

**LEGISLATIVE  
RESEARCH COMMISSION**

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**INTERIM REPORT**

TO THE

**1979**

**GENERAL ASSEMBLY OF NORTH CAROLINA  
SECOND SESSION, 1980**



**HYDROELECTRIC  
GENERATION OF POWER**



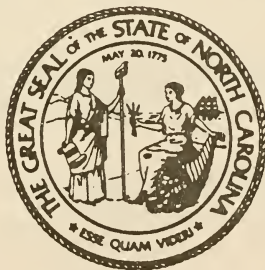
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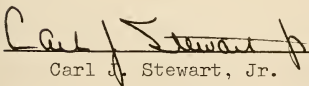
June 5, 1980

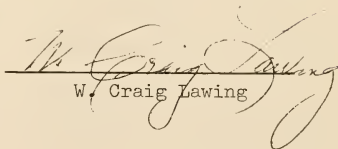
TO MEMBERS OF THE 1979 GENERAL ASSEMBLY, SECOND SESSION, 1980:

The Legislative Research Commission herewith reports to the 1979 General Assembly (Second Session, 1980) on the matter of hydroelectric generation of power. The report is made pursuant to Resolution 80 of the 1979 General Assembly.

This report was prepared by the Legislative Research Commission's Hydroelectric Generation of Power Study Committee and is transmitted by the Legislative Research Commission for your consideration.

Respectfully submitted,

  
Carl A. Stewart, Jr.

  
W. Craig Lawing

Cochairmen  
Legislative Research Commission





## INTRODUCTION

The Legislative Research Commission, created by Article 6B of General Statutes Chapter 120, is authorized pursuant to the direction of the General Assembly "to make or cause to be made such studies of and investigations into governmental agencies and institutions and matters of public policy as will aid the General Assembly in performing its duties in the most efficient and effective manner" and "to report to the General Assembly the results of the studies made," which reports "may be accompanied by the recommendations of the Commission and bills suggested to effectuate the recommendations." G.S. 120-30.17. The Commission is chaired by the Speaker of the House and the President Pro Tempore of the Senate, and consists of five Representatives and five Senators, who are appointed respectively by the Cochairmen. G.S. 120-30.10(a).

At the direction of the 1979 General Assembly, the Legislative Research Commission has undertaken studies of twenty-five matters, which were arranged into ten groups according to related subject matter. See Appendix A for a list of the Commission members. Pursuant to G.S. 120-30.10(b) and (c), the Commission Cochairmen appointed study committees consisting of legislators and public members to conduct the studies. Each member of the Legislative Research Commission was delegated the responsibility of overseeing one group of studies and causing the findings and recommendations of the various committees to be reported to the Commission. In addition, one Senator and one Representative from each study committee were designated

Cochairmen. See Appendix B for a list of the Study Committee members.

The General Assembly by Resolution 80 of the 1979 Session (House Joint Resolution 1531) authorized the Legislative Research Commission to study the issue of hydroelectric generation of power. The full text of Resolution 80 appears in Appendix C.

The National Conference of State Legislatures selected North Carolina for participation in its Small-Scale Hydroelectric Policy Project. The Energy Law Institute of the Franklin Pierce Law Center is under contract with the NCSL Small-Scale Hydroelectric Policy Project to provide research and staff support assistance to the project's technical assistance program for state legislatures.

The National Conference of State Legislatures and the Energy Law Institute have provided valuable assistance to the Study Committee in its consideration of small-scale hydro issues and the preparation of this report. The Committee has also received valuable assistance from the staff of the Research Triangle Institute and the Legislative Services Office.

## II. POTENTIAL OF SMALL-SCALE HYDROPOWER AS AN ENERGY RESOURCE.

Energy supply is one of the most important issues facing state legislatures today. The critical status of our energy future is receiving increased attention by state legislators as they seek to determine what states are required to do to ensure that future energy needs are met. The concern over our energy future results to a large degree from our present reliance on fossil fuels for our energy needs and the knowledge that petroleum is limited in terms of domestic reserves, and unreliable and costly in terms of imported supply.

In the United States, hydroelectric generation now provides about 14-15 percent of the electricity used. A total of 1,430 hydroelectric power plants include approximately 60,000 MW of conventional generating capacity and 10,000 MW of pumped storage capacity. The existing utilization is 35 per cent of the total hydroelectric power considered developable in plants greater than 5 MW. The Army Corps of Engineers report in 1978 estimated that 55,000 MW of additional electrical generating capacity is available for development now at existing dam structures in the United States. 5,100 MW of this total could be achieved through improved efficiency of existing turbine-generator installations. By adding turbine-generators to existing hydroelectric dams, another 15,900 MW could be accounted for in that total figure. Out of the estimated 33,600 MW that could be developed by installing power stations at existing dams, 27,000 MW potential is estimated for sites with the potential of 5 MW or less.

The study also estimates that this potential is the equivalent of replacing oil-fired capacity using 266 million barrels of oil annually or 727,000 barrels of oil per day. This projected savings is seven and a half times the oil saving projected in the President's plan for saving oil by installing solar heating in 2½ million homes by 1985. With the cost of electrical generation by oil and gas fired plants rising, the time delays of 7 to 10 years for a coal fired plant and 12 to 14 years for a nuclear plant increasing, the feasibility of small-scale hydro is at hand for many sites and near for others. Although the development of small-scale hydro will not solve the nation's energy problem, it can make a significant contribution. When combined with the development of other alternative energy resources, small-scale hydro can be viewed as a major solution to the problem of renewable energy for the future.

#### A. PHYSICAL CHARACTERISTICS.

Small-scale hydropower is an indigenous resource that can contribute to North Carolina's energy supply by providing a renewable source of clean energy at a reasonable cost. As a matter of convenience, a small hydropower project is defined as an installation having a potential capacity of under 25 megawatts. In reality, the classification of small hydropower is not so precise. In general, the small hydro concept suggests installations utilizing existing small dams or diversions, operating essentially as run of the river with little or no storage and minimal change in river regime.

A portion of the National Energy Act defines potential small power producers as those persons with site(s) of no more than 80 MW combined.

In a preliminary inventory of hydroelectric power resources compiled by the Army Corps of Engineers for the Southeast region, the state of North Carolina was identified as having the following potential:

	<u>0 - 25 MW Capacity Sites</u>		
	Existing	Incremental	Undeveloped
No. of Sites	58	123	40
Capacity (MW)	175	248	419
Energy (GWH)	644	673	1,930

MW=megawatt of capacity  
 1 MW=1000 kilowatts

GWH=gigawatt hours  
 1 GHW=1 million kilowatt hours

Incremental refers to existing dam sites where new capacity can be installed or existing capacity expanded.

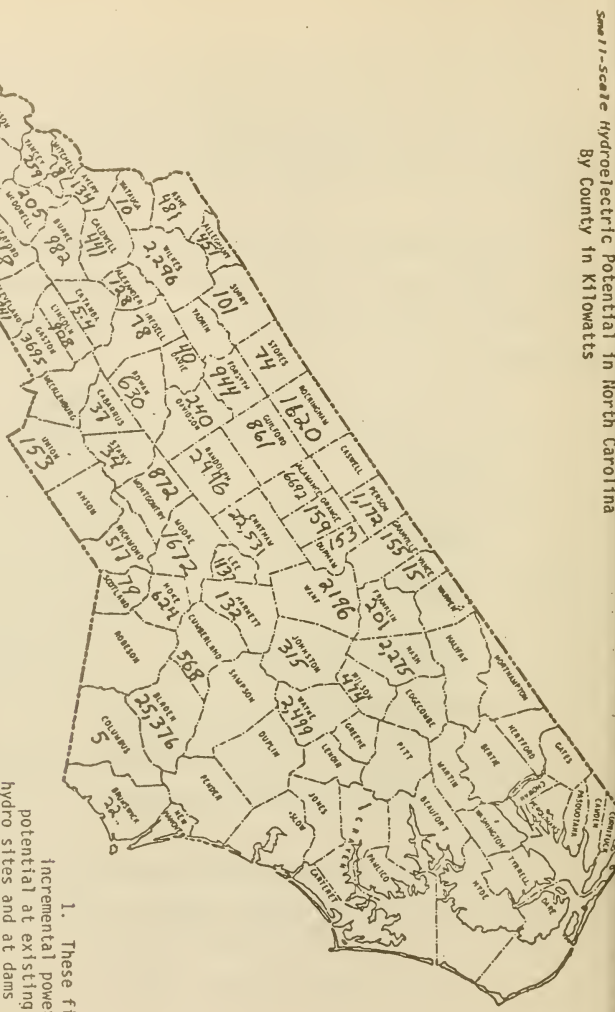
B. LOCATION

For an estimate of the location and potential size of the small-scale hydro resources by county, see the following map.

NORTH CAROLINA

2. Figures are from: "Existing Hydroelectric Dams and Dams with Hydroelectric Potential in North Carolina", Ken Meador and John L. Warren, Applied Ecology Department, Operations Analysis Division, Research Triangle Institute, Research Triangle Park, North Carolina 27709, October 1979.

1. These figures represent incremental power generation potential at existing small-scale hydro sites and at dams that are currently not fitted for electricity generation. They do not include large-scale hydro facilities, potential sites that are not currently dammed, or destroyed, junked and retired dams. Counties without a figure have no incremental small-scale hydro potential.



### III. ECONOMIC VALUE

Using the data supplied in the Corps' inventory, a rough "first-cut" approximation of North Carolina's small-scale hydro resource can be made. The following figures provide an approximate indication of the oil or coal that could be displaced annually if the known small-scale hydro sites with potential were developed to generate electricity.

	<u>Barrels<sub>1</sub></u> <u>of Oil<sup>1</sup></u>	<u>Tons<sub>2</sub></u> <u>of Coal<sup>2</sup></u>	<u>Dollars<sub>3</sub></u> <u>of Coal<sup>3</sup></u>	<u>People<sub>4</sub></u> <u>Served<sup>4</sup></u>
Incremental	1,100,000	281,000	11,000,000	67,300
Undeveloped	3,170,000	805,000	31,000,000	193,000

1. These figures represent the amount of oil necessary to generate an amount of electricity equal to the hydro potential in Section II.
2. These figures represent the amount of coal necessary to generate an amount of electricity equal to the hydro potential in Section II.
3. This is the cost of the coal in Column 2, assuming a cost of \$35 per ton.
4. These figures represent the number of people who could be served by the hydro potential in Section II, assuming 10,000 kwh per year average U. S. residential consumption.

Assumptions for above:

10,000 btu's coal or oil needed to generate 1 kwh  
12,000 btu's per pound coal  
145,000 btu's per gallon oil

#### IV. RESOURCE APPLICATION

Hydroelectricity produced from small-scale projects has several applications. Public utilities may be able to use this power to supplement their existing generating facilities with either additional base, peak, or cycle power depending on the dam's operational characteristics. Expansion or redevelopment of older dam structures may have direct use by industries seeking to expand jobs if increased power at a reasonable cost could be found. Similarly, industry might be attracted to a new location in the state if the development of small-scale hydropower were to provide it with an economical source of power. Several sites offer prospects for municipal governments to stabilize part of their power costs and in some cases, may allow them to expand their generating capacity. The latter would allow a municipal utility to reduce its need to buy power from other utilities and thereby decrease the overall costs to its rate payers. The resource application objective is to develop small-scale hydropower to the fullest extent possible as an indigenous energy source for North Carolina, both to offset the high cost of energy that will need to be produced utilizing fossil fuels or nuclear energy to meet future demand (produced from imported oil), and to stimulate the economy by increasing employment in regions throughout the state.



## V. RECOMMENDATIONS TO THE GENERAL ASSEMBLY

The Study Committee on Hydroelectric Generation of Power considered many proposals to encourage the development of small-scale hydro in North Carolina. The Study Committee rejected some of the proposals and may give further consideration to other proposals prior to the 1981 Session of the General Assembly. The Committee recommends to the General Assembly that action be taken in the following areas at this time:

### A. EXEMPT SMALL-SCALE HYDROELECTRIC AND OTHER RENEWABLE ENERGY PROJECTS FROM PORTIONS OF UTILITIES COMMISSION REGULATION.

The General Assembly has already recognized the value of exempting certain types of small energy facilities from Utilities Commission regulation by excluding the construction and operation of electric generation equipment primarily for self-use from the definition of public utility and the need to acquire a certificate of convenience and necessity. N. C. Session Laws, Ch. 652 (1979). The federal Public Utilities Regulatory Policies Act (PURPA) and the accompanying Federal Energy Regulatory Commission regulations go considerably beyond that and exempt qualifying renewable energy power production facilities up to 30 megawatts and cogeneration facilities up to 80 megawatts from state laws and regulations respecting rates and from financial and organization regulation of electric utilities. P. L. 95-617, §210, 16 U.S.C. §824a-3.

Persons primarily in the business of selling electricity from other than small renewable energy power production facilities, such

as most investor owned utilities, do not qualify. Municipalities would also not qualify. State commissions may apply to the Federal Energy Regulatory Commission for limitation on these exemptions.

45 Fed. Reg. 12214 (1980).

The PURPA exemption will preempt any state law or regulation found to be within the category of rate, financial or organizational regulation of electric utilities. The states may define the exemption for small-scale hydroelectric and other small renewable energy production facilities from state utility regulations. There is little need to subject small-scale renewable energy production facilities to the same type of regulation applied to existing large utility systems. These facilities are not natural monopolies and many of the traditional requirements of public utility regulation would only be a needless extra burden. Requirements concerning a system of accounts, reports, certificates of public convenience and necessity, and certificates for construction of generating facilities appear to be unnecessary regulation with respect to small-scale renewable energy facilities.

#### RECOMMENDATION

The Study Committee recommends that the General Assembly exempt small-scale hydroelectric and other small renewable energy production facilities from regulation by the Utilities Commission with respect to systems of accounts, reports, certificates of public

convenience and necessity, and certificates for construction of generating facilities.

SUGGESTED LEGISLATION

G.S. 62-3(23) is amended by adding a new subdivision to read:

"g. The term 'public utility' for purposes of Sections 35, 36, 110 and 110.1, and Articles 7 and 8 of this Chapter shall not include any electrical production facility that uses renewable energy sources (including solar energy, hydropower, geothermal energy, wind energy, and biomass conversion) as its primary energy source, has a capacity of 30 megawatts or less, and is owned or operated by a person not primarily engaged in the generation or sale of electric power (other than power solely from such small-scale renewable energy facilities)."

B. PROVIDE FOR A HIGHER RATE OF RETURN ON INVESTMENTS BY UTILITIES IN RENEWABLE ENERGY FACILITIES

Many of the current federal incentives for alternative energy development are not available to investor-owned utilities. For example, the substantial incentives for renewable energy projects contained in the Public Utility Regulatory Policies Act of 1978 are largely unavailable to large existing investor-owned utilities. While a number of incentives could be provided to encourage partici-

pation by investor-owned utilities in alternative energy generation development, one of the most direct and least complicated approaches is to authorize the Utilities Commission to allow an increased rate of return on future utility investments in small-scale hydroelectric and other renewable resource generation systems.

The anticipated near-term impact on retail electric rates is anticipated to be minimal and may be expected to be offset by the long-term benefits of more rapid renewable energy source deployment.

While the focus of the Study Committee is the encouragement of small-scale hydroelectric development, it seems appropriate to include all renewable energy projects in the incentive approach recommended by the Committee.

#### RECOMMENDATION

The Study Committee recommends that the General Assembly amend Chapter 62 of the General Statutes to authorize the Utilities Commission to set a higher rate of return for investments by utility companies in renewable energy facilities.

#### SUGGESTED LEGISLATION

G.S. 62-133(b) is amended by adding a new subdivision to read:

"(4b) With respect to investments in projects or systems designed to produce energy from renewable sources (including solar energy, hydropower, geothermal

energy, wind energy, and biomass conversion) construction of which was commenced after July 1, 1980, the Commission may, in fixing rates pursuant to subdivision (4), include an additional amount of return on investment, determined by the Commission to be in the public interest, to promote the development of renewable energy projects or systems."

C. AUTHORIZE THE UTILITIES COMMISSION TO SET LONG-TERM RATES FOR THE POWER OUTPUT SOLD TO PUBLIC UTILITIES OF SMALL-SCALE HYDROELECTRIC FACILITIES.

Title II of the Public Utilities Regulatory Policies Act of 1978 (PURPA) provides that public utilities must purchase the power output from certain small power producers. The rate required by the federal statute to be paid for this power output may not exceed the avoided cost of the utility. The avoided costs are the costs to the utility which can be avoided by obtaining the power from small power producers rather than from their own generation or purchasing from another utility. The rate set under PURPA must consider either the avoided costs calculated at the time of delivery or the avoided costs calculated at the time a legal and enforceable obligation is incurred. Thus, PURPA rates can be considered to examine the short-term avoided cost.

The regulations promulgated under PURPA permit, but do not require, state public utility commissions to set rates which examine the long-term avoided costs to the utility. The following recommendation requires the North Carolina Utilities Commission to set a rate not to exceed the estimated average avoided costs to the utility over the life of the contract. This recommendation as written will only apply to small-scale hydroelectric facilities

but could easily be expanded to include other renewable energy projects. This recommendation will provide a steady income stream to potential developers. This has many advantages, the most important being the steady income stream will improve financing possibilities.

This mechanism does not prevent voluntary contractual agreements between small power producers and purchasing utilities. If a voluntary contract cannot be achieved, the suggested legislation provides for the Utilities Commission to establish long-term rates. The long-term rates will be set by examination of the term of the contract, the estimated costs of additional or existing generating capacity, estimated costs of fuel and other operating expenses, and security of the fuel supply. Additionally, the rates set include consideration of the availability and reliability of the power supplied by the small power producers.

#### RECOMMENDATION

The study committee recommends that the General Assembly require the Utilities Commission to establish long-term rates for the power output of small-scale hydroelectric facilities purchased by public utilities.

#### SUGGESTED LEGISLATION

G. S. 62-3 is amended by adding a new subdivision to read:

"(27a) "Small power producer" means a person or corporation owning or operating an electrical power production facility with a power production capacity which, together with any other facilities located at the same site, does not exceed 80 megawatts of electricity and which depends upon renewable

resources for its primary source of energy. For the purposes of this section, renewable resources shall mean: hydroelectric power. A small power producer shall not include persons primarily engaged in the generation or sale of electricity from other than small power production facilities."

Chapter 62 of the General Statutes is amended by adding a new section to read:

"§62-156. Power Sales by Small Power Producers to Public Utilities.--

(a) In the event that a small power producer and an electric utility are unable to mutually agree to a contract for the sale of electricity or to a price for the electricity purchased by the electric utility, the commission shall require the utility to purchase the power, under rates and terms established as provided in subsection (b) of this section.

(b) No later than March 1, 1981, and at least every two years thereafter, the Commission shall determine the rates to be paid by electric utilities for power purchased from small power producers, according to the following standards:

(1) Term of contract. Long-term contracts for the purchase of electricity by the utility from small power producers shall be encouraged in order to enhance the economic feasibility of small power production facilities.

(2) Avoided cost of energy to the utility. The rates paid by a utility to a small power producer shall not exceed, over the term of the purchase power contract, the incremental cost to the electric utility of the electric energy which, but for the purchase from a small power producer, the utility would generate or purchase from another source. A determination of the avoided energy costs to the utility shall include a consideration of

the following factors over the term of the power contracts: the expected costs of the additional or existing generating capacity which could be displaced, the expected cost of fuel and other operating expenses of electric energy production which a utility would otherwise incur in generating or purchasing power from another source, and the expected security of the supply of fuel for the utilities' alternative power sources.

(3) Availability and reliability of power. The rates to be paid by electric utilities for power purchased from a small power producer shall be established with consideration of the reliability and availability of the power.



APPENDICES



APPENDIX A  
STATE OF NORTH CAROLINA  
LEGISLATIVE RESEARCH COMMISSION  
STATE LEGISLATIVE BUILDING  
RALEIGH 27611



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1979-80

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APPENDIX B

STATE OF NORTH CAROLINA  
LEGISLATIVE RESEARCH COMMISSION  
STATE LEGISLATIVE BUILDING  
RALEIGH 27611



MEMBERSHIP  
HYDROELECTRIC GENERATION OF POWER  
1979-80

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GENERAL ASSEMBLY OF NORTH CAROLINA  
SESSION 1979  
RATIFIED BILL

RESOLUTION 80

HOUSE JOINT RESOLUTION 1531

A JOINT RESOLUTION TO AUTHORIZE THE GENERAL ASSEMBLY TO STUDY  
HYDROELECTRIC POWER.

Whereas, both small and large scale hydroelectric power  
plants produce energy without atmospheric pollution, and use the  
force of gravity to produce electric power; and

Whereas, many small and large scale hydroelectric plants  
could produce substantial amounts of energy as part of a  
Statewide program of generating electricity without reliance on  
petroleum;

Now, therefore, be it resolved by the House of Representatives,  
the Senate concurring:

Section 1. The Legislative Research Commission is  
authorized to study the issue of hydroelectric generation power  
in North Carolina.

Sec. 2. This resolution shall become effective July 1,  
1979.

In the General Assembly read three times and ratified,  
this the 8th day of June, 1979.

JAMES C. GREEN

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James C. Green

President of the Senate

CARL J. STEWART JR

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Carl J. Stewart, Jr.

Speaker of the House of Representatives





