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UNITED STATES
GENERAL ACCOUNTING OFFICE

Problems In Planning And Constructing Transmission Lines Which Interconnect Utilities

Federal Power Commission

According to Federal and independent power studies, future reliability and adequacy of the electric power supply depends on the timely installation of generating and transmitting facilities to meet our future needs.

The Federal Power Commission should

- take the lead in promoting joint Federal-industry studies to identify and evaluate new interconnections and changes in existing interconnections;
- follow up on completed studies to resolve objections which might frustrate the adoption of study recommendations;
- work with utilities to establish criteria for interconnection studies, which will adequately consider national goals and identify factors which may adversely affect proposed interconnections; and
- work with utilities to make sure they use the criteria in both industry and Federal studies.

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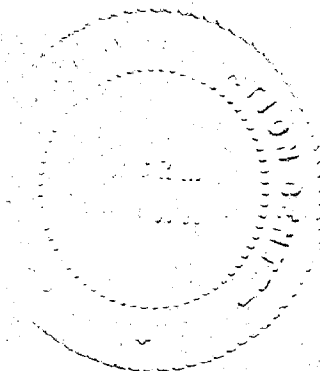
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UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

ENERGY AND MINERALS
DIVISION

B-180228



The Honorable Richard L. Dunham
Chairman, Federal Power Commission

Dear Mr. Dunham:

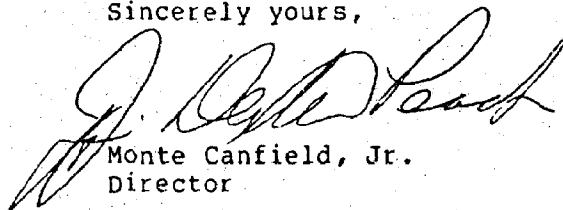
This report discusses problems in planning and constructing transmission lines which interconnect utilities. Our review was made to determine if needed interconnections were being identified and if they were being constructed in a timely manner.

This report contains recommendations to you on page 29. As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the House Committee on Government Operations and the Senate Committee on Governmental Affairs not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the Director, Office of Management and Budget, and to the Secretary of the Interior.

Sincerely yours,

COASTAL ZONE
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Monte Canfield, Jr.
Director

U.S. General Accounting Office

UNITED STATES
GENERAL ACCOUNTING OFFICE

PROBLEMS IN PLANNING AND
CONSTRUCTING TRANSMISSION LINES
WHICH INTERCONNECT UTILITIES
Federal Power Commission

D I G E S T

According to Federal and independent studies, the reliability and adequacy of the national electric power supply depends on the timely installation of new generating and transmitting facilities.

Electric utilities have increasingly interconnected with each other to permit the flow of electricity among them. Interconnections generally have technical and economic advantages for utilities, and similar benefits for regions and the Nation.

Individual utilities may save money through interconnections by

- sharing their electric power-generating capacity to cover an unexpected deficiency in their normal power supply,
- purchasing lower cost power,
- reducing or delaying additional generating capacity, and
- selling excess power that would not be otherwise used.

Even when an interconnection presents minimal or no economic advantage to a utility, a region or the Nation may benefit by

- the ability to transfer power to shortage areas during national emergencies,
- the conservation of scarce resources,
- the reduction of effects on the environment by delaying additional generating capacity, and
- the consideration of national defense issues.

EMD-77-21

DO INTERCONNECTIONS
MEET POWER NEEDS?

Yes--data from utilities, utility power pools, and national organizations shows that the present interconnections of utilities were sufficient at the time of our study to meet power needs in emergencies.

Utilities have transferred power to meet national or regional needs on a regular basis as well as during emergencies. For example, when the Tennessee Valley Authority's Browns Ferry nuclear plant was shut down due to a fire, the Authority purchased adequate replacement power from utilities which interconnected with it.

However, a report prepared for the Energy Research and Development Administration said that reliable and efficient production of the growing electric loads projected through the year 2000 would require higher capacity transmission lines to interconnect utility systems. (See pp. 4 and 5.)

ADEQUACY OF INTERCONNECTION
STUDIES

The Federal Power Commission, responsible for encouraging utilities to interconnect voluntarily, studied interconnections and issued 35 reports from 1969 to 1975. Power agencies within the Department of the Interior have also studied interconnections. (See p. 6.)

Federal studies for the most part were

- based on costs and benefits for the interconnecting utilities;
- aimed at systems in the Southwest and concentrated on small isolated systems rather than regional systems, which could result in larger benefits; and
- done without involving the affected utilities. (See p. 6.)

Need for expanded Federal
Power Commission role
recognizing national criteria

The national advantages of interconnections should be considered when planning lines among utilities. The Federal Power Commission did not do this when evaluating interconnections; instead it studied the economic benefits to the utilities, particularly those in the Southwest. (Twenty-eight of the 35 studies made were of the Southwest.)

Commission followup action on its studies is limited to maintaining status listings. It does not determine why the utilities have not established interconnections or further analyzed the proposed interconnections.

For example, one study examined the benefits of interconnection and coordination of 93 separate electric generating systems in Kansas and western and southern Missouri. The study estimated savings of \$1.92 billion between 1980-90 to the utilities. Whether there were possible national benefits in addition to those savings was not considered in the analysis. The Commission's only action was to send copies of the study in November 1975 to the utilities involved. However, Commission staff we interviewed felt that it could do more to promote and encourage voluntary interconnection if it had more resources. (See pp. 7 and 8.)

The Commission should establish national criteria to be used when considering needed interconnections because an interconnection could present no economic advantage (or disadvantage) to a utility, while providing advantages to a region or the Nation. These criteria should be directed at conservation of scarce resources, reduced transmission and generation, and reliable national emergency services and national defense. Each of these goals becomes increasingly important as the Nation's domestic energy supplies decrease.

According to the utilities contacted, unless an interconnection shows economic benefits to one or more of the interconnecting parties, a utility

will not act on its own to install an interconnection. Consideration of national goals should be an integral part of the interconnection planning process. Establishing criteria to evaluate whether those goals are met would be a first step in making the utilities aware of the Government's serious interest in promoting interconnections. If the criteria, once established, are not used by utilities in their decisionmaking, the Commission should move to seek legislative authority to compel their consideration.

The Energy Research and Development Administration is developing criteria for the study of electric utility system expansion. This is a good first step which would help the Commission establish national criteria and should help it determine the next steps in improving its performance in this area. (See p. 13.)

Need for joint interconnection studies

The Commission and Interior independently studied interconnections, usually without consulting the utilities. These studies were not well received by the utilities and, as a result, most recommendations have not been implemented. (See p. 14.)

The Commission should encourage joint Government-utility studies to systematically (1) identify and study future regional and inter-regional interconnections and (2) follow up on previous studies to determine why the utilities have not implemented them or further analyzed the proposed interconnection.

These studies should recognize the various purposes, needs, and objectives of each organization involved, as well as national goals. Differences among organizations will then be identified, discussed, and ultimately resolved. (See p. 28.)

Joint Federal-industry studies should determine how all relevant factors (financial, environmental, and institutional) affect interconnection and consider methods to develop alternative plans for providing the needed services. (See pp. 20 and 24.)

FACTORS AFFECTING CONSTRUCTION
OF INTERCONNECTIONS

The utility industry must deal with financial, environmental, and institutional considerations which may delay or cancel proposed interconnections. These factors are complex, and some are outside the control of individual utilities and at times, the utility industry. As a result, individual utilities and Government agencies may not be able to deal with these factors in a way to expedite the construction of transmission facilities. (See p. 19.)

RECOMMENDATIONS TO THE CHAIRMAN,
FEDERAL POWER COMMISSION

The Chairman should

- take the lead in promoting, throughout the Nation, joint Federal-industry studies to identify and evaluate new interconnections and changes in existing interconnections;
- follow up on completed interconnection studies to resolve objections to the studies which might result in adoption of study recommendations;
- work with utilities to establish criteria for carrying out interconnection studies which will require adequate consideration of national goals and timely identification of factors which may adversely affect the proposed interconnection; and
- work with the utilities to make sure the criteria are used; if they are not used voluntarily within a reasonable time after their release, the Commission should consider whether further steps should be taken to compel their consideration and seek additional legislation if necessary.

AGENCY COMMENTS

The Department of the Interior (see app. II) stated that our report presents a comprehensive analysis and agrees that transmission and generation should be planned to consider the advantages interconnections may offer for pursuing national or regional energy conservation programs, reduced transmission and generation investment, emergency service, and national defense.

The Federal Power Commission (see app. III) said that there is little basis presented in GAO's report to conclude that the Commission has not effectively carried out its responsibilities in promoting interconnections and that the current network speaks for itself.

The National Electric Reliability Council said that the present system of interconnections is a result of the efforts and good judgment of highly qualified, dedicated engineers and executives who are intimately involved in these matters.

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ABBREVIATIONS

BPA	Bonneville Power Administration
ERCOT	Electric Reliability Council of Texas
ERDA	Energy Research and Development Administration
FPC	Federal Power Commission
kV	kilovolt
MAAC	Mid-Atlantic Area Council
MARCA	Mid-Continent Area Reliability Coordination Agreement
NERC	National Electric Reliability Council
PJM	Pennsylvania-New Jersey-Maryland Interconnection
SEC	Security and Exchange Commission
SPP	Southwest Power Pool
TVA	Tennessee Valley Authority
WSCC	Western Systems Coordinating Council

CHAPTER 1

INTRODUCTION

Electric utilities have increasingly interconnected ^{1/} their systems because they provide more reliable and economical service. The Federal Power Commission (FPC) said that the following are the three principal objectives in providing adequate transmission facilities for the purpose of interconnecting utilities.

- "1. To support immediately any * * * area suddenly faced with a serious and unexpected deficiency in its normal generating supply. The network must have capacity to handle, well within stable limits, the automatic inflow of supporting power from the hundreds of generators in the surrounding interconnected network.
- "2. To transfer, without serious restrictions, capacity and energy within regions and between regions to meet power shortages. Emergencies can arise from innumerable causes, such as delays in commercial operation of new generation, problems with new equipment, the failure of major generating units or other elements of the system, and unexpected peak demands caused by weather extremes.
- "3. To exchange power and energy on a regional and interregional scale, and to achieve important reductions in generating capacity investment and in cost of energy production."

Other benefits of interconnected operation may include:

- Displacement of oil and natural gas with other types of generating fuels which are abundant (e.g., coal).
- Bulk energy transfers to take advantage of energy-cost differentials between the areas.

^{1/} An interconnection is a transmission line permitting a flow of electricity between the facilities of two electric systems. When the first transmission line is built between two systems, every additional line becomes part of a network because all transmission lines--intrasystem and intersystem--have an interacting role and become a part of an overall "system."

--Diversity exchanges made possible by differing load characteristics due to seasonal patterns, time zones, and weather.

--Sharing of operating reserve to take advantage of different costs of generation and to maximize efficiency in unit commitment and scheduling.

--Improvement in system stability.

Even in instances where an interconnection may not present an economic advantage to a utility, there may be advantages to a region or the Nation, such as

--the ability to transfer power to shortage areas during national emergencies,

--the conservation of scarce resources,

--the reduction of environmental impact by delaying or reducing additional generating capacity, and

--national defense considerations.

The present highly interconnected transmission network in the United States has been developed by the electric utility industry. Facilities have been installed so that the network can (1) sustain a wide variety of disturbances due to forces of nature, equipment breakdowns, a wide variety of load conditions and (2) provide a medium for mutual emergency support to all systems.

The development of the network by the industry has provided economies in operation and reductions in investments by sharing generating capacity, exchanging peakload assistance, transferring power to conserve high-cost fuel or critical types of fuel, and providing a reliable and adequate bulk power supply in the United States through emergency assistance among systems.

With the exception of Texas utilities ^{1/}, most large utilities are now interconnected across State boundaries; however, there is a continuing need to expand and improve power facilities. Through the years, improved transmission and generation technologies, growing loads, and system reliability requirements further stimulated transmission line construction.

^{1/} See page 24 for a discussion of the reluctance of Texas utilities to interconnect with out-of-state utilities.

The utilities operating independently and groups of utilities which form power pools plan and construct transmission lines to interconnect utility systems and various utility associations' study interconnections. In addition, Federal agencies are involved in planning and constructing (e.g., Department of the Interior), and promoting and encouraging (e.g., FPC) voluntary interconnections.

SCOPE OF REVIEW

Our objectives were to determine how FPC was carrying out its responsibility to promote and encourage voluntary interconnections, if needed interconnections were being identified and studied, what problems utilities had in constructing interconnections, and what the Federal interconnection role should be.

Our review was made primarily at (1) FPC's headquarters office in Washington, D.C., and its regional offices in Fort Worth, Texas; San Francisco, California; and New York, New York; (2) the Department of the Interior in Washington, D.C.; (3) the Bureau of Reclamation's Lower and Upper Missouri, Upper Colorado, and mid-Pacific regional offices; (4) Bonneville Power Administration (BPA) in Portland, Oregon; (5) National Electric Reliability Council (NERC) in Princeton, New Jersey; (6) four NERC regional councils--Southwest Power Pool (SPP), Electric Reliability Council of Texas (ERCOT), Western Systems Coordinating Council (WSCC), and Mid-Atlantic Area Council (MAAC); and (7) numerous public (non-Federal) and investor-owned utilities. We examined the pertinent documents, records, reports, and files relating to the above organizations' procedures for identifying, planning, and constructing interconnections.

CHAPTER 2
ADEQUACY OF INTERCONNECTIONS
TO MEET POWER NEEDS

In our review, which included an analysis of data from utilities, power pools, and national organizations, we found that present interconnections of utilities were sufficient at the time of our study to meet power needs in emergencies. However, Federal and independent studies of the reliability and adequacy of the national power supply indicate that future reliability and adequacy of the electric bulk power supply depends on the timely installation of new generation and transmission facilities to meet our future needs.

Also, several studies indicate that additional interconnections are economic but suggest further evaluation is needed. Unfortunately, there is little or no consensus on the validity of these studies. This matter is discussed in chapter 3.

We noted instances where utilities have transferred power to meet needs on a regular basis as well as during emergencies. For example, the Tennessee Valley Authority (TVA) power load requirements are higher in winter than in other seasons. According to TVA the seasonal variation in load requirements is largely compensated through its interchange agreement with other electric utilities. TVA receives power from utilities primarily in the winter and provides power to them primarily in the summer. Interchange agreements accounted for about 8 percent of total kilowatt-hours of power passing through TVA's system in fiscal year 1974.

The 1973 oil embargo necessitated the transfer of energy to the Middle Atlantic and New England States. A National Association of Regulatory Utility Commissions report ^{1/} said that from December 1973 to May 1974, 800,000 megawatt hours ^{2/} of energy had been transferred into this area. Also, when TVA's Browns Ferry nuclear plant was shut down due to a fire, TVA was able to purchase adequate energy from utilities with which it interconnected.

^{1/} 1974 Report of the Committee on Electric and Nuclear Energy.

^{2/} One megawatt equals one million watts.

The advantages of interconnections are recognized by the utility industry and additional interconnections are being constructed. In addition, an increasing need exists to strengthen the existing transmission network and construct higher capacity transmission lines. A National Electric Reliability Council 1/ report made in July 1975, stated that the future reliability and adequacy of the electric bulk power supply depends on the timely installation of new generation and transmission facilities to meet the projected electric loads and provide sufficient reserves for emergencies. NERC believes that, in view of recent delays and cancellations of planned facilities experienced by the power industry, the Nation's transmission system needs to be strengthened.

The report points out that

"* * * interconnections cannot replace a long-term deficiency in installed generating capacity or * * * fuel supply * * *. However, correction of any existing weakness in the transmission network will increase the operating flexibility and provide additional support when forced outages [shutdown of a generating plant for emergency reasons] cause shortages of generating capacity."

NERC in the report recommended that "* * * electric systems should continue to investigate all possible options for augmenting generating capability, and ways in which emergency transfer capabilities can be increased * * *."

A report prepared for the Energy Research and Development Administration (ERDA) said that much higher capacity transmission and distribution lines must be constructed to reliably and efficiently serve the growing electric loads projected through 2000.

1/ NERC is an organization formed by nine regional councils representing the Nation's utilities to augment the reliability and adequacy of bulk power supply in the electric utility systems of North America. NERC consists of nine regional reliability councils (see app. I) whose memberships comprise essentially all of the electric power systems in the United States and some Canadian systems.

CHAPTER 3

ADEQUACY OF INTERCONNECTION STUDIES

The Federal Power Commission has legislative responsibility to promote and encourage interconnections on a voluntary basis. In carrying out this responsibility, it studied and issued 35 interconnection reports from 1969 to 1975. However, these studies for the most part were

- based on costs and benefits accruing to the interconnecting utilities without consideration of any national criteria,
- aimed at systems in the Southwest and concentrated on small isolated systems rather than regional areas which could result in larger benefits, and
- made without involving the affected utilities, and their results were not always accepted by them; also, a followup on completed studies by FPC to encourage their acceptance was lacking.

Power agencies within the Department of the Interior and utilities have also performed interconnection studies, but their studies do not consider national criteria unless it benefits the participants. Interior, in two of its three interconnection studies, considered some national goals; but the studies basically reflected the advantages to the utilities.

The national advantages of interconnections--power transfers during emergencies, conserving scarce resources, reduction of environmental impact by delaying or reducing additional generating capacity, national defense--should be considered when planning lines between utilities. The National Electric Reliability Council and the Energy Research and Development Administration have emphasized the national importance of interconnections and their concern over the adequacy of interconnections in the future.

NEED FOR EXPANDED CONSIDERATION OF NATIONAL CRITERIA

FPC is the only agency with responsibility to promote and encourage voluntary interconnections. However, FPC has not

- (1) established national criteria for evaluating interconnections,
- (2) developed procedures calling for its regional offices to

review interconnections, (3) been involved in other studies performed by Interior and utilities, and (4) followed up on its own studies to determine why the utilities have not implemented them or further analyzed the proposed interconnection.

According to FPC, section 202 of the Federal Power Act (16 U.S.C. 791-825) directs FPC to :

"* * * promote and encourage the voluntary interconnection and coordination of electric utility facilities for the purpose of assuring an abundant supply of electric energy throughout the nation with the greatest possible economy and with regard to the proper utilization and conservation of natural resources."

Under the act FPC can order interconnections only during emergencies or when a utility or State commission requests an interconnection with another utility (but only after FPC determines the interconnection is necessary or appropriate for the public interest).

FPC studies

Through a preliminary analysis, FPC determines if the cost of power differs substantially between two or more utility systems or if other circumstances indicate the possibility of savings through interconnected operations. This analysis is to estimate the monetary benefits of interconnected and coordinated operations. If the preliminary analysis shows a benefit of an interconnection, FPC will do a detailed study independently to determine if the interconnection is cost beneficial. Also, according to FPC staff, it performs interconnection studies at the request of Members of Congress and utilities.

However, FPC has not established guidelines for its regional offices to systematically identify and study interconnections nor has it established national criteria for evaluating interconnections. As a result FPC's efforts to promote and encourage voluntary interconnections have been limited geographically and have only encouraged the involved utilities to interconnect when the corporate cost benefit ratio is favorable.

Our review of 28 of 35 FPC studies made between 1969 and 1975 showed that FPC did not consider national criteria or benefits. FPC interconnection studies were concerned with the benefits to the utilities and not the Nation.

FPC interconnection studies primarily focus on small isolated systems. During the period 1969-75 only two FPC studies involved more than two utilities. The 21 studies we reviewed involved small isolated systems in the Southwest. Followup action by FPC on its studies is limited to maintaining status listings on a routine basis and not determining why the utilities have not implemented the studies or further analyzed the proposed interconnection. The FPC staff, in commenting on their role to promote and encourage voluntary interconnections, said that they could do more in meeting FPC's responsibility if given more resources.

For example, FPC issued a report in November 1975 on the benefits of interconnecting and coordinating the operations of 93 separate electric utility generation systems operating in Kansas and western and southern Missouri. These systems included 3 generation and transmission cooperatives, 54 interconnected municipal generating systems, 28 isolated municipal systems, and 8 investor-owned electric utility systems.

The study estimated savings to the utilities of \$1.92 billion between 1980 and 1990 from full interconnection and coordination of these 93 systems without considering possible national benefits.

To realize these potential savings the utilities must

- establish a pooling agreement which allows the most efficient operation of the participating utilities' combined resources,
- establish a central control over all operating systems,
- obtain financing authority from the State legislatures in Kansas and Missouri to permit municipalities to participate in jointly planned and constructed facilities, and
- perform studies to determine transmission facilities required for full coordination.

FPC believes it will be difficult to get the smaller municipal systems to participate in a coordinated area-wide system, because municipal systems in that area have traditionally wanted to maintain total control over their systems. The only action FPC took was to send copies of the November 1975 study to the utilities involved; no followup action has been taken by FPC since then. However, FPC says it is monitoring these systems.

Department of the Interior's activities

Since 1968, two of Interior's power agencies--Bureau of Reclamation and Bonneville Power Administration--have performed three interconnection studies. Only two of these studies considered some national goals--oil conservation and diversity in customer demand between power systems--but even these considerations were in terms of the economic advantages to the utilities. National benefits were considered incidental.

For example, a steering committee in Interior published a study in 1968, "Transmission 190," which found that electricity supply and demand data indicate that seasonal variations in demand and related supply requirements by 1980 will permit diversity exchanges ^{1/} between the Pacific Northwest and the central United States. This conclusion was recognized in the FPC National Power Survey of 1964. The study investigated 12 different plans for making the interconnections, each of which showed positive benefit-to-cost ratios ranging from 1.3:1 to 1.9:1. The study stated that the proposed extra-high-voltage transmission interconnections would enable the interconnected utilities to look beyond their area boundaries for economical sources of energy. In addition, these utilities could share in the output of larger and more economical generating units.

The steering committee recommended that a program of inter-regional planning and construction be initiated--by Federal and non-Federal utilities--to provide the power system benefits identified in the report. The report related the benefits to the utilities by showing that interconnections would enable them to look beyond their area for economical energy sources and did not discuss the advantages to the Nation from the interconnection.

On December 16, 1975, the Secretary of the Interior received authorization, through Public Law 94-156, to engage in feasibility studies of 12 potential water resource developments. Included was the authority to study the power interconnections for the purpose of improving electric power transmission systems affecting the 17 Western States.

^{1/} Diversity exchanges can be used when one regional area's high use period occurs at a different time from another. Thus, the two regions exchange power so that each can import electricity during high use periods and export it during low use periods.

Interior's interconnection studies would (1) include consideration of potential power interconnections which would assist Federal, public, and investor-owned power suppliers to serve their customer's load requirements at a lower cost and (2) result in conservation of resources. An Interior official said that Interior has not requested funds for the study in their fiscal year 1977 budget.

Utilities' studies

Utility officials said that identification of potential interconnections by individual utilities is generally initiated by a utility which projects a deficit or surplus of capacity or energy. The utility will try to identify and evaluate potential generation facilities and/or interconnections which could be used to eliminate the deficit or transfer the surplus.

Utilities we contacted said that each potential interconnection is unique; therefore, each evaluation of an interconnection must be molded to reflect the specific characteristics of that interconnection, such as size and type of generation, amount of capacity and energy to be transferred, and distance between the utilities to be interconnected.

Utilities view interconnections as an advantageous method of meeting their capacity and energy requirements as long as the surpluses available from another system are dependable or a diversity between their systems can be utilized.

When evaluating interconnections, utilities consider the advantages to their systems; national and inter-regional needs and objectives do not concern them.

Some utility groups--known as power pools--have coordinated the planning and/or operation of their generation and transmission facilities. This allows the members of the pool to achieve greater economy and reliability. As of 1970 there were 22 formal power pools nationally which had 60 percent of the Nation's generating capacity.

One prerequisite to the achievement of coordinated operations is adequate transmission interconnections between the member utilities. The following explanation tells how one of these power pools identifies and evaluates potential interconnections.

The Pennsylvania-New Jersey-Maryland
Interconnection (PJM)

PJM is a voluntarily organized power pool responsible for the coordinated operation of the electric generation and transmission of bulk power for 11 investor-owned utilities. PJM operates a single system with central operational control over its members' generating and transmission facilities. This practice allows power to be freely transferred among members over interconnections so that electricity can be delivered to the ultimate customers as efficiently as possible. PJM is heavily interconnected--internally and externally--with 54 interties among system members and 25 with utilities not in the pool.

PJM uses two methods for identification and evaluation of potential interconnections. First, member companies develop plans for interconnections needed to meet their own system's requirements. Second, the Planning and Engineering Committee of PJM periodically conducts long-range planning studies to identify the overall needs of the pool without regard to ownership of facilities.

The Committee is responsible for coordinating the plans developed by member companies. The companies' planning is not superseded by the Committee; however, plans are reviewed for their effects on the reliability of the PJM system. This central review of proposed facilities is to make sure that the transmission facilities, including interconnections which are constructed, serve the best interests of the entire system.

The Committee's periodic studies provide general guidelines as to the preferred types, sizes, timing sequence, and general location of future generation and bulk transmission capacity needed by PJM. These overview studies have played an important part in PJM's development because they identify the need for facilities, including interconnections on a systemized basis rather than on the needs of individual utilities. However, according to PJM officials the final decision of what facilities are to be constructed remains with individual members.

Specifically, PJM considers the following as the benefits it derives from an integrated operation:

- Improved network reliability.
- Greater operating efficiency.

- Economies of scale.
- Better scheduling of additions.
- Flexibility in maintenance programs.
- Improved use of manpower and money.
- Lower cost to the customer.

NERC studies

NERC was formed voluntarily by the electric utility industry in 1968. Its membership includes Government, investor-owned, and public utilities in the United States as well as Canadian utilities interconnected with systems in the United States. NERC is managed by a Board of Trustees, which includes representatives from each of nine regional councils and all segments of the electrical industry. Although not a member, FPC attends NERC meetings as an official observer.

NERC's purpose is to augment the reliability and adequacy of bulk power supply in the electric utility systems of North America, rather than to consider economic factors. To achieve this goal, NERC proposes to

- "* * * --encourage and assist the development of inter-regional reliability arrangements among Regional Organizations or their members;
- exchange information with respect to planning and operating matters relating to the reliability and adequacy of bulk power supply;
- review periodically regional and inter-regional activities on reliability and adequacy;
- provide independent reviews of inter-regional matters referred to it by a Regional Organization; and
- provide information, where appropriate, to the Federal Power Commission and to other Federal agencies with respect to matters considered by the Council."

NERC evaluates whether existing and planned transmission facilities are adequate to provide reliable service and to support generation-deficient areas during emergencies. According to NERC many lines are built because they are essential for maintaining the integrity of the network, and if this were not so, the existing network would not have its present reliability and flexibility.

NERC established a permanent subcommittee (Inter-regional Subcommittee) in 1970 to continuously review the overall adequacy and reliability of the Nation's bulk power system. NERC feels the coordination efforts by the regional reliability councils has assured that the expansion of the network is always such that new facilities are compatible and the network can remain reliable. However, NERC does not consider national goals and objectives in its evaluations.

Efforts to develop national criteria

As previously stated in chapter 1, even in instances where an interconnection presents no economic advantages to a utility, there may be advantages to a region or the Nation. The only agency presently developing national criteria is ERDA.

ERDA contracted three companies in 1975 to develop criteria for the study of electric utility system expansion. Part of the study is expected to be completed by mid-1977. This process, which we believe has considerable value, is viewed by ERDA as an initial step in identifying all factors (quantitative and qualitative) which should be taken into account in identifying and evaluating potential interconnections.

One of the ERDA contracts requires the contractor to:

"Identify parameters which are necessary and sufficient for conduct of studies of national issues relating to bulk power supply expansion, including, but not limited to parameters in the following areas:

- a. National Resource objective and resource policy
- b. Load growth characteristics
- c. Economic trends or forces
- d. Supply criteria and objectives
- e. Fuel availability and costs
- f. Regulatory policy, national and state
- g. Electrical (system data)
- h. Technological factors (new equipment or process options)"

NEED FOR JOINT
INTERCONNECTION STUDIES

FPC and Interior have performed many of their interconnection studies independently from the affected utilities. All 28 FPC studies and 2 of the 3 Interior studies, included in our review, were done independent of utility input according to the utilities we talked to. These studies were not well received by the utilities. As a result, 14 FPC studies and both Interior studies have not been implemented. In our review we noted that four studies were performed involving inter-regional interconnections (two FPC and two Interior), none of which have had their recommendations implemented. The following two cases are examples of such inter-regional studies where joint involvement could have increased the opportunities for the acceptance of the study.

FPC study

FPC published a staff report on a proposed interconnection between the Electric Reliability Council of Texas and Southwest Power Pool 1/ in October 1972 2/. Electric utility systems within ERCOT are isolated from systems outside Texas. (See app. I.) The report concluded that interconnected and coordinated operation would result in a capacity savings of 2,080 megawatts between 1975 and 1980. This capacity reduction would represent a savings of \$193 million during the 5-year period. The savings would result because of shared generating capacity between the two reliability councils and would not reduce the level of system reliability existing under isolated operation.

FPC proposed three high-voltage interconnections to connect the two areas. They would provide an estimated inter-regional power transfer capability of about 2,200-megavolt amperes between ERCOT and SPP, and were estimated to have a cost of \$37 million, over the study period, resulting in an overall net savings of \$155 million.

Although ERCOT operates a number of interconnections with the Commission Federal de Electricidad, in the Republic of Mexico, no normally used interconnections connect ERCOT to

1/ ERCOT and SPP are two of the nine NERC regional councils.

2/ FPC ordered its staff to update and amend as necessary its 1972 study as a result of a petition and application filed with it by the four corporation utilities (Docket No. E-9558, issued July 21, 1976).

other councils in the United States. Several executives of the ERCOT utilities said that interconnection with SPP would be a costly project which would produce few tangible economic benefits.

Many of the ERCOT members we interviewed did not address themselves directly to the methods or conclusions of the FPC study, but expressed the opinion that reserves could not be reduced below present levels without adverse effects on system reliability. They also questioned the significance of FPC's findings on reserve savings in light of the fact that utilities in Texas give first priority to construction of coal-fired and nuclear-generating capacity (not reserve capacity). They argue that with or without interconnections, ERCOT will probably have a large reserve margin, since existing oil and natural gas generation will remain idle and can be used as reserves.

In addition to questioning the validity of the economic benefits projected by FPC, ERCOT criticized the cost estimate of interconnection developed by FPC. FPC concluded that only three segments of a high-voltage transmission line would be required to interconnect ERCOT and SPP. Several ERCOT representatives said that substantial funds would have to be spent on internal strengthening of both the ERCOT and SPP transmission system to permit stable operation. They added that the cost of this internal strengthening was not considered in FPC's study and, consequently, the cost of interconnecting ERCOT and SPP was considerably understated.

A number of ERCOT executives also said that ERCOT's pattern of isolated operation produces intangible benefits in the areas of planning and operation. For example, ERCOT is a group of manageable size utilities; therefore, planning conflicts can be resolved and responses to operating contingencies can be developed quickly by personal contacts between utility personnel. They said that if ERCOT is interconnected to other regions, problem solving will require more meetings, effort, and time.

Operating solely in intrastate commerce is a qualification for membership in ERCOT, and its chairman told us that ERCOT utilities believe isolated operation best meets their goal of providing economical, reliable electric service. Texas utility executives expect to face a number of regulatory problems if they interconnect interstate and are subjected to FPC jurisdiction.

Although we did not attempt to determine the validity of FPC's or ERCOT's contentions, the Central and Southwest Corporation, which has subsidiary utilities in ERCOT's and SPP's regions, evaluated the benefits from interconnecting its four subsidiaries. The study points out that long-run economic benefits of \$38.7 million are available by interconnecting the Corporation's subsidiaries. The study indicated that an additional potential savings of \$227 million is available if full, coordinated use can be made of the transmission systems in Texas. (A further discussion of the Corporation's study is contained in chapter 4.)

Although ERCOT is isolated from its neighbors, ERCOT officials said that joint studies would have the advantages of obtaining input from all parties and, therefore, would have a better chance of being accepted. The participants would identify and understand areas of disagreements--not necessarily eliminate disagreements. Such a joint effort, which would include ERCOT, should (1) reduce questions concerning the validity of projected economic benefits and cost estimates and (2) result in the study's acceptance.

Department of the Interior's study

The Bureau of Reclamation published an interconnection study in March 1975 which identified a potential for cost savings and reduction in oil and gas consumption. The interconnection considered was between the companies in the Mid-Continent Area Reliability Coordination Agreement (MARCA) and in the Western Systems Coordinating Council 1/.

The study was based on data published by MARCA and WSCC. The study projected that entities in the MARCA area may be capable of generating enough excess energy during light load periods to displace the consumption of 23.9 million barrels of oil at an estimated cost of \$245.3 million by 1983 when the line could be operational. The \$245.3 million represents about one-sixth of the amount required to construct the two 1,900-mile, 765 kilovolt (kV) alternating current lines. The study concluded that a more comprehensive interconnection study should be undertaken to determine how these two systems might be interconnected to achieve these savings.

1/ MARCA and WSCC are two of the NERC regional councils. See appendix I for map indicating the areas covered by MARCA and WSCC.

In March 1975 WSCC officials told us that they were not aware that such a potential had been identified. Some utility officials believed that it would not be reliable for customers to be supplied with electricity generated 1,900 miles away because of the possibility that the lines could go out of service and leave customers without power. In December 1975 the Congress authorized the Secretary of the Interior to engage in detailed feasibility studies of power interconnection potential. These studies will include consideration of a MARCA-WSCC interconnection.

As part of FPC's role of promoting and encouraging interconnections, it should participate in interconnection studies. NERC believes that studies can only be conducted by those who are intimately knowledgeable of the present facilities, the capabilities of the facilities, the mode of operation, and the limitations that exist. If FPC had participated jointly with Interior, as well as with WSCC and MARCA utilities, all parties would have been aware of the potential benefits. As a result of their awareness (and joint participation), their concern for reliability may have been reduced and could have increased the chances of their accepting the study conclusions or in the modification of the study to account for any valid concerns of the utilities.

UTILITY INDUSTRY VIEWS OF FPC RESPONSIBILITY TO PROMOTE INTERCONNECTIONS

We met with executives of 48 electric utilities to discuss FPC's responsibility to promote and encourage interconnections. These executives presented widely diverse opinions on the need for FPC involvement in identifying and evaluating interconnections, and on the need for FPC to take a more aggressive role in promoting interconnections through more studies. Most felt that the transmission system generally has been meeting the needs of the Nation.

The NERC president recognized the advantages of a joint Federal and utility industry effort to study potential interconnections. Such a joint effort should address and help solve the problems associated with constructing interconnections.

Some executives of a private utility favored FPC's efforts in promoting interconnections. They viewed FPC as a catalyst for more analysis of potential interconnections. An official of the Bonneville Power Administration believes that FPC could provide the needed leadership to ensure that all beneficial interconnections are identified and built.

Other private utility executives believed that FPC can not make any contributions to the utility industry by promoting and encouraging interconnections. Furthermore, utility executives told us that constructing additional interconnections will not by themselves solve the energy, fuel, or capacity problem facing the utility industry.

Most utility executives do not believe that FPC personnel possess the detailed knowledge of individual power systems necessary to effectively assess the specific costs and benefits of interconnections between such systems. For example, one of the criticisms of the FPC report which identified benefits to interconnecting ERCOT and SPP was the argument that it failed to recognize improvements to ERCOT's system which would be required before interconnections could be made. Utility executives contend that only engineers with a detailed knowledge of a given system would recognize such requirements.

Most of the utility executives we met with said that if FPC continues or expands its efforts in studying and promoting interconnections, it must be with the voluntary participation of the utilities affected. Such cooperative efforts would allow those individuals most familiar with the system to actually participate in the analysis. In their opinion these cooperative efforts could also ensure that study conclusions would be "objective and realistic" because they would have input from the utilities directly involved as well as the Government. Also, because all parties concerned would have a part in performing the studies, there would be a much higher probability that the recommendations would be implemented than if FPC were to do the studies independently.

In any future efforts to work more closely with utilities in joint studies of interconnections, FPC should make every effort to maintain its independence and objectivity.

CHAPTER 4

FACTORS AFFECTING

CONSTRUCTION OF INTERCONNECTIONS

The utility industry must deal with financial, environmental, and institutional considerations which may result in delay or cancellation of proposed interconnections. These factors are often complex and outside the control of individual utilities and, in some situations, the utility industry itself.

Delays and cancellations as a result of these factors may limit the efficiency and effectiveness of the utility industries' efforts to provide customers with the most reliable and economic supply of electrical power. The effect of delays and cancellations of interconnections could reduce operating flexibility and transmission capability. Furthermore, in a number of areas, delays in transmission lines could make the network vulnerable to outages.

Successful completion of many planned transmission lines needed to interconnect systems is questionable because of various factors. The following schedule shows some of the reasons cited by FPC 1/ for transmission line delays.

Line Delays as of June 1975

<u>Reason for delay</u>	<u>Number of lines delayed (note a)</u>	<u>Average delay</u> (months)
Fiscal problems	22	32.5
Environmental considerations	38	26.3
Institutional (prolonged procedures to obtain approval from Government agencies)	32	17.4

a/ Some lines are delayed for more than one reason.

1/ Data is from FPC's Transmission Line Construction Data for the month of June 1975.

Obstacles to the construction of lines have already caused many postponements. In June 1975 FPC reported that 184 (68 percent) out of the 271 transmission lines under construction were delayed. These delays were the result of the previous factors as well as others such as technological limitations and equipment delivery and installation problems. FPC reported that the delays ranged from 1 month to 13 years, and averaged 15 months. These factors have also caused cancellations of planned transmission lines.

FINANCIAL PROBLEMS

The electric power industry is one of the most capital-intensive industries in the United States, with financing requirements representing about 15 to 20 percent of all U.S. corporate financing. The utility industry's ability to provide a supply of electrical power between 1970 and 1976 had been financially restricted in many cases by

- rapid increases in the rate of inflation, which caused increased construction, operating, and maintenance costs,
- reduction in the development of new technological, cost-saving opportunities,
- increased public pressure to reduce the number of rate increases granted, and
- reduced investor confidence.

These conditions had a critical impact on many utility companies. According to FPC, the rapid expansion of the utility industry's external financing requirements, combined with rising interest rates, caused the deterioration of electric power company credit. Since 1970 the credit ratings of securities of approximately 70 major investor-owned utility companies had been declining; however, the economy has been improving, and credit ratings are now improving.

ENVIRONMENTAL CONSIDERATIONS

The production and delivery of electricity has undesirable effects on the environment. Some of these effects are

- land use effect caused by transmission rights-of-way,
- general esthetic effects such as noise and appearance, and

--interference with other spatial uses such as approaches to airports and waterways.

Electric utility companies must meet various Federal, State, and local environmental requirements that have significantly increased the time necessary for planning and constructing power facilities.

Also, the location of generating plants determines the location of transmission lines. While the plants may be environmentally acceptable, the resulting transmission lines may have to cross land where the lines would be environmentally unacceptable. Therefore, lines, as well as plant locations, must be jointly evaluated. Environmental acceptability of one does not mean the same acceptance of the other.

Although the requirements of State and Federal agencies vary in specific information requested, all generally require information to evaluate the environmental impact of the facilities. For example, the Interior's Bureau of Land Management requires the applicant who wishes to construct a line across Federal lands to submit an application and conduct an environmental impact survey from which an environmental report is prepared. The report includes

--a description of proposed construction and

--information concerning the project's impact on air space, air and water quality, scenic and esthetic features, historical and archaeological features, and wildlife, fish, and marine life.

The application and above required data are reviewed, and the district office prepares an environmental analysis report of the proposed construction. The report assesses the impact the proposed transmission line will have on the surrounding environment and contains an environmental statement and analysis of alternatives. During preparation of the report, the public is informed about the proposed construction, and comments are solicited. The completed report is sent to the Council on Environmental Quality which distributes copies to appropriate Federal, State, and local government bodies and sees that a notice appears in the Federal Register.

If a decision is made that the construction will significantly affect the environment, then an environmental impact statement must be prepared. A notice of the final statement is published in the Federal Register. The statement is supposed to include

- a description of construction,
- a description of environmental impacts,
- a summary of probable adverse environmental effects which cannot be avoided,
- a description of the relationship between local short-term uses and maintenance of long-term productivity,
- a summary of irreversible and irretrievable commitment of resources, and
- comments from the public, Federal, State, and local governments.

After the statement is approved by Interior, a permit is issued.

Utility and land agency officials state that it generally takes about 18 months to 2 years to obtain right-of-way permits for larger transmission lines. If law suits are filed against the proposed construction, the time may be even longer.

Present attitudes on protecting the environment are strong and legitimate. Environmental protection is not a peripheral aspect to constructing interconnections and, therefore, requires attention in planning such lines.

The following case exemplifies the many environmental considerations that have to be recognized.

Keeney-Salem transmission line

In 1965, Delmarva Power & Light Company initiated plans for a 500-kV transmission line in Delaware to connect with the Pennsylvania-New Jersey-Maryland Interconnection's 500-kV transmission system. The proposed line was designed to cross the State of Delaware extending from the western border with Maryland to the New Jersey State line on the eastern side of the Delaware River.

The Keeney-Salem interconnection has met continual concern from environmental groups. Since 1966 the following events have affected the proposed line:

- The original layout, presented in 1966, was not constructed because (1) the location's proximity to an airport limited the height of the line, (2) the low

height of the line did not allow ships adequate clearance on the Delaware River, and (3) the line would be too close to a historic park and a national cemetery.

--A second approach required a right-of-way paralleling the river. Opposition was made to this route on the basis that the line would be partly located on tidal marshland and would traverse potential parkland.

--A third alternative route was secured. Construction permit applications for this route were initiated in late 1969. Subsequent public hearings raised objections from local sailing clubs that the line would cause additional obstacles in the river and would be esthetically undesirable. The utility company, therefore, made several studies of both underground and overhead alternatives. None was found to be feasible. A construction permit for the proposed site was obtained from the Corps of Engineers in July 1973.

--Planning and construction began immediately. In October 1973 the Corps of Engineers, acting on a State of Delaware ruling, ordered work to stop. The Delaware State Attorney General stated that the permit had been improperly issued because the State Water and Air Resources Commission failed to hold a public hearing. The utility company filed a complaint in the courts challenging the State of Delaware's position.

--The legal issues were cleared and the permit needed to resume construction was given by the Corps of Engineers in August 1976. Construction began again in September 1976 and it is estimated that it will be 15 months from start to finish.

This line will be part of an extension of 500-kV bulk power system in PJM, and the two lines together are necessary to deliver the output of nuclear generating units to the various load centers. Delayed construction of the Keeney-Salem transmission line has required implementation of emergency operating procedures on several occasions to relieve critical line loadings.

INSTITUTIONAL CONSTRAINTS

The existence of statutes, policies, and contracts has caused institutional constraints to constructing transmission facilities. Such institutional constraints have kept utilities from considering or entering into some interconnection projects, while delaying some others. During our review, we identified the following instances affecting the construction of interconnections.

Reluctance of Texas utilities to interconnect

ERCOT prohibits any of its member companies from interconnecting with systems outside of Texas. This prevents members from buying or selling electric energy in interstate commerce.

The Central and Southwest Corporation, a public utility holding company, had operating subsidiaries in both ERCOT and SPP. Each subsidiary represented an economic operating area responsible for dispatching electric power within its boundaries. These subsidiaries include:

- Public Service Company of Oklahoma.
- Southwestern Electric Power Company.
- Central Power and Light Company.
- West Texas Utilities Company.

West Texas Utilities Company, at that time, had divisions in each Council and had two economic operating areas. Subsequently, West Texas Utilities Company's divisions merged and now belong to the same council (SPP).

In November 1975 the Corporation released an expansion study covering a 20-year period (1975-95) examining the relative economies of continuing the isolated pattern or operating as an interconnected system. The study recognized that the operating pattern had been well suited to an era when low cost and abundant oil and natural gas supplies were available locally to use as fuel for power generation. It also recognized that fuel conditions are undergoing a fundamental and probably irreversible change, and that recent emphasis on oil and natural gas conservation indicates the future baseload generation for the Corporation will be coal-fired or nuclear.

The expansion study indicated that additional long run total economic benefits of \$38.7 million by 1995 were available through interconnecting the operations of the four Corporation subsidiaries. However, these potential benefits to interconnected operation could not be realized because of ERCOT's membership requirement. The savings are primarily the result of operating economies available when using an economic dispatch which considers the consolidated electrical load of the entire interconnected area. The Corporation began a more detailed study of the specific costs and benefits in January 1976.

An additional potential savings of \$227 million ^{1/} above the \$38.7 million discussed above is available if full, coordinated use can be made of the transmission systems in Texas to transfer power between the Corporation's operating subsidiaries. In this situation, short-high-capacity interconnections could be put in place between ERCOT and SPP. Preliminary indications are that the Corporation's power transfers would not adversely affect the load of existing and planned ERCOT circuits. However, detailed load flow and stability studies are still required.

Legal limitation on Bonneville Power Administration energy transfers

Public Law 88-552 (16 U.S.C. 823) limits BPA in transferring surplus energy from the Pacific Northwest, and therefore, restricts utilities outside the Pacific Northwest from either constructing additional interconnections or increasing the capacity of the existing interconnections.

The act requires BPA to serve the requirements of the Pacific Northwest before marketing such power and energy outside the region. The act states that the export of Federal hydroelectric power in the Pacific Northwest is limited to surplus energy and surplus peaking capacity, and notes that the Secretary of the Interior can stop delivery of the surplus energy by giving notice, within 60 days, of any conditions that may impair the Northwest's energy. The act also states that the Secretary may terminate any contract of surplus peaking capacity upon notice within 5 years.

The 5-year provision, while protecting the Northwest, removes opportunities for new long-term contracts for power with

^{1/} The study does not recognize the impact that may accrue to other utilities.

Southwestern utilities. Without the assurance of a long-term contract, utilities we contacted state they would have no guarantees to meet their energy needs and justify their investment in new interconnections.

CHAPTER 5

CONCLUSIONS, RECOMMENDATIONS,

AND AGENCY COMMENTS

CONCLUSIONS

Although present interconnections appear adequate to meet our current needs based on experience to date, Federal and independent studies of the reliability and adequacy of the national power supply indicate that future reliability and adequacy of the electric bulk power supply depends on the timely installation of new generation and transmission facilities to meet our future needs. Further, several studies indicate that additional interconnections are economic. Unfortunately, there is little or no consensus on the validity of these studies.

This conclusion stems in part from our belief that FPC has not effectively carried out its existing responsibilities of promoting and coordinating interconnection throughout the Nation. Its recent studies have been conducted primarily in the Southwest and have received only partial acceptance by the utility industry. Interconnection studies have also been independently made by utilities, the Bureau of Reclamation, BPA, and others without FPC involvement.

We believe that FPC should establish national criteria to be used in considering needed interconnections because there may be many instances where an interconnection could present minimal or no economic advantage (or disadvantage) to a utility but could provide advantages to a region or the Nation. These criteria should allow consideration of such goals as energy conservation, reduced transmission and generation, reliable national emergency services, and national defense. Each of these goals is becoming increasingly important as the Nation's domestic energy supplies decrease.

National resource objectives and resource policy have not been considered by utilities as a benefit of an interconnection. Unless an interconnection shows economic benefits to one or more of the interconnecting parties, a utility will not act on its own to install it. We believe that consideration of such goals should be an integral part of the interconnection planning process.

ERDA is developing criteria for the study of electric utility system expansion. ERDA sees this as an initial step, which we believe has considerable value in identifying factors which

should be taken into account in identifying and evaluating potential interconnections. FPC, in establishing national interconnection criteria, should consider and use, where practical, the results of ERDA's study.

The establishment of such criteria would be a first step in making the utilities aware of the seriousness of the Government's interest in promoting interconnections. If the criteria, once established, are not used by the utilities in their decisionmaking, then FPC should move to seek legislative authority to compel their consideration. We believe, however, it is premature to move to such compulsory action at this time.

A recent study prepared for the Congressional Research Service pointed out that interconnection studies have been performed but that additional evaluation of those studies is needed. However, despite this need, no entity--Federal or non-Federal--assures that such further evaluations will be made. The only followup action that might be initiated would be if the specific participants decide on their own to further evaluate the interconnections.

We believe that a need exists for FPC to promote a joint Federal-utility effort to systematically (1) identify and study future interconnections on a regional and inter-regional basis, and (2) follow up on previous studies to determine why the utilities have not implemented them or further analyzed the proposed interconnection.

The interconnection studies that result from these joint planning efforts should recognize the various purposes, needs, and objectives of each organization involved, as well as national goals. This coordination should insure that differences among organizations will be identified and discussed, and ultimately improve the opportunity for their resolution.

Financial, environmental, institutional, and technological factors are affecting the utility industry's ability to provide its customers with completely reliable service at the lowest prices consistent with our Nation's social and environmental goals. Joint Federal-industry studies should include a determination of the impact of all relevant factors and consideration of methods to develop alternative plans for providing the needed services.

RECOMMENDATIONS TO THE CHAIRMAN, FPC

We recommend that the Chairman, FPC

- take the lead in promoting, throughout the Nation, joint Federal-industry studies to identify and evaluate new interconnections and changes in existing interconnections,
- follow up on completed interconnection studies to resolve objections to the studies which might result in adoption of study recommendations,
- work with utilities to establish criteria for carrying out interconnection studies which will require adequate consideration of national goals and timely identification of factors which may adversely affect the proposed interconnection, and
- work with the utilities to make sure the criteria are used; if they are not used voluntarily within a reasonable time after their release, the Commission should consider whether further steps should be taken to compel their consideration, including seeking additional legislation as necessary.

AGENCY COMMENTS AND OUR EVALUATION

Department of the Interior

Interior stated in their letter of November 29, 1976, (see app. II), that our report presents a comprehensive analysis and agrees that transmission and generation should be planned to consider the advantages interconnections may offer for pursuing national or regional energy conservation programs, reduced transmission and generation investment, emergency service, and national defense.

Interior pointed out that two of their studies were of an exploratory nature and for this reason, all potential parties were not included. We believe, however, that any interconnection studies should be of a joint nature to include all parties.

Federal Power Commission

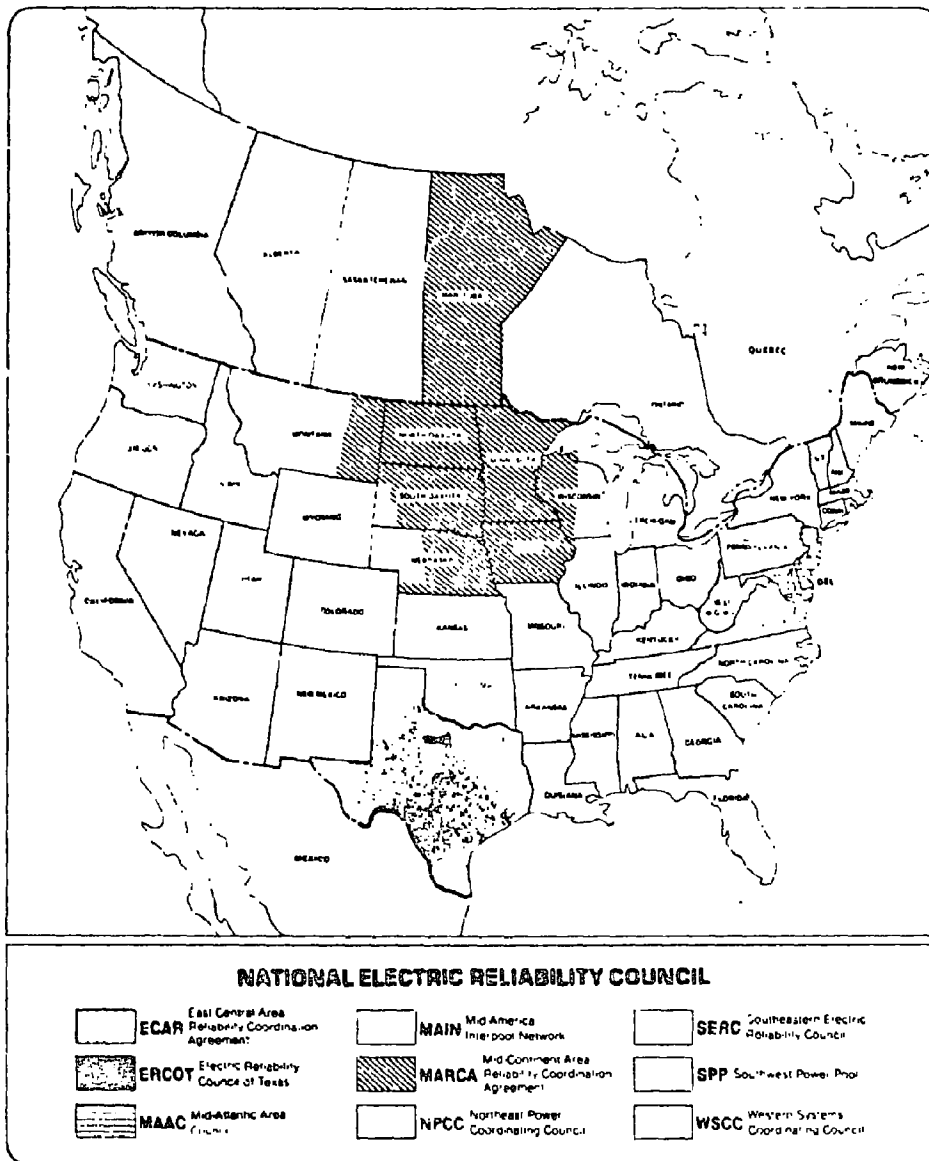
FPC said in their letter of November 3, 1976, that there is little basis presented in our report to conclude that FPC has not effectively carried out its responsibilities in promoting interconnections and that the current network speaks for itself. (See app. III.)

According to NERC, however, it has been the initiative of industry to interconnect and not because of FPC or any other Government agency. We believe the future electrical demands will require joint studies and that national criteria should be considered. Therefore, it is important for FPC to follow its mandate to promote interconnections.

National Electric Reliability Council

NERC said that the present system of interconnections is a result of the efforts and good judgment of highly qualified, dedicated engineers and executives who are intimately involved in these matters. NERC said that the present system of interconnections is a result of the planning and development by the electric utility industry.

We agree that the present system should be attributed to the electric utility industry; however, we believe that the future electrical demands will require joint studies and that national criteria should be considered. Therefore, it is important that industry and the Government work together to achieve this.





United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, DC 20240

NOV 20 1976

Mr. Monte Canfield, Jr.
Director, Energy and Minerals Division
General Accounting Office
Washington, D.C. 20548

Dear Mr. Canfield:

We have reviewed your proposed report to the Congress entitled "Problems in Planning and Constructing Transmission Lines which Interconnect Utilities" forwarded with your letter of October 4, 1976. While the report makes no recommendations to the Department, we offer the following comments in the hope that they will be useful in clarifying certain sections of the report.

General Comments

The subject draft report presents a comprehensive analysis of a highly complex subject. The GAO should be commended for the scope of its efforts and its presentation of a very difficult subject.

The main impact of the report suggests that the Federal Power Commission (FPC) establish and ensure the use of national criteria in future interconnection studies. The point is well taken. We feel transmission and generation should be planned to consider the advantages interconnections may offer for pursuing national or regional energy conservation programs, reduced transmission and generation investment, emergency service, and national defense.

The Department of the Interior should be actively involved in any interconnection planning since often regional interties require an interconnection with one or more of the five power marketing agencies of the Department.

The report is somewhat critical of past actions of the Department. The Bureau of Reclamation's authority for involvement in transmission interties is limited. Until the signing of Public Law 94-156 on December 16, 1975, the authority granted to the Secretary of the Interior, by the Reclamation Act of 1939 and the Flood Control Act of 1944, to be involved in power transmission was related to the marketing of surplus power from Federal hydroprojects. Acting within that authority, Reclamation has conducted or participated in several joint studies of interties.



APPENDIX II

APPENDIX II

The draft report makes no mention of studies that led to the eventual construction of interconnection transmission interties. Both the Bureau and the Bonneville Power Administration (BPA) have coordinated some interconnection studies with customers and other affected utilities. For example, the 3,900 MW capacity Pacific Northwest-Pacific Southwest intertie was constructed following a series of studies conducted jointly by Interior agencies and the utilities during the early 1960's. Furthermore, current studies are in progress, conducted by the same organizations, which consider increasing the capacity of the intertie lines by 1,400 MW.

While the report criticizes Reclamation for conducting studies without involving all potential interested parties, what seems to have been overlooked is the necessity to make a preliminary analysis of possibilities before in-depth studies can be formulated. The studies cited by GAO have all been reconnaissance-level studies attempting to determine whether further in-depth analysis is justified. Both the "Transmission Study 190" and the March 1975 "Intertie Appraisal Study," referred to in the report, were of an exploratory nature, as evidenced by the fact that the primary recommendation in the report of each of these studies is for further study.

Specific Comments

Digest, Page 1. In addition to the listed advantages, an economy which can be realized by the interconnection of utilities is a reduction of transmission capital investments and of environmental impact. These costs and impacts can result from the reduction of facility duplication. It should be noted, however, that while transmission interties can materially assist in energy conservation, this may not always be true. Transmission interties may enable the use of somewhat more efficient energy conversion installations to supply energy to consumers or enable a different raw energy resource to be used in conversion to electrical energy, such as the use of water that may otherwise be spilled. Only the gain in energy conversion efficiency can contribute to energy conservation, and this may be offset in part by transmission energy losses.

We think it would be useful to discuss in more detail in the body of the report the benefits to the nation of saving diminishing fossil fuel supplies, such as gas and oil, which would occur as a result of some interconnections.

Page 3, Second Paragraph. The report states that Interior studies did not involve the affected utilities. BPA has performed many interconnection studies in the Northwest involving the a.c. and d.c. interties,

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While the report criticizes Reclamation for conducting studies without involving all potential interested parties, what seems to have been overlooked is the necessity to make a preliminary analysis of possibilities before in-depth studies can be formulated. The studies cited by GAO have all been reconnaissance-level studies attempting to determine whether further in-depth analysis is justified. Both the "Transmission Study 190" and the March 1975 "Intertie Appraisal Study," referred to in the report, were of an exploratory nature, as evidenced by the fact that the primary recommendation in the report of each of these studies is for further study.

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APPENDIX II

APPENDIX II

Canadian interties, and interties proposed to Montana, Colstrip, etc. All of these studies involved the affected utilities and the results, generally, were accepted by the affected utilities.

[See GAO note 1, p. 36.]

Chapter 3, Pages 24 and 25. The discussion of the "Interior study" requires some editing such as:

[See GAO note 1, p. 36.]

Page 25, paragraph 2 - We recommend deletion. The effort being discussed is an appraisal to determine whether a "study" would be worthwhile. It is not practicable to have initial appraisal activity become multiorganization efforts.

Chapter 3, Page 27, Last Paragraph. We agree with the report's statement that to be successful, joint studies involving the technical experts of the utilities are essential. We would go one step farther and say that the studies should incorporate environmental concerns from their inception.

[See GAO note 1, p. 36.]

APPENDIX II

APPENDIX II

Chapter 4, Page 31, Environmental Considerations, First Paragraph.

The effects listed in the report appear to deal only with transmission, not generation and marketing. This paragraph could also list:

- The physical effect of removal of land from other uses;
- The effect of construction and operation on natural resources such as soil, vegetation, air, and water;
- The esthetic effects of noise and appearance;
- The economic effects."

In light of GAO's recommendation that joint Federal utility studies be conducted, when Federal lands or marketing agencies are involved it would appear appropriate that such studies should fall under the Federal lead agency role established by the National Environmental Policy Act (NEPA). The meeting of environmental requirements could be expedited by the consolidation of Intergovernmental Coordination (A-95) and NEPA reviews at the Federal level. BPA, in effect, does this with very few delays in projects occurring as a result of NEPA and other environmental legislation. Intertie studies might be conducted by a joint Federal/utility task group consisting of both utility technical and environmental planning expertise. Such expertise should be drawn from the utilities and the land management agencies involved. Such a task team under the Department of the Interior Federal lead agency designation could ensure that environmental factors are considered in the technical analysis of the intertie requirements. It would also provide a team which could complete the environmental impact statement resulting from the proposal generated by the feasibility studies.

[See GAO note 1, p. 36.]

Chapter 4, Page 39, Second Paragraph. The report states that the 5-year commitment limits long-term contracts with Southwestern utilities. It should be noted that BPA has 20-year power sales contracts with utilities outside the region with 5-year pullback provisions for specific purposes only.

This paragraph ignores the possibility of developing diversity exchanges.

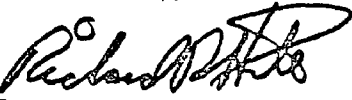
APPENDIX II

APPENDIX II

[See GAO note 1, p. 36.]

We appreciate the opportunity to comment on this very important subject.

Sincerely,


Deputy Assistant Secretary
Administration and Management

GAO notes:

1. The deleted comments relate to matters which were discussed in the draft report but omitted from this final report.
2. Page references in this appendix refer to the draft report and do not agree with the page number in the final report.

APPENDIX III

APPENDIX III

FEDERAL POWER COMMISSION
WASHINGTON, D.C. 20426

IN REPLY REFER TO:

NOV 3 1976

Mr. Monte Canfield, Jr.
Director, Energy and Minerals Division
U. S. General Accounting Office
Washington, D. C. 20548

Dear Mr. Canfield:

This is in response to your letter of October 4, 1976, inviting our comments on the draft of your proposed report to Congress to be entitled, "Problems in Planning and Constructing Transmission Lines Which Interconnect Utilities." A detailed review of the proposed report has indicated that it is deficient in some areas and that some of the reported conclusions are not supported by the facts in the text.

The GAO letter dated February 12, 1975, initiating this study stated that it was intended to be a general survey into the potential for increased effectiveness of interconnection and transmission systems for electric power. We feel that this would still be a more appropriate title for the report. This proposed report to the Congress by no means lists all the problems nor analyzes them as the present title might lead one to expect.

It is of particular concern to us that very little mention is made of the nine existing Electric Reliability Councils, of the work they are doing, or of the role that the Federal Power Commission has taken in initiating and continuing their work to provide an adequate and reliable bulk power supply in the United States.

It is our opinion that the nine Councils and the National Electric Reliability Council, working together and with the FPC, have made great strides toward assuring an adequate bulk power supply. A key part of this effort is the coordination and interconnection of the electric systems not only within each region but among regions. A comparison of the regional interconnections existing in 1967 with those existing today and with those planned will



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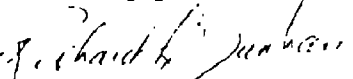
indicate a significant amount of interconnection progress. Although this endeavor on the part of the industry has been primarily voluntary, there seems little question that the interest, the participation and the urging of the FPC has been most instrumental in the progress that has been made.

The Commission has under consideration legislative proposals that would give it authority to order electric power wheeling under certain conditions. It should be pointed out that if this authority should be granted, one of the most important questions which we will have to face will be the decision on reasonable economic and financial terms for the provision of services.

The report states that the FPC has not effectively carried out its responsibilities in promoting interconnections. We believe that there is little basis presented in the proposed report for this conclusion. At one point, the report presents the opposite opinion when it states that existing interconnections are adequate.

We feel that the incorporation of the more detailed comments attached would strengthen the report. We would be happy to meet with you and your staff at your convenience to discuss these comments and other thoughts we may both have.

Sincerely yours,


Richard L. Dunham
Chairman

Enclosure [See GAO note.]

GAO note: The enclosure is not included here but was considered in this report.

APPENDIX IV

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PRINCIPAL OFFICIALS RESPONSIBLE
FOR ADMINISTERING ACTIVITIES
DISCUSSED IN THIS REPORT

Tenure of office
From To

FEDERAL POWER COMMISSION

CHAIRMAN:

Richard L. Dunham	Oct. 1975	Present
John N. Nassikas	Aug. 1969	Oct. 1975

CHIEF, BUREAU OF POWER

Whitman Ridgway	Apr. 1976	Present
Whitman Ridgway (acting)	Feb. 1976	Apr. 1976
T. A. Phillips	Nov. 1970	Jan. 1976

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