

ALASKA LEGISLATURE COMMITTEE FILES 1991-1992 8672
7042 HOUSE LABOR & COMMERCE



Alaska State Legislature

Please enter into the record my testimony to the HOUSE LABOR AND COMMERCE
committee name

committee on HOUSE BILL NO. 228, dated 4/17/91
bill/subject

I THINK THIS BILL TAKES AN IMPORTANT STEP IN THE DIRECTION OF RESPONSIBLE ENERGY USE AND ENERGY SUSTAINABILITY. THE ALLOCATIONS FOR LOW INCOME WEATHERIZATION, INSTITUTIONAL FACILITIES DEMAND SIDE MANAGEMENT PROGRAMS AND ONGOING RESIDENTIAL AND BUSINESS ENERGY EFFICIENCY IMPROVEMENT PROGRAMS ARE ESSENTIAL TO ASSIST ALASKA IN BECOMING ENERGY EFFICIENT AND HOPEFULLY SELF-SUFFICIENT IN THE FUTURE.

I WOULD LIKE TO SEE THE \$20 MILLION FOR GRANTS TO ELECTRIC UTILITIES CONSERVATION GO STRAIGHT TO THE PUBLIC AND SEE THE UTILITIES FIND CONSERVATION ON THEIR OWN (AS THEY ARE MANDATED TO DO IF THEY ARE COOPERATIVE MEMBERS), AS IT WILL BE THE UTILITIES WHO WILL REAP THE BENEFITS. IT HAS BEEN PROVEN THAT CONSERVATION IS MORE COST EFFECTIVE (AND PROFITABLE) THAN CONSTRUCTION OF MORE GENERATING CAPACITIES.

IN REGARDS TO AIR AND WATER POLLUTION FROM CONTINUED RELIANCE ON OIL AND COAL FUELED POWER GENERATION, CONSERVATION IS THE FIRST STEP TO BE TAKEN, IN A LARGE WAY, TO REQUIRE US TO BE ABLE TO EXIST SOLELY ON RENEWABLE ENERGY SOURCES (AND NON POLLUTING ONES) SUCH AS SOLAR AND WIND.

THE AMOUNT OF ENERGY WASTED CURRENTLY IN ALASKA, AND THE RESULTING NEEDLESS POLLUTION, IS IMMENSE. THE QUICKEST WAY TO REVERSE THIS ~~AND~~ TREND IS THROUGH AGGRESSIVE CONSERVATION PROGRAMS SUCH AS SEEN STARTED HERE.

Signed: Carl Rosenberg

Testifier

CARL ROSENBERG

Representing (Optional)

Box 81996 Fairbanks 99708

Address

479-3077.

Phone No.



Alaska State Legislature

Please enter into the record my testimony to the House Labor and Commerce
committee name

committee on HB 228, dated 4-17-91
bill/subject

I have a problem with this bill, starting with Sec 3,
Sec. 4, Sec. 5.

Sec. #3 Item 1-2 - not in demand at this time
this is a waste of money!

Sec. #3 Item 5-6 - does not explain what the
money will be used for. ? ?

Sec. #4 repayment of debt - not needed!!

this bill will not make funds available funds
for line extension, or for Electrical L.I.D.'s

Signed: [Signature]
Testifier

Representing (Optional)
P O Box 520985 Big Lake 99652
Address
892-8113
Phone No.



Alaska State Legislature

Please enter into the record my testimony to the ENERGY
committee name

committee on 76 + 77, dated 4-12-71
bill/subject

I support house bill 76 or 77 for the following reasons:

1. Increasing reliability
2. Economical, allow low cost in one area to displace higher cost in another area.
3. allow Bradley Lake to be usable to the greater Anchorage area.
4. Support of these bills in reality benefits the majority.

Signed: Jean Thibault
Testifier

Self
Representing (Optional)

Star Rt 1 Box 2208
Address

Chugach Ap. 688-2898
Phone No.

Electric Reliability

How does the Railbelt measure up?

A summary of the assessment report from the North American Electric Reliability Council, provided by the Railbelt interconnected electric utility systems of the Alaska Systems Coordinating Council.

Introduction

In March 1990 the North American Electric Reliability Council performed a reliability assessment of the Railbelt interconnected electric utility systems. Surveys consistently show that reliable electric service is important to consumers in Alaska's Railbelt. For some time electric utilities and agencies in the region have noted that while the Railbelt has sufficient generation resources, the transmission system which moves power throughout the region is not as strong as it should be to ensure a reasonable degree of reliability.

The NERC report identified two important reliability issues facing the Railbelt:

"First is the need for additional transmission interconnection lines between the three major load centers and their generation facilities. . . . Second is the need to maintain a proper balance between economy and reliability."

What is NERC?

The North American Electric Reliability Council was formed in 1968 by the electric utilities to coordinate, promote, and communicate about the reliability of their generation and transmission systems, and to foster the development of reliability standards. NERC provides planning and operating guides for bulk electric systems, and is comprised of nine Regional Reliability Councils and one Affiliate encompassing virtually all of the electric utility systems in the United States, Canada, and the northern portion of Baja California, Mexico.

NERC is governed by a 27-member Board of Trustees representing investor-owned, federal, rural electric cooperative, state and municipal electric systems throughout North America. Meetings of the Board are attended by observers from the U.S. Department of Energy, the Federal Energy Regulatory Commission, the National Energy Board of Canada, the Edison Electric Institute, the American Public Power Association, the National Rural Electric Cooperative Association, the Canadian Electrical Association, the Electric Power Research Institute, and the National Association of Regulatory Utility Commissioners.

About the ASCC and the NERC report

The Alaska Systems Coordinating Council is a NERC Affiliate composed of 18 utilities, a state agency and a federal agency. Nine ASCC members are interconnected in the Railbelt region, and account for 75 percent of the utility generation for the state of Alaska. These ASCC members, concerned with the reliability of their interconnected systems, requested that NERC assess the reliability of the Railbelt. The existing and proposed Railbelt electric utility systems were evaluated against traditional reliability criteria and practices followed by the interconnected electric systems of NERC's Regional Reliability Councils in the lower 48 states and Canada.

This publication summarizes the NERC findings on the reliability of the Railbelt interconnected electric systems. Where used, quotation marks enclose statements from the NERC Reliability Assessment set in *bold italic*.

North American Electric Reliability Council



Transmission adequacy in the Railbelt

The Kenai Peninsula, Anchorage and Fairbanks areas initially were isolated electric systems, and each developed generation and transmission facilities to meet the electrical demand of their areas prior to being interconnected. Currently a single transmission line connects Anchorage and Fairbanks, and a second single transmission line links Anchorage and the Kenai Peninsula.

The report emphasized the reliability benefits of the addition of the proposed 138 kilovolt circuit between Soldotna and Anchorage:

"The existing 115 kV interconnection line has a poor reliability history and has a transmission transfer capacity limit under 75 megawatts. . . . The second . . . Kenai interconnection to the Anchorage Bowl area would improve reliability by preventing the shedding of customer load if the existing interconnection line trips (with the possible exception of those times when the Kenai Peninsula generation is operating in anticipation of loss of the existing tie). When Bradley Lake comes into service, reliability will suffer without a second interconnection tie."

In a similar vein, the report identified the advantages of a proposed Healy to Ft. Wainwright transmission line:

"The addition of the proposed 105 mile 138 kV circuit between Healy generating plant and Fort Wainwright substation would not only provide an alternate path for loss of the circuit to Gold Hill, but would also provide essentially loop service between the Healy plant and the major part of the load in this area. . . . based on traditional planning criteria, the Healy-Fort Wainwright tie is required to assure an adequate source-to-load path from the dual sources at Healy (Healy generation plus the capacity purchases from the Anchorage Bowl and later from Bradley Lake) to the Fairbanks area."

These two proposed transmission lines are subject to funding by the Alaska State Legislature. While they would significantly strengthen the regional electrical network, the report also suggests future consideration should be given to providing an additional transmission path between Anchorage and Fairbanks:

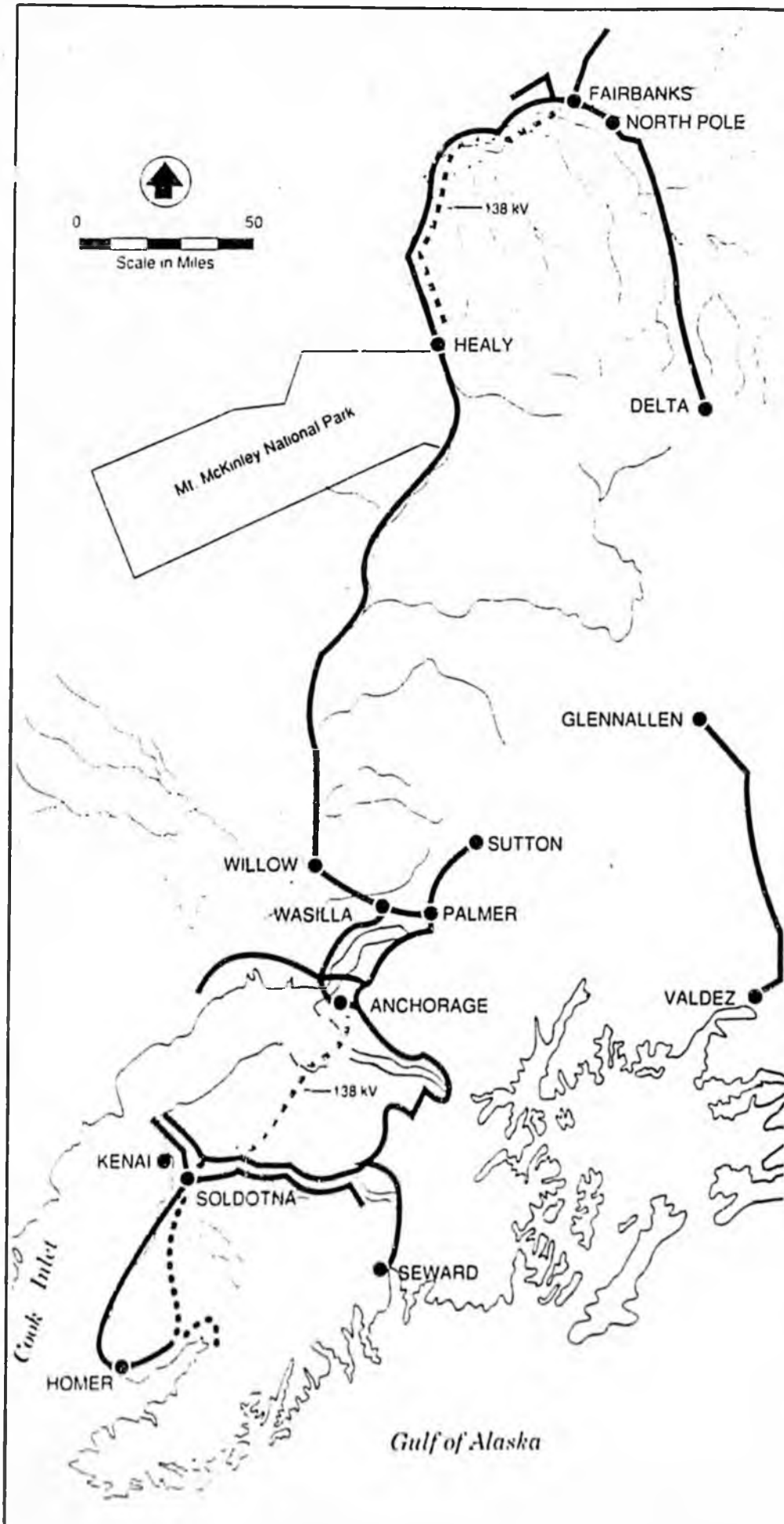
"Under traditional reliability criteria, a second transmission line between the Anchorage Bowl and the Fairbanks area would likely be required (either via Teeland and Healy, or preferably via a separate transmission path such as from the Anchorage Bowl to Glennallen to Jarvis Creek)."



Railbelt Transmission Systems and Proposed Interties

Northern Intertie:
Healy-Fairbanks
Approximately 97 miles
138 kilovolt rating

Southern Intertie:
Soldotna-Anchorage
Approximately 70 miles
138 kilovolt rating
(Underwater across
Turnagain Arm)



- Existing Transmission Lines
- Bradley Lake Transmission Lines
- - - - Proposed Northern and Southern Transmission Lines

Railbelt Interties Status Report

1990 Legislative Session

Electric utilities serving the Railbelt region requested state money held in the Railbelt Energy Fund be put toward construction of two new sections of transmission line to upgrade the existing intertie system.

The four-year-old Railbelt Energy Fund of \$230 million was opened to capital project appropriations in the last Legislature but no money went to building interties.

Late in the session, the Senate approved an appropriation measure calling for \$100 million (of the \$125 million sought by utilities) for interties construction. The House Majority Caucus declined to support the interties project at that time but agreed to placing \$100 million with interest in a new Railbelt Interties Reserve Account within the general fund. The understanding was this money would go for future construction of intertie network upgrades.

The remainder of the Railbelt Energy Fund was appropriated to a variety of energy and non-energy projects, mostly within the Railbelt region.

Interim Work

The Alaska Energy Authority (AEA) released a draft Railbelt Intertie Feasibility Study in January 1991. The AEA is moving ahead with work necessary to comply with the statutes and regulations regarding development of an energy project. No state funds were specifically appropriated for this purpose. Therefore, the Railbelt utilities contributed the funds required, about \$117,000, for the feasibility report.

1991 Agenda

The Railbelt utilities are again asking the Legislature to help fund and authorize construction of the intertie upgrade. The cost of construction is estimated at between \$152 million and \$160.7 million in 1991 dollars.

Governing bodies of the Railbelt utilities agreed last spring to pay for all costs of construction exceeding a state appropriation of \$125 million (with interest to follow that principal sum). That agreement was renewed in January 1991.

Bills authorizing interties construction and state funding with \$125 million were introduced in the House in January. With \$100 million plus interest now in the Interties Reserve Account, further state assistance will be needed to replace part of the Railbelt Energy Fund monies appropriated by the 1990 Legislature.

Role of the Governor

Actions taken by Gov. Walter Hickel will be a key factor in the development of these critically important projects. Specifically, Railbelt utilities will ask the new governor to:

1. Provide leadership to the Legislature in funding and authorizing the projects.
2. Provide direction to the AEA as a project development entity.
3. Direct the Office of Management and Budget to review interties studies and report their findings expeditiously.

Reliable Railbelt Energy Through Intertie Upgrades

Intertie proposal

The railbelt electrical utilities, representing some 300,000 residential, commercial and industrial consumers, proposes that the state of Alaska provide substantial financing assistance for the construction of two new sections of 138 kilovolt (kV) transmission intertie line - one between the Kenai Peninsula and Anchorage and a section between Healy and Fairbanks.

The Alaska Energy Authority estimates both sections will cost \$152 million or \$160.7 million (depending on Kenai-Anchorage line routing) in 1991 dollars. An AEA feasibility study, released in early 1991, concludes that benefits would exceed costs for the two interties.

The 138 kV Kenai-Anchorage southern intertie would bring Bradley Lake hydroelectric power into the Railbelt grid system. The Healy-Fairbanks northern intertie would allow more low-cost power to flow throughout the Railbelt. Together, the new lines would add reliability to the whole grid.

Making it work

Last session, the Legislature put unappropriated funds from the Railbelt Energy Fund into an "Interties Reserve Account" within the General Fund. It contains \$100 million plus interest.

Utilities serving the Railbelt region are asking the Legislature to appropriate this account to the Alaska Energy Authority (AEA) for construction of the proposed intertie sections. Additional state funding or financing of \$25 million is also sought.

Railbelt utilities will sign an agreement with the Energy Authority to pay full debt service. The utilities will continue to make payments to the state after capital costs are paid during the useful life of the lines.

Also, the utilities will cover costs of maintenance

and operation over the life of the new interties under a separate agreement with AEA.

These agreements show the utilities' willingness to share intertie costs so this vital upgrade of the Railbelt energy system can be built in a timely manner - and without putting a cost burden on consumers or the state.

Interties make sense

Interties are solid energy projects that bear economic analysis while yielding measurable benefits for some three-fourths of Alaska's population.

Alaska is looking at a window of opportunity to make the best use of its hydro generation capacity and lock in energy security and reliability for the railbelt population center. The 90-megawatt Bradley Lake project will be on line in a matter of months.

The state has a major investment in this \$330 million hydro project. Upgrading the Railbelt intertie grid will allow Bradley Lake to reach its fullest potential.

The Legislature has specifically set aside a \$100 million account to make sure Bradley Lake achieves its highest and best use and that Alaskans have access to reliable, economical power.

The next step is to upgrade the intertie system so consumers from Homer to Fairbanks can be assured of a strong, stable power transmission system plus access to more low-cost generation. Also, commercial and industrial growth hinges on reliable, affordable energy.

Upgrading the interties through a state-utilities partnership makes economic sense. The state will pay not one penny of operations and maintenance costs for this energy infrastructure. Some 300,000 Railbelt consumers experience no rate shock from this project and reap long-term energy savings.

Now is the time to secure reliable energy delivery for the whole Railbelt region with state funding assistance for the interties.



Advantages of an Upgraded Railbelt Intertie System

- ✓ **Reliability** - Power outages can cost millions of dollars in repair expenses, loss of business and loss of product and perishable goods. Upgrading the Railbelt power grid with two new sections of 138 kilovolt line will ease the strain on the system and help decrease the number and severity of transmission and generation related outages.
- ✓ **Economy Energy Transfer** - An improved transmission system will allow energy produced at low cost in one area to displace higher-cost energy in another area. This "economy energy" interchange between Anchorage and Fairbanks, for example, is now limited by the capacity of the existing fully loaded intertie line.
- ✓ **Hydro-thermal Coordination** - Thermal power plants operate most efficiently at or near full loading but load demands don't always allow this. Bradley Lake hydro generation can be used to increase the efficiency of gas-fired plants in the Railbelt by adding to or subtracting from the natural Railbelt electricity demand. This is called reshaping demand. A new Kenai-Anchorage intertie will increase this hydro-thermal coordination capability, thus creating greater savings through efficient power generation.
- ✓ **Less Line Loss** - The upgraded intertie system can yield savings through more efficient transmission of electricity. This is because the normal loss of energy in the lines due to resistance is decreased.
- ✓ **Capacity Sharing** - Power generation plants serving Anchorage, Fairbanks and the Kenai Peninsula are designed to produce more power than is normally needed so as to meet peak loads and emergency situations. With the two new intertie sections in service, power producers could share each other's reserve generating capacity. This ability to share excess capacity defers or avoids the need to add new units or build expensive new power plants as energy needs increase. An associated benefit comes in savings on standby generation unit maintenance. Capacity sharing allows utilities to use standby units less often to meet peak loads so money is saved as units require less scheduled maintenance, last longer, and use less fuel.

Associated Benefits

- ✓ **Utility Coordination** - With a stronger, more efficient transmission grid in place, Railbelt utilities can better coordinate operations and planning functions. Power providers working in harmony can lower costs for consumers.
- ✓ **Fuel Supply Competition** - An upgraded transmission system that handles loads better will allow electric utilities to access a variety of energy sources, thus boosting competition among fuels and suppliers.

Summary

Building the two new intertie sections in a timely manner will create a stable, reliable and more economical power delivery system to serve Alaska's major population and support economic growth within the region for decades to come.

Why Interties Now?

Here's 10 good reasons!

1. The Railbelt region has plenty of electrical generation capacity. More will be available when the 90 megawatt Bradley Lake hydroelectric project comes on line in 1991. The problem is getting that power where it's needed when it's needed with the existing transmission system.
2. The Railbelt transmission system has inadequate reliability by industry standards in the Lower 48. With Bradley Lake on line, the system will be woefully unreliable for the load centers it is expected to deliver power to by today's electrical standards.
3. A transmission system's reliability decreases as it ages. System reliability is bound to fall off as Railbelt load demand grows and maintenance costs on an aging system escalate.
4. There are less expensive "Band-Aid" approaches to increasing transmission system reliability. None carry the long-term economic benefits of new interties and the short-term savings are largely lost when a new system is finally built.
5. Utilities can't bear the full cost for interties construction now because ratepayers would not stand for it. Utility customers would have to shoulder the cost in higher electric bills.
6. Oil production, the source of 85 percent of Alaska's revenue, is on the decline. The state may not be able to help fund transmission system upgrades in the years ahead when the need for reliable power becomes even more crucial.
7. Power outages are a fact of life in Alaska. Those related to transmission lines are caused by equipment failures, earthquakes, volcanic eruptions, floods, avalanches, storms or other natural and man-made events. Putting a stronger transmission system in place will enable unaffected areas to send power to afflicted areas faster.
8. Economic development thrives on plenty of reliable and affordable energy. An area served by a weak power supply system with high maintenance costs won't attract new business and industry.
9. Consumer spending power influences business location, thus economic prosperity. People who must spend more on necessities such as electricity have less to spend on consumer goods and services.
10. The interties have been proven to be economically viable to build now. Their construction will create jobs. The upgraded power grid will produce millions of dollars in long-term benefits for consumers throughout the region.

Why State Funding of Interties?

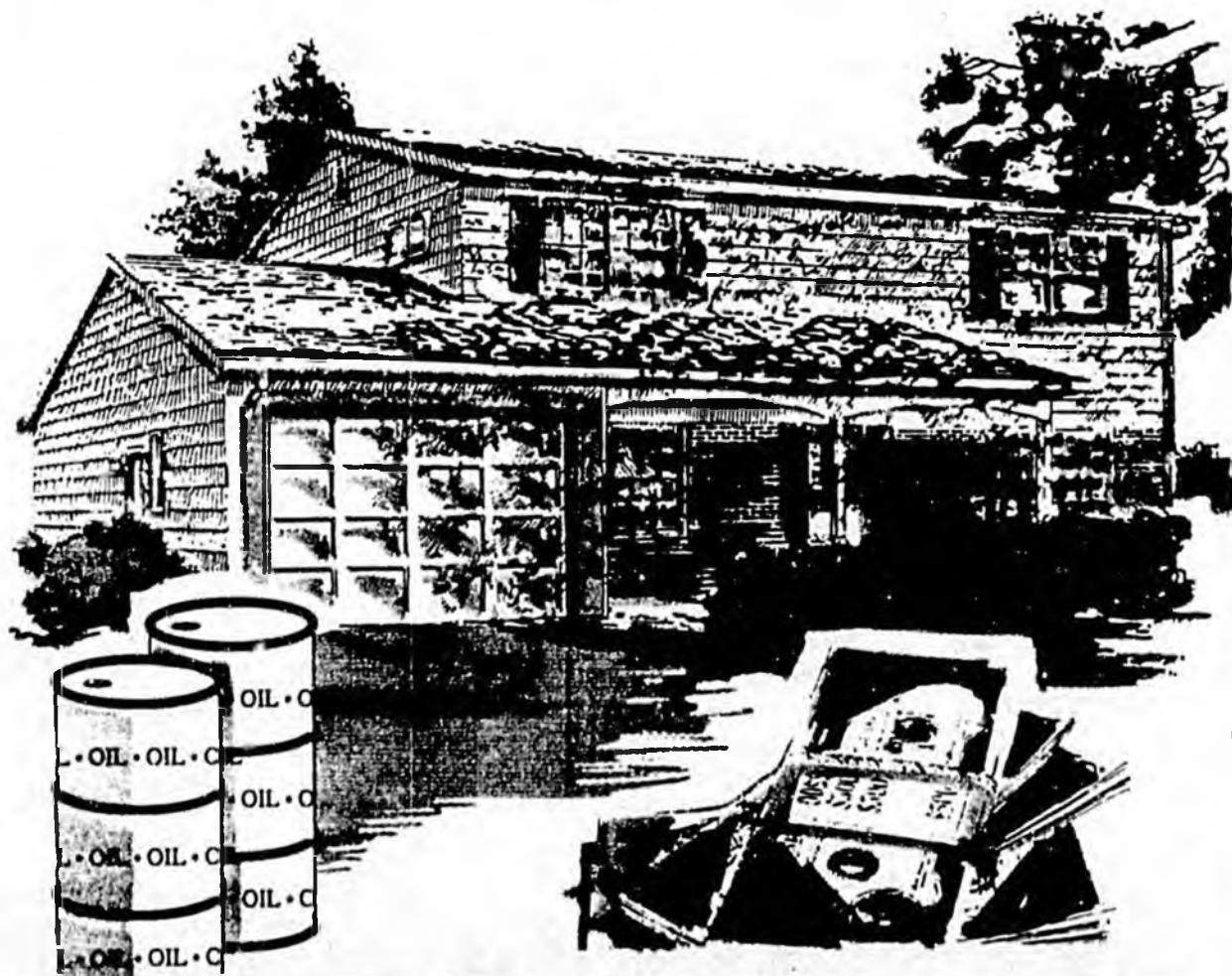
Here's 6 Good Reasons!

1. Construction of intertie lines from Kenai to Fairbanks is a regional project that spans four boroughs and the service areas of seven electric utilities. Without state funding participation, utility rates would increase dramatically.
2. The Legislature has set aside \$100 million in an Intertie Reserve Account. Using it for interties would fulfill a commitment that began with establishment of the Railbelt Energy Fund in 1986.
3. The state has a long history of participating in electric utility infrastructure funding and energy programs. Examples include the four-dam pool, Anchorage-Fairbanks intertie, Bradley Lake hydro project, and Healy Clean Coal Project. Also, the Power Cost Equalization program plus weatherization, energy efficiency, and energy audit programs are funded within state departments and agencies.
4. The Alaska Energy Authority is the state agency responsible for the proposed intertie projects from baseline studies through design, bidding, construction contract award, construction management and project acceptance. Various other state agencies would have right-of-way oversight as well.
5. State investment in a Railbelt transmission intertie upgrade would be a cost effective use of public funds on a benefit-cost analysis basis.
6. A stable, reliable power delivery system would stimulate private business and industrial location and expansion in the state's economic hub area. Economic benefits of a higher capacity Railbelt intertie grid would translate into an improved tax base, job opportunities, and less dependence on state funding contributions to social and economic programs.

ENLIGHTENED ENERGY

Because
we're not
living in the
dark ages
anymore.

A CONSUMERS GUIDE TO SAVING ENERGY AND MONEY



WITHOUT SACRIFICING COMFORT

A PUBLIC SERVICE PROVIDED BY THE ANCHORAGE DAILY NEWS



Enlightened Energy



Introduction

Enlightened Energy is a new approach to using energy. It doesn't ask people to do without. Instead it asks all of us to use energy wisely and efficiently. Amazing advances have been made in just the past few years which makes the latest energy technology affordable and available.

The benefits of Enlightened Energy

If we use our energy efficiently, we'll help preserve our environment and contribute to our Alaska's economic growth. We'll reduce our dependence on foreign oil, keep the cost of energy down, and aid our national security. All without sacrificing the comforts we've become accustomed to.

What are some examples of Enlightened Energy

Read *Enlightened Energy*. It offers dozens of ways to save. It is full of information about available energy saving programs and energy efficient technologies. *Enlightened Energy*. It is your guide to saving money while helping our environment and economy.

Our leaders support Enlightened Energy



"Greater energy efficiency can reduce energy costs to consumers, enhance environmental quality, maintain and enhance our standard of living, increase our freedom and energy security and promote a strong economy."

GEORGE BUSH
President of the United States



"The answer to reducing our nation's dependence on foreign oil has two equally important aspects. One is the careful development of our nation's energy resources. The other is a coordinated effort by all Americans to use our energy more efficiently."

TED STEVENS
United States Senate



"As a resident of Fort Yukon, I am well aware of the amount of money Alaskan families must pay to keep their homes warm."

"Alaska is a national leader in providing energy saving programs."

DON YOUNG
Congressman for all Alaska



"The fact is, the high cost of heating places is a serious drain on many local Alaskan economies...Every dollar saved by using our energy efficiently is another dollar that stays to strengthen the local economy."

FRANK MURKOWSKI
United States Senate

CORRECTION

**THIS DOCUMENT
HAS BEEN REPHOTOGRAPHED
TO ASSURE LEGIBILITY**

ENLIGHTENED ENERGY

Because
we're not
living in the
dark ages
anymore.

A CONSUMERS GUIDE TO SAVING ENERGY AND MONEY



WITHOUT SACRIFICING COMFORT

A PUBLIC SERVICE PROVIDED BY THE ANCHORAGE DAILY NEWS



The Enlightened Way To Buy A Home

Energy efficient homes save money on utility bills, and are more comfortable. A wise Alaskan homebuyer will consider the following areas when shopping for a home.

1. Records - Ask for utility bills for the last 1-2 years. Is the type of energy source used for space heating, water heating and cooking the best for the area?

2. Airtightness - The average Alaskan home has enough cracks and leaks to equal a 5 foot hole in the wall! Cracks and leaks raise your heating bill and create uncomfortable drafts. The best way to pinpoint how much and exactly where a home leaks is by getting a Blower Door Test, available through Energy Rated Homes of Alaska (see below).

3. Windows and doors - One third of the heating lost in a typical home goes through its windows and doors. Double pane windows are the minimum to look for. Even better - the new efficient windows called "Low E" windows. In doors, look for insulated foam cores and good weatherstripping.

4. Insulation - Minimum levels to look for in Anchorage are: R-38 ceilings and R-19 walls. Also, look for insulation in the floor, crawlspace, and floors over the garages. How it is installed is important too.

5. Heating systems - Heating is the largest expense in most homes. In cold climates like Alaska, it makes sense to invest in the highest efficiency systems available.

6. Controlled ventilation - Well designed, energy-efficient homes are not sealed boxes they are well-ventilated homes but the ventilation is intentional and controlled, not erratic and wasteful.

7. Household Appliances - The energy efficiency of nearly every household appliance has increased over the past 10 years.

Does it all sound a bit intimidating? The State of Alaska offers an affordable way to get an expert to look at these concerns for you. Call Energy Rated Homes of Alaska for a pre-purchase energy inspection at 345-3746 in Anchorage, or 800-478-3744 statewide.



STATE OF ALASKA

Executive Proclamation
by
Walter J. Hickel, Governor

Events in the Persian Gulf demonstrate how vulnerable America is due to our dependence on imported oil, and the high cost of staying warm in Alaska presents a severe strain on Alaskan family budgets and local economies.

Using our energy efficiently will contribute to Alaska's economic growth, help preserve our environment and aid our national security.

Enlightened Energy is a new approach to saving energy. It does not ask people to do without. Instead it allows all of us to use energy wisely and efficiently. Amazing advances have been made in just the past few years which make the latest energy technology affordable and readily available.

During the winter heating season it is even more important for us to be mindful of ways in which we can use our energy more wisely to be more comfortable and reduce our energy costs.

Alaska has a number of innovative programs to assist Alaskans in using their energy wisely.


NOW, THEREFORE, I, Walter J. Hickel, Governor of the State of Alaska, do hereby proclaim the week of March 17 - 23, 1991, as:

ALASKA ENLIGHTENED ENERGY AWARENESS WEEK

in Alaska, and urge all Alaskans to use our energy wisely and take advantage of the information about these opportunities in "Enlightened Energy, A Consumer's Guide to Saving Energy and Saving Money - Without Sacrificing Comfort."

DATED: February 21, 1991

Done by —
Walter J. Hickel
Walter J. Hickel, Governor
who has also authorized
the seal of the State of
Alaska to be affixed to
this proclamation.



Compiled and edited by Barbara Collins

Contributing writers - Steve Boden, Dianne Barske, Barbara Collins and Ginny Moore

Cover design and editorial design by Kristy Bernier.



Enlightened Energy



Introduction

Enlightened Energy is a new approach to using energy. It doesn't ask people to do without. Instead it asks all of us to use energy wisely and efficiently. Amazing advances have been made in just the past few years which makes the latest energy technology affordable and available.

The benefits of Enlightened Energy

If we use our energy efficiently, we'll help preserve our environment and contribute to our Alaska's economic growth. We'll reduce our dependence on foreign oil, keep the cost of energy down, and aid our national security. All without sacrificing the comforts we've become accustomed to.

What are some examples of Enlightened Energy

Read *Enlightened Energy*. It offers dozens of ways to save. It is full of information about available energy saving programs and energy efficient technologies. *Enlightened Energy*. It is your guide to saving money while helping our environment and economy.

Our leaders support Enlightened Energy



"Greater energy efficiency can reduce energy costs to consumers, enhance environmental quality, maintain and enhance our standard of living, increase our freedom and energy security and promote a strong economy."

GEORGE BUSH
President of the United States



"The answer to reducing our nation's dependence on foreign oil has two equally important aspects. One is the careful development of our nation's energy resources. The other is a coordinated effort by all Americans to use our energy more efficiently."

TED STEVENS
United States Senate



"As a resident of Fort Yukon, I am well aware of the amount of money Alaskan families must pay to keep their homes warm."

"Alaska is a national leader in providing energy saving programs."

DON YOUNG
Congressman for all Alaska



"The fact is, the high cost of heating places is a serious drain on many local Alaskan economies...Every dollar saved by using our energy efficiently is another dollar that stays to strengthen the local economy."

FRANK MURKOWSKI
United States Senate



Helping Businesses BEAT High Energy Costs

If you're like most business people, you probably believe energy efficiency means saving a few pennies here and a few nickels there - insignificant return for a big investment of effort. Wrong!

The Baranof Hotel in Juneau is saving an estimated \$4,500 a year in electricity costs. How? Through a major capital investment? Not at all. All of the hotel's old incandescent hallway lights were removed and replaced with 11-watt fluorescent fixtures.

It's what's being called a "twist of the wrist fix." New designs of fluorescent bulbs use 40% less electricity than the incandescent bulbs and can last 10 times longer.

Managing energy costs is no different from any other kind of business management. The questions to ask are pretty much the same: What are my costs? Where can I save money? What are the actions that will make my building more efficient? What kind of return will I get on my investment?

The State of Alaska's BUSINESS ENERGY ASSISTANCE TEAM (BEAT) can help small business owners answer those questions. The first step is a free energy audit. An energy advisor will do a walk-through survey of the building. The advisor will look for such things as heating systems, combustion efficiencies, lighting use, and refrigeration.

The advisor will then compute energy use rates and make recommendations for saving from various projects such as boiler tune-ups, insulation, replacement of obsolete equipment, and lighting efficiency improvements.

Energy savings mean more after-tax dollars for your company. Let BEAT show you how you can realize those savings. Call 273-9440.

Enlight

20 Simple Things Save Energy In

Q: How many light bulbs does it

A: ONE! A new compact fluorescent bulb is equivalent to a standard incandescent bulb. This means you can use in your home

So you can change one light bulb for another energy-efficient choice. Follow this how-to

What I can do today?

1. Survey all your incandescent lights. There may be many opportunities to replace them with the new compact fluorescent bulbs, saving three-quarters of the electricity used by incandescents! Especially spot those 60-100W bulbs - probably use several hours a day.
2. Turn down the temperature of the water heater to the winter setting (120 degrees).
3. Check your water heater to see if it has an insulating blanket. That insulating blanket can pay for itself in one year or less.
4. If you are a water bed user, pull up those blankets for the bed. Making the bed will insulate it, saving up to one-third of the energy the bed uses.
5. Look for the energy-saving settings on your dishwasher, refrigerator, washing machine, or clothes dryer. Start using them today.
6. Check the age and condition of your appliances. How old is your refrigerator? You may want to replace it with a new, more energy-efficient model before it quits on you!
7. Clean or replace furnace, air-conditioner, and heat-pump filters.

What can I do this week?

8. Take a trip to your hardware store. It may be time to buy a water-heater blanket, low-flow shower head, faucet aerator, and those compact fluorescent bulbs.
9. How efficient is your heating system? You may want to repair it or retrofit it to provide the same comfort level for less energy.
10. Rope caulk around leaky windows.

What can I do this month?

11. Collect all your utility bills, separating the electricity and gas bills. Spot the biggest bill and target it for energy conservation remedies.
12. Is there insulation in your attic or crawlspace? How much? Crawl in there and check it out.

Energy

Steps You Can Do To Your Alaskan Home

How can you eliminate 500 pounds of air pollutants?
How much does it save when you use it in place of a
What is one example of the energy-efficiency options
available today to save the environment?
How can you eliminate a quarter ton of air pollutants. What
Changes can you make in your own home?
What is the energy action checklist.

13. Insulate hot water pipes and ducts whenever they run through
unheated areas of your home.

14. Is your home drafty? Seal up leaks not just around doors or
windows but around utility cut-throughs for pipes, gaps around
chimneys and recessed lights in insulated ceilings, and unfinished
spaces behind cupboards and closets. Do you really want to
know where the worst leaks are? Hire an energy rater from Energy
Rated Homes of Alaska. Using a blower door, the rater can point
out those culprit cracks and holes. All those little leaks may add up
to as much as an open door or window but not be nearly as
obvious!

15. Install a clock thermostat to automatically setback your
thermostat at night.

16. Call an energy rater through Energy Rated Homes of Alaska
for a complete audit of your home and expert advice.

What can I do this year?

17. Insulate - around and above! If your walls aren't insulated,
have an insulation contractor blow cellulose into the walls. Bring
your attic insulation level up to snuff.

18. Replace aging, inefficient appliances. Maybe the appliance
seems to have a few good years left. Replacing it with a top-
efficiency model is still usually a better investment.

19. Upgrade leaky windows. You may decide to replace them
with more energy-efficient models or add weatherstripping or
storm windows.

20. Increase a southern exposure wherever possible. Can you let
in more light even on our dark winter days? The bright Alaskan
winter sun can bring in amazing amounts of heat, even at 10
degrees below. Does the house have an overhang for the south wall,
interfering with exposure to winter sun? It is best if window space
on the north side can be kept at a minimum.

Recycling in Alaska

The story of recycling in Alaska is a wonderful
example of cooperation between the public, private
and non-profit sectors of the state. In 1982, many
groups banded together to form ALPAR, Alaskans for
Litter Prevention and Recycling. ALPAR arranged for
special recycling back-haul rates with Sealand,
overcoming unique challenges recycling presents to
Alaskans.

The Anchorage Daily News- An Example of What One Business Can Do To Promote Recycling.

The Anchorage Daily News was one of the original
founders of ALPAR. Since then, the Daily News has
taken many steps to promote recycling and to use
recycled products in its production.

The newspaper is the only daily newspaper in Alaska
printing on recycled newsprint.

**In 1990, the Daily News used 3,935 tons
of recycled newsprint. Since one ton of
newsprint equals 17 trees, that's the
equivalent of saving over 66,000 trees.**

In addition to purchasing recycled newsprint, the
Daily News has become a statewide leader in
recycling. In 1990, the News recycled over 750 tons of
newsprint, keeping it out of municipal landfills.

Now through a cooperative effort with Pay n' Save,
the News has found a way to recycle the orange
sleeves used in newspaper delivery. Instead of going
to a landfill, the plastic bags are melted down and
remade into new Pay n' Save plastic bags.

Together with the Anchorage Recycling Center, the
News has begun a program of Kid-side Recycling. A
collection bin has been placed in every school yard
within the Anchorage School District for
neighborhood collection of old newspapers.

For commitment to recycling, the Anchorage Daily
News was named Alaska's Outstanding Company
Recycler in 1989, and received the Mayor's Pollution
Prevention Award in 1990.

One business, one person, each of us can make a
difference. For more information about what you
can do, call the Anchorage Recycling Center at
562-CANS.



Enlight Energy



The Enlightened Way To Build A Home

How would you like to build a home you could heat for less than half the conventional cost? New energy-efficient building techniques and materials can make that possible.

A new home in the Discovery Subdivision of Anchorage has been built to *Alaska Craftsman Home Program* standards. That means that the home is constructed to a set of guidelines designed to ensure its energy-efficiency and comfort. Local builder Bob Petersen included many energy saving features, high-tech but easily achievable measures, in the construction of the 2,545 square-foot home.

• **Windows** - dual-panes, filled with argon gas. The inner pane is coated with a low-emission glaze to help reduce the transfer of heat or cold. The result is a sunny, open home with windows providing about twice the insulating value of conventional thermal pane windows.

• **Continuous vapor barrier** - makes it virtually airtight. Moisture leakage from the interior through to the insulation is blocked by sealing outlets, windows and switches. This sealing protects the insulation's effectiveness.

• **Insulation** - an improved fiberglass batt. This home's 2" x 6" exterior walls allow extra space for the insulation.

• **Continuous flow heat exchanger** - allows for complete air exchange within the home every three hours, ensuring a healthy and clean environment. Yet heating dollars are saved since the exchanger draws heat from the outgoing stale air into the fresh incoming air.

The energy-saving features added 6% to the price of the home and qualified it for special financing. It has received a five-star plus rating from Energy Rated Homes of Alaska, the highest energy-efficiency rating.

Lenders recognize that if the home costs less to heat, there are more dollars available for the mortgage payment, thus allowing the homeowner to obtain a larger mortgage loan.

Sounds like something you'd like to look into before you build or remodel? Two-day courses are offered by the Alaska Craftsman Home Program, covering topics like regional design, building science and specifics such as ventilation, foundation and floors. For more information, call the Alaska Craftsman Home Program at 800-478-ACHP or 373-2247.



Alaska Craftsman Home Program Provides Model of Efficiency for home builders.

Energy Information

CUT OUT THIS CARD

Use it as a reminder of Alaska's Energy Hotline. Place it in a rotary file with your other important phone numbers.

ENERGY RESOURCE AND INFORMATION CENTER

Call to **ERIC** for information on energy resources or tips on ways to save energy in your home or small business. ERIC is operated by the Alaska Energy Education Service, a program of the Department of Community and Regional Affairs.

ERIC provides an array of services including free publications, book, magazine and video-lending library and specialists that are available to answer your specific energy questions.

1-800-478-INFO



Enlight

Energy



Financing Programs for Enlightened Energy Use

Let's say you have a five-star home. That means you've had an energy analysis done by **Energy Rated Homes of Alaska**, and your home was a shining example of energy efficiency. In a sense it's like bringing home an A-plus report card to your parents. You don't want to hide it, but use it to your best advantage.

If you want to sell your five-star home, make sure everyone knows about its superior rating. Tell the real estate agent and any potential home buyers. It means the home will cost them much less to operate. Some lenders will allow a home buyer to qualify for a higher mortgage if the home being purchased has at least a three-star rating. Through an **Energy Efficient Mortgage**, the lender recognizes that money can go into the monthly mortgage payment rather than into heating dollars.

An **Energy Efficient Mortgage** can also be used to improve an inefficient, underinsulated home. The costs of the home improvements that improve energy efficiency can be included in a mortgage at the time you buy or refinance a home.

The Home Energy Loan Program is another resource for homebuyers and remodelers. It offers up to \$2500 for buyers of efficient homes and interest rate subsidies on home improvement loans.

More financial help for energy-saving measures can come from the **Home Energy Rebate Program**. Sponsored by the Alaska Department of Community and Regional Affairs, it can give you a rebate for energy efficiency products you buy for your home.

Need more details on these financing programs? Call Energy Rated Homes of Alaska at 345-3746 or toll-free at 800-478-3744.

Warming Homes of Elderly and Low Income Families

When Ruby Hensley's husband died three years ago, he left Ruby with an unfinished house in Fairbanks, stacks of unpaid bills and no life insurance. Sagging sheets of insulation hung from the ceiling. Ruby resorted to heating only half of her house and keeping the rest at 60 degrees. Still she was spending over a third of her fixed income on heating.

This winter, her plight was brought to the attention of the state's **Low Income Weatherization Program**, and a team of carpenters arrived at her home. They completed her ceiling, as she watched with a grateful smile. That finished ceiling should cut Hensley's heating bills by about 25%.

Ruby Hensley's story is similar to many others encountered by workers in the State Of Alaska **Weatherization Program**, a unique effort to improve living standards for elderly and low-income Alaskans by improving the energy efficiency of their homes. Since the program began in 1979, approximately 20,000 homes have been assisted. Multifamily dwellings (four-plexes), single family homes, duplexes, mobile homes and log cabin homeowners are eligible for weatherization. Homeowners realize immediate, obvious, and long-term benefits.

Weatherization is especially beneficial to homes in rural Alaska, where approximately 16 to 37% of family income is spent on energy.

According to a 1988 Alaska Rural Housing Needs Assessment survey, 36% of rural homes can not maintain an indoor temperature of 70 degrees during the cold winter months. Rural housing is often substandard with inadequate construction for the harsh winters. Weatherization in these areas can provide even greater cost savings and increased comfort levels.

Not only does the weatherization program provide assistance to those most in need, it has proven that energy efficiency can be a tremendous tool for economic development. A 1989 study by the Institute for Social and Economic Research found that state spending on weatherization projects was one of the most effective programs in Alaska for creating jobs and generating personal income. For more information see the resource numbers listed on the back page.

Presented as a public
service by



Anchorage Daily News

A PULITZER PRIZE WINNING NEWSPAPER



KENI
AM 550
News Radio



ENSTAR Natural Gas Company

spensard builders supply

HOW TO PLUG INTO ENLIGHTENED ENERGY!

Programs and Services Available

Home Energy Rebate Program - This program will give you a rebate for energy efficiency products you buy for your home. Call 273-9448 for information.

Energy Rated Homes of Alaska - Provides home energy ratings, suggestions for energy- and money-saving improvements, and programs which assist the consumer to afford an energy efficient home. Call 800/478-3744.

Business Energy Assistance Team - Provides a free analysis of the energy needs and uses of a small business, makes suggestions for improving the energy efficiency of that business, and provides rebates for improvements. Call 273-9440.

Home Energy Loan Program - Available to decrease the cost of increasing the energy efficiency of your home. Call 273-9448.

Alaska Craftsman Home Program - Provides workshops and publications on building technologies. Call 478-ACHP or 373-2247.

Energy Resource Information Center - Provides answers to energy questions, and information about energy efficient products, technologies and programs. Call 800-478-4636.

Weatherization Program - Offers energy improvements to lower income Alaskans across the state. Call in Anchorage - 562-6360. Mat-Su, Kenai, Kodiak Island, Bristol Bay - 248-2232. Fairbanks area - 452-5323. Doyon Region - 452-8251. Southeast Area - 273-9442. Northern Alaska and Coastal Region - 279-2511.

Recycling Center - Recycles glass, aluminum, paper, cardboard etc. Call 562-CANS.

H B

7 7

DIVISION OF LEGAL SERVICES

LEGISLATIVE AFFAIRS AGENCY STATE OF ALASKA

P.O. Box Y, Juneau, Alaska 99811
(907) 465-3867 or 465-2450
FAX (907) 465-2029

Deliveries to: 240 Main Street
Court Plaza, Room 500
Mail Stop 3101

MEMORANDUM

May 13, 1991

SUBJECT: Transmission line appropriations (CSHB 77(L&C))

TO: Representative David Finkelstein
Chair, House Labor & Commerce Committee

FROM: Teresa B. Cramer *TBC*
Legislative Counsel

Enclosed is the CSHB 77 (L&C) as passed out of committee. I am concerned about the legality of one change made by the committee. In sec. 2(b), which appropriates money for grants for energy efficiency improvement programs under AS 37.05.316, the commission deleted the name of the recipient of the grant. The committee also included an alternative granting authority statute, AS 37.05.317. As the bill passed from committee, the appropriation was "for payment as a grant under AS 37.05.316 or 37.05.317 for energy efficiency improvement programs."

Neither AS 37.05.316 nor 37.05.317 gives the department authority to pick an initial grant recipient. Both statutes allow the department to select an alternative recipient. If challenged, a court might hold that the department lacked the power under either statute to select an initial grantee and that therefore the grant was ineffective. To avoid this possibility, the legislature could name an initial grantee or could use a granting statute which allows the department to choose the initial grantee. However, I am not aware of a grant program in the Department of Community and Regional Affairs that makes grants for energy efficiency improvement programs.

If I may be of further assistance, please advise.

TC:pl
91-:359.plm

Enclosure

Manager's Message

David Highers



Interties deserve state funding

Chugach's top legislative priority this year is to work for state funding for two new transmission lines that will strengthen the region's electric system serving three-fourths of Alaska's population. One line would be built from Soldotna to Anchorage to allow the output of the new Bradley Lake hydroelectric project to be fully integrated into the Railbelt power grid, while a second line between Healy and Fairbanks would allow better power sharing between Southcentral and the Interior over the existing Anchorage to Fairbanks Intertie.

Our support for the Interties isn't new. For several years now Chugach and the other electric utilities of the Railbelt have argued that building these power lines would be the best use of the monies originally set aside in the Railbelt Energy Fund after the cancellation of the Susitna hydroelectric project.

As you may recall, last year the legislature moved \$100 million plus interest from the fund into a Railbelt intertie reserve account of the general fund. Although the accompanying legislation stated that it was the intent of the legislature that the money be used for construction of the southern and northern Interties, construction is by no means guaranteed. That's why Chugach and other utilities are back in Juneau this session.

There are many arguments in favor of building the interties. Here are just a few:

- The most recent Alaska Energy Authority study concludes that the southern and northern Interties are cost effective, without even counting non-qualifiable benefits such as reliability enhancements and economic development potential.

- The Railbelt Energy Fund was established by the legislature in 1986 for just what the name implies. It was to be the Railbelt's share of more than \$1 billion worth of energy projects funded by the state. Despite the fact that for several years the Interties have been identified as

the best investment for the funds, last year, when the final \$230 million remaining in the REF was disbursed, only \$100 million was specifically earmarked for Intertie construction while much of the balance was spent for projects which were not necessarily in the Railbelt or even energy-related.

- The Interties will be a partnership venture between the state and the regional electric utilities, with the utilities paying all construction costs over \$125 million. Current construction cost estimates in 1991 dollars range from \$152 million to \$160 million.

- The Railbelt utilities will pay all operation and maintenance costs for the life of the project (estimated at 30 to 50 years), including a transmission service fee to the state.

- All the electric utilities in the Railbelt are either member-owned cooperatives like Chugach, or municipally-owned systems. None are privately-owned, profit-making companies. Together, these utilities serve three-fourths of the state's population.

- The North American Electric Reliability Council, in its first-ever assessment of the Railbelt interconnected systems, reported last year that the regional transmission network needs to be strengthened to bring reliability up to national standards.

The Interties represent an investment in basic infrastructure which will benefit the majority of Alaskans for years to come. That's why Chugach will continue to work during this legislative session on behalf of its members, and ratepayers throughout the Railbelt, for state funding for the Interties.



Underground cable replacement meetings set

Chugach plans to replace the underground cable in several subdivisions during the 1991 construction season. A series of public meetings will be held to explain the details of each project and answer questions. Property owners who will be directly affected will receive letters outlining the project. Individual subdivision project meetings will be held at 7 p.m. in the Chugach headquarters training room at 5601 Minnesota Drive on the dates indicated.



For more information, call Land Services at 762-4630

Subdivision	Meeting Date
Chester Heights	March 5
College Gate East	March 7
Indian Hills	March 19
Town & Country	March 26
Chugach Foothills	March 28
Anchorage International Airport	April 2
Baxter Heights	April 4

ANCHORAGE MUNICIPAL LIGHT AND POWER COMMISSION

RESOLUTION

A RESOLUTION URGING ELECTRICAL INTERTIE CONSTRUCTION SUPPORTED BY STATE AND UTILITY FUNDING

WHEREAS, the Interties Reserve Account was established with \$100 million in unexpended funds from the Railbelt Energy Fund, which was originally established to be used exclusively to meet the energy needs of Alaskans in the Railbelt region, and

WHEREAS, the Railbelt Energy Council endorsed use of a portion of the Railbelt Energy Fund to upgrade the Anchorage-Fairbanks electrical intertie system; and

WHEREAS, a study by the North American Reliability Council has determined that the existing Railbelt transmission system is below accepted industry reliability standards in the Lower 48 states; and

WHEREAS, Utility sponsored studies show that two new sections of 138 Kilo-volt intertie line would have positive benefit-cost ratios and would yield many millions of dollars in benefits; and

WHEREAS, because of limited existing intertie capacity, the full generation benefits of the Bradley Lake Hydro Project would not be realized without intertie upgrades; and

WHEREAS, the transfer of economical energy between Southcentral generation sources will be greatly enhanced with a new 138 kilovolt Kenai-Anchorage southern intertie; and

WHEREAS, transmission system reliability and increased control over major power outages will be much improved with the addition of a 138 kilovolt southern intertie; and

WHEREAS, electric utilities serving the Railbelt will pay operations and maintenance expenses including debt service on additional funds required beyond the requested \$125 million appropriation throughout the useful life of the lines.

NOW THEREFORE, BE IT RESOLVED; THAT

THE ANCHORAGE MUNICIPAL LIGHT AND POWER COMMISSION urges the Legislature to support an appropriation of \$125 million to the Alaska Energy Authority from, the Railbelt Interties Reserve account and other funds for construction of a 138 kilovolt line between Healy and Fairbanks and the addition of voltage compensation on the existing Anchorage-Fairbanks transmission line, and for construction of a new 138 kilovolt line between Soldotna and Anchorage.

Commission Resolution
Urging Electrical Intertie
Construction Supported by
State and Utility Funding
Page Two

Passed and approved this 18th day of March, 1991.

ANCHORAGE MUNICIPAL LIGHT AND POWER COMMISSION

Robert H. Shively
Chairman

Joseph R. Hauri
Vice Chairman

Arad Phillips
Commissioner

Kevin J. Smith
Commissioner

Patricia Hammer
Commissioner

Richard J. Jones
Commissioner

Alaska State Legislature

Legislative Research Agency



P.O. Box Y
Juneau, AK 99811-3100
Phone: (907) 183-3991
Fax: (907) 183-3351

November 20, 1990

MEMORANDUM

TO: Representative Mike Davis

FROM: Tom Chester *TC*
Legislative Analyst

RE: Benefit-Cost Comparison of Eight Railbelt Energy Projects
Research Request 91.025

You requested a comparison of economic benefits and costs of the Healy Clean Coal Project and other proposed Railbelt projects such as the Energy Conservation project.

To answer your question the first section of this memorandum (page 5) summarizes results of the benefit-cost analysis¹ section of the *Railbelt Intertie Reconnaissance Study*,² conducted under the auspices of the Alaska Power Authority (APA).³ We then begin an analysis of the Healy Clean Coal Project and discuss the effects of different energy load and fuel price scenarios on APA conclusions with regard to the Healy Clean Coal Project and the Energy Conservation Projects (page 15).

Section three (page 16) recalculates the Healy project's benefit-cost results to accommodate three modifications to APA assumptions. The fourth section (page 21) modifies the APA conclusions by limiting the analysis to costs and benefits born by Golden Valley Electric Association [GVEA] of Fairbanks).

Finally, we make recommendations for future studies, based on the assumption that the state will continue to have rising energy demands but will most likely have decreasing ability to subsidize energy projects (page 22).

¹Benefit-Cost analysis is a method of evaluating the relative merits of alternative public investment projects in order to achieve efficient allocation of resources. In principle, it entails little more than adjusting conventional business profit-and-loss calculations for construction projects to reflect social instead of private objectives, criteria, and constraints.

²Decision Focus, Inc., *Railbelt Intertie Reconnaissance Study: Benefit/Cost Analysis*, prepared for the Alaska Power Authority, June 1989.

³On July 1, 1989 the Alaska Power Authority was reorganized as the Alaska Energy Authority under Executive Order 75.

Representative Davis
November 20, 1990
Page 2

The APA study describes the economic costs and benefits of eight alternative Railbelt energy projects--including the Healy Clean Coal Power and Energy Conservation projects.⁴ In the APA study it was determined that only four projects resulted in expected benefits exceeding expected costs (providing favorable economic benefit-cost ratios and representing net increases in wealth). The four projects having favorable economic benefit-cost ratios were:

Limited upgrade of the Anchorage-Fairbanks intertie:

The existing intertie is limited to 70,000 watt (70 MW) input at Anchorage. The proposed upgrade to the intertie consists of electrical equipment (static var unit, one transformer, and six capacitors) which would increase the Anchorage input to 100 MW. Potential power that could be transmitted from Anchorage to Fairbanks across the intertie would increase from 61.6 MW to 84.2 MW. The cost of this project is approximately \$10 million (1987 dollars).

Construction of a natural gas pipeline linking Fairbanks with the Cook Inlet area:

A natural gas line to be constructed linking the Cook Inlet area with the Fairbanks area. The estimated capital cost of the project is \$183 million (1987 dollars) for the main pipeline and \$32.5 million (1987 dollars) for a Fairbanks distribution system.

Electric end-use conservation programs (components of the Energy Conservation Project). This is considered to be two projects since analysis was conducted on two distinct sets of conservation programs.

The APA analyzed eight energy conservation programs divided into two groups. In the first group were electric-to-gas water heat conversion, fluorescent lamp rebate, and incandescent to fluorescent lamp conversion programs. These programs netted about half the benefits and a third of the cost of the top eight conservation programs. The second set of programs, although not as efficient as the top three, included efficient electric water heaters, electric-to-gas clothes dryer conversions, electronic ballasts for fluorescent lights, efficient refrigerators, and sliding-scale rebates for efficient new construction of commercial buildings.

All four projects were found to have favorable benefit-cost ratios under all nine fuel price and energy load forecasts used by the APA as their base case scenarios. Although the natural gas pipeline is an expensive project, the

⁴Decision Focus Inc., *Railbelt Intertie Reconnaissance Study*, Volume 11, June 1989, prepared for the Alaska Power Authority. Chapter 2 of this volume is provided as Attachment A. It provides a brief overview of the eight projects covered in this memorandum.

other two projects investigated are low cost. The four projects found economically inefficient in the APA study were the following: Healy Clean Coal project, new intertie between Anchorage and Kenai, full upgrade of the existing Anchorage-Fairbanks intertie, and the Northeast intertie.

Of the economically inefficient projects only the Healy Clean Coal project is described in this memorandum. The Healy project would be a 55 MW power plant (50 MW available to customers) to be constructed near Healy, Alaska. The project would be funded from three sources: a \$93.2 million dollar Department of Energy grant under the Clean Coal Technology III demonstration Program; a \$30 million dollar state appropriation; and approximately \$60 million in revenue bonds.

Several construction cost estimates for this project exist. In the first two sections of this memorandum an estimate prepared by project proponents is used to estimate benefits and costs, and is one of two construction estimates used by the APA in its study. This construction estimate is the lowest of those prepared for use in the APA study. Use of this estimate in calculations results in a high measure of net benefits since net benefits increase as construction costs decrease (other things being equal). In section three an estimate prepared for use in the Alaska Industrial Development and Export Authority's (AIDEA) financial feasibility study of this project is used to determine benefits and costs. This estimate is the most recent, and is approximately 50 percent larger than that developed by project proponents. Calculation of net benefits using AIDEA's estimate may well provide the most reliable measure of benefits and costs since it takes into consideration specific site and technology information.

We begin our analysis of the Healy Clean Coal Project in section two of this memorandum, where we discuss the effects of different energy load and fuel price scenarios on APA conclusions with regard to the Healy Clean Coal and the Energy Conservation projects. The scenarios were devised by the APA to determine the sensitivity of the study conclusions to various prices of fuel and levels of demand for energy. Net benefits for the Healy project are negative under all APA price of fuel and load scenarios, while net benefits for the conservation projects are positive for all fuel price and load scenarios.

In section three we recalculate the Healy project's benefit-cost results to accommodate three modifications to APA assumptions. The first change calculates net benefits from moving the project's proposed site from the Usibelli coal mine mouth to a site four miles to the south. This places the project near the existing Healy power plant and is a cost savings recommendation of project promoters. The second change drops the federal subsidy from cost calculations. This change reduces the scope of the analysis to costs borne directly by Alaska residents. The final change is to substitute the plant construction estimates submitted by R.W. Beck for those of the plant

proponents.⁵ The R.W. Beck estimate was recently prepared for use by the Alaska Industrial Development and Export Authority (AIDEA) in their financial feasibility study of the project. The Beck estimate is approximately half-way between the low cost estimate of the plant proponents and the high cost estimate prepared by the firm of Stone and Webster for the APA's reconnaissance study.

Net benefits are positive for the Healy project if 1) the federal subsidy is dropped from the cost base, 2) the plant is built at the south site (near the existing power plant), and 3) the plant construction cost estimate of plant backers is substituted for that of Stone and Webster or Beck.

The fourth section modifies the APA conclusions by limiting the analysis to costs and benefits born by Golden Valley Electric Association (GVEA) of Fairbanks. This change allows the analysis to more closely represent costs as they are perceived by the operators of the proposed facility. In this analysis we show the rationale for the project despite its overall unfavorable project benefit-cost ratio.

In the final section we make recommendations for future studies. Our recommendations are based on the assumption that the state will continue to have rising energy demands but will most likely have decreasing ability to subsidize energy projects. Fortunately, the state will have several years before existing power sources fall short of supplying Railbelt energy demands.⁶ We recommend that the state use this period of excess railbelt energy supply to assure that a consistent, affordable plan is put into place for meeting future energy demands.

Developing such a plan requires that several things occur.⁷ First, the legislature should direct the APA to focus on developing a plan to meet the power requirements of the population at least cost. The emphasis needs to change from studying and approving specific capital power projects to

⁵R.W. and Associates, "Healy Coal Project Financial Plan and Feasibility Study", for Alaska Industrial Development and Export Authority (AIDEA), March 30, 1990.

⁶The Railbelt is not expected to need additional generating capacity until 2006.

⁷Governor's Energy Policy Task Force, "Recommended Guiding Principles for Alaska's Overall Energy Policy," January 20, 1988. The stated objectives of the task force and those outlined here are not exactly the same. Attachment B contains the recommendations of the task force.

Representative Davis
November 20, 1990
Page 5

determining the best (least-cost) combination of supply and demand side power programs that will meet energy requirements.⁸

Second, power projects should be evaluated strictly for their ability to meet energy requirements. Accordingly, employment, income, and other distribution goals should be met through programs specifically designed for those purposes.

Third, the Alaska Energy Authority (AEA) and the Alaska Public Utilities Commission (APUC) should be directed to develop an integrated power plan and to work with the private sector to see that the plan is implemented. Successful planning would require the state to work with industry to devise a rate structure and other incentives that assure planning consistent with the best interests of the state, the utilities, and users.

Fourth, the state should expend no funds on energy projects that are not consistent with the energy plan developed jointly between the state, industry, and other groups.

Finally, the existing tax structure and state-subsidized financing schemes should be evaluated to assure that no group unfairly prospers from state subsidized projects. This recommendation is especially important when private firms directly benefit from the expenditure of state funds.

SUMMARY OF BENEFIT-COST ANALYSIS FOR EIGHT POSSIBLE RAILBELT PROJECTS AS PRESENTED IN THE *RAILBELT INTERTIE RECONNAISSANCE STUDY*

The APA study summarized in this section was authorized by the legislature in the capital budget passed during the 1987 special legislative session. In the legislation the Alaska Power Authority was directed to conduct studies required under AS 44.83.177-185. The purpose of those authorized studies was to complete reconnaissance studies of Railbelt electrical interties. During the 1988 legislative session, the legislature modified the budget for the studies and included study of a gas pipeline between Cook Inlet and Fairbanks. The APA also later added studies for a Railbelt coal-fired power plant and electric end-use conservation programs.

In this section are provided APA's fuel and load scenarios, a description of the probability of occurrence assigned by the APA to each of the scenarios, an outline of the benefits that were evaluated by the APA in its study, a list of items not considered in the APA study but which may be considered important, a summary of the net benefit results as determined by the APA for the eight projects they investigated, and a brief description of the projects having positive expected net benefits.

⁸Attachment C contains definitions of demand-side management programs.

For purposes of modeling the costs and benefits of the various projects, a set of three oil price and three load forecasts for the years 1994 - 2028 was developed for the APA study. These forecasts resulted in nine distinct combinations of price and load forecasts. The likelihood that a price and load forecast combination would occur (a single probability of joint forecast occurrence) was established based on fuel price probabilities adopted by the APA and load forecast probabilities adopted by the APA and the University of Alaska Institute of Social and Economic Research (ISER).

Each of the eight projects was modeled nine times--each time using a different price and load forecast combination. The outcomes (costs and benefits) for each distinct modeling exercise were assumed to be as likely as the price and load forecast on which they were based. The expected costs or benefits presented below, for any project, result from weighing (multiplying) each cost or benefit by its probability of occurrence (the joint load and price probability) and then adding the weighted outcomes (outcome multiplied by probability) for all nine possible combinations together.

Tables 1 through 4 provide key modeling assumptions used by the APA in developing a benefit-cost analysis. Table 1 provides the low, middle, and high oil price scenarios through the year 2010. Table 2 does the same thing for electric demand. Table 3 provides the price of coal which was assumed to remain constant in 1987 dollars.

In Tables 1 and 2 the annual real growth rate (the rate of growth beyond inflation) between reported years is in parenthesis. For example, in Table 2 the growth rate of 0.02 percent reported for the year 2000 in the low case is the annual growth rate between the year 2000 and the previous reported year 1995.

TABLE 1
 CRUDE OIL PRICE SCENARIOS
 PRICE OF NORTH SLOPE OIL DELIVERED TO U.S. GULF
 (in 1987 Dollars)

Year	Scenario					
	Low		Middle		High	
	\$	%	\$	%	\$	%
1990	13		17		19	
2000	17	(2.72)	23	(3.07)	29	(4.32)
2010	19	(1.12)	24	(2.35)	39	(3.01)

Source: Alaska Power Authority, *Railbelt Intertie Reconnaissance Study*, June 1989, page 81.

Adapted by: Legislature Research Agency. The original APA numbers were for Saudi Light delivered to the U.S. Gulf. The numbers have been converted to reflect Alaska North Slope crude using data provided by the APA.

Note: The percentage growth rates are derived using the formula ending year price = (1 + percentage growth rate)^{number of years} * beginning year price.

TABLE 2
 RAILBELT ELECTRIC DEMAND FORECASTS
 (total energy GWh)

Year	Scenario					
	Low		Middle		High	
	GWh	%	GWh	%	GWh	%
1987	3305		3305		3305	
1990	3273	(-0.69)	3225	(-0.81)	3269	(-0.36)
1995	3153	(-0.52)	3271	(0.28)	3432	(0.98)
2000	3156	(0.02)	3395	(0.75)	3675	(1.38)
2005	3289	(0.83)	3641	(1.41)	4058	(2.00)
2010	3495	(1.22)	4053	(2.17)	4427	(1.76)

Source: Alaska Power Authority, *Railbelt Intertie Reconnaissance Study*, June 1989, page C5.

TABLE 3
PRICE of HEALY COAL
(in 1987 Dollars)

Waste Coal \$0.50/MBtu
Quality Coal \$1.20/MBtu

Source: Alaska Power Authority, *Railbelt Intertie Reconnaissance Study*, page 8-3.

Note: Coal is priced by its energy content and not by weight.
MBtu is Thousand British Thermal Units

TABLE 4
BASE CASE PROBABILITIES

<u>Fuel Price</u>	<u>Load Forecast</u>	<u>Joint Probability %</u>
Low	Low	0.30
Low	Middle	0.23
Low	High	0.06
Middle	Low	0.03
Middle	Middle	0.08
Middle	High	0.19
High	Low	0.00
High	Middle	0.02
High	High	0.08

Source: Alaska Power Authority, *Railbelt Intertie Reconnaissance Study*, page 5-4.

Note: Due to rounding errors the probabilities do not add up to one as expected.

Interpretation of the probabilities in Table 4 is straight forward. For example, Table 4 shows the APA assumed that the low fuel price and low load forecast had a 30 percent chance of occurring. Also the APA assumed that the high fuel price and low load forecast had no chance of occurring.

Other price/load scenarios were also evaluated by the APA. These other cases were referred to as sensitivity scenarios by the APA. They included a load forecast from the Railbelt utilities; no additional military or University of Alaska - Fairbanks load; the Alaska Department of Revenue middle fuel price forecast; two scenarios of hydro power availability; and a high natural gas price escalation between 2011 and 2028. These cases were not assigned probabilities of occurrence and are not discussed in this memorandum.

Source of Benefits

Project effects were broken down into the following categories by the APA when determining benefits:

1. System Stability

Electrical systems are stable when generators are "in-step" with each other. When the generators are not operating "in-step" and protective back-up devices fail, the result is power outages or damaged equipment. The value of increases in system stability was quantified and added in as project benefits.

2. Reliability

Projects can affect the number, duration, and magnitude of customer outages. Improvements in reliability were quantified and added in as project benefits.

3. Reduced Energy Cost

The savings in the cost of energy that a project allowed were evaluated as benefits.

4. Transmission Efficiency

Typically ten percent or more of energy transferred over interties is consumed during the transmission process. Reductions in transmission losses were quantified and added in as project benefits.

5. Capacity

Generating capacity expenditures avoided because of a project were quantified and added in as project benefits.

6. Operating Reserves Sharing

Operating reserves is excess capacity that is maintained to accommodate changes in customer demand and equipment failures. Reductions in required operating reserves stemming from a project increase that project's net benefits.

Omitted Issues

Some of the issues that may be considered significant but which are not covered in the APA analysis or benefit-cost analysis in general are as follows:

Employment

Employment consequences of the various projects are generally not mentioned. Although computing the effects of a project on total employment might appear to be straight forward, it is not. The employment computations depend upon economic concepts such as elasticities, capital/labor ratios, and regional leakages and multipliers. Determining values for such economic quantities requires original research and the imposition of assumptions for which no consensus can be developed.

Employment has many facets including quantity and duration. We mentioned above some of the issues involved in determining the quantity of employment. Equally as significant, however, is the length of employment. Policy, not economics, determines whether a project that creates 50 jobs for two years is more or less important than a project that creates five jobs for 50 years.

Income

Income and employment are closely related. Meaningful impacts of a project on income cannot be determined without reliable employment estimates. As mentioned under "employment," no such employment measurements are made.

Regional Stability

A region's ability to deal with a project's effects varies and depends upon such things as the state of the local economy. No discussion on these matters exists.

Leverage and Risk

The economic cost of various projects in the APA study varies from \$9 million to \$284 million (1987 dollars). The consequence of a project being an economic failure varies with the cost of the project. Not incorporated into the analysis is the increasing "risk" associated with large projects or analysis of who bears the cost of failure.

Environmental Issues

Environmental costs are captured in the APA study only to the extent that projects must meet existing environmental standards. Many less tangible, yet important, environmental costs may be associated with various projects. Some possible side effects of projects include increased haze (for the Healy plant), the possibility of increased ice fog (from natural gas emissions in Fairbanks during winter), or loss of aesthetic beauty (additional intertie hardware). Although these issues are mentioned, no attempt was made to quantify changes in

property value, employment, or tourism that might result from a given project's implementation.

Consistency

Although it is possible to argue that the state does not have an energy plan, discussion could be provided on how the projects "fit in" with prior projects. Many such issues could be raised. For example: Does the state wish to support a project that does not make best use of existing hydro power? Does the state wish to support a project that seems to contradict the purpose of the intertie? Exactly what environmental risks is the state willing to undertake?

These omitted factors, plus others, can be made part of benefit-cost studies. Their inclusion would make possible a more focused discussion of the relevant issues. As it is now, such considerations are dismissed by decision makers because they leave too much unanalyzed, too much unsaid.⁹

Expected Benefits

Projects with favorable benefit-cost ratios may not necessarily make everyone better off. Indeed, there may be many who are made worse off by any given project. A project is acceptable on economic efficiency grounds when it would be possible, in principle, to fully compensate those who lose by transferring to them a part of the gain from those who have been made better. (This compensation principal is known as the Hick-Kaldor compensation principal.) The process of effecting the transfer, if it occurs, typically involves political intervention.^{10,11}

The APA's expected results for the eight projects are presented in Table 5. The data in Table 5 shows that only four of the projects are economically efficient: a limited upgrade to the Anchorage-Fairbanks intertie, a natural gas line between Cook Inlet and Fairbanks, and various components of the Energy Conservation project. The last two columns of Table 5 are explained the following table.

⁹Methods exist for assigning shadow prices and thus quantifying many of these apparently qualitative factors.

¹⁰Lee Anderson, and R. Settle, *Benefit-Cost Analysis: A Practical Guide*, Lexington Books, 1979, p. 13. The Hicks-Kaldor compensation rule described is named after its authors.

¹¹Identifying and estimating the benefits of "winners" can be difficult. The legislative intervention mentioned typically involves some combination of taxation and social programs such as job retraining.

TABLE 5
 EXPECTED COSTS AND BENEFITS FOR RAILBELT INTERTIE RECONNAISSANCE STUDY PROJECTS
 (in millions of 1987 dollars)

	Est. Expected Costs \$	Est. Expected Benefits \$	Est. Net Bens. \$	Benefit to Cost Ratio	Source of Benefits and Costs	Prob. that Net Benefits are Postive
<i>Projects that are economically efficient</i>						
Limited Upgrade of Anch-Frbks Intertie	10	40	30	4.0	3,5	1.00
Gas Pipeline Between Cook Inlet & Fbks.	284	527	243	1.86	2,3,& 4,5	1.00
Top Three End-Use Conservation Programs	16	28	12	1.75	3,4,5	1.00
Top Eight End-Use Conservation Programs	44	61	17	1.39	3,4,5	1.00
<i>Projects that are economically inefficient</i>						
Northeast Intertie	188	159	-29	.85	2,3,5	0.08
Full Upgrade of Anch-Fbks. Intertie	134	96	-38	.72	2,3,& 4,5	0.00
50-MW Coal-Fired Power Plant	177	108	-69	.61	3,4,5	0.00
New Kenai-Anchorage Intertie	103	49	-54	.48	1,2,& 3,4,5,6	0.00

Notes:

- 1: All values are in 1987 million (present value for 1994 through 2028 discounted at 4.5 percent per year).
- 2: Estimated Net Benefits = Estimated Expected Benefits - Estimated Expected Costs.
- 3: Benefit to Cost ratio is a number, rather than a dollar figure, and are always greater than zero.
- 4: Economically efficient projects are those that lead to a net increase in the value of goods and services produced within the economy. Economically efficient projects have net benefits (benefits - costs) that are positive and benefit-cost ratios greater than one. The term "economically efficient" and "financially feasible" are not the same thing and one does not always imply the other.

Source: Decision Focus Inc., *Railbelt Intertie Reconnaissance Study*, prepared for the Alaska Power Authority, June 1989.

Numbers in the "Source of Benefits," column refer to the six categories of benefits described under the heading "Sources of Benefits" on page 9 of this memorandum. The column in Table 5 entitled "Probability that Net Benefits are Positive," is based on the nine price and load scenarios making up each project's expected value. As described previously, each one of the nine scenarios has a distinct probability of occurrence; these probabilities were given in Table 4. For each, fuel and load scenarios, net benefits were computed and the column "Probability that Net Benefits are Positive" is the sum of all scenario probabilities where the estimated net benefits were positive.¹² (For example, a column value of 1.00 for "Probability that Net Benefits are Positive," as in the case of Energy Conservation projects, implies that in all nine price and load forecast scenarios the net economic benefits were positive: all APA price and load forecasts result in benefits exceeding costs. Values of 0 indicate that there was no fuel price and load scenario which resulted in benefits exceeding costs. A value between 0 and 1 indicates that under some, but not all fuel price and load scenarios, net economic benefits were positive).

Description of Projects Having Positive Expected Net Benefits

Limited Upgrade to Intertie

The existing intertie is limited to 70 MW input at Anchorage. The proposed upgrade to the intertie consists of electrical equipment (static var unit, one transformer, and six capacitors) which increases the Anchorage input to 100 MW. Power received at Fairbanks would increase from 61.6 MW to 84.2 MW.

Energy transfers over the study period are all from Anchorage to Fairbanks. Nearly half of the benefits of this project can be traced to reduced usage of North Pole oil-fired turbines.

The value of this project ranges between \$1.2 million per year in 1994 and \$3.3 million per year in 2028. This project has little impact on reducing Railbelt capacity shortages due to the limited nature of the project.¹³

¹²This is standard statistical procedure.

¹³Mr. Thomas Stahr, the general manager of Municipal Light & Power Department of the Municipality of Anchorage has criticized this project as too limited in scope, experimental, and inconsistent with previous state energy expenditures. His testimony to the House Resource Committee is included as Attachment D.

Natural Gas Line

A natural gas pipeline could be constructed to link the Cook Inlet gas fields with the Fairbanks area. The estimated capital cost of the project is \$183 million (1987 dollars) for the main pipeline and \$32.5 million (1987 dollars) for a Fairbanks distribution system.

Nearly 80 percent of the gas line benefits accrue outside the electric power sector--in commercial and residential heating uses. The cost of this project, which includes the construction of a Fairbanks commercial and residential pipeline distribution system and the discounted present value of unavoidable operating and maintenance charges, is approximately \$284 million (in 1987 dollars). Although the costs are high, the net benefits for this program exceed those of any other project examined in the APA study.

The gas line project would most likely result in significant dislocations in the existing Fairbanks energy infrastructure. For example, refiners and distributors of heating oil would be adversely affected. These issues are not dealt with in this memorandum or in the APA study.

The overall effect on employment, however, is unclear since there would be increases in employment in the gas-energy sector and other sectors to the extent that lower cost energy increased disposable income and thus increases demand for other goods and services. None the less, it would be a situation of obvious winners and losers.

Energy Conservation Programs

For APA analysis, the various proposed conservation programs were divided into two groups. The first group consists of electric-to-gas water heat conversion, fluorescent lamp rebate, and the incandescent-to-fluorescent lamp conversion programs. These programs netted about half the benefits and a third of the cost of the top eight conservation programs. The second set of programs, although not as efficient as the top three, include efficient electric water heaters, electric-to-gas clothes dryer conversions, electronic ballasts for fluorescent lights, efficient refrigerators, and sliding-scale rebates for efficient new construction of commercial buildings.

All the programs are designed to encourage the installation of energy-efficient equipment at the time of normal replacement. The programs consist of dealer/contractor rebates designed to lower the relative price of the efficient equipment to nonefficient equipment as an incentive to selection by consumers.

For the top three programs, approximately half of the benefits accrue from the conversion from electric-to-gas water heaters. Consequently most of the reported energy savings result in the Anchorage area.

The advantages of these programs include their low cost and their expected ability to generate benefits exceeding costs (even with low oil price and load projections). The primary disadvantage is that project benefits depend upon consumers adopting and continuing to abide by project guidelines. For example, efficient refrigerators require maintenance of door seals. If this maintenance is not done, the benefits of this particular component of the program gradually disappear.

HEALY CLEAN COAL AND CONSERVATION PROGRAMS

In this section we provide the net benefits and benefit-cost ratios for the Healy Clean Coal and Energy Conservation projects for each fuel price and load scenario.

Using original APA assumptions, the data provided in Table 6 and Table 7 indicate that the Healy Clean Coal power plant is not economically efficient under any oil price and load forecast. The Energy Conservation Projects have benefits exceeding costs for all price and load forecasts.

TABLE 6
 ESTIMATED NET BENEFITS FOR HEALY CLEAN COAL AND ENERGY CONSERVATION PROGRAMS
 (in millions of 1987 dollars)

Price/Load	of Scenario Occurrence %	Healy Coal	Estimated Net Benefits \$	
			Top 3 Energy Conservation Projects	Top 8 Energy Conservation Projects
Low/Low	0.30	-94.25	9.57	11.51
Low/Mid.	0.23	-91.55	10.07	12.85
Low/High	0.06	-82.95	10.91	15.02
Mid/Low	0.03	-60.75	12.72	18.66
Mid/Mid.	0.08	-49.75	13.49	20.43
Mid/High	0.19	-45.05	14.64	23.50
High/Low	0.00	-20.15	15.73	25.63
High/Mid.	0.02	-6.25	16.60	27.59
High/High	0.08	-0.35	17.89	31.13
EXPECTED VALUES		-69.70	11.95	17.14
Probability that Net Benefits are Positive		0.00	1.00	1.00

Notes:

- 1: All values are in 1987 dollars (present value for 1994 through 2028 discounted at 4.5 percent per year).
- 2: Estimated Net Benefits = Estimated Benefits - Estimated Costs.

Source: Decision Focus Inc., "Railbelt Intertie Reconnaissance Study," prepared for the Alaska Power Authority, June 1989.

TABLE 7
 BENEFIT-COST RATIOS FOR HEALY CLEAN COAL AND ENERGY REDUCTION PROGRAMS

Scenarios Price/Load	Probability of Scenario \$	Healy Coal	Benefit-Cost Ratios	
			Top 3 Energy Conservation Projects	Top 8 Energy Conservation Projects
Low/Low	0.30	0.47	1.62	1.27
Low/Mid.	0.23	0.48	1.65	1.30
Low/High	0.06	0.53	1.71	1.36
Mid/Low	0.03	0.66	1.76	1.42
Mid/Mid.	0.08	0.72	1.80	1.46
Mid/High	0.19	0.75	1.87	1.52
High/Low	0.00	0.89	1.87	1.54
High/Mid.	0.02	0.96	1.92	1.58
High/High	0.08	1.00	1.99	1.66

Notes:

- 1: All values are in 1987 million (present value for 1994 through 2028 discounted at 4.5 percent per year).
- 2: Estimated Net Benefits = Estimated Benefits - Estimated Costs.
- 3: Benefit-cost ratios should be greater than 1.0 if the program is to be considered socially efficient.

Source: Decision Focus Inc., *Railbelt Intertie Reconnaissance Study*, prepared for the Alaska Power Authority, June 1989.

MODIFIED BENEFIT-COST ANALYSIS FOR HEALY CLEAN COAL POWER PROJECT

In this section we describe the effect on expected net benefits of changing APA assumptions about the Healy Clean Coal project. The changes are 1) excluding the federal subsidy from cost calculations, 2) moving the plant site to a location near the existing power plant at Healy, and 3) replacing the proponents construction cost estimate with a recent construction cost estimate prepared by R.W. Beck for AIDEA. We also comment on the possibility that the price of coal might be overstated for purposes of the benefit-cost study (reducing expected net benefits).

Cost Reductions Realized by Moving Proposed Plant Site

In the APA study the generating plant is located near the mine mouth. It has been suggested that the plant be located next to the existing facility (referred to as the South site) which is approximately four miles from the mine mouth site. It is claimed by project proponents that placing the new plant near existing facilities will reduce the combined operating costs of the two facilities by approximately \$2 million annually. Table 8 presents the net

benefits and benefit-cost ratios for this project using the assumption that the facility is built at the South site.¹⁴

TABLE 8
 NET BENEFITS AND BENEFIT-COST RATIOS FOR THE HEALY CLEAN COAL PROJECT BASED
 UPON LOCATION OF NEW FACILITY AT THE SOUTH SITE
 (in millions of 1987 dollars)

Scenarios Price/Load	Probability of Scenario Occurrence %	Healy Clean Coal Project	
		Net Benefits \$	Benefit-Cost Ratio
Low/Low	0.30	\$-45.25	0.65
Low/Mid.	0.23	-42.55	0.67
Low/High	0.06	-33.95	0.74
Mid/Low	0.03	-11.75	0.91
Mid/Mid.	0.08	-0.75	0.99
Mid/High	0.19	3.95	1.03
High/Low	0.00	28.85	1.22
High/Mid.	0.02	42.75	1.33
High/High	0.08	48.70	1.38

EXPECTED VALUE.....\$-24.31
 Probability that Net Benefits
 are Positive..... 0.29

Notes:

- 1: All values are in 1987 million (present value for 1994 through 2028 discounted at 4.5 percent per year).
- 2: Estimated Net Benefits = Estimated Benefits - Estimated Costs.
- 3: Benefit-cost ratios should be greater than one if the program is to be considered socially efficient.
- 4: Based upon plant cost assumptions of facility backers.

Source: Decision Focus Inc., *Railbelt Intertie Reconnaissance Study*, prepared for the Alaska Power Authority, June 1989.

Removing Federal Subsidy from Cost Calculations

In the APA study the federal grant of \$93.2 million is included as a cost. Costs, however, can be defined in two ways: opportunity costs and financial costs. Benefit-cost studies look at opportunity costs, not financial costs. The opportunity cost of the Healy Clean Coal project is the value of goods and

¹⁴The actual amount saved each year by moving the plant site was taken as \$2,219,000 for the years 1990 through 2028 discounted back to 1987 dollars at 4.5 percent per year.

services foregone by society as a result of the project. Financial costs are the costs born by facility owners.

Since there appears to be no other use to which these particular federal grant funds could be put within Alaska, it can be argued that there is no opportunity cost to Alaska in using the funds for this specific project. (Obviously there is a cost to the federal government of giving the funds to Alaska for this project.) Table 9 presents the net benefits and benefit-cost ratios for this project excluding the cost of the federal subsidy.¹⁵

TABLE 9
 NET BENEFITS AND BENEFIT-COST RATIOS FOR THE HEALY CLEAN COAL PROJECT
 BASED UPON DROPPING FEDERAL SUBSIDY FROM COST CALCULATIONS
 (in millions of 1987 dollars)

Scenarios Price/Load	Probability of Scenario Occurrence %	Healy Clean Coal Project	
		Benefits \$	Benefit-Cost Ratio
Low/Low	0.30	\$-44.25	0.65
Low/Mid.	0.23	-41.55	0.67
Low/High	0.06	-32.95	0.74
Mid/Low	0.03	-10.75	0.92
Mid/Mid.	0.08	0.25	1.00
Mid/High	0.19	4.95	1.04
High/Low	0.00	29.85	1.23
High/Mid.	0.02	43.75	1.34
High/High	0.08	49.70	1.39
EXPECTED VALUE.....		\$-23.30	
Probability that Net Benefits are Positive.....		0.37	

Notes:

- 1: All values are in 1987 million (present value for 1994 through 2028 discounted at 4.5 percent per year).
- 2: Estimated Net Benefits = Estimated Benefits - Estimated Costs.
- 3: Benefit-cost ratios should be greater than 1.0 if the program is to be considered socially efficient.
- 4: Based upon plant cost assumptions of facility backers.

Source: Decision Focus Inc., *Railbelt Intertie Reconnaissance Study*, prepared for the Alaska Power Authority, June 1989.

¹⁵The federal subsidy used for construction was taken as \$75,000,000 discounted back from 1996 to 1987 at 4.5 percent per year.

Locating at South Site *AND* Dropping of Federal Subsidy

Table 10 presents the net benefits and benefit-cost ratios for the Healy project using the South site for the plant and excluding the federal subsidy from the cost calculations (a composite of Table 8 and Table 9).

TABLE 10
 NET BENEFITS AND BENEFIT-COST RATIOS FOR THE HEALY CLEAN COAL PROJECT BASED UPON DROPPING FEDERAL SUBSIDY FROM COST CALCULATIONS AND LOCATING PLANT AT THE SOUTH SITE
 (in millions of 1987 dollars)

Scenarios Price/Load	Probability of Scenario Occurrence %	Healy Clean Coal Project	
		Net Benefits \$	Benefit-Cost Ratio
Low/Low	0.30	\$4.75	1.06
Low/Mid.	0.23	7.45	1.10
Low/High	0.06	16.05	1.20
Mid/Low	0.03	38.25	1.49
Mid/Mid.	0.08	49.25	1.63
Mid/High	0.19	53.95	1.69
High/Low	0.00	78.85	2.01
High/Mid.	0.02	92.75	2.18
High/High	0.08	98.65	2.26

EXPECTED VALUE.....\$29.19
 Probability that Net Benefits
 are Positive..... 1.00

Notes:

- 1: All values are in 1987 million (present value for 1994 through 2028 discounted at 4.5 percent per year).
- 2: Estimated Net Benefits = Estimated Benefits - Estimated Costs.
- 3: Benefit-cost ratios should be greater than one if the program is to be considered socially efficient.
- 4: Based upon plant cost assumptions of facility backers.

Source: Decision Focus Inc., *Railbelt Intertie Reconnaissance Study*, prepared for the Alaska Power Authority, June 1989.

Healy Plant Construction Costs Using R.W. Beck Estimates

The cost of construction used in all the foregoing Healy Clean Coal benefit-cost calculations is \$80 million (1987 dollars) and is the low cost estimate used in the *Railbelt Intertie Reconnaissance Study* prepared by the APA. In the *Healy Coal Project Financial Plan and Feasibility Study* prepared for AIDEA, R.W. Beck estimates the cost of plant construction to be approximately \$120 million (1987 dollars). The R.W. Beck estimate may be the best estimate of plant construction costs since it includes site and technology specific

information. If the \$120 million estimate of plant construction cost is substituted into the benefit-cost calculations, all cost estimates are increased by \$40 million, all net benefits and all expected net benefits are reduced by \$40 million. The results are shown in Table 11.

TABLE 11
 NET BENEFITS FOR THE HEALY CLEAN COAL PROJECT ASSUMING PLANT CONSTRUCTION
 COST OF \$120 MILLION
 (R.W. BECK FEASIBILITY STUDY)

Scenarios Price/Load		Probability of Scenario Occurrence %	Healy Clean Coal Project	
			Based on original APA Assumptions ¹ \$	Net Benefits Based on Plant Relocation and Exclusion of Federal Subsidy from Cost Calculations ² \$
Low	Low	0.30	\$-134.25	\$-35.25
Low	Mid.	0.23	-131.55	-32.55
Low	High	0.06	-120.95	-23.95
Mid.	Low	0.03	-100.75	-1.75
Mid.	Mid.	0.08	-89.75	9.25
Mid.	High	0.19	-85.05	13.95
High	Low	0.00	-60.15	38.85
High	Mid.	0.02	-46.25	52.75
High	High	0.08	-40.35	58.65
EXPECTED VALUE			\$-108.42	\$-10.41
Probability that Net Benefits are Positive			0.00	0.37

Notes:

- 1: Refers to assumptions underlying creation of Table 5 (except for the cost of construction).
- 2: Refers to assumptions underlying Table 10 (except for cost of construction). This figure may over state benefits due to possible double counting of benefits derived from building facility near existing plant.
- 3: All values are in 1987 million (present value for 1994 through 2028 discounted at 4.5 percent per year).
- 4: Estimated Net Benefits = Estimated Benefits - Estimated Costs.
- 5: Benefit-cost ratios should be greater than one if the program is to be considered socially efficient.
- 6: In the Financial Feasibility Study the cost of plant construction is given as \$136.9 million (1990 dollars). Discounting back to 1987 dollars at 4.5 percent results in a construction cost of \$120 million (1987 dollars).

Source: Decision Focus Inc., *Railbelt Intertie Reconnaissance Study*, prepared for the Alaska Power Authority, June 1989, and *Healy Coal Project Financial Plan and Feasibility Study*, prepared for AIDEA by Frank Moolin & Associates, Inc. in association with R.W. Beck and Associates.

Excluding the federal subsidy and relocating the plant adjacent to the existing facility allowed positive net benefits under all fuel price and load forecasts. This case was detailed in Table 10. Raising the cost of construction, however, reduces the probability of positive net benefits from 1.00 to 0.37 while expected net benefits drops from \$29 million to -\$10 million. For the plant to generate positive net benefits, a fuel price and load scenario at the middle-middle price/load scenario or higher is required (see Tables 1 and 2 for scenario assumptions).

FINANCIAL FEASIBILITY - A PRIVATE SECTOR PERSPECTIVE

In this section we provide a rationale for continued support of the Healy Clean Coal project by project proponents, despite negative net benefits.

In Table 5, \$-69.72 million is given as the expected net benefits for the Healy project. Increasing expected net benefits to zero from \$-69.72 million (providing benefits equal to costs or a benefit-cost ratio of 1, the minimum point of economic efficiency) requires some combination of increased benefits or reduced costs equal to \$69.72 million.

The original construction cost estimate was \$80 million. If construction costs could be lowered by \$69.72 million, expected costs would equal expected benefits (a benefit-cost ratio of 1). Realizing this type of savings implies a plant construction cost of \$10 million (\$80 million - \$69.72 million). No one argues that the project can be built for so small an amount.

So why would plant proponents, in this case Golden Vally Electric Association (GVEA) management, be willing to pay more than \$10 million for the new facility? The answer has two parts. First, GVEA management does not agree with all the APA assumptions: GVEA assumes a load scenario slightly higher than APA's high scenario. Under the GVEA load scenario, benefits derived from the Healy project increase to \$-59 million (from -\$69.9 million). This effectively increases the breakeven construction cost from \$10 million to \$20 million (\$80 million - \$59 million). Also described elsewhere in this memorandum was the GVEA estimate that moving the plant from the mine mouth to a location near the existing plant could be worth up to \$49 million in benefits not reported in the APA study (1987 dollars), raising the construction breakeven point to approximately \$69 million (\$20 million + \$49 million).

A second part to the answer involves the differences between economic and financial studies. In a benefit-cost study, the analytical question is whether a specific project increases society's net wealth. In answering this question, all project costs and benefits occurring anywhere in society are evaluated. In a financial study, a firm asks if a given project is profitable. Here only project costs and benefits accruing to the firm are evaluated. Thus, the results of a benefit-cost study and a financial feasibility study may well be different.

In the case of a financial feasibility study of the Healy project, two significant cost assumptions differ from those used in the benefit-cost study. First, construction of the new Healy plant would reduce intertie charges for the Fairbanks utilities (since less intertie would be used). This reduction in charges is important to GVEA because it represents a true cost savings to their operations. These savings are not realized, however, in the benefit-cost study since they represent ongoing expenses associated with the intertie whether Fairbanks uses the intertie or not. The cost is simply spread over the remaining users (the cost of the intertie to society has not changed--it has only changed for Fairbanks). Secondly, Fairbanks would be purchasing less power from Anchorage and as a result would pay Anchorage less margins (allowed sale profits). Reduction in margin payments by Fairbanks utilities represents a real savings to those utilities. In a benefit-cost study this reduction is merely a shifting of margin payments from Anchorage to Fairbanks. Since this shift does not imply a savings to society, the benefit-cost study does not take them into account. These reductions in charges are worth approximately \$40 million to Fairbanks utilities over the project planning period (which ends in 2028).¹⁶

Reducing costs by this \$40 million raises the breakeven point to approximately \$109 million (\$69 million + \$40 million). This is well in excess of the approximate \$60 million of revenue bonds that must be issued and constitute the debt obligation that must be incorporated into the rate base.

Although other differences might exist, these show the conceptual difference between the two types of studies and provide a rationale for continued interest in the project by its backers despite negative expected net benefits.

RECOMMENDATIONS FOR FUTURE PROJECTS

Despite the current increase in oil prices and state revenues, long-run estimates indicate a steady decline in revenues.¹⁷ At the same time, population estimates indicate a constant or increasing total state population. The state is approaching a time when most likely it will not be able to afford meeting power requirements through the brute force method of building additional, subsidized power projects. In anticipation of that time, the

¹⁶The savings to GVEA consists of two parts: first, a savings of \$2 million per year in margins to Anchorage producers; and second, a savings of \$0.7 million per year in reduced intertie operating and maintenance charges. The stream of savings is discounted back to 1987 using a 4.5 percent discount rate.

¹⁷State of Alaska, Department of Revenue, *Revenue Sources Book*, Spring 1990. See mid-case scenario, page 34.

Alaska state government should initiate a planning process that incorporates several key elements.¹⁸

First, the state should turn its attention from evaluating the feasibility of specific projects to determining how to best meet the public's need for a reliable source of energy.¹⁹ The legislature should require the APA to focus on developing a plan to meet the power requirements of the population at least cost. The emphasis needs to change from studying and approving specific capital power projects to determining the best (least-cost) combination of supply and demand side power programs that meet energy requirements.^{20,21}

Second, power projects should be evaluated strictly for their ability to help meet energy requirements at least cost. Accordingly, employment, income, and other distribution goals should be met through programs specifically designed for those purposes. Related issues, however, should be adequately addressed to assure rational discussion of the various omitted topics.

Third, the AEA and the APUC should work more closely with the private sector to implement the plan. Successful planning would require the state to work with industry to devise a rate structure and other incentives that assure a plan consistent with the best interests of the state, the utilities, and consumers.

Fourth, the state should expend no funds that assist energy projects that are not consistent with the energy plan developed jointly between the state, industry, and other groups.

¹⁸See Governor's Energy Policy Task Force, "Recommended Guiding Principles for Alaska's Overall Energy Policy," January 20, 1988. The stated objectives of the task force and those outlined here are not exactly the same. Attachment B contains the recommendations of the task force.

¹⁹Attachment E contains relevant sections of *Energy Planning in Alaska: Past Efforts and a Future Direction*, published by the House Research Agency, February 1988, that explain the relevance and importance of demand side planning and the need for an integrated resource plan if a sensible, cost-efficient energy strategy is to be developed in Alaska.

²⁰Attachment C contains definitions of demand side management programs.

²¹The APA study did not include analysis to determine the least-cost solution for meeting the power requirements of the Railbelt through the study horizon of 2028. For example, the possibility exists that a combination of two demand side management programs (energy conservation and the limited upgrade to the intertie) at a combined cost of approximately \$30 million are the energy equivalent of the Healy Clean Coal project (at around \$150 million - 1987 dollars).

Representative Davis
November 20, 1990
Page 24

Finally, the existing tax structure should be evaluated to assure that no group unfairly prospers from state-subsidized power projects. This recommendation is especially important when private firms directly benefit from the expenditure of state funds.

Ideally a least-cost solution or integrated resource plan for meeting the energy requirements of the Railbelt area during the next quarter century will involve a planning process that includes participation from both the public and private sectors. The state is in an ideal position to garner such cooperation because of its role as the provider of economic subsidies and as the facilitator of debt financing through agencies such as APA and AIDEA.

I hope this information is useful. If you have any questions, please contact this agency.

Attachment

ATTACHMENT A
"Description and Costs of Alternatives,"
Railbelt Intertie Reconnaissance Study
Section 2, Volume 11, June 1989
Prepared by Decision Focus Incorporated for APA

Section 2

DESCRIPTION AND COSTS OF ALTERNATIVES

2.1 NEW INTERTIE BETWEEN ANCHORAGE AND THE KENAI PENINSULA

The preliminary design and cost estimates for these options were developed by Power Engineers, Incorporated. Two route alternatives were identified:

1. "Enstar" route, which follows an existing natural gas pipeline through the Kenai National Wildlife Refuge, followed by a submarine crossing of Turnagain Arm into Anchorage. The capital cost is estimated at \$81.7 million (in 1987 dollars). Annual operations and maintenance cost is estimated at 1.5 percent of capital cost, or \$1.2 million per year.
2. "Tesoro" route, which follows an existing oil products pipeline along the west coast of the Kenai Peninsula, followed by a submarine crossing of Turnagain Arm into Anchorage. The capital cost is estimated at \$99.4 million (in 1987 dollars). Annual operations and maintenance cost is again estimated at 1.5 percent of capital cost, or \$1.5 million per year.

Either line would be constructed at 230 KV and have a transfer capacity of 250 MW. Because the Enstar route crosses land within the Wildlife Refuge that had been proposed (though not yet designated) as "wilderness," it was anticipated that both Congressional and Presidential approval would be required to obtain the necessary right-of-way. Though cost considerations clearly favor the Enstar route, the Tesoro route was developed in case the proposed wilderness designation forced abandonment of the less expensive alternative. However, the Department of Interior has now acted favorably on a request by the State to exclude from wilderness designation a corridor adjacent to the Enstar pipeline for possible future construction of the proposed intertie. If Congress agrees to exclude the intertie corridor from wilderness designation, the two proposed routes would then be roughly equivalent in terms of permitting difficulty.

Preliminary schedules for permitting and construction suggest that completion of the intertie should not be expected prior to 1994, regardless of the route.

2.2 FULL UPGRADE OF THE EXISTING ANCHORAGE-FAIRBANKS INTERTIE

The preliminary design and cost estimate for this proposal was developed by Harza Engineering Company. Presently, the transmission link between the Wasilla area and Fairbanks consists of three segments:

1. Wasilla to Willow—138 KV line owned by Matanuska Electric Association.
2. Willow to Healy—345 KV line owned by the Alaska Power Authority (APA). The line is presently operated at 138 KV, consistent with voltages at either end.
3. Healy to Fairbanks—138 KV line owned by Golden Valley Electric Association (GVEA).

The full upgrade proposal consists primarily of new 345 KV line construction between Willow and the Chugach Electric Association (CEA) transmission system south of Wasilla, and new construction between Healy and Fairbanks. (Existing segments would be supplemented, not replaced, by the new line construction.) This revised link between Anchorage and Fairbanks would initially be operated at 230 KV, raising the transfer capability from the present level of 70 MW to 225 MW.

The capital cost of this upgrade is estimated at \$118.2 million in 1987 dollars. The additional operations and maintenance cost of the intertie following this upgrade is estimated at \$900,000 per year, again in 1987 dollars.

The main issue with respect to land use involves the new segment from Healy to Fairbanks. The proposed route crosses federal land south of the Tanana River near Fairbanks. Agreement would have to be worked out with the military at Fort Wainwright.

Again, preliminary schedules for permitting and construction suggest that completion of the upgrade should not be expected prior to 1994.

2.3 LIMITED UPGRADE OF THE EXISTING ANCHORAGE-FAIRBANKS INTERTIE

This option was developed by Power Technologies, Incorporated (PTI) at the request of APA and represents an alternative that would provide a small but potentially useful increment of transfer capability over the existing intertie. Presently,

Fairbanks can receive an estimated 61.6 MW of power over the intertie when 70 MW is input from Anchorage, assuming the existing 25-MW Healy coal plant is in operation at the time. Most of the losses are incurred on the section of the line between Healy and Fairbanks. The limited upgrade alternative would allow Fairbanks to receive an estimated 84.2 MW over the intertie when 100 MW is input from Anchorage. In other words, an additional 30 MW of power input from Anchorage would allow an additional 22.6 MW to be received in Fairbanks.

The estimated capital cost of this limited upgrade is \$8.8 million in 1988 dollars. Its main components consist of one SVS (static var) unit supplementing the three units now in place on the intertie, one additional transformer, and six series capacitors. The additional operations and maintenance cost is estimated at \$0.1 million per year.

The present system does not meet the system performance criteria established for the limited upgrade. In order for the present system to meet the same criteria at 70-MW export from Anchorage, the additional SVS unit and one series capacitor would have to be installed. This implies that system performance under the proposed limited upgrade would be improved relative to system performance today.

2.4 NEW INTERTIE FROM PALMER THROUGH GLENNALLEN TO DELTA JUNCTION (NORTHEAST INTERTIE)

The preliminary design and cost estimate for this alternative was developed by Power Engineers, Incorporated. The proposed line would be constructed at 230 KV but operated initially at 138 KV with a transfer capacity of 150 MW. In combination with the existing Anchorage-Fairbanks intertie, the combined transfer capability would therefore be 220 MW, minus whatever intermediate load is served along the Northeast intertie route. For illustration, if the intermediate load served by the intertie in the Glennallen-Valdez area were 10 MW, the combined transfer capability between Anchorage and Fairbanks would be 210 MW.

The capital cost of the Northeast intertie is estimated at \$155 million in 1988 dollars. Annual operations and maintenance cost is estimated at 1.5 percent of capital cost, or \$2.3 million per year.

Preliminary schedules for permitting and construction suggest that completion of the intertie should not be expected prior to 1994.

2.5 COAL-FIRED POWER PLANTS IN THE RAILBELT

Preliminary design and cost estimates were developed by Stone & Webster Engineering Corporation. Capital cost as well as operations and maintenance cost estimates were developed for coal-fired power plants in three different sizes (50 MW, 100 MW, and 150 MW) and four different Railbelt locations (Healy, Nenana, Beluga, and Matanuska Valley).

Table 2-1 shows a summary of the capital cost estimates and Table 2-2 shows a summary of the operations and maintenance costs.

Table 2-1

CAPITAL COST ESTIMATES (1988 dollars)

	<u>Healy</u>	<u>Nenana</u>	<u>Beluga</u>	<u>Matanuska</u>
50 MW				
\$/kW	3,322	3,378	3,476	3,119
Total (\$M)	166.1	168.9	173.8	155.9
100 MW				
\$/kW	2,499	2,522	2,610	2,340
Total (\$M)	249.9	252.3	261.0	234.0
150 MW				
\$/kW	2,143	2,158	2,235	1,952
Total (\$M)	321.5	323.7	335.3	292.9

Table 2-2

ANNUAL OPERATIONS AND MAINTENANCE COST ESTIMATES* (millions of 1988 dollars)

	<u>Healy</u>	<u>Nenana</u>	<u>Beluga</u>	<u>Matanuska</u>
50 MW	7.2	7.2	7.2	7.4
100 MW	10.2	10.2	10.2	10.5
150 MW	13.0	13.0	13.0	13.4

* Excludes first year costs for training and commissioning

The combustion technology selected for development of these estimates is atmospheric fluidized bed, based primarily on its expected cost advantage over conventional pulverized coal plants. The cost advantage results from the avoidance of a flue gas desulfurization system.

Organizations proposing to build coal-fired power plants at Healy and at Nenana have thus far maintained that such plants with capacities of approximately 100 MW could be built at an installed cost of about \$1,600 per kilowatt, in contrast to the Stone & Webster estimate of about \$2,500 per kilowatt. In other words, the Stone & Webster estimate is on the order of 50 percent higher than the estimates suggested by these prospective sponsors.

Because comparable detail has not been made available for the lower estimates, the causes of this substantial difference are not precisely known. However, it appears that the major issue is the estimate of cost differential between Alaska and the lower 48, especially in the area of labor cost.

The power system analysis focused on a single coal-fired power plant proposal: a 50-MW minemouth plant at Healy. Results are presented for two different capital cost estimates: \$1600 per kilowatt as previously estimated by potential project sponsors, and \$3322 per kilowatt as estimated by Stone & Webster for the 50-MW size. These estimates are applied only to the cost of constructing a single-purpose power plant, and do not include the additional cost that would be incurred for a cogeneration plant that could provide a significant volume of steam to an adjacent facility as well as 50 MW of power.

Stone & Webster also provided an estimate of the additional cost necessary to build and operate a cogeneration plant that could produce not only 50 MW of power, but also sufficient high quality steam for drying an estimated 650,000 tons per year of coal, although very limited resources were available for this estimation task. Their estimate is that the additional capital cost is \$368 per kilowatt, and the additional operations and maintenance cost is \$400 thousand per year. These factors were used in attempting to assess the impact on coal plant economics of constructing a cogeneration facility as proposed rather than a single-purpose power plant.

Stone & Webster concluded that coal-fired power plants at any of the four sites, and at any of the three sizes, could meet environmental standards including air quality standards, and should be able to obtain all necessary permits.

2.6 NATURAL GAS PIPELINE LINKING FAIRBANKS WITH THE COOK INLET AREA

Preliminary design and cost estimates for this alternative were also prepared by Stone & Webster Engineering Corporation. The capital cost of a 16-inch diameter natural gas pipeline linking Fairbanks with the Cook Inlet area is estimated at \$190 million in 1988 dollars. A 16-inch system could accommodate preliminary projections of residential and commercial consumption in the Fairbanks area over the next 30 years and, if required, its capacity could be expanded with compression to accommodate military consumption as well. (For purposes of comparison, the Stone & Webster capital cost estimate for a 20-inch pipeline—the size initially proposed by Enstar Natural Gas Company—is \$235 million in 1988 dollars.)

The probability that North Slope natural gas will be available in Fairbanks for transmission to Anchorage at sustained price levels that undercut Cook Inlet gas during the next 30 years was judged by APA to be too low to form a basis for pipeline planning at this time. Though possible future levels of Anchorage demand for natural gas were, as a result, not considered in sizing the pipeline proposal, the selected 16-inch system would be capable of carrying nearly enough gas to satisfy current levels of residential and commercial demand in Anchorage.

The capital cost of the distribution system in Fairbanks is estimated at \$33.8 million in 1988 dollars. The annual operations and maintenance expense for the system additions is estimated at \$4.0 million (\$2.4 million for the distribution system, \$1.6 million for the main transmission pipeline).

The major environmental issue with respect to pipeline construction would be the potential cumulative effect on fisheries resources of the numerous instream crossings proposed. However, proper construction techniques can reduce these impacts below significant levels. With respect to air quality impacts, it is expected that widespread conversion to natural gas would reduce pollutants, especially sulfur dioxide and particulates, though increased production of water from natural gas combustion compared with coal or oil may produce increased ice fog during cold weather conditions.

2.7 ELECTRIC END-USE CONSERVATION PROGRAMS

The Institute of Social and Economic Research (ISER) was given the task of identifying the most promising electric end-use conservation programs that could be devised for the Railbelt and estimating their expected costs and load reduction impacts. Because these programs are generally less well understood than the other alternatives presented in this section, they are described below in greater detail.

Based on preliminary screening criteria, nine programs were identified by ISER for further analysis. Eight of the nine programs are structured around dealer/contractor rebates, i.e., rebates to the businesses that sell or install eligible efficiency equipment, thereby reducing the price of efficiency investments faced by consumers. The ninth program would provide rebates to the owners and designers of new or remodeled commercial buildings based on the design efficiency of lighting and ventilation systems.

All the programs are intended to encourage the installation of efficient equipment either initially (in the case of the ninth program) or at the time of normal replacement of standard equipment. No intensive retrofit programs are proposed, primarily because they are more expensive (useful equipment is prematurely replaced) and the present cost of electrical generation in the Railbelt is relatively low. However, though the proposed programs are more cost-effective than accelerated retrofit-type programs, they need more time for their effects to fully register. Because the stock of appliances and equipment takes 10 to 20 years to turn over, programs that encourage efficiency upgrades at the time of normal replacement must be in place for 10 to 20 years to have the potential for affecting the entire appliance stock.

The nine programs are summarized briefly below, with the residential programs listed first, followed by commercial.

1. *Water Heater Conversions:* \$500 rebate for the conversion of a residential electric water heater to natural gas.
2. *Efficient Electric Water Heaters:* \$40 rebate for the purchase of an electric water heater with an efficiency over 95 percent.
3. *Gas Dryer Rebates:* \$170 rebate for installation of gas piping to a clothes dryer within a residence, \$50 rebate for purchase of a gas clothes dryer.
4. *Efficient Refrigerator Rebates:* \$50 rebate for purchase of refrigerator at least 28 percent more efficient than required by new federal appliance efficiency standards.
5. *Efficient Freezer Rebates:* \$50 rebate for purchase of freezer at least 35 percent more efficient than required by new federal appliance efficiency standards.
6. *Fluorescent Lamp Rebates:* Rebates from \$0.30 to \$1.80 for purchase of energy efficient fluorescent lamps.

7. *Electronic Ballast Rebates:* \$13 rebate paid for each electronic fluorescent ballast. (A ballast is the device used to start and provide proper operating conditions for fluorescent lamps.)
8. *Incandescent to Fluorescent Conversions:* \$7 to \$12 rebates for purchase of compact fluorescent lamps, adapters, and fixtures suitable for replacing incandescent lamps.
9. *Sliding-Scale New Construction Rebates:* \$1 per square foot rebate for every one watt per square foot reduction in lighting or ventilation power consumption below a threshold level. This rebate applies in the commercial sector to new construction or remodel projects, and would be divided (85 percent / 15 percent) between the building owner and the architect/engineer project designer.

The commercial lighting programs (#6, #7, and #8 above) generate nearly 60 percent of the expected savings from all nine programs. Within the residential category, the electric water heater conversion program appears to have the most impact and also the lowest cost per kilowatthour saved.

In estimating program impact, care was taken to avoid double counting efficiency measures already assumed to occur within the electric demand forecast (i.e., "market driven" efficiency), and to base projected response rates of consumers to these incentives not only on the available electric end-use data for the Railbelt but also on the program participation rates reported by others. It is estimated by ISER that if the incentive payments for all nine programs were held in place over a period of 20 years, the savings in the 20th year would be approximately 7 percent of estimated load. Load reduction impact builds over the 20-year period up to this 7 percent peak and then declines over the ensuing 20 years due to the termination of incentives, the retirement and replacement of equipment bought earlier with the incentives, and the return to "normal" purchasing behavior. The amount of electricity saved, as well as program cost, is roughly proportional to the length of the program. If the programs were in place for 5 years instead of 20, program impact would peak in year 5 at roughly 2 percent of estimated load, and then decline from there.

The technology screening analysis described in the Interim Report of the Railbelt Intertie Feasibility Study (January 30, 1989) confirmed that the top three programs consisted of two commercial lighting programs (incandescent to fluorescent conversions and rebates for more efficient fluorescent lamps) and the residential electric-to-gas hot water heat conversion program. The one program that was eliminated from further analysis was the residential rebate program for efficient freezers. For the purpose of further analysis, the programs were therefore combined into two groups: the "top three" programs and the "next five" programs.

In addition, it was assumed for subsequent analysis that the programs would remain in place for 10 years. This judgment was based on the idea that program funding over a 20-year period was unrealistic, but that more than a few years of implementation would be necessary for these types of programs to have a significant impact.

Program costs can be presented either as "resource costs" or "budgetary costs." Resource costs are used in the economic analysis and refer to the total resources expended to achieve the electric energy saving. Using the rebate program for efficient fluorescent lamps as an example, the resource costs include the incremental cost of the more efficient lamp, the additional cost of fuel for providing heat to the building (since the reduced heat output of the efficient lamps requires more output from the heating system), and the administrative costs of the rebate program. Budgetary costs include the administrative cost of the program and the cost of the rebates themselves.

For the top three programs implemented over a ten-year period, the discounted present value of resource costs is approximately \$15 million. The sum of budgetary costs is estimated at \$16.7 million in 1987 dollars, and \$24.3 million in nominal dollars assuming incentive payments increase with inflation at 4.5 percent per year.

For the next five programs, the discounted present value of resource costs is approximately \$27 million (again assuming a 10-year implementation period). The sum of budgetary costs is estimated at \$29.6 million in 1987 dollars, and \$43.9 million in nominal dollars assuming incentive payments increase with inflation at 4.5 percent per year.

ATTACHMENT B
"Recommended Guiding Principles for Alaska's Overall Energy Policy"
Alaska Energy Policy Task Force, Draft, January 20, 1988
pp D-2 to D-4

ALASKA ENERGY POLICY TASK FORCE

January 20, 1988

Draft

RECOMMENDED GUIDING PRINCIPLES FOR ALASKA'S OVERALL ENERGY POLICY

1. The overall goal of Alaska's energy policy should be the long-term availability to all Alaskans of an adequate supply of energy at the lowest total costs to the users, the environment and the State.
2. Recognizing the need to avoid rate-shock--particularly in those rural areas of Alaska where energy costs are very high, it is the policy of the State to avoid actions that in themselves create rate-shock, and also to pursue strategies intended to achieve the lowest combined costs to the State and the consumer.
3. Recognizing the value of free-market forces in bringing about the most effective uses of energy at the least overall cost, State government shall seek to develop a climate that fosters private industry, and in general, the state shall not compete with private enterprise.
4. Recognizing that Alaska's current mix of energy programs may not be the most efficient and cost-effective, and that some programs may work at cross-purposes to others, it is an immediate objective of State energy policy to integrate and modify the various energy programs where necessary to effectively serve the needs of Alaska's citizens, and with the least overall cost.
5. Recognizing that energy conservation is in the best interests of Alaska's citizens, and that efforts directed toward conservation can be more cost-effective than development of additional energy resources, the State's energy policy shall be to promote energy conservation by various means that may include education, technical assistance, development of new technologies, and perhaps direct assistance.
6. Recognizing that state government should take the primary role in necessary energy-related regulatory activities, the state's energy policy shall be to conduct those regulatory activities efficiently and cost-effectively and, as much as is practical, in coordination with other state activities.

7. Recognizing that the federal government has been conducting energy programs in Alaska and that it may continue these or similar programs in future, Alaska's energy policy shall be to coordinate closely with the federal government so that the combined federal and state activities are mutually complimentary and are directed toward the long-term benefit of Alaska's citizens.
8. Recognizing that Alaska has copious energy resources of nearly all forms--including petroleum crude, natural gas, coal, hydropower, geothermal energy, wind energy and biomass--the State's energy policy shall be to make these resources available for development.
9. Recognizing the diversity of Alaska's peoples and the fact that they live in a variety of settings within a land having several distinctly different climatic zones, the State's energy policy shall be to conduct the state's energy activities with a high awareness of the differing regional needs.
10. Recognizing the value of a proper level of planning, it is the policy of the State of Alaska, where expenditure of State funds is involved, to assist as is necessary in such planning activities as are required to accommodate the future energy needs of the State.
11. Recognizing that the state, at no or minimal cost to itself, can sometimes assist local and regional organizations in reducing capital costs of energy-related projects, it is the policy of the State to provide such assistance by either offering at cost (market-rate) loans or by assisting entities to obtain loans from other sources at the lowest cost.
12. Recognizing that it is the proper role of the state to develop information and to provide it to all parties--private industry, publicly owned organizations, and energy users--the State shall promote and participate in the collection, archival, analysis and dissemination of information needed for the conduct of energy activities; and to foster and participate in education and in research and development of energy technologies specifically useful in Alaska.

13. Recognizing that Alaska is highly subject to natural disasters, and also that Alaska is a non-contiguous state which occupies a strategic location in world affairs, thereby possibly making it subject to man-made disasters, the State's energy policy shall be to encourage local and regional energy self-sufficiency so as to mitigate the effects of each event.

14. Recognizing the high cost of energy in rural Alaska and the relative insecurity of rural Alaska economic and energy systems, it is the policy of the State of Alaska to give emphasis to the special energy needs of rural areas.

15. Recognizing that it is in the financial interest of Alaska to do so, the State should continue to own the present power production and transmission systems. It should avoid ownership of any new generation facilities if local or regional utilities can plan and build the facilities at lower combined cost to the State and the consumers. The State should continue to be involved in the planning, building and financing of transmission facilities in those cases where it is determined that the utilities or the private sector cannot provide the facilities at lower total cost to the State and the users.

ATTACHMENT C
"Demand-Side Management," Appendix A
Energy Planning in Alaska: Past Efforts and Future Direction,
House Research Agency Report 88-B, February 1988

APPENDIX A

Demand-Side Management¹

Demand-side management is the planning and implementation of utility activities designed to influence customer use of electricity in ways that will produce desired changes in the utility's load shape--i.e., changes in the time pattern and magnitude of a utility's load. Utility demand-side management programs include: load management, new uses, strategic conservation, electrification, customer generation and adjustments in market share. Demand-side management includes only those activities that involve a deliberate intervention by the utility in the marketplace to alter its load shape. Demand-side management extends beyond conservation and load management to include programs designed specifically to build load in both peak and off-peak periods.

The optimal approach to assessing the viability of demand-side management is to incorporate that assessment into the utility's formal strategic planning process with demand-side alternatives being one of many choices available to meet utility objectives. Using a three step hierarchic process to incorporate demand-side management into the planning process is an effective technique. These three steps are: establish broad utility objectives, set specific operational objectives, and determine desired load shape modifications.

The first level of a utility's formal planning process is to establish overall organizational objectives. These strategic objectives are quite broad and generally include such examples as improving cash flow, increasing earnings, or improving customer and employee relations. While overall organizational objectives are important guidelines for utility long-range planning, there is a need for a second level of the formal planning process in which a utility's objectives are operationalized to determine specific actions. It is at this operational level that demand-side management alternatives should be examined and evaluated. Specific operational objectives are established on the basis of each utility's unique situation. Operational objectives that can be addressed by demand-side management include:

¹Unless otherwise noted, this section is based on information from Battelle-Columbus Division and Synergic Resources Corporation, Demand-Side Management, Volume 1: Overview of Key Issues, Prepared for the Edison Electric Institute and Electric Power Research Institute, EA/EM-3597, August 1984.

- Reducing the need for critical fuels;
- Reducing or postponing capital investment in construction programs;
- Avoiding electrical rate increases;
- Increasing revenues or sales;
- Providing customers with options for controlling their monthly utility bills;
- Reducing risks by investing in diverse alternatives;
- Increasing operating flexibility and system reliability;
- Decreasing unit cost through more efficient loading of existing and planned generating facilities;
- Satisfying regulatory constraints or rules;
- Minimizing potential environmental impacts; and
- Improving the image of the utility.

Once established, operational objectives are translated into the desired load shape changes.

Because there are so many demand-side alternatives, the process of identifying potential candidates can be conducted more effectively by considering several aspects of the alternatives in an orderly fashion. Demand-side activities can be categorized in a two-level process in which the second level has three steps:

- Level I: • Load Shape Objectives
- Level II: • End Use
 - Technology Alternatives
 - Market Implementation Methods

The first step in the identification of demand-side alternatives is typically the selection of an appropriate load shape objective to ensure that the desired result is consistent with utility goals and constraints. Once the load shape objective has been established, it is necessary to find ways to achieve it. This is the second level in the identification process which involves three steps. The first step is identifying the appropriate end uses whose peak load and energy consumption characteristics generally match the requirements of the load shape objectives. In general, each end use (e.g., residential space heating, commercial lighting) exhibits typical and predictable load patterns. The extent to which a given end use can be used to achieve the desired load shape modification is one factor used to select an end use for demand-side management.

The second step involves choosing appropriate technology alternatives for each target end use. This process considers the suitability of the technology for satisfying the load shape objective. Even though a technology is suitable for a given end use, it may not produce the desired results. For example, although water heater wraps are appropriate for reducing domestic consumption water heater electric consumption (strategic conservation), they are not appropriate for load shifting. If load shifting was the primary objective, an option such as direct load control via receiver/switches would be a better choice. Residential demand-side technologies can be grouped into four general categories:

- Building envelope alternatives;
- Efficient equipment and appliances;
- Thermal storage equipment; and
- Energy and demand control options.

Examples of technologies in these four categories are shown in Table A.1.

The final step in identifying demand-side management alternatives involves the methods for encouraging the customer to participate in the program. Marketing methods vary for different technologies. Frequently, two or more customer adoption strategies are used simultaneously to promote a given program. The different types of customer adoption techniques require differing levels of utility involvement. Direct incentive programs, for example, represent a high degree of utility support in promoting demand-side programs. In contrast, customer awareness strategies require less. Examples of customer adoption techniques are presented in Table A.2

TABLE A.1 RESIDENTIAL DEMAND-SIDE TECHNOLOGY ALTERNATIVES

<p align="center">EFFICIENT EQUIPMENT AND APPLIANCE ALTERNATIVES</p> <ul style="list-style-type: none"> • HEAT PUMPS <ul style="list-style-type: none"> - Central Air Source Heat Pump - Ground-Water Source Heat Pump - Ground-Coupled Heat Pump - Multizone Heat Pump - Room Heat Pump • HIGH EFFICIENCY APPLIANCES <ul style="list-style-type: none"> - High-EER Air Conditioner - Energy-Efficient Cooking Appliances - Energy-Efficient Washers and Dishwashers - Energy-Efficient Refrigerators and Freezers - Efficient Lighting Fixtures and Lamps • DUAL FUEL AND ELECTRIC HEATING <ul style="list-style-type: none"> - Dual Fuel Heating Systems - Add-On Heat Pump - Active Solar Space Heating - Task Heating - Zoned Resistance Heating • WATER HEATING EQUIPMENT <ul style="list-style-type: none"> - Heat Pump Water Heater - Heat Recovery Water Heater - Solar Water Heating 	<p align="center">THERMAL STORAGE EQUIPMENT</p> <ul style="list-style-type: none"> • HEAT STORAGE <ul style="list-style-type: none"> - Central Ceramic Heat Storage - Room Ceramic Heat Storage - Slab Heating • COOL STORAGE <ul style="list-style-type: none"> - Residential Ice Storage Air Conditioning
<p align="center">BUILDING ENVELOPE ALTERNATIVES</p> <ul style="list-style-type: none"> • THERMAL TREATMENT <ul style="list-style-type: none"> - Insulation (Ceilings, Walls, Floors) - Storm and Thermopane Windows, Storm Doors - Window Treatments (Shades, Solar Screens) - Duct and Pipe Insulation - Water Heater Blanket • INFILTRATION AND INDOOR AIR QUALITY <ul style="list-style-type: none"> - Infiltration and Indoor Air Quality Control • PASSIVE SOLAR DESIGN AND DAYLIGHTING <ul style="list-style-type: none"> - Passive Solar Design - Daylighting 	<p align="center">ENERGY AND DEMAND CONTROL EQUIPMENT</p> <ul style="list-style-type: none"> • DIRECT UTILITY CONTROL <ul style="list-style-type: none"> - Receiver Switches - Water Heater Cycling Control - Air Conditioner Cycling Control • LOCAL UTILITY OR CUSTOMER CONTROL <ul style="list-style-type: none"> - Variable-Service-Level Devices - Timers - Appliance Interlocks - Programmable Controllers - Temperature-Activated Time Switches - Load Management Thermostats - Swimming Pool Pump Control

SOURCE: Battelle-Columbus Division and Synergic Resources Corporation, Demand-Side Management, Vol. 1: Overview of Key Issues, August 1984.

TABLE A.2 EXAMPLES OF CUSTOMER ADOPTION TECHNIQUES

CUSTOMER ADOPTION TECHNIQUE	OBJECTIVE	SPECIFIC ALTERNATIVES
Customer Education	Increase customer awareness of utility programs.	Bill inserts, brochures, information packets, displays, clearinghouses, direct mailings.
Direct Customer Contact	Through face-to-face communication encourage greater customer response to utility programs.	On-site energy service audits, workshops/energy clinics, store fronts/vendor sales and service.
Trade Ally Cooperation (i.e., architects, engineers, appliance dealers, heating, cooling contractors)	Increase utility capability in marketing and implementing programs.	Cooperative advertising and marketing, training, certification, selected product sales/service.
Advertising and Promotion	Increase public awareness of new programs, influence and control customer response.	Mass media (radio, TV, and newspaper), point-of-purchase advertising.
Alternative Pricing	Provide customers with pricing signals that are reflective of real economic costs and encourage a desired market response.	<ul style="list-style-type: none"> • Demand rates—rates based on the maximum kilowatt usage of a customer; the rates thus provide an incentive for customers to improve their load factor. • Time-of-use rates—rates where higher costs are incurred by the customer for using during a utility's peak period and lower costs during off-peak periods. • Off-peak rates—rates priced to reflect lower off-peak costs which offer customer service for specific end uses such as storage heating or storage water heating • Seasonal rates—rates where the season in which the utility reaches its peak has a higher flat rate than other seasons. • Inverted rates—rates where consumers pay more for each unit of electric consumed in later tail blocks. The first block may or may not consist of a lifeline rate • Variable levels of service—rates where customers subscribe to a minimum electric service consistent with their needs—e.g., interruptible rates. • Promotional rates—rates designed to attract targeted groups of customers to a utility service area for the purpose of encouraging economic development. • Conservation rates—reduced rates based on a customer's dwelling meeting minimum energy efficiency standards, including mechanical systems.
Direct Incentives	Reduce up front purchase price and risk of hardware investments to the customer and increase short-term market penetration.	<ul style="list-style-type: none"> • Low/no interest loans—loans issued to customers below the current lending rate with the length of time for repayment varying. • Cash Grants/Rebates/Buy Back—money paid to customers based on some criteria, usually the efficiency of the device, energy/demand saved, and difference in utility average and marginal costs. • Subsidized installation/modification—utility arranges to have demand-side options installed for a reduced fee or free-of-charge.

SOURCE: Battelle-Columbus Division and Synergic Resources Corporation, Demand-Side Management, Vol. 1: Overview of Key Issues, August 1984.

Taken in sequence, the four steps described above are:

- Establish the load shape objective to be met;
- Determine which end uses can be appropriately modified to meet the load shape objective;
- Select technology options that can produce the desired end use-load shape change; and
- Identify an appropriate market implementation program.

The selection of the most appropriate demand-side management alternatives is probably the most crucial and difficult question a utility faces. This process is difficult because of the number of demand-side alternatives. In addition, because the relative attractiveness of alternatives depends upon specific utility characteristics, such as load shape, summer and winter peaks, generation types, customer characteristics, and load growth, transfer of results from one service area to another may not be appropriate.

Because there are so many different demand-side alternatives available to a utility, they should be analyzed through a hierarchy of evaluation levels, starting with an intuitive selection, continuing with an aggregate analysis, and ending with a detailed and comprehensive evaluation. The first level, intuitive selection, is based on a thorough understanding of the conditions within the service area, of the generating system and any planned expansion, and of the operating characteristics of the demand-side alternatives. The intuitive selection process does not identify those alternatives that are "best" but instead identifies a number of alternatives that are, at least initially, appropriate to achieve stated goals.

The next level in identifying alternatives is a more quantitative analysis that examines costs and benefits to all parties affected by implementation of the specific program over the program's lifetime. Interested parties include the utility, program participants, other customers, and society-at-large. To calculate the costs and benefits requires quantitative information on the impact of the alternative on peak and total energy sales, the expected participation in the program, the costs of implementation, and generating system data (such as costs for existing and planned capacity and fuel costs for base and peaking units). Comparison of the benefit/cost ratios will yield a preliminary ranking of programs.

The final step in the selection of the most appropriate demand-side alternatives is a detailed analysis of the most cost-effective alternatives. In a typical detailed analysis, the performance of the utility system from both an operational and financial viewpoint is simulated over time, with and without the selected demand-side alternative. This analysis estimates changes in the generating system and its operation that will result from the altered load shape produced by the selected demand-side alternatives.

Implicit in the selection process is a definite strategy to reduce the information requirements to manageable levels consistent with the trade-off between the data collection/analysis expense and the resulting level of accuracy in the evaluation. This strategy focuses on quickly and efficiently reducing the number of alternatives appropriate for a given utility. Detailed analyses of demand-side management alternatives are data intensive, requiring information in four major categories:

- Service area specific customer and end-use characteristics (type of equipment in use, stock estimates of equipment, patterns of usage);
- Operating/technical characteristics of the alternatives;
- Characteristics of the supply system (operating costs, reliability, initial cost); and
- Customer acceptance of alternatives.

Once the cost-effectiveness of demand-side management programs has been determined, programs can be implemented. Program implementation involves the many detailed day-to-day decisions that must be made to realize the goals of the program. Developing, installing, and operating a generating plant takes years of planning and scheduling, rigorous analytical modeling, calculations concerning reliability and maintenance, and strict construction scheduling. Similarly, the implementation of a demand-side management program intended to replace the need for all or part of a generating plant requires equally rigorous evaluation. The lack of data, inadequate experience with building models, and problem complexity are challenges to be overcome.

The implementation phase usually occurs in distinct stages. As a result of logistics and uncertainty over customer acceptance and response, a demand-side program can be introduced gradually through pilot projects. If the results from the pilot experiments look promising, the utility may proceed with full-scale implementation and operation.

ATTACHMENT D
Testimony of Thomas R. Starr to the
Alaska House Resource Committee

TESTIMONY OF THOMAS R. STAHR
TO THE HOUSE RESOURCES COMMITTEE

Mr. Chairman, members of the House Resources Committee, my name is Thomas Stahr and I am General Manager of the Municipal Light and Power Department of the Municipality of Anchorage. I am testifying in favor of the funding and construction of new electric transmission interties, both from Anchorage to the Kenai and from Anchorage to Fairbanks.

In its draft study the Alaska Power Authority assumed that certain technological fixes applied to existing old, low capacity transmission lines would result in performance nearly as good as a new transmission line. The result of this assumption was a perceived low benefit to cost ratio for both interties and a anomalously high benefit to cost ratio for the limited upgrade of the northern intertie. I want to explain why, in my professional opinion, these results are illusory and why implementation of the proposed enhancements may result in serious problems.

First, it is necessary to understand that the Bradley Project, as designed, has certain rather unique control features which limit normal operation to operating interconnected with a relatively large power system. Since there is no surge tank or surge chamber in the turbine water supply, operation of the power control valves are restricted to a very slow rate so it is necessary to have other generation units operating in parallel to absorb sudden load variations. There is a device to deflect water away from the turbine runner (wheel) which is normally used to prevent dangerous overspeed on sudden loss of load and it is hoped this device can be used to help govern the unit but there may be no way short of adding the usual surge tank to markedly improve load pick up ability. The braking resistor being proposed as a part of the technological fix is also to help control the tendency toward speed and voltage increase before the deflectors can operate. It is incomprehensible to me why a project would be designed so that strong interconnections are absolutely necessary for successful operation and then the agency ultimately responsible for that design would attempt to argue that the strong interconnection is not cost effective.

The existing Chugach line connecting Anchorage to the Kenai is thirty some years old and in need of major repair. Certainly well within the study period it will have to be replaced. While I have no detailed estimates of what this will cost, location and route alone indicate this cost will be high compared to the cost of constructing a line on the route proposed for the new line. This old line is also subject to frequent faults and interruptions due to snow slides and other environmental factors. I can personally attest to problems this causes our customers in Anchorage and to the strains the repeated short circuits place on ML&P generators which absorb much of the surge on the Anchorage end. Faults on this old line have frequently caused Providence Hospital and other ML&P customers with sensitive load requirements to be forced to transfer to emergency

line into something nearly as good as a new line let's examine what it will do for the new line and what the additional benefits of rebuilding the old line are if we have an enhanced new line. Looking at the benefits shown, the major ones are for reduced transmission losses, increased economy energy, capacity sharing and reliability improvements. These constituted 92% of the benefits of building the new line. Starting with losses and assuming the 138Kv new line was in place there would be very minor loss reduction from rebuilding the old line because it is so much longer. There would be little if any reliability improvements. In fact, I believe rebuilding the old line would likely make reliability worse. On capacity sharing, the longer length of the old line makes it of marginal value and finally, it's effect on economy energy would be marginal. Therefore, at least qualitatively, using the study logic, we can see there is very little value in rebuilding the old line so under this premise it would not be done. But the study assumed it would be done so the study impeaches itself.

At this point, I want to make it clear that we have not determined that the old line should or should not be rebuilt. What we have determined is that the cost of rebuilding the old line cannot be ignored and it either must be included in the benefits of the new line or the benefit of the existing line with the high tech fixes are not as great as assumed. Thus, the benefits of a real new line are much greater than represented. I am convinced either of these resolutions to the logical fallacy will result in a benefit to cost ratio well in excess of one.

I urge you to fund the Interties so we can obtain needed transmission lines which will continue to benefit railbelt ratepayers for years to come.

ATTACHMENT E
Energy Planning in Alaska: Past Efforts and A Future Direction,
House Research Agency Report 88-B
pp 20 to 28

CORRECTION

**THIS DOCUMENT
HAS BEEN REPHOTOGRAPHED
TO ASSURE LEGIBILITY**

TESTIMONY OF THOMAS R. STAHR
TO THE HOUSE RESOURCES COMMITTEE

Mr. Chairman, members of the House Resources Committee, my name is Thomas Stahr and I am General Manager of the Municipal Light and Power Department of the Municipality of Anchorage. I am testifying in favor of the funding and construction of new electric transmission interties, both from Anchorage to the Kenai and from Anchorage to Fairbanks.

In its draft study the Alaska Power Authority assumed that certain technological fixes applied to existing old, low capacity transmission lines would result in performance nearly as good as a new transmission line. The result of this assumption was a perceived low benefit to cost ratio for both interties and an anomalously high benefit to cost ratio for the limited upgrade of the northern intertie. I want to explain why, in my professional opinion, these results are illusory and why implementation of the proposed enhancements may result in serious problems.

First, it is necessary to understand that the Bradley Project, as designed, has certain rather unique control features which limit normal operation to operating interconnected with a relatively large power system. Since there is no surge tank or surge chamber in the turbine water supply, operation of the power control valves are restricted to a very slow rate so it is necessary to have other generation units operating in parallel to absorb sudden load variations. There is a device to deflect water away from the turbine runner (wheel) which is normally used to prevent dangerous overspeed on sudden loss of load and it is hoped this device can be used to help govern the unit but there may be no way short of adding the usual surge tank to markedly improve load pick up ability. The braking resistor being proposed as a part of the technological fix is also to help control the tendency toward speed and voltage increase before the deflectors can operate. It is incomprehensible to me why a project would be designed so that strong interconnections are absolutely necessary for successful operation and then the agency ultimately responsible for that design would attempt to argue that the strong interconnection is not cost effective.

The existing Chugach line connecting Anchorage to the Kenai is thirty some years old and in need of major repair. Certainly well within the study period it will have to be replaced. While I have no detailed estimates of what this will cost, location and route alone indicate ths cost will be high compared to the cost of constructing a line on the route proposed for the new line. This old line is also subject to frequent faults and interruptions due to snow slides and other environmental factors. I can personally attest to problems this causes our customers in Anchorage and to the strains the repeated short circuits place on ML&P generators which absorb much of the surge on the Anchorage end. Faults on this old line have frequently caused Providence Hospital and other ML&P customers with sensitive load requirements to be forced to transfer to emergency

generation. Supercharging this old line with technological fixes will militate against efforts to isolate Anchorage customers from efforts of faults on this line.

The technical fixes proposed to transform the old line into something approaching a real new transmission line are the addition of power system stabilizers, series capacitors and static var units. All of these devices are used in certain instances to overcome transmission or stability problems when a more conventional approach is inadequate. But to the best of my knowledge, they have not heretofore been considered as a surrogate to a proper transmission line. Each of these devices can cause serious problems if misapplied or if unanticipated operating conditions occur. Series capacitors have, on occasion, engendered sub-synchronous resonance conditions which can be damaging to generators and large industrial motors. Power Technologies, Inc., who proposed the technological fixes, admit they cannot be sure that sub-synchronous problems can be precluded and that other fixes must be used. Unless exhaustive studies are done beforehand we may find out we have a problem the same way most series capacitor problems are found, that is by bitter and expensive experience. Static var units are active devices, hence, subject to failure and miss operation. With the Anchorage/Fairbanks tie line we went through several years of problems before getting the static var units to perform properly. They also create harmonics on the power system which can cause problems for customers' electronic equipment. Certainly the few static var units we now have in service have not caused a problem but with massive additions the situation may be different. The power system stabilizers will help system stability only when they operate as planned but unless all possible situations are modeled, conditions may arise where they destabilize the system. Additionally, the combination of all these devices together means we will be operating a power system in the outer limits of standard utility operating practice. It has long been a fundamental Alaskan power system design principle that this is not the place to experiment with new technology when our customers are the experimental subjects. We should take heed from the recent Ontario Hydro experience where the whole Province was blacked out by Auroral currents and the cause was the saturation of a static var unit used in conjunction with series capacitors, exactly the same combination the Power Authority is suggesting we use. Ontario Hydro had used this combination because they had no alternative in bringing power from remote hydro plants. It is being proposed in our case because it is perceived as a cheap fix. Personally, I doubt that it is a fix or that in the long run that it will be cheap.

If one examines the alleged benefits from the new transmission line one does not find any benefits due to not having to rebuild the old transmission line. I have been told that it is because they expect the utilities to rebuild the old line in any case. To test this hypothesis, one should imagine the case where the new line has been built and the benefits of replacing the old line are being considered. Certainly part of it would be required in any case, to get power to Girdwood and Seward. Much cheaper distribution lines could bring power to Portage and Whittier and for Sunrise and Hope a small automated diesel could be installed at an insignificant fraction of the cost of rebuilding a major transmission line segment. Now, if we accept the Power Authority's "silk purse" scenario that a few high tech gadgets will transform the "sows ear" of the old