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SUMMARY REPORT  
of  
HYDROPOWER WORKSHOP

November 4, 1976

1. On Thursday, November 4, 1976, a Federal interagency workshop on hydroelectric power development was sponsored by the Federal Energy Administration's Assistant Administrator for Energy Resource Development. It was attended by representatives of the eight Federal agencies with direct interests in hydroelectric power, namely the Corps of Engineers (COE), the Department of the Interior (DOI), the Energy Research and Development Administration (ERDA), the Federal Energy Administration (FEA), the Federal Power Commission (FPC), the Rural Electrification Administration (REA), the Tennessee Valley Authority (TVA), and Water Resources Council (WRC). The agenda and attendance list for the workshop are provided at TAB A and TAB B respectively. Summaries of the presentation and panels are listed below in chronological order.

2. Introductory Remarks

a. Mr. William Rosenberg expressed his appreciation for the interest shown by the various agencies in the workshop and welcomed their participation. He pointed out that hydropower is often overlooked or underemphasized in today's endeavor to find energy alternatives to imported oil and gas; nuclear, coal and the advanced technologies receive more publicity. He stressed that the Federal Energy Administration is prepared to cooperate with all the agencies to insure that hydropower receives proper consideration.

b. Mr. Robert Hanfling stated that FEA's funding and resource commitment to hydropower has been limited. Reliance has been in the Federal agencies with hydropower operational responsibilities to insure hydropower development is properly considered. He recognized that this approach can result in piecemeal planning and development. He mentioned the New England Federal Regional Council's report entitled New England Hydroelectric Development Potential as a positive effort to determine what potential exists for this energy alternative. In outlining the agenda of the workshop, he encouraged maximum participation by all attendees.




### 3. National Energy Outlook

To provide an overall framework for the workshop, Mr. David Nissen gave a brief description of how the National Energy Outlook is prepared; the contents, milestones, and the parties responsible for the various sections; and some of the preliminary results of the 1977 modeling efforts. The preliminary NEO/77 outline is provided at TAB C. Highlights of his presentation were:

- Project Independence Evaluation System (PIES) modeling was shaped by the 1973 oil embargo. There was the need to assess the impacts of oil imports and alternatives. Also there was a need to assess the demand response to various market forces.
- The National Energy Outlook has been evolutionary. In 1974 the primary focus was on oil imports and the possibilities of import substitution on the domestic supply and demand sides. In 1975, the demand side was completely re-specified. This led to a major re-evaluation of electric utilities policy.
- A brief description of the PIES modeling segments including electricity generation and capacity formation was given.
- The 1977 outlook for natural gas and oil is gloomier because of delays associated with routing Alaska gas to the lower 48 and delays in outer continental shelf development.
- In the electrical sector, the advantage of nuclear power over coal-fired generation is being re-examined.
- Hydropower can be expected to contribute a lesser segment of electric power (percentagewise) with passage of time.

### 4. FPC Hydropower Activities

a. Mr. Ronald Corso pointed out that FPC has statutory jurisdiction over all non-federal hydroelectric development projects. However, the courts have increasingly extended their jurisdiction in hydro projects via their decisions on litigation. He stated that there was intense interest by the utilities in pumped storage projects during the 1960-1970 time frame, but the environmental opposition to these projects with the associated delays/defeats has dampened their interests. Examples given were the Blue Ridge Project and the Middle Snake River decision. He distributed a copy of a recent presentation on Private Sector Hydroelectric Development in the United States. (TAB D). Today the trend appears to be toward smaller conventional hydroelectric installations. When



considering hydroelectric development, one must recognize that the economics used have placed hydro in an unfair position. He encouraged discussion of this subject as well as the overlapping jurisdictions of Federal agencies (veto power) which adversely affect hydropower development.

b. Mr. Neal Jennings outlined FPC's efforts in providing data on developed and undeveloped hydro potential. He distributed a preliminary inventory of facilities (TAB E). He indicated that the FPC report covering hydroelectric power resources over 5 MW will be published sometime after beginning of 1977. Present figures are 57,000 MW developed and 114,000 MW undeveloped potential for conventional hydroelectric power.

##### 5. Corps of Engineers Hydropower Activities (COE)

Mr. Gene Lawhun outlined the present and future COE activities in hydropower. He stated that COE had been directed by the Congressional Appropriations Committees to prepare a report identifying additional hydropower generating potential at all Corps projects (existing, under construction, and planned). COE has completed the report which is undergoing Administration review. He provided statistics on COE hydro capacity and construction as follows:

- COE operates and maintains 65 hydro projects consisting of 295 generating units with aggregate name-plate capacity of almost 16,000 MW.

- In 1975, COE facilities generated over 85 million megawatt-hours of net energy (equivalent of roughly 145 million barrels of oil).

- In 1975, five new plants consisting of 16 units added 1,228 MW of capacity.

- Under construction are:

- Six multipurpose projects which contain 17 units totalling 927 MW to be completed by 1982.

- At eight existing plants, 33 units are being added to increase capacity by 3,294 MW.

- Under study or having been studied are 35 new plants which could add an estimated 21,706 MW, if built.

He also pointed out that COE has moved into the slant-axis technology. First unit was installed at Ozark Lock and Dam on the Arkansas River in November 1972 followed by an additional 4 units completed in 1975. The project provides 100 MW (20 MW each) of capacity. Similarly 3 slant-axis units (20 MW each) were completed at Webbers Falls Lock and Dam in 1973. A six-unit plant being installed at the Harry S. Truman Dam in Missouri

will add 160 MW in 1979. These six units are reversible blade units which provide 27 MW each as generators and 36,000 HP as motors.

Mr. Lawhun then passed out a summary developed from a list of 424 potential sites where new or additional hydropower could be installed (TAB F). This list was prepared at congressional request. He briefly explained the various categories of the projects. Some 250,760 MW of capacity with an estimated average annual production capability of 297,814,958 megawatt-hours were identified.

He then outlined COE's study activities as follows:

- Institute of Water Resources' 1975 study entitled Hydroelectrical Power Potential at Corps of Engineer Projects. It provided a broad framework for considering hydroelectric development. It identified a range of analytical and policy problems to be addressed and presented recommendations. He elaborated on key ones, such as (1) need for screening criteria and procedures to identify potential sites for more detailed examination; (2) changing economic value of hydropower; and (3) constraints, e.g., environmental.

- Feasibility studies of 24 sites possessing 20,000 MW of potential hydropower is in progress. This capacity includes a rather optimistic assessment of pumped storage potential.

- Phase I AE&D studies of 10 sites totalling 6,525 MW are in progress. Six of these are expansions of existing facilities.

- Studies show several existing and authorized projects in Southwestern Power Administration's marketing area could be expanded for additional peaking capacity, but marketing arrangements would have to be changed to make the addition attractive.

- The pumped-storage potential in Columbia and Snake River basins is underway. Insufficient information is available to provide estimates at this time.

- The recently enacted Water Resources Development Act of 1976 (P.L. 94-587) authorizes COE to undertake a comprehensive study of hydropower resources to include pumped storage potential, low head potential, efficient utilization of output, and additional installations at existing COE projects. The Act also authorizes \$5 million per year in 1978 and 1979 for feasibility studies of promising installations.

He indicated that the most promising area for developing additional hydroelectric capacity by COE will be add-ons.



#### 6. Department of Interior Hydropower Activities

Mr. William Wilson distributed a handout (TAB G) and elaborated on the following points.

- DOI is the largest electricity marketing agency in the U.S.
- DOI markets the power generated from Corps of Engineers facilities.
- Marketing is governed by statutory language. Pointed out preference customers given priority but that surplus power is sold to the private utilities as well.
- Achievement of power resource goals constantly sought.
- Bureau of Reclamation is both a marketing and a construction agency for hydropower.

#### 7. Tennessee Valley Authority Hydropower Activities

Mr. Jim Cross stated that TVA began with one hydroelectric plant and one steam turbine plant. Since 1950 the demand for electric power has increased to the point where hydropower could not support the need for power. Therefore fossil-fuel plants were constructed. Then in 1966, TVA filed an application to construct its first nuclear plant. Now TVA has commitments to develop 17 nuclear units. He stressed that he did not want to belittle hydropower because it provides by far the cheapest and most flexible power. Presently hydropower represents 17% of TVA's capacity, and cost to produce one kilowatt hour of power for TVA last year from the various sources was .6 mills for hydro, 10 mills for steam, 16 mills for purchased power, and 31 mills for gas turbine power. Besides cost advantages, he pointed out the advantage of the load following response characteristics of hydropower. He indicated that TVA planned to construct its first pumped storage project (Raccoon Mountain project) but is encountering considerable environmental opposition. He then stressed the following on-going activities in TVA:

- Looking at possible additions to existing projects to better utilize the hydropower potential. State-of-the-art permits this increase of capacity at about \$250/KW.
- Rewinding of generators has added 129 MW of capacity at the low cost of \$10/KW.
- Opposition from land owners in our investigations for a second pumped storage project.
- Possibility of plant up-rating and modification of existing hydroelectric units.

- Cost picture constantly changing but it appears that main hydro potential in TVA area has been developed.
- Hydro has been good to TVA. Investment made at \$175/KW.

#### 8. ERDA Hydropower Activities

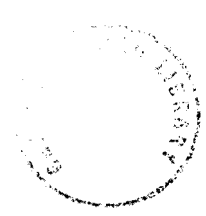
Mr. Phil McGee presented the current ERDA hydroelectric power program. He noted that the Agency's authority and responsibilities are for research, development and demonstration relative to the commercial feasibility and practical applications for the use of energy.

ERDA's hydroelectric energy program is divided into three basic parts--tidal energy, underground pumped storage, and the more conventional hydroelectric technology.

The work in tidal energy consists of a study contract with the firm of Stone and Webster of Boston, Massachusetts. The contract runs from April 1976 through January 1977 and costs \$169,000. The purpose of the work is to provide an analysis--on a worldwide basis--of the present and long range outlook as to the cost of electrical energy generated from tidal power. The objectives of the report are: to report on the status of the technology as it exists today; to render expert judgment as to its potential use; determine the opportunities that exist within the United States for its use; determine whether or not research and development opportunities exist; and determine what the environmental, societal and legal consequences from a tidal project would be in today's environment.

The Agency's program in underground pump storage is as follows:

- ERDA is sponsoring a study being done by Argonne National Laboratory entitled "Selecting and Evaluating Pumped Hydro Storage Projects." The schedule for the study is from December 1975 through December 1976 and the contract cost is \$210,000.
- In addition, ERDA has a contract with Charles T. Main of Boston, Massachusetts for "Assessment of Technical and Economic Feasibility of Underground Pumped Hydroelectric Storage" on a national basis. The contract period is from August 1976 through May 1977 and the cost is \$165,000 and is shared by ERDA and the Bureau of Reclamation.

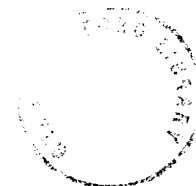


- Currently ERDA has a request for proposals (RFP) on the street for a preliminary engineering design and site exploration effort entitled "Compressed Air Energy Storage/Underground Pumped Hydro." This is a joint effort by ERDA and the Electric Power Research Institute (EPRI). Plans are to make a contract award in February 1977.
- The Agency is currently in the process of formulating a program in conventional hydroelectric technology and has in hand several unsolicited proposals. The proposals request to do work in the following areas of technology: study of hydroelectric potential through development of small hydroelectric sites; feasibility study using flowing streams and rivers to generate hydroelectric power; the potential of retrofitting unused low head dams; research to improve the efficiency of the impulse reaction turbine; and the study of the feasibility of preserving hydro storage head by evaporation reduction.

9. Panel Discussion - Marketing of Federal Hydroelectric Power

a. Mr. William Clagett provided a brief synopsis of Bonneville Power Administration (BPA) marketing. Highlights were:

- BPA provided last year some 82 billion kilowatt hours of electricity to 115 preference, 23 industrial, and 6 private utility customers. It markets the power from some 24,000 megawatts of federal generating capacity. Because of the historic cheapness of hydroelectric power, 50% of the total energy in the area is provided by BPA. However, BPA is now experiencing the transition that TVA has already made, namely development of generation alternatives to hydro because of constraints on hydro development in specific areas or because the potential is fully developed.
- One federal facility (Libby Dam re-regulation) is being added.
- There is the possibility of adding units on existing sites.
- Sometime in the future, pumped storage may be further exploited. There are some 9,000 MW of potential at existing sites. Also the Corps of Engineers has identified some 530 projects having pumped storage potential.





- BPA is planning to provide only 200 MW of additional firm power. All other will be for peak loads. Thermal generation will become the baseload in the future.
- Some of the constraints of BPA hydroelectric power generation are:
  - Realization factors (Discount 5-13% to account for river flow fluctuation).
  - Tourist accommodation (approximately 18,000,000 kilowatt-hours per year sacrificed).
  - Geese nesting (pool level controlled to insure nests not destroyed).
  - Fish spill for salmon survival (approximately 4-5 billion kilowatt-hours per year are sacrificed which is the equivalent of the output of a typical nuclear plant).
  - Intertie with Southwestern Power Administration investigated but realization factors limit practicality.

b. Mr. Emerson Harper briefly outlined the marketing of the Alaska Power, Southeastern Power, and Southwestern Power Administrations. Highlights were:

(1) Alaska Power Administration:

- Has 77 megawatts of existing capacity.
- Has greatest potential for hydro development.
- Alaska's electrical demand seen as 15 billion kilowatt-hours minimum.
- Corps of Engineer's Upper Susitna project would add 1,500 megawatts capacity. Phase I design authorized on October 22, 1976. DOI will begin marketing studies for transmission, etc. Project would serve Anchorage and Fairbanks.



- Hydropower development in Alaska is constrained by the environmental acts such as Native Claims.

(2) Southeastern Power Administration:

- Provides 3 % of the regional needs.
- Owns no transmission lines.
- Cited projects under construction such as Carter, Laurel, and Russell.
- Studying six pumped storage projects.

(3) Southwestern Power Administration:

- Markets power generated from 1917 MW of capacity.
- Has 218 MW under construction.
- Studying the feasibility of added units using planning figure of 2,600 hours/KW-year as opposed to 1,700 hours/KW-year.
- May have about 4,000 MW of justifiable potential for pumped storage.

c. Mr. Raymond Harman outlined the marketing activities of the Bureau of Reclamation (BOR). Highlights were:

- BOR is primarily a water resource development agency for DOI. Power marketing is somewhat a sideline.
- Has 10,000 megawatts of capacity which serves some 450 customers.
- BOR has been in the power marketing business since 1906 (commercially since 1909).
- Owns 16,000 miles of transmission line. Interconnects with every major system in the western U.S.
- Actively participates in reliability councils, engages in planning with various power groups, makes load estimates for region.
- Currently sells firm power at about \$15/kilowatt-year for peak demand plus 3 to 4 mills/kwh. Have tried to maximize firm power to its wholesale customers.



- Added capacity will probably be marketed as "peaking without energy" meaning the customer returns energy at off peak time.
- BOR has experienced problems marketing power under this arrangement.
- Developing some 200 MW of pumped storage.
- Marketing in Colorado at \$25-30/kilowatt-year. Applications doubled the deliverable capacity.
- Explained that statutes governing BOR's marketing were designed to assist rural America and to provide power for irrigation and municipalities. The law says preference customers (public entities served first) are sold power at cost to the government and not what power is worth in today's changing energy picture.
- In response to questions, indicated that sale to highest bidder has been considered but would require changes in present laws.

d. Mr. William Telaar explained that Department of Agriculture (REA) is a lending authority. As of June 30, REA had some 8,000 MW of capacity with only about 60 MW being hydroelectric. The picture could change with more involvement in Alaska, e.g. Kodiak. REA is finding that purchasing power is not easy. He differentiated between power and energy. Power must be firm. He indicated that there is increased interest in small hydro units.

e. Discussion from the floor led to the following:

- In cost/benefit analysis, DOI is prohibited from considering cost escalation; FPC is not nor is ERDA.
- Long-term firm power contracts in the Southwestern Power Administration have restrained hydropower development. There is considerable thought of integrating high cost capacity with low cost capacity. It was reiterated that each Administration is governed by different laws. It was also pointed out that capacity could be added at sites such as Norfolk but the added capacity would not increase firm energy.



- In response to the question "Should federal power be sold at cost or at a profit depending on market conditions?", there was general recognition that it is a political issue. Tying preference customers closer to the private power rates would generate considerable regional opposition. There was doubt expressed that uniform procedures could be established even if judged desirable.
- Opinion was expressed that load forecasts often are financial estimates especially in private sector. Net result is that regions such as Northwest may face a power shortage.
- Consensus was that a more balanced consideration of power costs with other costs on multipurpose hydro projects is needed. Value of power is low when compared with cost of private power.

10. Panel Discussion - Planning/Licensing/Regulatory Aspects of Hydroelectric Power.

a. Mr. Frank Davenport outlined the role of the Water Resources Council in coordinating water resources planning to include states as well as federal agencies. He stressed the need for comprehensive planning for land and water resources to obtain proper balance.

b. In response to the question "Is there a proper balance between energy and environmental considerations?", the following points were made:

- Substantial losses in time and money are incurred in the prolonged hearings on energy facilities. No real cost comparison is made of impacts of actions under Endangered Species, Wilderness areas, and Wild and Scenic Rivers Act. Examples given were loss of 1800 MW of potential at Blue Ridge Project and 3,500 MW between Glen Canyon and Hoover Dam. Wild and Scenic area considerations have constrained the Western Energy Expansion study, e.g. Benton site reduced to 1/5 the capacity of previous plans. Also, DOI has told FPC not to license projects on potential Wild and Scenic Rivers. No time frame is stated for length of time needed to study these potential WS&R's.



- Principles and Standards provisions of the Water Resources Planning Act (PL 89-80) offer a vehicle to achieve a proper balance between energy and environmental considerations.
- Attitudes of local population impact heavily on development. Coordination at state and local level at early stages is essential.
- Socio-economic considerations of a project are highly important. Must be clearly highlighted.
- Influence of groups, such as Geothermal Institutional Panel, should be recognized. No such group exists for hydroelectric power.

c. In response to questions on planning aspects of the Water Resources Development Act of 1976, it was pointed out that it pertains only to Corps of Engineer projects and that the Hydroelectric Power Development Fund.

d. Some comments were made on Sen. Doc. 97. Opinion was expressed that portions of the restraints were self-inflicted. Point was made that cost-benefit analysis still does not include cost escalation of fuel.

e. In response to question "Who should take the lead on public education on value of pumped storage?", no agency volunteered nor did any consensus emerge as to who should. However, the value of pumped storage was recognized.

f. In response to the question "Is anything being done to to reduce the licensing/regulatory lag times associated with hydroelectric projects?", the following points were made:

- FPC is presently reviewing its regulations on applications for projects. Process is about 50% completed.
- Recognition is given to small projects versus major projects. 1,500 KW is the dividing line now. New legislation will propose 15,000 KW as the dividing line between major and minor projects. Also a dam height and storage capacity criteria will be included.
- Applications are being made for as low as 2 KW. This illustrated the need for a short form application.



- New regulations will include provisions for a discharge permit. The Corps of Engineers and FPC are closely coordinating. EIS requirements will be discussed in the regulations.
- When draft regulation are circulated, agencies are encouraged to coordinate promptly and efficiently.

11. Panel Discussion - R & D/Studies/Advanced Technology Requirements

- a. Research and Development efforts in progress were enumerated.
  - REA has no real R & D but its cooperatives are receptive to any energy exchange. Definite interest has been expressed in small units (100-200 KW in size).
  - BPA's research is predominately in transmission. Gave description of the 1100 KV line soon to be energized. BPA is examining physical problems associated with high voltage transmission. Has an 800 KV DC test system and a 500 KV underground test system.
  - Corps of Engineers has no real R & D in the hydro-electric area. Its efforts have been primarily in identifying the study areas. There is a need to scrutinize more closely the institutional constraints. What is the value of stored water for alternative uses? Hydropower should be analyzed from a system approach rather than as single unit. A methodology study which would assure uniformity in national planning would be of value.
  - DOI outlined its efforts in weather modification and the Western Energy Expansion Study.
  - FPC pointed out the difficulties in determining dependable capacity. Also value of government projects are maintained at the same value over entire life span of project. Some study of this procedure is needed. FPC's early efforts in wind systems were outlined.



- Funds available for Hydropower research were given as:
  - BPA - approximately \$300,000
  - FPC - approximately \$100,000
  - COE - approximately \$150,000
  - ERDA - approximately \$554,000 (does not include cost of RFP currently out which will increase this dollar amount somewhere between \$750,000 and \$1,000,000).
  - REA - none
  - FEA - none

12. In summary it was agreed that Federal interagency work groups should be formed to examine the following areas in more detail:

- a. Institutional (federal and non-federal) constraints on hydroelectric development (consider small dam rehabilitation).
- b. Economic evaluation to include cost benefit formula using "life cycle" method of evaluation.
- c. Hydropower within the total water use planning and management.
- d. System interconnection (large-small).
- e. Inventory of small hydroelectric generation units.
- f. Optimum plant factor over time (years)
- g. System to establish economic benefits versus environmental cost criteria (NEPA, W & SR, Wilderness areas, siting constraints).
- h. System mix for maximum operational efficiency.
- i. Legislative needs for meaningful national hydro development program.
- j. Coordinated list of hydro potential sites throughout Federal agencies.
- k. Feasibility of large scale integration of solar (including wind) generated electricity into the Federal hydroelectric power systems.\*
- l. Determination of needed research and development.

\* Note: FEA, in conjunction with other agencies, is examining the feasibility of the development of a large early market for solar (particularly wind) powered generation equipment to aid in the accelerated commercialization and increased use of these non-depletable energy resources.



FEA will contact the agencies to determine who should be the point of contact for these problem areas.







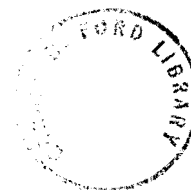
AGENDA

HYDROPOWER WORKSHOP

NOVEMBER 4, 1976

FEA (12th and Pennsylvania), Room 7132

TIME	SUBJECT	PRESENTER-	AGENCY
9:00 - 9:15	Introductory Remarks	W. Rosenberg R. Hanfling	FEA FEA
9:15 - 9:20	Administrative Announcements	C. Jones	FEA
9:20 - 9:40	National Energy Outlook	D. Nissen	FEA
9:40 - 9:55	Federal Power Commission (FPC) Hydropower Activities Report	R. Corso N. Jennings	FPC FPC
9:55 - 10:10	Corps of Engineers (COE) Hydropower Activities Report	E. Lawhun	COE
10:10 - 10:25	Department of Interior (DOI) Hydropower Activities Report	W. Wilson	DOI
10:25 - 10:40	Coffee Break		
10:40 - 10:50	Tennessee Valley Authority (TVA) Hydropower Activities Report	J. Cross	TVA
10:50 - 11:00	Energy Research and Development Administration (ERDA) Hydropower Activities Report	P. McGee	ERDA
11:00 - 12:00	Panel Discussion - Marketing of Federal Hydroelectric Power	W. Claggett E. Harper R. Harman W. Telaar	DOI DOI DOI REA
12:00 - 1:00	Lunch		
1:00 - 2:30	Panel Discussion - Planning/ Licensing/Regulatory Aspects of Hydroelectric Power	C. Olentine, G. Fauss S. Zanganeh R. Corso J. Cross F. Davenport	FEA Moderator DOI COE FPC TVA WRC

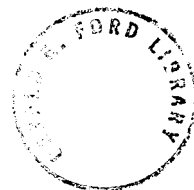


HYDROPOWER WORKSHOP AGENDA (Continued)

2:30 - 2:45	Coffee Break		
2:45 - 4:15	Panel Discussion - R&D/ Studies/New Initiatives/ Advanced Technology Requirements	P. McGee, ERDA Moderator J. Frederick COE W. Clagett DOI N. Jennings FPC	
4:15 - 4:30	Summary	C. Jones	FEA



B



LIST OF ATTENDEES  
HYDROPOWER WORKSHOP  
NOVEMBER 4, 1976

FEA (12th and Pennsylvania), Room 7132

CORPS OF ENGINEERS

Frank Britnell	-	Construction Operations, Directorate of Civil Works
Jay Frederick	-	Technical Director of Institute of Water Resources
Robert Kinsel	-	Engineering Division, Directorate of Civil Works
William Knight	-	Planning Division, Directorate of Civil Works
Eugene Lawhun	-	Office of Policy, Directorate of Civil Works
Helen Ramatowski	-	Office of Policy, Directorate of Civil Works
Shapur Zanganeh	-	Engineering Division, Directorate of Civil Works

DEPARTMENT OF INTERIOR

William Clagett	-	Assistant Administrator, Bonneville Power Administration
Gerald Fauss	-	Planning Division, Bureau of Reclamation
Raymond Harman	-	Chief, Division of Power, Bureau of Reclamation
J. Emerson Harper	-	Power Engineering Advisor to the Assistant Secretary - Energy and Minerals
Dick Porter	-	Bureau of Reclamation
William Wilson	-	Staff Assistant to the Assistant Secretary - Land and Water Resources



ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

Barbara Allen - Office of Assistant Administrator  
for International Affairs

George Chang - Division of Energy Storage Systems,  
Assistant Administrator for  
Conservation

Jay Holmes - Office of the Assistant Administrator for  
Solar, Geothermal and Advanced Energy  
Systems

David Israel - Director, Office of Program Integration

Phil McGee - Division of Physical Research, Assistant  
Administrator for Solar, Geothermal and  
Advanced Energy Systems

FEDERAL ENERGY ADMINISTRATION

Robert Borlick - Office of Coal, Nuclear and Electric Power  
Analysis

Elena Dougherty - Office of Utility Project Operations

George Grimes - Office of Utility Project Operations

Robert Hanfling - Deputy Assistant Administrator, Utility  
Projects

Curtis Jones - Director, Office of Utility Project  
Operations

David Nissen - Director, Energy Systems Modeling and  
Forecasting

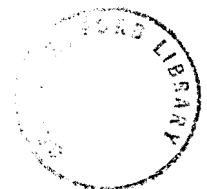
Charles Olentine - Office of Utility Project Operations

William Rosenberg - Assistant Administrator, Energy Resource  
Development

Mike Rosenzweig - Office of Coal, Nuclear and Electric Power  
Analysis

Elaine Smith - Power Plant Acceleration Task Force

Samuel Taylor - Office of Energy Conversion



FEDERAL POWER COMMISSION

Ronald Corso - Division of Licensed Projects,  
Bureau of Power

Neal Jennings - Division of River Basins, Bureau of  
Power

RURAL ELECTRIFICATION ADMINISTRATION

Guan Hsiung - Power Plant Branch, Power Supply and  
Engineering Standards Division

Ben Jankowski - Chief, Power Plant Branch, Power Supply  
and Engineering Standards Division.

William Telaar - Power Supply and Engineering Standards  
Division.

TENNESSEE VALLEY AUTHORITY

J. L. Cross - Acting Chief, Power Supply Planning  
Branch

Jan Jansen - Power Supply Planning Branch

WATER RESOURCES COUNCIL

Frank Davenport - Project Leader, Water Resources Council,  
Water for Energy Program





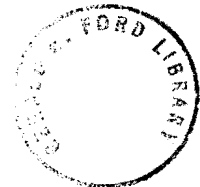


## NEO/77 OUTLINE

<u>Chapters</u>	<u>Lead</u>
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A. Historical Trends	
B. Highlights of Last Year	
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A. Introduction	
B. The Forecasting Model	
C. The Reference Forecast	
D. Scenario Discussion	
III. World Energy Markets	Borre'
A. Evolution Since the Embargo, Changing Economic Patterns	Kraft
B. U.S. and World Energy Trade Outlook	Pearson
C. Sensitivity Analysis	Treat
IV. Energy Demand, Conservation and Economic Growth	MacRae
A. Energy Demand	MacRae
B. Effect of Conservation Programs	Hemphill
C. Effect of Energy Policy on the Economy	Kraft



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|--|-----------|
| V. Fossil Fuel Supply and Distribution                 | Freeman   |
| A. West Coast Oil Disposition                          | Adger     |
| B. OCS Development of Oil and Gas                      | Mayfield  |
| C. Natural Gas Supply and Distribution                 | Rodgers   |
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| VI. Electricity Demand and Supply                      | Eysymontt |
| A. Electricity Demand (Update of NEO 76)               | Lady      |
| B. Comparative Economics of Electricity Supply         | Lady      |
| C. Institutional Considerations in Electricity Supply  | Hanfling  |
| D. Financial Considerations in Electricity Supply      | Feldman   |
| VII. Energy Development 1985-2000                      | Lady      |
| A. Interface with ERDA Plans and Analytical Activities | Lady      |
| B. Impact of Reserve Depletion                         | Rodgers   |
| C. Contribution of Emerging Technologies               | Kuhn      |
| D. Energy Impacts on Economic Growth                   | Kraft     |



Appendices

- A. Overview of the Analysis Process
- B. Demand
- C. Oil and Gas Supply
- D. Refineries
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- I. Conservation
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- K. Economy/Energy Considerations
- L. Capital Requirements
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- O. Statistical Appendix

Lead

Greenberg  
MacRae  
Rodgers  
Pearson  
Pendley  
Borlick  
Walton  
Lady  
Hemphill  
Pearson  
Kraft  
Santogrossi  
Dearborn  
Greenberg  
Curtis





Private Sector Hydroelectric Development  
in the United States

Ronald A. Corso  
Federal Power Commission, Washington, D. C.

Mr. Chairman, fellow panelists, and guests of the Joint Power Generation Conference, I am pleased to have this opportunity to present to you some views on the potential for hydroelectric power development by the non-Federal or private sector of the electric power industry. I should mention at the outset that in using the term private development, I am speaking of all private and non-Federal public entities engaged in the development of hydroelectric projects.

Congress has authorized the Federal Power Commission to license all private hydroelectric developments which utilize navigable waters, occupy United States lands, use water or water power from a government dam, or affect the interests of interstate commerce. By this definition and the interpretation of the Commission's authority by the Courts, this essentially means that virtually all privately developed hydroelectric projects are subject to the Commission's jurisdiction. This puts the Commission in the unique position of being apprised of the "state of the art" for private hydroelectric development. Information on private hydroelectric development is made available to the Commission in several ways, i.e. through applications for license and preliminary permits or through inquiries by potential applicants. I should at this point note, that, in addition to licenses, the Commission also issues preliminary permits. Such permits do not authorize construction, but they do offer the advantage of maintaining priority for filing an application for license while a Permittee studies the feasibility of a proposed project. Under the Federal Power Act, a preliminary permit may be issued for up to 3 years. However, a permit is not a necessary prerequisite to an application for license.

Based on available information, we believe there is reason to be optimistic about the future of hydroelectric development. As we all know, renewed interest in hydroelectric power has been generated by the present energy shortage. Hydroelectric power offers the most readily

available energy source as an alternative to power that uses valuable non-renewable fuel resources. We hear a great clamor to develop new energy sources, such as solar power, wind power, and nuclear fusion, to name a few. These power sources may offer an answer to our energy needs in the future. Hydroelectric power presents an immediate solution, because it is a proven technology and the most efficient and reliable energy source available at this time.

Public utilities, consulting firms, Federal and other public agencies, and the Congress are acutely aware of this. For instance, many public utilities are studying possible developments and reassessing the potential for redevelopment of existing hydroelectric facilities. A number of consulting firms are studying the hydroelectric potential in many areas of the nation, particularly where fuel costs are excessive. The Federal Energy Administration, the Energy Research and Development Administration and the Federal Power Commission are actively encouraging the development of our hydroelectric power resources. Chairman Dunham of the Commission, in his speech this past April before the Southeastern Electric Exchange, indicated that the Commission will devote more of its energies to the electric utility industry, giving special attention to the potential of hydroelectric development. State agencies are encouraging hydroelectric development, particularly in Alaska where the State legislature approved a bill to assist the financing of hydroelectric projects through the use of oil revenues. In addition, Congress has a number of bills before it to encourage hydroelectric development. As with other power developments, hydroelectric power faces certain obstacles, particularly in the environmental area. However, with the combined efforts of all concerned and a commitment to seek solutions to environmental and other problems, a significant portion of the nation's hydroelectric potential can be realized.

I would now like to turn to a brief statistical summary of the hydroelectric potential. Recent statistics compiled by the Commission's Staff indicate that there is a potential for the development of 113,000 MW of capacity capable of producing 407 billion kWh annually. The existing installed hydroelectric capacity is about 66,000 MW. This represents over 13 percent of the nation's total installed generating capacity and produces 15 percent of the total generation. Approximately 35,000 MW of hydroelectric capacity

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has been licensed by FPC for private development. Licensed projects now under construction total about 3,000 MW. It is estimated that projects now under license have a potential ultimate capacity of an additional 14,000 MW. The Commission also has before it in pending applications for license and preliminary permits, and under outstanding preliminary permits proposed projects totalling approximately 21,000 MW.

Table 1 lists applications for license pending before the Commission as of January 1976. You will note that of the total 10,286 MW of proposed capacity, there are over 9,000 MW of pumped-storage projects. This is a continuation of the trend which began in the last decade, and is a result of the economic benefits that a pumped-storage project offers in large electric systems, particularly when operated in conjunction with nuclear plants.

Table 1  
Applications for License or Amendment of License  
Pending January 1976

FPC Proj. No.	Project Name	Applicant	Type	Capacity (MW)
120	Big Creek No. 3	Southern Calif. Edison Co.	C	35
201	Blind Slough	City of Petersburg, Alaska	C	2.6
349	Martin	Alabama Power Co.	C	60
485	Bartlett's Ferry	Georgia Power Co.	C	100
1971	Hells Canyon	Idaho Power Co.	C	225
2016	Cowlitz River	City of Tacoma, Wash.	C	40.5
2245	Cannelton	City of Vanceburg, Ky.	C	70
2409	North Fork Stanislaus R.	Calaveras Co. Water District, Calif.	C	320
2426	Castaic & Calif. Aqueduct	Dept. of Water Resources, Calif. and City of Los Angeles	C,PS	1509.1
2511	Redcliff	Colorado Water Conservation District	C	11.25
2614	Greenup	City of Vanceburg, Ky.	C	70
2709	Davis	Monongahela Power Co. Potomac Edison Co. & West Penn Power Co.	PS	1000
2716	Adair County	Virginia Electric and Power Co.	PS	2100
2725	Rocky Mt.	Georgia Power Co.	PS	675
2729	Breakabeen	Power Authority of the State of New York	PS	1000
2735	Helms	Pacific Gas & Electric Co.	PS	1050
2740	Bad Creek	Duke Power Co.	PS	1000
2742	Solomon Gulch	Copper Valley Electric Assoc., Inc., Alaska	C	18
2753	Mt. Hope	Jersey Central Power & Light Co.	PS	1000
Subtotal - Conventional				1261.45
Subtotal - Pumped-Storage				9025.0
Total				10,286.45

C = Conventional Development  
PS = Pumped-Storage Development

Table 2 lists outstanding preliminary permits where feasibility studies are underway for proposed projects having the potential to develop 5382.5 MW of capacity. Table 2 reflects the trend noted in Table 1, i.e. most of the projects would be pumped-storage facilities. We expect that most of these projects will be before the Commission under applications for license after feasibility studies are completed.

Table 2  
Outstanding Preliminary Permits  
January 1976

FPC Proj. No.	Project Name	Permittee	Type	Capacity (MW)
2718	Antilon Lake	PUD No. 1 of Chelan County, Washington	PS	1000
2723	Brown's Canyon	PUD No. 1 of Douglas County, Washington	PS	1000
2728	Carlyle	City of Breese and Carlyle, Illinois	C	8
2733	Village Bend-DeCordova	Brazos Electric Power Coop., Inc., Texas	C,PS	730
2734	Madison County	Carolina Power & Light Co.	PS	1000
2739	Meldahl	City of Vanceburg, Ky.	C	70
2741	Kings River	Kings River Irrigation District, Calif.	C	394.5
2746	Boyd County	Nebr. Public Power Dist.	PS	1000
2751	Gallipolis	Ohio Power Co.	C	40
2752	Kootenai River	Northern Lights, Inc., Montana	C	140
Subtotal - Conventional				712.5
Subtotal - Pumped-Storage				4670.0
Total				5382.5

Table 3 lists applications for preliminary permit pending before the Commission as of January 1976. This Table lists proposed projects having a total installed capacity of 5464.5 MW. While the greater portion of the capacity listed in Table 3 would be developed by pumped-storage projects, you will note that there are a greater number of conventional projects. This reflects the recent trend toward the development of projects which were either marginal or uneconomical, and reflects the impact created by high cost fossil fuels. Information from the electric utilities indicates that we can expect an increased interest in conventional developments. Information furnished by the industry also indicates that we can expect applications for license or preliminary permits for as much as 5,000 MW in the foreseeable future.

To some, the prospect of additional developments beyond those now announced is not probable. They point to the long licensing process, economic constraints, and environmental opposition. This presents a substantial challenge. The Federal Power Commission has committed itself to decreasing the licensing process. We must also commit ourselves to seeking solutions to the economic and environmental problems that have stymied many hydroelectric developments.

Table 3  
Applications for Preliminary Permit  
Pending January 1976

FPC Proj. No.	Project Name	Applicant	Type	Capacity (MW)
2730	Black Star	Southern Calif. Edison Co.	FS	1235
2743	Terror Lake	Kodiak Electric Assoc., Inc., Alaska	C	30
2749	Randolph	Southside Electric Coop., Virginia	FS	3575
2750	Black River	Town of Springfield, Vt.	C	22.5
2754	Ashuelot River	City of Keene, N.H.	C	18
2755	Thomas Bay	Thomas Bay Power Co., Alaska	C	38
2756/ 2764	Chace Hill	Green Mt. Power Corp./ City of Burlington, Vt.	C	6
2757	Juniper-Cross Mt.	Colorado Water Conservation District	C	78
2759	Missiquoi	Swanton Village, Vt.	C, PS*	80
2760	Power Creek	City of Cordova, Alaska	C	10
2761	South Fork American River	El Dorado County Water Agency, Calif.	C	300
2762	East Georgia	Central Vermont Public Service Corp.	C	30
2763	Sheephorn	City of Golden & Vidler Tunnel Co., Colorado	C	62
Subtotal - Conventional				654.5
Subtotal - Pumped-Storage				4810.0
Total				5464.5

\* Not included in Subtotal-Pumped-Storage

Present economic theory dictates that the lowest cost generating facility will be constructed next. This places marginal hydroelectric projects in a disadvantageous economic position, with the prospect that they may never be constructed. One is led to question this approach when you consider that the lower cost generating facility is usually using a non-renewable resource, such as coal or oil. Perhaps our economic theories should be evaluated with a view toward giving credit to hydroelectric developments for preserving non-renewable natural resources. We should also consider re-defining our economic comparisons to consider more realistically the useful life of a hydroelectric facility versus that of an alternative thermal plant. Experience indicates that we can expect a hydroelectric facility to last as much as 100 years with proper maintenance, whereas the life expectancy of a thermal plant is about 25 years. Proper consideration of this aspect would place a hydroelectric project in a more favorable economic position, and I believe, an appropriate position.

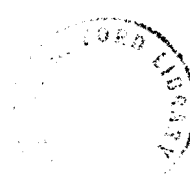
Environmental considerations have delayed or prevented the development of a number of hydroelectric projects. For example, after almost 20 years of consideration before the Commission, possible development of the Middle Snake River was terminated by conservation oriented legislation passed by Congress and signed by the President this past December. The Middle

Snake River Project had an ultimate potential of about 3.5 million kW and 7 billion kWh. We must all agree that environmental considerations may dictate that certain projects should not be constructed. On the other hand, this is not an insurmountable obstacle for every project. We should look to those projects where environmental problems are at a minimum or can be mitigated in some way. Matters that deserve considerable attention are the development of the hydroelectric potential at existing dams and reservoirs and improved technology.

The Commission recently issued two licenses for the installation of power facilities at government dams on the Ohio River. The minimal environmental consequences are evident and the potential is significant. These two projects, when operational, will save the equivalent of 1,000,000 barrels of oil per year.

There are three developments listed in Tables 1 and 2 which deserve special attention because they offer the prospect of overcoming some of the environmental problems we are encountering today. In its application for license for the 1000 MW Mt. Hope Pumped-Storage Project, Jersey Central Power & Light Co. proposes a high head facility with an underground reservoir. The proposed project would develop a gross head of 2400 feet using single-stage reversible units. This represents a significant step forward inasmuch as present installations develop up to about 1600 feet of gross head. If the equipment manufacturers can meet this challenge and deliver reliable equipment to operate under these conditions, many environmental problems will be solved. A 50 percent increase in operating head will result in a corresponding decrease in reservoir size. With less inundated land, there should be less environmental opposition. With equipment capable of operating under these conditions, many more potential sites are available from which to choose projects which are acceptable from both an engineering and environmental view point. Further, the prospect of developing pumped-storage projects with one or both reservoirs underground offers the potential of eliminating most environmental problems.

Table 2 lists the proposed 1000 MW Brown's Canyon Project located on Columbia River, Washington, now under study by Douglas County Public Utility District No. 1. This proposed project would also have an operating head of about 2400 feet and, therefore, offers some of the same advantages as the Mt. Hope Project. The Brown's Canyon Project would not be an underground facility. However, it would use as its lower reservoir the existing Lake Entiat, the reservoir of the FPC licensed Rocky Reach Project No. 2145. Table 1 also lists Pacific Gas & Electric Company's 1050 MW Helms Pumped-Storage Project which will utilize two existing reservoirs for its upper and lower pools.



Underground reservoirs, use of existing reservoirs, and greater operating heads are important areas where we can minimize environmental problems and delays in getting plants in service.

I suggest to you that with an increased effort and some innovative thinking, the hydroelectric potential of the nation can be realized at an ever faster pace.

The statistics I have presented indicate that the future of hydroelectric development is indeed encouraging. I hope that my brief remarks have stimulated you to also be encouraged. Obviously, hydroelectric power development is not a panacea to the energy shortage, nor is

hydroelectric development without its problems. However, it is a viable, tangible energy resource which should be developed to its fullest practicable limit. To put the matter into perspective, the development of one-half of the nation's hydroelectric potential would save the equivalent of almost one million barrels of oil per day, the President's announced goal for energy independence. Therefore, while hydroelectric power will not become the major source of energy, it can make a very significant contribution to meeting the nation's energy needs.

I would like to thank you for the opportunity to speak before this conference on the nation's hydroelectric power potential.







DATA ON HYDROELECTRIC POWER SITES  
IN THE UNITED STATES  
DEVELOPED AND UNDEVELOPED  
AS OF JANUARY 1, 1976

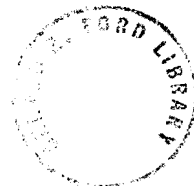
From Federal Power Commission  
Inventory of Hydroelectric Power Resources

by

Neal C. Jennings

Interagency Hydropower Workshop  
Federal Energy Administration  
Washington, D.C.  
November 4, 1976

Note: The views expressed in this paper are those of the author and not necessarily represent the views of the Federal Power Commission or any of its members.



DATA ON HYDROELECTRIC POWER SITES IN THE UNITED STATES --  
DEVELOPED AND UNDEVELOPED AS OF JANUARY 1, 1976

In connection with river basin investigations made either in cooperation with various Federal agencies including the Corps of Engineers and the Bureau of Reclamation, or in the course of its licensing activities, the Federal Power Commission maintains up-to-date records on the Nation's hydroelectric power potential. The potential is based on a site-by-site inventory of all the river basins in the conterminous United States as well as in Alaska and Hawaii. Data on nearly 2,800 sites, both developed and undeveloped, are published every four years. The latest report, entitled "Hydroelectric Power Resources of the United States, Developed and Undeveloped," was published in 1972. A 1976 edition is nearing completion.

The possibility of developing any of the conventional undeveloped sites depends upon engineering, economic, environmental, and other considerations which may vary over time. Most sites have shown indications of engineering feasibility -- some have evidenced economic feasibility as well. Some sites are now receiving more favorable consideration due to recent fuel shortages and the increased costs of power from alternative sources. Many sites have not been analyzed sufficiently to evaluate their economic or environmental costs and benefits. The totals, however, do give an indication of the upper limit of the conventional water power potential of the country.

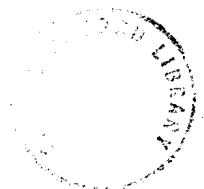
As of January 1, 1976, the total conventional hydroelectric power capacity in the United States, developed and available for development, was about 170.7 million kilowatts. Of that total about 57.0 million kilowatts was developed, including 26.5 million kilowatts in plants licensed by the FPC and 27.1 million kilowatts in Federal plants. Additionally, about 9.7 million kilowatts of reversible capacity were installed at pumped storage projects, including 8.5 million kilowatts under license and 0.6 million kilowatts in Federal plants.

Figures 1 and 2 show the distribution of the developed and undeveloped conventional hydro potential among major drainages and geographic divisions.

The following Summary Table shows the status of development and planning of conventional and pumped storage hydroelectric developments as of the beginning of 1976. Capacity equivalent to that planned or projected could possibly be added within the next two decades. This would bring the total installations to about 79.3 million kilowatts in conventional capacity and 37.3 million kilowatts in pumped storage capacity.

Tables I and II list the individual projects and sites included in the categories of Under Construction, Planned, and Other Projected in the Summary Table.

Attention is called to the fact that the data presented herein are provisional, subject to possible revision.



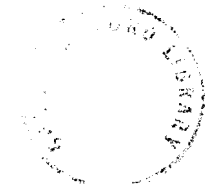
HYDROELECTRIC CAPACITY IN THE UNITED STATES  
BY STATUS OF DEVELOPMENT AND PLANNING  
(As of January 1, 1976)

	Installed Capacity Millions of Kilowatts		
	Conventional	Pumped Storage	Total
I. DEVELOPED	57.0	9.7	66.7
II. UNDEVELOPED <sup>1/</sup>			
Under Construction	8.2	4.3	12.5
Planned <sup>2/</sup>	2.0	6.4	8.4
Other Projected <sup>3/</sup>	12.1	16.9	29.0
Subtotal	22.3	27.6	49.9
Remaining Undeveloped	91.4	-	-
III. TOTAL POTENTIAL	170.7	-	-

<sup>1/</sup> Includes 33.3 million kilowatts in Alaska and Hawaii and 11.2 million kilowatts designated for study and under moratorium for hydroelectric development under the Wild and Scenic Rivers Act; excludes 9.2 million kilowatts removed from FPC inventory as a result of the Wild and Scenic River Act and other special acts.

<sup>2/</sup> Included in reports to FPC from the Regional Electric Reliability Councils, estimated to be installed by 1985.

<sup>3/</sup> Undeveloped capacity not under construction or in reports of the Regional Electric Reliability Councils, but which have FPC license or permit status, are Federally authorized or recommended, or have structural provisions for plant additions.



# CONVENTIONAL HYDROELECTRIC POWER DEVELOPED AND UNDEVELOPED - JANUARY 1, 1976

## BY MAJOR DRAINAGES

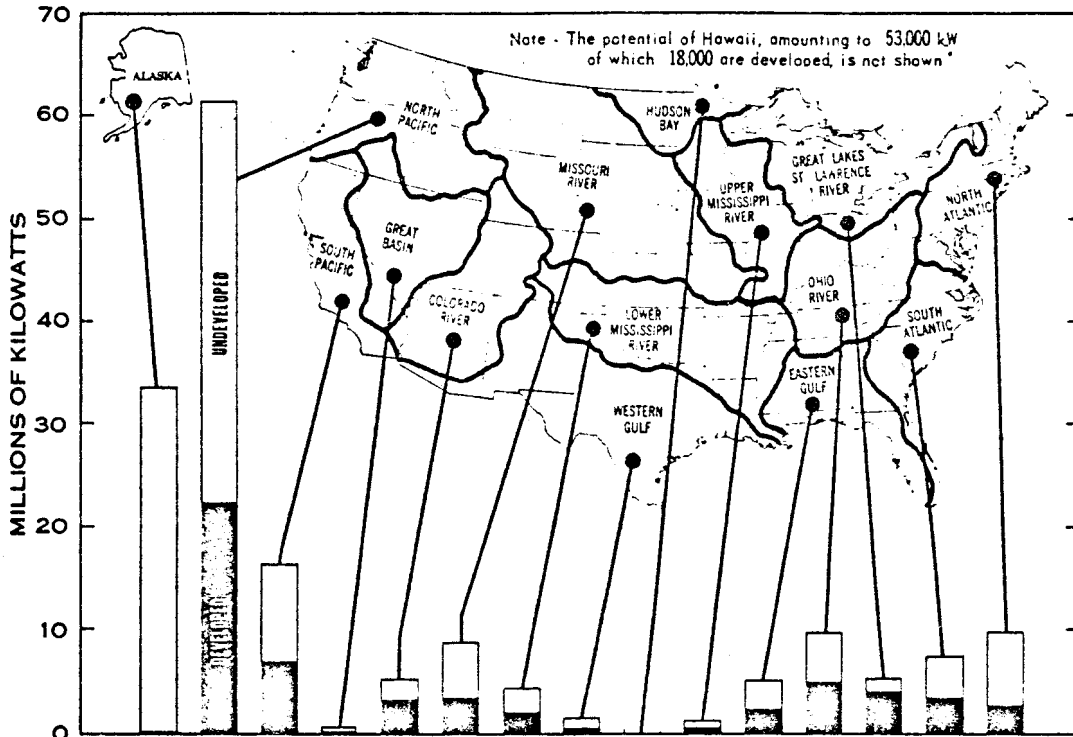


Figure 1

## BY GEOGRAPHIC DIVISIONS

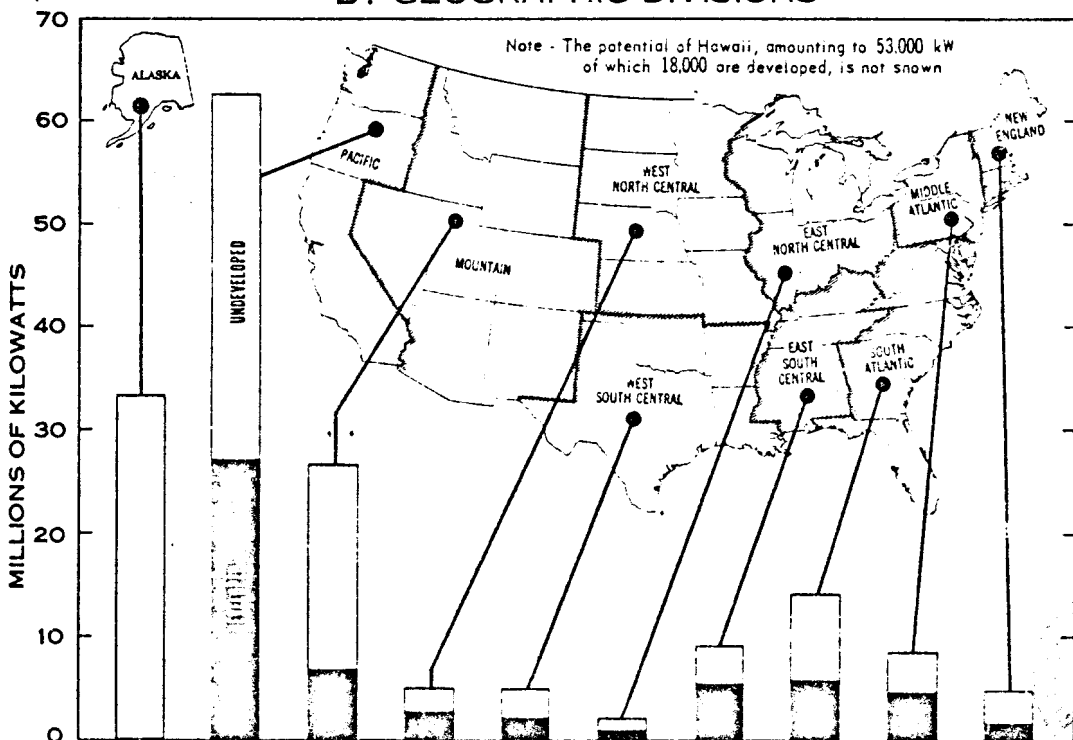


Figure 2



TABLE I - CONVENTIONAL HYDROELECTRIC PLANTS OR ADDITIONS  
UNDER CONSTRUCTION, PLANNED, OR PROJECTED - JANUARY 1, 1976<sup>1/</sup>

PLANT	OWNER	RIVER	STATE	STATUS <sup>2/</sup>	FPC PROJECT NO	UNDER CONSTRUCTION		PLANNED <sup>3/</sup>		OTHER PROJECTED <sup>4/</sup>	
						INSTALLED CAPACITY KW	AVERAGE ANNUAL GENERATION 1,000 KWH	INSTALLED CAPACITY KW	AVERAGE ANNUAL GENERATION 1,000 KWH	INSTALLED CAPACITY KW	AVERAGE ANNUAL GENERATION 1,000 KWH
CORNELL	NORTHERN STATES PWR	CHIPPewa	WIS	LO	2639	28,600A	120,000				
CLARENCE F CANNON	CORPS OF ENGINEERS	SALT	MO	FA	-	27,000	42,100				
FONTANA	TENNESSEE VALLEY AUTH	LITTLE TENN	NC	FA	-	13,500G	0				
WALLACE DAM	GEORGIA POWER CO	OGCNEE	GA	LO	2413	108,000	128,000				
LAUREL	CORPS OF ENGINEERS	LAUREL	KY	FA	-	61,000	67,000				
CHICKAMAUGA	TENNESSEE VALLEY AUTH	TENNESSEE	TENN	FA	-	3,000G	0			3,000G	0
DOUGLAS	TENNESSEE VALLEY AUTH	FRENCH BROAD	TENN	FA	-	2,800G	0				
CHEROKEE	TENNESSEE VALLEY AUTH	HOLSTON	TENN	FA	-	4,650G	0				
R L HARRIS	ALABAMA POWER CO	TALLAPOOSA	ALA	LO	2628	135,000	169,000				
NOXON RAPIDS	WASHINGTON WTR PWR CO	CLARK FK	MONT	LO	2075	114,000A	107,000				
LIBBY	CORPS OF ENGINEERS	KOOTENAI	MONT	FA	-	210,000A	428,000	420,000A	859,000		
CRYSTAL	BUREAU OF RECLAMATION	GUNNISON	COLO	FA	-	28,000	120,000				
DAVIS(LAKE MOHAVE)	BUREAU OF RECLAMATION	COLORADO	ARIZ	FA	-	3,000G	0			3,000G	0
BONNEVILLE 2ND PH	CORPS OF ENGINEERS	COLUMBIA	WASH	FA	-	540,800A	1,160,000				
ICE HARBOR	CORPS OF ENGINEERS	SNAKE	WASH	FA	-	111,000A	174,000				
LOWER MONUMENTAL	CORPS OF ENGINEERS	SNAKE	WASH	FA	-	405,000A	517,000				
LITTLE GOOSE	CORPS OF ENGINEERS	SNAKE	WASH	FA	-	405,000A	288,000				
LOWER GRANITE	CORPS OF ENGINEERS	SNAKE	WASH	FA	-	405,000A	1,424,000				
ROCK ISLAND	CHELAN CITY PUD NO 1	COLUMBIA	WASH	LO	963	410,400A	1,296,000				
CHIEF JOSEPH	CORPS OF ENGINEERS	COLUMBIA	WASH	FA	-	1,045,000A	1,761,000				
GRAND COULEE	BUREAU OF RECLAMATION	COLUMBIA	WASH	FA	-	3,300,000A	6,025,000	17,000G	110,000		
LOST CREEK	CORPS OF ENGINEERS	ROGUE	ORE	FA	-	49,000	303,000				
AUBURN	BUREAU OF RECLAMATION	N FK AMERICAN	CALIF	FA	-	300,000	860,000				
NEW MELONES	CORPS OF ENGINEERS	STANISLAUS	CALIF	FA	-	300,000	385,000				
PYRAMID	CALIF DEPT WTR RES	W BR AQUEDUCT	CALIF	LA	2426	157,000	852,000				
COTTONWOOD	CALIF DEPT WTR RES	E BR AQUEDUCT	CALIF	LA	2426	14,100	114,000				
DEVIL CANYON	CALIF DEPT WTR RES	E BR AQUEDUCT	CALIF	LA	2426	59,800A	390,000				
SILVIS LAKE	KETCHIKAN CITY OF	SILVIS LAKE	ALASKA	LO	1922	2,100	6,300				
BRUNSWICK-TOPSHAM	CENTRAL MAINE PWR & LT	ANDROSCOGGIN	ME	LO	2284			9,700A	69,700		
RACINE	OHIO POWER CO	OHIO	OHIO	LO	2570			40,000	220,000		
RICHARD B RUSSELL	CORPS OF ENGINEERS	SAVANNAH	GA	FA	-			300,000	467,000		
GOAT ROCK	GEORGIA POWER CO	CHATTAHOOCHEE	GA	SP	2177					67,000A	25,000
BARTLETTS FERRY	GEORGIA POWER CO	CHATTAHOOCHEE	GA	LA	485			50,000A	35,000	50,000G	30,000
MARTIN DAM	ALABAMA POWER CO	TALLAPOOSA	ALA	LA	349			60,000A	42,000		
HITCHELL	ALABAMA POWER CO	COOSA	ALA	LO	82			80,100A	119,000		
AMISTAD	IBWC/SO TEX & MEXINA	RIO GRANDE	TEX	FA	-			32,000	66,000	48,000G	90,000
LIBBY REREGULATOR	CORPS OF ENGINEERS	KOOTENAI	MONT	FR	-			50,400	180,000		
BROWNLEE	IDAHO POWER CO	SNAKE	IDAHO	LA	1971			225,000A	123,000		
AMERICAN FALLS	IDAHO POWER CO	SNAKE	IDAHO	LO	2736			92,400	400,000		
SEMINOLE	BUREAU OF RECLAMATION	NORTH PLATTE	WYO	FA	-			12,600A	3,300		
HORROW POINT	BUREAU OF RECLAMATION	GUNNISON	COLO	FA	-			9,000G	0		
DYNE	BUREAU OF RECLAMATION	DIAMOND FK PIPE	UTAH	FA	-			33,000	132,400		
SLATH WATER	BUREAU OF RECLAMATION	SIXTH WATER CR	UTAH	FA	-			90,000	134,000		
SYAR	BUREAU OF RECLAMATION	STRAWBERRY OFF	UTAH	FA	-			10,500	53,100		
ROSS	SEATTLE DEPT LT	SKAGIT	WASH	LO	553			300,000A	368,000		
MAYFIELD	CITY OF TAKOMA	COWLITZ	WASH	SP	2016			40,500A	96,000		
SAN LUIS OBISPO	CALIF DEPT WTR RES	COASTAL AQUEDUCT	CALIF	LA	2428			5,900	42,000		
KERCKHOFF	PACIFIC GAS & ELEC	SAN JOAQUIN	CALIF	LO	96			100,000A	600,000		
BIG CREEK NO 3	SO CALIF EDISON	REDINGER LAKE	CALIF	LA	120			35,000A	0		
DICKEY-LINCOLN SCH	CORPS OF ENGINEERS	ST JOHNS	MAINE	FA	-					830,000	1,154,000
TOCKS ISLAND	CORPS OF ENGINEERS	DELAWARE	NJ	FA	-					70,000	281,000
ST PETERSBURG	CORPS OF ENGINEERS	CLARION	PA	FR	-					120,000	244,000
MELDAHL	VANCEBURG CITY OF	OHIO	OHIO	PO	2739					70,000	350,000
GREENUP	VANCEBURG CITY OF	OHIO	OHIO	LA	2614					70,560	300,000
GALLIPOLIS I & D	OHIO POWER CO	OHIO	OHIO	PO	2751					40,000	120,000
GARRISON	CORPS OF ENGINEERS	MISSOURI	N DAK	SP	-					212,000A	0
FORT RANDALL	CORPS OF ENGINEERS	MISSOURI	S DAK	SP	-					176,000A	0
BIG BEND	CORPS OF ENGINEERS	MISSOURI	S DAK	SP	-					330,000A	0
GAHE	CORPS OF ENGINEERS	MISSOURI	S DAK	SP	-					144,000A	0
GAVINS POINT	CORPS OF ENGINEERS	MISSOURI	NEBR	SP	-					33,300A	0
SALEM CHURCH	CORPS OF ENGINEERS	RAPPAHANNOCK	VA	FA	-					89,000	161,000
GATHRIGHT	CORPS OF ENGINEERS	JACKSON	VA	FA	-					49,000	54,700
LOWER BLUE RIDGE	APPALACHIAN POWER	NEW	VA	LO	2317					200,000	0
BLUESTONE	CORPS OF ENGINEERS	NEW	W VA	FA	-					180,000	447,000
ST STEPHEN	CORPS OF ENGINEERS	SANTEE & COOPER	SC	FA	-					84,000	418,000
HARTWELL	CORPS OF ENGINEERS	SAVANNAH	GA	FA	-					66,000A	100,000
WEST POINT	CORPS OF ENGINEERS	CHATTAHOOCHEE	GA	FA	-					35,000A	68,000
LOWER VADA	CORPS OF ENGINEERS	FLINT	GA	FR	-					28,000	167,000
LOWER AUCHUMPKEE	CORPS OF ENGINEERS	FLINT	GA	FA	-					77,000	122,000
LAZER CREEK	CORPS OF ENGINEERS	FLINT	GA	FA	-					83,000	121,000
SPEWRELL BLUFF	CORPS OF ENGINEERS	FLINT	GA	FA	-					100,000	160,000
ALLATOONA	CORPS OF ENGINEERS	ETOWAH	GA	FA	-					36,000A	26,000
CELINA	CORPS OF ENGINEERS	CUMBERLAND	KY	FA	-					108,000	280,000
CANNELTON	VANCEBURG CITY OF	OHIO	KY	LA	2245					70,560	340,000
DEGRAY	CORPS OF ENGINEERS	GADDO	ARK	FA	-					40,000A	86,600

SEE FOOTNOTES AT END OF TABLE



TABLE I (Contd.) - CONVENTIONAL HYDROELECTRIC PLANTS OR ADDITIONS  
UNDER CONSTRUCTION, PLANNED, OR PROJECTED - JANUARY 1, 1976<sup>1/</sup>

PLANT	OWNER	RIVER	STATE	STATUS <sup>2/</sup>	FPC PROJECT NO	UNDER CONSTRUCTION		PLANNED <sup>3/</sup>		OTHER PROJECTED <sup>4/</sup>	
						INSTALLED CAPACITY KW	AVERAGE ANNUAL GENERATION 1,000 KWH	INSTALLED CAPACITY KW	AVERAGE ANNUAL GENERATION 1,000 KWH	INSTALLED CAPACITY KW	AVERAGE ANNUAL GENERATION 1,000 KW-H
NORFORK	CORPS OF ENGINEERS	N FORK	ARK	FA	-					85,000A	22,000
NAN	CORPS OF ENGINEERS	ARKANSAS	OKLA	FR	-					25,000	99,500
DE CORDOVA BEND 3	BRAZOS ELEC PWR CO	BRAZOS	TEX	PO	2733					60,000	42,300
DENISON	CORPS OF ENGINEERS	RED	TEX	FA	-					105,000A	70,000
ALLENSPUR	BUREAU OF RECLAMATION	YELLOWSTONE	MONT	FR	-					250,000	679,000
FORT PECK	CORPS OF ENGINEERS	MISSOURI	MONT	SP	-					185,000A	0
KOOTENAI	NORTHERN LIGHTS	KOOTENAI	MONT	PO	2752					140,000	500,000
DWORSHAK	CORPS OF ENGINEERS	N FK CLEARW	IDAHO	FA	-					660,000A	20,300
GUFFEY 2/	BUREAU OF RECLAMATION	SNAKE	IDAHO	FR	-					85,000	525,600
BLISS	IDAHO POWER	SNAKE	IDAHO	SP	1971					25,000A	7,000
LYNN GRANDALL	BUREAU OF RECLAMATION	SNAKE	IDAHO	FR	-					240,000	821,000
FALISADES	BUREAU OF RECLAMATION	SNAKE	IDAHO	SP	-					135,000	267,000
SHERIDAN	BUREAU OF RECLAMATION	TONGUE	WYO	FR	-					25,000	92,000
THEFF CREEK	BUREAU OF RECLAMATION	CLARK FK	WYO	FR	-					125,200	510,000
JUNIPER	COLO R WTR CONS DIS	YAMPA	COLO	PA	2757					45,000	150,000
CROSS MOUNTAIN	COLO R WTR CONS DIS	YAMPA	COLO	PA	2757					33,000	100,000
MCCOY	CITY OF GOLDEN	COLORADO	COLO	PA	2763					50,000	250,500
MIDDLE SULTAN	SNOROMISH COUNTY PUD	SULTAN	WASH	LO	2157					32,000	129,000
UPPER SULTAN	SNOROMISH COUNTY PUD	SULTAN	WASH	LO	2157					84,000	122,000
NINE FOOT CREEK	KLICKITAT COUNTY PUD	WHITE SALMON	WASH	LA	2241					40,000	87,000
MOSSYROCK	CITY OF TACOMA	COMLITZ	WASH	SP	2016					150,000A	300,000
MERWIN	PACIFIC PWR & LT	LEWIS	WASH	SP	935					60,000A	60,500
YALE	PACIFIC PWR & LT	LEWIS	WASH	SP	2071					108,000A	200,000
JOHN DAY	CORPS OF ENGINEERS	COLUMBIA	WASH	FA	-					540,000	1,970,000
PRIEST RAPIDS	GRANT COUNTY PUD 1	COLUMBIA	WASH	SP	2114					473,100A	730,000
WANAPUM	GRANT COUNTY PUD 1	COLUMBIA	WASH	SP	2114					498,750A	1,540,000
BOUNDARY	SEATTLE DEPT OF LT	PEND OREILL	WASH	SP	2144					275,500A	425,000
MCMARY 2ND PH	CORPS OF ENGINEERS	COLUMBIA	OREG	FR	-					1,050,000A	300,000
HELLS CANYON	IDAHO POWER	SNAKE	OREG	SP	1971					130,500A	40,000
OXBOW	IDAHO POWER	SNAKE	OREG	SP	1971					47,500A	47,500
KENO	PACIFIC PWR & LT	KLAMATH	OREG	LO	2082					100,000	225,000
PINE FLAT	KINGS R CONSV DIST	KINGS	CALIF	PO	2741					165,000	300,000
SALMON FALLS	EL DORADO COUNTY	S FK AMERICAN	CALIF	PA	2761					95,000	190,000
COLONA DAM	EL DORADO COUNTY	S FK AMERICAN	CALIF	PA	2761					45,000	130,000
ROGERS CROSSING	KINGS R CONSV DIST	KINGS	CALIF	PO	2741					100,500	180,000
EL DORADO	EL DORADO COUNTY	S FK AMERICAN	CALIF	PA	2761					80,000	328,000
PLUM CREEK	EL DORADO COUNTY	S FK AMERICAN	CALIF	PA	2761					80,000	240,000
MARYSVILLE	CORPS OF ENGINEERS	YUBA	CALIF	FA	-					50,000	250,500
TABLE MOUNTAIN	CORPS OF ENGINEERS	SACRAMENTO	CALIF	FA	-					54,000	287,000
COLLIERSVILLE PH	CALAVERAS COUNTY WTR	STANISLAUS	CALIF	LA	2409					75,000	253,000
BOARDS PH	CALAVERAS COUNTY WTR	N FK STANISLAUS	CALIF	LA	2409					97,500	487,000
GANNIS PH	CALAVERAS COUNTY WTR	N FK STANISLAUS	CALIF	LA	2409					50,000	205,000
JUNCTION	KINGS R CONSV DIST	DINKEY CREEK	CALIF	PO	2741					39,000	238,000
PEART	KINGS R CONSV DIST	DINKEY CREEK	CALIF	PO	2741					50,000	241,000
TERROR LAKE	KODIAK ELEC ASSN INC	CANYON	ALASKA	PA	2743					30,000	184,000
DEVIL CANYON	CORPS OF ENGINEERS	SUSITNA	ALASKA	FR	-					738,000	4,190,000
HATANA	CORPS OF ENGINEERS	SUSITNA	ALASKA	FR	-					478,000	2,720,000
BRADLEY LAKE	CORPS OF ENGINEERS	BRADLEY CREEK	ALASKA	FA	-					63,900	335,600
SMETTISHAM	ALASKA POWER ADM	SHEEL	ALASKA	FA	-					27,000A	105,000
THOMAS BAY	THOMAS BAY PWR COMM	THOMAS BAY	ALASKA	PA	2755					30,000	130,000
38 SITES SMALLER THAN 25,000 KW										385,135	1,245,000
TOTALS						8,242,750	16,738,400	2,013,400	4,119,500	12,108,605	27,714,500

1/ CAPACITY AND GENERATION AT UNDEVELOPED SITES, EXCEPT "A" DENOTES ADDITION TO EXISTING PLANT AND "a" DENOTES ADDITION TO A PLANT FOR WHICH THE INITIAL INSTALLATION IS PRESENTLY UNDER WAY. "C" DENOTES REWIND ADDITION.

2/ LO-FPC LICENSE OUTSTANDING FA-FEDERALLY AUTHORIZED  
LA-FPC LICENSE OR AMENDMENT APPLIED FOR FR-FEDERALLY RECOMMENDED  
PO-FPC PRELIMINARY PERMIT OUTSTANDING SP-STRUCTURAL PROVISIONS FOR ADDITIONAL UNITS INCLUDED AT EXISTING PLANT  
PA-FPC PRELIMINARY PERMIT APPLIED FOR BUT LICENSE AMENDMENT OR FEDERAL AUTHORIZATION REQUIRED PRIOR TO INSTALLATION

3/ DEVELOPMENTS INCLUDED IN REPORTS OF APRIL 1, 1976, TO THE FPC BY THE REGIONAL ELECTRIC RELIABILITY COUNCILS FOR COMPLETION BY 1985; PLANT DATA FROM FPC INVENTORY.

4/ POTENTIAL DEVELOPMENTS 25 MW OR GREATER NOT UNDER CONSTRUCTION OR INCLUDED IN REPORTS OF THE REGIONAL ELECTRIC RELIABILITY COUNCILS BUT WHICH HAVE FPC LICENSE OR PERMIT STATUS, ARE AUTHORIZED OR RECOMMENDED FOR FEDERAL CONSTRUCTION, OR HAVE STRUCTURAL PROVISIONS FOR PLANT ADDITIONS.

5/ POSSIBLE ALTERNATIVE TO SWAN FALL REDEVELOPMENT. (NOT LISTED IN TABLES 2 & 4)

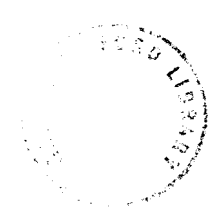


TABLE II - PUMPED STORAGE HYDROELECTRIC PLANTS OR ADDITIONS DEVELOPED, UNDER CONSTRUCTION, OR PROJECTED - JANUARY 1, 1976

PLANT	OWNER	RIVER	STATE	STATUS 1/	FPC PROJECT NO	REVERSIBLE CAPACITY - KW				TOTAL POTENTIAL CONVENTIONAL CAPACITY KW	
						DEVELOPED	UNDER CONSTRUCTION	PLANNED 2/	OTHER PROJECTED 3/		TOTAL
BEAR SHAMP	NEW ENGLAND POWER CO	DEERFIELD	MASS	LO	2669	600,000				600,000	-
NORTHFIELD MT	CONN LIGHT & PWR CO	CONNECTICUT	MASS	LO	2485	1,000,000				1,000,000	-
ROCKY RIVER	CONN LIGHT & PWR CO	ROCKY	CONN	LA	2632	7,000				7,000	24,000
BLENHHEIM-GILBOA	POWER AUTH STATE OF NY	SCHOHARIE CR	NY	LO	2685	1,000,000				1,000,000	-
LEMISTON-NIAGARA	POWER AUTH STATE OF NY	NIAGARA	NY	LO	2216	240,000				240,000	1,953,900
YARDS CREEK	JERSEY CNL PWR & LT	DELAWARE	NJ	LO	2309	388,961				388,961	-
HUDDY RUN	PHILA ELEC PWR ET AL	SUSQUEHANNA	PENN	LO	2355	800,000				800,000	-
KINZUA	PENN ELEC & CLEV ELEC	ALLEGHENY	PENN	LO	2280	396,000				396,000	26,100
LUDINGTON	CONSUMERS POWER CO	LAKE MICH	MICH	LO	2680	1,978,800				1,978,800	-
TALM SAUK	UNION ELECTRIC CO	E FX BLACK	MO	LO	2277	408,000				408,000	-
UPPER SMITH MT	APPALACHIAN POWER CO	ROANOKE	VA	LO	2210	132,050	104,000			236,050	300,200
HIVASSEE	TENNESSEE VALLEY AUTH	HIVASSEE	NC	FA	-	59,500				59,500	57,600
JOCASSEE	DUKE POWER CO	KEOWEE	SC	LO	2503	612,000				612,000	4/
DEGRAY	CORPS OF ENGINEERS	CADDO	ARK	FA	-	28,000				28,000	80,000
SALINA	GRAND RIVER DAM AUTH	GRAND	OKLA	LO	2524	260,000			260,000	260,000	-
BUCHANAN	LOWER CO RIV AUTH	COLORADO	TEXAS	-	-	11,250				11,250	22,500
FLAT IRON 3	BUREAU OF RECLAMATION	CO BIG THOM DIV	COLO	FA	-	8,500				8,500	-
O'NEILL	BUREAU OF RECLAMATION	DELTA MENDOTA	COLO	FA	-	25,200				25,200	-
CABIN CREEK	PUBLIC SERVICE CO	SO CLEAR CR	COLO	LO	2351	300,000				300,000	-
MORMON FLAT	SALT R PROJ PWR DIST	SALT	ARIZ	-	-	48,645				48,645	9,200
HORSE MESA	SALT R PROJ PWR DIST	SALT-GILA	ARIZ	-	-	99,878				99,878	34,155
GRAND COOLEE	BUREAU OF RECLAMATION	COLUMBIA	WASH	FA	-	100,000		200,000		300,000	-
THERMALITO	CALIF DEPT OF WTR RES	FEATHER DIV	CALIF	LO	2100	82,500				82,500	65,200
EDWARD G HYATT	CALIF DEPT OF WTR RES	FEATHER DIV	CALIF	LO	2100	293,250				293,250	702,000
GASTAIC	LA CITY & ST OF CALIF	GASTAIC CR	CALIF	LA	2126	425,000	850,000			1,275,000	56,000
SAN LUIS	BUREAU OF RECLAMATION	SAN LUIS CR	CALIF	FA	-	424,000				424,000	-
SENATOR WASH	BUREAU OF RECLAMATION	SENATOR WASH	CALIF	FA	-	7,200				7,200	-
HARRY S TRUMAN	CORPS OF ENGINEERS	OSAGE	MO	FA	-	160,000				160,000	4/
CLARENCE CANNON	CORPS OF ENGINEERS	SALT	MO	FA	-	31,000				31,000	27,000
FAIRFIELD	SO CAROLINA ELEC & GAS	FREES CR BD	SC	LO	1894	518,400				518,400	-
WALLACE DAM	GEORGIA POWER CO	OCONEE	GA	LO	2413	216,000				216,000	108,000
CARTERS	CORPS OF ENGINEERS	COOSAWATTEE	GA	FA	-	250,000				250,000	250,000
RACCOON MT	TENNESSEE VALLEY AUTH	TENNESSEE	TENN	FA	-	1,530,000				1,530,000	-
MT ELBERT	BUREAU OF RECLAMATION	ARK CANAL	COLO	FA	-	100,000		100,000		200,000	-
MONTZUMA	ARIZONA POWER AUTH	GILA OFFSTRM	ARIZ	LO	2573	505,400				505,400	-
BREAKABEEN	POWER AUTH STATE OF NY	SCHOHARIE CR	NY	LA	2729			1,000,000		1,000,000	-
BOYD COUNTY	NEBRASKA PUBLIC PWR	NEBR	NEBR	PO	2746			1,000,000		1,000,000	-
BATH COUNTY	VIRGINIA ELEC & PWR	BACK CREEK	VA	LA	2716			2,100,000		2,100,000	-
DAVIS	MONONGAHELA PWR CO	BLACKWATER	W VA	LA	2709			1,000,000		1,000,000	-
BAD CREEK	DUKE POWER CO	BAD CREEK	SC	LA	2740			1,000,000		1,000,000	-
ROCKY MOUNTAIN	GEORGIA POWER CO	HEATH CREEK	GA	LA	2725			675,000		675,000	-
HELMS	PACIFIC GAS & ELEC	KINGS	CALIF	LA	2735			1,050,000		1,050,000	4/
MISSISSQUOI	SHANTON VILLAGE OF	MISSISSQUOI	VT	PA	2759			80,000		80,000	2/
CORNWALL	CONSOLIDATED EDISON	HUDSON RIVER	NY	LD	2338			2,000,000		2,000,000	-
MOUNT HOPE	JERSEY CNL PWR & LT	WHITE MEADOW	NJ	LA	2753			1,000,000		1,000,000	-
ST PETERSBURG	CORPS OF ENGINEERS	CLARION	PENN	FR	-			300,000		300,000	120,000
PRAIRIE CREEK	BUREAU OF RECLAMATION	PLATTE OFFSTRM	NEBR	FA	-			16,800		16,800	-
TURKIP-FALLING	SOUTHSIDE ELEC COOP	TURNIP CR	VA	PA	2749			830,000		830,000	-
RANDOLPH-HUNTING	SOUTHSIDE ELEC COOP	ROANOKE	VA	PA	2749			1,260,000		1,260,000	4/
ROANOKE-WALLACE	SOUTHSIDE ELEC COOP	ROANOKE	VA	PA	2749			780,000		780,000	-
CUB CREEK	SOUTHSIDE ELEC COOP	CUB CREEK	VA	PA	2749			800,000		800,000	-
MOLLYS-SENECA CR	SOUTHSIDE ELEC COOP	SENECA CREEK	VA	PA	2749			420,000		420,000	-
UPPER BLUE RIDGE	APPALACHIAN POWER CO	NEW RIVER	VA	LO	2317			1,600,000		1,600,000	4/
ROWLESBURG	CORPS OF ENGINEERS	CHEAT	W VA	FA	-			350,000		350,000	2/
GREEN RIVER PROJ	EPIC INC	GREEN	NC	PA	2700			500,000		500,000	-
MADISON COUNTY	CAROLINA PWR & LT	SUGARCAMP BR	NC	PO	2734			2,000,000		2,000,000	-
SPEVRELL BLUFF	CORPS OF ENGINEERS	FLINT	GA	FA	-			50,000		50,000	100,000
VILLAGE BEND	BRAZOS ELEC PWR COOP	BRAZOS	TEXAS	PO	2733			730,000		730,000	-
BROWNS CANYON	PUD NO 1 DOUGLAS CO	COLUMBIA	WASH	LA	2753			1,000,000		1,000,000	-
BLACK STAR	SO CALIF EDISON	SANTIAGO CR	CALIF	PA	2730			1,235,000		1,235,000	-
TOTALS						9,735,734	4,264,800	6,450,000	16,886,800	37,337,134	

1/ LO-FPC LICENSE OUTSTANDING PA-FPC PRELIMINARY PERMIT APPLIED FOR  
 LA-FPC LICENSE OR AMENDMENT APPLIED FOR FA-FEDERALLY AUTHORIZED  
 PO-FPC PRELIMINARY PERMIT OUTSTANDING FF-FEDERALLY RECOMMENDED

2/ DEVELOPMENTS INCLUDED IN REPORTS OF APRIL 1, 1976, TO THE FPC BY REGIONAL ELECTRIC RELIABILITY COUNCILS; PLANT DATA FROM FPC INVENTORY.

3/ POTENTIAL DEVELOPMENTS NOT UNDER CONSTRUCTION OR INCLUDED IN REPORTS OF THE REGIONAL ELECTRIC RELIABILITY COUNCILS BUT WHICH HAVE FPC LICENSE OR PERMIT STATUS, OR ARE AUTHORIZED OR RECOMMENDED FOR FEDERAL CONSTRUCTION.

4/ REVERSIBLE CAPACITY SHOWN COULD BE USED FOR CONVENTIONAL GENERATION.







POTENTIAL HYDROPOWER DEVELOPMENT

TABLE I

Potential Hydropower Development Categories

	<u>Category</u>	<u>Capacity (MW)</u>	<u>Average Annual * Energy (MWh).</u>
A	Operational project with authorized hydropower additions	2,036	597,074
B	Projects under construction with authorized hydropower additions	74	141,000
C	Projects under construction or operational which require hydropower authorization	8,841	12,692,770
D	Projects authorized with power but not yet under construction or operational	2,997	5,249,800
E	Projects requiring reauthorization because of a change in capacity	546	795,000
F	Potential projects not yet authorized but having hydropower capability	106,021	266,632,992
G	Detached pumped-storage projects	130,245	11,706,392
	TOTALS	250,760	297,814,958

\* Total energy potential understated.  
Energy data not available for all projects.

September 1976



2



DEPARTMENT OF THE INTERIOR

Raymond Peck - Deputy Assistant Secretary - Energy and Minerals

William R. Wilson - Office of the Secretary - Land and Water Resources

Emerson Harper - Office of the Secretary - Energy and Minerals

William Clagett - Bonneville Power Administration

Gerald Faust - Bureau of Reclamation

Raymond Harman - Bureau of Reclamation

Interior Power Marketing Agencies

Bonneville Power Administration

Bureau of Reclamation

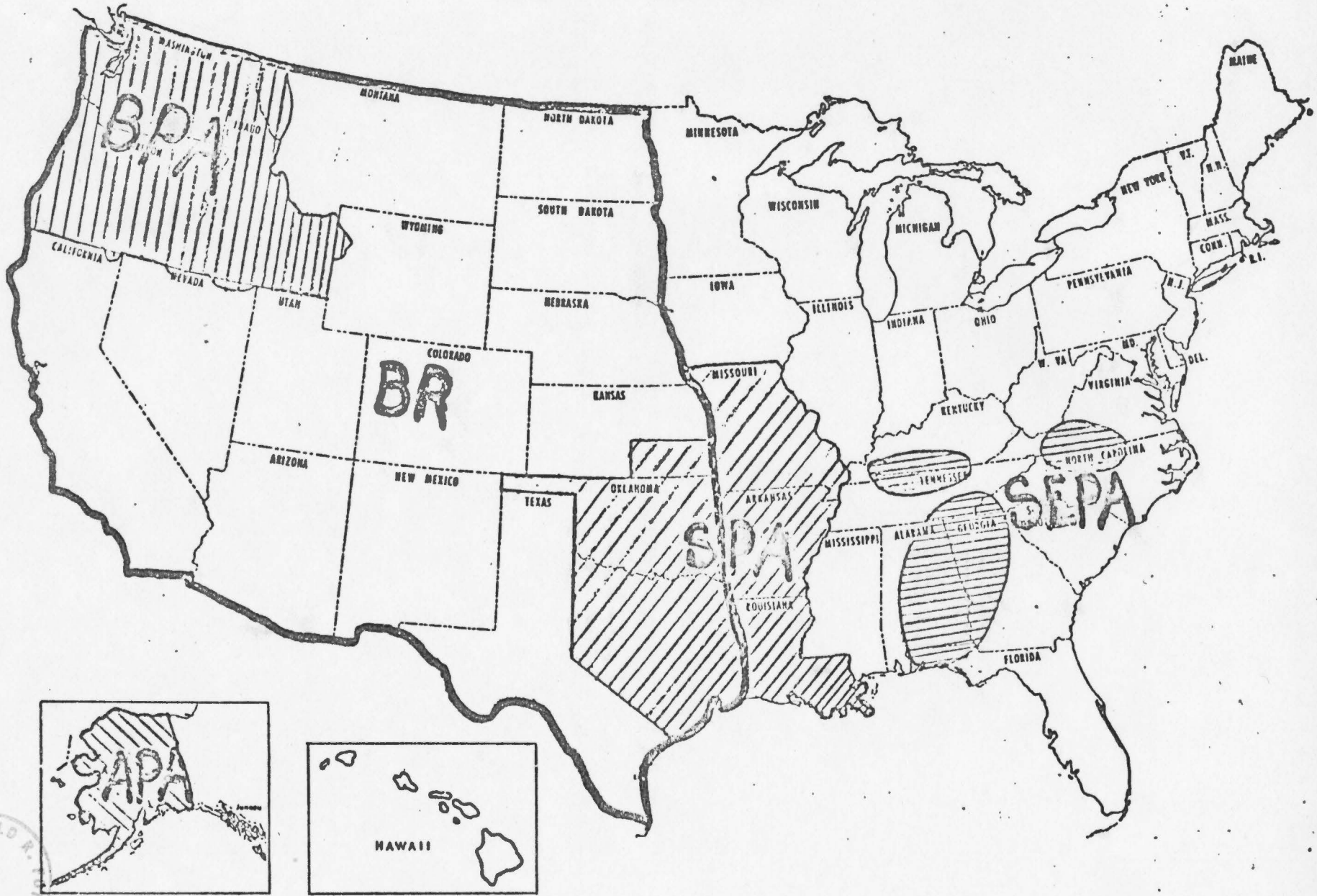
Southwestern Power Administration

Southeastern Power Administration

Alaska Power Administration



MARKETING DISTRICTS  
AREAS OF OPERATIONS



2



GENERAL POWER RESOURCE GOALS

Generate and market power at Federal multipurpose projects to assist in recovering Federal investment and to optimize resource use.

Stimulate planning, construction and operation of electric power facilities to provide an adequate and reliable supply of electric energy.

Coordinate integration of Federal with non-Federal projects.

INTERIOR'S POWER CUSTOMERS  
(approximately)

Preference (public power)	756
Utilities (private)	56
Federal Facilities	48
Industries served	23



INTERIOR'S ELECTRIC POWER PROGRAMS

SUPPORT POWER FACILITIES WHEN ECONOMICALLY FEASIBLE  
IN MULTIPURPOSE HYDRO PROJECTS

MARKET ELECTRIC POWER GENERATED AT CORPS OF  
ENGINEERS AND BUREAU OF RECLAMATION DAMS

ENCOURAGE NECESSARY RESEARCH - EHV TRANSMISSION (1,100 KV) &  
EFFICIENCY AND RELIABILITY STUDIES

CONSTRUCT, OPERATE AND MAINTAIN FACILITIES NECESSARY  
TO MARKET POWER

COORDINATION OF POWER PLANNING, DESIGN AND POOLING



POWER MARKETING OPERATIONS  
FY 1976

<u>Agency</u>	<u>Gross revenues</u> (in millions)	<u>Marketed capacity</u> (MW)	<u>Miles trans. lines</u> (in thousands)	<u>Energy Marketed</u> (Billions of KW-HRS)	<u>Percent of generation in the area</u>
Southeastern	\$ 48	2,401		8.1	3
Alaska	2.1	77	.09	.2	10 & 50
Southwestern	51	1,917	2	3.9	5
Reclamation	270 <sup>/1</sup>	7,709 <sup>/2</sup>	16	38.0	3-35 (in 5 areas)
Bonneville	<u>302</u>	<u>13,618</u>	<u>13</u>	<u>83.6</u>	<u>50</u>
Total	<u>\$ 673.1</u>	<u>25,722</u>	<u>31</u>	<u>133.8</u>	

<sup>/1</sup> Excludes sales to BPA of \$8.4 million

<sup>/2</sup> Reclamation generation capacity of 9,659 MW less marketed to BPA of 4,030 MW plus Corps of Engineers generation of 2,048 MW and IBWC of 31.5 MW. Includes Navajo generation.