State and industry advisory committees. It is a matter of seeing that each State committee completes its own plans and in each State coordination is required with the local committees.

All we can do is to emphasize to the State committees that we so wish them to go ahead and push these plans.

We have not attempted to impose a uniform plan on all the States nor to tell the States what we think the details of the operational

plans in each State should be. So that this is a much slower business than would be the case if we did not have 50 States whose cooperation is required.

In the sixth place the FCC is aware that the widespread ownership and use of transistor and battery operated sets is a great asset to the country. We have thought that it was not appropriate for a Government agency to undertake a promotional campaign to encourage the sale and purchase of these sets. We have, however, encouraged the broadcasting industry to do so.

Seventh, the Commission has supplemented its statement of criteria to be used in comparative cases to indicate that the provision of auxiliary power equipment in AM and FM stations is an important factor so far as the Commission is concerned in choosing between applicants.

Eighth, the FCC is requesting continuing regular reports from communications common carriers as to the progress they are making regarding installation of emergency power systems at strategic centers.

Ninth, the Commission will consider, if necessary, requiring as a matter of regulation, that carriers provide emergency power system at important locations. We have not yet reached any conclusion that such a regulation is necessary. This is merely a matter for future consideration.

Tenth, the Commission is continuing its study of the service and safety and special radio fields to determine which ones may require regulations providing for independent auxiliary power sources. In view of the diversity and the number of these services this again is nothing that can be done quickly or arbitrarily. There is such great diversity and such large numbers involved that we feel we must rely by and large on our industry advisory committee. It would be unfair not to pay tribute to them.

They have rendered magnificent cooperation and have done some excellent work.

Mr. ROGERS of Texas. Thank you, Mr. Loevinger. Mr. Rooney.

Mr. ROONEY. Judge, how many radio stations were in this six-State area?

Commissioner LOEVINGER. There is a complete listing of them. There were 174 standard broadcast stations, 125 daytime-only stations, 168 FM stations, and 51 television stations.

Mr. ROONEY. Of all of the stations there were only 121 that were operating during the emergency?

Commissioner LOEVINGER. Yes. As I say on pages 5, 6, 7 of our report, this is broken down by categories of service. Some of the AM stations were daytime-only stations that had already gone off the air because of the limitation of their hours. One hundred of the 124 had signed off for the day. Thirteen, however, resumed operation with emergency power, went on the air despite the fact that they were daytime-only stations, in order to render service.

As I say, so far as television stations are concerned, although a number of them did as a matter of public service continue operation, my own feeling is that this was not really a crucial or important factor because there are relatively so few battery-operated television sets.

It is no good for them to transmit unless somebody can recieve them. There are a lot of battery-operated AM and FM sets but relatively few television sets.

Mr. ROONEY. What are the voluntary corrective measures that the companies are using to insure continuity in case of either emergency?

Commissioner LOEVINGER. Which companies, sir?

Mr. ROONEY. The licensed radio stations.

Commissioner LOEVINGER. Some of the stations that did not have auxiliary power are putting it in. This is really all that is involved by and large. If you have power you can continue to operate.

Mr. ROONEY. The FAA is assisting local airports in installing generators. Does the FCC conemplate helping any of the radio stations?

Commissioner LOEVINGER. No, sir. We have no money for this purpose.

Mr. ROONEY. It is a matter of dollars and cents?

Commissioner LOEVINGER. Strictly a matter of dollars and cents.

Mr. ROONEY. I have no further questions. Thank you.

Mr. ROGERS of Texas. Mr. Commissioner, with regard to the auxiliary power which Mr. Rooney was talking about, rumors have been spread around that the FCC plans to make as a requirement for granting licenses in the future and for renewals, that the station or licensee make a showing of adequate auxiliary power to stay on the air during emergencies.

Would you address yourself to that topic?

Commissioner LOEVINGER. No, sir; we have not made it a requirement. So far as I know it has not been proposed that we should do so.

Mr. ROGERS of Texas. Of course this would cause alarm, as you can well understand, among some of the smaller stations.

Commissioner LOEVINGER. Yes, sir.

Mr. ROGERS of Texas. It is very easy to see how a large station with a large income would be wanting not only to serve the public but to keep its facilities open for its own profit reason, that it may very well make a capital investment to make auxiliary power available to them. In these discussions has there been any thought given as to the showing by the licensee of the auxiliary power facilities of the local power company that is serving the station?

Commissioner LOEVINGER. I am sorry, I don't quite understand that question, Mr. Rogers.

Mr. ROGERS of Texas. Say you had a station applying for a license or a man applying for a license in a small market. Do you make him in his application show what his power facilities are; that is, what local power company is serving him and what auxiliary power the local power company has in the event of an emergency?

Commissioner LOEVINGER. My impression is that we have not inquired into this. I think that we will begin to inquire into this as a matter of information.

Let me add to this, Mr. Rogers. It is not necessary and perhaps is not desirable that all stations stay on the air in every emergency. In fact, one of the things that was noticeable was that throughout the area affected by this blackout there was excellent radio reception during the blackout simply because of the fact that some of the stations were off the air and that this resulted in less interference and therefore the stations that were on the air were heard better.

Part of the emergency broadcast system which is implemented by national defense emergency authorization to specific stations is the calculation of which station should stay on the air in an emergency.

It is neither necessary nor desirable that all stations be on the air. Rather it is important to have stations spaced both geographically and in the spectrum so that we can get the maximum effect out of the broadcasting that does take place.

There is room during peacetime operations for a large number of relatively small local stations that would not necessarily be required to be on the air in an emergency.

Mr. ROGERS of Texas. As I understand this you have pursued this policy for some time of designating some certain stations that the FCC can say to all other licensees, "Get off the air because we have an emergency," and the emergency stations you designate know who they are and that they are supposed to stay on the air.

Commissioner LOEVINGER. Yes, sir.

Mr. ROGERS of Texas. One man came to me and talked to me about this particular situation. He seemed to be a little bit mixed up about it because he did not realize that this was in effect now; he had some fears, he had heard that this was going to be done, and that it was done and that if it was done these stations would use this for advertising purposes and say, "Listen always to my station because I am the emergency station and if anybody stays on the air I have to stay on the air."

Now the FCC would not allow that sort of thing.

Commissioner LOEVINGER. We have been conscious of that danger. Steps are taken to provide—to avoid exploitation of it. Everything possible has been and is being done to avoid commercial exploitation of these emergency arrangements. As you say, they are in effect now and there is a very large number, Mr. Miller tells me there are in the neighborhood of 2,000 or more NDEA's now outstanding.

We have not had reports of their use in this fashion.

Mr. ROGERS of Texas. I would presume that these 2,000 reach every area in the United States.

Commissioner LOEVINGER. Virtually every area. There are some areas that do not get primary ground service, that are dependent upon sky wave. This is true even as to normal broadcasting.

By and large these are areas between the Rocky Mountains and the Mississippi where there is a lot of open space.

Mr. ROGERS of Texas. Now your referred to the wire communications and I think that they did a tremendous job. The reports that you have and the information you have both from the A.T. & T. and the groups and the Western Union was that the communications did stay on continuously.

Commissioner LOEVINGER. By and large. The major outage was with respect to overseas communications, particularly Western Union had some difficulty which is, I think, quite understandable.

Western Union had its major headquarters in downtown New York. Western Union had taken steps to have power available from two separate power stations or substations of Consolidated Edison. Also they had both alternating and direct current power available and means for converting from one to the other so that any power failure

that could be anticipated could be compensated for by switching to the other source of power.

In over 20 years they never had a power failure of both sources and they had been advised by a Consolidated Edison study that there was no practical possibility of such a power failure. In fact, however, of course it did occur.

They did go off the air from this office. Some of the overseas communications were interrupted. By and large, communications within the country were routed through other offices, were handled at places where power was available.

Mr. ROGERS of Texas. Now it was then—was the same thing true of the A.T. & T. facility?

Commissioner LOEVINGER. A.T. & T. I think pretty well continued, even with their overseas services.

Mr. ROGERS of Texas. They had their own auxiliary power?

Commissioner LOEVINGER. They had their own auxiliary power.

Mr. ROGERS of Texas. Now the overload situation that you were talking about in this emergency, that could probably be described as a teenage problem on a large scale.

Commissioner LOEVINGER. Believe me, I understand what you mean. I have teenagers.

Mr. ROGERS of Texas. What steps are being taken by the communications commission with regard to this sort of situation in an emergency?

Commissioner LOEVINGER. I guess, to be candid, I have to admit that we have not done anything about it. I don't really quite know what there is to be done other than ask the broadcasters to ask the public not to use the telephone unless it is necessary.

Mr. ROGERS of Texas. Are the telephone facilities more or less geared to the average use or are they geared to higher use in order to absorb?

Commissioner LOEVINGER. They are geared to normal peaks but this kind of thing exceeded all normal peaks. I just don't know how you can construct a system that will take care of really abnormal peaks because if you do it is simply too large to be economical.

Mr. ROGERS of Texas. Now this poses another question in the general area of what Mr. Rooney was talking about, that the FAA is undertaking to help finance some of the facilities with regard to airports.

I will ask you if any thought has been given by the Federal Communications Commission to, say, subsidizing these different radio and TV stations to make it possible for them to have auxiliary power.

I think your answer was that you did not have money for that. Has any thought been given to that?

Commissioner LOEVINGER. As I say, there is some money available from the Department of Defense for a number of radio stations. By and large this has been distributed. It has been distributed with a notion of maintaining the most effective emergency broadcasting system for military use but the same facilities are of course available for peacetime emergencies.

The FCC itself is not a disbursing agency and has no such money. I have real doubt that our experience with this emergency would justify us in asking Congress for additional money for this purpose.

So far as the telephone system is concerned we might ask A.T. & T. to subsidize the FCC. I don't think it would work the other way around.

Mr. ROGERS of Texas. I have had several letters on this subject on the very issue. In a number of them people make suggestions about these things. Of course they bring up matters that I think the American public is thinking about. One of those seems to be that they feel probably the Federal Government should get in the role of making it possible for, we will say, local power companies to have a grant of some kind to provide auxiliary power for emergencies so that the cost of maintaining auxiliary power in a certain area will not be immediately dumped back on the user of that particular facility in that area. Speaking of electric power, the same thing would be true of the communications facilities, especially the wire communications facilities, that if additional power was required auxiliary power could get into a load factor like we were talking about a minute ago, that it would be quite a heavy imposition upon the average payer of the telephone bill to maintain this.

It would not be used except in an emergency.

Commissioner LOEVINGER. This was not a power problem, Mr. Rogers. This was a systems problem. The overloading of the lines was not because of an inadequacy of power to handle this but simply because there were not enough telephone lines to handle all the calls that the people at the peak were trying to make.

What you are talking about is not auxiliary power but constructing another telephone system. This is not an economical and practical thing.

Mr. ROGERS of Texas. There would be the same problem in communications as would be present in power because the telephone companies would have to put in more of a system in order to absorb this additional impact.

Somebody would have to pay for that and it would be the telephone user. Because of the public utility regulations it would just simply fall back on him. Do you feel, Judge, the facilities at the present time, based on how they measured up in the Northeast blackout and what we know about them now, are sufficient to meet the emergencies that might occur similar to this one?

Commissioner LOEVINGER. Substantially, yes. I think that this is not to say that everything was perfect. However I think what is required is reasonable and well within the financial capabilities of the carriers themselves.

In other words, the kind of thing that may be necessary will be duplicate and essentially redundant lines to specific crucial points. I see no point in having a lot of redundant capacity for ordinary dormitory neighborhoods let us say, just because people might even get panicky in an emergency.

You would want it to a few points like airports, military installations, and places of that sort. This I think is within the capacity of the companies and the systems and I think that these things are being done and are by and large being taken care of.

We made an examination, for example, of the situation of the military installations, Norad, SAC, and these places. Some circuits were lost but by and large—not by and large—just without qualification these headquarters had communications available to them, it is my understanding, at all times.

They were never cut off from adequate communications. There were some anomalies and some defects discovered in the military emergency communications and these are being worked on.

Mr. ROGERS of Texas. Steps are being taken according to the Deputy Director who was here yesterday, Mr. Thomas Rogers, to correct any of the deficiencies which showed up which he told the committee were at a minimum actually.

Commissioner LOEVINGER. Yes.

Mr. ROGERS of Texas. And they were not vital deficiencies, but I gathered they were to be expected in any area where you have any human element involved?

Commissioner LOEVINGER. I agree with their judgment. From the information we have they are not major and they are subject to correction. I don't believe that any additional program of subsidy is necessary to handle them.

Mr. ROGERS of Texas. Now you spoke of the use of radio signals as opposed to the TV signals in an emergency of this kind. I think this was very well proven by the emergency that was created by the blackout.

There are a great number, of course, of transistor radios that made it possible for people to know and understand this problem where otherwise they would again have been completely cut off from communications.

Now the transistor radios of course were the link because you don't have transistor television sets that are widespread.

I know there are quite a few of them. But in your explanation of the broadcasting of the television programs, itself, did you say that unless you do get the picture that the requirement on all the components is so great that it could very well cause them to deteriorate quickly?

Commissioner LOEVINGER. No. The way television sets are now constructed you cannot receive the audio or sound signal without the visual or picture carrier being transmitted by the TV broadcast station also.

What one or more stations have done is to put a special kind of modulation on, in effect, a substitute for the visual signal. This results in a picture that is all black; instead of a picture you get a black tube. But because you are feeding maximum power into the visual part of the circuitry, this in turn wears the whole apparatus out much faster than normal use would do.

Consequently it is not regarded as very good practice except for emergency use.

Mr. ROGERS of Texas. But you can get the visual without the audio.

Commissioner LOEVINGER. I am not sure. I am advised no.

Mr. ROGERS of Texas. When the audio goes off the sign comes on, "Trouble with the audio, just bear with us."

But I have never seen one where the picture went off and the sound said, "We have had trouble with the picture, wait for it to get back on."

Is that the way it works?

Commissioner LOEVINGER. My engineers say that both carrier signals have to be present all the time but you may not get modulation of

the audio, for example. You may not get any sound but you are getting something from the station.

Mr. ROGERS of Texas. Judge, does the Commission intend to make any recommendations with regard to any of the communications facilities or operations in this country as a result of what you have found out from the blackout?

Commissioner LOEVINGER. So far as I know now, Mr. Rogers, it is not necessary for us to recommend anything to Congress. I believe that a remedy of all the problems lies well within the capability of the carriers and the present authority of the Commission.

Mr. ROGERS of Texas. And you think that they are all quite well known?

Commissioner LOEVINGER. I won't go so far as to say they are all well known but those that are not known are under study.

Mr. ROGERS of Texas. Mr. Rooney has called my attention to a question here. When this apparatus wears out, what we were talking about a minute ago, is that the apparatus of the broadcaster or the receiver?

Commissioner LOEVINGER. I think it is the transmission apparatus.

Mr. ROGERS of Texas. Do you have any more questions, Mr. Rooney?

Mr. ROONEY. No.

Mr. ROGERS of Texas. Thank you very much, Judge.

It was very kind of you to come up. We may call on you later.

Commissioner LOEVINGER. I will be available at any time, sir.

Mr. ROGERS of Texas. That concludes the testimony this morning. The subcommittee will adjourn subject to call of the Chair.

(Whereupon, at 1:45 p.m., the subcommittee adjourned, subject to call.)

○

KANSAS STATE UNIVERSITY LIBRARY
OCT 25 1966
MANHATTAN, KANSAS