

ALASKA LEGISLATURE SPECIAL COMMITTEE / SUBJECT FILES 8672

997 SCOMM44: HOUSE POWER ALTERNATIVES STUDY COMM. 1979-80 997

CAPITAL PROJECT EXPENDITURES (CASH FLOW)	TOTAL	BUDGET YEAR	BUDGET YEAR Plus 1	BUDGET YEAR Plus 2	BUDGET YEAR Plus 3	BUDGET YEAR Plus 4	REMAINING COST
Planning and Engineering	300,000	300,000					
Land							
Construction							
Equipment							
Administration and Other							
Total Annual Expenditure (Capital Cost)	300,000	300,000					

CONTINUATION OF NARRATIVE

V. Identification of Alternatives Considered.

The utility can delay action on the projects to wait for possible federal funding and action. Funds are not available from the Rural Electrification Administration for front end studies of projects, and they may not be available for expenditure on capital intensive generation projects. Other alternative energy options will be investigated as part of the study which is proposed.

PRELIMINARY PROFILE:

Small-Scale Hydroelectric Development In Alaska

September 1979

National Conference of State Legislatures
Energy Program: Small-Scale Hydroelectric Policy Project
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I. INTRODUCTION

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

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

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

It is obvious that if this country is to satisfy its future energy needs, the development of alternative energy sources must be addressed. The Small-Scale Hydroelectric Policy Project of the National Conference of State Legislatures is designed to assist selected state legislatures in looking at the benefits that a state can derive from the development of small-scale hydro, and in carrying out a review of state laws and regulations that affect the development of the states' small-scale hydro resource.

In summary, the technology is proven, the sites are there, the need is evident, and the economic feasibility is becoming clearer. However, there are several variables at the state level which critically affect the threshold feasibility level of small-scale hydro. These variables are generally described as legal, institutional, environmental and financial.

II. POTENTIAL RESOURCE

Small-scale hydroelectric power is an indigenous resource that can contribute to Alaska's energy supply by providing a renewable source of clean energy at a reasonable cost. Under the current Department of Energy small hydro program, the definition of small-scale hydro eligible for inclusion in the program was defined by Congress as existing sites not presently used to produce power or where existing capacity could be expanded. In reality, the classification of small hydro is not so precise and a bill has already been introduced in Congress to remove the existing dam structure program eligibility restrictions.

In general, the small hydro concept suggests installations requiring only small dams or diversions, operating essentially as run-of-the-river with little or no storage and minimal change in river regime.

Of the existing sites in the .05 to 25 MW category in Alaska (see Table I), most of them are located near a population cluster. The resource list indicates there are 24 sites in the .05 to 15 MW range with a potential capacity of 77 MW or 305 MWH. In the 15 to 25 MW range, there are 6 existing dams with a potential capacity of 120 MW or 309 MWH. In terms of undeveloped small hydro potential, there are 184 sites in the .05 to 15 MW range with a potential new capacity of 1,053 MW or 4,754 GWH and there are 53 sites in the 15 to 25 MW range with a potential new capacity of 1,014 MW or 4,158 GWH. These figures are the preliminary gross estimates developed by the Army Corps of Engineers for the National Hydropower Study.

Table I

Preliminary Listing. Existing Water Resource Projects with Small Scale ^{1/} Additional Hydropower Potential ^{2/} State of Alaska

Census Division	Project Name	Existing Development		New Potential		Total	
		Capacity (MW)	Energy (MWH)	Capacity (MW)	Energy (MWH)	Capacity (MW)	Energy (MWH)
Potential Additional Capacity Range - 0.5 MW - 15 MW							
Fairbanks	Livengood Dam	0	0	0.21	0.5	0.21	0.5
Juneau	Salmon Creek Dam	0	0	6.36	31.1	6.36	31.1
Juneau	Annex Lake Dam	3.50	6.0	2.05	19.2	5.55	25.2
Juneau	Gold Creek 5	1.60	6.8	1.13	5.2	2.73	12.0
Juneau	Salmon Creek						
	No. 1	1.40	3.0	1.49	9.8	2.89	12.8
Juneau	Salmon Creek						
	No. 2	2.80	5.0	1.68	15.1	4.48	20.1
Ketchikan	Ketchikan Lakes	4.20	14.8	1.05	9.2	5.25	24.0
Ketchikan	Lake Connell Dam	0	0	12.46	37.6	12.46	37.6
Ketchikan	Lake Whittman	4.05	20.0	0	0	4.05	20.0
Kodiak	Uganik	0.03	0.1	4.20	13.6	4.23	13.7
Kodiak	One Mile Creek	0	0	11.99	28.2	11.99	28.2
Outer Ketchikan	Purple Lake	3.00	10.4	2.21	8.1	5.21	18.5
Prince of Wales	Linkum	0.02	0	2.85	8.9	2.87	8.9
Seward	Moose Pass	0	0	0.70	3.2	0.70	3.2
Sitka	Sheckley	0	0	5.70	32.4	5.70	32.4
Sitka	College	0	0	9.78	31.8	9.78	31.8
Sitka	Short	0	0	1.07	3.2	1.07	3.2
Sitka	Bahovel	0	0	1.56	5.2	1.56	5.2
Sitka	Swanson	0	0	1.00	2.6	1.00	2.6
Sitka	Pelican Creek	0.50	2.0	2.19	5.7	2.69	7.7
Skagway-Yakutat	Dewey Lakes	0.38	1.0	5.14	24.0	5.52	25.0
Valdez-Chit.-Whit.	San Juan	0.11	0.1	0.39	2.0	0.50	2.1
Valdez-Chit.-Whit.	Grouse Creek	0	0	0.50	2.1	0.50	2.1
Valdez-Chit.-Whit.	Dayville	0.20	0.2	1.40	6.7	1.60	6.9
Subtotals	24	21.79	69.4	77.61	305.4	99.40	374.8
Potential Additional Capacity Range - 15 MW - 25 MW							
Ketchikan	Upper Silvis Lake	0	0	17.93	54.1	17.93	54.1
Ketchikan	Beaver Falls	5.00	25.5	17.39	42.1	22.39	67.6
Ketchikan	Beaver	0.07	0.1	18.24	43.6	18.31	43.7
Kodiak	Parks	0	0	20.98	49.3	20.98	49.3
Kodiak	Dry Spruce	0	0	23.51	56.1	23.51	56.1
Wrangell-Petersburg	KaKu	0.03	0.1	22.21	64.1	22.24	64.2
Subtotals	6	5.10	25.7	120.26	309.3	125.36	335.0
TOTALS	30	26.89	95.1	197.87	614.7	224.76	709.8

Notes:

1/ Small scale is defined here as a maximum total existing and/or potential capacity of not more than 25 MW.

2/ Preliminary estimates as of June 1979 from the National Hydropower Study, Corps of Engineers.

III. STATUTORY AND REGULATORY CONCERNS

The NCSL Small-Scale Hydroelectric Project has available a comprehensive seventy-five page report on the legal parameters of small-scale hydroelectric development in Alaska. The following is a summary.

A. Land and Water Ownership

The fundamental task for a small-scale hydroelectric developer is to acquire control over or the right to use the necessary surface and water rights for the project.

1. Land

- (a) Federal - the right to use federal lands for a small-scale hydroelectric project depends on the status of the lands involved (national park, monument, forest, etc.). Permission, usually via a lease, must be obtained from the managing agency. These agencies include the Park Service, Forest Service and Bureau of Land Management. The Federal Energy Regulatory Commission also has general authority to dedicate federal lands for small-scale hydro use. The Federal Land Policy Management Act is a statute of general application.
- (b) Native Alaskan - Native Regional and Village Corporations will eventually possess \$1 billion in liquid assets and over 44 million acres of land. This will potentially make such entities major actors in small-scale hydro. Negotiations to use native lands must be conducted with the relevant corporation. The Bureau of Indian Affairs will often be involved as well.
- (c) Private - access to and use of private lands will normally involve a contract of sale or a lease. It should be noted that navigable stream beds are in the public domain even where surrounded by private lands.
- (d) State - the Department of Natural Resources (DNR) may sell or lease state lands by public auction. Leases may run for primary terms of up to 55 years. Leased land remains under ultimate state control, and various permits may be required:

- special land use permit
- right-of-way permit
- upland permit
- grazing land permit
- tidelands permit
- shore fisheries permit
- miscellaneous land use permit

(Consult the Directory of State Permits)

Some of the required permits may be obtainable through a master permit application to Department of Environmental Conservation (discussed below).

2. Water

The right to divert (impound) and use water must be obtained from the State by a small-scale hydroelectric developer. Alaska is a prior appropriation state, although some early riparian mining claims may exist. Under the Water Use Act of 1966, the DNR will grant a permit to appropriate if:

- prior rights will not be unduly affected
- the proposed means of diversion are sound
- the proposed use will be beneficial
- the proposed use will be in the public interest

Upon completion of the impoundment and the inception of the use -- perfection of the appropriation -- the permit will be certified.

Policy Concerns

- The major concern in this area is the unsettled status of Alaskan lands pending resolution of the "D-2" legislation. Small-scale hydroelectric development may encounter substantial delays until land ownership and classification is settled.
- A second concern relates to the somewhat uncertain status of vested riparian water rights in Alaskan watercourses. This may create problems regarding obtaining water rights.

B. State Licensing

This section must be read against the background of possible federal pre-emption under the Federal Power Act. Although the U.S. Supreme Court has held the Act to be superior to state procedures, the Federal Energy Regulatory Commission (FERC) has adopted a policy that small-scale hydroelectric developers should comply with state licensing requirements prior to obtaining a federal license. Thus, Alaska's regulatory policies remain relevant to small-scale hydro.

1. Environmental

The Department of Environmental Conservation (DEC) administers a "one-stop" permitting process to coordinate a multiplicity of environmental requirements. Through a master application to the DEC the small-scale hydroelectric developer may obtain virtually all the necessary permits. It should be noted, however, that control over the surface and water rights necessary to the project is a prerequisite. In addition, local approval of the project must be demonstrated separately. Some of the most relevant permits include:

- water pollution control permit - although small-scale hydroelectric projects may result in the release of oxygenated or deoxygenated water and trace metals, the applicability of the Alaska Water Pollution Control Act to small-scale hydro is unclear at this time.
- certificate of reasonable assurance - small-scale hydroelectric projects on navigable watercourses must demonstrate compliance with §401 of the Federal Water Pollution Control Act (FWPCA), as administered by the DEC.
- anadromous fish protection permit - the Department of Fish and Game has the authority to require small-scale hydroelectric projects to protect anadromous fish spawning routes and grounds. This may necessitate construction of fishways and ladders or, in the alternative, the payment of compensation, the dedication and construction of a fish hatchery or the posting of a bond to allow the state to enlarge existing facilities.

2. Local

The extent of local political control over small-scale hydro is unclear, except as to the requirement of compliance with local land use plans or zoning in conjunction with the DEC master permit process. The need for local land use,

building, road or other permits will vary by site and as to whether the political subdivision is a "home rule" entity. It should be noted that municipalities have jurisdiction over utilities not regulated by the State Public Utility Commission (PUC).

3. Public Utility Commission

The PUC exercises broad authority over utilities in Alaska. While some very small hydro projects may escape regulation, most will need to obtain a "certificate of public convenience and necessity" to operate -- whether privately or publicly-owned. All private small-scale hydroelectric utilities will fall under PUC rate jurisdiction, as well as public small-scale hydroelectric utilities in competition with other existing utilities.

It should be noted that the Public Utility Regulatory Policies Act (PURPA) has a major potential impact with regard to existing small-scale hydroelectric sites, including: expedited licensing, mandatory interconnection and wheeling, mandatory purchase and sale of power contracts with existing utilities, and possible exemption from FERC and PUC jurisdiction.

4. Miscellaneous

The DNR administers Alaska's parks and recreational facilities, as well as the Historic Preservation Act. Small-scale hydroelectric development must be compatible with DNR policies in these areas.

Policy Concerns

- With regard to water pollution, the status of small-scale hydro under the state Water Pollution Control Act should be determined. In addition, a clear designation of "navigable" watercourses is needed to allow small-scale hydroelectric developers to plan with regard to the applicability of the FWPCA.
- The necessity of measures to protect anadromous fish is likely to be quite common. The financial impact on small-scale hydro should be assessed.
- Localities with small-scale hydroelectric potential should be required to include such development in their land use or zoning plans in order to integrate their approval function with the DEC master permit process.
- Exemption of small-scale hydroelectric facilities from PUC jurisdiction may constitute a stimulus to development. The impact of PURPA in this area needs to be clarified.

C. Liability

Liability for seepage, overflow or dam failure may constitute a significant financial burden on small-scale hydro. Insurance coverage for such events may be expensive and difficult to obtain -- especially where the dam owner is held to a strict liability standard. Strict state safety and inspection programs may reduce the perceived risk by insurers.

Policy Concerns

- The state may consider legislatively adopting either the negligence or strict liability standard for small-scale hydroelectric projects.
- The state may adopt adequate safety and inspection programs to improve insurability, as well as modifying state insurance laws to provide reasonable liability insurance coverage.
- The state may consider insuring small-scale hydroelectric projects which are adequately bonded or pass a safety certification inspection.

D. Financial

1. Taxation

There are numerous state and local taxes likely to impact small-scale hydro, including:

- income tax
- corporation tax
- business license tax
- property tax
- sales and use tax

State, municipal and federal property are exempt from general taxation. In addition, electric cooperatives have a unique tax structure.

2. Funding Sources

Both state and federal monies may be available to assist in small-scale hydro. Financial assistance is especially important at the feasibility study stage, where all expenditures are at high risk. The Department of Commerce and Economic Development (DOCED) will have a lead role in this area. Funding sources and actors include:

- water resources revolving loan fund (DOCED)
- alternative power resource revolving loan fund (DOCED)
- Alaska State Development Corporation loans (DOCED)
- Alaska Industrial Development Authority fund (DOCED)
- Alaska Power Authority fund and loans (DOCED)
- Municipal Bond Bank Authority bond issues (Dept. of Revenue)
- Regional Electrical Authority bond issues (13 REA's)
- Alaska Renewable Resources Corporation investment fund (new state corporation)
- Rural Electrification Act funding (federal through non-profit electric cooperatives)
- Alaska Hydroelectric Development Fund (Corps of Engineers)

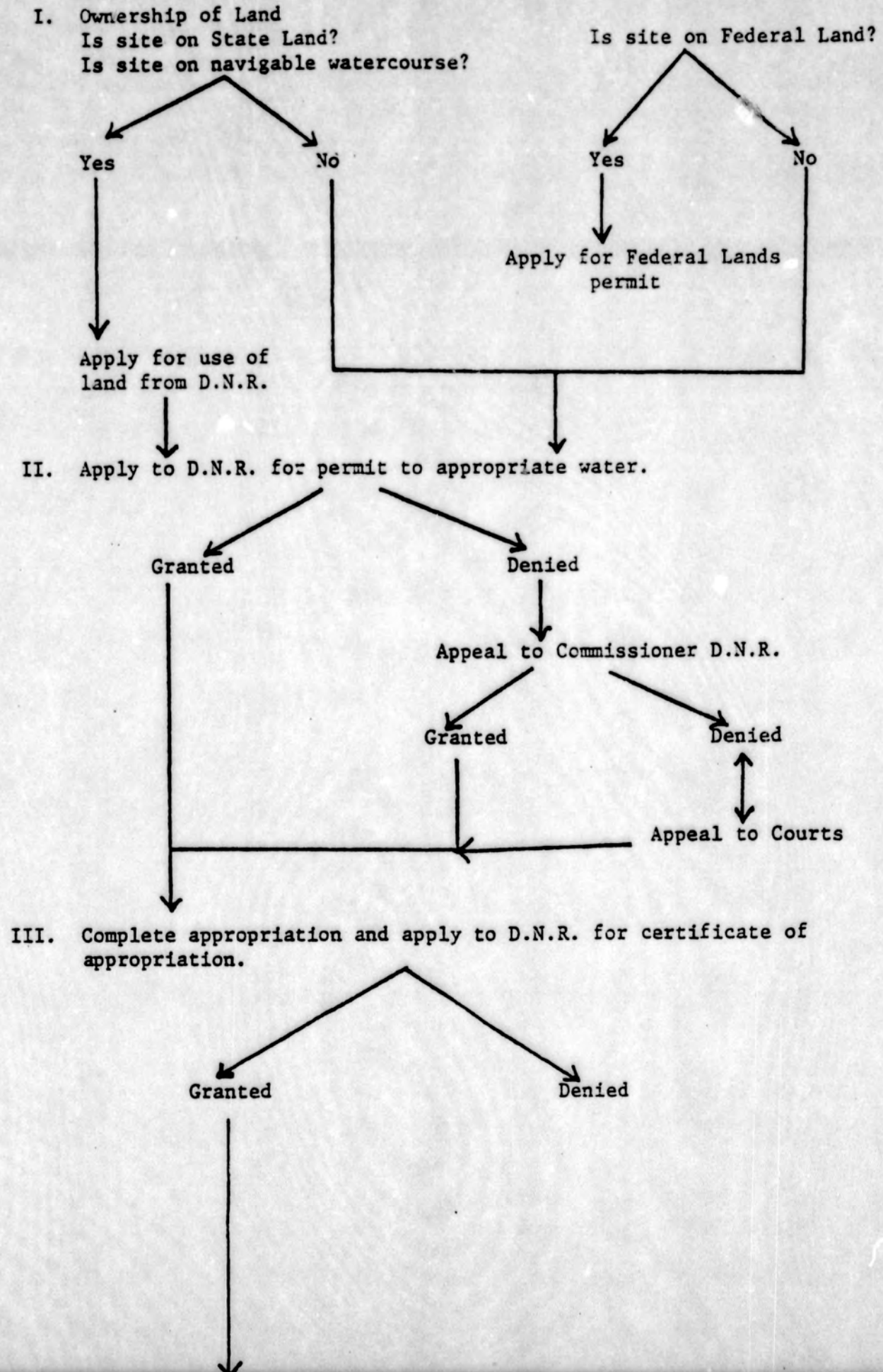
It should be noted that the utility of these funding sources for small-scale hydro has yet to be established. In addition, some of these funds may only be available to publicly-owned or non-profit projects.

Policy Concerns

- The effect of state taxation on small-scale hydro should be assessed. Various tax credits and exemptions may be considered as incentives.
- The availability and usefulness of the various funding sources needs to be established and assessed. The administrators of the funds need to be educated with regard to small-scale hydro's benefits and financial needs.

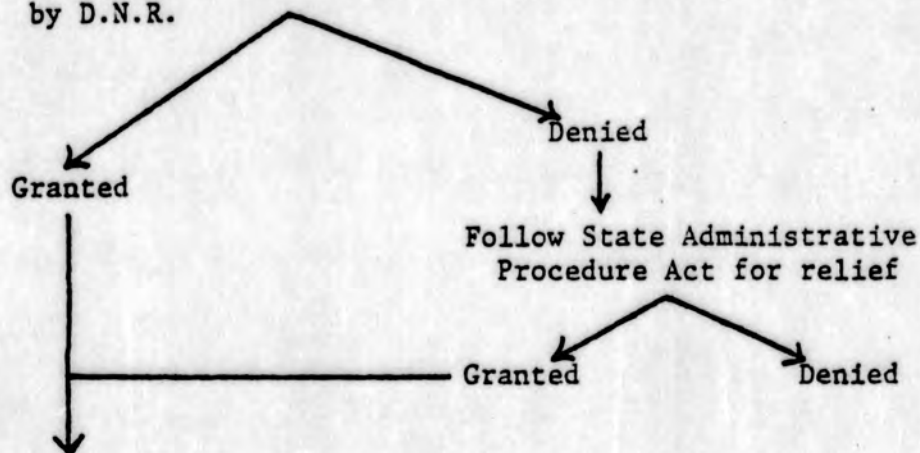
Acknowledgement: The foregoing summarizes a research document prepared under contract to NCSL by the Energy Law Institute of the Franklin Pierce Law Center; Director--Peter Brown.

FLOW DIAGRAM



IV. Submit master application to Department of Environmental Conservation.

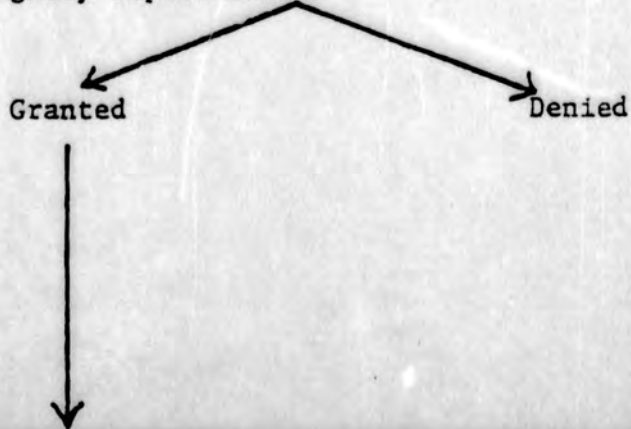
- Department circulates, for comment, the application to all executive departments and affected municipalities.
- Department submits to applicant necessary permit applications for completion.
- Applicant returns completed forms.
- Department returns forms to appropriate agencies.
- Permits may be required for:
 - a. Water pollution control from D.E.C.
 - b. Certificate of reasonable assurance from D.E.C.
 - c. Anadromous fish protection permit from the Department of Fish and Game.
 - d. Endangered species and critical habitat permits from Department of Fish and Game.
 - e. Construction of fishway, fish ladders and hatcheries from Department of Fish and Game.
 - f. Interference with salmon waters permit from Department of Fish and Game.
 - g. State Game Refuge Land Use Permit from the Department of Fish and Game.
 - h. State Game Sanctuary Permit from Department of Fish and Game.
 - i. Parks and recreational facilities use permit from D.N.R.
 - j. Compliance with Alaska Historic Preservation Act administered by D.N.R.



V. If retail sales of power contemplated, apply for a certificate of public convenience and necessity from P.U.C.



VI. If necessary, apply for permit for construction of transmission lines from Highway Department.



VII. If necessary, apply for funding from various programs within Department of Commerce and Economic Development or the Alaska Renewable Resources Corporation. (Municipalities have additional opportunity with the Municipal Bond Bank Authority.) Federal funding may also be available.



- VIII. Continuing obligations:
- State and local taxes
 - Comply with conditions of all permits and licenses
 - Obtain liability insurance for dam breach

Acknowledgement: This flow diagram is taken from a report prepared under contract to NCSL by the Energy Law Institute of the Franklin Pierce Law Center; Director--Peter Brown.

SCOMM

#44:34



*Please return
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February 21, 1978

Ms. Clarissa Quinlan, Acting Director
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Dear Clarissa:

FUTURE POWER PLANNING FOR THE RAILBELT

In recent telephone conversations you expressed an interest in receiving suggestions on what gaps and key questions remain following our power planning study for the Railbelt recognizing that time and financial resources precluded our covering all bases.

In response, we convened the "Power Planning Division of Battelle-Alaska" to discuss the situation and come up with suggestions based on our perception of what DEPD and the Alaskan Power Authority face as the next steps. The following paragraphs are a summary of our thoughts, somewhat arbitrarily broken out into the following categories.

- Supply Alternatives
- Power Need (Demand) Forecasting
- Energy Costs and Supply System Management
- Institutional Questions
- Environmental Costs

I have listed the above broad categories in the order of our perception of priority and hence not necessarily in the best order. Each of these areas are discussed in limited detail below indicating why work is needed and what approach might be taken to meet the need. Where there is an obvious correlation with the Corps of Engineers Plan of Study we have so noted.

1.0 SUPPLY ALTERNATIVES

The final version of our current project will pin down the costs of thermal options pretty well. However, the two smaller hydro options (Bradley Lake and Chakachamna) seem to deserve another look--possibly as "bite size" projects for APA and as a vehicle for promoting the cooperation of the utilities in evolution of an ultimate Railbelt Power Pool or coordinating council.



Based on currently available data, hydropower from Chackachamna and/or Bradley Lake projects appears quite competitive with coal-fired alternatives for meeting the "southern" load center needs which seem to require the earliest attention. Bradley Lake economics are fairly sound whereas the Chackachamna information dates back sixteen years. The project is unique in that it involves about 11 miles of tunneling. The technology for large diameter tunneling has changed markedly since the 1962 Bureau of Reclamation evaluation.

The potential Chakachamna project has the following attributes:

- (1) The scale is apt: approximately 350 MW and the project site not far from the CEA Beluga Station and transmission corridor.
- (2) Power costs (based on dated information) appear very competitive to coal.
- (3) The project has some verbal support from CEA and AMUS although such a project may be beyond their capability.
- (4) Geotechnical and environmental cost data is sparse.
- (5) Impingement on the proposed Lake Clark National Park is unknown. If the Park is established, it may preclude a Chackachamna project.
- (6) Chackachamna, appropriately intertied, could contribute to meeting the power loads required in support of Upper Susitna development as well as general load growth.

The desirability of the Bradley Lake project (70 MW) may hinge as much upon system reliability benefits and handling potential industrial loads (PALNG for example) on the Kenai as upon transmission to the Anchorage area. Both of these issues are somewhat subjective but can be analyzed with well accepted techniques if appropriate load scenarios can be postulated.

Suggested Approach

1. Bradley Lake:

- a. Refine analyses of potential Kenai loads and resources.
 1. Industrial development and conversions.
 2. Intertie to Anchorage area.
 3. Alternative capacity retirements that might be possible.

2. Chackachamna

- a. Analyze basis for 1962 report.
- b. Evaluate possible institutional conflicts (proposed Lake Clark National Park).
- c. Update capital cost components recognizing changes in construction technology.
- d. Evaluate interaction with future Railbelt system development.

This area does not appear to be addressed in the Plan of Study although possibly in Tasks PF-4, 9, and 14.

2.0 POWER NEED FORECASTING

Eric Yould has already mentioned this as a near term priority item. We concur based on observation of all recent power planning throughout the U.S., and the controversies that can arise. Obviously, it is just good business to obtain the best possible estimate of future loads along with some idea of their uncertainty. Assured timely marketability of power will be necessary to service the debt. The greater the assurance of full marketability, the lower the interest rates. On the other hand, groups opposed to development have found the issue of "need vs. demand" as a powerful vehicle for stopping or delaying projects they are opposed to for one reason or another.

In this regard we do not agree with Bob Cross's comment (page 5 of his letter of January 6th). The "Marbet" case in Oregon was close-by and the distinction between "need" and "demand" is more than just semantics. The same issue is presently strong in other states.

 We believe that ISER did as good a job as could be done given the limitations of data and the time and resources they had available. It is possible that their forecasts cannot be substantially improved upon. Nevertheless, DEPD and/or APA are going to have to justify any given project based on forecasts of power need that, even if admittedly not exact, recognize and treat all pertinent variables and their consequences at a level of sophistication that is state-of-the-art. This should be done at least to the extent that opposing interests will admit that DEPD/APA did the best possible job.

As all working in the subject area will agree, this is a difficult area to deal with. Suitable historical data may not be available and direct price elasticities, even if available, are difficult to extend due to the recent marked change in power cost trends. The problem is compounded by substitution of natural gas in the Cook Inlet region. Future Alaskan gas prices will

increase subject to external market forces and new gas regulation. The consequences are obvious although long-term consumer responses are far less so. Data from other parts of the country may have to be "imported" and adjusted for Alaska.

Battelle is engaged in a project for the Northeast utilities (NEPOOL) that has developed a great deal of data that, if appropriately adjusted, might be applicable. Even if not exact, it probably is the best available.

In any event, we do not agree with Bob Cross that price elasticity is zero (page 3 his letter of comment) or that ISER's inability to find adequate data even suggests it is really immeasurable. The literature suggests a price elasticity of -0.2 to as high as -4.0 depending on the sector.

Given the uncertainties that all parties should agree exists, we suggest more than just development of better forecasts should be done. The public and decision makers should additionally be informed of the degree of uncertainty and the possible consequences of planning on one outcome and having another actually evolve. This issue was raised by both Bob Cross and Tom Stahr in their comment letters. We concur that it is a very real question but one unfortunately not commonly and publicly recognized.

Therefore, we feel the forecasting requirement is more than the task of just producing better or more defensible forecasts. The latter is the necessary first step but the public and their decision makers need to understand the nature of the uncertainties and the economic consequences of erring in one direction or another. The State of Alaska would probably be ahead of the rest of the country if it factored these uncertainty considerations into its planning process. We strongly recommend that the State do so. California made a start at this issue but it never completed the work. There is fair information available for the consequences of the over capacity but the consequences of being short of capacity are less well understood and would have to be developed. Planning biased on high side forecasts generally provides a higher degree of flexibility through slipping construction schedules. Earlier than anticipated retirement of more costly thermal capacity is another good option.

Suggested Approach

The above power need forecasting area is addressed in the Plan of Study as Power Market Studies Task 1 through 9. The consequences of forecast errors do not appear to be covered in the plan of study.

We also suggest that DEPD or APA establish early a system for information collecting. This could be done in cooperation with the utilities and start assembling a data base that can be used to improve subsequent forecasts.

3.0 ENERGY COSTS AND SUPPLY SYSTEM MANAGEMENT

I originally intended to forward separate suggestions relating to energy cost and development of supply system management methods. However, in attempting to put down our ideas in a rational fashion, the subjects became so interrelated that I've lumped them together. This area also goes hand in hand with 2.0 POWER NEED FORECASTING as discussed above and in following paragraphs. Some subdivision of this area is possible as noted below:

Power Plant Unit Energy Costs

The comment draft of the Railbelt study raised a number of questions regarding the cost of thermal power from individual plants. Knowledgeable people within the State suspect that we may have underestimated coal costs and we concur based on new data. There is also a feeling that our capital cost estimates may be high particularly for Beluga. We share that suspicion and recognize that interest and amortization charges are a major component in the total power costs even for thermal systems. The net result of adjusting these costs may be a downward shift of thermal power costs moving them to a more competitive position vis-a-vis the higher cost hydroelectric options such as Bradley Lake. This will make the call more chancey. Our final report on Railbelt power will include adjustments and best guesses as of now.

On the hydro side, Upper Susitna possibly has higher risk of going up in capital cost than coming down. This would likely result if more conservative structural concepts have to be adopted.

The net result of all the above may be a narrowing of the gap between estimated hydro and thermal power costs. Since there will be a continuing need to carry evaluations of alternatives on the ledger, APA should at some point try to improve the estimates of thermal power costs, particularly the "Alaska Factor".

It is one thing to talk (as we did in the Railbelt Study) of costs of power from individual units generating under a set of operating assumptions as to plant factors over time, etc. It is another thing to address the cost of power generated by a system where cost minimization can be improved by load dispatching to generating units with successively higher marginal costs of production. With efficient load dispatching, recognizing the seasonal or other constraints on capacity, considerable reduction in overall power costs can be achieved. Individual plant factors can however significantly differ from the assumptions we have used thus far and the optimum can only be achieved through iterative solutions and some computerization is essential.

The important thing is to plan the system and not just single units. This includes not only the call up of new capacity but the retirement of more

costly capacity. We did not do this in our Railbelt Study as time and resources did not permit. This omission is probably the greatest shortcoming of our report--we never retired any higher cost units. System power cost should also include transmission, distribution and billing costs.

Typically plants operated in a system are called on, or loaded, in a sequence from the least to the most expensive to fill the area under the load duration curve. Usually, high capital, low operating cost plants are base loaded and the reverses are placed in peaking service to the extent they can load follow.

The inclusion of conventional hydropower complicates the problem of finding the minimum cost operating plan. The marginal cost of hydro is essentially zero. This implies that conventional hydro plants should be the first in the economic loading order. However, the total amount of hydro energy available is limited by the river flows and reservoir sizes. Usually, the total energy is not sufficient to run the hydro units 100 percent of the time at fuel capacity. Nevertheless, the economic loading strategy should be such that all the hydro energy is discharged. Although base loading hydro can achieve this objective, in a mixed hydro thermal system, the economically optimum full discharge strategy is to employ the hydro capacity to remove as much of the area under the load duration curve from the top of the curve and thus minimize call up of the most expensive energy.

This is a difficult concept to cover in a brief letter but will be quite an important factor to consider in minimizing the system-wide cost of power. This will be a tricky thing to handle in resource planning as the seasonal load curves must be considered, the seasonal availability of water either for storage or discharge, and the nature and load following ability of various thermal units in the system must be taken into account. There are a number of linear program "global"(a) optimization codes that have been used around the country and elsewhere. However, given the nature of the probable future Railbelt system, the number of uncertainties involved and cases that you might want to examine,(b) we do not feel they are appropriate at this time. These codes can be very complex and also costly to run but still suffer from the "exact solution to an approximate problem" syndrome. A simple deterministic simulation approach appears more appropriate at this time for Alaska. Nevertheless, it is certainly appropriate and desirable for DEPD or APA to familiarize itself with the more advanced planning tools and seek one that best fits the Alaska context.

- (a) In the sense of optimization over a several decade planning horizon.
- (b) For example, just on Upper Susitna alone, there will be a number of alternative dam heights and reservoir volume cases to be considered that will need to be integrated with the Design Tasks in the Plan of Study. Devil Canyon before Watana is one option for example.

It should be recognized that the manner in which the Upper Susitna hydro-system is operated will affect downstream flow modifications that will have bearing on the environmental impact. Thus evaluations of Susitna loading should be done fairly early so that the results can be used in the environmental assessment.

Suggested Approach

To some extent the above area is addressed for Susitna hydro in the Plan of Study Tasks PS-1, 2, 4, PS-12, 13 and PM-10.

In terms of system planning, we suggest that a system be put in place to enable rapid calculation of the cost of power as a function of a number of variables: physical, loads, economic, regulatory, and timing. The results given in our Chapter 8.0 were hand calculated on a very few options, and did not portray power costs. Even so, these computations consumed considerable time. The best approach to this area is beyond the scope of a letter.

For thermal options we suggest the following:

1. Alaska Location Factors:

- a. Refine locational factors effecting capital costs including attention to scale effects, proportion of material vs. onsite construction costs, etc.

2. Alaska Specific Factors:

- a. Refine special factors such as escalation (over "lower 48") required for
 - 1. Plant enclosure needs
 - 2. Covered coal storage and handling systems
 - 3. Cooling systems special requirements
 - 4. Costs of other raw materials, e.g. limestone.
- b. Base refinement on discussions with utilities, component suppliers, transportation concerns and Alaskan construction specialists.

In addition, some early-on work is desirable on evaluating when the Cook Inlet-Fairbanks intertie should be scheduled. Given the probable power demands for construction of Upper Susitna, the intertie may be desirable earlier than previously supposed.

4.0 INSTITUTIONAL QUESTIONS

The sheer length of our Chapter 10 attests to the extent of the institutional problems! Being aware of some of the problems that have occurred in the "lower 48", we believe the State should develop a plan, very likely of the critical path type, laying out what has to be done, when, and in what detail to meet the various Federal and State requirements. This should parallel the development of a framework for the legal work required. Too often the lawyers get into the act late in the game and the planners and engineers find they missed assembling the data and documentation necessary to meet the various statutory requirements.

Another area involves the terms and conditions of power sales contracts. I presume APA will eventually evolve into the role of a marketer of bulk power to the distribution utilities. How these contracts are drafted will affect APA's position in the money market. Close working with bond attorneys and consultants will be necessary.

Careful monitoring of the D2 lands plan should also be maintained regarding site identification and potential restrictions.

The Coastal Zone Act requires another look particularly as a source of financial assistance to the State. This is particularly pertinent to Beluga and Chakachamna projects.

Dick Schuller of Battelle-HARC along with Joel Haggard put forward some thoughts on energy facility siting to you last year. Given probable developments, their ideas are still germane but perhaps now can be better focused.

Federal policy: This should begin to gel in a few months. The pertinent aspects include coal conversion, fuel excise taxes, well head regulation, alternative wheeling and interconnections, contingency plans, and conservation programs. I expect that a log of loop holes will be included in the "final" version and DEPD/APA should profit from keeping abreast of the developments and their impact on the State. Possibly the State could influence regulatory interpretation of the Act as it applies to Alaska.

5.0 ENVIRONMENTAL COSTS

In our Railbelt analysis, we did not get into this area at all although that was the original intent--there just was not enough time and there obviously were other more crucial items to deal with. Nevertheless, the environmental costs of all alternative generation modes are going to have to be developed as part of any project licensing and siting requirements (See Chapter 10.0).

In the Interim Feasibility Report, the Corps went about as far as they could on the Upper Susitna projects based on the available data. Any further analysis should probably await the results of the various elements called out in the Plan of Study.

To our knowledge, there is little information on the environmental costs of the potential Bradley Lake and Chakachamna projects and their associated transmission facilities. It may be premature to pursue environmental studies on these until their potential is better understood from an economic and systems integration standpoint. Anadromous fisheries effects, pool level fluctuation, habitat effects and transmission corridor questions will be the key elements for Chakachamna. Pool level fluctuations and transmission corridor questions are possibly the major issues for Bradley Lake.

For the coal fired thermal options, presumably CEA and GVEA/FMUS will cover the appropriate environmental analysis as part of their responsibilities in connection with Beluga or Healy-2 projects. Therefore it may not be necessary for DEPD/APA to become directly involved unless the latter is a participant in the financing. However, APA will ultimately have to treat the environmental costs of alternatives to hydroprojects as part of the NEPA requirements and will need at least generic environmental cost data at a minimum.

Suggested Approach

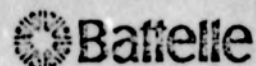
1. Generic Effects:

- a) Develop information on atmospheric emissions, water quality parameters, land use, solid waste disposal, water consumption and employment for power plants per se.
- b) Develop information on associated operations including mining (coal and limestone) effects such as land disturbance, restoration, water quality impacts and so on including attention to the requirements of the Surface Mine Restoration Act. Transportation system impacts must also be covered as well as transmission systems.

2. Site Specific Effects:

- a) The Healy site may well become saturated with Healy-2 and may even run into problems with the latter unit from the standpoint of compliance with the Air Quality Act amendments and ice fogging of the highway. Careful analysis of air quality factors should be undertaken including modeling of terrain effects.
- b) For the interior load center, alternative siting plans should be developed with the primary issues being air quality and water questions. We earlier thought that the Nenana Area might make sense but new meteorological data suggest it may be out and siting at Clear may be better.

Ms. Clarissa Quinlan
February 21, 1978
Page 10



- c) The Beluga area may be in good shape from an air quality standpoint due to prevailing ventilation. Water availability and disposal may be a larger factor and deserves attention.

My apologies for the length of this letter and the delay in getting it to you. The general set of questions you raise are not simple however, and this note can only touch the surface. I hope to be in Anchorage in the near future and would like to discuss these matters with you and Eric.

Gregg Erickson, Director of Research for Legislative Affairs, also expressed interest in these areas so I'm giving him copy coverage.

Hope the above thoughts are of value. Please call if there are any questions.

Best regards,

A handwritten signature in cursive script, appearing to read "Ward".

W. H. Swift, Project Manager
Alaska Power Planning

WHS:nm

cc: E. Yould
G. K. Erickson ✓

Batelle Report

The capital and operating costs for both fossil fuel and hydroelectric generating plants were discussed in Chapter 6.0. The capital and operating costs for fossil fuel generating options to be used in this analysis were presented for the Anchorage/Cook Inlet/Kenai region and the Fairbanks region in Tables 6.13 and 6.14, respectively. The hydroelectric capital and operating costs to be used were presented in Tables 6.10 and 6.11.

The fuel costs were also discussed in Chapter 6.0. The best estimates of the fuel costs were summarized in Figure 6.8.

The interest and escalation rates corresponding to each of the three inflation rate scenarios were presented in Table 7.1.

8.3 LEVELIZED COSTS FOR SELECTED GENERATING OPTIONS

8.3.1 Description of Selected Options and Summary of Costs

The levelized cost of power for 28 fossil fuel and 4 hydroelectric generating options available to the Railbelt are presented and analyzed in this section.

Four types of generating units were analyzed: 1) 100, 200, and 400 MW coal steam turbines, 2) 100 MW gas combined cycle units, 3) 100 MW oil combined cycle units, and 4) various hydroelectric options. Costs of power were calculated for coal fired steam turbine plants located at Beluga, Anchorage, Healy, and Nenana. Coal was assumed to be supplied from the Beluga area reserves (Threemile or Capps Fields) to Beluga plants and from Healy via the Alaska Railroad to the other locations. Alaska Power Authority (APA), REA, and municipal plant financing options were examined. Fuel supply financing was assumed to be private throughout. Coal plants were evaluated with and without flue gas desulfurization (FGD).

Costs of power were evaluated for oil-combined cycle units located in the Cook Inlet and Fairbanks (North Pole) area. The fuel for these plants is assumed to come from refineries in the same areas. As with coal fired plants APA, REA, and municipal financing options were examined.

Gas combined cycle units were also assumed to be located either in Cook Inlet or North Pole area. Fuel for units in the Cook Inlet area were assumed to obtain fuel from the Cook Inlet area while those located at North Pole were assumed to obtain gas from the proposed ALCAN gas pipeline. All three financing options were again evaluated.

Four hydroelectric projects were examined: 1) Bradley Lake, 2) Chakachamna, 3) Watana only (Upper Susitna), and 4) Watana plus Devil Canyon (Upper Susitna --proposed by Corps of Engineers). Data for these options were based upon Corps of Engineers cost estimates.

The costs are summarized in Tables 8.1, 8.2, and 8.3 for the 0%, 4%, and 7% inflation scenario, respectively. Costs are presented for plants coming on line in 1980, 85, 90, 95, and 2000. Appendix D provides details of the cost estimates and all assumptions used in their derivation.

8.3.2 Analysis of Results

Many issues can be analyzed by examining the data presented in Tables 8.1, 8.2, and 8.3. Several of these are discussed in this section.

Lowest Cost of Power to the Railbelt

Hydroelectric options typically produce power at about 1/2 to 3/4 the cost of coal steam turbines and combined cycle units. These results are true for all three inflation rates. It is important to keep in mind that the estimates upon which the hydroelectric costs are based are the results of preliminary studies only. As further site studies such as the Plan of Study for Upper Susitna Hydro Power are undertaken the capital costs may increase.⁽¹⁾ The capital costs of the Upper Susitna hydroelectric options would have to approximately double to eliminate the cost of power advantage that exists using present data. The costs presented for the Watana and Watana plus Devil Canyon include the cost of transmission to the Fairbanks and Anchorage load centers.

The hydroelectric options have relatively long planning and construction lead times. For example, it is estimated the Watana or Watana plus Devil Canyon will not be available until at least 1991. Bradley Lake and Chakachamna

TABLE 8.3. Levelized Cost of Power for Railbelt Generating Options
7% Inflation Rate

Case Number	Generation Type	Location	Fuel Source	Plant Financing	F.G.D.	Power on Line Date				
						1980	1985	1990	1995	2000
1	Coal Steam Turbine	Beluga	Beluga	APA		Case Deleted				
2						Case Deleted				
3					Yes	116.25	183.80	290.93	460.96	731.03
4					No	105.41	166.97	264.74	420.13	667.24
5						Case Deleted				
6						Case Deleted				
7					Yes	124.58	196.92	311.58	493.47	782.20
8					No	112.67	178.40	282.74	448.45	711.84
9						Case Deleted				
10						Case Deleted				
11		Anchorage	Healy		Yes	116.77	185.13	293.80	466.65	741.74
12					No	106.74	169.49	269.36	428.38	681.74
13				REA	Yes	124.38	197.13	312.68	496.37	788.53
14					No	113.40	179.99	285.88	454.39	722.68
15				Municipal	Yes	118.06	187.17	297.01	471.70	749.69
16					No	107.87	171.28	272.17	432.80	688.70
17	(400 MW)			APA	Yes	113.07	179.22	284.35	451.57	717.74
18	(100 MW)				Yes	131.56	208.17	329.72	522.69	829.27
19	Gas Combined Cycle	Cook Inlet	Cook Inlet		NA	120.99	195.35	312.40	499.93	800.51
20				REA	NA	122.44	197.63	316.00	505.59	809.42
21				Municipal	NA	121.24	195.74	313.02	500.90	802.04
22	Oil Combined Cycle			APA	NA	118.12	189.62	303.17	485.07	776.57
23				REA	NA	119.57	191.90	306.77	490.73	785.48
24				Municipal	NA	118.37	190.01	303.79	486.04	778.11
25	Coal Steam Turbine	Healy	Healy	REA/Munic.	Yes	114.35	180.44	284.96	450.41	712.43
26					No	101.73	160.75	254.22	402.32	637.15
27		Nenana			Yes	127.34	201.35	318.64	504.64	799.78
28					No	114.09	180.66	286.29	453.98	720.34
29				APA	Yes	119.14	188.45	298.34	472.68	749.46
30					No	107.05	169.57	268.83	426.50	677.08
31	Oil Combined Cycle	North Pole	TAPS	REA/Munic.	NA	122.24	196.10	313.38	501.13	801.86
32				APA	NA	120.75	193.76	309.70	495.34	792.74
33	Gas Combined Cycle		ALCAN	REA/Munic.	NA	125.11	201.83	322.60	515.99	825.79
34				APA	NA	123.62	199.49	318.93	510.20	816.68
40	Hydro	Bradley Lake	NA		NA	80.32	124.88	194.42	303.00	472.71
41		Chakachamna			NA	76.39	119.37	186.66	292.09	457.37
42		Watana			NA	55.19	86.64	136.05	213.69	335.72
43		Watana + Devil Canyon			NA	43.55	68.25	107.00	167.84	263.35

also have long lead times. At the present time there are no plans to intertie the Fairbanks and Anchorage load centers until construction of the Upper Susitna projects. For these reasons both the Fairbanks and Anchorage areas will have to add new thermal capacity before any of the hydroelectric options evaluated here could come on line if they are to meet the forecasted load growth as noted in Section 8.5. The cost of power produced by the various fossil fuel generating options for the Anchorage and Fairbanks areas are discussed below.

Lowest Cost of Power to the Anchorage Region(1980-1990 Power on Line Date)

To compare the costs of power for the Anchorage area an assumption must be made about the costs of transmission from Beluga to Anchorage. These transmission costs were estimated to be 2.5 mills in 1975 dollars.⁽²⁾ Using the Handy-Whitman index this is equivalent to about 3.9 mills in January 1, 1977 dollars. This estimate is used in this comparison.

Assuming that FGD is required coal steam turbine units located at Anchorage and combined cycle units located on Cook Inlet produce power delivered to Anchorage 5-9% cheaper than coal steam turbine units located at Beluga. If FGD is not required the cost of power from the coal steam turbine units becomes cheaper than power from the combined cycle units.

Lowest Cost of Power to the Fairbanks Region (1980-1990 Power on Line Date)

As was the case with the Anchorage region, assumptions must be made about the costs of transmission from Healy and Nenana to Fairbanks. It is assumed that transmission costs increase the cost of power by 3.0 mills from Healy to Fairbanks and 1.5 mills from Nenana to Fairbanks.

Assuming that FGD is required, the oil and gas combined cycle units located at North Pole produce power at a lower cost to the Fairbanks market than coal steam turbine units located at either Healy or Nenana. Assuming the FGD is not required the coal steam turbine units product the cheapest power for the Fairbanks market.

8.4 SENSITIVITY ANALYSIS

8.4.1 Sensitivity of ECOST2 Results to Changes in Input Parameters

In any parametric analysis such as is presented in Section 8.3 it is important to know which input parameters have the most effect on the results, i.e., which input parameters are the results most sensitive to. This information serves as a guide to the analyst pointing out those parameters which maximally affect the results. Additional research can then be focused on those parameters to insure their accuracy. This information is also useful to the reader since it allows he or she to focus attention on the derivation or source of the parameters which the model is most sensitive to.

To test the sensitivity of ECOST2 to the input parameters, each parameter was varied between a value 10% higher than the base case and a value 10% lower than the base case (20% total change). The percentage change in the levelized cost of power for the years 1980 and 2000 were then calculated from these model runs. These percentage changes are presented for three cases in Table 8.4, 8.5, and 8.6. Table 8.4 corresponds to a coal steam turbine unit located in the Anchorage area (Case 11). Table 8.5 corresponds to a gas combined cycle unit located in the Cook Inlet area (Case 19). Table 8.6 presents the results for the Watana hydroelectric project (Case 42). In each case the relative change in the levelized cost of power caused by a 20% change in the input parameter for 1980 and 2000 power on line dates are entered in the first two columns. The parameters that the model is most sensitive to are ranked in Column 3.

The data presented in Table 8.4 indicates that the results presented for Case 11 (and for the other coal steam turbine plants also) are most sensitive to the fuel escalation rate. The results are also relatively sensitive to the unit fuel cost, heat rate, and plant utilization factor.

The data presented in Table 8.5 points out that the results for the oil and gas combined cycle cases are also most sensitive to the fuel escalation rate. Again the results are also sensitive to the heat rate and unit fuel costs.

TABLE 8.4. Sensitivity of Levelized Cost of Power to 20% Change in Input Parameters - Coal Steam Turbine - (Case 11)

Input Parameter	Sensitivity (% Change) Power on Line Date		Relative Sensitivity
	1980	2000	
Capital cost	8.1	8.5	4
Heat rate	11.0	11.8	2
Operating and maintenance cost	1.1	0.7	
Financing discount rate	6.9	6.7	6
Facility construction time ^(a)	0.1	0.1	
Payback period ^(b)	6.4	6.4	7
Insurance rate	0.2	0.2	
Tax rate	0.7	0.7	
Interim replacement rate	0.3	0.3	
Plant utilization factor	10.0	9.3	3
Unit fuel cost	11.0	11.8	2
General inflation rate	0.7	0.96	
Construction escalation rate	0.3	10.7	5
Fuel escalation rate	15.1	34.4	1

*opposite
of
hydro*

(a) Facility construction time is considered an integer in the analysis. It was varied between 4 and 6 years (50% change).

(b) The sensitivity of ECOST2 to changes in the payback period was tested separately since the present formulation constrains the payback period to 5 year increments.

As shown in Table 8.6 the results for the hydroelectric cases are most sensitive to the capital cost estimates, construction escalation rate, financing discount rate, and plant utilization factor.

8.4.2 Special Sensitivity Analyses

This section points out some additional concepts and parameters which have a relatively strong impact on the analysis presented in this chapter.

TABLE 8.6. Sensitivity of Levelized Cost of Power to 20% Change in Input Parameters - Hydroelectric - (Case 42)

Input Parameter	Sensitivity (% Change) Power on Line Date		Relative Sensitivity
	1980	2000	
Capital costs	21.8	21.9	1
Operating and maintenance costs	0.3	0.2	
Financing discount rate	21.1	21.2	4
Facility construction time ^(a)	0.3	0.3	
Payback period	2.4	2.4	
Insurance rate	0.2	0.2	
Tax rate	1.9	1.9	
Plant utilization factor	23.1	23.1	3
General inflation rate	0.3	0.4	
Construction escalation rate	0.0	27.3	2

(a) Facility construction time is considered an interger in the analysis. It was varied between 5 and 7 years (40% change).

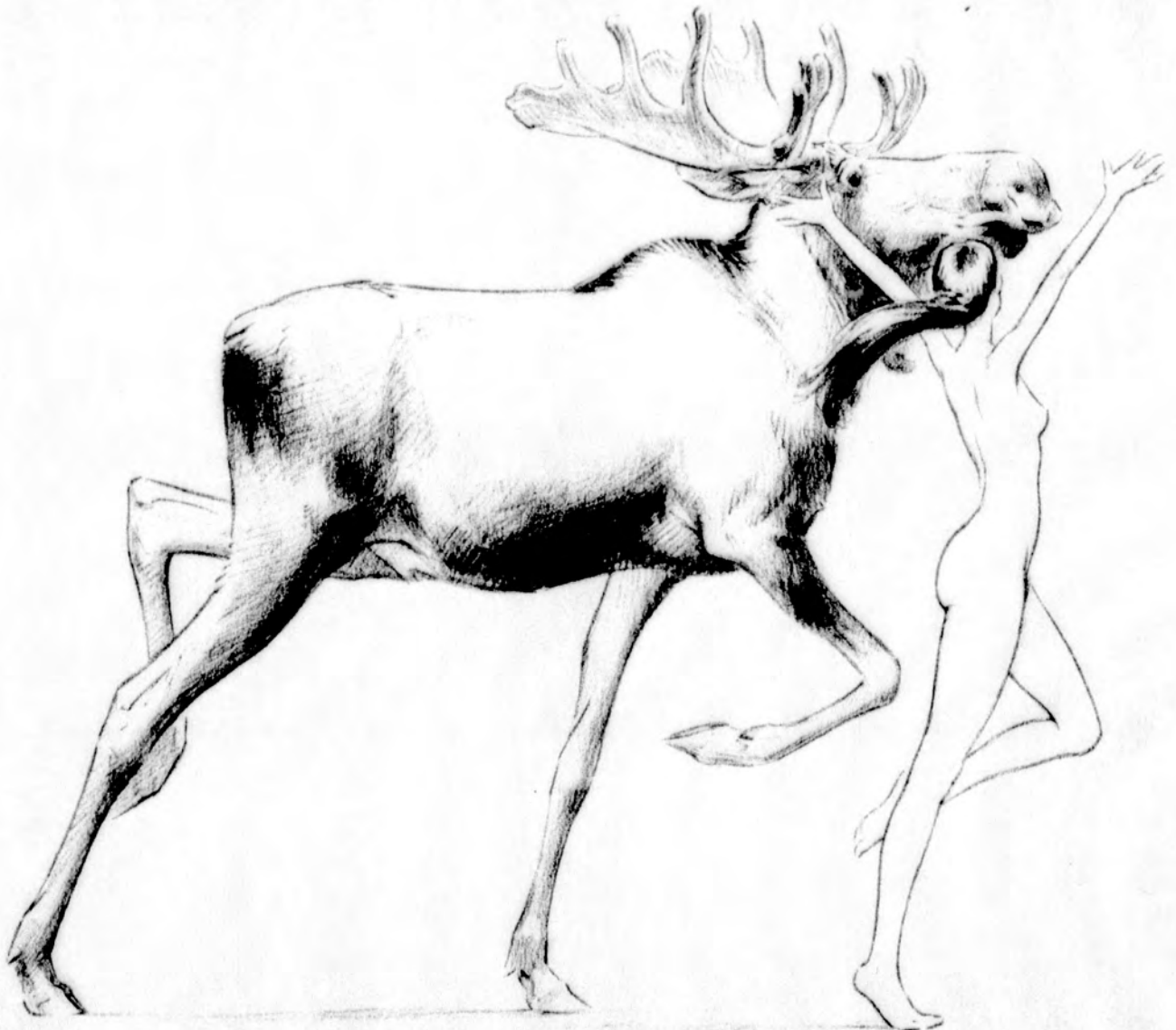
Plant capital costs contribute a greater portion of the total cost of power for coal steam turbine plants than for combined cycle plants. Fuel costs largely determine the cost of power from a combined cycle plant. The effects these differences have on the relative annual cost of power for steam turbine and combined cycle plants is shown in Figure 8.2. The annual cost of power from the steam turbine increases much more rapidly as the PUF decreases than does the annual cost of power from the combined cycle plant.

These differences have a significant impact on the decision as to which type of capacity to build. If the capacity is to be used for base load (high plant utilization) steam turbine units are more attractive relative to combined cycle units than if the new capacity will be used to meet intermediate or peak loads (low plant utilization). Steam turbine units must be operated at a relatively high PUF to keep the costs of the power produced down. Combined cycle units on the other hand can be operated over a wider range of PUFs without such a significant increase in the cost of power. For these

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COVER

Melissa and McGonnegal

by Bill Berry

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Editorial . . .

THE ALL-OPEC PIPELINE

I wish I could remember all the arguments why the oil line to Valdez was to be so much better. Even worse, I wish I had obtained signed, legally binding statements that would have insured that the pre-pipeline promises would hold true. One of the prominent reasons for the Valdez line, which we can all remember, is that it would be an "all-American line"; American producers, American transportation, American customers, and no way for OPEC shenanigans to interfere with a purely American venture. In November 1973 OPEC raised its prices to about \$8 per barrel of crude, which punctuated the need for an independent domestic oil supply.

Last week, OPEC raised its crude prices significantly. Within a day, heating oil prices in Fairbanks rose 20 percent. Alaskan oil, refined and distributed within the state, costs as if it were OPEC oil. Energy independence? All-American?

During the fray before the Alyeska Pipeline was built, the conservation community claimed that Alaska was going to be torn up for corporate profits more than for oil for America. For

example, most Alaskan oil would probably end up in Japan even though the domestic fuel shortage of 1973-74 was the primary stimulus for building the pipeline. Industry vigorously denied that point of view. In this case, however, Congress insured that Alaskan oil would be considered as domestic supply by prohibiting its export. The Alaskan congressional delegation is now arguing for the sale of Alaskan crude to Japan even during the current energy shortage.

Take heed! Important lessons can be learned from the above examples for both conservationists and the public in general. Listen carefully to the significant proposals, and pay particular attention to the environmental and quality of life promises being offered. If the promises are sincere, then there should be little trouble incorporating them into enabling legislation or managing regulations. If the promises are not sincere, then expose it and help straighten out the debate so it covers the real issues.

L.R.M.

IN TRIBUTE TO BILL BERRY

By Rosemarie and Neil Davis

In a memorial for him at the Noel Wien Library in Fairbanks, the collection of William D. Berry's work was an impressive sight. Hurriedly assembled by family and friends following Bill's sudden death on May 14, 1979, this collection was but a part of his life's artistic production; yet the sheer number and the variety of items displayed made a huge impact upon all who knew him.

Bill had started his career as a wildlife artist even before he could draw. His first works, at age three, were animal figures cut from paper with scissors. As Bill grew older, he came to recognize fully the violence in nature, but he never portrayed it in his art. Even during the years when he served in World War II, his art centered on the humor, kindness and good of which men were capable. He chose to oppose the evils of life by creating images of compassion and warmth.

That night at the memorial, Bill's unfinished mural on the library wall was simultaneously the backdrop and the focal point for the display of his work. In the mural Bill had created a comprehensive and compatible habitat for his cast of real and imaginary characters. The immense effort and time Bill put into the mural was typical of most of his projects. This one went slowly, in part, because the project was not just a painting; it was a social happening. Many hours were spent talking about the mural, painting, or life in general with children and adults who stopped by to watch Bill work.

In other ways, the unfinished mural was like Bill Berry's Wildlife Map of Alaska completed in 1966. Each part of the map was a little painting in itself, done in intricate detail. Bill used a brush with a single camel's hair to paint the irises in the eyes of the salmon seen leaping out of the Gulf of Alaska and Bristol Bay. He repainted the sea urchin when he discovered that the sea urchins of the region were slightly different in color than the one he had first portrayed.

Weeks could go by without the casual observer being able to notice change in the wildlife map. Of course Bill knew what changes he had created, and he never seemed impatient with himself. Besides, the normal flow of life takes time. It takes time to paint birthday cards for family and friends and to build elaborate animal masks for parties. It takes time to livetrapp the flies and the bees that have gotten into the studio and to carry them outside to freedom.

Bill's eye could capture an animal's pose with incredible speed. One fleeting glimpse of a bird or the arching turn of a moose's neck created an instantaneous perception in Bill's mind that was quickly transformed into a field sketch. Then months or years might pass before the initial perception evolved through a series of secondary sketches or color separation plates (each individually painted) to emerge finally as a finished work.

For Bill Berry, the end seemed not nearly as important as the getting there — and, while getting there, maintaining a tolerance for all ways and forms of life.



©

BEYOND (d) (2)

The Alaska (d)(2) legislation has been a focal issue of national conservation organizations as well as Jimmy Carter's top conservation priority. As a member group of the Alaska Coalition, the Alaska Conservation Society has committed itself to a strong environmentalist bill. Yet coincidentally the Society has attempted to infuse a uniquely Alaskan perspective into the coalition and thus into a National Interest Lands bill. For example, sport hunting is generally compatible with wilderness integrity in Alaska; indeed, for many, it is integral to the Alaska Wilderness experience. Consequently, the Society has pushed for the establishment of National Preserves rather than National Parks in many areas in order to maintain this use.

Some of those members of the Society who have worked closely with the Alaska Coalition or have testified before Congress have felt their efforts were frustrated, if not futile. Issues important to Alaskans have been minor issues in the national perspective. Today, the Society's limited power in shaping legislation is undoubtedly waning further as Congress approaches the final stages of a bill acceptable to both houses.

We shouldn't be very surprised nor too upset that the Society has not been heard nor our position carefully weighed in the legislative proceedings. The Society is a small, primarily Alaskan group; our ability to influence national issues is thus slight. Yet we have had considerable influence at state and local levels on other issues. Much of the fine-tuning of the federal management of new parks, preserves, wildlife refuges, and forests will occur at these latter levels after passage of a National Interest Lands bill. This will also be the time when we will be able to infuse our perspective into the decision-making process.

Federal agencies must seek public input and review on a

number of management decisions. As many of us have sensed, particularly after visits to Yosemite and Yellowstone National Parks, park designation is not necessarily synonymous with management for wilderness quality. The National Park Service's development plans for areas within its jurisdiction will certainly require close scrutiny by the Society. There will also be numerous decisions on uses compatible with proposed wilderness status for much of the National Interest Lands. We should remember that present use patterns, for example backcountry cabins, have not precluded potential wilderness designations — many human activities have left Alaskan wilderness "essentially unaltered" in the language of all proposed bills. Will the public have input into decisions on permit systems and access? Will backcountry cabins be left open for public use or locked as are those in McKinley Park? These are questions which may seem trivial at the present time but which will greatly affect the degree to which traditional Alaskan uses persist on federal lands.

The National Interest Lands legislation and settlement of Native Land Claims will checkerboard the patterns of land ownership in the state. The (d)(2) issue has overshadowed important conservation questions in state-owned areas. With very little public involvement, the state has developed a five-year lease plan for offshore oil and gas. Has the public, who are the ultimate beneficiaries of such sales, had sufficient input into these decisions? How do we know that the decisions are being made with full understanding of environmental effects and economic trade-offs? The Society must strive for greater public awareness and input in the state's decision-making process.

The pattern of the state's future development will be determined by a handful of issues such as the Susitna Dam project. As part of the feasibility study approved in the last legislative session, a study of alternative sources of power, both hydroelectric and other, will be conducted. The Susitna Dam would be an expensive project, which, when eventually completed, would generate an overabundance of expensive energy — overabundance, that is, unless we Alaskans were unwisely to desire and to push for rapid population and industrial growth in the railbelt area. Hopefully, the alternative study will carefully weigh alternatives of smaller scale in relation to the needs of moderately growing communities in this area. The decisions made on this project will play a major role in the future patterns of growth of the entire railbelt region.

I look forward to passage of a National Interest Lands bill. National conservation organizations and the President see the bill as the end of a long effort. As they turn their attention away from Alaska, we Alaskans will be able to focus better on conservation issues within the state. Perhaps most importantly, however, passage of a bill will be the end of a battle which has fragmented and sharply divided Alaskans. The (d)(2) issue has not been simply a conservation issue within the state; it has also been a complex issue of state vs. federal control of land, individual freedoms, and unnecessary or unwanted federal regulation. By joining the Alaska Coalition, by viewing the (d)(2) issue as a critically important conservation issue, the Society has alienated old friends who saw the proposed legislation from other perspectives. Once the legislation is passed, the Alaska conservation community will again find a focus and a unison so sorely lacking these past few years.



CAMP BEAR PAW,
TANAI N.T. FOREST
JULY 29, 1952
(MEMORANDUM)

MOST CONSPICUOUS
FEATURES ARE SNOWY
WHITE MARGINS OF EARS &
BIG WHITE FEET (DARK
SOLED)

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What Next? . . .

MARINE MAMMALS

By Dr. Francis H. Fay

The mammals of Neptune's kingdom have had a curious history of interaction with human officialdom. They have been ignored, dealt mischief, bombed, clubbed, studied, embraced, and, most recently, drowned in verbage. And, in Alaska, the story spins on.

Under federal jurisdiction from 1867 through the first 58 years of this century, any marine mammal of commercial value was exploited mercilessly. Bowhead, humpback, and gray whales almost disappeared; walrus ebbed to scarcity; fur seals declined, and sea otters disappeared from most of their Alaskan range. Other species, like sea lions and harbor seals, were harassed away from salmon fishing grounds. In the 1950's, when bounties weren't stimulating enough of a seal kill, territorial officials depth-bombed seals chased from mudbars in the Copper River delta.

Meanwhile, currents of protectionism were rising in the slack water of the nation's bureaucracies. Official protection from unregulated killing was extended to fur seals and sea otters in 1911, to bowhead and gray whales in 1931, and to humpback whales in 1946. In 1959-60, when new management authority for non-treaty mammals (mammals not covered by international treaties), passed to the new State, Alaska swiftly developed a basic conservation regime consisting of broad-ranging research, controlled harvests, and adequate protection. Despite pointed criticisms from fishermen, who had fish stolen and nets destroyed by seals and sea lions, and from people who believe that airborne hunting of polar bears is ethically wrong, the State's program deserved the respect it received from scientists and most user groups.

In 1972 Congress wiped out State management with the Marine Mammal Protection Act. Regulated harvests were replaced by unregulated and unrecorded harvest under remote "control" by federal agencies. The State's research program largely disintegrated and was saved from total chaos only by money for environmental assessments of oil and gas leasing impacts.

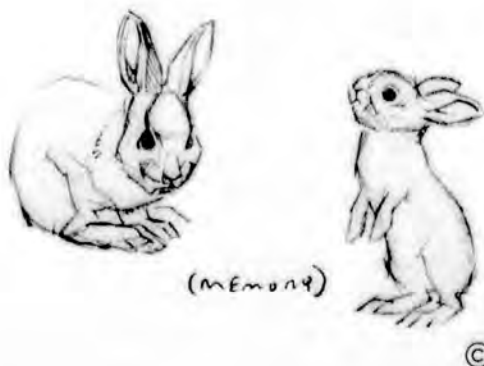
The 1972 Act set up a process through which a state can regain management authority (with constant federal review) and the moratorium on marine mammal harvests can be waived. In January 1973, Alaska applied for a waiver of the moratorium and return of management for nine species. In April 1976, management authority for walrus alone was returned to the State, but the State is beginning to wonder why it bothered.

There has been a running battle over the amount and kind of data the State is required to provide annually to justify its program; federal officials insist on vastly more information than they ever obtained themselves. And just a few weeks ago, a court decision on the taking of walrus for ivory by Bristol Bay natives suggests that under the Marine Mammal Protection Act neither the State nor the Federal government may be able to regulate subsistence harvests until the stock on mammals is depleted. Codified crisis management, some call it.

Meanwhile, the State's request for management of belugas, of bearded, ringed, ribbon, spotted, and harbor seals, of sea lions, and of sea otters and polar bears oozed through mucky bureaucracies for six years, almost to the day. In January 1979 the National Marine Fisheries Service and Fish and Wildlife Service told the State that management would be returned if the latter would agree to accept certain harvest quotas and meet detailed reporting requirements. The State faces a tough choice: accept requirements that, quite literally, no one could meet (thus risking endless court cases and injunctions), or forget the whole thing and hope that the Federal government can some day put together a management program itself.

Frustrated by this endless legal and political tangle, the State told federal agencies on June 4, 1979, that "unless there is satisfactory resolution of the waiver and our legal authority to manage, by notice of this communication we are returning walrus management to the Department of Interior, effective July 1, 1979 . . . The State will not allocate any funds toward marine mammal management in F.Y. 1980 . . . Our marine mammals staff will be disbanded over the next year and a half . . ."

Out beyond, where the tawny rockweed glistens on black polished rocks, a growing bottom fishery forewarns us of a problem in ecosystem management — the likes of which we've never seen — that could rip apart present balances of fur, fins and feathers in the North Pacific. In the Bering Sea, walrus numbers seem to be reaching a historic peak, with a crash very possibly only a year or three away. On Chukchi and Beaufort ice, Eskimo hunters kill uncounted numbers of polar bear sows with cubs, a sure-fire way to have the most impact on bears with least human benefit. Seismic blasting east of Barrow is pushing ringed seals and their newborn pups away from traditional fast-ice areas. It isn't at all clear that federal officialdom really cares.



CONCERNS ABOUT THE SUSITNA HYDRO-PROJECT

By Roman Motyka and Terry Reichardt

The need for the large amounts of electric power that will be provided by the Susitna River Dams Project has not been demonstrated. Total residential industrial electrical energy consumption in the railbelt area was about 1.9 billion kilowatt hours (KWH) in 1977. The two Susitna dams will produce 6.9 billion KWH, over 3-1/2 times the amount of energy needed to meet 1977 consumption. We feel that the growth projections used to justify the project are inflated and unrealistic. For example, when APA has projected energy demands for the Alaska railbelt (i.e., the Anchorage-Fairbanks area), they have included the energy needs of the Kenai Peninsula and of the military. In fact, the power needs of the Kenai Peninsula will primarily be met by the Bradley Lake hydro-project. The military in Alaska has always generated its own power in the past and very probably would not use a centralized, highly vulnerable energy source such as Susitna, in the future.

The APA's projected growth patterns include a doubling to tripling of railbelt population in less than 20 years and a continued annual increase in per capita energy consumption of 3 percent or more per year. These projections result in energy demands of four to ten times present needs by 1995. The most recent trends in population growth and energy conservation in Alaska make such projections totally unrealistic. In fact, statistics from Golden Valley Electric Association (GVEA), the major commercial utility in the Fairbanks region, show that their per customer energy consumption is declining in Fairbanks. During the past three-year period, GVEA residential and commercial/industrial per customer usage has DECLINED at average rates of 12.5 percent/year and 5.5 percent/year, respectively. Statistics from Anchorage utilities and from APA show that the annual increases in per customer usage have tapered significantly in the Anchorage area over the past three years. Total energy consumption in the Fairbanks area actually declined in 1978. Present energy consumption in Fairbanks is running considerably below what had been projected for this community in the Corps of Engineers' initial feasibility study.

The Corps of Engineers has overestimated future power needs before. This occurred when justifying the construction of the Snettisham Dam near Juneau. The dam was built by the Army Corps of Engineers and is administered by the Alaska Power Administration. Although brought on line in 1973, the Juneau Power Utility is buying only one-fifth of the total capacity of the project. Consequently, the cost of power to the utility company is over twice the rate the Corps originally anticipated. Because of the slow growth in load, in order to cover the interest rates on the bonds that funded this project, it is expected that the price will again be increased in 1985 by 75 to 80 percent. With a much bigger project such as the Susitna, such a mistake would be a financial disaster.

No matter what the increase or decrease in energy consumption will be, the Susitna Project will not come on until the turn of the century. Utility companies will be required to build new power plants to meet the needs before the Susitna could come on line. Susitna power then represents an enormous glut of energy. In order to make the project economically feasible, the Corps will have to find a way to sell the excess power. Their proposed solution is rapid industrialization and the introduction of some highly energy intensive industries to the railbelt. Some of their proposals are a bauxite processing plant, a uranium enrichment plant, mineral processing plants, coal gasification plants, liquid natural gas plants, oil refineries, etc. Not only is this highly speculative, but such industrialization is totally incompatible with the expressed opinions of the majority of Alaskans who do not desire rapid large-scale industrial growth.

The Susitna Project, in fact, represents a de facto imposition of an accelerated growth plan upon Alaska which is totally contrary to Alaska's desire for planned growth and control over the future. No consideration appears to have been given to the impact which doubling and tripling the population in less than 20 years will have on land use in the railbelt area and the large increase in hunting pressure in the surrounding region and throughout the State, nor to the environmental impact of such large industrialization to the railbelt area.

THE ECONOMIC FEASIBILITY OF THE SUSITNA PROJECT IS HIGHLY QUESTIONABLE

Even when using the Corps' very conservative cost estimate of \$2.6 billion, economic feasibility has been judged as marginal. The Susitna Project would involve two dams, each one larger than the Hoover Dam. The project would be the biggest and most expensive ever attempted by the Corps. It would also be the first large-scale hydro-project ever attempted by the Corps in a subarctic region, an environment notorious for its engineering difficulties. Compounding the engineering problems is the fact that the dam sites will be located in a highly active seismic region. Dealing with such problems can easily lead to significant cost overruns on the project.

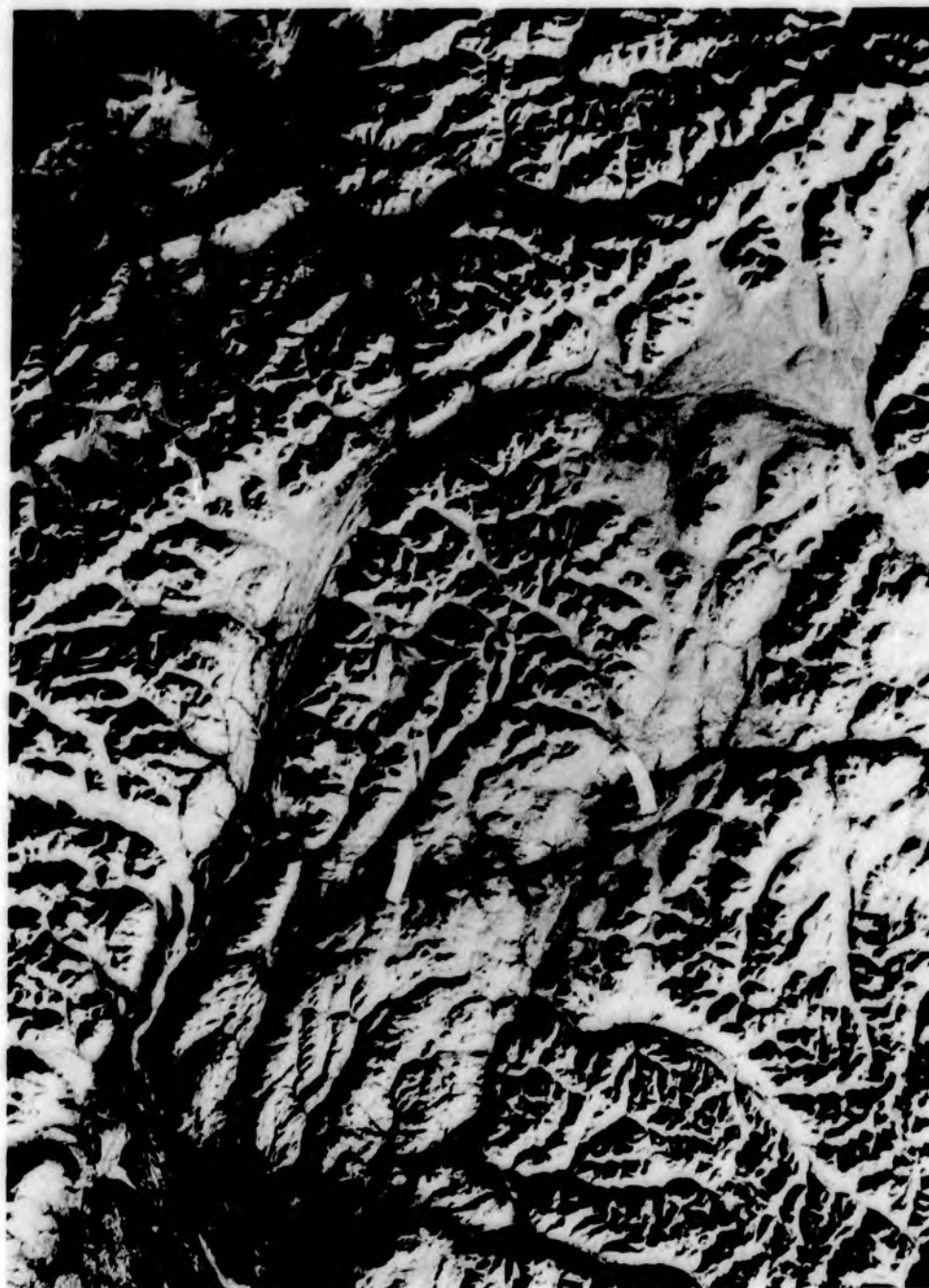
The Office of Management and Budget (OMB) has shown that if the Susitna Project has a cost overrun of as low as 30 percent, the benefit-cost ratio would be less than unity, making the project economically unfeasible. The Snettisham Dam in Juneau, Alaska, had a cost overrun of 36 percent, over and above inflation, and it was a much smaller project. A study made for the U.S. Senate showed that large custom engineering projects, such as Susitna, have cost overruns, over and above inflationary costs, of between 50 and 500 percent. In Alaska, the best cost estimates for construction of the oil pipeline, *based on all the final environmental stipulations*, was \$2.5 billion. The end costs were \$9 billion, a cost overrun of 300 percent.

Several additional hidden costs have not yet been brought up or discussed by the Corps. For example, the Susitna Project is going to be a highly centralized source of electrical energy. The major metro area, Fairbanks and Anchorage, and communities along the railbelt cannot and will not rely solely on this source; otherwise they would become vulnerable to any malfunction at the dam sites or along the power links. In fact, the utilities are required by Federal law to have reserve power on hand equal to the largest generating plant on the line. Such backup electrical generation systems will have to be built and maintained, and will add significantly to the overall costs of the project.

Such costs have not yet been factored into overall cost-effectiveness and neither have the additional costs of engineering the dams against large earthquakes and a subarctic environment. There are also many of us who feel that the costs of environmental damage and potential hazards should be factored into the equation. For example, almost 40 percent of Cook Inlet's salmon harvest comes from the Susitna River. This is more than a \$15 million per year industry, almost 5 percent of the yearly benefits of the dam project at peak production. Recent research by the Alaska Department of Fish and Game has indicated that severe impacts to the fishery may occur with the construction of the dams.

We, as Alaskans, are deeply concerned about who will have to pay the inevitable cost overruns associated with a project of such massive scale. If the Federal government does not foot the bill of cost overruns, then the burden must inevitably fall onto the Alaskan railbelt electrical utility rate payers, and with

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the strong possibility of State government involvement, onto all Alaskan taxpayers.

THE POTENTIAL SEISMIC RISKS ARE SIGNIFICANT

The seismic hazards come from two factors. The first is that the two huge dams and their associated reservoirs will be located in an area that is well-recognized for its high degree of seismic activity. The second is that the reservoirs themselves can induce seismic activity.

Much of the present seismic activity in the region appears to be connected to the well-known Denali fault system. This fault lies between 40 to 50 miles from the proposed dam sites and follows an arcuate path to the north and west of the Susitna basin (see accompanying map).

Of greater concern is the recently recognized Susitna fault, an active fault which crosses the Susitna River immediately west (less than 5 miles) of the proposed site for the Watana Dam. At least five moderate earthquakes (and many smaller ones) have occurred on or near this fault within the past six years. The fault extends from the Susitna Glacier in the Delta Range to south of the Talkeetna River, a distance of over 60 miles. This region is a zone of crustal weakness and the fault is thought to be acting as a splay off the Denali fault system.

Compounding the problem of the natural seismicity in the area will be the loading caused by the impoundment of water behind the dams. It is a well-known fact that reservoirs commonly induce seismicity. Rather severe earthquakes, up to magnitude 6.4, have accompanied the filling of reserves at a number of dams around the world including places which had previously been aseismic. In one case, a reservoir-induced earthquake at Konya Dam in India caused severe property damage and the loss of 200 lives.

The Susitna dams and their reservoirs will lie on opposite sides of the active Susitna fault with the upper part of the Devil's Canyon reservoir actually overlying a portion of the fault. The high loading and water from these reservoirs could very possibly trigger strain energy which had been stored in the rocks prior to impoundment and could result in a massive earthquake whose epicentral region is likely to lie within the immediate vicinity of the Susitna dams.

The following is a quote from J. P. Rothe's "Fill a Lake, Start an Earthquake," *New Scientist*, 39, 75-78, 1968:

It is by now clear that one can cite specific cases where tremors, some of which are severe enough to produce extensive damage, are caused by the construction of dams. When he builds these, Man plays the role of the Sorcerer's Apprentice: in trying to control the energy of rivers, he brings about stresses whose energy can be suddenly and disastrously released.

Wendell V. Mickey, who was Chief of the Seismology Division of NOAA, recommended that "no dam should be built within the disturbed zone of an active fault."

If a huge earthquake causes physical damage to either dam, the potential exists for massive floods to sweep down the lower Susitna River. Such floods could swamp the Parks Highway and the Alaska Railroad and devastate the communities along this transportation corridor — Gold Creek, Talkeetna, and others. Even if direct physical damage does not occur to the dams, earthquake-generated ground motions and landslides into the reservoir could generate tsunami-like waves that could overtop the dams and result in flooding down the river. The earthquake itself could also cause direct damage to communities near the epicenter.

The Corps claims they have upgraded their design so that the dams will withstand an 8.5 magnitude earthquake whose epicenter is 40 miles away and is at a depth of 20 miles. More recently, the Corps has finally recognized the severe seismic

hazard in the immediate vicinity of the proposed dam sites. Much of their proposed Phase I feasibility study centers around exploring this problem.

It's debatable whether the Corps can really design the dam structures to withstand the severe ground accelerations near the epicenter of a large earthquake and still preserve the overall cost effectiveness of the project. The more massive the structure, the more likely it will be able to withstand an earthquake, but size can add considerably to the costs.

A further problem, and a potentially more serious one, is that there is no way to fully evaluate beforehand the effect that reservoir loading will have on the active Susitna fault. This can only be done during the actual filling of the reservoir. If the impoundment of water at Watana and Devil's Canyon begins causing an increase in the frequency and intensity of earthquakes, the Corps will most certainly be compelled, in the interests of public safety, to stop the filling of the reservoirs.

Earthquakes could be induced even after the reservoirs are filled, particularly if there are large fluctuations in water level. Such fluctuations will occur yearly at Susitna because during the peak energy demand months, the winter months, water flow into the reservoirs will be lowest.

Most Alaskans are not prepared to take the almost inevitable seismic risk in order to secure electrical energy whose need has yet to be demonstrated.

THE SUSITNA PROJECT POSES A SIGNIFICANT THREAT TO THE REGION'S FISHERIES AND WILDLIFE

We believe that the effects of the Susitna Project on fisheries and wildlife have been severely underplayed by the Corps. Our brief talks with biologists have alerted us to the probability that the project could drastically reduce the Susitna River's salmon production, seriously reduce Nelchina Basin moose and caribou stocks, and, as a result, decrease recreational opportunity while simultaneously increasing local recreation pressures on remaining wildlife. A full and careful evaluation of these aspects must be undertaken by competent people BEFORE getting into the Susitna Dam Project.

More than 20 percent of the State's total moose harvest comes from the game unit surrounding the proposed Susitna Project. The Alaska Department of Fish and Game considers the Nelchina Basin, within which the Susitna Project will be located, one of the most important game areas in the State, providing large numbers of game animals and roadside access for hunters and viewers. A very significant part of fall and winter moose habitat used by moose in this unit would be covered by the impoundments. This could mean a considerable reduction in moose numbers which would limit hunting and viewing opportunities.

The calving grounds for the Nelchina caribou herd (20,000 animals) are near the proposed impoundment sites. Movement of animals to and from the calving ground could be impeded by the reservoirs. Considerable mortality to the herd could result during the crossings. More likely, as with reindeer in Norway, they may cease migrating. The ensuing limitation of range can be expected to cause a drastic plunge in their population. Most non-migrating herds number in the hundreds. The feasibility study itself could adversely affect the caribou herd. The study would build a road to the dam sites, creating access for many people. Ensuing trails could lead people directly into the calving grounds. In 1978 close to 3,000 people applied for permits to hunt the Nelchina caribou herd.

Adjacent to these lands, in McKinley Park, the McKinley caribou herd has deteriorated badly. It is questionable whether it will ever recover. The Nelchina caribou herd of 20,000 animals is really the only other herd of account in the Interior. With the pipeline already affecting the Western Arctic herd and the threat of oil and gas development in the Arctic National Wildlife Range that could disastrously affect the Porcupine

herd, we may find in the future that the Nelchina herd is of national significance.

Thirty-eight percent of the Cook Inlet salmon harvest comes from the Susitna. The Susitna River is the *highest* producer of all salmon species flowing into Cook Inlet, save the sockeye. It is the second or third highest producer of sockeye salmon. In the winter the Susitna runs clear, and thus it is satisfactory for the rearing of juvenile salmon *which move into it at that time*. The dam would probably cause the winter waters to run silty and thus would be unsatisfactory for that purpose. This condition would affect the entire length of the river down to the mouth. Also, the probable decrease in water level downstream from the dam to the mouth during summer would reduce the existence of and access to spawning sites.

AN ADEQUATE ANALYSIS OF ALASKA'S CHOICES OF ALTERNATE ENERGY PATHS HAS NOT BEEN MADE

To construct and become dependent upon a single, centralized energy source is contrary to what we consider to be good energy planning for Alaska. Rather, we feel that energy sources should be decentralized and varied. Several alternatives are available for Alaska and need to be investigated in greater detail before becoming locked into a Susitna Project. At least 32 alternate smaller-scale hydro-power sites have been identified in the Alaskan railbelt area. In-depth studies of these potential hydro-sites is conspicuously lacking. To our knowledge, only cursory studies have been made and these were done during the late 1940's. Smaller-scale hydro holds a distinct advantage over Susitna. Such projects could come on line much sooner and could be incremented in to meet energy demands as they occur. We feel that a thorough evaluation of this alternative hydro-power path is needed before proceeding with Susitna.

Proper insulation of homes and businesses and other conservation measures can lead to tremendous savings of energy. Further, although many people find it hard to believe, solar power in Alaska is becoming increasingly practical. New homes are being designed to take advantage of passive solar heating

and solar heated water tanks in the Fairbanks area have been shown to be competitive with electrically heated water tanks. Because they are labor intensive, such conservation alternatives can significantly increase local employment. Furthermore, purchase of construction materials for such improvements would greatly benefit local business and add to the diversification of local economies.

The New Carter Water Policy requires that the federal agency considering a dam must prepare a nonstructural or demand reducing alternative. No effort has been made by any agency to do this.

SUMMARY

We feel that the Army Corps of Engineers, the Alaska Power Administration, and the Alaska Power Authority (a state agency) are overstepping the bonds of their authority in their attempts to circumvent the State's planning process, by trying to impose an energy policy onto the State. We further feel that the seriousness of the problems regarding economic feasibility, financing, geologic hazards, and environmental risks warrant delay of any action on the Susitna Project until

1. An independent evaluation of the Corps' projected construction costs, economic feasibility, financing, and geologic-environmental risks can be made.
2. Alaska's energy alternatives and choices of paths for growth and development are fully examined.
3. The Alaskan citizenry has been made fully aware of the implications of Susitna power and of what alternate choices are available.
4. The public is allowed to participate in choosing the direction in which the State is to proceed.

(The legislature has appropriated \$8.2 million for Phase I studies (part of a \$25 million plus study), with the condition that either there will be a guarantee of Federal reimbursement of the project studies or that private contractors rather than the Corps of Engineers will perform the work. An appropriation of \$200,000 was also set up for a study of alternatives to the Susitna Dam Project. ACS and the Fairbanks Environmental Center have requested that the Alaska Council of Science and Technology oversee this independent study. — Ed.)

OUT OF THE MAILBOX

Mr. Bob Weeden
Alaska Conservation Society
Box 80192
College, Alaska 99708

Dear Bob:

I just read your ACS November newsletter, and wanted you to know how impressed I was with the level of activity you have maintained. I know a lot of it is your own hard work, but all of the folks who cover these issues should be complimented. I was surprised to see how much coverage you had achieved, and I want to encourage you to keep it up.
Best regards

Sincerely,
Guy R. Martin
Assistant Secretary
Land and Water Resources



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OIL SPILL RESPONSE IN ALASKA

from U.S. Fish and Wildlife Service press release

For ten days in March 1967, the *Torrey Canyon* leaked her cargo of 117,000 tons of crude oil into the sea off the southeast coast of England. This marked the first major tanker accident in history. Almost one year following the *Torrey Canyon* incident, the Oil Spill Regional Response Team (RRT) concept was founded in the U.S. The teams consist of a few key individuals from various state and federal agencies that are trained to react to an oil spill crisis. In the event of an oil spill, three main "players" take a place on the team, a regulatory control agency, a resource agency, and a scientific coordinator.

Generally, one of four major REGULATORY AGENCIES takes the responsibility for containing and cleaning an oil spill, depending on the location of the spill. The four regulatory agencies in Alaska are the U.S. Coast Guard, the Alaska Department of Environmental Conservation (ADEC), the Environmental Protection Agency (EPA), and the U.S. Geological Survey (USGS). The U.S. Coast Guard responds to spills in coastal and marine waters, whereas ADEC responds to coastal spills within three miles of shore and inland spills. EPA also responds to inland spills, but ADEC has the primary responsibility. The U.S. Geological Survey responds to spills in Federal waters or on Federal land if the spill resulted from oil drilling operations. For example, if a spill occurs in coastal waters, the U.S. Coast Guard would assign an on-scene coordinator to supervise and coordinate the clean-up operations. The party responsible for an oil spill is obligated, according to federal law, to clean it up and compensate for damages, but this is usually

not feasible since an oil spill can easily cost millions of dollars.

The Regional Response Team has identified three phases to an oil spill response: (1) Immediate response for control of the spill, (2) Containment, mopping, and clean-up of the spill, and (3) Impact assessment during and after the spill. The first two phases of the response, however, are hindered by the inherent characteristics of Alaska. Interest and response to oil spills is great in Alaska, but oil clean-up operations are drastically inhibited by Alaska's sparse population and vast size. Many of the small coastal towns just don't have the facilities for handling a major oil spill.

There are a wide variety of spill types in Alaska ranging from spills along the coast to spills on permafrost, which will require some unique techniques for clean-up and new knowledge about how different oils behave in frigid conditions.

Presently, over one hundred million barrels of oil per day are removed from Alaska and with the national energy focus on oil and gas, that figure may continue to rise. The chances of a major oil spill in Alaska continues to increase and it is not a question of whether or not a spill will occur, but rather when and where.

Alaskans have assurance, however, that steps have been taken to respond to major oil spills and to prevent a major ecological disaster. The Regional Response Team concept is a big step in the right direction.

(This step in the right direction is the consolation prize to those who survived the oil boom avalanche. — ed.)



— Boom in use at Seldovia oil spill.

USFWS

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3. The Alaskan citizenry has been made fully aware of the implications of Susitna power and of what alternate choices are available.
4. The public is allowed to participate in choosing the direction in which the State is to proceed.

(The legislature has appropriated \$8.2 million for Phase I studies (part of a \$25 million plus study), with the condition that either there will be a guarantee of Federal reimbursement of the project studies or that private contractors rather than the Corps of Engineers will perform the work. An appropriation of \$200,000 was also set up for a study of alternatives to the Susitna Dam Project. ACS and the Fairbanks Environmental Center have requested that the Alaska Council of Science and Technology oversee this independent study. — Ed.)

OUT OF THE MAILBOX

Mr. Bob Weeden
Alaska Conservation Society
Box 80192
College, Alaska 99708

Dear Bob:

I just read your ACS November newsletter, and wanted you to know how impressed I was with the level of activity you have maintained. I know a lot of it is your own hard work, but all of the folks who cover these issues should be complimented. I was surprised to see how much coverage you had achieved, and I want to encourage you to keep it up.
Best regards

Sincerely,
Guy R. Martin
Assistant Secretary
Land and Water Resources



©

THE IJC: A ROLE IN THE ARCTIC NATIONAL WILDLIFE RANGE?

By Jane Aspnes

Alaskan Natives are vocally opposed to oil and gas exploration in the Arctic National Wildlife Range calving grounds. Kaktovik residents have submitted a resolution specifically requesting that no exploration be allowed. Residents of all the other villages neighboring the Range have requested wilderness status for the area. Wilderness status would ban mineral or petroleum exploration.

But the Arctic National Wildlife Range no longer concerns just Alaskans. It became a binational venture in July 1978 when Canada set aside 9 million acres adjacent to 8.9 million acres already withdrawn by the U.S. in 1960. Two primary reasons were given by the Canadians for their addition to the Range: to protect the wildlife (primarily the Porcupine caribou herd which migrates between Canada and the U.S.) and to protect native hunting, trapping, and fishing activities. Consequently, management and land use decisions for any part of the Range, U.S. or Canadian, have an international impact.

The U.S. and Canada are presently developing a management plan for the total area. However, this plan will include recommendations only. It will not provide a legal framework for negotiating disputes that might arise from acts of Congress. There is one organization though, that does provide an impartial system for resolving border disputes: the International Joint Commission (IJC). Other states and provinces that share a common border have found that the IJC is the best mechanism for dealing with transboundary environmental issues.

The IJC's existence began in 1909 when the U.S. and Canada agreed to the Boundary Waters Treaty. A six-member International Joint Commission of Inquiry is empowered under the 1909 treaty. The treaty gives two areas of responsibility to the IJC: investigative and adjudicative. Judicatory responsibilities involve permission authority over projects affecting the level of boundary waters. Investigative responsibilities involve studying a problem and making recommendations to the gov-

ernments. Alaska is the only state bordering Canada that has not used the IJC to investigate and make recommendations on transboundary issues.

The initial response of a state or province faced with border problems might be to step across the border to the capital and talk directly to the other party. However, Article I, section 10 of the U.S. Constitution specifies that a state cannot enter into any treaty alliance or confederation. Therefore, any bilateral negotiations or plans concerning the Arctic National Wildlife Range must include Washington, D.C., and Ottawa in the process.

The original intent of the Boundary Waters Treaty was to prevent disputes over water apportionment and development. However, Article IX of the treaty gives the right to investigate "any other questions or matters of difference." This clause has recently enabled the IJC to study air pollution problems. Commissioner Max Cohen has stated, "border problems are an interaction of air, land, and water," thus expressing the IJC's interest in land use planning. The involvement of the IJC in Wildlife Range management issues would set a precedent, but is legal under Article IX.

There are advantages to involving the IJC. First, it insures that a problem will be studied. Secondly, it provides an impartial recommendation on the situation based upon the study and public hearings. It should be stressed that the members of the commission serve impartially and are not negotiators. The process does take time, often three to five years on a single issue, which can be viewed as an advantage or disadvantage depending upon one's point of view.

Historically, the IJC has an excellent record. In most cases closely. A few cases have remained unresolved because both governments chose to do nothing. But, most importantly, it gives both sides a chance to be heard on a issue.



YOUNG SNOWSHOE
CAPTURED ON BLUE
TAKE ROAD - TAHOE
NAT. FOREST

EATING
LETTUCE

©

RABBIT WILL NOT
USE FOREST TO
HOLD DOWN FOOD, EVEN
IF CONVENIENT

CAMP BEAR PAW, TAHOE NAT.
AUG. 8, 1952 FOREST



VISIONS OF UNICORNS:

A TRIBUTE TO BILL BERRY

By Mary Shields

Alaska's spring birches and autumn bearberries, Her noble moose and busy red-backed voles, Her people and Her future generations will miss the presence of Bill Berry. Those of us who knew Bill personally, and those of us who knew, or will know him through his artwork, will cherish the precious gifts he gave us. Bill shared his sensitive understanding of the beauty, joy, and humor of life. He helped us to see the little things around us and by his example we learned we were not looking closely enough. He inspired us to look for unicorns, and thanks to his friendship, more of us spy them every day. We see a unicorn with our hearts and Bill will always be there with each new sighting. Our hearts will ache a little each time, but will live and grow more joyfully because Bill helped us to look.

WOODSMOKE

by Ginny Hill Wood

Spring sprang so fast in Interior Alaska this year we were deprived of that usual euphoric interlude when there is nothing to do but watch the snow melt, the daylight lengthen, and the good earth appear. During this period, the summer ahead seems to stretch endlessly on into the future with plenty of time for contemplating fishing, floating, or backpacking trips, plus all the improvements we are going to make this year around the homestead before fall.

But instead, one day we were still in winter with two feet of snow in the woods; then hardly more than a week later, there was the bare ground baking under 72 degrees of sunshine. We scarcely had time to put away skis, snow shovels, and longjohns before we had to take off the studded tires, get out the rakes and hoes, and try to remember where we put our shorts.

We are never ready for what happens even when we know what happens is inevitable. Like our latest crude oil crises. The print was barely dry on a Fairbanks Daily News-Miner editorial exhorting Alaskans to join Wyoming's rebellion against the federal government's 55 mph speed restriction (left over from our 1973 energy crisis) when the shortage of fuel at the pumps was making headlines again.

This occurred while we were still trying to make sense out of the Alice-in-Alaskaland situation of that frenetic push to get a Prudhoe Bay to Valdez oil pipeline built (and damn the cost, the caribou, and the conservationists — full steam ahead!) only to find West Coast refineries saturated with the gooey stuff and maybe it should be peddled to Japan in exchange for their oil allotments from the Arabs being delivered to our thirsty east coast refineries. We puzzled over how this Japanese/Middle East/U.S. connection jibed with the cry for freedom from foreign oil dependence that drowned out consideration of a trans-Canada pipeline route (can't trust those foreigners, y' know!) which would have delivered crude to eastern refineries to begin with.

Then the Shah of Iran was deposed and the oil derricks there stopped pumping while new potentates took over. One week California refineries were glutted, then a few weeks later the stoppage of 6 percent of our oil imports caused long lines of motorists at the gas pumps and "out-of-gas" signs at service stations in the same state.

Shortly after the "incident" at Three Mile Island, the April RURALITE, the monthly freebie distributed by the Golden Valley Electrical Association and other publicly owned rural electric utilities in Oregon, Washington, Idaho, Alaska, and Nevada, was delivered to my mailbox. In it was an editorial which scathingly attacked environmentalists, "no-growthers," soft energy freaks, and nuclear power plant protestors who "seek to revolutionize American society and turn us into a nation of nut gatherers."

RURALITE also reported the following:

"Rep. Mike McCormack of Washington says solar cultists are deliberately misleading the American people when talking about getting 20 percent of energy needs from solar by the year 2000. McCormack, who is chairman of the House Science and Technology Subcommittee on Advanced Energy, says we will be lucky if we get 4 percent. He said that the Council on Environmental Quality talks about 25 percent. 'They are worshipping something without facts,' McCormack added that 'these solar cultists want the USA to commit energy suicide.'"

Well, out to the garden. Seeds are still something one can depend on — and maybe, also, firewood and your bicycle.



©



MALE (OR
JUVENILE MALE)
TAIL PLUMAGE -
PATTERN INDISTINCT

©



(LIFE &
MEMORY)
OCT. 23, '61
DENISE L.

©



COCK SPRUCE GROUSE ON
DISPLAY GROUND - FLYING UP
INTO LOWER BRANCHES OF SPRUCE
(ANY OF SEVERAL TREES IN AREA)
WITH WHIRRING, LOGGED FLIGHT &
FLYING DOWN AGAIN - ALMOST
A HAZE OF BIRD DROPPED TO
FOREST FLOOR (ABOUT) & AND
STUTTING BRIEFLY BEFORE REPEATING
THE PERFORMANCE. FOLDED WINGS
FLICKED OUTWARD RAPIDLY OCCASIONALLY
AS BIRD STUTTED (TOP, LEFT).

MAY 13, '62, DENEKI LAKES, ALASKA.
(COMPLETED MAY 10, FROM MEMORY AND REF)

All drawings in this issue are by Bill Berry with the permission of Liz Berry.

The Alaska Conservation Society

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A.1.1 - Introduction

This Plan of Study has been prepared by Acres American Incorporated in response to the Request for Proposal issued on June 25, 1979, by Mr. Eric Yould, Executive Director of the Alaska Power Authority. It includes significant contributions from other firms who would generally be involved as subcontractors in the event that a contract to undertake the study itself is awarded to Acres American Incorporated. Major participants in the Acres team include R&M Consultants, Inc.; Woodward Clyde Consultants; Terrestrial Environmental Specialists, Incorporated; Cook Inlet Region Incorporated/Holmes and Narver, Incorporated; Salomon Brothers; and Frank Moolin Associates.

The gestation period for giant projects tends to be long. Wild bursts of enthusiastic effort followed by periods of genuine apathy (or total despair, depending upon whose vantage point is selected) are common. Development of the Susitna River has so far followed that classic pattern.

As early as 1952, the Bureau of Reclamation published a report identifying a large number of potential hydroelectric power sites in Alaska, noting pointedly the strategic advantages enjoyed by the Susitna River because of its proximity to Anchorage and Fairbanks. Even then, Devil Canyon was perceived as the place to install a large dam. It was--and is--a steep, narrow rock walled canyon through which silt laden grayish waters swirl and churn and turn to white froth as they rush for the sea. Updates by the Bureau led to proposed authorization in 1961 of Devil Canyon and Denali--a site far up-river of Devil Canyon, astride extensive wet lands and marshy areas, where the Susitna draws strength from relative placidity before it attempts the inevitable plunge through miles and miles of canyons.

Another giant project was under active contemplation in the early sixties and its mind boggling size, together with the engineering challenges it offered, were especially exciting in a brand new state and during the space technology wars then being waged. The Rampart hydro project would have created a pool larger than the State of Connecticut if it had ever been built.

While the Rampart studies put the Susitna project in limbo for a while, a number of long time Alaskans worried about the risks of such a venture. As fate and thoughtful argument would have it, Rampart is unlikely to be built at any time in this century.

Susitna was delayed long enough, though, to allow for discovery and development of then economical natural gas production. By the time the warnings of energy doomsayers were beginning to be heard and felt in 1973, the Susitna project once again began to appear attractive. The Bureau of Reclamation updated its earlier studies in 1974, recommending a four dam system, and the U. S. Army Corps of Engineers launched a major pre-feasibility study which led to a recommendation in 1976 by the Chief of Engineers that the Susitna Project be authorized. The Corps plan recommended two high dams, the first of which would be built as a massive earthfill gravity structure 810 feet in height at the Watana site more than

ACRES

Sept. 79

from Acres American proposed Susitna Plan of Study

30 miles upstream of Devil Canyon. The second Corps dam was to be 635-foot high thin arch concrete structure which would sweep across the canyon from rock abutment to rock abutment -- essentially the same as the Bureau's Devil Canyon proposal.

By June 1978, the Corps of Engineers had prepared a Plan of Study requiring 24 million dollars and offering a program leading to completion of a detailed feasibility study. Further investigations by the Corps confirmed the adequacy of the Watana site, though they did reveal that some changes were required in particular for the spillway arrangement. As the situation now stands, provided that the necessary appropriations are made, the State of Alaska could choose to proceed along a course of action which leads to a study undertaken by the Corps and reimbursed by the State. A unique risk protection feature would permit the return of State funds in the event that feasibility is not shown.

The alternative to further federal involvement in the Susitna project is a scenario which includes selection of a private engineering firm as the State's consultant. Qualifications have been reviewed by the State for all those interested firms with strong hydroelectric development capabilities and three have been engaged to prepare a Plan of Study detailing the steps necessary to permit filing a license application to the Federal Energy Regulatory Commission (FERC). This Plan of Study describes a series of tasks and subtasks, along with reasons for these, as well as providing information regarding organizational matters and team qualifications.

A.1.2 - Primary Objectives of Study

- (i) Establish technical, economic and financial feasibility of the Susitna Project to meet future power needs of the Railbelt Region of the State of Alaska.
- (ii) Evaluate the environmental consequences of designing and constructing the Susitna Project.
- (iii) File a completed license application for the project with the Federal Energy Regulatory Commission.

A.1.3 - Specific Objectives of the Study

To meet the primary objectives of the study, the following specific objectives are proposed:

- (i) Determine the future electric power and energy needs of the Southcentral Railbelt Area.
- (ii) Assess alternative means of meeting the load requirements of the Railbelt Area.

- (iii) Prepare an optimal development plan for the Susitna Project wherein power costs and probable impacts are minimized, safety is enhanced, and financing is achievable.
- (iv) Establish a definitive estimate of the total cost of bringing power on line, together with a statement of cash flow requirements.
- (v) Evaluate the physical, economic, and financial risks of the Susitna Project and determine ways and means to avoid or minimize their consequences.
- (vi) Evaluate existing environmental and social factors as they now exist in the proposed project area, assess the impacts of the proposed project, enhance environmental values to the extent possible, and recommend mitigating measures.
- (vii) Estimate the annual system power costs in the Southcentral Railbelt Region with and without the project, study the integration of Susitna power into the Railbelt utility systems, and assess power marketability.
- (viii) Prepare a complete license application and file this with the Federal Regulatory Commission.
- (ix) Ensure that the needs and desires of the public are known, keep interested parties and the public informed, and afford an opportunity for public participation in the study process.
- (x) Determine an optimal program for achieving financing, including resolution of issues regarding tax-exempt status of bonds which may later be offered.
- (xi) Minimize the financial risks and expenditures which must be incurred by the State of Alaska in pursuit of the above objectives should development of the Susitna Project prove to be not in the best interests of the State.
- (xii) Maximize opportunities for equal employment opportunities for Alaskans and for involving in the work members of those Native Corporations in the region.

A.1.4. - Primary Aspects for Susitna Requiring Study

(i) Introduction

As with any major hydroelectric project, the number of investigations and substudies required to achieve the primary objectives noted in paragraph A.1.2 above is significant. Each of these requirements is described in terms of precise tasks and subtasks in Section A5. Even so, a number of primary aspects, particularly insofar as they address major concerns, deserve to be highlighted. Thus certain key areas of the study are highlighted in succeeding subparagraphs.

(ii) Power Studies

While this Plan of Study had necessarily to be written on the assumption that project feasibility will in fact be demonstrated, we are well aware of the importance of demonstrating that a need for significant increases in power generating capacity does truly exist in the Railbelt Area and that this need can best be satisfied by the Susitna Project. Indeed, it is clear that the absence of need or the discovery of a better means of satisfying it if it exists will represent prima facie evidence that development of the project is not in the best interests of the State. Power studies will be undertaken to examine and define a range of load forecasts and to assess possible alternatives or groups of alternatives which together could satisfy the projected demand.

We will avail ourselves of intimate knowledge of Alaska in general and the Railbelt in particular through employment of the Alaskan office of Woodward-Clyde Consultants (WCC) to undertake load forecasting studies. WCC in turn has arranged for consultation from the University of Alaska, particularly for use of their econometric models. The study of non-hydro alternatives by WCC (reviewed by Acres' Thermal Power Division) and of hydro alternatives by Acres will be enhanced through use of the General Electric Optimum Generation Program, Series V (sophisticated computer models designed to permit multiyear analysis of generation system mixes) which we have successfully used in the past for a comprehensive study of alternatives to the Dickey-Lincoln School Lakes Project in New England.

(iii) Financing Plan

Successful financing of giant projects is inevitably a complex and time-consuming task. Our own expertise in this area, as evidenced by participation in the successful financing of the Churchill Falls Project where Mr. J. G. Warnock managed the team responsible for bond support documents, will be available to our financial consultants, Salomon Brothers. This well known investment banking firm has managed or co-managed 655 issues of tax-exempt bonds in the total amount of \$48.3 billion since January 1, 1974. Dr. C. P. Chapman will manage risk analysis studies. His unique special capabilities in that area have been demonstrated time and again for large projects including some in subarctic environments.

(iv) Ice Engineering

The study of ice engineering has necessarily been an important part of Acres' efforts for past projects in recent years. Our successful involvement in hydroelectric projects throughout North America, with a total installed capacity of over 14,000,000 kW, is a matter of record. Assistance in ice engineering studies will be provided as well by R&M whose hydrologic investigations of rivers and streams throughout Alaska has been significant. Our conceptual designs for

minimizing the problems associated with frazzile ice, ice jams, ice shelving and the like will be subjected to exhaustive modeling after license application has been made and during the preparation of detailed designs. Problems associated with permafrost are also familiar to the Acres organization: our staff have extensive experience in developing unique and effective methods of dealing with such problems in connection with large power projects in subarctic regions.

(v) Earthquake Engineering

Of the many potential risks associated with the Susitna Project, those associated with seismic problems are probably the most significant. Certainly, no single area of concern is likely to have more immediate catastrophic consequences if the engineering work has not been done thoroughly and well. Not only is it important to design all structures to survive unscathed in the event of an earthquake, but it is also essential to determine the extent to which creation of reservoirs on the Susitna River will itself induce earthquakes.

Our approach to this problem is twofold: first, we have engaged the services of the California office of WCC to undertake extensive seismic studies. WCC has operated in Alaska for over ten years and has amassed a considerable data base on geological and geotechnical conditions, faulting, and seismicity of the Anchorage and Railbelt Areas. WCC have also had extensive seismic experience with major dam and power projects elsewhere. Second, we have recommended a list of eminent professional engineers whose accomplishments are recognized worldwide as the basis for selection by the Power Authority of one or more external review boards. The engineering board would be provided funds on the order of \$1 million with which to undertake confirmatory or additional seismic studies. Acres would offer coordination services and administrative support, where appropriate, to the board(s), but authority to select, remunerate, terminate and to direct their activities would remain with the Power Authority.

(vi) Project Management/Construction Management

In order to provide Alaskan-experienced project and construction management capability in the POS team, Acres will combine with its in-house resources the additional resources of the Frank Moolin and Associates, Inc. organization. This company presently operates out of Fairbanks, Alaska and provides executive project and construction management experience to the energy industry. The Moolin team provides many years of "hands-on" experience on varying sizes and types of projects, including recent responsibility for construction of the Trans-Alaska Pipeline, a \$4.2 billion effort. Members of the organization provide an unusual, multi-disciplined, combination of energy, industry and heavy construction experience. In addition, conditions unique to planning, managing and constructing projects on the Alaskan scene are familiar to all of these individuals.

Wittow

Date: February 20, 1979

Memorandum to ACS Board members and other interested parties

From: Roman J. Motyka

Subject: Susitna River Dams Project (SRDP)

Several of us are trying to put together a question and answer fact sheet on the Susitna project and the proposed State funding of the Phase I Army Corps of Engineers feasibility study. We would appreciate your review of the following series of questions and answers and any comments you may have on them.

The first question and answer is taken verbatim from the February 16, 1979, edition of the Fairbanks Daily News-Miner (I have copies of the entire article for those who are interested):

Q. What is the Sustitna River dams project?

A. " As proposed by the Army Corps of Engineers in 1976, the project would eventually consist of two dams on the upper Susitna River. The first dam, Watana, would go in about 100 miles upstream from Talkeetna. An earthfill structure, it would be 810 feet high and would create a reservoir 54 miles long. It was proposed to go on the line in 1994. Next would be the Devil Canyon dam. It would be 635 feet high and would be built of concrete. It would sit 32 miles downstream from Watana, and is envisioned to go into operation as soon as needed--tentatively about 1999 but perhaps concurrently with its big sister if the need were there. A transmission line would be strung from Fairbanks to Anchorage as part of the project. Hooked into the power plants at both dam sites, it would take about 75 percent of the power south and the rest north. The two dams could produce 6.1 billion kilowatt hours "firm annual energy." The railbelt's present consumption, excluding industrial and national defense energy, is about 2.8 billion KWH. "

This question and answer (Q & A) gives a good introductory statement as to what SRDP is all about. However, the last paragraph is highly misleading and needs to be changed. The energy figures quoted, 2.8 billion KWH, is the total energy consumption and not just electrical. At present the data upon which APA bases this figure is unavailable and needs to be researched. It probably includes all fossil fuel used to generate electricity and to heat buildings. It may also include transportation ~~of~~ energy, i.e., cars, trucks etc.

I've checked an independent source (an ISER report on Alaska's electric power requirements, June 1976) which gave the total electrical energy consumption in 1974 for the combined Fairbanks and Anchorage metro areas at about 1.2 billion KWH. This figure includes industrial users.

If we use a projected growth rate of at most 9% per year, this would give a total of 1.7 billion KWH electrical energy consumption for 1978. Industrial usage is probably at least 30% of the total so that the actual electrical energy consumption by residential and small commercial users is probably on the order of 1.2 billion KWH compared to 2.8 billion KWH quoted in the above article.

The reasons why using the total energy consumption figures to justify the SRDP is totally inappropriate and misleading are the following: The total energy figures include fossil fuels used to generate electricity. The use of fossil fuel-generated electricity for home heating is notoriously inefficient--perhaps less than 30%. Furthermore, the total energy figure includes fossil fuels being used to directly heat buildings.

The continued use of direct fossil fuel heating, increased energy conservation, home insulation, plus increased reliance on passive solar heating are all likely to reduce reliance on electric heating in the future*. Thus using total energy consumption leads to a large overestimate of electrical energy needs.

The last paragraph in the above Q & A might more accurately read:

"The railbelt's present electrical energy consumption rate, excluding industrial and national defense energy, is about 1.2 billion kilowatt hours. According to Army Corps of Engineers and the Alaska Power Authority, the two dams will produce 6.1 billion KWH of 'firm annual electrical energy.' This is over 5 times the present rate of residential and small commercial user electrical energy consumption.

Q. What are the geologic and environmental risks associated with the Susitna River Dams Project?

A. There are several with the seismic hazard being the most prominent. The seismic hazards come from two factors. The first is that the two huge dams and their associated reservoirs will be located in an area that is well-recognized for its high degree of seismic activity. The second is that the reservoirs themselves can induce seismic activity.

Much of the present seismic activity in the region appears to be connected to the well-known Denali fault system. This fault lies between 40 to 50 miles from the proposed dam sites and follows an arcuate path to the north and west of the Susitna basin.

Of greater concern is the recently recognized Susitna fault, an active fault which crosses the Susitna River immediately west (less than 5 miles) of the proposed site for the Watana dam. At least 5 moderate earthquakes

* In fact, the recent trend away from total electric homes has been so strong that GVEA in Fairbanks has more electrical energy than it can sell and recently cancelled its plans to build a new Healy coal plant.

(and many smaller ones) have occurred on or near this fault within the past six years. The fault extends from the Susitna Glacier in the Delta Range to the south of the Talkeetna River, a distance of over 60 miles. This region is a zone of crustal weakness and the fault is thought to be acting as a splay off the Denali fault system.

Compounding the problem of the natural seismicity in the area will be the loading caused by the impoundment of water behind the dams. It is a well-known fact that reservoirs commonly induce seismicity. Rather severe earthquakes, up to magnitude 6.4, have accompanied the filling of reserves at a number of dams around the world including places which had previously been aseismic. In one case, a reservoir-induced earthquake at Konya Dam in India caused severe property damage and the loss of 200 lives.

The Susitna dams and their reservoirs will lie on opposite sides of the active Susitna fault with the upper part of the Devil's Canyon reservoir actually overlying a portion of the fault. The high loading and water from these reservoirs could very possibly trigger strain energy which had been stored in the rocks prior to impoundment and could result in a massive earthquake whose epicentral region is likely to lie within the immediate vicinity of the Susitna dams.

The following is a quote from J. P. Rothe's "Fill a Lake, Start an Earthquake," New Scientist, 39, 75-78, 1968:

"It is by now clear that one can cite specific cases where tremors, some of which are severe enough to produce extensive damage, are caused by the construction of dams. When he builds these, Man plays the role of the Sorcerer's Apprentice: in trying to control the energy of rivers, he brings about stresses whose energy can be suddenly and disastrously released."

If a huge earthquake causes physical damage to either dam, the potential exists for massive floods to sweep down the lower Susitna River. Such floods could swamp the Parks Highway and the Alaska Railroad and devastate the communities along this transportation corridor--Gold Creek, Talkeetna and others. Even if direct physical damage does not occur, earthquake-generated ground motions and landslides into the reservoir could generate tsunami-like waves that could overtop the dams and result in flooding down river. *(to the dams)*

The earthquake itself could also cause direct damage to communities near the epicenter.

Q. What does the Army Corps of Engineers plan to do about the seismic hazards problem?

A. The Corps claims they have upgraded their design so that the dams will withstand an 8.5 magnitude earthquake whose epicenter is 40 miles

away and is at a depth of 20 miles. More recently the Corps has finally recognized the severe seismic hazard in the immediate vicinity of the proposed dam sites. Much of their proposed Phase I feasibility study centers around exploring this problem.

It's debatable whether the Corps can really design the dam structures to withstand the severe ground accelerations near the epicenter of a large earthquake. The more massive the structure, the more likely it will be able to withstand an earthquake, but size can add considerably to the costs. Any trade-offs, ^{between} costs and structural soundness, the Corps intends to make must be seriously examined.

A further problem, and potentially more serious one, is that there is no way of fully evaluating beforehand the effect reservoir loading will have on the active Susitna fault. This can only be done during the actual filling of the reservoir. If the impoundment of water at Watana and Devil's Canyon begins causing an increase in the frequency and intensity of earthquakes, the Corps will most certainly be compelled, in the interests of public safety, to stop the filling of the reservoirs.

Earthquakes could be induced even after the reservoirs are filled, particularly if there are large fluctuations in water level. Such fluctuations will occur at Susitna because during the peak energy demand months, the winter months, water flow into the reservoirs will be lowest.

The question that must be asked is whether the State of Alaska is prepared to take the almost inevitable seismic risk in order to secure electrical energy whose need has yet to be demonstrated.

Q. What other direct environmental problems are there with the SRDP?

A. Flooding of a large portion of the Susitna basin will destroy a large area of prime moose winter habitat.

input from Terry R.



Another problem associated with the dams is the increased flow of water into the lower Susitna River basin during the winter months. (The increased flow will be necessary to provide power during the winter.) This could result in massive overflow problems and the buildup of river ice that could inundate the areas adjacent to the river. This could destroy willow and brush along the river^{bank} which moose are highly dependent upon during winter months. River ice could also cause damming later in the spring that could result in floods.

★ One further problem associated with the outflow from the dams is that the water will be essentially free of silt. Without a sediment load, the water will begin to erode the river channel. Furthermore, with the reduction of sediment transport from upstream, the lower Susitna wetlands and delta may not be replenished and may begin to erode away. This is occurring at the Nile River Delta because of the Aswan dam.

Q. With the environmental risks so high, do we really need the dams, especially since it appears they will be supplying much more power than we need?

A. It is not at all clear that we really do need the SRDP. Eric Gould (the Executive Director of the APA) and the Alaska Power Authority have justified the project in the past on claims that the railbelt electrical energy needs will increase drastically in the coming years. Supposedly by 1995, this demand will be four to ten times the present level. Such forecasts are based on projections made by the APA itself! Neither the basis for these projections nor reports explaining the projections have as yet been made available to the general public.

We did investigate one reference cited by Gould to confirm APA's predictions. This was a report issued by ISER. Reading through the article we were perplexed to find that a so-called "no-growth" projection resulted in a quadrupled demand for electrical energy by 1995! Upon close examination of the article we were astonished to find that what no-growth meant to ISER was this: an annual population increase in the railbelt area in excess of 4.5% per year, more than four times the national average. This would result in more than doubling the present population by 1995. Apparently what "no-growth" referred to was that, in this projection, per-capita consumption of electrical energy would remain static at mid-1970's level. The industrial sector, however (which was projected to grow ^{as} rapidly as the population), was projected to increase their electrical energy consumption by 5.8% per year, resulting in a tripling of per-capita usage by 1995! This is in spite of the most recent trend of decreased per-capita energy usage in Alaskan industry.

Such growth in population and energy use would be considered accelerated growth anywhere else in the world, but in this ISER report it is considered to be the lowest economic development projection. Apparently ISER must be contemplating the movement of some highly energy intensive industry to account for the drastic per-capita increases.

No consideration appears to have been given to the impact which doubling the population in less than 20 years will have on land use in the rail-belt area and the large increase in hunting pressure in the surrounding region and throughout the State.

Q. Well, if we don't really need all this energy, for whom is it intended?

A. That's a good question and we're not sure what the answer is. Despite Eric Gould's and the APA's claims otherwise, their projections do imply large-scale energy-intensive industrial growth. What other potential users can there be? A recent report put out by the Department of Commerce and Economic Development states this quite clearly (Jobs and Power for Alaskans, July 1978, pp. 85-86):

"Hydro projects are characteristically extremely expensive to install and require considerable sums of money to be spent before feasibility and refined total cost can be determined...

"(For) large hydro projects, the increased use of electricity or the encouragement of energy intensive industry may be necessary to utilize excess energy in a project which might not otherwise be economically feasible to construct."

Q. What about the economic feasibility of the project?

A. With what is already known, economic feasibility looks grim. Even using the Army Corps of Engineers' very conservative construction estimates of \$2.6 billion and the APA's inflated energy projections, the project has been judged only marginally feasible.

Bear in mind that the costs on the Trans-Alaska Pipeline skyrocketed from \$900 million to \$8 billion, a 900% increase. A similar cost overrun on the Susitna project would bring the final tab to \$23.4 billion.

There also are additional hidden costs that have not yet been brought up or discussed by the Corps or APA. For example, the SRDP is going to be a highly centralized source of electrical energy. The major metro areas, Fairbanks and Anchorage, and communities along the railbelt cannot and will not rely solely on this source; otherwise they would become vulnerable to any malfunction at the dam sites or along the power links. Back-up electrical generation systems will have to be built and maintained.

Such costs have ^{not} yet ^{been} factored into overall cost-effectiveness and neither have the additional costs of engineering the dams against large earthquakes. There are also many who feel that the costs of environmental damage and potential hazards should also be factored into the equation.

Q. Who is going to pay for the feasibility study?

A. It looks like the State will unless some legislation currently under consideration is stopped or amended. Right now the APA and the Governor's office is asking for a direct appropriation of \$8.2 million to begin the first part of the study. The entire study will cost at least \$25 million with probable cost overruns. The APA and the Corps want the money now so they can start work before the spring thaw. 

Despite Senator Gravel's assertions otherwise, Federal reimbursement for the study seems highly improbable. The current trend in Washington, D. C., is to reduce spending and to cut back in hydro projects. There is also strong feeling that Alaska has already received more than its share of Federal subsidies. Furthermore, Senator Gravel has not endeared himself with the current administration nor with some key congressmen whose influence is necessary for consideration of the funding, particularly the head of the Water Resources Committee in the House of Representatives.

Even if the Feds do come up with the money, the mechanism of the reimbursement remains vague. Supposedly if the Phase I study shows the dam is feasible, then the Feds are supposed to reimburse the State. But who judges feasibility? The State? The Feds? Furthermore, what are the criteria? Economic? Environmental? Geologic hazards?

Before any appropriation is approved by the State legislature, these points must be clarified.

At the very least, the appropriation bill should be amended to define feasibility and the mechanism of pay-back.

Q. Who will pay for the construction of the dams, if the State decides to proceed?

A. The Feds have already backed out of any full-scale funding for the SRDP. This is primarily because they see no reason for paying so much to build dams that will benefit so relatively few people. Because the Feds will not fund the project, Senator Gravel and others in the State have begun agitating for State financing of the dams through APA-issued bonds. Because of the risks involved in the dams and the probable cost overruns, the State will have to secure the bonds. The only source for such security is the Permanent Fund. There has also been some suggestion of direct financing of the SRDP using the Permanent Fund. The Fund is already being eyed to help finance the gas pipeline, and petrochemical industry. If the Susitna project is added to this list, we can only let out an exasperated cry of "What next?".

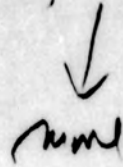
Notes - The answers to the following two questions are still in the idea stage and we would really value your input on them.

Q. What should be done about the SRDP Bill, currently before the legislature?

A. Amend or change the bill to:

1. Establish a citizen's Review board to oversee the assessments of future power needs and energy alternatives.
2. Hire an independent agency such as Resources for the Future to ~~perform~~ perform some of the studies.
3. Broaden scope of study to include unbiased investigation of all alternatives.
4. Because of the intimate connection between APA and Army Corps of Engineers (Eric Gould, the executive director of APA was the chief hydrologist with the Corp and has been a staunch proponent of Louisiana ever since its inception) other agencies should be hired to perform the studies. They will probably be cheaper.
5. Include provisions for open hearing on all aspects.

6. Define the mechanism of judging feasibility
7. Clarify federal no-involvement.



Q. What are the energy alternatives?

A. (we really need help in this question
most of all)

1. Small scale hydro?

★ The Corps has identified at least
40 rivers with potential for hydro-power
along the rail-hold. They have now
made their report available to the public.

2. Energy conservation

3. Solar, wind etc

4. Fossil Fuels.

To really adequately answer the above question
we need an honest unbiased appraisal
of Alaska's future electrical and other
energy needs will be.

Questions:

get figures behind power projections

What is existing usage?

Effects on caribou herds

Moore herds in Malchina Basin

23% of annual harvest?

Value of Susitna salmon harvest

Effects on fish?

for commercial fisheries

How in an economic feasibility figures

Gravel study

2.1

2.3-2.5

2.8

2.23

Bradley Lake

4.4

4.6 - 4.24

Gravel

Wild & Scenic Rivers

4.27 - 4.32

Summary of House Resource Committee Hearing on Sustina Project (SJR 6 & SB 63)

March 5, 1979

1. Eric Yould, Alaska Power Authority

Yould gave a general explanation of the project's history, general financing provisions and the timetable.

Cotten asked about the questions raised in Weeden's letter, specifically the demand projections ~~and~~:

Yould: even at an extreme low growth scenario of only .8% increased consumption per year, the project would still be economically viable.

Cotten then asked about the appropriateness of the Corps doing the feasibility study.

Yould: revenue bond market--we have to sell our bonds to conservative, knowledgeable investors on Wall st. They wouldn't buy the bonds if they didn't trust the Corps. (praise to wisdom of wall st, amen)

Yould escaped with no further questioning by the committee

2

2. Hugh Malone

Main question--what analysis of alternatives has been done? Who is making an evaluation of which project is best? Are we sure that this is the best deal? A range of varying costs--what are the next best alternatives?

Would like to see the OMB study of 32 other sites. What is the impact of this projection the Beluga coal field power plant proposal? Or on other large-scale alternatives such as using royalty gas via an in-state line?

Last year's legislature appropriated \$300,000 for the study of alternatives (note--not exactly true), but the study funds were contingent on federal guarantees. ~~The commitment~~ Was made when the state's only commitment was to revenue bonds. I'm not saying that we shouldn't appropriate the eight million, only that we need to look at alternatives.

What are the effects of the federal administration of the Corps contracts? The OMB wants additional information, before its approval.

Signoffs still have to be obtained from the local village corporations. We need to know which ones have an interest in this land. D2 is a problem, the river has been selected as a proposed wild and scenic river--what are the effects of that?

Even if the federal backing comes through, if the state decides not to go ahead with the project for our own reasons, we have to pay. and the ratepayers will have to bear the burden of cost overruns.

Agencies promote projects that they are interested in. We should get an independent analysis of the available alternatives; then decide what the magnitude of the state commitment should be. If the legislature provides funding, some sort of interim oversight committee should be set up, with the responsibility for renewing the Corps contract.

"I don't want the ratepayers on the hook." Alternative, incremental power plants may be more economical. Final shot--make sure Fish and Game has adequate money for biological studies.

3. Jim Brennen-as citizen and ~~xxxx~~ Alaska Center for the Env.

should delay funds for a year--M OMB dissatisfactions, BLM permits, federal guarantees, possible alternatives are all questions that have not yet been resolved. stressed need to develop decentralized sourcews of power and inevitability of the development of the Beluga coal fields.

4. Roman Motyka--on own behalf, member of geophysical institute, environmentalist

My concerns--cost overruns, as exemplified by pipeline. Seismic problems. Costs of backup systems. Limitations of bonding. Are demand forecasts backed up by assumptions of a capital move, energy-intensive industry moving into the state? What other options are available?

Eliasonasked the biological concerns, social impact, Zharoff concurred with Eliason's questions.

Carney--conservation groups should make some positive, specific suggestions, instead of always criticizing.

Chatterton attempted to trip Roman up by asking detailed questions about his seismic map and knowledge of the area.

Osterbeck--are you in favor of coal-fired plants, and coal-mining?

Eliason--are there any historical examples of a dam attracting industry?

5. Dick Logan, for F&G

Susitna supports the Cook Inlet fishery, of extremely high value. Dam also will affect upland habitats of moose, caribou and brown bear.

~~NBE~~ NEPA requires that ecological questions be addressed--EIS will cover questions, the feasibility studies have to be run to get the answers.

Have effect on caribou migration, possible thermal bloc to salmon spawning. Dams have caused big loss in fish populations, most impact will be downstream from dam. Hatcheries to replace have had varying success.

Osterbeck--what are impacts of alternatives? Logan--pipeline, coal plant would have much less effect than hydro project.

Eliason--what are the effects of flow levels, temperature shanges?

Logan--we're able to manipulate the dam outflow to adjust temperatures, rate, can ~~possibl~~ increase fish populations, though increase in salmon is unlikely.

Halford--do you have enough money to do an adequate job? Logan--Yes; we proposed more, but understand it's a tight budget year (for Corps?) will accept what we get.

6. David Hutchins--exec. director of ass. of rural ~~xxxx~~ electric coops

strongly support ~~susitna~~ susitna project. recent decrease in Fb power demand not representative of the rest of the Railbelt. Susitna is the best alternative for the region. Healy coal was shelved because of costs associated with the Clean Air Act. Small hydro projects are supplemental, not replacements.

Chatterton--would nuclear power be more cost-effective? Hutchins--don't know. Hutchins also stressed the federal prohibitions on using gas to generate electricity.

Zharoff--thanked everyone for electrifying testimony, keeping committee current on positive and negative aspects, generating discussion. numerous groans.

Box 349, Soldotna, Alaska
March 17, 1979

Alaska Conservation Society
Box 80192 College Branch
Fairbanks, Alaska

Dear Members:

As a former member of the Alaska Conservation Society, Alaska Center for the Environment, Friends of the Earth (but not of Man), and the Sierra Club; I'd like to rebut your recent testimony against my pet project, the Susitna Hydropower Project. Generally speaking, I'd say this project's present single biggest problem is with you ultra conservationists, environmentalists, and preservationists — who's obvious delaying tactic is to study the project to death with endless bad things that may happen, but not one good thing that will.

Your first teleconference statement to the House Resources Committee: We believe the State cannot afford to channel that money wholly thru agencies already committed in support of the project. O.K.— fine. Our State can easily afford to hire an independent, private agency to make an overall economic feasibility study of this project and other comparable alternatives, if you don't trust the objectivity of the Corps of Engineers. Meanwhile, why not let the Corps proceed with their 25 million dollar, 4 year engineering study to determine the project cost and environmental impact (an important part of economic feasibility), or don't you trust them with that either?

Your second statement: A.C.S. recognizes that energy needs will grow, that new energy sources will be needed, and pledge our support of an acceptable system for meeting those needs, and recognize that to oppose a poor choice is less than half of our full social responsibility. Noble words, indeed — but you still haven't suggested one solid alternative comparable to the Susitna Project, and haven't said one good word for that. Is that facing our future energy needs with "full social responsibility"? And yet you question the Corps lack of objectivity.

Your third statement: We believe that effects of the Susitna Project on fisheries and wildlife have been underplayed to date — evaluation of these aspects must be undertaken by competent people. Well, certainly, that's exactly what Corps of Engineers will do as part of their Environmental Impact Study with input from public hearings in the process. Of course, one thing is for damned sure: everything man does in this world is a trade-off, so any way we generate power is going to cause some environmental damage — even retreating into candle-lit caves.

Your Problem No. 1: The need for such a large project has not been shown. Really now, is that bad? Don't you know that both dams do not have to be built and completed simultaneously, and that generators are commonly added to big dams as the need develops? What could be nicer than to start a large hydro-electric project with a decade or two of year-around employment — and who's ultimate capacity far exceeds our foreseeable needs? Sure beats make-work public works projects or unemployment compensation, and seems much preferable to scrambling from one power shortage crisis to another — doesn't it?

Your Problem No. 2: It's economic feasibility is, at best, marginal; at worst a terrible loss. Now that's a fine pre-judgement to make before the engineering & feasibility studies have even started. Right or wrong, you know who and what caused most of TAPS 900% cost overrun. And who can accurately predict the cost of anything 5-10 years ahead these days? On vital matters like harnessing energy, once a decision is made to do something, we must plunge ahead and complete it regardless of cost overruns (like TAPS). And of course there are risks involved, but that's the price of progress.

Your Problem No. 3: The project risks massive flooding from earthquake damage. Maybes; but do you really have such little faith in the Corps of Engineer's ability and judgement to think they would advocate building a large dam where it is likely to fail? Come on now, be realistic.

Your Problem No. 4: A caribou herd of 20,000 animals will be threatened. That positive assertion is followed by 5 "could" possibilities. Well, maybe the caribou will be adversely effected and that's a price we will have to pay — no one will know until afterward. But if you're really so damned concerned about caribou mortality, why not thin out the wolves now?

Your Problem No. 5: More than 20% of the State's total moose harvest comes from the game unit surrounding the proposed Susitna Project. For it's size, the Susitna Project reservoir area will be small, since it is located in an unusually narrow valley (in extreme contrast to the Rampart proposal on the Yukon River). Of course, some moose habitat will be destroyed, but with moose populations rapidly declining all over the State from other causes, plenty should be left for the few survivors 10 years from now.

Your Problem No. 6: 38% of the Cook Inlet salmon harvest comes from Susitna. This resource could be threatened. In the first place, no salmon pass the first dam site at Devil's Canyon; the current is too swift. Furthermore, large dams reduce silty water downstream, not increase it as you say. And what percentage of the Susitna salmon run spawns in the mainstream and what in it's ^{many large} tributaries? In any case the dams could ^{easily} control the water flow during the brief spawning season to optimum water level, instead of "reduce the existence of and access to spawning sites" as you say.

Your Problem No. 7: The Susitna is not our only possibility for hydropower. Certainly not, but which of these 32 other hydropower sites in the railbelt area has Susitna's potential output, small reservoir area, central location, and convenient access from the Alaska Railroad? Come on, name one.

Your Problem No. 8: The State will probably be stuck with the bill — paying \$2.6 billion or a lot more. Well now, what's wrong with that; shouldn't we pay our own way? If not, who should? And can you think of a better investment for the State's oil revenue (currently \$940 million/year), or shall we dissipate more on the State bureaucracy (a favorite haven for many "conservationists"—right?)

Your Problem No. 9: The Corps should not do the feasibility study.

Alright, "Since the Corps will be doing the planning, design and construction", let the State hire "an outside, independent, unbiased agency" to conduct the feasibility study. Of course, if the project proves to unfeasible, there will then be no chance of study reimbursement from Uncle Sam, as there otherwise is.

Your Problem No. 10: The study should be delayed. Well, that sums up your position nicely. Sure, that's the safest thing to do in the short-run, and hopefully we will all be dead before an energy crisis arrives. Or at worst, end up in candle-lit caves still pondering the problem after our oil and gas is gone, and it's too late to make the transition. The disadvantage of delaying the study is that time is of essence. Every year we wait will be one more year before the Susitna Project replaces our current nearly 100% dependence for power on extremely wasteful and low priority use of natural gas and oil. Isn't that urgent enough to get the show on the road as soon as possible?

Well, it is for me and others, so I say this time "damned the environmentalists and full speed ahead" with the Susitna Project, which appears so far to be our best hope for a large, perpetual, renewable, clean source of power with a minimum of environmental damage. Of course, it is very important for our State to make a firm commitment now that this hydro-electric power will be used only to replace existing oil and gas power generation (which it will barely be capable of doing when completed 10-20 years from now), and not sold to induce new heavy industry into the railbelt area. That's the real joker in the deck now, which the gung-ho developers in Alaska would rather not discuss. And we have promoters like Senator Gravel talking about a domed city at Mt. McKinley with a monorail to Anchorage energized from the Susitna Project. That worries me some, too, but I don't see where we have much choice but to take that chance.

In closing I'd like to add that even Iran, with it's abundance of gas and oil, has had the good sense to invest heavily in hydro-electric power. Can we do less? This has been a hell-of-a-way to spend a St. Patrick's Day afternoon, but it will be worth the effort if it just stimulates your thinking about the consequences of endless study and delay. I still consider myself a conservationist, but not your extreme breed that instinctively opposes any and all large developments.

Cheers,

C.C. to others

Charlie Parker

CHARLIE PARKER, R.L.S.
Land Surveyor & Map Sales
Box 349 Soldotna, Ak. 99669
Phone 262-4580



Alaska Conservation Society

Incorporated in 1960

Box 80192 College, Alaska 99701

April 10, 1979

The Honorable Bill Miles, Chairman
House Resources Committee
Pouch V
Juneau, AK 99811

*also sent to
Russ Mackin*

Dear Chairman Miles:

In previous correspondence and in testimony before the House Resources Committee, the Alaska Conservation Society has outlined several problems our organization perceives regarding the proposed Susitna hydro-project. A more detailed analysis of some of these concerns accompanies this letter. We hope you will read about them and our recommendations.

Being fully informed about the problems with Susitna is especially important, now that the Alaska Power Authority is preparing to ask the legislature for a direct appropriation to conduct the feasibility study, a study which may eventually cost upwards of \$40-50 million. Given the many questions which still surround the Susitna project, the scale of potential State involvement, and the problems with IRS concerning the bonding of the construction phase of the project, it seems logical to us that for wise State energy planning, a totally independent evaluation of the Susitna project, energy demand projections, and alternative energy sources be done before becoming mired politically and economically in the Susitna project.

If the legislature should decide to start the Susitna feasibility study, then we strongly advise that only a minimum budget be funded and that the studies be limited to biological and environmental aspects. Such studies can be conducted by in-State agencies without involvement of the Army Corps of Engineers. The cost of such studies would probably not exceed \$1.5 million. A better understanding of the biological and environmental risks of the Susitna project together with both an independent evaluation of economics and feasibility of Susitna and a study of the State's energy alternatives would provide the State with a solid base of information upon which future energy policy decisions can be made.

We wish also to once again emphasize that the Alaska Power Authority is not a planning agency; it is an implementing agency, one with strong ties to the Army Corps of Engineers and to the Susitna project. We question the propriety of using this agency to provide an objective,

April 10, 1979

unbiased appraisal of Susitna feasibility and alternatives. The State should be very cautious about channelling funds for further studies of Susitna through agencies which may already be committed to supporting the project.

Sincerely,

Ed *Mary Lee Croft*
Ed Murphy, President
Alaska Conservation Society

EM/fp

Enclosure

April, 1979

Concerns About the Susitna Hydro-Project

1. The projected energy demand used by the Army Corps of Engineers is totally unrealistic.

The need for the large amounts of electric power that will be provided by the Susitna River Dams Project has not been demonstrated. Total residential industrial electrical energy consumption in the railbelt area was about 1.9 billion kilowatt hours (KWH) in 1977. The two Susitna dams will produce 6.9 billion KWH, over 3-1/2 times the amount of energy needed to meet 1977 consumption. The Army Corps of Engineers has continued to use the highly inflated and unrealistic growth projections made by the Alaska Power Administration (APA) to justify the Susitna project. Public involvement in APA's (a federal bureaucracy) projections has been conspicuously lacking, and APA has commonly manipulated statistics to suit their needs and bolster their arguments for excessively large future energy demands. For example, when APA has projected energy demands for the Alaska railbelt (i.e., the Anchorage-Fairbanks area), they have included the energy needs of the Kenai Peninsula and of the military. In fact, the power needs of the Kenai Peninsula will primarily be met by the Bradley Lake hydro-project. The military in Alaska has always generated its own power in the past and very probably would not use a centralized, highly vulnerable energy source such as Susitna, in the future.

The APA's projected growth patterns include a doubling to tripling of railbelt population in less than 20 years and a continued annual increase in per capita energy consumption of 3% or more per year. These projections result in energy demands of four to ten times present needs by 1995. The most recent trends in population growth and energy conservation in Alaska make such projections totally unrealistic. In fact, statistics from Golden Valley Electric Association (GVEA), the major commercial utility in the Fairbanks region, show that their per customer energy consumption is declining in Fairbanks. During the past three-year period, GVEA residential and commercial/industrial per customer usage has declined at average rates of 12.5%/year and 5.5%/year, respectively. Statistics from Anchorage utilities and from APA show that the annual increases in per customer usage have tapered significantly in the Anchorage area over the past three years. Total energy consumption in the Fairbanks area actually declined in 1978. Present energy consumption in Fairbanks is running considerably below what had been projected for this community in the Corps of Engineers' initial feasibility study.

The Corps of Engineers has overestimated future power needs before. This occurred when justifying the construction of the Snettisham dam near Juneau. The dam was built by the Army Corps of Engineers and is administered by the Alaska Power Administration. Although brought on line in 1973, the Juneau Power Utility is buying only one-fifth of the total capacity of the project. Consequently, the cost of power to the utility company is over twice the rate the Corps originally anticipated. Because of the slow growth in load, in order to cover the interest rates on the bonds that funded this project, it is expected that the price will again be increased in 1985 by 75 to 80 percent. With a much bigger project such as the Susitna, such a mistake would be a financial disaster.

No matter what the increase or decrease in energy consumption will be, the Susitna Project will not come on until the turn of the century. Utility companies will be required to build new power plants to meet the needs before the Susitna could come on line. Susitna power then represents an enormous glut of energy. In order to make the project economically feasible, the Corps will have to find a way to sell the excess power. Their proposed solution is rapid industrialization and the introduction of some highly energy intensive industries to the railbelt. Some of their proposals are a bauxite processing plant, a uranium enrichment plant, mineral processing plants, coal gasification plants, liquid natural gas plants, oil refineries, etc. Not only is this highly speculative (coal gasification plants are not yet a reality), but such industrialization is totally incompatible with the expressed opinions of the majority of Alaskans who do not desire rapid large-scale industrial growth. The Susitna project, in fact, represents a de facto imposition of an accelerated growth plan upon Alaska which is totally contrary to Alaska's desire for planned growth and control over their future. No consideration appears to have been given to the impact which doubling and tripling the population in less than 20 years will have on land use in the railbelt area and the large increase in hunting pressure in the surrounding region and throughout the State, nor to the environmental impact of such large industrialization to the railbelt area.

2. The economic feasibility of the Susitna project is highly questionable.

Even when using the Corps' very conservative cost estimate of \$2.6 billion, economic feasibility has been judged as marginal. The Susitna project would involve two dams, each one larger than the Hoover Dam. The project would be the biggest and most expensive ever attempted by the Corps. It would also be the first large-scale hydro-project ever attempted by the Corps in a subarctic region, an environment notorious for its engineering difficulties. Compounding the engineering problems is the fact that the dam sites will be located in a highly active seismic region. Dealing with such problems can easily lead to significant cost overruns on the project.

The Office of Management and Budget (OMB) has shown that if the Susitna project has a cost overrun of as low as 30%, the benefitcost ratio would be less than unity, making the project economically unfeasible. The Snettisham Dam in Juneau, Alaska, had a cost overrun of 36%, over and above inflation, and it was a much smaller project. A study made for the U.S. Senate showed that large custom engineering projects, such as Susitna, have cost overruns, over and above inflationary costs, of between 50 and 500%. In Alaska the best cost estimates for construction of the oil pipeline, based on all the final environmental stipulations, was \$2.5 billion. The end costs were \$9 billion, a cost overrun of 300%.

Several additional hidden costs have not yet been brought up or discussed by the Corps. For example, the Susitna project is going to be a highly centralized source of electrical energy. The major metro area,

Fairbanks and Anchorage, and communities along the railbelt cannot and will not rely solely on this source; otherwise they would become vulnerable to any malfunction at the dam sites or along the power links. In fact, the utilities are required by Federal law to have reserve power on hand equal to the largest generating plant on the line. Such backup electrical generation systems will have to be built and maintained, and will add significantly to the overall costs of the project.

Such costs have not yet been factored into overall cost-effectiveness and neither have the additional costs of engineering the dams against large earthquakes and a subarctic environment. There are also many of us who feel that the costs of environmental damage and potential hazards should be factored into the equation. For example, almost 40% of Cook Inlet's salmon harvest comes from the Susitna River. This is more than a \$15 million per year industry, almost 5% of the yearly benefits of the dam project at peak production. Recent research by the Alaska Department of Fish and Game has indicated that severe impacts to the fishery may occur with the construction of the dams.

OMB has raised several other important questions regarding the feasibility of the Susitna project. The Corps has yet to adequately answer these questions. OMB's comments have been appended to the testimony and deserve serious consideration.

We as Alaskans are deeply concerned about who will have to pay the inevitable cost overruns associated with a project of such massive scale. If the Federal Government does not foot the bill of cost overruns, then the burden must inevitably fall onto the Alaskan railbelt electrical utility rate payers, and with the strong possibility of State Government involvement, onto all Alaskan taxpayers.

3. The potential seismic risks are significant.

The seismic hazards come from two factors. The first is that the two huge dams and their associated reservoirs will be located in an area that is well-recognized for its high degree of seismic activity. The second is that the reservoirs themselves can induce seismic activity.

Much of the present seismic activity in the region appears to be connected to the well-known Denali fault system. This fault lies between 40 to 50 miles from the proposed dam sites and follows an arcuate path to the north and west of the Susitna basin (see accompanying map).

Of greater concern is the recently recognized Susitna fault, an active fault which crosses the Susitna River immediately west (less than 5 miles) of the proposed site for the Watana dam. At least 5 moderate earthquakes (and many smaller ones) have occurred on or near this fault within the past six years. The fault extends from the Susitna Glacier in the Delta Range to the south of the Talkeetna River, a distance of over 60 miles. This region is a zone of crustal weakness and the fault is thought to be acting as a splay off the Denali fault system.

Compounding the problem of the natural seismicity in the area will be the loading caused by the impoundment of water behind the dams. It is a well-known fact that reservoirs commonly induce seismicity. Rather

severe earthquakes, up to magnitude 6.4, have accompanied the filling of reserves at a number of dams around the world including places which had previously been aseismic. In one case, a reservoir-induced earthquake at Konya Dam in India caused severe property damage and the loss of 200 lives.

The Susitna dams and their reservoirs will lie on opposite sides of the active Susitna fault with the upper part of the Devil's Canyon reservoir actually overlying a portion of the fault. The high loading and water from these reservoirs could very possibly trigger strain energy which had been stored in the rocks prior to impoundment could result in a massive earthquake whose epicentral region is likely to lie within the immediate vicinity of the Susitna dams.

The following is a quote from J. P. Rothe's "Fill a Lake, Start an Earthquake," New Scientist, 39, 75-78, 1968:

"It is by now clear that one can cite specific cases where tremors, some of which are severe enough to produce extensive damage, are caused by the construction of dams. When he builds these, Man plays the role of the Sorcerer's Apprentice: in trying to control the energy of rivers, he brings about stresses whose energy can be suddenly and disastrously released."

Wendell V. Mickey, who was Chief of the Seismology Division of NOAA, recommended that "no dam should be built within the disturbed zone of an active fault."

If a huge earthquake causes physical damage to either dam, the potential exists for massive floods to sweep down the lower Susitna River. Such floods could swamp the Parks Highway and the Alaska Railroad and devastate the communities along this transportation corridor--Gold Creek, Talkeetna and others. Even if direct physical damage does not occur to the dams, earthquake-generated ground motions and landslides into the reservoir could generate tsunami-like waves that could overtop the dams and result in flooding down the river. The earthquake itself could also cause direct damage to communities near the epicenter.

The Corps claims they have upgraded their design so that the dams will withstand an 8.5 magnitude earthquake whose epicenter is 40 miles away and is at a depth of 20 miles. More recently the Corps has finally recognized the severe seismic hazard in the immediate vicinity of the proposed dam sites. Much of their proposed Phase I feasibility study centers around exploring this problem.

It's debatable whether the Corps can really design the dam structures to withstand the severe ground accelerations near the epicenter of a large earthquake and still preserve the overall cost effectiveness of the project. The more massive the structure, the more likely it will be able to withstand an earthquake, but size can add considerably to the costs.

A further problem, and potentially more serious one, is that there is no way to fully evaluate beforehand the effect that reservoir loading will have on the active Susitna fault. This can only be done during the actual filling of the reservoir. If the impoundment of water at Watana and Devil's Canyon begins causing an increase in the frequency and intensity of earthquakes, the Corps will most certainly be compelled, in the interests of public safety, to stop the filling of the reservoirs.

Earthquakes could be induced even after the reservoirs are filled, particularly if there are large fluctuations in water level. Such fluctuations will occur yearly at Susitna because, during the peak energy demand months, the winter months, water flow into the reservoirs will be lowest.

Most Alaskans are not prepared to take the almost inevitable seismic risk in order to secure electrical energy whose need has yet to be demonstrated.

4. The Susitna project poses a significant threat to the region's fisheries and wildlife.

We believe that the effects of the Susitna project on fisheries and wildlife have been severely underplayed by the Corps. Our brief talks with biologists have alerted us to the probability that the project could drastically reduce the Susitna River's salmon production, seriously reduce Nelchina Basin moose and caribou stocks, and as a result, decrease recreational opportunity while simultaneously increasing local recreation pressures on remaining wildlife. A full and careful evaluation of these aspects must be undertaken by competent people before getting into the Susitna dam project.

More than 20% of the State's total moose harvest comes from the game unit surrounding the proposed Susitna project. The Alaska Department of Fish and Game considers the Nelchina Basin within which the Susitna project will be located, one of the most important game areas in the State, providing large numbers of game animals and roadside access for hunters and viewers. A very significant part of fall and winter moose habitat used by moose in this unit would be covered by the impoundments. This could mean a considerable reduction in moose numbers which would limit hunting and viewing opportunities.

The calving grounds for the Nelchina caribou herd (20,000 animals) are near the proposed impoundment sites. Movement of animals to and from the calving ground could be impeded by the reservoirs. Considerable mortality to the herd could result during the crossings. More likely, as with reindeer in Norway, they may cease migrating. The ensuing limitation of range can be expected to cause a drastic plunge in their population. Most non-migrating herds number in the hundreds. The feasibility study itself could adversely affect the caribou herd. The study would build a road to the dam sites, creating access for many people. Ensuing trails could lead people directly into the calving grounds. In 1978 close to 3,000 people applied for permits to hunt the Nelchina caribou herd.

Adjacent to these lands, in McKinley Park, the McKinley caribou herd has deteriorated badly. It is questionable whether it will ever recover. The Nelchina caribou herd of 20,000 animals is really the only other herd of account in the Interior. With the pipeline already affecting the Western Arctic herd and the threat of oil and gas development in the Arctic National Wildlife Range that could disastrously affect the Porcupine herd, we may find in the future that the Nelchina herd is of national significance.

Thirty-eight percent of the Cook Inlet salmon harvest comes from the Susitna. The Susitna River is the highest producing river into Cook Inlet of all salmon species, save the sockeye. It is the second or third highest producer of sockeye salmon. In the winter the Susitna runs clear, and thus it is satisfactory for the rearing of juvenile salmon which move into it at that time. The dam would probably cause the winter waters to run silty and, thus, would be unsatisfactory for that purpose. This condition would affect the entire length of the river down to the mouth. Also, the probable decrease in water level downstream from the dam to the mouth during summer would reduce the existence of and access to spawning sites.

5. An adequate analysis of Alaska's choices of alternate energy paths has not yet been made.

To construct and become dependent upon a single, centralized energy source is contrary to what we consider to be good energy planning for Alaska. Rather, we feel that energy sources should be decentralized and varied. Several alternatives are available for Alaska and need to be investigated in greater detail before becoming locked into a Susitna project. At least 32 alternate smaller-scale hydro-power sites have been identified in the Alaskan railbelt area. In-depth studies of these potential hydro-sites is conspicuously lacking. To our knowledge, only cursory studies have been made and these were done during the late 1940's. Smaller-scale hydro holds a distinct advantage over Susitna. Such projects could come on line much sooner and could be incremented in to meet energy demands as they occur. We feel that a thorough evaluation of this alternative hydro-power path is needed before proceeding with Susitna.

Proper insulation of homes and businesses and other conservation measures can lead to tremendous savings of energy. Further, although many people find it hard to believe, solar power in Alaska is becoming increasingly practical. New homes are being designed to take advantage of passive solar heating and solar heated water tanks in the Fairbanks area have been shown to be competitive with electrically heated water tanks. Because they are labor intensive, such conservation alternatives can significantly increase local employment. Furthermore, purchase of construction materials for such improvements would greatly benefit local business and add to the diversification of local economies.

Another alternative which has not yet been fully explored, is the potential of direct use of natural gas for home heating, water heating,

and cooking in Alaska. Such direct use of natural gas has been shown to be twice as efficient as using gas-generated electricity for these same purposes. Studies have shown increased use of natural gas for home space heating in the Anchorage area. This trend is expected to continue into the foreseeable future.

The New Carter Water Policy requires that the federal agency considering a dam must prepare a nonstructural or demand reducing alternative. No effort has been made by any agency to do this.

Summary

We feel that the Army Corps of Engineers, the Alaska Power Administration and the Alaska Power Authority (a state agency) are overstepping the bounds of their authority in their attempts to circumvent the State's planning process, by trying to impose an energy policy onto the State. We further feel that the seriousness of the problems regarding economic feasibility, financing, geologic hazards, and environmental risks warrant delay of any action on the Susitna project until:

1. An independent evaluation of the Corps' projected construction costs, economic feasibility, financing and geologic-environmental risks can be made.
2. Alaska's energy alternatives and choices of paths for growth and development are fully examined.
3. The Alaskan citizenry has been made fully aware of the implications of Susitna power and of what alternate choices are available.
4. The public is allowed to participate in choosing the direction in which the State is to proceed.

QUESTIONS ON THE ECONOMIC FEASIBILITY OF THE SUSITNA PROJECT, ALASKA
PUT FORTH BY THE OFFICE OF MANAGEMENT AND BUDGET

There are a number of areas where additional information on the Susitna Project is needed to provide an adequate basis for assessing its engineering and economic feasibility. These areas are as follows:

1. Watana site geology and test borings

The cost estimates for Watana have been derived without benefit of any test borings at the Watana Site. This is a departure from standard Corps practice, which calls for exploratory drilling at all sites before projects are proposed for authorization. Test borings would provide more reliable data on which to base cost estimates and on which to assess any potential seismic problems. The Watana Site is located near the Susitna fault and also within 50 miles of the Denali fault--an area where major earthquakes have occurred in the past.

2. Contingency estimates

A standard 20% contingency factor was used in arriving at cost estimates. A contingency of 30% could result in reducing the benefit cost ratio to 1. A larger contingency factor could reduce the ratio below unity. The recently completed Snettisham project in Alaska cost 36% more than original estimates, after correction for inflation.

A review of the 20% contingency factor should be undertaken in light of the best existing information on comparable projects and project locations.

3. Area redevelopment benefits

These benefits are a correction for the use of otherwise unemployed labor during construction. Though standard procedures permit this benefit category for power projects, it would seem that such benefits should not be accepted in the Susitna Report because private development for power purposes would produce equivalent benefits.

An evaluation of the validity of the use of ARA benefits in the Susitna Report should be made.

4. Construction schedule

The 11-year construction schedule for the Watana project, based on preliminary inspection of comparable projects, appears to be on the short side. A longer schedule of 14 years appears more reasonable because of (1) normal slippages and (2) a three-year peak construction schedule that calls for more work to be put in place on a single site than the Corps has ever accomplished in similar time periods. This should be reexamined and its effects on the project B/C ratio calculated.

5. Supply estimates

The analysis of the without project condition needs to be expanded considerably to clearly analyze the following:

1. Why, with natural gas projected to be in such short supply, the Anchorage utilities have only contracted for 55% of proved reserves or 25% of estimated ultimate reserves.
2. The sensitivity of the analysis to the collapse of OPEC and the cost of shipping oil to the East Coast.
3. The necessity for an Anchorage-Fairbanks intertie at a cost of \$200-300 M.
4. Scheduling of powerplants and the reduced risk of building small increments.

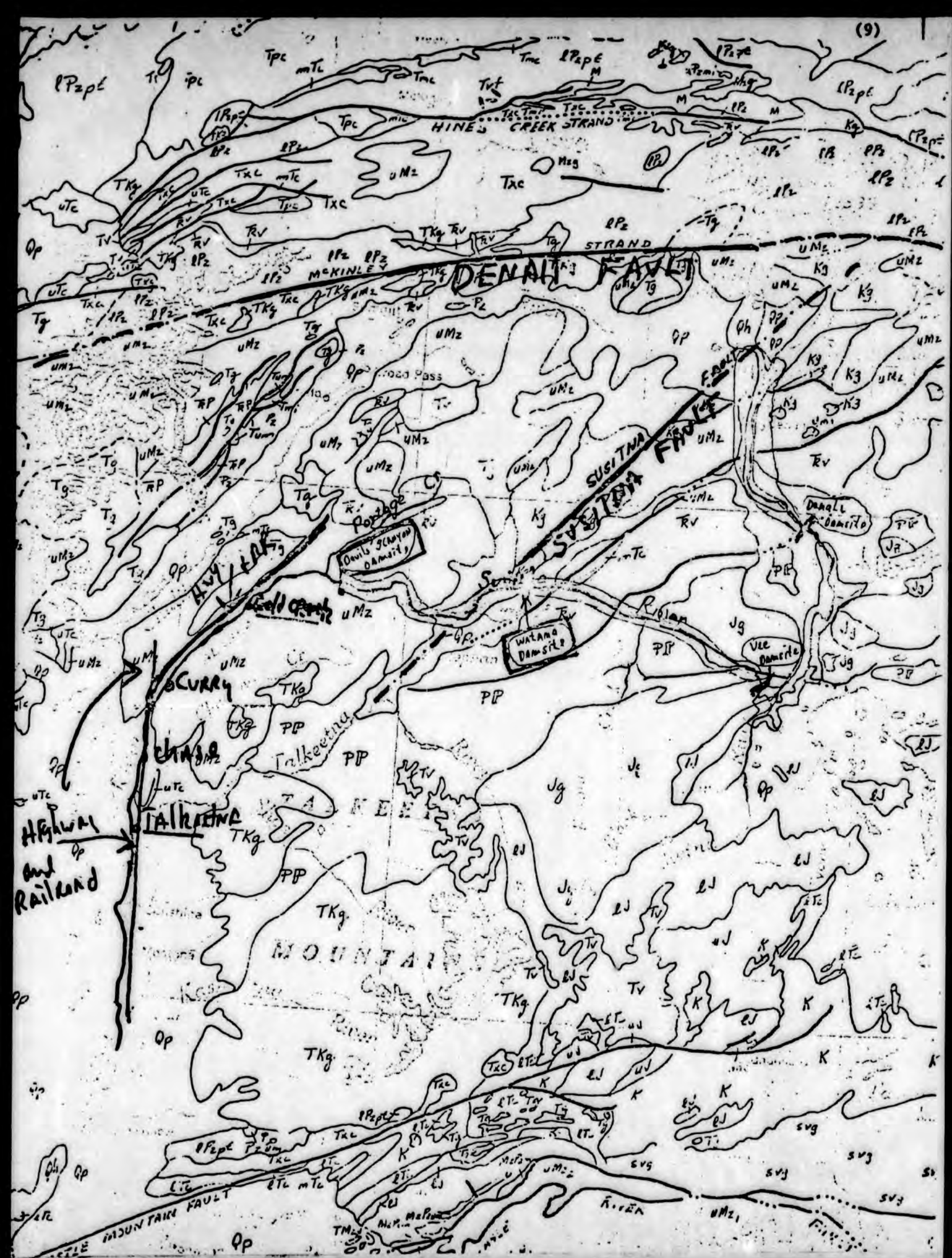
6. Demand estimates

The analysis of load growth should be more specific with respect to:

1. Increasing use by consumers; and,
2. Increasing number of consumers.
3. Industrial growth, i.e., where does Alaska's comparative advantage lie outside the area of raw materials and government functions?

7. Sensitivity analysis

Power demand should be subjected to a sensitivity analysis to better assess the uncertainties in development of such a large block of power. The typical utility invests on the basis of an 8-10 year time horizon. The Susitna plan has an 11-16 year horizon in face of risks that loads may not develop and the option of wheeling power to other markets is not available. It should be noted that the power demand for Snettisham was unduly optimistic when it was built. This resulted in delays in installing generators. A similar error in a project the size of Susitna would be much more costly and would have a major adverse effect on the project's economics.



Brian,

Conversation

8/22/79

This was part of a draft
state response to the Corps on
their final EIS on Susitna.
That's another story, but I
thought the comments by
Dave Sturdevant* of DEC
would interest you in your
efforts on the new study.
Let's keep in touch.

2663

Yours,

Tom Singer

CC Trans Union
4/1/79

delay decs - until
study
" complete

- DEC -

refer to Gov
from Brian

[Send Tom
outline]

Dave Sturdevant

465-2663

Response of the Alaska Department of Environmental Conservation to the Upper Susitna River Basin Hydroelectric Power Development Final Environmental Impact Statement:

Thank you for the opportunity to review the FEIS for the Upper Susitna River Basin Hydroelectric Development (January 1977).

In reviewing the FEIS, we find that many of the concerns expressed by this Department in our comments (attached) on the DEIS have not yet been answered to our satisfaction. For example, in our comments on the DEIS, we addressed the problem of excess capacity as a spur to uncontrolled growth. In the FEIS, the contention that the project will not have any significant effect on growth (p. 65) is based on population and demand projections. These projections are of questionable accuracy and currency. In the Fairbanks North Star Borough's "Energy Use Inventory" the conclusion is drawn (p. 69) that even APA's demand and population projections are unwarrantedly high. For this reason, APA has updated its projections. The new projections, positing significantly lower population-demand rates, are not used in the FEIS. Testing projections against actual demand, ISER's forecast indicates rates closer to a limited growth model identified in earlier projections.

The APA demand projections are based on estimated annual population growth and per capita energy growth. The respective figures used in the median projection are roughly .034 and .0275; high, .051 and .0375; and low, .027 and .0175.

Historical growth rates are indicated below:

	<u>70-73</u>	<u>73-77</u>
Energy per capita:		
Fairbanks	10.5	10.6
Anchorage	14.2	12.7
Population statewide	3.0%	5.6%

The significance of the above observations lies not only in the potential for excess capacity that would act as a spur to growth, but also in the validity of the assessment of alternatives. Several single dam projects are eliminated from consideration in the FEIS' alternatives as producing

DEIS - 6/76

D.S. has # of problems with demand projections of AKPAAdm.
are lower than most

populations projections are also too high

by Matz report for FL

ACE survey
on alternative energy

too limited a supply of electricity to meet demand. [Readjustment of the demand projection may lead to re-evaluation of the alternatives.] We further question the FEIS' assumption that power could be on line by 1986, as APA indicates on-line power in 1994. Alternatives are assessed in terms of the 1986 projection. Reassessment of the alternatives considered should deal more with likely mixes of energy sources than with "either/or" arrangements. The alternatives discussion is superficial:

- ✓ a) No cost figures are included;
- ✓ b) The natural gas supply is not examined, nor are Chugach Electric's plans to continue with gas;
- ✓ c) We disagree that "Nuclear power should be considered a likely long-range source of baseload power;"
- ✓ d) The solar alternative ignores non-electric solar potential;
- ✓ e) The potential for displacement of current electric uses through conservation should be examined, as should increased efficiency, and alternate renewable fuels. Electricity "saved" can then be applied elsewhere. This process is accepted by many utilities "outside" as the cheapest and quickest source of new power.

Regarding the section, "Environmental Impacts of the Proposed Action", we find our DEIS comments still valid. Additionally, although many adverse or potentially adverse impacts are identified, consideration of mitigating measures is not in evidence.

Any dam complex will even out the annual flow cycle, reducing summer flow and increasing winter flow. At the same time winter turbidity will be increased from near zero to an estimated 15-35 ppm, according to the FES. It appears this would constitute a violation of a Water Quality Standards, and would have to be resolved.

Wittow
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The Politics of Hydroelectric Power in Alaska:
Rampart and Devil Canyon--A Case Study

Completion Report
OWRT Agreement No. 14-34-0001-7003
Project No. A-060-ALAS

Claus - M. Naske
and
William R. Hunt

Institute of Water Resources
University of Alaska
Fairbanks, Alaska 99701

The work upon which this completion report is based was supported by funds provided by the U. S. Department of the Interior, Office of Water Research and Technology as authorized under the Water Resources Research Act of 1964, Public Law 88-379, as amended.

RAMPART DAM

In 1959 Congress appropriated money for an initial Corps of Engineers' study of the feasibility of Rampart Dam. Subsequently more money was made available and, over the next few years, the Rampart project occasioned a controversy whose size matched that of the proposed facility. The controversy exposed the problems associated with the construction of such vast public power projects; it revealed the concerns of opposing interested agencies and opinion groups; and, above all, it highlighted the time lag affecting such projects.

It is not the purpose of this study to show that Rampart was either a sound scheme, unfortunately aborted, or a foolish one, justly suspended. We wish, rather, to show the complexity of public response, and the relationship of the Rampart project to the planning of Devil Canyon.

The investigation of the feasibility of a hydroelectric facility at Rampart Canyon on the Yukon River originated with a resolution of the Senate Public Works Committee dated April 24, 1959. This memorandum requested that the Board of Engineers for Rivers and Harbors of the U. S. Army Corps of Engineers investigate and report on the project. A small sum, \$49,000, was appropriated for the study.

Rampart Canyon, a narrow portion of the Yukon River near the town of Rampart about 100 miles northwest of Fairbanks, offered impressive possibilities for hydroelectric development. The corps's study indicated that the site could hold the largest dam in the world, one which would be backed by a reservoir larger than Lake Erie produced by the flooding of 10,000 square miles. Such a project's electrical power output would be commensurate with its physical proportions: five million kilowatts of power could be generated each year, fully two and one-half times as much as Grand Coulee Dam and twice that of any other dam in existence. These awesome statistics had been gathered prior to Congress's resolution of April 1959, so it was clear that the scope of the potential development was generally understood.

Sponsors of Rampart in the U. S. Senate predicted that the economic benefits of Rampart would be very great. At that time Alaska was not yet officially represented in the Senate and Rampart's proponents included

Richard L. Neuberger, an Oregon Democrat who had an abiding interest in Alaskan matters. As the corps prepared to investigate Rampart, Neuberger told Oregonians and others in September 1959 that Rampart was one example of a means by which the new state of Alaska could contribute to Pacific Northwestern prosperity. "Rampart dam on the Yukon River alone," Neuberger told realty board members from five Pacific Northwest states, "could support an aluminum industry which would dwarf even that in our own states of Oregon and Washington. Much of this economic progress is bound to spill over into the states which are Alaska's neighbors."⁽¹⁾

The Corps Promotes Rampart

In October 1959, Governor William A. Egan of Alaska announced that work by the Corps of Engineers on a survey of the engineering and economic feasibility of Rampart had begun.⁽²⁾ On the same date, a corps official, Harold L. Moats, chief of the civil works planning branch, described Rampart to the Anchorage Chamber of Commerce. Since the high cost of power was an endemic Alaskan problem, the chamber was cheered to hear that Rampart hydroelectric power could be produced for a mere two mills per kilowatt hour at the dam. Moats also explained that the experiences of Russians and Scandinavians indicated that Rampart power could be transmitted by ultra high voltage to Seward, Anchorage, and Valdez for only an additional mill per kilowatt hour. In fact, the Rampart area appeared to be the only place left in the United States where water power could be developed to electric power for less than four mills per kilowatt hour.

Moats suggested other benefits of the proposed 1.3 billion dollar project as well. The 470-foot dam would probably raise the mean annual air temperature of the area one or two degrees, perhaps making the surrounding territory suitable for agriculture. According to the press, Moats assured his audience that Rampart "would be justified by the amount of industrial development that would take place in its wake." But he warned his listeners that "it will be many years before the first kilowatt can be wrung out of Rampart."⁽³⁾

Congress's initial appropriation of \$49,000 for the Rampart study in 1960 was supplemented for 1961 by a further \$225,000 to the Corps of Engineers. Early in 1961 the Alaskan congressional delegation announced