

ALASKA LEGISLATURE SPECIAL COMMITTEE / SUBJECT FILES 86/2

983 SCCOMM44: HOUSE POWER ALTERNATIVES STUDY COMM. 1979-80

Questions to be addressed in this section for each agency are the following:

1. What is its legal jurisdiction, and what is the main statutory derivation of that authority?
2. What is its decision-making process?
3. What important state, federal, and local certificates, licenses, permits and other documents would be required for construction in Alaska of new electrical generating facilities?
4. What are the history, governing legislation, current status, plans and proposals of the Alaska Power Authority?

- (D) History of the Susitna River hydroelectric project with regard to studies conducted, promotion activities, legislation, and past and pending proposals for the project; description of significant legislation related to the hydroelectric project and legislation pertaining to alternatives to the project currently pending before the U.S. Congress or the Alaska legislature.

CLAUSE II - PERIOD AND DATES OF PERFORMANCE

- (A) This contract shall have a retroactive starting date of November 15, 1979 and shall expire on December 31, 1979 at which time the final report described in Clause I of this contract is due.
- (B) This agreement may be terminated by either party upon written notice to the other.

CLAUSE III - PROJECT DIRECTOR

The Project Director shall be Representative Brian Rogers, Box K, College, Alaska 99708.

CLAUSE IV - COMPENSATION AND METHOD OF PAYMENT

- (A) The Consultant shall be compensated at the following rates for work performed by professional personnel, provided, however, that not more than 8 hours shall be charged for any one person in any 24 hour period:

Arlon Tussing	\$85.00
Lois S. Kramer	\$50.00
Barbara F. Morse	\$30.00

- (B) The Consultant shall submit time statements with billing on which there shall be certified the time worked under this contract, the subject of the work, and the starting and ending time of the work to the nearest one-tenth of an hour. The Contractor shall certify that the time billed under this contract has not been billed to or paid for by any other party. The Consultant may present the billing for work under this contract at the time he submits the final report.

- (C) The Consultant shall be reimbursed for travel and other expenses authorized in advance by the Project Director, except that per diem shall be paid at prevailing State rates and all air travel shall be reimbursed on the basis of coach class fares.
- (D) Total payments under this contract, including expenses, shall not exceed \$5,000.00 (Five Thousand Dollars).

CLAUSE V - OFFICE SPACE, EQUIPMENT, CLERICAL SUPPORT

Office space, equipment and clerical support necessary to carry out the Consultant's obligations under this contract shall be supplied by the Consultant at no cost to the Agency.

CLAUSE VI - RECORDS, DOCUMENTS, AUDIT

The Consultant shall maintain accurate records as may be required by the Project Director. The records are subject to inspection by the Agency or the Project Director at all reasonable times. All documents, reports and writings generated as a consequence of work done under this contract shall become the property of the State of Alaska and, on completion of the work or at the termination of this agreement, shall be delivered to the Agency. The Consultant shall keep the Project Director informed as to the progress of the work performed under this agreement and shall provide progress reports as specified by the Project Director.

CLAUSE VII - CONFLICT OF INTEREST

The Consultant affirms that he is not now engaged in any professional business relationship that could reasonably be construed to constitute a conflict of interest relative to this obligation under this contract and that he will notify the Project Director before undertaking any such professional business relationship.

CLAUSE VIII - ALL WRITINGS CONTAINED HEREIN

This agreement contains all the terms and conditions agreed upon by the parties. No other understandings, oral or otherwise, regarding the subject matter of this agreement shall be deemed to exist or to bind either of the parties of this agreement.

IN WITNESS WHEREOF, the parties have executed this agreement
on the dates indicated.

CONSULTANT:

Arlon R. Tussing 12/20
ARLON R. TUSSING Date
Business License No. 46323

LEGISLATIVE AFFAIRS AGENCY

M. R. Charney 12/28/79
M. R. CHARNEY Date
Executive Director

Accepted:

Brian Rogers 12/18/79
Rep. Brian Rogers Date
Project Director

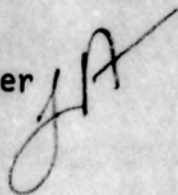
Approved as to form:

Billy G. Berrier 12/14/79
Billy G. Berrier Date
Agency Legal Counsel

To Representative Rogers:

Enclosed for your records is a copy of the amendment to the contract between House Power Alternatives and Arlon Tussing.

Lynn Ager

A handwritten signature in dark ink, appearing to be 'LA' with a long, sweeping horizontal stroke extending to the right.

AMENDMENT NO.1
TO THE CONTRACT BETWEEN
STATE OF ALASKA
LEGISLATIVE AFFAIRS AGENCY
AND
ARLON R. TUSSING AND ASSOCIATES, INC.

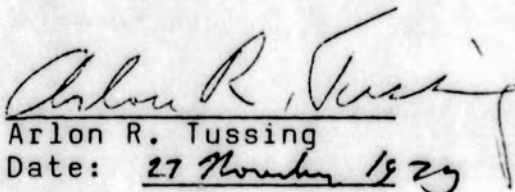
IT IS MUTUALLY AGREED THAT THE CONTRACT EFFECTIVE NOVEMBER 15,
1979 BETWEEN THE ABOVE PARTIES IS HEREBY AMENDED AS FOLLOWS:

SECTION II. PERIODS AND DATES OF PERFORMANCE is
amended to add:

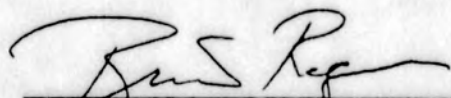
(E) Lois S. Kramer's professional services
will neither be in effect nor billable prior to
December 4, 1979.

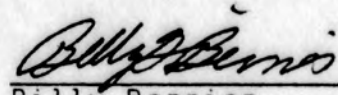
IN WITNESS WHEREOF, the parties have executed this amendment
to this agreement on the date indicated below.

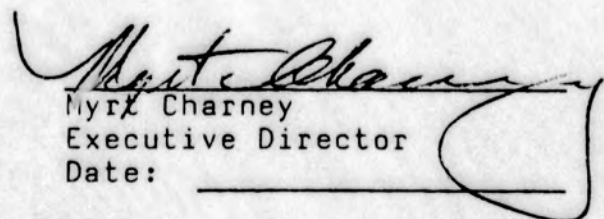
CONTRACTOR


Arlon R. Tussing
Date: 27 November 1979

LEGISLATIVE AFFAIRS AGENCY


Representative Brian Rogers
Project Director
Date: 12/1/79


Billy Berrier
Legal Counsel
Date: 12/6/79


Myrle Charney
Executive Director
Date: 12/17/78

CONTRACT BETWEEN

STATE OF ALASKA - LEGISLATIVE AFFAIRS AGENCY
Pouch Y - State Capitol
Juneau, Alaska 99811

AND

MARK WITTOW
302 W. 3rd Street
Juneau, Alaska 99801

The parties to this agreement are the LEGISLATIVE AFFAIRS AGENCY, on behalf of the House Power Alternatives Study Committee, hereinafter referred to as the "AGENCY," and MARK WITTOW, hereinafter referred to as the CONTRACTOR.

THE PURPOSE OF THIS AGREEMENT is to provide assistance and consulting services to the Committee.

IT IS THEREFORE MUTUALLY AGREED THAT:

CLAUSE I - STATEMENT OF WORK

- (A) The Contractor shall coordinate the work of the various contractors to the Committee.
- (B) The Contractor shall assist the committee in preparing its report to the Legislature, as described in Section 3, Chapter 76 of the 1979 Session Laws of Alaska.
- (C) The Contractor shall provide general assistance to the committee as directed by the project director.

CLAUSE II - PERIOD OF PERFORMANCE

- (A) The work under this contract shall be performed between January 3, 1980 and May 31, 1980, unless extended or terminated in accordance with (B) below.
- (B) This contract may be terminated by either party upon 15 days' written notice to the other.

CLAUSE III - PROJECT DIRECTOR

The Project Directors shall be the Honorable Hugh Malone and the Honorable Brian Rogers, Co-Chairmen of the House Power Alternatives Study Committee.

CLAUSE IV - COMPENSATION AND METHOD OF PAYMENT

- (A) Payment for the work performed under this agreement shall be at the rate of \$2100 (Twenty-one Hundred Dollars) per month, to be paid before the last working day of each month for work carried out between the 15th day of the preceding month and the 15th day of the current month. Time sheets shall be approved monthly by the Project Director. Total compensation for work performed under Clause I of this agreement shall not exceed \$10,500 (Ten Thousand Five Hundred Dollars). The Agency shall deduct from each monthly payment income tax and other deductions required by law.
- (B) The Contractor shall be reimbursed on the basis of coach class fares and prevailing state employee per diem rates for all travel expenses authorized by either of the Project Directors. Total compensation authorized for travel expenses is \$2000 (TWO THOUSAND DOLLARS).
- (C) Total payments under this contract, including expenses, shall not exceed \$12,500 (Twelve Thousand Five Hundred Dollars).

CLAUSE V - OFFICE SPACE, EQUIPMENT, CLERICAL SUPPORT

Office space, equipment and clerical support of the Contractor that will be necessary to carry out his obligations under this contract shall be supplied by the Agency at no cost to the Contractor.

CLAUSE VI - RECORDS, DOCUMENTS, AUDIT

The Consultant shall maintain accurate records, including detailed time records, as may be required by the Project Director. The records are subject to inspection by the Agency or the Project Director at all reasonable times. All documents, reports and writings generated as a consequence of work done under this contract shall become the property of the State of Alaska and, on completion of the work or at the termination of this contract, shall be delivered to the Project Director.

CLAUSE VII - REPORTS

The Contractor shall keep the Project Director informed as to the progress of the work performed under this agreement and shall provide progress reports as specified by the Project Director.

CLAUSE VIII - ALL WRITINGS CONTAINED HEREIN

This agreement contains all the terms and conditions agreed upon by the parties. No other understandings, oral or otherwise, regarding the subject matter of this agreement shall be deemed to exist or to bind either of the parties of this agreement.

IN WITNESS WHEREOF, the parties have executed this agreement
on the dates indicated.

CONTRACTOR

Mark Wittow 1-17-80
MARK WITTOW Date
Alaska Business License No. 98004

LEGISLATIVE AFFAIRS AGENCY

M. R. Charney 1/18/80
M. R. CHARNEY Date
Executive Director

Accepted:

Brian Rogers 1-17-80
Representative Brian Rogers Date
Co-Chairman, House Power Alternatives
Study Committee

Approved as to form:

Billy G. Berrier Jan. 16, 1980
Billy G. Berrier Date
Agency Legal Counsel

Hugh Malone 1/17/80
Representative Hugh Malone, Date
Co-Chairman, House Power Alternatives
Study Committee

ARLON R. TUSSING & ASSOCIATES / 880 H St., Suite No. 210, Anchorage, Alaska 99501

4 January, 1980

rec'd
1/9
MW

Representative Brian Rogers
Box K
College, Alaska 99708

Dear Brian:

Here is a copy of our first report, " . . . on the electric utility industry currently serving the Railbelt area of Alaska; the state and federal government agencies that promote, plan, and regulate the generation and distribution of electricity in Alaska; the history and status of the proposed Susitna hydroelectric project; and related topics."

As we stated in our proposal, and as the contract provided, the paper is "a background document for legislative staff, [etc.] . . . and is not intended for public distribution in its present form." I believe, however, that it meets the specification in the proposal and contract that it be "brief, concise, and easily understood by non-specialists."

I plan to include the same material in perfected and annotated form in the main report, so whatever is of value here will not be lost to the larger audience.

The research and writing for this paper overlapped that required for our other report so much that it is meaningless to try to segregate them strictly. For this reason, I shall shortly send you a statement covering the first \$5,000 in effort on the two projects together, in the form of a statement reflecting effort on this project alone.

Very truly yours,



Arlon R. Tussing

enclosure

cc: Hugh Malone
Lois Kramer

AMENDMENT NO. 1
CONTRACT BETWEEN
STATE OF ALASKA - LEGISLATIVE AFFAIRS AGENCY
AND
MARK WITTOW
302 West 3rd Street
Juneau, Alaska 99801

IT IS MUTUALLY AGREED THAT THE CONTRACT BETWEEN THE ABOVE PARTIES
DATED JANUARY 18, 1980, IS HEREBY AMENDED AS FOLLOWS:

CLAUSE IV, Paragraph (A), page 2, is amended to read:

- (A) Payment for the work performed under this agreement shall be at the rate of \$2550 (Two Thousand Five Hundred Fifty Dollars) per month, to be paid before the last working day of each month for work carried out between the 15th day of the preceding month and the 15th day of the current month. Time sheets shall be approved monthly by the Project Director. Total compensation for work performed under Clause I of this agreement shall not exceed \$12,750 (Twelve Thousand Seven Hundred Fifty Dollars). The Agency shall deduct from each monthly payment income tax and other deductions required by law.

IN WITNESS WHEREOF, the parties have executed this amendment to this agreement on the dates indicated below.

CONSULTANT

LEGISLATIVE AFFAIRS AGENCY

Mark Wittow 2/12/80
MARK WITTOW Date
Ak. Bus. Lic. 98004

M.R. Charney 2/18/80
M.R. CHARNEY Date

Accepted:

Approved as to form:

Brian Rogers 2/12/80
Rep. Brian Rogers Date
Co-Chairman, House Power
Alternatives Study Committee

Billy G. Berrier Feb 11, 1980
Billy G. Berrier Date
Agency Legal Counsel

Hugh Malone 2/14/80
Rep. Hugh Malone Date
Co-Chairman, House Power
Alternatives Study Committee

AMENDMENT NO. 1
CONTRACT BETWEEN

STATE OF ALASKA - LEGISLATIVE AFFAIRS AGENCY

AND

ARLON R. TUSSING & ASSOCIATES, INC.

IT IS MUTUALLY AGREED THAT THE CONTRACT BETWEEN THE ABOVE PARTIES
DATED NOVEMBER 6, 1979, IS HEREBY AMENDED AS FOLLOWS:

SECTION I, Paragraph (A), page 4, is amended by adding the following
subparagraph:

5. Examine and evaluate how effectively the plan of study prepared by Acres American Incorporated for the proposed Susitna Hydroelectric Project addresses the issues below. In addition, the Consultant will address and analyze these issues as they specifically relate to decisions concerning electric power generation in the Railbelt during the next twenty years.
 - a. Possibilities for conservation through load management (due to increased load factors) and for involvement of regulatory agencies and existing utilities;
 - b. Determination of plant mix and necessary reserve margins;
 - c. Anticipated retirement of existing capacity and its effects on system capacity and facility planning;
 - d. Need for generation and transmission system reliability, establishing appropriate and compatible standards;
 - e. Effect of interest and discount rates on project costs;
 - f. Likelihood and effect of cost overruns;
 - g. Significance of other northern hydroelectric power projects.

SECTION II, Paragraph (D), page 5, is amended to read:

- D. The Contractor shall submit a review draft of the report described in Clause I to the Project Director not later than 15 April, 1980, and a final photo ready version not later than three weeks after receiving comments from the Project Director.

SECTION III, Paragraph (A), page 5, is amended to read:

The Project Directors shall be Representatives Brian Rogers and Hugh Malone.

SECTION IV, Paragraph (A), page 5, is amended to read:

- A. The Contractor shall be compensated at the following rates for professional services of principal and associate; provided that not more than eight hours shall be chargeable for any one person in any 24 hour period:

Arlon R. Tussing	\$85.00 per hour
Lois S. Kramer	\$50.00 per hour.

SECTION IV, Paragraph (E), page 6, is amended to read:

Total compensation for work performed under this agreement, inclusive of all expenses, shall not exceed \$20,000 (Twenty Thousand Dollars).

IN WITNESS WHEREOF, the parties have executed this amendment to this agreement on the dates indicated below.

CONSULTANT

LEGISLATIVE AFFAIRS AGENCY

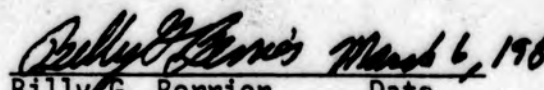

ARLON R. TUSSING Date
IRS No. 91-1078282

M. R. CHARNEY Date
Executive Director

Accepted:

Approved as to form:


Rep. Brian Rogers Date 3/7/80


Billy G. Berrier Date March 6, 1980
Agency Legal Counsel


Rep. Hugh Malone Date 3/7/80

March 18, 1980

To: Representative Malone

From: Lynn Ager

Enclosed for your records is a copy of the signed amendment to Arlon Tussing's contract with the Power Alternatives Study Committee. Please let us know if we can be of further assistance.

AMENDMENT NO. 1
CONTRACT BETWEEN

STATE OF ALASKA - LEGISLATIVE AFFAIRS AGENCY

AND

ARLON R. TUSSING & ASSOCIATES, INC.

IT IS MUTUALLY AGREED THAT THE CONTRACT BETWEEN THE ABOVE PARTIES
DATED NOVEMBER 6, 1979, IS HEREBY AMENDED AS FOLLOWS:

SECTION I, Paragraph (A), page 4, is amended by adding the following
subparagraph:

5. Examine and evaluate how effectively the plan of study prepared by Acres American Incorporated for the proposed Susitna Hydroelectric Project addresses the issues below. In addition, the Consultant will address and analyze these issues as they specifically relate to decisions concerning electric power generation in the Railbelt during the next twenty years.
 - a. Possibilities for conservation through load management (due to increased load factors) and for involvement of regulatory agencies and existing utilities;
 - b. Determination of plant mix and necessary reserve margins;
 - c. Anticipated retirement of existing capacity and its effects on system capacity and facility planning;
 - d. Need for generation and transmission system reliability, establishing appropriate and compatible standards;
 - e. Effect of interest and discount rates on project costs;
 - f. Likelihood and effect of cost overruns;
 - g. Significance of other northern hydroelectric power projects.

SECTION II, Paragraph (D), page 5, is amended to read:

- D. The Contractor shall submit a review draft of the report described in Clause I to the Project Director not later than 15 April, 1980, and a final photo ready version not later than three weeks after receiving comments from the Project Director.

SECTION III, Paragraph (A), page 5, is amended to read:

The Project Directors shall be Representatives Brian Rogers and Hugh Malone.

SECTION IV, Paragraph (A), page 5, is amended to read:

- A. The Contractor shall be compensated at the following rates for professional services of principal and associate; provided that not more than eight hours shall be chargeable for any one person in any 24 hour period:

Arlon R. Tussing	\$85.00 per hour
Lois S. Kramer	\$50.00 per hour.

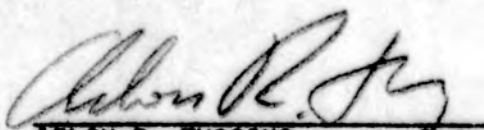
SECTION IV, Paragraph (E), page 6, is amended to read:

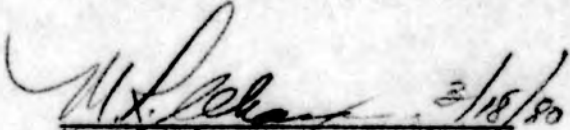
Total compensation for work performed under this agreement, inclusive of all expenses, shall not exceed \$20,000 (Twenty Thousand Dollars).

IN WITNESS WHEREOF, the parties have executed this amendment to this agreement on the dates indicated below.

CONSULTANT

LEGISLATIVE AFFAIRS AGENCY

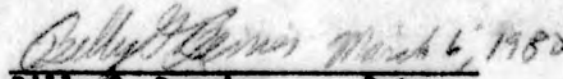

ARLON R. TUSSING Date
IRS No. 91-1078282


M. R. CHARNEY Date
Executive Director

Accepted:

Approved as to form:


Rep. Brian Rogers Date 3/7/80


Billy G. Berrier Date
Agency Legal Counsel March 6, 1980


Rep. Hugh Malone Date 3/7/80

April 7, 1980

To: Rep. Hugh Malone



From: Janelle Parker, Special Assistant to Myrt Charney

Enclosed for your records is a copy of the signed contract between Gregg Erickson and the House Power Alternatives Study Committee. Please let me know if I can be of further assistance.

CONTRACT BETWEEN

**STATE OF ALASKA - LEGISLATIVE AFFAIRS AGENCY
Pouch Y - State Capitol
Juneau, Alaska 99811**

AND

**GREGG ERICKSON
316 Coleman Drive
Juneau, Alaska 99801**

The parties to this agreement are the LEGISLATIVE AFFAIRS AGENCY, on behalf of the Legislative Council's House Power Alternatives Study Committee, hereinafter referred to as the "AGENCY", and GREGG ERICKSON, hereinafter referred to as the "Consultant".

THE PURPOSE OF THIS AGREEMENT is to provide the House Power Alternatives Study Committee with the consulting services of Gregg Erickson for a study of the feasibility of coal-fired power generation for the Railbelt area of Alaska.

IT IS THEREFORE MUTUALLY AGREED THAT:

CLAUSE I. - STATEMENT OF WORK

- (A) The Consultant shall prepare and deliver a written report on the economic, political and technical feasibility of coal-fired power generation for the Railbelt area of Alaska. The report shall specifically address the following points:
- (1) Previous work on potential of coal-fired generation for the Railbelt.
 - (2) Potential of existing Healy operation.
 - (3) Present institutional barriers to coal generation, and their possible resolution.
 - (4) Economic, social and environmental costs and benefits of coal generation in comparison with other forms of power production.

- (5) The potential for coal generation in the Railbelt during the next twenty-five years -- how much power could coal be expected to provide, with what attendant costs?
- (6) The feasibility of coal generation with and without related coal development possibilities.

CLAUSE II. - PERIOD AND DATES OF PERFORMANCE

- (A) Unless extended or terminated by mutual agreement, this contract is effective March 30, 1980 and expires May 10, 1980.
- (B) A written report is to be submitted by May 2, 1980, in print-ready form. If report is not submitted by May 9, 1980, 5 p.m. PST, no payment will be made. If report is submitted between May 2, 1980 and May 9, 1980, 10% of total contract fee shall be deducted for each day the report is late.
- (C) This contract may be terminated by either party upon written notice to the other.

CLAUSE III. - PROJECT DIRECTORS

The Project Directors shall be Representative Brian Rogers and Representative Hugh Malone, acting on behalf of the House Power Alternatives Study Committee.

CLAUSE IV. - COMPENSATION AND METHOD OF PAYMENT

- (A) For the work specified in this contract, the Consultant shall be compensated at the rate of \$7,000.00 (Seven Thousand Dollars).
- (B) Payment shall be made at the completion of the report.
- (C) Total payments under this contract, including expenses shall not exceed \$7,000.00.

CLAUSE V. - OFFICE SPACE, EQUIPMENT

Office space, equipment of the Contractor that will be necessary to carry out his obligations under this contract shall be supplied by the Contractor at no cost to the Agency.

CLAUSE VI. - RECORDS, DOCUMENTS, AUDIT

The Consultant shall maintain accurate records, including detailed time records, as may be required by the Project Directors. The records are subject to inspection by the Agency or the Project Directors at all reasonable times. All documents, reports and writings generated as a consequence of work done under this contract shall become the property of the State of Alaska and, on completion of the work or at the termination of this contract, shall be delivered to the Project Directors.

CLAUSE VII. - REPORTS

The Consultant shall keep the Project Directors informed as to the progress of the work performed under this agreement and shall provide progress reports as specified by the Project Director.

CLAUSE VIII. - CONFLICT OF INTEREST

The Contractor affirms that he does not now have any consulting or professional business relationships with anyone with whom it could be construed as having a conflict of interest.

CLAUSE IX. - ALL WRITINGS CONTAINED HEREIN

This agreement contains all the terms and conditions agreed upon by the parties. No other understanding, oral or otherwise, regarding the subject matter of this agreement shall be deemed to exist or to bind either of the parties of this agreement.

IN WITNESS WHEREOF, the parties have executed this agreement on the dates indicated.

CONTRACTOR

LEGISLATIVE AFFAIRS AGENCY



GREGG K. ERICKSON Date
(Ak. Business License 73957)



M. R. CHARNEY Date
Executive Director

Accepted:

Approved as to form:



Rep. Brian Rogers Date



Billy G. Berrier Date
Agency Legal Counsel



Rep. Hugh Malone Date

April 14, 1980

Gregg Erickson
316 Coleman Drive
Juneau, AK 99801

Dear Gregg,

To clarify your contract with the committee on the potential of coal-fired power generation in the Railbelt, I will ask that this letter be attached to your contract in the Legislative Affairs Agency files. The committee understands that:

1. Except for the consideration of institutional constraints, your paper will largely review and analyze existing studies on the potential for coal-fired generation in the Railbelt. We do not expect you to do more than this, given the funding and time constraints set out in your contract.
2. Fred Boness will be assisting you, and that you will be subcontracting with him for a portion of the study. Although Mr. Boness has clients who have a possible interest in the use of Alaska's coal reserves, these clients have no current interests in Alaska. The committee does not feel that Mr. Boness' involvements constitute a conflict of interest for his work with you.

Full responsibility for the meeting of the terms of the contract is retained by you. The two points above are for clarification only, and in no way constitute any attempt to alter your contract.

Sincerely,

Mark Wittow
Study Coordinator
for Representatives Malone and Rogers
Co-Chairmen and Project Directors

MW/jk

ALASKA POWER AUTHORITY

333 WEST 4th AVENUE - SUITE 31 - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-2715

October 17, 1979

The Honorable Brian Rogers
Co-Chairman
House Power Alternatives
Committee
Post Office Box K
College Branch
Fairbanks, Alaska 99708

Dear Representative Rogers:

I am writing to confirm an understanding reached between the Alaska Power Authority and your committee staff relating to the electrical load forecast study for the Railbelt area.

The Power Authority will utilize the results of the load forecast developed under contract by the Institute of Social and Economic Research to the extent that the forecast meets acceptable standards of professional quality and objectivity. Further, the Power Authority will pay up to \$30,000 for accomplishment of the work, if such funds are made available to the Power Authority for such purposes. Appropriated funds earmarked for Susitna feasibility studies will be available to the Power Authority upon release by Governor Hammond and thereafter can properly be applied to help defray the cost of the load forecast study.

Sincerely,



Eric P. Yould
Executive Director

CONTRACT BETWEEN

STATE OF ALASKA
LEGISLATIVE AFFAIRS AGENCY
Pouch Y
Juneau, Alaska 99811

AND

DYNAMIC RESEARCH CORPORATION
SR Box 10612
Fairbanks, Alaska 99701

The parties to this Agreement are the LEGISLATIVE AFFAIRS AGENCY, hereinafter referred to as the "Agency", and DYNAMIC RESEARCH CORPORATION, hereinafter referred to as the "Contractor."

THE PURPOSE OF THIS AGREEMENT is to provide the Interim Susitna Study Committee, through the Agency, professional services relating to issues studied by the committee.

IT IS THEREFORE MUTUALLY AGREED THAT:

CLAUSE I. STATEMENT OF WORK

- (A) The Contractor shall examine and evaluate the geotechnical portions of three (3) proposals for detailed feasibility studies for the Susitna Hydroelectric Project; prepare a written report consisting of an evaluation of each proposal, a comparative evaluation, and suggestions for questions during oral presentations on September 27 and 28, 1979; and other tasks as may be directed by the project director. The Contractor shall attend the oral presentations on September 27 and 28, 1979.

CLAUSE II. TERM OF CONTRACT

- (A) The period of this contract shall begin September 11, 1979 and terminate September 30, 1979, unless extended, or terminated in accordance with (B) of this Clause.
(B) This contract may be terminated by either party on written notice to the other.

CLAUSE III. PROJECT DIRECTOR

The project director shall be Representative Brian Rogers, co-chairman of the Interim Susitna Study Committee.

CLAUSE IV. COMPENSATION AND METHOD OF PAYMENT

- (A) The Contractor shall be compensated at the rate of \$15 per hour for his own services.
- (B) The Contractor shall be reimbursed on the basis of coach class airfare and prevailing state employee per diem rates for all travel expenses authorized in advance by the Project Director. Travel expense claims shall be submitted on forms provided by the Agency. Contractor shall be reimbursed for long distance telephone charges incurred in the course of the Contractor's work under this contract.
- (C) Total compensation under this contract, inclusive of all expenses, shall not exceed \$1,100.00.

CLAUSE V. OFFICE SPACE, EQUIPMENT, CLERICAL SUPPORT

Office space, equipment and clerical support necessary to carry out the Contractor's obligations under this contract shall be supplied by the Contractor at no cost to the Agency, unless authorized by the Project Director.

CLAUSE VI. RECORDS, DOCUMENTS, AUDIT

The Contractor shall maintain accurate records, including detailed time records as may be required by the Agency. The records are subject to inspection by the Agency at all reasonable times. All documents, reports and writings performed under this contract are, upon delivery to the Agency or at termination of this agreement, the property of the Agency.

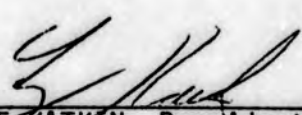
CLAUSE VII. ALL WRITINGS CONTAINED HEREIN

This agreement contains all the terms and conditions agreed upon by the parties. No other understandings, oral or otherwise, regarding the subject matter of this agreement shall be deemed to exist or to bind either of the parties to this agreement.

IN WITNESS WHEREOF, the parties have executed this agreement on the dates indicated below.

CONTRACTOR

LEGISLATIVE AFFAIRS AGENCY
(by direction of the Executive Director)



LAWRENCE KATKIN, President
DYNAMIC RESEARCH CORPORATION

Dated: 9/11/79

IRS Identification No. _____

Alaska Business License _____

MYRTON R. CHARNEY
LEGISLATIVE AFFAIRS AGENCY

Dated: _____

Accepted:

Approved as to form:



REP. BRIAN ROGERS
SUSITNA STUDY COMMITTEE
Dated: 9/11/79

AGENCY LEGAL COUNSEL

Dated: _____

**Department of the Treasury
Internal Revenue Service**

29262300 L

DYNAMIC RESEARCH CORPORATION
SR BOX 10612
FAIRBANKS

AK 99701

Date of This Notice

If you inquire about
your account, please
refer to this
number or attach a
copy of this notice

05-29-79
Employer Identification Number
92-0071645

575 B 010155555
15555555

NOTICE OF NEW EMPLOYER IDENTIFICATION NUMBER ASSIGNED

Thank you for your application for an employer identification number. The number above has been assigned to you. We will use it to identify your business tax returns and any other related documents, even if you have no employees.

Please keep this number in your permanent records. Use the number and your name, exactly as shown above, on all Federal tax forms that require this information, and refer to the number in all tax payments and in tax-related correspondence or documents. You may wish to make a record of the number for reference in case this notice is lost or destroyed.

We appreciate your cooperation.

AMENDMENT NO. 1

CONTRACT BETWEEN
STATE OF ALASKA - LEGISLATIVE AFFAIRS AGENCY

AND

DYNAMIC RESEARCH CORPORATION
SR Box 10612
Fairbanks, Alaska 99701

IT IS MUTUALLY AGREED THAT THE CONTRACT BETWEEN THE ABOVE PARTIES
DATED SEPTEMBER 14, 1979, IS HEREBY AMENDED AS FOLLOWS:

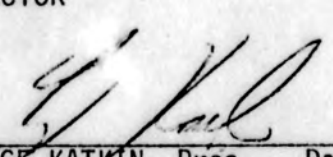
CLAUSE II, Paragraph (A), page 1 is amended to read:

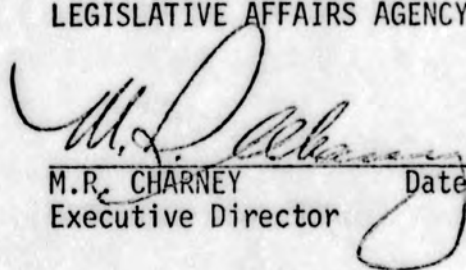
- (A) The period of this contract shall begin September 11, 1979
and expire December 31, 1979, unless extended or
terminated in accordance with (B) of this Clause.

IN WITNESS WHEREOF, the parties have executed this amendment
to this agreement on the dates indicated below.

CONTRACTOR

LEGISLATIVE AFFAIRS AGENCY

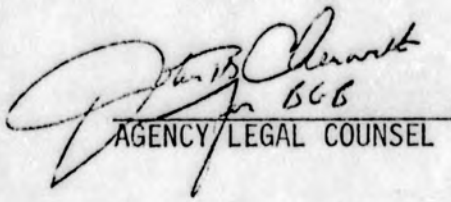

LAWRENCE KATKIN, Pres. Date
DYNAMIC RESEARCH CORPORATION
IRS Ident. No. 92-0071645


M.R. CHARNEY Date
Executive Director

Accepted:

Approved as to form:


Rep. BRIAN ROGERS Date
Susitna Study Committee


AGENCY LEGAL COUNSEL Date
10/5/79

CONTRACT BETWEEN

STATE OF ALASKA
LEGISLATIVE AFFAIRS AGENCY
Pouch Y
Juneau, Alaska 99811

AND

DYNAMIC RESEARCH CORPORATION
SR Box 10612
Fairbanks, Alaska 99701

The parties to this Agreement are the LEGISLATIVE AFFAIRS AGENCY, hereinafter referred to as the "Agency", and DYNAMIC RESEARCH CORPORATION, hereinafter referred to as the "Contractor."

THE PURPOSE OF THIS AGREEMENT is to provide the Interim Susitna Study Committee, through the Agency, professional services relating to issues studied by the committee.

IT IS THEREFORE MUTUALLY AGREED THAT:

CLAUSE I. STATEMENT OF WORK

- (A) The Contractor shall examine and evaluate the geotechnical portions of three (3) proposals for detailed feasibility studies for the Susitna Hydroelectric Project; prepare a written report consisting of an evaluation of each proposal, a comparative evaluation, and suggestions for questions during oral presentations on September 27 and 28, 1979; and other tasks as may be directed by the project director. The Contractor shall attend the oral presentations on September 27 and 28, 1979.

CLAUSE II. TERM OF CONTRACT

- (A) The period of this contract shall begin September 11, 1979 and terminate September 30, 1979, unless extended, or terminated in accordance with (B) of this Clause.
(B) This contract may be terminated by either party on written notice to the other.

CLAUSE III. PROJECT DIRECTOR

The project director shall be Representative Brian Rogers, co-chairman of the Interim Susitna Study Committee.

CLAUSE IV. COMPENSATION AND METHOD OF PAYMENT

- (A) The Contractor shall be compensated at the rate of \$15 per hour for his own services.
- (B) The Contractor shall be reimbursed on the basis of coach class airfare and prevailing state employee per diem rates for all travel expenses authorized in advance by the Project Director. Travel expense claims shall be submitted on forms provided by the Agency. Contractor shall be reimbursed for long distance telephone charges incurred in the course of the Contractor's work under this contract.
- (C) Total compensation under this contract, inclusive of all expenses, shall not exceed \$1,100.00.

CLAUSE V. OFFICE SPACE, EQUIPMENT, CLERICAL SUPPORT

Office space, equipment and clerical support necessary to carry out the Contractor's obligations under this contract shall be supplied by the Contractor at no cost to the Agency, unless authorized by the Project Director.

CLAUSE VI. RECORDS, DOCUMENTS, AUDIT

The Contractor shall maintain accurate records, including detailed time records as may be required by the Agency. The records are subject to inspection by the Agency at all reasonable times. All documents, reports and writings performed under this contract are, upon delivery to the Agency or at termination of this agreement, the property of the Agency.

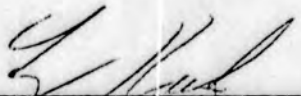
CLAUSE VII. ALL WRITINGS CONTAINED HEREIN

This agreement contains all the terms and conditions agreed upon by the parties. No other understandings, oral or otherwise, regarding the subject matter of this agreement shall be deemed to exist or to bind either of the parties to this agreement.

IN WITNESS WHEREOF, the parties have executed this agreement on the dates indicated below.

CONTRACTOR

LEGISLATIVE AFFAIRS AGENCY
(by direction of the Executive Director)



LAWRENCE KATKIN, President
DYNAMIC RESEARCH CORPORATION
Dated: 9/11/79
IRS Identification No. 92-0071645
Alaska Business License Applied For



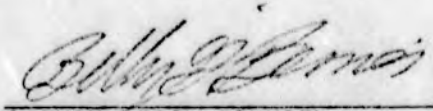
MYRTON R. CHARNEY
LEGISLATIVE AFFAIRS AGENCY
Dated: 9/14/79

Accepted:

Approved as to form:



REP. BRIAN ROGERS
SUSITNA STUDY COMMITTEE
Dated: 9/11/79



AGENCY LEGAL COUNSEL
Dated: Sept 14, 1979

SCOMM

#44:26

DETAILED WORK PLAN

Electricity Requirements for the Railbelt

A Study for the House Special Committee And the Alaska Power Authority

Scott Goldsmith
Assistant Professor of Economics
Institute of Social and Economic Research

November 14, 1979

(comments welcome)

Task A. Methodological Review and Data Collection

Subtasks

1. Review existing models of Alaska economy for applicability to projecting relevant economic variables for electric power demand analysis.
 - a. MAP econometric model
 - b. State of Alaska, Department of Commerce and Economic Development, Econometric Forecasting Model
 - c. State of Alaska, Department of Labor, Econometric Forecasting Model
2. Review alternative potential economic projecting techniques.
 - a. Extrapolation
 - b. Input-output model
 - c. Economic base model
 - d. Harris regional model
 - e. Delphi technique
-  *3. Choose a projection technique and document both its strengths and weaknesses as well as those of economic projections in general.

* Indicates a written product

4. Review methods for projecting the level of electricity consumption within a region.
 - a. Extrapolation
 - b. Econometric analysis
 - c. End-use analysis
5. Review the existing studies of electric power requirements for the railbelt and other parts of Alaska.

- a. Institute of Social and Economic Research, Electric Power in Alaska 1976-1995
- b. Alaska Power Administration, Alaska Power Survey, 1976
- c. . Upper Susitna River Project Power Market Analyses, 1979.
- d. . Devils Canyon Status Report, 1974
- e. Southcentral Alaska Water Resources Study, Electric Power Needs Assessment, 1979
- f. Battelle Pacific Northwest Laboratories, Alaskan Electric Power 1978
- g. U.S. Corps of Engineers, Susitna River Basin Feasibility Study, 1976

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- *6. Choose a load growth projection technique and document its strengths and weaknesses.
 7. Collect annual electricity consumption data by user type from Alaska Public Utilities Commission and Federal Energy Regulatory Commission filings for the following utilities:
 - a. Chugach Electric Association
 - b. Anchorage Municipal Light and Power
 - c. Golden Valley Electric Association
 - d. Fairbanks Municipal Utility System
 - e. Cordova Public Utilities
 - f. Copper Valley Electric Association
 - g. Homer Electric Association
 - h. Matanuska Electric Association
 - i. Seward Electric System

This will include total consumption, number of customers, average price, large consumers, and usage by all-electric homes.

8. Collect electricity consumption data from the military for railbelt facilities. This will include:
 - a. Elmendorf Air Force Base
 - b. Fort Richardson Army Base
 - c. Eilson Air Force Base
 - d. Fort Wainwright
 - e. Clear Air Force Base
 - g. Greely Air Force Base

9. Collect electricity consumption data from existing industrial consumers of electricity who presently generate their own power and energy consumption data from industrial consumers of energy who could potentially switch to electricity consumption should conditions warrant such a change. These users would include:
 - a. Refineries
 - b. Pipelines
 - c. LNG plants
 - d. Ammonia-Urea producers
 - e. University of Alaska
 - f. Others as identified during the course of the study
10. Collect data from various sources on the number of households in the railbelt, type of space heating and other major appliances in use, age distribution of the housing stock, other quality characteristics, and space heating requirements. Data sources will include:
 - a. 1960-1970 Census
 - b. 1975 Anchorage Housing Survey
 - c. Real estate industry sources
 - d. National Association of Homebuilders
 - e. Anchorage Borough
 - f. Matanuska-Susitna Borough
 - g. Fairbanks Borough
 - h. Kenai Borough
 - i. Anchorage Natural Gas Utility
 - j. Electric Utilities
 - k. University of Alaska Cooperative Extension Service
 - l. End-use studies conducted in other states and regions
 - m. Other sources which are identified during the course of the study
11. Collect economic data necessary to update economic component of MAP econometric model through 1978. Sources of this data are Alaska Department of Labor and Bureau of Economic Analysis of U.S. Department of Commerce.
12. Collect time series data on relevant economic, social, and other variables necessary for econometric analysis of demand for electricity in railbelt. In addition to data collected under sub-task A.1., this would include:
 - a. Heating-degree days
 - b. Price of alternative fuels--gas, fuel oil
 - c. Personal income
 - d. Population
 - e. Employment

ask by us
under what
conditions, price,
would they
switch?

-  *13. Write a report indicating the sources of all data collected as well as the possible uses and limitations of that data.

Task B. Economic Model Specification

Subtasks

1. Add 1978 economic data to the MAP statewide econometric model data base within TROLL.
2. Calculate 1978 values for gross state product by industry for incorporation within the model.
3. Investigate the potential for updating the income tax sector of the state revenue component of the model.
4. Reestimate wage rate, gross product, and employment by industry equations as well as price and personal income equations with new data.
5. Test the validity of the updated version of the model through statistical analysis of the individual equations and the behavior of the simulations.
6. Make changes in model specification necessitated by structural change in the Alaskan economy.
7. Calibrate the model with updated startup values and exogenous variables.
8. Extend the exogenous data series to the year 2005.
9. Evaluate the validity of the economic projections on the basis of analysis of the most important and critical variables and relationships within the model. These include:
 - a. The ratio of residentiary employment to basic sector employment
 - b. Migration response to economic activity in the state and nation
 - c. Labor force participation rate and unemployment rate
 - d. Growth of and size distribution of real wages
 - e. Relationship between government expenditures and employment
 - f. Relationship between private sector economic activity and government spending



- *10. Prepare a report documenting the changes made to update the state model and the results of the analysis of the plausibility of model output, including sensitivity to model structure and assumptions.
- 11. Test the validity of the MAP regional econometric model in allocating the level of statewide economic activity to the existing regions utilized within the MAP regional model. This will be done on the basis of ex-post simulation of the recent past.
- 12. Adjust the population allocation mechanism or other equations as necessary in the regional economic model to produce satisfactory tracking results for the recent past.
- 13. Develop a procedure for allocating the economic activity within the Southcentral Region of the state as defined in the MAP econometric model to the following subregions:

- a. Greater Anchorage market
- b. Greater Fairbanks market
- c. Valdez-Glennallen
- d. Non-railbelt
 - 1) Kodiak
 - 2) Seward?
 - 3) Other small communities not linked to public electric utilities

This procedure will be based upon a historical analysis of the relative growth rates of employment in these subregions.

- 14. Validate this technique where possible by independent analysis of the growth patterns and prospects of these subregions.
- *15. Prepare a report documenting the theory underlying the allocation method chosen as well as a description of that method itself.

Task C. Economic Projections

Subtasks

1. Review the input scenarios developed for previous projects utilizing the MAP econometric model, in particular the Southcentral Water Study.
2. Update the input scenarios for the basic sectors and develop three scenarios which can be described as follows:
 - a. A low case which is, in the judgment of the authors, the least likely possible level of future exogenous economic activity in the state
 - b. A high case which is, in the judgment of the authors, the highest likely possible level of future economic activity in the state
 - c. A likely case which, in the judgment of the authors, is the most likely level of future economic activity.
3. Develop updated projections of petroleum revenues and state and local government expenditure patterns in response to both population growth and revenue availability. Examine three cases of state government growth.
 - a. Growth at an exogenous rate
 - b. Growth related to population increase
 - c. Growth related to availability of revenues
4. Use the input scenarios to generate projections of Alaskan economic activity using the MAP model.
5. Test the relative sensitivity of the economic projections to variation in both individual components of the basic sector input scenarios and the government spending scenarios.
6. Hold a workshop at which the projections as well as the input scenario assumptions for the basic sectors and the government sector are presented to the Project Director and to invited experts.
7. Revise the input scenarios on the basis of comments received at the workshop.
8. Using the MAP model, generate economic projections for the statewide economy on an annual basis through the year 2005. Also generate projections for the three railbelt areas indicated under Task B.12. Nine projections will be obtained combining the assumptions of C.2. and C.3.

- *9. Document the input scenarios and the economic projections as well as the sensitivity of projections to variation of input scenario assumptions.

Task D. Assessment of Interfuel Substitution Possibilities

Subtasks

1. Review the literature on econometric studies of electricity demand (load).
2. Assess the value of such studies and appropriateness of such a technique in the estimation of electricity load for the railbelt.
3. Utilizing an econometric procedure, analyze the price and income elasticity of residential electric power requirements in the railbelt area. This must utilize a time series analysis because of the lack of data to do a cross-section analysis. The Institute previously attempted a cross-section econometric analysis with limited success. This is documented in "Future Electricity Requirements in Alaska," by Scott Goldsmith. Based upon that analysis, the most important variables will likely be electricity price, natural gas price, income, and heating-degree days.
- *4. Report and interpret the results of this analysis.
5. Develop "econometric-end-use" model to be used in forecasting residential and commercial railbelt electricity load requirements (see attached article by Robert W. Shaw). The essential feature of the model is the end-use detail which is explicitly incorporated within the analysis. This approach offers the advantage of being able to evaluate the effects of a large variety of factors in addition to price on electricity requirements. Policy-regulatory factors and technical factors causing demand to change can be considered. The problem with such a model lies in the amount of data necessary to implement the model.

The idea behind such a model is that electricity use is a derived demand--derived from the demand for end uses which electricity as well as alternative fuels or conservation can meet. To determine electricity requirements, one must calculate the number of electricity-using appliances and the amount of electricity consumed in each. The most important factors in this analysis include:

- a. Population
- b. Income
- c. Initial capital stock
- d. Age of capital stock
- e. Price of electricity and alternate fuels
- f. Relative efficiency of new additions to capital stock
- g. Utilization rate of capital stock
- h. Economic structure
- i. Regulations restricting the free choice of alternatives

The basic model structure is presented diagrammatically as Figure 1.

- 6. For each of the three areas of the railbelt indicated in Task B, develop a base line inventory of existing end-use patterns in the residential, military, and commercial markets.
 - a. Number of housing units, distribution by type, distribution by age
 - b. Square feet of floor space and insulation properties by type and age and trends over time
 - c. Average household size and trends over time in this parameter
 - d. Electricity residential hookups relative to households and trends
 - e. Vacancy rate of housing stock
 - f. Depletion rate of housing stock
 - g. Average and incremental percentage of consumers by housing type utilizing electricity, gas, oil, wood, coal, and propane for space heating
 - h. Saturation levels and percentages supplied by electricity for modern cooking, refrigeration, clothes drying, water heating, and other appliances
 - i. Electricity consumption per unit in as much detail as possible
 - j. Number of commercial units (nonresidential apartments, etc.)
 - k. Square feet of floor space and insulation properties of buildings as well as trends over time
 - l. Historical relationship between income, households, population, and commercial space
 - m. Commercial vacancy rates and depletion rate
 - n. Electricity use for space heating
 - o. Electricity use for other activities
- 7. Develop parameters for estimating the saturation levels and rates of growth to those levels of:
 - a. Electricity hookups
 - b. Modern space heating
 - c. Modern cooking facilities
 - d. Modern refrigeration facilities
 - e. Modern clothes drying facilities
 - f. Small electric appliances

Figure 1. Electricity End-Use Model

$$\begin{aligned} \text{RESIDENTIAL ELECTRICITY REQUIREMENTS AT TIME } T \text{ (KWH)} = & \sum_i \left[\text{INITIAL HOUSING UNITS TYPE } i * (1 - \text{RATE OF SCRAPPING } i)^T * \left\{ \left(\% \text{ OF INITIAL UNITS } i \text{ WITH ELECTRIC APPLIANCE } j, \right. \right. \right. \\ & \left. \left(\text{AVERAGE ELECTRICITY CONSUMPTION IN APPLIANCE } j \text{ IN UNITS IN INITIAL HOUSING TYPE } i \text{ (KWH)} \right) * (1 - \text{CONVERSION RATE TO NON-ELECTRIC APPLIANCE } j)^T + \right. \\ & \left. \left. \left(\text{SATURATION FUNCTION FOR APPLIANCE TYPE } j \right) * \left(\% \text{ OF INCREMENTAL APPLIANCES OF TYPE } j \text{ FUELED BY ELECTRICITY} \right) * \left(\text{AVERAGE ELECTRICITY CONSUMPTION IN INCREMENTAL APPLIANCE } j \text{ IN INITIAL HOUSING UNITS TYPE } i \right) \right\} \right] \end{aligned}$$

i = SINGLE FAMILY
DUPLEX
APARTMENT
TRAILER

j = space heat
water heat
refrigeration
cooking
clothes drying
other

$$+ \left\{ \left[\frac{\text{POPULATION AT TIME } T}{\text{AVERAGE SIZE OF HOUSEHOLD AT TIME } T} \right] - \left[\frac{\text{INITIAL HOUSING UNITS}}{\text{AVERAGE SIZE OF HOUSEHOLD AT TIME } T} \right] * (1 - \text{RATE OF SCRAPPING})^T \right\} *$$

$$\sum_i \left[\left(\% \text{ OF NEW HOUSING UNITS OF TYPE } i \right) * \sum_j \left\{ \left(\% \text{ OF NEW UNITS WITH ELECTRIC APPLIANCE } j \right) * \left(\text{AVERAGE ELECTRICITY CONSUMPTION IN APPLIANCE } j \text{ IN NEW UNITS } i \right) * \left(\text{SATURATION FUNCTION FOR APPLIANCE TYPE } j \text{ IN NEW HOUSING UNITS} \right) \right\} \right]$$

COMMERCIAL ELECTRICITY REQUIREMENTS AT TIME T (KWH) =

SAME FORMAT WITH AVERAGE BUILDING SIZE IN SQ FEET AN ADDITIONAL VARIABLE

8. Develop parameters for estimating the depletion rate of the housing and commercial building stock.
9. Develop parameters for estimating the scrapping rate for major appliances in the residential and commercial sectors.
10. Develop parameters for estimating the percentage of specific end uses which will be supplied by electricity as a function of price of electricity and other fuels. Different parameters will apply to the present stock of appliances and to the new stock.
- *11. Write a report summarizing the base line study, describing the model, and indicating the sources for all parameter and variable estimates.

Task E. Electricity Use Projections

Subtasks

1. Inventory the present level of industrial and other non-residential or commercial (such as government) electricity consumption in the railbelt, both purchased and self-generated.
2. Develop assumptions for the growth in electricity consumption of these consumers.
3. Inventory present industrial and other residents presently consuming energy not in the form of electricity. Estimate the potential electricity load requirements of each.
4. Identify major commercial and industrial uses of electricity which may be technically feasible within the projection period and estimate the load requirements of each.
5. Develop a set of energy price scenarios which will be used in the determination of appliance saturation levels, relative percentages of different fuel-using appliances, and growth in energy use in the industrial sector.
- *6. Write a short report describing these price scenarios.

7. Using the MAP econometric model and the end-use model developed under Task D, estimate electric power requirements for the residential and commercial components of the railbelt electricity market by five-year increments to 2005. Individual projections will be based upon the following sets of end-use assumptions:
 - a. Increasing saturation in appliance use, existing intensity of appliance utilization, and moderate increases in the prices of coal and natural gas relative to oil (approaching BTU parity). This implies an increase for Anchorage in the relative price of natural gas space heating. For Fairbanks, the outcome is less clear because of the alternative electric power generating modes possible for the community.
 - b. Conservation in intensity of use in new installation based upon presently available technology, increasing saturation in appliance use, and same relative price assumptions as in (a).
 - c. High electricity-use case where electricity substitutes for other fuels where possible over time.
 - d. Low electricity use where alternatives substitute for electricity where possible.
8. Analyze the problem of attempting this type of price-sensitive end-use analysis over long time horizons when changes in relative prices of fuels may occur several times during the period and thus influence the appliance stock in ways different than if the time period had a fixed set of relative prices.
9. To these projections, add military and industrial load requirements, divided into probable purchased and produced components to obtain total load requirements.
10. Using the end-use model, analyze additional special cases as indicated by other components of the study.
11. Separately estimate on the basis of a simplified version of the end-use model the requirements of electricity consumers not connected to the present or projective grid.
- *12. Prepare a report describing the analysis carried out under this task and the results.

Task F. Assess Projection ProbabilitiesSubtasks

1. Identify the range of electric power requirements forecasts based upon the previous analysis.
2. Develop a subjective probability distribution for the forecasts.
3. Identify those specific assumptions regarding economic growth and electricity use growth which are most sensitive to the load growth forecast.
4. Choose a forecast which appears the most probable.
- *5. Prepare a report describing this sensitivity analysis.

Task G. Prepare Final ReportSubtasks

1. Present study results to legislative committee as directed by the Project Director.
- *2. Write summary report in nontechnical language presenting principal findings and conclusions of study.

New Factors in Utility Load Forecasting

By ROBERT W. SHAW, JR.

LOAD forecasting is the cornerstone of all utility planning. To provide useful input to facility and financial planning, utility load forecasters must be able to project electric energy sales and peak loads fifteen or twenty years into the future. Yet load forecasting has become an increasingly difficult challenge as social, economic, demographic, and political forces converge to form an ever-changing pattern of complexity. The relatively primitive trend line forecasting methods of past decades — which were adequate in their time — are today being replaced with more sophisticated approaches needed to cope with the “new factors” which the forecaster must address.

Two general load forecasting approaches are currently in widespread use in the utility industry: (1) econometric models, and (2) end-use (or engineering) models. Econometric models rely on historical data and statistical techniques to forecast future use of electric energy — in the aggregate for a service area or by customer class — as a function of the price of electricity, the price of alternate energy sources, population,

personal income, and other economic-demographic variables. These models are based on the assumption that customer response to changes in these variables will be the same in the future as it was in the past. They cannot deal explicitly with factors such as technological change or regulatory initiatives other than those affecting prices.]

The author suggests that the deficiencies in two existing general approaches to utility load forecasting — econometric models and end-use engineering models — may be corrected through a combination of the best features of both. The utility load forecaster would, as one result, be given greater flexibility in assessing the many factors with which he is confronted. This article identifies many of those factors — which constitute a changing forecast environment — and provides a schematic description of the kind of econometric end-use forecasting approach proposed by the author.



Robert W. Shaw, Jr., is a vice president of Booz, Allen & Hamilton Inc., where he manages the firm's technical and planning practice for electric utilities. He has directed projects on load forecasting, corporate planning, and technology assessment. Dr. Shaw received his PhD degree in applied physics from Stanford University, a Master's degree in electrical engineering, and a Bachelor's degree in engineering physics from Cornell University. He is serving as executive director of the Electric Power Research Institute's utility modeling forum.

End-use models build a forecast on detailed information regarding the way electric energy is used in each consuming sector of the utility's service area. Although these models frequently suffer from a severe lack of data, they do provide a way to deal with the multitude of factors which can cause end-use patterns to change. These models have a serious drawback, however, in that they usually do not explicitly consider the effect of price on the consumption of electricity. This is not an essential flaw in the model structure, but merely an indication that forecasters have not yet pushed the modeling art far enough.

Econometric End-use Forecasting Models

To correct the deficiencies in both general approaches and give the utility forecaster greater flexibility in addressing the new factors he must consider, a forecasting approach which combines the most important features of both econometric and end-use models has been suggested. The basic elements of the method are shown in Figure 1 (this page). In simplified terms, the forecast of electric energy consumed during a particular year is the product of the number of utility customers (disaggregated into categories such as residential, commercial, industrial, etc.), the number of electricity-consuming devices that each customer has connected to the grid, and the amount of electricity consumed by each device during the year. Econometric relations are developed to describe the projected change in these three basic components as a function of price and other economic and demographic variables. This type of "econometric end-use models" has recently been used by several utilities to improve their forecasting capability.

The econometric end-use model is simple to describe in concept but much more difficult to execute in practice, because it requires an extensive data base defining the structure of end-use patterns in detail. Very few utilities have such a data base at their disposal. The first and most challenging task in the forecasting effort is to assemble and refine the necessary data over a period of years.

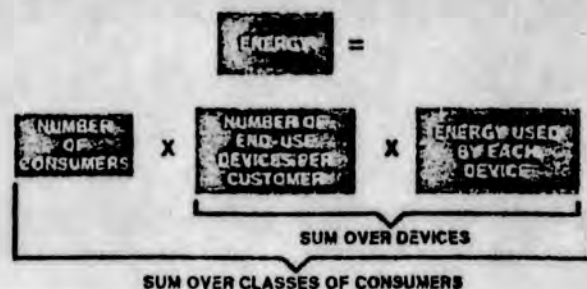
Once the end-use data have been assembled, price and income effects are built into the model — as indicated schematically in Figure 2 (page 21). The econometric methods used in the analysis are essentially identical to those used in market-penetration models. The models describe how the number of different devices used by customers in each sector depends on: price of electricity, prices of alternative fuels that could operate comparable devices, marketplace price of the devices, income (personal or corporate), and characteristics of the sector; i.e., for the residential sector, number of persons per household.

The final step is to develop models such as those illustrated in Figure 3 (page 22) which link the amount of energy consumed by typical devices with:

- The price of the electricity used to run them
- The income of the user
- The efficiency of the device
- The characteristics of present or planned load management programs
- Other socioeconomic and technical variables.

This schematic and highly simplified description of the econometric end-use forecasting approach masks the complexity of the models involved and gives little indication of the extraordinary level of effort required to assemble the necessary data base. To overcome these problems in the early stages of forecast development, the level of disaggregation used in the models can be tailored to fit the data base available. In later years, as

FIGURE 1
AN ECONOMETRIC
END-USE MODEL COMBINES
THE BEST FEATURES OF BOTH



the data base expands, the level of disaggregation can be increased.

The Changing Forecast Environment

The econometric end-use approach to utility load forecasting has the capability to deal with the changing social and economic environment which influences load growth. The "new factors" which characterize this uncertain environment were of little importance in the past, but they must now be taken into account if forecasts of electric energy consumption and peak demand are to be useful in utility decision making. These new factors fall into three generic groups: policy-regulatory factors, technical factors, and economic-demographic factors.

Policy-regulatory factors include fuel price and use controls, efficiency standards, mandatory conservation regulations, load management programs, incentives to adoption of alternative technologies, and changes in rate structure. Changes in policies and regulations can occur at almost any time, taking the forecaster by surprise, and sometimes causing an immediate impact on load growth.

Technical factors, on the other hand, are easier to deal with because changes in technology typically do not penetrate the market very rapidly. Technical factors important to load forecasting include: new end-use devices, improved efficiency of traditional devices, dispersed energy supply technologies (such as solar heating or cogeneration), and new systems for load control and management.

Sometimes these first two categories overlap. For instance, technical advances in solar heating may occur over time, but the use of solar heating may be accelerated by economic incentive mechanisms and government-supported research and development. A similar relationship exists with technical achievements in appliance efficiency, and government-imposed efficiency standards.

Economic-demographic factors also are important to accurate load forecasting. Like technical and policy developments, regional economic and demographic characteristics are changing more rapidly than they did in the past. These factors can best be addressed by constructing a regional economic-demographic model of

a utility's service territory, accounting for population shifts, employment, personal and corporate income, etc. Such models are difficult to create and specify, but they have been built and they work reasonably well.

New Factors Affecting Residential Load Growth

For the remainder of this discussion, we shall assume that a state of the art regional model exists and produces acceptable forecasts of population, employment, and so on in the utility's service area. Our major concern will be to examine specific new factors in the areas of policy regulation and technology as they impact the residential, commercial, and industrial components of a utility's load and energy sales.

There are many new factors which could affect residential load growth over the rest of this century, including improvements in the efficiency of buildings and appliances, greater use of solar heating systems, load management programs, and new energy-consuming devices.

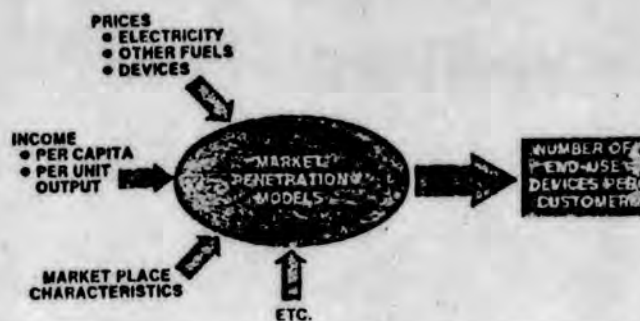
Building Shell Efficiency Improvements. The recently legislated National Energy Act (NEA) requires utilities to help home owners install improved attic and wall insulation, caulking, weather stripping, etc., to decrease heat loss from their homes. Technically it is feasible to make the typical residential building far more efficient than it currently is — reductions in energy use by factors of two or three are possible. The economics of various levels of improvements are the subject of much debate. The results depend strongly on regional differences and on assumptions regarding fuel price increases. It is generally accepted that a modest investment in ceiling insulation, for example, can lead to a significant energy savings (up to 25 per cent of the heating load) and pay off in a year or two.

These NEA provisions could lead to a substantial near-term reduction in utilities' electric heating loads — though perhaps less than has been suggested because electric homes are typically quite efficient already. To account for this effect in its forecast, the utility would have to monitor the number of retrofit installations in its service area, conduct measurements to determine the average reduction in energy use per building, and project the eventual saturation level of retrofit installations. It also would be desirable to obtain data on the energy efficiency of new homes in the service area.

Appliance Efficiency. Appliances are a major component of residential electric load. The NEA mandates improvements in the efficiency of major appliances, but the standards will not become effective for several years. To account for these future appliance efficiency improvements, the utility forecaster must differentiate between old and new appliances after the early 1980's, and develop new data on electric consumption levels for the new appliances which enter the market.

Although the use of more efficient appliances will tend to decrease energy consumption, net energy use will increase if people continue to buy more and more electricity-consuming devices. The introduction of

FIGURE 2
MARKET MODELS CAN BE USED
TO PROJECT HOW MANY END-USE
DEVICES THERE WILL BE



entirely new devices — such as electric vehicles — could also result in sharp growth of electric energy sales. The consequences of an increasingly electrified economy must be accounted for in the load forecast, as new electricity-consuming devices enter the marketplace over the next few decades.

Solar Heating Systems. Another factor of concern to utility forecasters is the market penetration of solar heating systems. Although solar heating currently is not economical in most parts of the country, it is possible that the NEA's solar incentives coupled with rising fuel prices could cause significant market penetration of solar heating systems within the next decade. In many cases the backup for solar heating systems will be electric. As a result, it is conceivable that increased use of solar systems could reduce electric energy consumption on an annual basis, but exacerbate the peak-load problems.

To account for increased use of solar heating systems, the forecaster must use market models to predict how rapidly solar technology will penetrate the service area, as a function of various price and policy factors. Measurements must be made to determine the annual electric energy consumption — and the impact at peak — of solar systems with electric backup. A similar approach can be used to account for the possible introduction of passive solar designs in new homes.

Load Management. While increased use of solar heating systems may be detrimental to utilities' load factors, improved load management programs will likely offset these effects and benefit the entire utility industry. A variety of schemes has been recommended to help flatten the load duration curve, ranging from ripple controls on water heaters to time-of-day rates. Many of these schemes are being tested now, and there is already evidence that poorly designed load management programs can have adverse effects on load shape. For example, time-of-day rates can lead to a new and even higher peak in the hour after the peak rate ends, if there is no "shoulder" rate.

Dealing with load management options in the forecast is extremely difficult, because little data are available to help predict how customers will respond to load management efforts. It is important, therefore, for utilities to gather and disseminate data from the

experiments which are now being conducted. These data will help predict the average usage rate per controlled appliances; the impact of storage, feedback meters, etc., on usage levels; and response of customers to various rate structures.

In principle, the econometric end-use forecasting model has the flexibility to deal with both rate changes and engineering-oriented load management options. The problem is lack of data; but this problem should be resolved as the results of ongoing experiments are disseminated, and new experiments are initiated. The importance of load management cannot be overstated. Improved load management means more efficient use of the industry's capital stock — its generating plants and transmission lines — and that is good business.

New Factors Affecting Commercial Load Growth

The nonmanufacturing or commercial sector often represents the fastest-growing component of load in a utility's service area. Yet it is the most difficult component to deal with in forecasting, because it includes a broad spectrum of customers — ranging from restaurants, to shopping centers, to high-rise office buildings — using energy in a variety of ways.

The new factors which could have a major impact on commercial sector load growth include building efficiency standards, dispersed energy sources, and improved equipment efficiency.

Building Efficiency. Among the conservation-related provisions of the National Energy Act are standards to improve the energy efficiency of commercial buildings. These standards, which are not expected to be in place until the mid-1980's, will not have an immediate effect because the building stock turns over slowly. In the long run, however, the impact of these standards on load growth may be substantial, reducing the energy consumption of new office buildings by a factor of two or more. Even now, many states are in the process of adopting the voluntary ASHRAE 90-75 standard, and advanced building-design concepts are being developed with the aim of attaining even greater reductions in the energy consumption of new buildings.

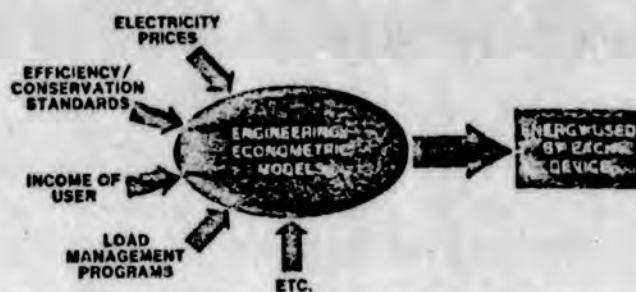
Dispersed Energy Sources. Not only are commercial buildings the prime targets of new energy-efficiency standards, they are also attractive candidates for pioneering the use of dispersed energy sources, including solar heating and cooling, total energy systems, and fuel cells. These innovations may penetrate the market rapidly, particularly if the commercial sector becomes subject to interruptible service as part of state or federal load management policies. There are two crucial issues which the forecaster must address in dealing with these new sources:

- The penetration rate of each type of device on a standard industrial code specific basis
- The impact of each device on the utility's load, particularly at the peak.

To account for the possible introduction of dispersed

FIGURE 3

ENGINEERING/ECONOMETRIC MODELS CAN BE DEVELOPED TO PROJECT CHANGES IN CONSUMPTION OF VARIOUS DEVICES



energy sources, the utility load forecaster must construct market models to estimate penetration rates, based on historical experience with similar new technologies (such as central air conditioning). Load profiles for the new devices will have to be established through field measurements of early users.

Equipment Efficiency. A third factor important in forecasting commercial sector load is the improved efficiency of lighting, office machines, compressors, pumps, commercial ranges and ovens, and other equipment. The approach used in dealing with these efficiency improvements is similar to forecasting the impact of appliance efficiency improvements in the residential sector, but is complicated by the heterogeneity of commercial sector users.

The commercial sector will also be influenced — perhaps more strongly than the residential sector — by changes in the way electricity is priced, and by the prices of competing energy sources. Econometric models which incorporate price explicitly into the penetration and consumption models — for both current and future end uses — are of particular importance in the commercial sector. The same point holds true for the industrial sector.

New Factors Affecting Industrial Load Growth

Projecting load growth in the industrial sector is complicated by three factors. When a new industrial facility locates in the service territory, or leaves it, the load can change by a large increment at one time. Also of importance is the fact that industrial energy use is strongly dependent on the health of the national economy — it was the industrial load that dropped most sharply in the recession that followed the 1973 oil embargo. A third factor is that fuel shifting and process changes, initiated for economic or regulatory reasons, can create large new loads in a short time period.

In order to understand better their industrial load, most utilities are moving toward highly disaggregated industry (or plant) specific forecasting techniques. These techniques address end uses at the process level, and account for industrial output in the service territory as a function of national as well as regional economic

indicators. Once these models are in place, it is a relatively straightforward task to deal with new factors such as energy conservation standards, process efficiency improvements, regulations constraining the use of oil and gas, and alternative energy sources.

Energy Conservation Standards. Although the federal government has promulgated a set of energy-efficiency targets for the ten most energy-intensive industries, compliance is still voluntary, and may remain so. Industry's primary concern is not the cost of energy, but the certainty of supply — the efficiency of end use is of secondary importance. Thus in order to pursue conservation targets, industries may switch to electricity-based processes, shifting the burden of inefficient fossil fuel conversion to the utility.

Process Efficiency. Improvements in process efficiency, although part of the overall conservation effort, warrant special attention because they are the focus for substantial research and development effort on the part of both industry and the federal government. Dealing with process efficiency improvements is not much different, in principle, than examining the efficiency of specific appliances in the residential sector. Because there is so much room for process efficiency improvements in most industries, it behooves the utility forecaster to disaggregate his models to the point where these improvements can be captured when there is evidence that they are occurring.

Coal Conversion. A highly disaggregate model is also desirable in order to capture the influences of new NEA-mandated regulations providing for industrial use of coal instead of oil or gas. In many cases, industrial users may choose to convert to electric energy rather than cope with the problems inherent with coal use, including environmental effects and supply uncertainties. As with process efficiency improvements, a highly disaggregated end-use model is essential if these effects are to be addressed correctly in the forecast.

Alternative Sources. The NEA also provides incentives for industrial use of cogeneration, as well as for the use of solar energy, geothermal resources, and other advanced technologies. Increased use of such technologies could reduce electric energy sales to the industrial sector significantly. Again, detailed end-use models — reflecting specifically the potential for use of alternative sources in industrial process applications — will be necessary to account for switchovers in the load forecast.

Limitations of Models

This discussion has stressed the use of analytical models to address the new factors affecting electric load growth. It is important, however, to remember that models are only a tool. They are intrinsically:

- Nothing more than a systematic way to structure the available data and information about a situation. They can in no way transcend the data used to create them, although they may occasionally help the forecaster to discover relationships which were not intuitively evident.

- Limited by the "boundaries of the modeler's understanding"* of what is happening in the world around him. If he does not know, for example, how customers will respond to changes in regulation or technology based on past experience, then models cannot help the forecaster out of the bind imposed by his ignorance.

The art and science of load forecasting will have taken a major step forward when it progresses to the point where accounting — in an explicit way — for the types of factors discussed here is truly feasible. But the challenge of trying to foresee what new factors — beyond those we already envision — will emerge in the years ahead is even more forbidding. Unfortunately, anticipating basic changes in the course of society is something that no utility forecaster will ever be able to do. The tool of sensitivity analysis, which can help him address the "what-if" questions, is perhaps the most effective way of assessing the potential impacts of events such as new regulations or potential technological breakthroughs on load growth.

Dealing with the new factors affecting load growth requires a commitment on the part of utility managers to the development of analytical tools and the data necessary to understand what is going on in the service territory, and to specify the forecasting models. It is legitimate to ask if the investment in data and models is worth the return. There is no simple answer to this question. The returns from improved forecasting come both in reduced levels of uncertainty and in a better understanding of the potential impacts which various futures could have on the utility. Only senior management can decide when an incremental improvement in its perspective on the future is outweighed by the marginal cost of achieving it.

*"Electric Load Forecasting: Probing the Issues with Models," EMF Report 3, Vol. 1, Energy Modeling Forum, Stanford University, Stanford, California, April, 1979, p. 7. EMF is sponsored by the Electric Power Research Institute.

Telecommunications Policy Conference: Call for Papers

The eighth annual Telecommunications Policy Research Conference (scheduled for spring, 1980) will provide a forum for analysis and discussion of important telecommunications policy issues. Participants will include researchers and policymakers from academia, government, and industry. Those engaged in research which has implications for telecommunications policy are invited to submit abstracts (500 words or less) by December 1, 1979. Authors of papers selected for presentation at the conference will be reimbursed for travel and conference living expenses if no alternative source of funding is available. Please send abstracts to: TPRC Organizing Committee, c/o Robert Dansby, American Telephone and Telegraph Company, 195 Broadway, Room 1942B, New York, N. Y. 10007.

ALASKA CENTER FOR POLICY STUDIES

204 E. 5TH AVE., SUITE #201, ANCHORAGE, AK 99501 (907) 272-6113

November 15, 1979

ALTERNATIVE ENERGY/CONSERVATION STUDY

for the

HOUSE POWER ALTERNATIVES STUDY COMMITTEE

Phase II: Workplan for
Reconnaissance Study of Conservation and Renewable
Resource Potentials

- Part 1. End Use Structure.....Alaska Federation
a. Residential for Community
b. Commercial Self-Reliance
c. Industrial
d. Transportation
- Part 2. Conservation Potential.....Alaska Federation
for Community
Self-Reliance
- Part 3. Alternative Energy Source
Potential.....Mark Fryer and
Associates
a. Geothermal
b. Waste Heat
c. Solid Waste
d. Wind
e. Wood
f. Hydro
g. Solar (active, passive,
and photovoltaic).....Rich Seifert,
Institute of
Water Resources
- Part 4. Implementation and Management
Considerations.....Alaska Public
Interest Research
Group
a. State law
b. State agencies
c. Utilities
d. Financing
e. Local government
f. Research & Demonstration
g. Values and attitudes
h. Marketing
i. Employment

Legislative Recommendations, January 7, 1980

Final Report, April 1, 1980

Part 1 - END USE STRUCTURE - Responsibility: Alaska Federation
for Community Self-Reliance.

The Federation will provide an analysis of the energy end use structure of the railbelt area. End use data for the north of the Alaska Range shall be gathered by the Federation, while data for the part south of the Range shall be gathered by ISER in cooperation with the Federation.

The Federation will estimate total regional energy consumption and break down this total according to the amounts of energy used in the various sectors. The sectors are:

- residential
- commercial
- industrial
- government
- military
- transportation

Within each sector are several subsectors. Depending on the data available, we will further break down the energy consumed in each sector to the appropriate subsector. We will identify sources of energy supply heat below 100 C and those which supply heat over 100 C.

The following sectors shall be investigated in the manner described:

Residential Sector - The Federation shall determine quantitative estimates for the energy end use structure broken into heat and electricity consumption. Subsectors such as space heat, water heat, lighting, etc, shall be and quantified as possible.

Information to be gathered will include: 1) number of housing units, broken down according to type 2) heating degree days, and 3) heating requirements for a standard house.

Commercial Sector - This sector includes retail stores, office buildings, hospitals, restaurants, and the like. The Federation shall determine quantitative estimates for the end use structure broken into heat and electricity consumption with subsectors such as space heat, water heat, lighting, etc, identified as possible.

Government Sector - End use structure will be analyzed in terms of heat and electrical consumption with subsectors identified as possible.

Industrial Sector - This sector includes manufacturing, mining, agriculture and construction as well as petroleum refining and other processes. The Federation will break down the end use structure according to type of industry and fuel sources required.

Military Sector - For the purposes of this study, the military reservations will be regarded as a totally independent entity with its own source and end use structure. Subsector breakdown of end use shall be provided as possible with information available from the reservations.

Generally, energy requirements of the subsector will involve educated "guesstimates." The Federation may base these "guesstimates" on energy intensities per square foot or intensities per employee.

Transportation Sector - The Federation will quantify vehicle miles travelled for Alaska automobiles, trucks, boats, buses, barges, airplanes, and the Alaska Railroad. Comparisons of fuel efficiencies will be made.

Work Product: Final Draft Report - January 15, 1980
Final Report - February 1, 1980

Part 2 - CONSERVATION - Responsibility: Alaska Federation for
Community Self-Reliance.

The Federation will identify ways in which to increase the energy productivity of the energy being applied to various tasks in the railbelt area. Concentration will be on "technical fixes."

The Federation shall:

- discuss energy use efficiency in terms of the Second Law of Thermodynamics.
- quantify current energy uses for performing certain tasks.
- identify opportunities to increase present efficiencies.
- estimate capital costs of implementing technical fixes to raise energy productivity (comparative economic advantages of different efficiency technologies will be estimated using methodology agreed upon and used commonly by all subcontractors).
- quantify the resultant increases in energy productivity.
- estimate the indirect benefits of conservation in terms of economic multipliers and the creation of new workplaces.

The Federation shall examine the conservation potential in each sector and provide quantitative estimates of potential savings. In the case of transportation, discussion of conservation will be limited to decisions that can be made in Alaska.

Work Product: Draft Report - February 15, 1980
Final Report - March 1, 1980

Part 3 - ALTERNATIVE ENERGY SOURCE POTENTIAL - Responsibility: Mark Fryer and Associates.

The work will analyze renewable energy resources along the railbelt:

1. Geothermal
2. Solar
3. Waste Heat
4. Solid Waste
5. Wind
6. Wood
7. Hydro

Three maps will be drafted, each containing renewable energy resource "opportunity" isolines (Solar, Wind, & Waste Heat). The isoline "opportunity index" for each resource map will contain:

- * Cost of non-renewable resource currently in use
- * Climate factors
- * Availability of renewable resource at current costs

The level of independence upon the non-renewable resource will be determined for each of the options examined. This analysis will be developed on a unit model basis, through the construction of generic and use consumption machines:

- * Residential model
- * Institutional model
- * Commercial model

Work Product:

- A. Draft Reports, due January 1, 1980, on;
 1. Small hydro, geothermal, tidal power, solid waste and waste heat
 2. Solar study
 3. Wood resources
 4. Wind Power
- B. Railbelt Map on Resource Potential, due March 1, 1980, for:

1. Wind
2. Solar
3. Waste heat

C.

Final Intra-Project Report on Alternate Energy
Sources Potential, due March 1, 1980

Part 4 - Implementation and Management - Responsibility: Alaska Public Interest Research Group (AkPIRG).

AkPIRG will address the management, regulatory, and legal issues presented by a program to encourage conservation and the use of alternative renewable energy resources, looking at the institutional and financial barriers to wider acceptance and use. Specifically:

1. State law. Alaska statutes and pending legislation will be analyzed to determine their effects on the acceptance of alternative energy sources and conservation efforts. In conducting this review, AkPIRG will examine the laws of other states and Canadian provinces/territories. Of particular concern will be:

- a) building codes and standards
- b) public facility procurement policy
- c) solar access rights
- d) waste heat recovery
- e) electrical efficiency standards

2. State agencies. Examine the organization, management, funding, and mandates of state agencies with responsibility for conservation or alternative energy. Review:

- a) level of coordination between agencies
- b) short and long range goals
- c) planning capabilities
- d) staffing and funding levels
- e) sensitivity to community needs

3. Utilities. Among other things, AkPIRG will consider:

- a) existing utility involvement in conservation and alternative energy programs
- b) implications of the National Energy Act
- c) role of the APUC

4. Finance Mechanisms. The how and who of paying for energy programs, including:

- a) private market
- b) government loans and subsidies
 - AHFC
 - APA
 - REA
 - other agencies and approaches
- c) tax incentives

5. Local government. Programs involving energy conservation and alternative energy may have to depend upon local governments to require better use of existing resources and to develop new ones. This may include building standards, zoning for cogeneration, or government-run winterization programs. We will look at communities of different sizes in different areas and climates of the railbelt.

6. Research and demonstration. Key to any Alaskan soft energy path will be R&D efforts to eliminate information gaps and demonstrate the viability of new approaches to heating and power generation. AkPIRG will:

- a) describe state R&D programs
- b) identify specific data problems
- c) suggest priorities for additional research
- d) identify needed pilot and demonstration projects

7. Values and attitudes. The perceptions of key energy players, including public officials, utility managers, financiers, builders, and consumers, have an important part in determining the availability of conservation and alternative sources of energy. AkPIRG will interview and survey these groups to determine their perceptions of the barriers to an effective soft energy path program for Alaska.

8. Marketing. If attitudes or lack of information are a barrier to the acceptance of conservation and alternative energy, new or expanded marketing efforts may be important. We will look at the type of marketing problems these energy approaches encounter and discuss possible responses.

9. Employment impacts. AkPIRG will undertake a review of the employment benefits of an aggressive solar and conservation program, as compared to more centralized, capital-intensive energy production strategies.

Work Product: The AkPIRG work relating to current, proposed and needed legislative modifications shall be provided in two parts. The first shall be completed on or before January 7, 1979. This part of AkPIRG's work shall be completed on or before January 7, 1979. This part of AkPIRG's work will consist of explicit legislative recommendations that can be embodied in legislation to be introduced during the 1980 session of the legislature. The final version of AkPIRG's work will include these recommendations as well as findings concerning other legislative modifications deemed appropriate.

These elements of AkPIRG's work shall be provided to the Center for inclusion in the overall report on or before March 1, 1980 for the drafts, and by March 15, 1980, for the final versions.

Janice Love

CSHB-364 Energy conservation policy

Utility law: utility payments for private home energy audits, insulation or home energy systems may be included in ratebase. Utilities may make loans from Alaska Energy ~~Ex~~ Conservation Bank. State pays 20 % of utility bill for residences meeting minimum energy efficiency standards & offers free audit and conservation loans to meet those standards. Utilities required to purchase excess electricity from on-site small power generators. Utility energy conservation information programs may be taken as tax credit to \$25,000. ~~XXXXXX~~

Financing Mechanisms. Alaska Energy Conservation Bank established. (Separate \$100 million appropriation bill). Makes loans for energy conservation improvements to homes and businesses. 9½ per cent interest. Guarantees loans made by banks, credit unions, savings and loans, and utilities subject to APUC jurisdiction to 95% of loan. Self-insures for fire and theft losses. Alaska Housing ~~xx~~ Finance Corp and regional housing authorities allowed to directly or indirectly finance energy conservation in housing. Energy conservation improvements include insulation, vapor barriers, thermal mass, on-site renewable energy production, weatherstripping, solar greenhouses, waste heat conversion. State accepts energy conservation lien against property as collateral if energy audit shows payback possible within 10 years. Businesses may expense/accelerated depreciate e.c. improvements.

Research and Development. State purchase of equipment for renewable energy and energy conservation research, including anemometers, pyranometers, geothermal drilling equipment, heat transfer testing equipment. Build by competitive bidding in each of 20 largest cities 4 prototype conservation houses - ~~xxxx~~ bidders eligible for no more than one per city and 10 total. Establishment of Alaska Center for Innovation to offer r&d consultation for Alaska and Yukon residents.

Marketing. State pays transportation costs to and within Alaska for energy conservation and renewable energy technology to equalize costs. Public radio and television programs on energy funded - perhaps series. State funding of additional cooperative extension/energy extension publications. DEPD may make grants to local organizations for renewable energy/energy conservation workshops, conferences, public meetings and demonstrations.

Information and Education: Funds for purchase by local, school, regional, or community ~~and~~ college and University libraries of energy libraries. Funds for energy information translations into Native languages, curriculum development, traveling energy shows, appropriate to Alaska. University research funded to include dissemination of results.

University of Alaska. Energy research endowment established, funded at \$25 million. Funds from endowment or income from endowment administered by A.C.S.T. for basic renewable energy resource, climatologic, energy conservation research. Energy experiment station, Arctic engineering experiment station established. Energy economist positions established at UAA and ISER. Compile ~~xxxx~~ ^{catalog} of local energy.

Emergency assistance: program of financial assistance including bulk fuel loans, free energy conservation materials and technical assistance for poor, employment and training of economically disadvantaged rural people, DOT/FF coordination with regional agencies and communities for planning and routing of energy conservation, renewable energy and emergency energy assistance.

Tax on waste heat of certain volume assessed on heat wasters. Tax credit allowed for waste heat recovery systems.



REVISED
RESEARCH PROPOSAL

TO

THE CENTER FOR POLICY STUDIES
ANCHORAGE, ALASKA

SOLAR ENERGY IN ALASKA'S RAILBELT
A BRIEF REVIEW OF ITS POTENTIAL

Richard D. Seifert
Institute of water Resources
University of Alaska
Fairbanks, Alaska

November 1979

The Problem:

The plan to build the Susitna Hydroelectric project has presented a series of political controversies to the state government. Because of the inevitable uncertainty surrounding the actual level of need for electrical energy in the future, it was decided that a study of the alternatives to hydroelectricity was in order. A specific component of those alternatives is solar energy. The possible (hypothetical) and probable levels of development of the solar component of energy use for Alaska's railbelt will be the focus of this study.

Results will be given for each type of solar energy in a "tally sheet" fashion according to its possible and probable application and contribution to railbelt energy requirements. Types of solar energy application to be analyzed and the end use they can best meet are listed below:

APPLICATION	END USE
1. Solar Energy in the Residential Sector	
a. Active space heating	Heat (< 100°C)
b. Active water heating	Hot Water (< 100°C)
c. Photovoltaic	Electricity
d. Passive space heating	Heat (< 100°C)
2. Solar Energy in the Commercial Sector	
a. Active space heating	Heat (< 100°C)
b. Active water heating	Hot Water (< 100°C)
c. Photovoltaic	Electricity
d. Passive solar heating	Heat (< 100°C)
e. Greenhouse agriculture	Food and Heat
3. Solar Energy in the Industrial Sector	
a. Heat applications	Heat, Hot water (< 100°C) Steam (> 100°C)
b. Photovoltaic	Electricity
4. Technically undeveloped or unproven concepts	(Varied)

It is important to recognize that solar energy best provides a synergistic source of energy when coupled with extensive and appropriate energy conservation measures. The two technologies used together are

FAIRBANKS

AK 64.82

THERMAL ANALYSIS

TIME	PERCENT SOLAR	INCIDENT SOLAR (MMBTU)	HEATING LOAD (MMBTU)	WATER LOAD (MMBTU)	DEGREE DAYS (F-DAY)	AMBIENT TEMP (F)
JAN	0.	2.35	28.60	2.72	2383.	-11.2
FEB	9.9	8.35	22.68	2.46	1890.	-2.2
MAR	32.1	17.40	20.65	2.72	1721.	10.4
APR	49.7	18.70	13.00	2.63	1084.	28.4
MAY	70.7	17.98	6.59	2.72	549.	46.4
JUN	95.7	17.08	2.53	2.63	211.	59.0
JUL	96.6	16.12	1.77	2.72	148.	60.8
AUG	73.0	13.83	3.65	2.72	304.	55.4
SEP	45.9	12.19	7.41	2.63	617.	44.6
OCT	17.0	9.09	14.82	2.72	1235.	24.8
NOV	1.6	5.20	22.40	2.63	1867.	3.2
DEC	0.	0.11	28.04	2.72	2336.	-11.2
YR	22.7	138.40	172.13	32.02	14344.	

ECONOMIC ANALYSIS

OPTIMIZED COLLECTOR AREA =	390. FT ²
INITIAL COST OF SOLAR SYSTEM = \$	12700.
THE ANNUAL MORTGAGE PAYMENT FOR 20 YEARS = \$	1530.
YRS UNTIL UNDISC. FUEL SAVINGS = INVESTMENT	9.
YRS UNTIL UNDISC. SOLAR SAVINGS = MORTGAGE PRINCIPAL	13.
UNDISCOUNTED CUMULATIVE SOLAR SAVINGS = \$	27652.
PRESENT WORTH OF YEARLY TOTAL COSTS WITH SOLAR = \$	101045.
PRESENT WORTH OF YEARLY TOTAL COSTS W/O SOLAR = \$	108571.
PRESENT WORTH OF CUMULATIVE SOLAR SAVINGS = \$	7526.

Table 3: An analysis of solar energy compared to electricity used for space heating and domestic hot water for a case in Fairbanks, Alaska, (GVEA electricity @ 8¢/kwh). The solar system would provide 22.7% of the total annual heat loads.

YR	INTRST PAID	END OF YR PRINC	DEPRC DEDUCT	PROP TAX PAID	INC TAX SAVED	BACKUP FUEL COST	INSUR, MAINT COST	COST WITH SOLAR	SAVNGS WITH SOLAR	PM OF SOLAR SAVNGS
0	0	4464	0	0	0	0	0	496	-496	-496
1	535	4402	0	99	222	391	49	915	-147	-136
2	528	4332	0	105	221	430	52	963	-118	-101
3	519	4254	0	111	220	473	55	1016	-87	-69
4	510	4167	0	118	220	520	59	1075	-52	-38
5	500	4070	0	125	218	572	62	1139	-14	-9
6	488	3961	0	132	217	629	66	1209	27	17
7	475	3838	0	140	215	692	70	1285	74	43
8	460	3701	0	149	213	761	74	1369	126	68
9	444	3548	0	158	210	838	79	1462	184	92
10	425	3376	0	167	207	922	83	1563	247	114
11	405	3184	0	177	204	1014	88	1674	317	136
12	382	2968	0	188	199	1115	94	1796	395	156
13	356	2727	0	199	194	1227	99	1929	480	176
14	327	2457	0	211	188	1349	105	2076	575	195
15	294	2154	0	224	181	1484	112	2237	679	214
16	258	1815	0	237	173	1633	118	2413	794	231
17	217	1435	0	252	164	1796	126	2607	921	249
18	172	1010	0	267	153	1976	133	2820	1061	265
19	121	533	0	283	141	2174	141	3054	1215	281
20	64	0	0	300	127	2391	150	3311	1385	297
YRS UNTIL UNDISC. FUEL SAVINGS = INVESTMENT									9.	
YRS UNTIL UNDISC. SOLAR SAVINGS = MORTGAGE PRINCIPAL									15.	
UNDISCOUNTED CUMULATIVE SOLAR SAVINGS = \$									7572.	
PRESENT WORTH OF YEARLY TOTAL COSTS WITH SOLAR = \$									15337.	
PRESENT WORTH OF YEARLY TOTAL COSTS W/O SOLAR = \$									17027.	

Table 2: This table shows the year-by-year economic analysis of a solar domestic hot water optimum system for Fairbanks, in Autumn, 1979. Physical and economic assumptions for this example are fully described in the text.

The following conditions and physical characteristics apply to this example:

Collector Tilt: 65°

Water use: 100 gal/day @ 140°F

Backup fuel costs: \$23.99 per million BTU (equivalent to GVEA
8¢/kwh electricity)

Amortization: 20 yr mortgage @ 12%

Cost/ft² collectors: \$30

No tax credit is considered.

The results of this optimization show the percentages by month which solar energy can economically provide for a Fairbanks residence. Note that a detailed economic analysis is possible using F-Chart. The results are presented in Table 2. These results can be matched if one considers both domestic hot water and space heat. The results of this type of simulation are shown in Table 3 for an average house of "1970" vintage, which requires 12000 BTU/°F-day for heating.

The results show that at \$30 per square foot for collector costs, 49% of the annual hot water load can be supplied from solar energy. For the case of solar energy for both space and hot water heating, the annual fraction is less impressive, approximately 22.7%. Both these examples do not include the effect of the present federal tax incentives which would result in bottom-line, first year credits of \$1,180 for the Table 1 case, hot water only, and \$2,200 the space heating and hot water example shown in Table 3. This will obviously decrease the payback period substantially, and makes the solar investment much more appealing.

The examples given are also easily adapted to commercial applications analysis, which will be done using F-Chart to show their competitive position, need for tax incentives, and probable end use effect as a percentage of space and hot water users.

The photovoltaic generation of electric power will be examined. When considering photovoltaic power, the only situations where stand-alone operation of a photovoltaic plant are likely to be possible are in modest, energy conservation houses in high solar radiation areas utilizing either individual or communal facilities for energy storage. In all other cases (in Alaska as well as elsewhere) some interconnection

essential to the satisfactory application of solar energy. Analysis of the solar component for Alaska's railbelt will necessarily assume a strong component of energy conservation. This is however, wholly in order for the study, and should also be reflected in the energy conservation report and other renewable resource analysis elements of this report, as they all are enhanced by energy conservation practices.

Tools available for modelling solar energy applications and their performance include the F-Chart and TRNSYS computer models. Data is available for Fairbanks, Summit (in Broad Pass), Matanuska (Palmer Ag. Station), Homer, Big Delta, and McGrath, for use with F-Chart. Tapes of the solar radiation data for hourly modelling using TRNSYS are available for Fairbanks, Barrow, Bethel, Matanuska, and Annette Island.

F-Chart enables the economic optimization of active solar energy applications by comparing their costs to the life-cycle cost of alternative and conventional fuels. One can also predict the monthly average performance of solar energy systems for heating and for domestic hot water. This information will be reported in the study.

The goal of this study is to determine the extent to which solar energy can substitute the present end-uses of energy in Alaska's railbelt, especially for space heating and hot water. For this reason it is essential that the economic projections from the Institute for Social and Economic Research be made available at the earliest convenience. At that point, using the economic projections as a basis, the rate of replacement of the housing stock can be estimated. This will be a key piece of information to enable calculation of the most probable rate of construction incorporating solar alternatives. It will do so for both active and passive applications. The economic optimization provided by F-Chart enables the quantification of the solar contribution given both as a total sum of BTU's and as a percentage of the total for an individual home or as a percentage of sectoral end use (i.e. all home space heating).

As an example of the type of detailed analysis that will be provided, included here is an optimization of domestic hot water heating using solar energy in Fairbanks, Alaska (Table 1).

FAIRBANKS

AK 64.82

****THERMAL ANALYSIS****

TIME	PERCENT SOLAR	INCIDENT SOLAR (MMBTU)	HEATING LOAD (MMBTU)	WATER LOAD (MMBTU)	DEGREE DAYS (F-DAY)	AMBIENT TEMP (F)
JAN	0.	0.80	0.	2.72	2383.	-11.2
FEB	27.7	2.83	0.	2.46	1890.	-2.2
MAR	69.5	5.89	0.	2.72	1721.	10.4
APR	80.6	6.33	0.	2.63	1084.	28.4
MAY	81.3	6.09	0.	2.72	549.	46.4
JUN	83.9	5.78	0.	2.63	211.	59.0
JUL	78.6	5.46	0.	2.72	148.	60.8
AUG	67.6	4.68	0.	2.72	304.	55.4
SEP	59.3	4.13	0.	2.63	617.	44.6
OCT	34.6	3.08	0.	2.72	1235.	24.8
NOV	5.1	1.76	0.	2.63	1867.	3.2
DEC	0.	0.04	0.	2.72	2336.	-11.2
YR	49.1	46.84	0.	32.02	14344.	

****ECONOMIC ANALYSIS****

OPTIMIZED COLLECTOR AREA =	132. FT2
INITIAL COST OF SOLAR SYSTEM = \$	4960.
THE ANNUAL MORTGAGE PAYMENT FOR 20 YEARS = \$	598.
YRS UNTIL UNDISC. FUEL SAVINGS = INVESTMENT	9.
YRS UNTIL UNDISC. SOLAR SAVINGS = MORTGAGE PRINCIPAL	15.
UNDISCOUNTED CUMULATIVE SOLAR SAVINGS = \$	7572.
PRESENT WORTH OF YEARLY TOTAL COSTS WITH SOLAR = \$	15337.
PRESENT WORTH OF YEARLY TOTAL COSTS W/O SOLAR = \$	17027.
PRESENT WORTH OF CUMULATIVE SOLAR SAVINGS = \$	1690.

Table 1: A thermal and economic analysis of solar energy for domestic hot water heating compared to Golden Valley Electric Association. Autumn, 1979, electricity rates (residential).

with the existing electric utility will likely be sought. In this study, the utility attitude, costs of solar photovoltaic electricity, and its future will be assessed conservatively. Presently the engineering firm of CH2M-Hill is conducting a study for the National Solar Energy Research Institute for applications potential in the Pacific Northwest Region, which includes Alaska. The results of this latest study will be analyzed and included in this study, as will information from the many studies of the U.S. Department of Energy.

Conjunctive Studies:

This is a proposal to provide a one component analysis in a study involving the many possible alternatives to the Susitna Hydroelectric Project. The projections of this (solar component) study are critically dependent upon timely and complete assessments of two other elements of the total study: The population/economic growth projections, and the energy conservation analysis. The proposer will need to use these data extensively and will need to have access to it quickly, as the deadline for submission of the report on the solar component is April 15, 1980. In addition, travel to organizational meetings to establish a communications network among the consultants for each element of the study is included in the budget (2 round trips to Anchorage).

Final Report:

A final report will be submitted on or before April 15, 1980. It will be suitable for submission to the legislature as an element of the Susitna Alternatives Study. It will include quantitative estimates of solar energy end use in the Alaskan railbelt area to the year 2001. Figures will be based on solar radiation data for Fairbanks, Homer, and Matanuska (Palmer), projections of economic and population growth such as building unit construction, energy prices, tax incentives, and other relevant information from the projections study, and the influence of several different scenarios of energy conservation.

Methodologies which will be employed include end use analysis, F-CHART computer analysis of active solar systems, TRNSYS computer analysis of passive solar options, and analyses of photovoltaic and some unproven technologies.

Recommendations of policy for improving the competitive position and consumer acceptance will also be provided.

A budget follows.

BUDGET FOR SOLAR COMPONENT
SUSITNA ALTERNATIVES STUDY

1. SALARY:

1.1	R. Seifert	
	1.0 month @ \$2450/month	\$2,450.
1.2	Annual Leave/Sick Leave	
	(15.9% of 1.1)	390.
1.3	Total Salary and leave benefits	2,840.
1.4	Staff Benefits (22.1% of 1.3)	628.
1.5	Total Salaries and Benefits	<u>\$3,468.</u>

2. OVERHEAD CHARGES:

2.1	Overhead charges, Institute of Water Resources rate (50.8% of 1.3)	<u>\$1,443.</u>
-----	--	-----------------

3. TRAVEL:

2	R.T. Fairbanks - Anchorage	\$ 256.
1	R.T. Fairbanks - Juneau	254.
2	days per diem @ \$55/day	110.
		<u>\$ 620.</u>

TOTAL REQUESTED FUNDS \$5,531.

tz:HH#

wwwos

ALASKA POWER AUTHORITY

333 WEST 4th AVENUE - SUITE 31 - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-2715

May 9, 1980

The Honorable Hugh Malone
House of Representatives
Alaska State Legislature
Pouch V
Juneau, Alaska 99811

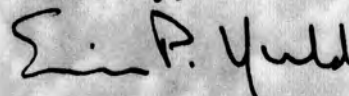
Dear Representative Malone:

Thank you for your letter of May 5, 1980 concerning Susitna appropriations.

I do not agree with your position regarding the \$3.3 million needed to insure full year funding for Susitna activities. While all of our Susitna contracts are indeed subject to the availability of funds as you have suggested, the implication of your position is that we can stop and start this program at will. I reiterate that this is a very complex undertaking and is the product of painstaking planning and coordination. In the event that Susitna does prove to be the best option, but supplemental funds are not available on a timely basis, the wording of our contracts will be of little value. My point is, adequate lead time is necessary to insure resources are available to accomplish the myriad of tasks that must be performed. If termination did occur but funds were later appropriated, the administrative process alone needed to reinstate the numerous people working on this project both in the State and private sector would be a veritable nightmare leading to lost time and increased cost to the program.

I hope that you will reconsider your recommendation.

Sincerely,



Eric P. Yould
Executive Director

cc: Ron Lehr
Representative Meekins
Senator Sackett

ALASKA POWER AUTHORITY

MAY 5 RECD

333 WEST 4th AVENUE - SUITE 31 - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-2715

April 30, 1980

Honorable Brian Rogers
House of Representatives
Pouch V
Juneau, Alaska 99811

Dear Mr. Rogers:

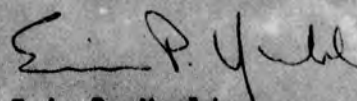
It has been brought to my attention that there is misunderstanding concerning funding needs for the Susitna Hydropower studies. FY '81 requirements remain unchanged from those submitted by the Governor: \$7.5 million in the supplemental budget request, and \$3.3 million in the normal capital budget request for a total of \$10.8 million. This level of funding is the minimum needed to allow the Power Authority to remain on its "critical path" of 30 months. The program additions recommended by Arlon Tussing (costing an additional \$1.4 million) could be incorporated into this 30 month program if the Legislature desired.

There has been an exhaustive effort made to initiate this very complex program. Thus, in the event the project is found to be feasible in roughly the February 1981 time frame, should prior actions have been taken by this Legislature that would preclude or restrict funds that would normally have been expended in parallel with next year's legislative decisions on FY '82 Susitna appropriations, the entire program would be in serious jeopardy of grinding to a halt.

The termination of logistics, geotechnical and biological data collection contracts, as well as prime contractor, sub-contractor, Power Authority staff, and Native agreements would occur as a result of nonavailability of program funds. Should this occur, it would be virtually impossible to reinitiate this level of support in a time frame to salvage our existing program even in the event the Legislature did concur to proceed with the remainder of the study program. In all probability, the FY '82 summer field season and program continuity would be lost.

Please consider very seriously our full budget request for the Susitna program.

Sincerely,



Eric P. Yould
Executive Director

EPY/va13/1

May 5, 1980

Mr. Eric P. Yould
Executive Director
Alaska Power Authority
333 West 4th Avenue, Suite 31
Anchorage, AK 99501

Dear Mr. Yould:

Thank you for your letter of April 30 regarding your funding recommendations for the Susitna Project.

I can understand your reasons for requesting the entire \$10.8 million appropriation this session. However, I do not agree that the \$3.3 million must be appropriated at this time. Although the situation was different this year, supplemental requests are normally approved by March.

Contracts can be written contingent on the availability of funds for future work as a normal course of action.

My own recommendation is that the legislature appropriate the \$7.5 million plus \$1.2 million for revisions to the plan of study as recommended by Arlon Tussing, this year. The 1981 session can act in a timely manner on funding required next year.

Sincerely,

Hugh Malone

cc: Mr. Ron Lehr
Rep. Gardiner
Senator Tillion
Rep. Meekins
Senator Sackett
Rep. Duncan
Rep. Rogers
Rep. Miles

HM/jk

ALASKA POWER AUTHORITY

333 WEST 4th AVENUE - SUITE 31 - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-2715

April 30, 1980

Honorable Hugh Malone
House of Representatives
Pouch V
Juneau, Alaska 99811

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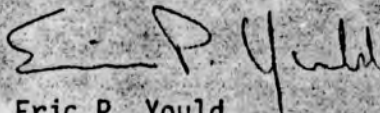
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Please consider very seriously our full budget request for the Susitna program.

Sincerely,



Eric P. Yould
Executive Director

EPY/va13/1

ALASKA POWER AUTHORITY

333 WEST 4th AVENUE - SUITE 31 - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-2715

April 30, 1980

Honorable Hugh Malone
House of Representatives
Pouch V
Juneau, Alaska 99811

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Please consider very seriously our full budget request for the Susitna program.

Sincerely,



Eric P. Yould
Executive Director

Energy for the Future...

...A Community Meeting
on the Susitna Hydroelectric Project
and Other Power Alternatives



Be among the first to have input during the early stages of the Susitna hydroelectric feasibility study. Hear about the power alternatives to Susitna hydro that are being considered, and learn about the citizen participation process, and how you can be involved during the next two and a half years.

Community Meetings:

Fairbanks, 7 pm, Monday, April 14
Travelers Inn Gold Room, 813 Noble

Talkeetna, 7 pm, Tuesday, April 15
Talkeetna Elementary School

Wasilla, 7 pm, Wednesday, April 16
Wasilla High School

Anchorage, 7 pm, Thursday, April 17
Bartlett High School Yellow Cafeteria
(Enter from Muldoon and Glenn Hwy. interchange;
follow signs once inside building.)

Review copies of the plan of study are available at public libraries in your community. For more information, call the Public Participation Office at 276-0001.

Alaska Power Authority

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

AGENDA Community Meetings April 14, 15, 16 and 17, 1980

WELCOME	- 5 Minutes	Power Authority
DESCRIBE PLAN OF STUDY	- 25 Minutes	Acres
ENERGY SOURCES FOR THE RAILBELT AND EVALUATION PROCESS	- 15 Minutes	Power Authority
QUESTIONS AND ANSWERS	- 20 Minutes	Power Authority and Acres
TABLE TOP DISCUSSION BY CITIZENS	- 20 Minutes	Power Authority
DESCRIBE PUBLIC PARTICIPATION PROGRAM AND ACTION LISTS	- 15 Minutes	Power Authority
SHORT REPORT ON TABLE TOP DISCUSSIONS	- 20 Minutes	Power Authority and Acres
PERMITS	- 5 Minutes	CIRI/H&N
SUMMARY	- 5 Minutes	Power Authority
PUBLIC COMMENT	-	Until all comments have been heard.
CLOSING	- 5 Minutes	Power Authority

COMMUNITY MEETING -- DATES, TIMES, AND PLACES

April 14:	Fairbanks	7:00 p.m.	Traveler's Inn Gold Room
April 15:	Talkeetna	7:00 p.m.	Talkeetna Elementary School
April 16:	Wasilla	7:00 p.m.	Wasilla High School
April 17:	Anchorage	7:00 p.m.	Bartlett High School Yellow Cafeteria (near visitor parking lot); North Muldoon Road (enter from the Muldoon and Glenn Highway interchange)

ALASKA POWER AUTHORITY

333 WEST 4th AVENUE - SUITE 31 - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-2715

April 7, 1980

Representative Brian Rogers
Pouch V
Juneau, Alaska 99811

REC'D
APR 9

Dear Representative Rogers:

I want to be sure that you knew that the first round of community meetings for the Susitna hydroelectric plan of study will be held next week. I have enclosed a copy of a flyer for the meetings. Please pass it around or post it to help advertise the meeting.

You are especially invited to join us at the meetings because of the work you are doing for the Power Alternatives Study Committee.

An agenda is attached. Of particular interest is the part describing the process by which alternatives to Susitna will be examined and analyzed, and the points at which the public is involved.

We are making every effort possible to give the public ample opportunity to make comments, especially in the early stages of the study when additions or changes to the plan of study are easier to accomodate.

I also want you to know that I am receiving copies of your work and will be using some of it as I prepare information for the general public throughout this year. I will be checking with Mark Wittow to make sure that I am referencing your work accurately.

Reserve copies of the plan of study are available at libraries in these areas: Anchorage--Z. J. Loussac, Alaska Resources Library, the University of Alaska Library, and Eagle River; Fairbanks--Noel Wien and Elmer E. Rasmuson at U of A; Kenai Peninsula--Seward, Homer, and Kenai; Mat-Su Borough--Palmer, Wasilla, Willow and Talkeetna. The Alaska Resources Library and Rasmuson Library also have one copy each that may be taken from the library.

I hope to see you at one of the meetings next week.

Sincerely,



Nancy Blunck
Director
Public Participation Program

Enclosures

ALASKA POWER AUTHORITY

333 WEST 4th AVENUE - SUITE 31 - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-2715

March 12, 1980

The Honorable Hugh Malone
Alaska State Legislature
Box 9
Kenai, Alaska 99611

Dear Senator Malone:

In February, Eric Yould, Executive Director of the Alaska Power Authority, sent you a copy of the plan of study for the Susitna Hydroelectric Project and invited you to attend community meetings at which you will receive more information and have the opportunity to influence the manner in which the work within the plan of study is to be accomplished.

The first round of community meetings will be held April 14, 15, 16, and 17, a few weeks later than originally scheduled. Hopefully, the change in schedule will give you more time to review the plan of study and prepare your questions and comments. The meetings will be held:

April 14:	Fairbanks	7:00 p.m.	Traveler's Inn Gold Room
April 15:	Talkeetna	7:00 p.m.	Talkeetna Elementary School
April 16:	Wasilla	7:00 p.m.	Wasilla Junior High School
April 17:	Anchorage	7:00 p.m.	Bartlett High School

Yellow Cafeteria (near visitor parking lot) North Muldoon Road (enter Muldoon and Glenn Highway interchange)

We expect this first series of meetings to be informative and dynamic. ACRES, the consultant conducting the plan of study, will present a slide show outlining various aspects of the feasibility study. Information summarizing current knowledge of alternatives to the Susitna Hydroelectric Project will also be presented. We will explain the Public Participation Program and the "Action Lists", the primary method for receiving public comment throughout the 30 month period of the plan of study.

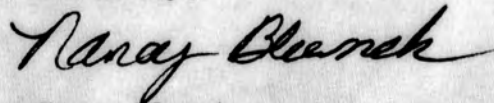
After you have been given information, you will have time to ask questions and make comments. Some discussion will take place in small groups where there will be opportunity to share ideas. A written record of the comments of each group will be considered as part of the official record of the meeting. Since the format of this meeting does not allow time for testimony, those wishing to testify may present their comments in writing or tape record their remarks on recorders provided at the end of the meeting. Action List forms will be provided at the meeting; comments

filled out on Action List forms will be reviewed by ACRES and responded to in writing.

If you can't make it to the April meetings, please note that this first series of meetings will not be your only opportunity to make comments and receive information. I urge you to contact my office to see how you can participate. I can be reached at 276-0001.

I look forward to working with you over the next two and a half years.

Sincerely,

A handwritten signature in cursive script, reading "Nancy Blunck".

Nancy Blunck
Director
Public Participation Program

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

AGENDA Community Meetings April 14, 15, 16 and 17, 1980

WELCOME	- 5 Minutes	Power Authority
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TABLE TOP DISCUSSION BY CITIZENS	- 20 Minutes	Power Authority
DESCRIBE PUBLIC PARTICIPATION PROGRAM	- 15 Minutes	Power Authority
DESCRIBE ACTION LISTS	- 10 Minutes	Power Authority
SHORT REPORT ON TABLE TOP DISCUSSION RESULTS	- 20 Minutes	Power Authority and Acres
PERMITS	- 5 Minutes	Acres and CIRI/H&N
CLOSING	- 5 Minutes	Power Authority

After the meeting officially ends, persons are invited to:

1. Submit written testimony.
2. Record verbal testimony.
3. Fill out action forms and turn in that night.
4. Ask questions of Power Authority staff, Acres, or their sub-contractors.

COMMUNITY MEETING -- DATES, TIMES, AND PLACES

April 14:	Fairbanks	7:00 p.m.	Traveler's Inn Gold Room
April 15:	Talkeetna	7:00 p.m.	Talkeetna Elementary School
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April 17:	Anchorage	7:00 p.m.	Bartlett High School Yellow Cafeteria (near visitor parking lot); North Muldoon Road (enter from the Muldoon and Glenn Highway interchange)

MEMORANDUM

TO: [Ron Lehr, Director
Division of Budget & Management
Office of the Governor

DATE: January 23, 1980

FILE NO: RP 80-350X

TELEPHONE NO:

FROM: George Matz, Budget Analyst
Division of Budget & Management
Office of the Governor

SUBJECT: Alaska Power Authority Request
to Establish Seven Positions
for the Susitna River Feasibility
Study

The Alaska Power Authority (APA) requests permission to establish seven CIP positions for work directly related to and funded by the Susitna River Hydroelectric Project Feasibility Study. Positions requested for project management include: Project Engineer, Field Auditor II, Project Inspector, and Secretary I. Positions requested for a public information program include an Information Officer III, Administrative Assistant III and Clerk IV. All positions will be located in Anchorage.

Funding for each of these positions will come from the Susitna River Hydroelectric Project Feasibility Study which was appropriated \$8,528,000 in the FY 80 Capital Budget.

The feasibility study is expected to take 2½ years and require another \$21,084,280 in funds. The appropriation was to the Office of the Governor, but contracted to the APA by RSA. Although the APA has responsibility for the timely and satisfactory completion of the study, a majority of the effort has been contracted to a private engineering firm, ACRES American. The project management position will oversee performance by ACRES and sub contractors to assure the State that the feasibility study objectives and tasks are met. Responsibilities for each position are as follows:

Project Engineer - The Project Engineer will have lead responsibility for monitoring the performance of the contractor and subcontractors and will provide the Division of Energy and Power Development with information relevant to energy planning.

Project Inspector - the Project Inspector will monitor the performance of study activities on Native lands as well as affirmative action minority hiring for the project and will provide project reports to the Cook Inlet Native Corporation.

Field Auditor II - the Field Auditor will review the accounting and financial procedures of contractors to assure the State of accurate and timely cost controls.

Secretary I - The Secretary will provide secretarial and clerical support to the project management staff.

January 23, 1980

A significant part of the feasibility study is the public information program. The APA has decided to conduct the public information program rather than delegating this responsibility to ACRES. In addition to providing the public with information via workshops, news releases, and literature, a system will be established to provide timely and detailed answers to all study questions submitted by the public. In essence, the public information program will provide a public forum which addresses future energy strategies for the Railbelt. Positions required for this level of effort include the following:

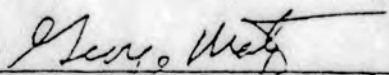
Information Officer III - This position will be responsible for overall management of the program, and for organizing a number of planned public meetings and workshops.

Administrative Assistant III - The Administrative Assistant will be responsible for researching, writing and producing much of the written information which is being planned. Emphasis will be placed on translating technical data to laymen's terms. A memo from Nancy Blunck (see attached) lists the responsibilities of this position.

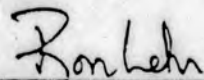
Clerk IV - The Clerk will provide secretarial and clerical support for the public information program. It should be noted that only one third of this position is expected to be devoted to clerical duties. In addition, one third of this position's time will be spent on writing/editing and the remaining one third on research/investigation. Consequently, the professional to clerical ratio will be about eight to one.

All of these positions and the approximate level of funding was in the Plan of Study which predicated the FY 80 capital appropriation for the Susitna River Hydroelectric Project Feasibility Study. These positions will expire on the RSA completion date which is March 31, 1981 unless additional funding becomes available.

Your approval is recommended.


George Matz, Budget Analyst
Division of Budget and Management

 Approved this 29 day of Jan, 1980.


Ron Lehr, Director
Division of Budget and Management
Office of the Governor

ALASKA POWER AUTHORITY

333 WEST 4th AVENUE - SUITE 31 - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-2715

October 19, 1979

The Honorable Brian Rogers
Alaska State Legislature
Post Office Box K
College Branch, Fairbanks, Alaska 99708

Dear Representative Rogers:

The planning for Railbelt power generation will move another step forward at an Alaska Power Authority Board of Directors meeting scheduled for November 2, 1979. At this meeting the Board will consider the choice between the Corps of Engineers and Acres American Incorporated as engineer for the Susitna Feasibility Studies. You are invited to comment on that choice during the November 2 meeting which will begin at 1:00 PM at the offices of the Power Authority in Anchorage.

The Acres draft Plan of Study, provided to you in early September, is now under revision. Acres will submit an updated study cost estimate at the November 2 meeting. The revised cost estimate will be the result of Power Authority and public comment provided to Acres and will reflect the elimination of the electrical load forecast from the study, a newly coordinated biological impact assessment program and certain other changes.

If it is decided by the Board and Governor to choose Acres over the Corps of Engineers, these and any additional changes will be incorporated in a revised plan of study document which will be available for widespread public and agency review in late November or early December. The scope and timing of public participation in refining the plan of study is outlined on Plate T 12.1 of the Acres draft Plan of Study. Note the typographical error on Plate T 12.1 which shows the POS available for public review in December 1980 instead of December 1979.

If you have any questions regarding this procedure, please do not hesitate to call me or Mr. Robert Mohn at 277-7643 for clarification.

Sincerely,



Eric P. Yould
Executive Director



ALASKA POWER AUTHORITY

333 WEST 4th AVENUE - SUITE 31 - ANCHORAGE, ALASKA 99501

Phone: (907) 277-7641
(907) 276-2715

June 4, 1979

Mr. Gregg Erickson, Director
Legislative Affairs Agency
Pouch Y
Juneau, Alaska 99811

Dear Mr. Erickson:

As promised at our meetings in Anchorage on May 24 and 25, 1979, I am providing some initial comments on the study of alternatives to Susitna hydropower development.

1. The plan for Susitna development selected by the Corps of Engineers after preliminary feasibility studies consists of two large dam projects. This plan was arrived at through consideration of three factors: technical feasibility, maximization of long-term economic benefit and minimization of environmental impact. A factor not considered in plan formulation was economic/financial risk in the face of uncertainty. The recent supplemental studies completed by the Corps of Engineers include tests to assess the economic sensitivity of the proposed plan to variation in load growth, discount rates, and costs of the alternative modes. No attempt, however, has been made by the Corps to reformulate the plan to reduce economic/financial risk.

The need to develop a reduced risk plan to facilitate project financing was recognized and noted by several engineering firms that have reviewed the Corps of Engineers plan. Such a plan might include a staged development at the Watana site or perhaps a completely new development plan for the basin. The detailed feasibility studies to be conducted over the next several years will address this issue. I have attached information provided in 1977 by Harza Engineering Company in which more moderately sized initial development is recommended. (See attached, page 4-6.)

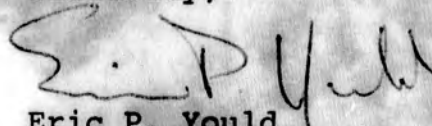
As you proceed in the study, then, please keep in mind that the currently accepted 2-dam plan is by no means the only way to develop the Susitna potential. A more gradually staged plan of development may emerge from the detailed studies. This, in fact, is my hope and expectation.

2. In the determination of the various generation mode power cost estimates (or probability distributions), there is a need for consistent uniform treatment among alternatives. This applies to locational cost factors, unit prices, contingency factor assumptions, etc. The lack of such consistency could severely bias the study conclusions. I recommend that this issue of uniform treatment be addressed in the study plan. For this reason, it would seem to me that the use of a single consultant for estimating the cost of all alternatives would be preferable to using several different consultants.
3. As I understand it, the impetus for this study was largely from the environmental community. One of the major concerns of the environmentalists is that the "soft path" of energy provision, using "appropriate technology" in small dispersed increments, is not receiving adequate consideration in the decision making process. It seems only reasonable, then, to address the full range of energy alternatives in this study. I recommend that the environmental groups be contacted early on and given an opportunity to offer their suggested generation scenarios. It would then fall upon you to select from among the full range of alternatives those that deserve detailed attention in the study.
4. In a related matter, geothermal energy has been suggested by some as an alternative to Susitna. Our research indicates that "hot dry rock" applications offer the best hope of economic development on a significant scale. This technology is presently under development by Los Alamos Scientific Laboratories in New Mexico. Drilling for wet steam in the vicinity of volcanic activity may also be a possibility. A cost of study for geothermal development in Alaska is under way at Energy Systems, Inc. of Anchorage. I suggest that the geothermal alternative be one that is explored, at least initially.
5. Another alternative requiring consideration is smaller hydroelectric potential in the Railbelt area. The Alaska Power Administration in Juneau is the authority on this issue. The Power Administration just recently completed an analysis of alternate sites for the Corps of Engineers' supplemental feasibility studies of Susitna. Another source of information on the subject is the CH2M Hill study done for the Corps. As I mentioned during our discussion, this latter work is primarily an environmental and land use review with the participation of environmental interests. I have asked the Corps (Ron Turner, 752-3432) to send you a copy.

6. Information on electrical energy alternatives for Southcentral Alaska is currently being gathered as part of the inter-governmental Southcentral Level B Water Resources Study. The Alaska Power Administration is the lead agency for the electric power task force and can probably provide a useful assessment of energy options.
7. The provision of Railbelt electrical power is now and will continue to be the responsibility of the several utilities. With this in mind, I hope you maintain frequent contact with the utility managers through the course of the study. It is really their problems that we are trying to shed light on.

It was very beneficial for Robert and I to talk with you about the study. Robert, by the way, will be coordinating most of our Susitna Activities and I would appreciate his being kept informed on your studies as they progress. It appears that you intend to drive to the heart of the controversy. We look forward to clear and useful results, hopefully followed by definitive action on the part of the State. Please keep us informed as the study plan takes shape.

Sincerely,


Eric P. Yould
Executive Director

Attachments:
as noted

cc: Chuck Behlke

ALASKA POWER AUTHORITY

AGENDA

Anchorage, Alaska

September 27, 1979

- ~ I. Review and Approval of Minutes of the August 10, 1979 meeting in Anchorage.
- ~ II. Opportunity for public comment.
- ~ III. Consideration of a loan from the Power Project Revolving Loan Fund for the Mennonite Creek Hydro-electric Project.
- ~ IV. Consideration of actions with respect to the Swan Lake Project.
- ~ V. Selection of a consultant for the Nome/Kotzebue Study.
- ~ VI. Consideration of the Lake Tye Letter of Understanding.
- VII. Internal Operations of the Power Authority:
 - ~ (a) Susitna Project Management Proposals.
 - ~ (b) Bond Counsel Contract.
 - ~ (c) Power Authority Budgets. *\$41 million FY81 \$400 K operating*
\$ 8 million FY82
\$ 6 million FY83
 - ~ (d) Proposed Legislation.
- VIII. *Result - Authorization Legislation Not appropriate for Governor*
Any other Business or Action which may properly come before the Board.
- IX. Actions Relative to the Susitna Project:
 - (a) The proposed agreement with Cook Inlet Native Corporations.
 - (b) Presentations by the three Engineering firms on Alternative Methods of Proceeding with the Susitna Project.

① Redesignation \$2M power proj → APA Tye
② Gov. Solomon Lake. 2-county rule. Stop-the-clock - (No legis authorization?)

ALASKA POWER AUTHORITY

333 WEST 4th AVENUE - SUITE 31 - ANCHORAGE, ALASKA 99501

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July 2, 1979

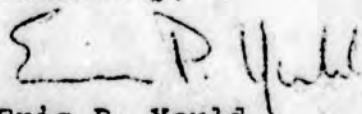
The Honorable Mike Gravel
United States Senate
3121 Dirksen Senate Office
Building
Washington, D.C. 20510

Dear Senator Gravel:

It was a pleasure having the opportunity to discuss the Susitna project with you last Friday. As you requested, I have attempted to outline those actions which might be taken to hasten the development of Susitna. I have laid out four options that are reasonably available. For your convenience, I have also included the State appropriation bill, and the existing and amended versions of your Federal legislation (Sec. 203). The remainder of this document summarizes the "pros" and "cons" of using the private sector or the Corps of Engineers to accomplish the Susitna project.

★ I know that this document is more than you asked for, but I feel it is important for you to be fully aware of all of the avenues available and some of the issues. [Common to all approaches is the need for Tax legislation before completion of the field explorations.] Without this legislation, Susitna will probably not be constructed. If this technical problem can be effectively dealt with, the overriding considerations involve the length of time before the start of construction, but more importantly, the length of time to power-on-line. While the question of which avenue would be most expedient remains unanswered at this time, perhaps with special legislation that you would be successful in implementing, the joint venture with the Corps of Engineers would be the best approach. In any event, the Power Authority has contracted with three private engineering firms to develop competing proposals to the Corps plan and I think it is imperative that we see what they have to offer before locking ourselves into the Corps of Engineers. Previous contact with the private sector has indicated that expeditious treatment by FERC could result in a construction start within three and one-half years from this fall.

Sincerely,


Eric P. Yould
Executive Director

Attachments

Hydroelectric Power Development Act of 1979

(Amendment to Section 203 of the Water Resources Development Act of 1976, pending in Congress.)

"Sec. 203(a)(1) The Congress finds that the expeditious development of hydroelectric power generating facilities that are environmentally sound to assist the Nation in meeting existing and future energy demands is in the national interest.

"(2) The Congress therefore declares that the expertise of the Chief of Engineers can and should be utilized, in accordance with this section, for the benefit of local public bodies in the development of projects in any case where the Secretary determines that 50 per centum or more of the benefits of the project are attributable to hydroelectric power generation when the project is fully operational.

"(b) There is hereby established in the Treasury of the United States a Hydroelectric Power Development Fund (hereafter in this section referred to as the "fund") to be and remain available for expenditures authorized by this section. The fund shall consist of (1) repayments by non-Federal public authorities of expenditures made from the fund, (2) any appropriations made to the fund, and (3) interest on moneys in the fund invested in accordance with subsection (d).

"(c) There is authorized to be appropriated for deposit in the fund established by subsection (b) of this section the sum of \$25,000,000.

"(d)(1) If the Secretary determines that moneys in the fund are in excess of current needs, he may request the investment of such amounts as he deems advisable by the Secretary of the Treasury in direct, general obligations of, or obligations guaranteed as to both principal and interest by, the United States.

"(2) With the approval of the Secretary of the Treasury, the Secretary may deposit moneys of the fund in any Federal Reserve bank or other depository for funds of the United States, or in such other banks and financial institutions and under such terms and conditions as the Secretary and the Secretary of the Treasury may mutually agree.

"(e)(1) The Secretary is authorized, for any project that meets requirements of subsection (a)(2) of this section, to obligate moneys in the fund to pay for, or reimburse expenditures for, the cost of the phase I design memorandum made by a non-Federal public authority pursuant to this subsection. The Secretary is authorized to enter into an agreement with a non-Federal public authority to pay from the fund the cost to such non-Federal authority of preparing a phase I design memorandum on condition that such non-Federal authority repay such cost to the fund if (A) the phase I design memorandum report demonstrates the feasibility of constructing the project, and (B) the non-Federal authority within three years of the date of completion of the report, is either able to borrow money for construction costs based upon the security of the project or its revenues or actually commences construction of such project. If either of the conditions in clause (A) or (B) is not met, such costs shall be borne by the United States and the report on such project shall be submitted to Congress. The Secretary is also authorized to accept funds from a non-Federal authority for costs incurred for preparing phase I design memorandum if the Secretary first agrees with the non-Federal public authority to reimburse such costs from the fund (i) if the report demonstrates infeasibility of the project, or (ii) if the report is feasible, the non-Federal public authority is not able to borrow money to pay construction costs of the project, including the costs of the phase I design memorandum, based on the security of the project or its revenues within three years of the completion of the phase I design memorandum. Payments by the Secretary from the fund shall be subject to appropriations acts. Payments by the Secretary under this subsection for phase I reimbursement shall include reimbursement of any interest expense of the non-Federal public authority resulting from bonds or notes such authority has issued to finance the phase I design memorandum and for any other expenses normally associated with the issuance and administration of revenue bond and note financings. Failure to complete a phase I report being prepared in accordance with the provisions of this subsection within a reasonable time in accordance with the schedule fixed in the phase I design memorandum agreement entered into by the Secretary with a non-Federal public authority due to federal actions or inactions not primarily occasioned by the actions or inactions of the non-Federal public authority, including, but not limited to, federal inaction in failing to appropriate at any time amounts necessary to reimburse such

costs and expenses in accordance with the schedule fixed in the phase I design memorandum agreement, shall also constitute a determination that such report demonstrates the project is infeasible for purposes of this subsection except that if such project is constructed within five years of the date of such determination of infeasibility, the non-Federal authority shall repay to the fund all phase I costs. The Secretary shall hold and apply any moneys in the fund available for reimbursement of the phase I costs of a particular project of a non-Federal public authority for which the Secretary has expended non-Federal funds, in accordance with the terms of a phase I design memorandum agreement entered into by the Secretary with the non-Federal public authority for the benefit of the holders of bonds or notes issued to provide such non-Federal funds. The Secretary shall transmit a copy of a completed phase I report, including a proposed agreement between the Corps of Engineers and the non-Federal public authority setting forth the terms and conditions for construction of the project, in accordance with the provisions of this section, to Congress and to the non-Federal public authority, not later than thirty days after the date of completion of the report. If the proposed agreement for construction of the project is entered into and approved pursuant to subsection (g) within two years of completion of the favorable report, the project shall be constructed in accordance with subsection (g) if the non-Federal public authority is able to borrow money to pay construction costs of the project, including the costs of the phase I design memorandum, based on the agreement and the security of the project or its revenues within three years after completion of the favorable report. The Governors of the States or their designee may use the phase I design memorandum report prepared in accordance with the provisions of this subsection as they determine necessary to undertake construction of a project by a non-Federal public authority. The United States shall not be liable for the payment of any damages resulting from a non-Federal authority's use of the phase I report and the construction of any project by a non-Federal public authority in connection therewith, other than damages due to negligence of the United States.

"(f) The Secretary, in accordance with a contract between the non-Federal public authority and the Secretary, is authorized to construct projects eligible under subsection (a)(2) of this section, including engineering and design, land acquisition, site development, and offsite improvements necessary for construction.

"(g)(1) Prior to initiating any construction work under the authority of this section, the agreement submitted to Congress in accordance with subsection (c) must be approved by resolution of the Committee on Environment and Public Works of the Senate and of the Committee on Public Works and Transportation of the House of Representatives. The non-Federal authority shall pay the full anticipated costs of constructing the project determined by the agreement at the time such costs are incurred, together with normal contingencies and related administrative expenses of the Secretary, and such payments shall be held by the Secretary for payment of obligations incurred by the Secretary on a project for construction under this section.

"(2)(A) The United States shall pay all costs over the anticipated costs fixed in the agreement with the non-Federal public authority, if such costs are (i) occasioned by acts of nature, (ii) occasioned by failure on the part of the Secretary to adhere to the agreed schedule of work or a failure of design, or (iii) are necessary to be paid by the United States to permit operation of the project in accordance with the initial determination of feasibility. Payments by the Secretary of such costs shall be subject to appropriations Acts.

"(B) Any Federal funds paid under subparagraph (A) of this paragraph shall be repaid to the Treasury with interest by the non-Federal public authority from revenues received from the sale of power. Payments shall commence following retirement of all bonds issued by the non-Federal public authority for the project. Interest payable under this subparagraph shall be at the rate the Federal Government must pay on such obligations at the time of payment pursuant to such subparagraph (A).

"(h) As used in this section the term 'Secretary' means the Secretary of the Army, acting through the Chief of Engineers.

"(i) This section may be cited as the 'Hydroelectric Power Development Act of 1979'."