HCR

21

SFIN

FILE

SENATE FINANCE COMMITTEE REPORT

DATE: 5/14/03

FURTHER:

DATE TURNED IN TO OFFICE: 16 May 2003

Finance Committee considered CS FOR HOUSE CONCURRENT RESOLUTION NO. 21(FIN)

HCR 21 ALASKA ENERGY POLICY TASK FORCE

Relating to establishing the Alaska Energy Policy Task Force.

and recommends:

[✓] be **replaced** with S CS CS HCR 21 (FIN)

[ ] adopt **previous** CS CS Forthcoming ( )

[ ] attached amendment(s)

[ ] adopt Letter of Intent by ______ Committee

[ ] further referral to ______ Committee

Senate Bill:
[✓] same title
[ ] new title

House Bill:
[ ] same title
[ ] technical title
[ ] new: SCR #____

NEW FISCAL NOTE(S):

Department	Date	Fiscal	Zero	FN#

PREVIOUS FISCAL NOTE(S):

Department	Date	Fiscal	Zero	FN#
Legislature	5/4/03	78.0		#1

[ ] **APPROPRIATION - no fiscal note**

SIGNATURES AND RECOMMENDATIONS:	DO PASS	DO NOT PASS	NO REC	AMEND
Donald L. Taylor	✓			
Ben Stevens	—			
[signature]	✓			
[signature]			✓	
COCHAIR: Lyda Green	✓			
COCHAIR:				

FISCAL NOTE

STATE OF ALASKA
2003 LEGISLATIVE SESSION

Fiscal Note Number: 1
Bill Version: CSHCR 21(FIN)
(H) Publish Date: 5/9/03

Revision Date/Time (Note if correction):
Title: Relating to establishing the Alaska Energy Policy Task Force.
Sponsor: Representative Harris
Requester: House Finance Committee

Dept. Affected: Legislature
BRU: Legislative Council
Component: Council and Subcommittees
Component No. 783

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

OPERATING EXPENDITURES	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
Personal Services	54.0					
Travel	20.0					
Contractual	3.0					
Supplies	1.0					
Equipment	0.0					
Land & Structures						
Grants & Claims						
Miscellaneous						
TOTAL OPERATING	78.0	0.0	0.0	0.0	0.0	0.0
CAPITAL EXPENDITURES						
CHANGE IN REVENUES ( )						

FUND SOURCE (Thousands of Dollars)

FUND SOURCE	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
1002 Federal Receipts						
1003 GF Match						
1004 GF	78.0					
1005 GF/Program Receipts						
1037 GF/Mental Health						
Other (Specify Type--Do not abbreviate)						
TOTAL	78.0	0.0	0.0	0.0	0.0	0.0

Estimate of any current year (FY2003) cost:
Check this box (X) if funding for this bill is included in the Governor's FY 2004 budget proposal: [ ]

POSITIONS

POSITIONS	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
Full-time						
Part-time	1					
Temporary						

ANALYSIS: *(Attach a separate page if necessary)*

HCR 21 establishes the Alaska Energy Policy Task Force to review and analyze the state's current and long term energy needs. This Task Force is composed of 9 public members who will meet in person and by teleconference and will submit a report regarding their finds regarding a Railbelt energy plan to the Legislature by December 31, 2003.

Prepared by: Karla Schofield, Deputy Director — Phone 465-3852
Division: Administrative Services — Date/Time 5/8/03 8:28 AM
Approved by: Pamela Varni, Executive Director — Date 5/8/2003
Agency: Legislative Affairs Agency

(Revised 9/2001 OMB)

FISCAL NOTE #1

STATE OF ALASKA
2003 LEGISLATIVE SESSION

BILL NO. CSHCR 21(FIN)

ANALYSIS CONTINUATION

The task force will be staffed by a range 18. Personal Services cost 54.0

Travel for the public members of the task force and staff to attend meetings 20.0

Travel for the Executive Branch members will be absorbed within Executive Branch Agencies.

Contractual for phone costs, postage - 3.0

Costs for teleconferencing and for printing the report will be absorbed within the Legislative Affairs Agency.

SENATE FINANCE
COMMITTEE
Amendment Number: #1
Bill Number: HCR 21
Sponsor: Stevens Date: 5/16/03
Logged In By: Robin
adopted

AMENDMENT

OFFERED IN THE SENATE BY SENATOR B. Stevens

TO: CSHCR 21(FIN)

Page 2, line 19, following "revenue":

Insert "or the commissioner's designee"

SENATE CS FOR CS FOR HOUSE CONCURRENT RESOLUTION NO. 21(FIN)

IN THE LEGISLATURE OF THE STATE OF ALASKA

TWENTY-THIRD LEGISLATURE - FIRST SESSION

BY THE SENATE FINANCE COMMITTEE

Offered:
Referred:

Sponsor(s): REPRESENTATIVES HARRIS, Masek, Chenault, Foster, Morgan, Lynn, Cissna, Wilson, Dahlstrom, Guttenberg, Crawford, Gara, Berkowitz

A RESOLUTION

Relating to establishing the Alaska Energy Policy Task Force.

BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:

WHEREAS an adequate, reliable, reasonably priced, and safe supply of electric energy is a basic necessity; and

WHEREAS other infrastructure elements such as water, wastewater, transportation, and telecommunications systems are dependent on an adequate, reliable, reasonably priced, and safe supply of energy; and

WHEREAS meaningful economic development and technological advancement cannot occur in Alaska without an adequate, reliable, safe, and reasonably priced energy supply; and

WHEREAS over 85 percent of the state's electrical consumption occurs in the Railbelt; and

WHEREAS the needs of the non-Railbelt areas of the state include more electrical infrastructure and less expensive power; and

WHEREAS it would be beneficial to examine how electricity is generated, transmitted, and distributed in Alaska in order to meet the state's existing and future electrical needs in the safest and most efficient manner; and

WHEREAS the financial resources of the state are limited;

BE IT RESOLVED that the Alaska State Legislature establishes the Alaska Energy Policy Task Force to review and analyze the state's current and long-term energy needs; and be it

FURTHER RESOLVED that the task force shall consider how best to incorporate state-owned Railbelt energy assets as part of the solution for the Railbelt's current and long-term electrical needs; and be it

FURTHER RESOLVED that the task force shall also address those elements of the state's long-term energy needs that can be solved through action on the part of industry, government, or both industry and government working together, such as through pooling and integrated resource planning; and be it

FURTHER RESOLVED that the task force shall develop a long-term energy plan for Alaska that will efficiently enhance the state's economic future; and be it

FURTHER RESOLVED that the task force shall be composed of nine members as follows:

(1) one member from the directors of the Alaska Energy Authority, selected by the directors;

(2) the commissioner of revenue or the commissioner's designee; Amend. #1

(3) two members chosen by the governor who are not members of the legislature;

(4) three members chosen by the president of the senate who are not members of the legislature, one of whom must be from a list of three names proposed jointly by the minority leaders of the house of representatives and the senate, and the appointment from the list shall be made after consultation with the speaker of the house of representatives;

(5) two members chosen by the speaker of the house of representatives who are not members of the legislature; and be it

FURTHER RESOLVED that members shall be chosen in such a manner that a utility will not have more than one representative on the task force, but at least one member will be from a Railbelt electrical utility, and at least one member will be from a non-Railbelt electrical utility; and be it

FURTHER RESOLVED that the members of the task force shall select a chair from among themselves; and be it

FURTHER RESOLVED that task force members who are not state employees are entitled to per diem and travel expenses as for members of boards and commissions under AS 39.20.180; and be it

FURTHER RESOLVED that a staff member and other resources shall be provided to the task force, as necessary, by the legislature; and be it

FURTHER RESOLVED that the task force shall submit a report of its findings regarding a Railbelt energy plan to the legislature by December 31, 2003, and may make any interim reports on Railbelt energy issues it considers advisable; and be it

FURTHER RESOLVED that the task force shall submit reports of its finding regarding energy plans for areas of the state other than the Railbelt to the legislature by March 31, 2004, and may make any interim reports it considers advisable; and be it

FURTHER RESOLVED that the task force is terminated at 11:59 p.m. on April 15, 2004.

Alaska State Senate

Senate Finance Committee

Official Business

Mail Stop 3100
State Capitol
Juneau, Alaska 99801-1182

FAX COVER SHEET

DATE: 16 May 2003 TIME: 3:30 pm

TO: Legal Services

NUMBER OF PAGES, INCLUDING COVER SHEET: 2

FROM: MINDY ROWLAND
SENATE FINANCE COMMITTEE SECRETARY
PHONE: 465-4935
FAX: 465-2187

NOTES: Final Please
SCS HCR 21 (FIN) 23-LS1079\H

plus attached amendment (#1)

Thx.
mindy

Alaska State Legislature

REPRESENTATIVE JOHN HARRIS

District 35 - Valdez, Cordova, Whittier, Glennallen, Delta Junction, Tatitlek, Kenny Lake, Paxson, Gakona, Chenega Bay

SPONSOR STATEMENT
COMMITTEE SUBSTITUTE FOR HOUSE CONCURRENT RESOLUTION 21 (FIN)

Relating to establishing the Alaska Energy Policy Task Force

The purpose of this resolution is to establish a task force composed of non-legislative members to develop a long-term energy plan for Alaska.

The task force will be composed of:

- A member from the directors of the Alaska Energy Authority
- The Commissioner of Revenue
- Two members chosen by the Governor
- Three members selected by the President of the Senate, one of whom must be from a list of three names proposed jointly by the minority leaders of the House and Senate.
- Two members selected by the Speaker of the House

The task force will elect its own chair from among the members. It is intended that the task force be composed of non-legislative members and that a utility will not have more than one representative. If utility members are selected, at least one must be from a Railbelt electrical utility and at least one member must be from a non-Railbelt electrical utility.

The task force, once selected, is charged with developing a long-term energy plan for the Railbelt area first and submit a report to the legislature by December 31, 2003. Their second task is to develop a long-term energy plan for the non-Railbelt parts of the state and submit a report by March 31, 2004.

A comprehensive long-term energy plan is needed for the state to promote more economic development and technological advancement. A sustainable, affordable and reliable source of power will be required to enhance that growth. A thorough review of existing and long-term needs will assist our state and all electrical power consumers in meeting that goal.

Co-Chair: Community and Regional Affairs Committee; Member: Resources, Labor and Commerce, Oil and Gas, Fisheries and Regulation Review
Session: State Capitol, Juneau, Alaska 99801-1182 • Phone: (907) 465-4859 Fax: (907) 465-3799
Interim: P.O. Box 1245, Valdez, Alaska 99686 • Phone (907) 835-2836 Fax: (907) 835-3732

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SECTION 4

Railbelt Region

The south-central area of Alaska, including the Kenai Peninsula through Anchorage and into Fairbanks in the interior of the state, is generally referred to as Alaska's Railbelt because it corresponds to the route of the Alaska Railroad, a major ground transportation link between Seward, Anchorage, and Fairbanks. Approximately 72 percent of the state's total population resides in the Railbelt Region.

The Railbelt boroughs or other census areas are as follows (also see Figure 4-1):

- Anchorage
- Fairbanks/North Star
- Kenai Peninsula (includes Homer and Seward)
- Matanuska-Susitna
- Southeast Fairbanks census area

Demographic and Economic Characteristics

The total population of the Railbelt Region in 1997 was estimated by the State Department of Labor to be 443,000. This includes Anchorage, Fairbanks/Northstar, Kenai Peninsula, Matanuska-Susitna, and Southeast Fairbanks.

Since the last official census in 1990, the population of this area increased at an average annual rate of 1.5 percent. The population and rate of change since 1990 are shown in Table 4-1 for each of the census areas in the Railbelt.

TABLE 4-1
Population and Rate of Change in Railbelt Areas Since 1990

Borough/Census Area	1997 Estimated Population	Average Annual Rate of Change, 1990-1997 (%)
Anchorage	251,145	1.5
Fairbanks Northstar	84,451	1.2
Kenai Peninsula	47,356	2.2
Matanuska-Susitna	54,519	4.6
Southeast Fairbanks	5,614	(0.7)
Total	443,000	1.5

The Municipality of Anchorage, with a 1997 population of 251,000, is the most populous community in the state, followed by the Fairbanks North Star Borough at 84,000.

Provided by Rep. Harris

The population centers in the Railbelt tend to be larger and have more diversified economies than the rest of the state. Anchorage is the state's center of commerce, serving as the headquarters for oil and gas industries; communications, finance, and real estate firms; the Alaska Railroad; and government agencies. On the Kenai Peninsula, tourism, commercial fishing, fish processing, government, timber and lumber, agriculture, transportation services, construction, and retail trade play major roles in the economy. Fairbanks, Alaska's second largest city, is the center of Alaska's interior and serves as a center for government, has the main campus of the University of Alaska, and acts as a transportation hub and tourism center.

Based on 1990 census data, the Railbelt area has 75 percent of the State's personal income and 74 percent of its households. The average 1997 personal income per capita for the Railbelt ($25,742) was about the same as for the United States as a whole ($25,290).

Description of Energy Uses

Electric Service

Utilities

The Railbelt electric utilities are all publicly owned (municipally or cooperatively). The utilities and the cities and boroughs they serve are listed in Table 4-2. The service areas of these electric utilities are interconnected with one another as shown in Figure 4-1.

Generation Mix

The total installed electric generating capacity in the Railbelt is 1,420 MW, as shown in Table 4-3. Power generation in the Railbelt is made up of gas-fired generation (894 MW), oil-fired generation (241.5 MW), hydroelectric (177 MW), and coal (51 MW). This does not include the Healy Clean Coal Project with a capacity of 53 MW. The Kenai Peninsula-Anchorage area generation is primarily natural gas fired, with a moderate amount of hydroelectricity. The Fairbanks area is predominantly oil fired, with some coal. For the entire region, the mix is 62 percent natural gas, 17 percent oil, 13 percent hydroelectric, and 8 percent coal (Figure 4-2). The Railbelt electric utilities enjoy a certain economy of scale in their operations when compared to the rest of Alaska.

In 1997, Railbelt electric energy generation was 70 percent natural gas based, 13 percent hydroelectricity, 13 percent oil, and 5 percent coal. All of the coal was used by GVEA for the Fairbanks area, where coal was the fuel for 27 percent of the electricity generated. The rest of GVEA's electricity generation was oil fired. In the Anchorage area, 84 percent of the generation was with natural gas and 16 percent was hydroelectric.

TABLE 4-2
Railbelt Cities, Boroughs, and Electric Utilities

City/Borough	Utility	Ownership Type	Customers Served	Peak Demand (MW)[b]	MWh Sales
Anchorage[a]	Anchorage Municipal Light & Power (ML&P)	Municipal	29,456	151	838,533
Anchorage and upper Kenai Peninsula	Chugach Electric Association, Inc. (Chugach)	Rural Utility Service (RUS) Cooperative	66,594	388.3	1,025,250
Fairbanks, Delta, Nenana, Healy, Cantwell	Golden Valley Electric Association, Inc. (GVEA)	RUS Cooperative	30,709	175.5	841,820
Homer, Seldovia, English Bay, Port Graham, Soldotna, Kenai	Homer Electric Association, Inc. (HEA)	RUS Cooperative	21,594	78.8	424,126
Palmer, Wasilla, Willow, Sutton, Talkeetna, and NE part of Anchorage	Matanuska Electric Association (MEA)[c]	RUS Cooperative	34,684	97.7	455,516
City of Seward and north 25 along Seward Highway	City of Seward	Municipal	2,066	9	48,961

[a] ML&P provides service to a large portion of the commercial and high-density residential areas within the Municipality. Chugach and MEA serve the remainder of the loads within the Municipality.
[b] Retails sales only; excludes sales for resale.
[c] Excludes the Unalakleet Division.

Source: 1997 data from the U.S. Energy Information Administration, except as noted.

The Healy Clean Coal Project (HCCP), a 53-MW coal-fired powerplant, will become available in 1999. The HCCP is owned by AIDEA. GVEA is obligated to purchase all power generated at the HCCP if it is in commercial operation by the year 2000. GVEA has initiated litigation against AIDEA in a dispute regarding the terms of the power purchase contract.

The utilities have no firm plans to develop new additional generating resources in the next 10 years.

GVEA is in the process of installing a 40-MW battery energy storage system (BESS) in south Fairbanks to provide 20 minutes of backup power under outage conditions. The BESS, in conjunction with the second Healy to Fairbanks transmission line discussed below, will provide GVEA's spinning reserve requirement and will allow increased use of less expensive energy from the south. With Healy generation on-line, the northward transfer of less expensive energy is limited to about 20 to 30 MW. With the second line, this can be increased to over 60 MW.

GVEA is using four different load-shedding approaches to shed load when the Railbelt intertie is lost. With the installation of the BESS, these systems will not be needed. GVEA estimates that the battery installation will reduce its power supply/transmission- related outages by 75 percent.

TABLE 4-3
Railbelt Region Generating Plants

Project	No. of Units	Type	Utility Ownership	Nameplate Capacity (MW)	Heat Rate Range (Btu/kWh)
ML&P Plant 1	4	Gas	ML&P	68.3	13,980 – 17,324
ML&P Plant 1	2	Oil	ML&P	2.2	
ML&P Plant 2	4	Gas-Combined Cycle	ML&P	266.3	8,527 – 11,557
Beluga	8	Gas-Combined Cycle	Chugach	418.1	9,149 – 17,320
Bernice Lake	3	Gas	Chugach	87.0	13,512 – 13,715
International	3	Gas	Chugach	54.2	15,030 – 17,384
Soldotna	1	Oil	Chugach	37.9	11,401
Chena	1	Coal	Aurora	29.0	12,256
Fairbanks North Star	4	Oil	GVEA	40.4	14,560 – 25,679
Healy (Fairbanks North Star)	1	Oil	GVEA	25.0	
North Pole	2	Oil	GVEA	129.4	9,154 – 9,751
Healy	1	Oil	GVEA	2.5	11,451 – 13,995
Healy	2	Coal	GVEA	25.0	11,451 – 13,995
Bradley Lake	2	Hydro	Alaska Energy Authority	114.0	NA
Eklutna	2	Hydro	Jointly owned by ML&P, Chugach, and MEA	47.0	NA
Cooper Lake	2	Hydro	Chugach	16.6	NA
Seldovia (Kenai Peninsula)	4	Oil	HEA	2.1	NA
Unalakleet Imatanuska-Susitna	1	Oil	MEA	2.0	NA
Healy Clean Coal Project (HCCP)	1	Coal	AIDEA	53.0	NA

Source: U.S. Energy Information Administration, 1997.

In general, the natural gas and oil-fired generation units in the Railbelt have heat rates ranging from 8,500 to 17,000 Btu/kWh. The units with the lower heat rates are more fuel efficient to operate. Both Chugach and ML&P have combined-cycle units that use exhaust heat from gas-fired combustion turbines to produced steam and drive steam turbines. The overall efficiency of these combined cycle units is superior to simple-cycle combustion turbines.

In the southern Railbelt area, the Bradley Lake and Cooper Lake projects are preferably operated to follow system loads and maintain system frequency. Because of transmission constraints (the single 115-kV line from the Kenai Peninsula to the Anchorage area) and generation instability concerns, it is normal practice to keep this line's loading to minimal levels. As a result, the use of the Kenai hydroelectric projects to follow load is constrained and opportunities are lost for less expensive energy transfer into the Kenai.

Transmission Interconnections

The overall transmission line interconnections in the Railbelt are shown in Figure 4-3. Details of the transmission systems in Anchorage, Fairbanks, and Homer are shown in Figures 4-4, 4-5, and 4-6, respectively.

The Fairbanks area is interconnected to the Anchorage area by the Alaska Energy Authority's Alaska Intertie, a 170-mile, 345-kV transmission line, currently operated at 138 kV. This line allows GVEA to purchase lower cost electrical energy from the Anchorage utilities. This is a single radial line between the Anchorage area and the Fairbanks area. In the Fairbanks area, there is a system of looped 138-kV and 69-kV lines.

At Healy, GVEA has 25 MW of coal-fired generation and takes the 53-MW output of the HCCP, for a total of 78 MW of generation at Healy to serve the Fairbanks area. The line north from Healy has a transfer capacity of 100 MW. For the line into Healy from the south, normal loading is currently about 20 to 30 MW. This line from the south has an emergency transfer rating of 70 MW. Above this transfer level, Fairbanks will suffer an outage if the transmission line goes out of service.

A second transmission line (to be constructed at 230 kV and operated at 138 kV) between Healy and Fairbanks is currently in the permitting process and is expected to be in operation in late 2001. This line will allow the increased use of less expensive energy from the Anchorage area. As discussed above, the BESS will increase the south-to-north transmission capacity to 140 MW.

In the Anchorage area, there is a looped system of 115-kV, 138-kV and 230-kV transmission lines. These lines are owned by either Chugach or ML&P.

Between the Anchorage area and the Kenai Peninsula, there is a single Chugach-owned radial 115-kV transmission line with a transfer capability of 70 MW. This limits the ability to transfer Bradley Lake output to the purchasing utilities in the Anchorage area. Less espensive energy flows both ways on the line depending on the relative incremental costs of generation on the Kenai and the Anchorage area. On the Kenai Peninsula, transmission service to the Homer area is looped; service to the Seward area is radial.

The single-line interconnection between the Kenai and Anchorage areas is a significant constraint. It contributes to a lack of electric system stability, results in low levels of transfer capability, limits the opportunities for transfers of less expensive energy, and constrains the coordinated operation of the Kenai hydroelectric projects and the Anchorage area thermal plants. An environmental impact study is being prepared for a new southern intertie that would provide a second transmission line from the Anchorage area to the Kenai. If constructed, the earliest this line might be in service is estimated to be 2005. This line would increase the transfer capability from 70 MW to 125 MW.

Electric transmission issues in the Railbelt have been the subject of study for many years. The Alaska Systems Coordinating Council is a subgroup of the North American Electric Reliability Council (NERC) and promotes improved reliability through regional coordination. In 1991, it adopted planning and operating criteria for the Railbelt utilities to help ensure that the Railbelt bulk power system is efficient and reliable. These criteria guide transmission planning and generation planning and operation in the Railbelt.

A 1998 study by Black and Veatch International evaluated the merits of centralized generation dispatch of Railbelt generation. The Black and Veatch study estimated saving of 3.5 percent a year from joint operation and development of Railbelt generation. The present value of the estimated savings was $48 million, before the costs of establishing the joint operation infrastructure. The Railbelt utilities disagreed over the significance of these savings and whether in fact joint operation would save money.

Electricity Consumption per Customer

The annual energy consumption of residential customers of the Railbelt utilities averaged 8,079 kWh (673 kWh per month) in 1997. Annual consumption per customer varied significantly between the utilities, however, with Seward the highest at 9,141 kWh and ML&P the lowest at 6,160 kWh (Table 4-4). There is no readily apparent correlation between the cost of power and the average annual usage.

Over 80 percent of ML&P's sales were to commercial customers; there were no sales to "industrial" class customers. For Chugach, almost 50 percent of its sales were to commercial customers and over 3 percent were to industrial customers.

TABLE 4-4
Average Annual Energy Usage in 1997

Utility	Average Annual kWh per Customer
Anchorage Municipal Light & Power	6,160
Chugach Electric Association	8,142
Golden Valley Electric Association	9,013
Homer Electric Association	7,765
Matanuska Electric Association	8,722
Seward Electric System	9,141
TOTAL	8,079

Source: http://www.eia.doe.gov/cneaf/electricity/esr/t14a.txt.

The average annual electricity bill in the Railbelt is $824.80 and ranges from a low of $597.14 at ML&P to a high of $1,094.80 at Seward. As a percentage of household income, this represents an areawide average of 1 percent.

Fuel Sources

Natural gas is the primary generation fuel in Anchorage, the Kenai Peninsula, and the Railbelt as a whole. In the Fairbanks area, however, coal serves as the primary generation fuel supplemented by import of gas-fired electricity from Anchorage. Three hydroelectric facilities (Eklutna, Bradley Lake, Cooper Lake) provide the rest of the generation in the Railbelt.

Most of the natural gas used as generation fuel is from the Beluga River gas fields located west of Anchorage. Chugach's Beluga powerplant is located near the gas fields. Gas to fuel ML&P's powerplants is delivered by pipeline to the immediate Anchorage area, where both of ML&P's plants are located. Natural gas is also found on the Kenai Peninsula. The Soldotna powerplant is located near these gas wells.

Coal is mined in Healy, located south of Fairbanks, and is used to fuel GVEA's Healy powerplant and the HCCP project, both located near the mine in Healy. Coal also is transported by rail to Fairbanks where the Chena powerplant is located.

Cost of Power

The retail cost of power to consumers in the Railbelt averaged 8.66 cents per kWh in 1997 with a range of 7.87 cents per kWh at GVEA to 11.78 cents per kWh at Seward. The cost of power to residential customers ranged between 9.46 cents per kWh at GVEA to 11.98 cents per kWh at Seward, with a region average of 10.21 cents per kWh. On average, commercial customers paid 8.19 cents per kWh. With the exception of Seward, Railbelt commercial rates are somewhat lower than residential rates. Table 4-5 shows the average retail cost of power to consumers in the Railbelt region. Figures 4-7 and 4-8 show the average electric rates by utility and by sector.

TABLE 4-5
1997 Average Revenue per kWh Sold

	Cost of Power (cents/kWh)			
Utility	Total	Residential	Commercial	Industrial
ML&P	8.11	9.69	7.67	NA
Chugach	8.85	9.88	7.86	6.47
GVEA	7.87	9.46	8.96	6.29
HEA	8.94	11.45	9.76	5.06
MEA	10.07	10.96	8.64	NA
Seward	11.78	11.98	13.33	10.35
Railbelt Average	8.66	10.21	8.19	7.04

Service Reliability

Overall service quality in the Railbelt is good, comparable with other similarly sized utilities elsewhere in the country. Planning efforts are undertaken regularly to assure adequate power supply reserve margins.

In 1995, the last year for which outage data was available, the outage hours per customer were as shown in Figure 4-9. Given the nature of the service areas, this reliability level is good.

Heating

Fuel Typas

Space heating in the Railbelt area is provided primarily by natural gas in the Anchorage / Matanuska-Susitna area and by fuel oil in the Fairbanks area. Electricity plays a small part in space heating, and its role is growing smaller because of the higher cost. Figure 4-10 shows household space heat data from the 1990 census for the State and for the Railbelt. The usage patterns are significantly different between the Anchorage area and the Fairbanks area. In the Anchorage area, where natural gas has been available for many years, it was reported in 1990 to have been used as the primary source of heat in over 81 percent of households (Figure 4-11). Since then, it is expected that the use of electricity for heat has declined further through conversions to natural gas and low rates of use in new construction.

In the Fairbanks area (Figure 4-12), 1990 household space heating was done primarily with oil (73 percent), wood (9 percent), coal (7.8 percent), and electricity (5.8 percent). There has been an effective ban on electric space heat for many years. Most space heating is done with oil. Some commercial space heat in Fairbanks is provided through a centralized district heating system using steam from the Chena powerplant.

Market Structure

Enstar Natural Gas Company serves the areas of Anchorage, Big Lake, Bird Creek, Chugiak-Eagle River, Eklutna, Girdwood, Houston, Indian, Kenai, Knik, Nikiski, Palmer, Peters Creek, Portage, Sterling, Soldotna, Wasilla, and Whittier. At the end of 1997, Enstar served 94,000 customers.

Enstar also holds a certificate to serve gas to Homer and Seward, where gas service is currently not available. Enstar must, however, begin gas service to Homer and Seward by December 31, 2000, to keep its certificate.

In September 1997, the Fairbanks Natural Gas application was approved, allowing it to offer natural gas service in selected areas of Fairbanks. FNG is a subsidiary of Northern Eclipse, which liquefies the gas at a small liquefaction plant across the Knik Arm from Anchorage. The liquefied natural gas (LNG) is transported to Fairbanks by truck and cryogenic trailer. FNG takes ownership of the gas in Fairbanks when it is offloaded to LNG storage tanks. FNG then revaporizes the gas and distributes it through a conventional gas transmission and distribution system.

Fuel oil is distributed by local fuel oil distributors.

There is also a small district heating system in Fairbanks where steam is produced at the Chena powerplant and distributed by underground pipes to local commercial facilities. The steam is used primarily for space heating purposes.

Fuel Sources

Enstar's natural gas supplies come from the Beluga River natural gas field. Enstar does not own the gas; two-thirds of the field is equally owned by Arco Alaska and Chevron USA and operated by Arco. One-third is owned by ML&P.

Fuel oil supplies are refined by Mapco and PetroStar in the Fairbanks area, and Tesoro on the Kenai Peninsula. Most of the heating oil produced in these refineries is trucked to the domestic instate market. Propane is also produced by Tesoro on the Kenai Peninsula. However, the propane production capability is insufficient to meet the total instate demand, and a significant amount is imported, primarily from British Columbia.

Fuel Volumes

Data were not found for the actual volumes of natural gas, fuel oil, electricity, and other fuels used for space heating in the Railbelt. Fuel used for heating purposes has been quantified for the state as a whole by State Department of Labor.

Cost

During 1997, the average residential gas consumption for Enstar was 15.1 thousand cubic feet (MCF) per month, and, as of March 31, 1998, the charge at this consumption level was $57.05. The cost of fuel oil delivered to a residence in the Fairbanks area is approximately $1.01 for a 500-gallon delivery. The average residence uses approximately 1,500 gallons annually, with a wide range among residences because of size, construction, occupancy, and weather.

Issues and Possible Solutions

Issue: Availability of Natural Gas for Power Generation and Heat

Population Affected

443,000 (73 percent of the state population)

Discussion

Both ML&P and Chugach rely on natural gas for most of their power generation. Also, most space heating in the Anchorage area is done with natural gas. The long-term availability of natural has become a significant issue.

Natural gas was discovered in the Cook Inlet area over 30 years ago as a result of oil explorations. The volume of gas was well above the amount needed to supply local needs. To exploit this surplus, a LNG plant (now owned by Phillips-Marathon) and an ammonia-urea plant (now owned by Unocal) were built at Nikiski on the Kenai Peninsula to process the gas for export. Phillips-Marathon in 1996 applied for an extension to its federal export license from March 31, 2004, to March 31, 2009.

Whether or not continued export of natural gas at current levels will adversely affect the supply of natural gas in the Cook Inlet area for power generation, space heating, and other uses, is not clear. The U.S. Department of Energy's extension of the export license indicates that the department believes there are adequate supplies through March 2009. A federal license is not required for the export of ammonia-urea.

The LNG and ammonia-urea plants represent about 60 percent of the annual consumption of Cook Inlet natural gas. This level of consumption is essentially fixed through March 2009. Approximately 30 percent of the consumption of Cook Inlet natural gas is for space heat (14 percent) and power generation (16 percent). The remaining consumption is almost all for gas field operations.

Enstar Natural Gas, Aurora Gas, Cook Inlet area gas distributors, and Unocal intervened in the proceeding. Unocal argued that Railbelt area demand for natural gas would exceed the available supply on cold winter days, perhaps as soon as 2001-2002. Enstar forecast problems in 2004 or 2005. However, the U.S. Department of Energy extended the export permit in April 1999 to March 2009, allowing the export of 64 billion cubic feet of natural gas per year.

Possible Solutions / Approaches

I. Monitoring of the Availability of Natural Gas in the Cook Inlet Area

II. Exploration/Development of Additional Cook Inlet Supplies

III. State Participation in Next Export License Renewal/Extension Proceeding

IV. Alternative Energy Resource Development and Long-Term Power Supply Planning

   A. Matanuska coal
   B. Interior coal
   C. Hydroelectric
   D. Wind
   E. Solar
   F. Tidal
   G. Coal-bed methane

V. Adoption of Energy Efficiency Measures

   A. Building codes
   B. Process use
   C. Electricity and space heat end-use conservation programs

VI. Alaska North Slope Natural Gas Pipeline to Railbelt

Issue: Cost of Power

Population Affected

443,000 (73 percent of the state population)

Discussion

Figure 4-8 compares the average electric rates per kWh of electricity in the United States, statewide, and the Railbelt. The figure includes the overall averages and is also broken down for the residential, commercial, and industrial sectors. It can be seen that electricity in Alaska is more expensive than nationally, by about 47 percent. The Railbelt-area enjoys rates that are less than the statewide average but still 26 percent higher than the national average.

A recent study of the benefits of power pooling and joint future generation development, performed by Black & Veatch for the Alaska Public Utilities Commission (now the Regulatory Commission of Alaska), found that the savings for joint unit dispatch and joint development of future generation were about 3.4 percent annually and had a present value of $48 million, before the costs of establishing the pool. The Railbelt utilities were not unanimous in their interpretation of the study. The savings level was regarded by several as significant and by Chugach as insignificant.

The capacity of the Railbelt intertie at this time constrains the ability to transmit less expensive energy to the Fairbanks area to about 20 MW. The construction of the second transmission line from Healy to Fairbanks increases the transfer capability to about 60 MW, allowing increased transfer of less expensive energy from the south.

The installation of the BESS allows GVEA to meet its reserve obligations. It will not need to operate diesel generation for reserves. The BESS will also allow GVEA to discontinue use of its load shedding systems and is expected to reduce power supply related outages by 75 percent.

If a second transmission line is constructed between the Kenai and Anchorage area, it also should allow increased transfer of less expensive energy in both directions.

The 1997 average price for natural gas delivered to Alaska utilities in 1997 was $1.81 per MCF; nationally, the price was $2.74 per MCF. Delivered gas prices to the residential, commercial. and industrial sectors were all well below the national averages.

Possible Solutions/Approaches

I. Management and Regulation

  A. Find ways to introduce additional elements of competition into electric utility operations and management

  B. Allow power suppliers to serve retail customers of other utilities / allow retail customers to chose their power supplier

  D. Sell municipal or cooperative utilities to private firms / owners.

  E. Consolidate generation ownership / operation

  F. Institute performance-based regulation

  G. Implement joint utility dispatch of generation to take advantage of cost differences

  H. Consolidate utility operations to reduce administrative costs

   I. Consolidate utility ownership to achieve scale economies
   J. Make transmission a common carrier (similar to FERC Order 888/889)

II. System Upgrades
   A. Increase Railbelt Intertie capacity (north and south)
   B. Install larger, more fuel efficient generating units
   C. Upgrade/repower powerplants
   D. Remove transmission system capacity bottlenecks
   E. Reduce system line losses

III. Improve Energy Use Efficiency
   A. Distributed generation to reduce line losses
   B. Cogeneration
   C. Waste heat recovery
   D. Energy-related building codes
   E. Implementation of end-use energy efficiency standards / programs

Issue: System Reliability

Population Affected

443,000 (73 percent of the state population)

Discussion

Railbelt electric system reliability can be addressed in three categories:

- Generation and the ability to survive loss of the largest unit(s)/plant
- Transmission and the ability to maintain service on loss of a key transmission line
- Substation/distribution outages and the ability to serve load with facilities out of service

Responsibility for these issues has traditionally been with the utility (ies) owning and operating the system. As discussed above, the Alaska Systems Coordinating Council promotes improved reliability through regional coordination. Since construction of the interties connecting the Anchorage area with the Kenai and with Fairbanks, many of the major outages have been related to the loss of transmission and the resulting imbalance of generation and load within a given area. These issues have been studied almost continuously for many years. Construction of the second Healy to Fairbanks transmission line by GVEA and the installation of the BESS is estimated to reduce power supply related outages in the Fairbanks area by 75 percent.

Construction of a second intertie between the Kenai and the Anchorage area will significantly improve the transmission stability between the two areas, reduce the number of outages resulting from loss of a single line, and improve system reliability.

At the distribution level, normal urban area utility system planning is to have sufficient capacity in neighboring substations and substation feeders to allow system switching / sectionalizing to be used to isolate substations and feeders and to maintain service with only brief outages.

Possible Solutions / Approaches

I. Implement Joint System Generation Planning/ Distributed Generation

II. Strengthen the Transmission System

 A. Build a second intertie between Anchorage and Healy

 B. Build a second transmission line between Anchorage and the Kenai Peninsula

 C. Periodically review and update transmission system protection schemes

 D. Implement distributed generation

 E. Install underground lines

III. Maintain Line Rights-of-Way to Minimize Outages from Trees and Limbs

IV. Provide for Incentive or Penalty Based Rate Regulation

 A. Set clear reliability standards

 B. Provide incentives or penalties for performance

V. Install Energy Storage Systems and UPS Systems

SECTION 5

Southeast Region

The Southeast Region is defined in this study as the communities of:

- Ketchikan
- Petersburg
- Wrangell
- Sitka
- Juneau
- Valdez
- Glennallen
- Kodiak

These include the communities served by the Four Dam Pool hydroelectric generating plants. Southeast Alaska communities not included in the above list receive Power Cost Equalization (PCE) assistance and are addressed in the Rural Alaska Region. Figure 5-1 shows the locations of these communities, along with their interconnecting transmission lines.

Demographic and Economic Characteristics

The State Department of Labor estimated the total 1997 population of the Southeast Region communities to be 77,978. This includes the population in the adjacent boroughs for Ketchikan, Sitka, Juneau, and Kodiak, which receive most of their electric service from the local electric utility. Since the last official census in 1990, the population of these communities has increased at an average annual rate of 0.9 percent. The population and rate of change since 1990 are shown in Table 5-1 for each of the Southeast Region communities.

The Southeast Region communities are small to medium-sized cities with economies based on fishing, fish processing, forest products, tourism, government, and, in the case of Valdez, petroleum transport and processing. For Juneau, precious metal mining is currently and has periodically in the past been an important element of the economy. A significant common feature of all these communities is the dependence on hydroelectric generation facilities for electric energy. Oil and electricity are the primary energy sources for space heating. There is no natural gas currently available in the Southeast Region.

The average 1997 personal income per capita for the Southeast Region is $26,484. This is slightly higher than for the Railbelt ($25,742), and also higher than that for the United States as a whole ($25,290).

Provided by Rep. Harris

TABLE 5-1
Population of Southeast Region Communities

Community	Estimated Population[a]	Average Annual Rate of Change, 1990-1998 (%)
Ketchikan Gateway Borough[b]	13,849	0.4
Wrangell	2,589	0.5
Petersburg	3,398	0.7
Sitka Borough	8,481	0.3
Juneau Borough	30,200	1.5
Valdez	4,155	0.3
Glennallen	488	1.0
Kodiak Island Borough[c]	14,818	0.5
Total	77,978	0.9

[a] Borough data are for 1997; community data are for 1998.
[b] 1998 population of City of Ketchikan alone is 8,460.
[c] 1998 population of City of Kodiak alone is 6,859.

Description of Energy Uses

Electric Service

The Southeast Region electric utilities are electrically isolated with two exceptions. Petersburg and Wrangell are interconnected with a transmission system connected to the Lake Tyee hydroelectric project, and Valdez and Glennallen are served by the Copper Valley Electric Association and are also interconnected (see Figure 5-1). The majority of the Southeast Region electric energy produced is generated at hydroelectric projects owned by the State or by the communities themselves. In 1998, the federal government sold to the State the Snettisham hydroelectric project that serves the Juneau area.

The significant development of hydroelectric resources in the past has contributed to relatively stable electric rates in the Southeast Region. The hydroelectric generation also results in electric rates that are reasonably comparable to the Railbelt, except for the cities of Kodiak, Valdez, and Glennallen.

Utilities

The Southeast Region electric utilities are all publicly owned (municipally or cooperatively) except for Alaska Electric Light & Power (AELP), which is an investor-owned utility. The utilities and the communities they serve are listed in Table 5-2.

As shown in Table 5-2, the total number of Southeast Region customers served by the utilities is 37,704, of which approximately 80 percent are residential customers. Energy sales for the region in 1997 totaled 760,014 MWh, of which 296,640 MWh or 38 percent was to

TABLE 5-2
Southeast Region Utilities and Communities Served

Community	Utility	Type	Customers Served [a]	MWh Sales [b]
Ketchikan	Ketchikan Public Utilities (KPU)	Municipally owned	7,096	139,725
Wrangell	Wrangell Light Department	Municipally owned	1,465	19,628
Petersburg	Petersburg Municipal Power & Light	Municipally owned	1,876	34,987
Sitka	Sitka Municipal Electric Department	Municipally owned	4,459	86,455
Juneau	Alaska Electric Light & Power	Investor owned	13,962	286,783
Valdez and Glennallen	Copper Valley Electric Association, Inc. (CVEA)	Rural Utility Service (RUS) Cooperative	3,187	74,751
Kodiak	Kodiak Electric Association, Inc. (KEA)	RUS Cooperative	5,659	117,685
Total			37,704	760,014

[a] Number of customers served in 1997.
[b] Total energy sales (megawatt-hours—MWh) to all customers in 1997.

residential customers. CVEA has a large commercial customer, the PetroStar refinery in Valdez, which represents approximately 25 percent of CVEA's total load (based on 1998 sales). A significant percentage of KEA's total energy sales, approximately 60 percent, is to its Large Commercial customer class consisting primarily of seafood processing facilities.

Major impacts in regional employment occurred during the 1990s with the closure of two wood pulp manufacturing facilities in Sitka and Ketchikan. Both of these plants generated most of their own electric energy with steam turbines fueled with a combination of oil and process wastes. The closure of the pulp mills caused a significant reduction in total employment in their respective communities, which in turn is expected to have a negative impact on near-term population growth and potentially reduce the overall energy needs in Sitka and Ketchikan. Although it had been forecast that the 1993 closure of the Alaska Pulp mill in Sitka would decrease electrical energy requirements in Sitka, an overall reduction has not been experienced and electrical loads continue to grow, although at a relatively modest rate.

Generation Mix

The total installed Southeast Region electric generating capacity is 396.4 MW, of which 197.7 MW is hydroelectric (50.3 percent), 126.6 MW is diesel (32.2 percent), and 68.8 MW (17.5 percent) is oil-fired combustion turbines.

All utilities in the region rely upon hydroelectric generation as the primary electric energy resource, with diesel and oil-fired combustion turbines serving as a backup and supplement to hydro. Based on actual experience in 1995, hydroelectric generation represents approximately 90 percent of the total annual electric energy generated in the region. The actual percentage of energy generation from hydroelectric resources varies from year to year depending on local precipitation and other factors.

The Southeast Region's total average annual energy generation capability from existing hydroelectric projects is approximately 928,000 MWh (see Table 5-3). A significant portion of the total generation capability of the Lake Tyee project is surplus to the needs of Petersburg and Wrangell, the only two communities interconnected to this project. There also is surplus energy generation capability at the Snettisham project serving Juneau, and the combined generation capability of the Blue Lake and Green Lake projects in Sitka continues to exceed the load of that community. As with any hydroelectric system, the energy generation of the Southeast hydroelectric projects varies from year to year based on local precipitation.

TABLE 5-3
Southeast Region Hydroelectric Generating Plants

Project	Communities Served	Owned By	Capacity (MW)	Generation Capability (MWh)[a]
Swan Lake	Ketchikan	State	22.6	71,000
Ketchikan Lakes	Ketchikan	KPU	4.2	[b]
Silvis Lake	Ketchikan	KPU	2.1	[b]
Beaver Falls	Ketchikan	KPU	5.4	66,100[b]
Lake Tyee	Wrangell and Petersburg	State	20.0	125,000
Solomon Gulch	Valdez and Glennallen	State	12.0	46,000
Terror Lake	Kodiak	State	22.6	117,000
Snettisham	Juneau	State	78.3	317,000
Annex Creek	Juneau	AEL&P	3.6	25,000
Gold Creek	Juneau	AEL&P	1.6	5,000
Salmon Creek	Juneau	AEL&P	5.0	30,000
Blue Lake	Sitka	Sitka	6.7	56,800
Green Lake	Sitka	Sitka	18.6	58,900
Crystal Lake	Petersburg	Petersburg	2.0	10,000

[a] Estimated average annual energy generation capability if fully used. Includes firm and secondary generation capability.
[b] For planning purposes, the average annual energy generation capability of KPU's hydroelectric generating plants are shown generally in total.

Four Dam Pool

Four Dam Pool is a group of hydroelectric generating plants (Solomon Gulch, Swan Lake, Terror Lake, and Lake Tyee) owned by the State from which power is sold to CVEA, KPU, KEA, Petersburg, and Wrangell. The Four Dam Pool was established in 1985 shortly after the four hydroelectric projects were completed and placed in service. Power is sold from the Four Dam Pool to each of the utilities pursuant to the terms of a long-term (45-year) power sales agreement (PSA). The purchasing utilities are required by the PSA to supply their respective net energy requirements (total requirements less generation from utility-owned hydroelectric projects) through purchases from the Four Dam Pool.

The wholesale power sales rate is the same to each of the purchasers and is adjusted each year to reflect actual operating costs. At the present time (year ending June 30, 2000), the Four Dam Pool wholesale power rate is 6.8 cents per kWh. Of this amount, 4.0 cents per kWh is a fixed-debt service component that does not change each year, and 2.8 cents per kWh is the O&M component. In the past, the wholesale power rate has varied between 6.2 and 6.8 cents per kWh.

Funding for construction of the Four Dam Pool was provided by the State, partly in the form of a grant and partly in the form of a low-interest loan. The loan amount was initially established at $192 million, and the 4.0 cents per kWh debt service component of the wholesale power sales rate is tied to the terms of loan repayment pursuant to the PSA. It is estimated that the Four Dam Pool utilities will pay approximately $10.5 million to the State in fiscal year 2000 through the debt service component of the wholesale power sales rate. In addition to O&M costs and debt service, the purchasing utilities pay $500,000 per year to a renewal and replacement fund for the Four Dam Pool projects. To the extent the need for renewals and replacements exceeds the amount in the fund, the State is obligated to pay the additional amounts.

The Four Dam Pool projects are operated by the purchasing utilities through contractual arrangements. Management of the Four Dam Pool is provided by the Project Management Committee (PMC) which is composed of representatives of each of the purchasing utilities and the State. In recent years, discussions have been held between the State and the Four Dam Pool purchasing utilities concerning the possible sale of the projects to the utilities. No action has been taken to sell the Four Dam Pool projects at this time.

Transmission Interconnections

Most of the Southeast Region electric utilities are electrically isolated, operating independently from any other electric utilities. At present, the only interconnected utilities are Petersburg and Wrangell, which are interconnected with each other and the Lake Tyee hydroelectric project by an 81-mile-long, 69-kV transmission line owned by the State (Figure 5-1). Three other relatively long State-owned transmission lines interconnect the Snettisham hydroelectric project to Juneau (44 miles, 138 kV), the Swan Lake hydroelectric project to Ketchikan (30 miles, 115 kV) and the Solomon Gulch hydroelectric project to Valdez and Glennallen (106 miles, 138 kV).

Valdez and Glennallen are the two load centers of CVEA's electric system. CVEA uses the transmission line to deliver power to its system from Solomon Gulch as well as to more efficiently operate its other power plants to serve the loads of its customers.

Several studies have been conducted over the last 15 years providing preliminary plans for, and evaluating the feasibility of, transmission interconnections throughout Southeast Alaska. Interconnections between Southeast Alaska and Canada have been investigated as part of the overall study efforts. Additional transmission interconnections would allow wider access to present hydroelectric surpluses, permit utilities to share reserves and dispatch generating units on an integrated basis, and help support future resource development in the region.

At present, KPU is pursuing the development of a $73.2-million transmission interconnection between the Swan Lake project and the Lake Tyee project. This transmission line has been designed and funding sources are currently being pursued. The Southeast Conference, a consortium of Southeast Alaska communities, is also investigating and seeking federal and State funding sources for additional transmission interconnections in Southeast Alaska. Further, AEL&P has recently investigated the feasibility of a transmission interconnection with the Greens Creek Mine on Admiralty Island.

Electricity Consumption per Customer

Annual electricity consumption for residential customers of the Southeast Region utilities averaged 9,677 kWh (806 kWh per month) in 1997. Annual consumption per customer varied significantly among the utilities. Sitka was highest at 11,730 kWh per residential customer (978 kWh per month), and CVEA was lowest at 6,440 kWh per residential customer (537 kWh per month). The price of electricity to consumers is the most significant factor in the variance in electricity consumption among the various communities.

During the mid-1980s to early 1990s, electricity prices were deemed low enough in Sitka and Juneau to encourage the installation of electric space and water heating systems in homes and businesses in these communities. The availability of surplus hydroelectric energy also provided incentives to establish rate structures favorable to electric space heat. As a result, electricity consumption per customer is higher in these communities than elsewhere in the Southeast Region. As the price of oil has remained relatively constant in recent years, present trends in Sitka and Juneau are towards less electric space and water heat.

Fuel Sources

Oil, principally diesel, presently serves as the only source of generation fuel used by the Southeast Region utilities. Except for CVEA, diesel fuel is transported to each of the communities by marine barge. Diesel fuel is delivered to CVEA's two powerplants overland by truck. Fuel supply contracts, usually of a year in duration, are competitively sought by the utilities. Most of the fuel contracts are priced to fluctuate with either the Seattle or Anchorage index of diesel fuel.

Because diesel generation primarily serves as a supplement to hydroelectric generation in the Southeast Region and fuel deliveries can be made year round, fuel storage capacity is not a critical issue. There is also significant privately owned fuel storage capability in each community. Total fuel use by the Southeast Region utilities in 1998 was 5,502,000 gallons.

In late 1999, CVEA will begin operation of a combustion turbine powerplant located at the PetroStar refinery in Valdez. This 5.3-MW cogeneration plant will be fueled with a byproduct of the refinery operation.

Cost of Power

Figure 5-2 compares the 1997 average cost of power in the Southeast Region, 10.3 cents per kWh, to the U.S. average of 6.9 cents per kWh and the State average of 10.1 cents per kWh. It also compares the Southeast residential, commercial, and industrial rates with U.S. and Alaska averages.

The retail cost of power to consumers in the Southeast Region averaged 10.3 cents per kWh in 1997, with a range of 8.5 cents per kWh in Juneau to 14.9 cents per kWh in Valdez and Glennallen (CVEA). The cost of power to residential customers ranged between 9.1 cents per kWh in Sitka and 18.3 cents per kWh in Valdez and Glennallen, with a region average of 10.5 cents per kWh. On average, commercial customers paid 10.7 cents per kWh; however, in most of the communities, commercial rates are somewhat lower than residential rates. Table 5-4 and Figure 5-3 show the average retail cost of power by utility to consumers in the Southeast Region.

TABLE 5-4
Average Annual Cost of Power in Southeast Region Utilities

Community	Cost of Power[a] (cents/kWh)			
	Total	Residential	Commercial	Industrial
Ketchikan	8.8	9.1	8.7	7.4
Wrangell	10.7	9.3	9.4	NA
Petersburg	9.0	9.8	8.1	8.2
Sitka	9.2	9.1	9.3	7.4
Juneau (AEL&P)	8.5	9.6	8.6	7.1
Valdez and Glennallen (CVEA)[b]	14.9	18.3	13.9	NA
Kodiak (KEA)	14.6	15.7	14.8	13.9
Total	10.3	10.5	10.7	11.5

[a] Based on 1997 revenues and sales.
[b] Rates to CVEA customers in Glennallen are 15 to 20 percent higher than to its customers in Valdez.

In general, the cost of purchased power and other power production expenses are the largest single component of the total costs incurred by the utilities. These costs vary from utility to utility and from year to year. The cost of power from the Four Dam Pool to Ketchikan, Petersburg, Wrangell, CVEA, and KEA is currently 6.8 cents per kWh. A portion of this cost is fixed (4.0 cents per kWh), but the remainder of the cost is adjusted each year as O&M costs fluctuate. Following the sale of the Snettisham project to the State in 1998, the cost of Snettisham power to AEL&P is approximately 3.5 cents per kWh. This cost is expected to remain relatively constant for the near future.

The cost of power from community-owned hydroelectric facilities varies depending primarily on the amount of debt currently being serviced through rates. Operating costs of most hydroelectric facilities are relatively low. Diesel generation costs are dependent on fuel prices but, at current prices, are in the range of 5 to 7 cents per kWh for most of the utilities of the Southeast Region, excluding payment of capital recovery costs.

Service Reliability

The overall service quality in the communities of the Southeast Region is good, comparable with other similarly sized utilities elsewhere in the country. Figure 5-4 shows the reported 1995 outage hours per customer for each of the utilities. Valdez and Glennallen reported the same hours, with the longest outages being in the All Others category, which suggests it was a transmission-related outage in 1995. No data were reported for Petersburg, Wrangell, or Sitka.

Most of the Southeast Region electric systems are large enough to accommodate normal daily load fluctuations without causing significant voltage or frequency degradation on the system.

Heating

Market Structure

Space heating in the Southeast Region is generally provided by oil-fired heating systems and electricity. Figure 5-5 shows the use of various heating sources by household in the Southeast Region in comparison to statewide usage. The use of electricity for space heat is highly dependent on the price of electricity and is only seen in significant quantities in Sitka and Juneau. Both of these communities have in the past encouraged electric space heat to help use available hydroelectric generation surpluses. Many homes built in Sitka in the 1980s and 1990s were installed with electric space heating systems. Even in Sitka and Juneau, however, the cost of electricity for space heat is high when compared to new, efficient oil-fueled heating systems. There is an identified market shift away from electric heat in both Sitka and Juneau at the present time.

Water heat generally is provided by the same source as space heat in the communities of the Southeast Region. That is, homes and businesses with oil space heat generally have oil-fueled water heat.

Fuel Types

Most of the heating fuel used in the Southeast Region is oil distributed to homes and commercial buildings by local fuel suppliers. Propane (LPG) is also used in limited quantities. In most communities, wood is used as a supplemental heating source by some homeowners. The percentage of space heating needs in the Southeast Region supplied by the various fuel types is shown in Figure 5-6 based on data from the 1990 census for residential units. As can be seen, 67, 18, and 10 percent of the space heating needs in the Southeast Region are provided with oil, electricity, and wood, respectively.

Fuel Sources

Fuel oil and propane are supplied by local distributors. Except in Valdez and Glennallen, fuel is delivered to each community by marine barge, stored in privately owned storage facilities, and distributed in accordance with consumer demand to the consumer's onsite fuel tanks. Most communities have competing distributors. The primary suppliers of fuel oil in the Southeast Region are Petro Marine Services, Delta Western, Sitka Fuels, Taku Oil Sales, and Andries Oil. It is estimated that approximately 60 percent of the fuel oil used in Southeast Alaska comes from refineries in the Pacific Northwest and 40 percent from Alaska refineries, primarily from the Cook Inlet area.

Fuel Volumes

The actual amount of electricity used for space heat is unknown because it is simply metered together with all other electric loads. Fuel oil used for heating purposes is tabulated for the state as a whole by the State Department of Revenue (DOR). In 1997, the DOR data indicate that approximately 154 million gallons of oil were used in the state for nongovernment heating purposes. No quantification of the total amount of heating fuel used in the Southeast Region is available. No. 2 fuel oil (diesel) is the most common type of oil used for heating purposes, although stove oil, or No. 1 fuel oil, is being used in newer high-efficiency heating appliances.

The amount of fuel oil used to heat a home varies significantly depending on home size, type of construction, weather conditions, type of heating systems, and other factors. Estimates provided by local suppliers in Juneau indicate that typical oil heat residences in Juneau require between 1,200 and 1,800 gallons of fuel oil per year. For most homes, this would be the total fuel quantity for both space and water heating purposes. The quantity of fuel oil used in homes during the winter is noted to vary from 100 gallons per month in newer, well-insulated homes to as high as 300-400 gallons per month in older, poorly insulated homes.

As a comparison, a heating fuel oil requirement of 1,200 gallons per year would correspond to an equivalent electricity requirement of approximately 17,000 kWh per year.

Cost

At the present time, the retail cost of delivered No. 2 fuel oil in Ketchikan is approximately $1.04 per gallon. During the winter of 1998-99, the price of oil heating fuel was approximately 20 percent lower than the current price; however, oil prices in the winter of 1998-99 were at a multiyear low. Southeast Region heating oil prices have fluctuated over time along with other petroleum-based fuel prices.

Trends

During the mid to late 1980s, the availability of surplus hydroelectric generation capability in some of the communities in the Southeast Region served as the basis for developing incentive rate structures to encourage electric space heating. AEL&P offered a "dual fuel" electricity rate that would allow customers with both oil and electric heat systems to purchase electricity at a low rate when surplus hydroelectric generation was available due to lower than normal system loads or higher than normal precipitation periods. The stable and relatively low electricity prices in Sitka provided building contractors with sufficient justification to install electric base board heaters, which are the lowest capital cost heating systems in new residential units. The increase in electric space heat in Sitka, however, was more a result of public acceptance of electricity as the preferred heat source.

With technology improvements and increasing consumer awareness, there is a shift away from electric to oil heat in Juneau and Sitka, where the use of electric space heat has been the most significant. Although this is causing a reduction in total electric energy requirements, it is coming at a time when hydroelectric generation surpluses are declining. Improving building standards and improvements in heating systems should produce a continuing reduction in the quantity of fuel oil needed, on a per customer basis, for space heat in the region. The shift from electric to oil heat in Juneau and Sitka, however, is causing a compensating increase in total fuel oil requirements in these communities.

An alternative heating fuel, liquefied natural gas (LNG), has been proposed periodically by developers for various communities in the region. LNG would be transported to storage systems in the communities, vaporized, and distributed in piping systems to individual homes and businesses. The cost to produce and deliver LNG to customers is still considered higher than for competing fuel sources, chiefly oil.

Issues and Possible Solutions

Issue: Cost of Power

Population Affected

78,000 (15 percent of the state population)

Discussion

Although the cost of power to consumers in the Southeast Region is generally comparable to the Railbelt (except for CVEA and Kodiak) and is comparable to certain regions of the Lower 48, it is much higher than the national average. The cost of power in the Southeast Region, particularly in Kodiak, Valdez, and Glennallen, is high enough to serve as a deterrent to certain commercial and industrial activity. Electricity rates, along with other infrastructure service costs, are a factor in the determination of locating businesses. If the rates are comparably attractive, communities often compete to attract industry using their utility services and rates as a benefit.

In the Southeast Region, the high cost of electricity relative to the national average might be due in large part to the isolation of the electric systems and the relatively small customer base over which to spread the fixed costs of the electric systems. Consolidation of electric utilities is occurring in many areas of the country to provide a basis to lower costs and increase market share. Deregulation, competition, and increased reliance on independent power producers have all contributed to lower costs as well.

The geography of Southeast Alaska will probably always contribute to higher utility costs in the region. Not only are construction costs higher than elsewhere in the country, the physical separation of the communities also acts as a barrier to utility consolidation and the economies of scale that consolidation could provide.

Possible Solutions / Approaches

I. Opportunities for Increased Economy of Scale

   A. Build transmission lines between utilities for reserve sharing, economy energy transfers, and coordinated generation dispatch

   B. Find ways to increase power sales, especially where surplus power from existing hydro projects is available

Consolidate utility(ies) operations to reduce administrative costs.

II. Opportunities for Improved Efficiency

A. Find ways to introduce elements of competition into electric utility operations and management

B. Break up the Four Dam Pool so that each utility realizes the full value of any O&M savings achieved with respect to their individual projects

C. Divest the Four Dam Pool by the State

D. Sell municipal utilities to private firms

E. Sell municipally owned generating facilities to nonmunicipal owners

F. Reduce system line losses

G. Investigate alternative generating technologies and fuel availability

H. Pursue possible cogeneration opportunities

I. Coordinate fuel supply solicitations and deliveries

J. Provide incentives to utilities for greater utilization of State-owned hydroelectric projects

K. Conduct regular regional coordination meetings and coordinate future energy planning on a regional basis

III. Opportunities for Improved Energy Use Efficiency

A. Waste heat recovery

B. Energy-related building codes

C. Incentive-based electric rates

D. Implementation of end-use conservation programs

Issue: Reliability of Electric Service

Population Affected

78,000 (15 percent of the state population)

Discussion

Reliability of electric service has been and will continue to be an important issue for electric consumers in the Southeast Region.

In the past, the electric systems in the Southeast Region have continued to improve reliability by maintaining generation reserves and improving their respective physical distribution facilities. Improvements to transmission facilities, such as the re-siting of the original Snettisham transmission line, replacement of Snettisham submarine cables, and major retrofits to the Lake Tyee transmission system, have been made to address reliability issues. Transmission systems in the Southeast Region are still vulnerable to a number of environmental factors, a problem that is made worse due to the remote location of these lines and the difficulty in providing repairs. The Southeast transmission system is also limited to single lines between generation facilities and the distribution systems. Redundant transmission lines do not exist.

Except for Petersburg and Wrangell, the electric utilities in the Southeast Region operate independent electric systems with no interconnection to other systems. In most areas of the country, individual electric utilities are interconnected with adjacent utilities, and numerous transmission interconnections exist. Interconnected systems are considered crucial to the overall cost-effective reliability of electric service. The lack of interconnection in the Southeast Region prevents the utilities from sharing generation reserves and from employing economic dispatch of power plants on a regional basis. Further, the geographic isolation of the Southeast utilities and the resulting independence of operation hinders the regular sharing of certain maintenance capabilities and equipment inventories that could be used to positively affect reliability.

Although the further development and improvement of transmission systems in the Southeast Region could improve overall system reliability and possibly reduce operating costs, the high cost associated with such improvements means that they would probably be implemented over a long period of time, at best. In the meantime, other measures will need to be undertaken to assure continued improvement in providing reliable electric service. Principal among these measures is the proper maintenance of existing distribution, generation, and transmission facilities. Because the Southeast Region utilities provide for this maintenance on their own, it is critical that they continue to appropriately fund maintenance and repair costs. Electric rates must be sufficient to provide revenues to pay maintenance costs as well as provide for the periodic replacement of system components over time.

The continued maintenance of adequate generation reserves is crucial. Most of the utilities provide reserves at least equal to the largest single contingency their system has. In this manner, KPU maintains the ability to supply its full demand when the Swan Lake project is unavailable. During the summer of 1999, a shutdown of the Lake Tyee transmission line for a major repair has necessitated that Petersburg and Wrangell operate local diesel generators for an extended period. One of Wrangell's main diesel units failed during this period, and, although it is not clear that inadequate maintenance was a contributor to this failure, it does indicate that overall reliability depends upon system components being maintained properly even when the components are not in regular use.

Possible Solutions/Approaches

I. Transmission Interconnection Planning and Development

   A. New

   B. Redundant

II. Establish Planning Policies for Generation Reserves and Determine Compliance with Such Policies

III. Encourage Distributed Generation

IV. Provide Distribution System Flexibility to Meet Single Contingency Failure Without Prolonged Outage

V. Perform Preventive Maintenance

VI. Promote Community Involvement in Appropriate Level of Reliability

A. Governing Body

B. Community

C. Others

Issue: Meeting Demand Growth

Population Affected

78,000 (15 percent of the state population)

Discussion

The cost of new generating resources makes it necessary to constantly weigh the risks of oversupply or undersupply by the local utility. It is important for a utility to have a good understanding of the range of future power needs to provide as much planning lead time as possible. The longer the lead times, the better the risks and associated costs can be effectively managed.

Southeast Region electric utilities have long depended on hydroelectric generation systems for the majority of their power supply. Diesel generators have been used in the region to meet most of the remaining electric needs. Loads have now grown to the point in some communities where the existing hydroelectric generation is insufficient to meet loads and the area's utilities are faced with developing new resources.

Known power supply evaluations and development activities presently currently underway are:

- AEL&P. Investigating the feasibility of the Dorothy Lake hydroelectric project, including a phased development process.
- KPU. Recently installed a new 10.3-MW diesel generator at the Bailey powerplant in Ketchikan and pursuing the permitting of two small hydroelectric plants at Lake Whitman and Lake Connell. Pursuing procurement of funds to construct a transmission line between the Lake Tyee and Swan Lake hydroelectric projects.
- Cape Fox Corporation/Ketchikan Electric Company. Obtained federal license for the development of the 10-MW Mahoney Lake hydroelectric project. Attempting to negotiate a contract with KPU to have KPU purchase the generating output of the project.
- Metlakatla. Evaluating the development of a transmission interconnection with KPU.
- Sitka. Evaluating various transmission interconnections. Pursuing installation of a new diesel generator.
- CVEA. Installing a 5.3-MW combustion turbine at the PetroStar refinery in Valdez.

Hydroelectric systems have high initial costs and low operating costs when compared to other fossil fuel-based generating facilities. They also require several years to plan, design, permit, and construct. Because hydroelectric plants are usually sized to accommodate the available water and other physical aspects of the site, they are often bigger than immediately needed by a small utility. Absorbing the costs of a larger than needed hydroelectric plant in the rate base is often difficult for a small utility in the early years of the plant's operation.

Given the limited opportunities for economic hydroelectric development, the Southeast Region utilities are installing other technologies. CVEA is presently currently installing a combustion turbine at the PetroStar refinery in Valdez. This new generating plant will supplant diesel generation and will also allow for additional system load growth.

The funding and ownership of new generating facilities are also changing. Elsewhere in the nation, most new powerplants are being constructed by nonutility entities that construct and operate the plants and contract with local utilities to sell them the power. With such arrangements, utilities do not need to procure construction capital, and the risks and related costs of lower than expected demand are transferred from the utilities to the powerplant owners.

The area's utilities are also faced with the potential for the community's largest employer to announce closure of its operation, thereby causing a reduction in employment, population, and electricity demand in the community. They also face the possibility that a new commercial enterprise might need large quantities of power, requiring the local utility to quickly install new generating facilities.

Possible Solutions /Approaches

I. Forecast Loads on an Ongoing Basis

II. Solicit proposals for power supply when facing the need for additional generating resources.

III. Monitor Alternative Technologies

IV. Reduce Generation Resource Development Risk

   A. Sales contracts with customers

   B. Long-term power contracts with private developers who share risk

   C. Joint development with others

V. Reduce Financial Risk

   A. Implement ratchet-based rates

   B. Encourage or discourage electric space heat as resources permit

   C. Pursue procurement of state and federal funds for hydroelectric and transmission system development

VI. Develop Interconnections with Other Systems

Issue: Utility Management

Population Affected

78,000 (15 percent of state population)

Discussion

Attracting good management for relatively small and remote utility systems can be difficult. Many of the electric utilities in the Southeast Region have been fortunate to retain managers for a number of years, which has contributed to a consistent, well-planned approach to utility operation and expansion. Other utilities have seen fairly high turnover in management. It appears to be beneficial to the communities when utility managers have strong ties to the community.

The relatively high turnover in Southeast Region utility management in some communities is often a result of friction between utility boards or city councils and management, lack of local career advancement opportunities, relatively slow rate of utility growth, and perceived undesirable living environment. If managers are hired from outside the region, particularly from outside the state, their tenure with the local utility in Southeast Alaska is relatively short.

Possible Solutions / Approaches

I. Opportunities for Increasing Longevity of Utility Management

A. Encourage promotion of existing utility managers from within the state

B. Provide State-sponsored utility management training programs

C. Conduct State-sponsored informational and training seminars for utility boards, city councils, and other governing bodies

D. Support periodic regional utility management conferences

E. Provide opportunities for meetings between among management, legislators, and State, and other government officials related to electric utility issues

Issue: Significant Reliance on Fuel Oil for Space Heat

Population Affected

78,000 (15 percent of state population)

Discussion

Approximately 62 percent of the homes in the Southeast Region rely upon fuel oil for space and water heat. Almost all of this fuel oil must be imported to the region by sea-going barge. Because shipping lanes in the region are open year-round, fuel oil deliveries are provided on a regular basis. An interruption in the ability of suppliers to obtain fuel oil for a period of time or an interruption in the transportation system could result in periodic shortages of fuel oil in the region. With no reasonable alternative heating fuels other than wood and a limited hydroelectric generation supply, a disruption in the regular delivery of oil to the region could be catastrophic. The price of oil is also highly susceptible to fluctuation caused by a number of global factors.

Possible Solutions/Approaches

I. Decrease Reliance on Oil Heat

A. Encourage development of LNG delivery systems

B. Change building standards to make homes and businesses more energy efficient.

C. Develop additional hydroelectric resources and sell power for heating purposes at rates comparable to the cost of oil

D. Encourage more use of newer technology oil heating appliances (monitor stoves)

E. Retrofit existing structures and heating systems for greater efficiency

II. Reduce Vulnerability to Outside Oil Availability Interruptions and Pricing Fluctuations

III. Build More Regional Bulk Fuel Storage Facilities

A. Investigate feasibility of obtaining fuel supplies from Canada through direct pipelines

B. Consolidate regional fuel delivery systems

C. Coordinate regional fuel purchases

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Rural Alaska Energy Plan

Initiatives Aimed at Improving Rural Energy Efficiency & Reliability

DRAFT
Executive Summary

Version 1e
31 December 2002
Prepared for:
Alaska Energy Authority
Alaska Industrial Development and Export Authority

By:
MAFA
In Collaboration with
Northern Economics, Inc.

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Provided by Rep. Harris

Foreword

This report was prepared as part of the Alaska Industrial and Export Development Authority/Alaska Energy Authority assessment of opportunities to improve the efficient, reliable delivery of rural Alaska energy services.

This report builds upon the foundations provided in several earlier reports on rural Alaska energy infrastructure concerning cost effective technology options (Screening Report, 2001) and efficient operations, maintenance, and management of rural utilities (OMM Report, 2001). This report seeks to supplement that earlier work with analyses of new and recently available data on rural electrical and heating loads, residential and school end-use consumption, diesel generator unit condition, vintage, and performance, housing stock, end-use program effectiveness assessments, energy market redesign and transformation efforts, cost information on diesels, control systems, combined heat and power, wind systems, lighting, and residential electrical and heating appliances.

Significant energy savings in rural Alaska electrical and heating are possible through coordinated community planning, improving market incentives, expanding consumer education efforts, encouraging management best practices, extending metering and telemetry to enable more effective management of electric utilities, and leveraging cost-effective capital equipment investments for utilities and end-users.

Many efficiency measures have been adopted by utilities and end-users. Without an aggressive effort to make efficiency a priority, the prospects for further efficiency gains appears modest due to the confluence of several market impediments including: an existing subsidy system (PCE) that "takes back" the benefits of efficiency improvements, small dispersed energy markets, limited information and availability of alternatives, and the high payback requirements of rural households when trading off first cost and potential energy savings.

The potential for energy efficiency improvements is spread widely and must be pursued on many fronts. Concerted efforts are required to provide managers and end users with a share of the benefits of their efforts to improve efficiency, leverage investment in improved equipment and infrastructure, and to increase attention on energy efficiency.

The authors benefited greatly from the substantial assistance received from many organizations and individuals in the course of this study. Interviewees helped to ensure that a wide variety of perspectives were portrayed, and reviewers of individual sections have contributed greatly to its accuracy and completeness.

MAFA and Northern Economics, Inc. wish to express their appreciation for the generous contributions and support of those many contributors.

Omissions and commissions remain the sole responsibility of the primary author, MAFA.

Table of Contents

1 Executive Summary

1.1 Introduction

Rural Alaska utilities, schools and residential households account for about $170 million in annual energy expenditures [utility payments for fuel & non-fuel costs; school payments for heating fuel & electricity; residential household payments for heating fuel & electricity; PCE payments to utilities].

Promoting a combination of utility management best practices, investments in commercially available cost-effective production and end-use technologies, and fine tuning of the power cost equalization incentive structure, rural energy efficiency could be increased by as much as 20% over the next 15 years, compared to business as usual.

The rural Energy Plan envisions investing roughly $55 million over *five* years and achieving benefits on the order of $68 million over *fifteen* years, for a benefit cost ratio of 1.23, and net benefits on the order of $13 million [See Appendix: Rural Alaska Energy Plan Summary].

While estimates of the savings potential may vary significantly depending upon future market conditions, i.e., especially the price of fuel, there appears to be general agreement among those interviewed for this report that the potential for improved energy efficiency for utilities, schools, and households in rural Alaska remains significant.

The new program initiatives include:

- Investments in measurement and monitoring systems to improve operations, maintenance, and management performance
- Annual rural energy conference to share operations, maintenance and management best practices
- Improvements in management efficiency incentives
- Rural community energy awareness meetings
- Capital Investments:
  - Diesel system technology, including new efficient gen sets
  - Combined heat and power (cogen) systems
  - Wind-Diesel hybrid systems
  - End-Use lighting and appliances
- Rural School Model Energy Code
- Cogeneration Template Agreements for Schools, Water Utilities

1.1.1 Operations, Maintenance, & Management

In aggregate, roughly 30% of the total cost of rural electric utilities is fuel and 70% is non-fuel expenses, primarily consisting of people, equipment and financing.

Investments in new equipment designed to improve efficiency tend to increase financing costs and decrease fuel costs, with net fuel cost savings on the order of 10% or less. Given that fuel represents 30% of the total cost of service, a 10% fuel efficiency improvement yields a 3% or less total cost of service improvement.

In comparison, given that non-fuel expenses represent roughly 70% of the total cost of service, a 10% improvement in operations, maintenance and management may yield a 7% total cost of service improvement.

Thus, our first focus is to identify efficiency improvements that will reduce the total cost of service in the areas of operations, maintenance and management.

The recommended Operations, Maintenance, & Management portfolio consists of:

A) Invest in systems to measure operations, maintenance, and management performance

B) Sponsor annual rural Energy conference to:

   1) Facilitate identification and sharing of best practices

   2) Provide formal recognition of best O&M practices with annual micro-grant awards program

C) Improve management efficiency incentives

   1) Improve utility efficiency incentives

   2) Reduce regulatory uncertainty associated with new management of rural electric utilities

   3) Remove disincentives to equity investments

D) Improve customer choice and enhance competitive market dynamics

   1) School and Utility cogeneration template agreements

   2) Community meetings to raise household energy efficiency awareness

1.1.1.1 Measure Performance

The adage "you can't manage what you don't measure" applies in rural Alaska energy. A necessary but not sufficient condition for improved efficiency performance is to understand the efficiency of the current system and then identify what measures are likely to improve efficiency.

In order to improve the efficiency performance of rural Alaska electric utilities, especially those utilities that tend to have modest local resources, a high priority should be placed on investing in new cost-effective metering that allows measurement, recording, and remote monitoring of rural electric utility system efficiencies.

An initial program of $2 million a year over five years is recommended to begin to help facilitate improved management practices at the roughly 60-80 utilities that tend to have modest local resources and periodically require outside assistance to maintain their systems.[1]

Utilities that install and maintain the metering systems that enable remote metering of system efficiencies are then eligible for matching grants for diesel system efficiency improvements.[2] In many cases, once system efficiencies are measured and evaluated, modest changes in operations may be able to achieve significant efficiency improvements.

After operational changes are pursued, matching capital grants should be available to target cost-effective system improvements. An initial program of $2 million a year in 50% matching grants over five years is recommended for those capital improvements. This can take the form of an on-going solicitation for efficiency improvements from those utilities that have working metering and monitoring systems in place.

The installation of remote metering has the secondary benefit of reducing the uncertainty of potential new management when evaluating the attractiveness of providing service to a utility with modest local resources.

The total program cost of $4 million a year is included in the diesel technology spreadsheet and analysis in the Appendix.

1.1.1.2 Annual Rural Energy Conference

In order to facilitate identification and sharing of management, operations, and maintenance best practices and to provide a forum for formal recognition of best O&M practices with a micro-grant awards program, an annual rural energy conference is recommended. Travel funds should be made available to enable broad participation from rural communities. In addition, formal recognition of three best O&M practices may be provided at the conference in the form of a presentation of the "case study" followed by a micro-grant of $5,000 for each winner.

1.1.1.3 Improve Management Efficiency Incentives

In response to the draft Screening Report for the Alaska Rural Energy Plan (2001), some expressed concern that the existing Power Cost Equalization (PCE) program did **not** provide utility managers with efficiency incentives. A few suggested that, on its face, the PCE formula appeared to reward inefficient utility managers by reimbursing 95% of a utility's costs between the "urban price floor" and the "rural price cap" of 52.5 cents per kWh.

In response to these concerns, MAFA reviewed the PCE program and its administration with the goal of *improving management efficiency incentives*.

[1] The communities of interest typically include those that have received circuit rider assistance over the past few years. MAFA recommends that the "measurement system" procurement be either one (100%) or two (50/50) contracts where contract performance includes keeping measurement systems operating over more than one season.

[2] System efficiency metering data should be a prerequisite to receive diesel efficiency matching grants.

MAFA recommends the following changes to improve management efficiency incentives:

A) Allow *all* utilities to capture some of the potential benefits of "regulatory lag" that is currently provided to *regulated* utilities for their *non-fuel* costs.

   1) Regulated utilities are not *required* to annually update their PCE non-fuel costs. As a result, the PCE eligible non-fuel costs for some regulated utilities are based on cost filings from the 1980s. To the extent the utility has been able to achieve labor efficiencies from 1980 to now, it has been able to use the savings from those efficiencies as it sees fit.[3]

   2) In contrast, non-regulated utilities are required to update their non-fuel costs annually. To the extent that labor efficiencies are achieved, the PCE program captures most of them when the non-fuel costs are updated and the level of PCE support is reduced.

   3) **Recommendation PCE1**: Extend time period between administrative reviews of required annual non-fuel cost updates from one to three years.

   4) **Recommendation PCE2**: Extend time period between administrative reviews of fuel efficiency (kWh sold per gallon) from one to three years.[4]

B) Reduce the regulatory uncertainty associated with new management of rural electric utilities by streamlining Regulatory Commission of Alaska (RCA) timeline and process for new management[5]

   1) **Recommendation PCE3**: Request revision of RCA administrative procedures to simplify process and improve timeline for rural utility certificate transfers

C) **Recommendation PCE4:** Remove disincentives to *equity* capital investments in rural electric utilities by changing PCE Statues to treat *return on equity* as a cost eligible for reimbursement.[6]

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[3] Keep in mind that if the utility achieved significant labor efficiencies and tried to flow all of them through to the bottom line, the RCA financial review of annual reports is designed to identify excessive earnings and take corrective action where appropriate.

[4] Continue to flow through *fuel price* changes. Allow regulatory lag for fuel efficiency.

[5] MAFA highly recommends an independent review of the APUC rejection of the AVEC-Bethel Merger. A cursory review of the record suggests that the benefits arising out of the potential for the proposed merged regional cooperative (AVEC/Bethel) to be able to take over smaller troubled utilities was not adequately considered.

[6] See AS 42.45.110(a). The costs used to calculate the amount of power cost equalization for all electric utilities include all allowable costs, **except return on equity**, used by the Regulatory Commission of Alaska to determine the revenue requirement for electric utilities subject to rate regulation. This exception should be eliminated to "level the playing field" between debt and equity investments in rural electric utilities.

1.1.1.4 Improve Customer Choice & Enhance Competitive Market Dynamics

In order to improve customer choice of energy services and enhance the competitive market dynamics in rural Alaska communities, the AEA should sponsor local community energy awareness meetings.

The Alaska Energy Authority (AEA) could act as a neutral third party facilitator of a community meeting by:

- Inviting local residents, businesses, and school administrators to attend; provide 50 gallons drum of fuel oil as door prize
- Inviting energy service providers (utilities, fuel suppliers, wind and end-use program contractors, etc.) to make presentations of what they have to offer
- Providing independent technical support staff

The goal of the sponsored meeting is to provide:

- Heightened community awareness of energy issues,
- A neutral forum for energy service providers to highlight their respective services,
- Independent third party technical support to assist community members with questions concerning energy service provider presentations.

1.1.1.5 Operations, Maintenance, & Management Summary

In total, the operations, maintenance and management program recommendations, §1.1.1.1 through §1.1.1.4 above (excluding capital investments which are described in the following sections) are estimated to have direct costs on the order of $250,000 per year over five years – representing $25,000 net per year for the annual energy conference and $25,000 per year to help facilitate local community energy awareness meetings.

1.1.2 Electric Utilities Diesel Generation & Distribution

From 1985 to 2002, rural electricity consumption grew from 160.8 MWh to 383 MWh in 2002, a 138% increase in 17 years. At the same time, utility fuel consumption rose from 14.9 million gallons a year to 28.2 million gallons a year, an 89% increase. Aggregate fuel efficiency rose from 10.6 kWh_{sold} per gallon to 12.6 kWh_{sold} per gallon, a 19% increase. Thus, on an aggregate average basis, **fuel efficiency gains over the time period have saved rural Alaskan utilities roughly 8 million gallons of fuel per year.**[7]

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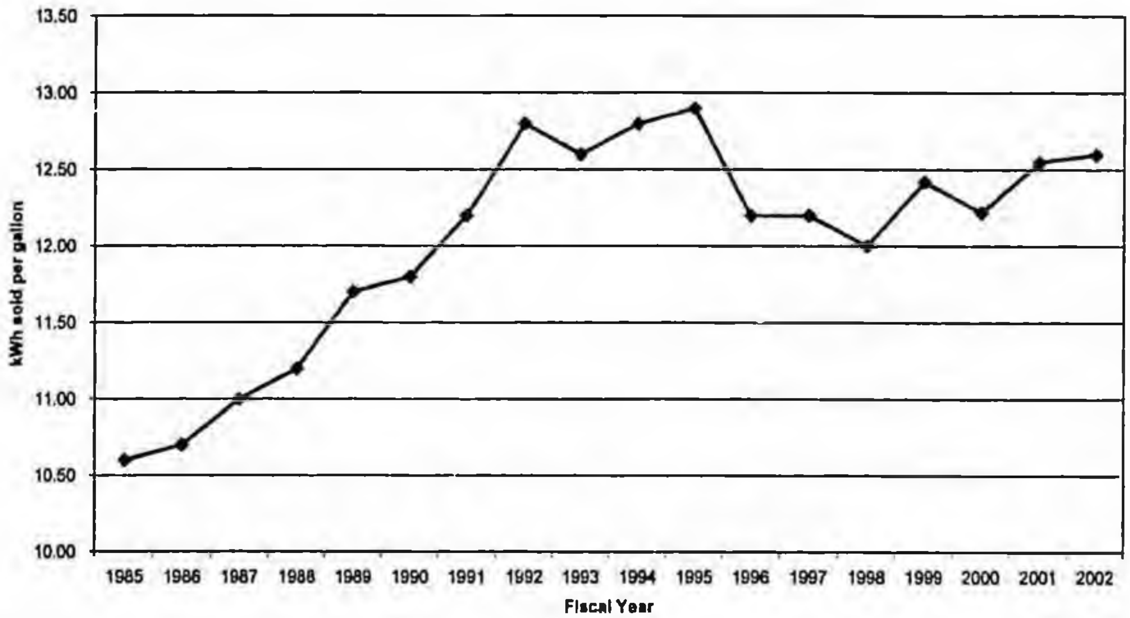
[7] Over the same time period new energy efficient lighting, electrical appliances, and space heating units were placed into service, typically reducing energy inputs required to maintain the same or in many cases expanded outputs. Unfortunately, we have been unable to find historic end-use consumption data comparable to that available from utilities so it is difficult to know how large the end-use efficiency gains may have been since 1985.

Aggregate Fuel Efficiency
PCE Program Participants



Under ideal conditions, the efficiency of rural Alaska diesel technology may approach 15.2 kWh_{sold} per gallon.[8] Nome Joint Utilities has been able to achieve fuel efficiencies *averaging* 14.5 kWh_{sold} per gallon over the FY96-FY02 time period. Other large utilities have been able to achieve fuel efficiencies in recent years in the 12.7 to 13.7 kWh_{sold} per gallon range. As the size of the community served declines, the fuel efficiency tends to decline *and* become more variable. Thus, on paper, the biggest opportunities for fuel efficiency improvements tend to be found in smaller remote villages where local management, operations, maintenance, and financial capacity may be a larger challenge than capital investment.

As more fully discussed in the Management Section above, in order to effectively target the remaining diesel system efficiency gains the first step for many utilities is to upgrade, replace, or install new metering systems. This will enable managers (and public and private funding entities) to quantitatively assess whether the next increment of efficiency is cost-effectively obtained through a change in operations, maintenance, management, new controls, or new diesel generators or some combination.

For those utilities that have management information on system efficiencies and how well system components are matched to their respective loads, matching capital funds should continue to be made available as part of an on-going solicitation for cost reductions and efficiency improvements.

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[8] Assume ideal aggregate *average* diesel generation efficiency of 16 kWh generated per gallon and "aggregate distribution and station loss" of 5% of kWh sold. Thus, kWh sold = [kWh generated * (1-distribution loss)], or 16 * [1-.05] = 15.2 kWh sold per gallon.

Summary:

Investment:	$1.5 Million a year in metering, monitoring, management information systems + $2.5 Million a year in matching capital grants over five years as part of solicitation for cost reductions and efficiency improvements
Benefits Estimate:	$16-$20 million over 15 years
Benefit/Cost Ratio:	0.92 - 1.15

1.1.3 Combined Heat & Power Systems (Cogeneration)

Roughly 27% of the existing rural Alaska electricity diesel generating plants operate combined heat and power systems where heat from the diesel generator jacket water is used to reduce the need for fuel consumed by heat-only boilers.[9]

System configurations vary widely. Some communities have a district heating system where multiple buildings are served by the heat from the diesel plant. Others use the heat from the diesel plant for the washeteria, water tank, piped water distribution system, or other heating load.

Based on a preliminary assessment of the market, it appears that on the order of 70% of rural Alaska communities should be able to make cost effective use of combined heat and power systems – whether to heat a school, clinic, water system or other local energy need.[10]

However, it appears that, despite the economic benefits on paper potential buyers of the heat from the utility (school administrators, water utility managers) may not be buying due to conflicting information about the benefits and concerns about reliability and control. These potential customers may benefit from *standardized contracts* that reduce the level of effort required to execute mutually beneficial arrangements. Standardized contracts also have the potential to improve comparability of contracts and enable buyers to have some confidence that they are getting a "reasonably" good deal compared to others who are similarly situated.

The rural energy plan recommends $50,000 to be invested in developing template agreements for schools, water utilities, clinics, offices, etc. In addition, the plan recommends $100,000 a year over five years be made available as "micro grants" ($10,000 each) to school administrators and water utility managers to help them explore the feasibility of using heat from their local electric utility.

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[9] See Rural Electric Utility Facility Assessment, 2000.

[10] As it turns out, ice making is a common use of combined heat and power systems in Northern Europe. Some rural Alaskan utilities appear to have successfully provided ice making capability in conjunction with their energy systems. Kotzebue has installed an ice making system to take advantage of the "extra" energy available from its wind-diesel hybrid system during the summer when the ice can help extend the fish processing capabilities of an area. So in addition to improving energy efficiency and displacing fuel, creative use of combined heat and power systems may create opportunities for new services.

In order to expand the addressable market and improve the potential value of the combined heat and power systems, schools and water utilities may benefit from *standardized system designs* that take advantage of the quality and quantities of heat typically available from utility diesel cogeneration systems. The rural energy plan recommends $100,000 to be invested in developing school heating system design guidelines.

In addition, the plan recommends making available $500,000 a year for five years in matching grants for repairs, upgrades, and expansions of existing combined heat and power systems to enable reliable cost effective delivery of heat from diesel plants to local heat customers.

Finally, in light of the potential for small office and residential household scale combined heat and power units, the plan recommends that $200,000 be made available for micro combined heat and power demonstration projects in rural Alaska.

Summary:

Investment:	$630,000 a year average over five years
Benefits Estimate:	$2.3 - $4.6 million over 15 years
Benefit/Cost Ratio:	0.85 to 1.66

1.1.4 Wind Power

Following the oil price spikes of the 1970s and early 1980s, there was a resurgence of interest in wind power. Neil Davis, in Energy Alaska reported that:

> A compilation of wind energy conversion machines given by Reckard and Newell (1981) indicates that there were approximately 100 machines in operation or planned for operation in 1981.
>
> Approximately two-thirds of the installed systems were independent of other energy systems – that is they are battery charging systems – but the other one-third are tied into existing utilities. The independent battery-charging system range in size from a rated maximum power output of 24W to 10kW, and the wind-energy converters hooked to utility systems range from a maximum rated output of 1.5 to 20 kW.

The level of interest appeared to subside into the late 1980s and early 1990s as diesel fuel prices tended to decline in real terms and the maintenance challenges of wind turbines in remote arctic environments proved more daunting than some had anticipated.

Within the past five years, as the cost of wind power has continued to decline faster than diesel and wind turbine technology has improved, there has been a resurgence of interest in rural Alaska *utility scale* wind turbine systems.

Beginning in 1997, Kotzebue Electric Association (KEA) installed a low penetration wind-diesel system. The wind turbines in Kotzebue were funded as three distinct project phases. In 1997 (first phase), KEA installed the first three grid-connected wind turbines. These turbines have been operating continuously for nearly five years. Through a grant from the National Renewable Energy Laboratory (NREL) and direct appropriations from the U.S. Department of Energy (DOE), seven additional turbines were installed in 1999.

For the 12-month period, January 2000 through December 2000, the Kotzebue wind facility delivered 1,064,000 kWh of electricity to the Kotzebue distribution system, (106,400 kWh/turbine) operating at an 18.3% average capacity factor. The long term projected output achieved in calendar year 2000 was 104.4%.[11] The overall wind turbine system availability was 98.3%.[12] The average annual wind speed was reported at 5.9 meters per second (13.2 miles per hour) at a 26.5-meter hub height, which would tend to characterize the site in wind power class 3.[13]

Other recent utility scale wind turbine projects include St. Paul and Wales:

- The system in St. Paul Island is a high penetration system with no electrical storage, although "excess energy" is stored in a hot water tank. The hybrid system is designed to support an 80,000 square foot industrial facility (called POSS Camp) owned by Tanadgusix Corporation. The wind turbine power system provides both electric and thermal energy to the POSS Camp. The installation of the hybrid system was completed on March 31, 1999 and was formally commissioned on June 12, 1999.
- The Wales diesel power system consists of three diesel generator sets rated at 75 kW, 142 kW, and 148 kW. The system is manually controlled and essentially run as a single-diesel plant. The Wales wind-diesel hybrid power system consists of the diesel generator sets, two 65-kW wind turbines, a 156 kVA rotary power converter, a 31 kWh battery bank, and a 234 kW electric boiler secondary loads system controls. The estimated average annual penetration of the hybrid system is about 100% and the peak penetration was estimated at approximately 350%.

Based on an economic analysis of currently available individual PCE eligible communities, roughly 31 rural Alaska communities representing 15,000 residents, present **attractive** opportunities for wind resource development – with reconnaissance benefit/cost ratios ranging from 1.0 up to 1.7. These communities represent, in aggregate, a total present value benefit of $38.6 million and a total present value cost of $35.2 million.[14] The potential net economic benefits from these communities are sufficient to justify a wind resource development program on the order of $35 million – including $1.6 million for detailed reconnaissance, preliminary design, and final

[11] Thus, with 10 turbines, the average turbine output was 106,400 kWh/year in 2000 operating at 104.4% of the long-term projected output. Thus, the long run average output per turbine delivered to the grid is estimated at 102,000 kWh/year per the DOE Wind TVP statistics. This compares to a net per turbine output of 118,730 kWh/year used by Global Energy Concepts in their January 2000 Wind Power Economic Evaluation – an apparent downward revision in the long term energy output of roughly 14%.

[12] DOE Wind Turbine Verification Program Web Site , "TVP Projects at a Glance."

[13] It is interesting to note that the NREL Wind Resource Atlas estimated the wind resource in Kotzebue as a wind power class 6.

[14] Total Cost = Capital + O&M + Wind Development Program Costs = $27.5M + $6.1M + $1.6M = $35.2M. All figures are expressed in present value 2002$, based on cash flow estimates over a15 year life using a 5% real discount rate.

feasibility plus $27.5 million for final design and construction contingent upon a finding of net economic benefits at the final feasibility analysis stage.[15]

Another 17 communities representing 16,000 residents represent **potentially attractive** opportunities for wind resource development – with reconnaissance benefit/cost ratios ranging from 0.85 to 1.0. These communities represent, in aggregate, a total benefit of $53 million and a total cost of $58 million under the medium wind penetration scenario. While the benefit/cost estimates for these communities is less than one in the preliminary reconnaissance for medium wind penetration, they are within the margin of uncertainty associated with the market reconnaissance. As such, they appear to warrant additional in-depth record and on-site reconnaissance to reduce the uncertainty of the potential value of wind resource development in these communities.[16]

Based on this initial market reconnaissance study, the Rural Energy Plan recommends a **wind resource development program on the order of $30 million over roughly five years** ($27.5M capital + $1.6 M Wind Recon).

The wind resource development program includes detailed site-specific reconnaissance, preliminary design, final feasibility, and, contingent upon final feasibility determinations, is expected to reach around 30 rural Alaska communities representing on the order of 15,000 rural residents.

In order to maximize the economic value of wind resource development, the recommended program focuses on systematically reducing the uncertainty associated with the initial market value estimates. A review of best practices in the industry suggest a program where construction funds are not committed until a final project feasibility assessment is made based upon detailed site specific reconnaissance and *at least* two to three years of detailed local wind data at the proposed site.[17]

Summary:

Investment:	$6 million a year average over five years
Benefits Estimate:	$30 - $40 million over 15 years
Benefit/Cost Ratio:	0.9 to 1.1

1.1.5 End-use heating & electricity

The review of end-use heating and electricity markets focused on rural households and schools as the two primary markets where the adoption of cost effective energy efficiency measures appeared to be relatively modest compared to the commercial sector.

[15] See Figures 2.2 and 2.3: Wind Resource Assessment Program

[16] Please note that Kotzebue has a benefit/cost ratio of 0.86 in the market reconnaissance study under the medium wind penetration case. An investment in additional reconnaissance in these **potentially attractive** communities is roughly equivalent to buying an option on the potential that the B/C for wind resource development in these communities will exceed one after further reconnaissance.

[17] See National Wind Coordinating Council, Wind Energy Series No. 4, January 1997.

1.1.5.1 Households

Of the roughly 30,000 rural Alaska households identified in the 2000 Census, it appears that nearly 25,000 of those households participated in the PCE program in FY00. The average rural household energy consumption is outlined below.

Table 1: Typical Alaskan Household Energy Consumption

	Rural Average	Anchorage	Fairbanks	Juneau
Median Household Income (MHI)	$40,380[18]	$55,546	$40,577	$62,034
Annual Electric Consumption	5040 kWh	7782 kWh	9048 kWh	10,428 kWh
Average Price[19] (After PCE)	$0.20/kWh	$0.095/kWh	$0.089/kWh	$0.102/kWh
Annual Amount	$1080	$739	$805	$1064
[redacted]				
Space Heating Consumption	700 gallons per year	2100 CCF per year	1500 gallons per year	1000 gallons per year
Average Price	$2.00 per gallon[20]	$0.40 pe	$0.75 per gallon	$0.79 per gallon
Annual Amount	$1400	$890[21]	$1125	$790
[redacted]				

Sources: PCE Annual Reports, Natural Gas Feasibility Studies, CBJ, MAFA estimates

[18] The weighted average rural Alaska median household income based on census data reported in 1997 is $40,380, spanning the range of over $56,000 in both the North Slope and Bristol Bay to under $24,000 in Wade Hampton.

[19] Rural Average based on Annual PCE Statistics (FY2000). Urban figures based upon Cooperative Extension Service consumer expenditure survey (2000).

[20] Bethel $2.04 per gallon, March 2000 Cooperative Extension Service Survey; MAFA Estimated weighted average of Weatherization Rural Fuel Price Survey (2000) plus rural communities not covered by survey.

[21] Includes $4.50 per month customer charge

In aggregate, rural Alaska households consume roughly:

Electricity	126,000,000 kWh/year		$38.7 million/year
		Less	$16 million/year PCE
		Net	$22 million/year
Heating Fuel	17,500,000 gallons/year		$35 million/year
		Less	$ 9 million/year LIHEAP
		Net	$26 million/year

Of the total rural Alaska household consumption of roughly 126,000,000 kWh a year, there appears to be on the order of 33% in *potential savings* due to end-use efficiency (including fuel switching).[22]

Of the total rural Alaska household consumption of roughly 17,500,000 gallons a year, there appears to be on the order of 10% in *potential savings* due to end-use efficiency (including fuel switching).[23]

Some of that potential savings is being realized every year as households periodically replace existing inefficient lighting, appliances, fixtures and heaters with new, mostly more efficient ones.

The challenge is to develop programs that cost-effectively accelerate the replacement of existing inefficient stuff with newer more efficient stuff without creating a net efficiency loss for the utility that may experience a short-term reduction in system efficiency due to decreased demand on generation systems sized for larger demand.

With that in mind, we conducted a small sample end-use survey of rural households, analyzed data from the AHFC weatherization program, and interviewed business people providing energy appliances and energy services to rural Alaska along with weatherization program employees and contractors. We examined numerous studies, reports and data from end-use programs, including a few in rural Alaska. In the end, the quantity and quality of rural end-use data remains limited, leaving significant uncertainty as to the potential net benefits of several of the measures identified in the screening report.

[22] Engineering calculations of aggregate household electrical energy use could improve from roughly 6.7kWh/sq ft/year to around 4.5kWh/sq ft/year if rural households adopted a number of the end-use energy efficiency measures identified in the study – including switching from electrical hot water heaters to efficient oil-fired water heaters.

[23] Engineering calculations of aggregate household heating energy use could improve from roughly 1.14 gallons per sq foot per year to around 1.0 gallon per sq foot per year if rural households switched to high efficiency direct vent heaters for space and water heating. Note that while the *net* effect of switching from electric to oil-fired hot water heaters is positive, the increase in fuel consumption to heat hot water may not be entirely offset by the fuel savings due to more efficient space heating. The net effect is dependent upon housing characteristics and water consumption patterns.

Nonetheless, the benefits of new high efficiency lighting and electric water heater replacement programs appear to far outweigh the cost, including the potential for "free riders", short-term declines in utility energy demand and efficiency, and market uncertainty.

In contrast, the benefit/cost ratios of refrigerator replacement, new direct vent high efficiency heaters, and television are positive, but the uncertainty about the benefits of the program compared to existing market trends is significant. As a result, we recommend small pilot programs to better assess the benefits of a specific program compared to market trends absent the new program.

Finally, the relative benefit/cost ratios of other incremental programs remains less attractive based on the limited data and analysis we have been able to conduct. As a result, we do not recommend any new programs in those areas at this time. We do not rule out the possibility that additional data and new analysis may find new or expanded initiatives that provide net economic benefits.

1.1.5.2 Schools

It appears that roughly 4.1 million square feet of school buildings existing in the PCE eligible communities in rural Alaska. Based on anecdotal evidence, the average electrical consumption is estimated at 12 kWh/square foot/year. Average heating fuel consumption is estimated at 1.2 gallons/square foot/year.

Thus, in aggregate, rural Alaska school buildings consume roughly:

Electricity	49,200,000 kWh/year	$14.8 million/year
Heating Fuel	5,000,000 gallons/year	$ 7.5 million/year

Of the total rural Alaska school facility consumption of roughly 49,200,000 kWh a year, there appears to be on the order of 50% in *potential savings* due to end-use efficiency.[24]

Of the total rural Alaska household consumption of roughly 5,000,000 gallons a year, there appears to be on the order of 50% in *potential savings* due to end-use efficiency.[25]

Some of that potential savings is being realized every year as schools periodically replace existing inefficient lighting, appliances, fixtures and HVAC equipment with new, mostly more efficient ones.

Again, like the household market, the challenge is to develop programs that cost-effectively accelerate the replacement of existing inefficient stuff with newer more efficient stuff without creating a net efficiency loss for the utility that may experience a short-term reduction in system efficiency due to decreased demand on generation systems sized for larger demand.

[24] Based on an assessment of Canadian schools from the Yukon Territories where best practices indicate electrical consumption on the order of 6 kWh/square foot/year and heating fuel consumption on the order of 0.6 gallons per square foot per year. While there may be some differences between usage patterns and acceptable performance of school heating systems in the Yukon compared to Alaska, anecdotal evidence from cross-border sporting events suggests the differences to be relatively minor.
[25] Ibid.

Table 2: Summary of End-Use Energy Efficiency Technologies & Initiatives

Technology	[illegible]	[illegible]	[illegible]	[illegible]
Lighting	1 in 8 rural lights reported to be Compact Florescent Light (CFL) in rural sample. Diffusion appears relatively slow in rural compared to urban areas where relatively inexpensive CFLs are widely available at "box stores." Relative performance of CFLs to other lights may restrain market penetration relative to analysis based on "energy economics" alone	Replacement of inefficient incandescent bulbs with more efficient CFLs can save on the order of $25 per year per bulb Incremental benefits are sufficient to overcome a high percentage of free riders that may participate in the program.	Households = 0.8 To 1.9 Schools = 1.2 To 2.4	Recommend lighting education and light bulb replacement program for households ($350K per year) and schools ($500K per year). School market has higher B/C due to scale efficiencies.

Table 2: Summary of End-Use Energy Efficiency Technologies & Initiatives

[illegible]	[illegible]	[illegible]	[illegible]	Comments
Refrigeratior	Rural households sample averages 1.1 refrigerators. Appliance standards and Energy Star program continue to improve efficiency of new refrigerators. Rate of new purchase and resale of older units is unknown.	Replacing an old refrigerator prior to the end of its normal life may save on the order of $100 a year Providing a credit toward the purchase of an Energy Star may provide savings on the order of $15 a year (difference between energy star and new refrigerator that meets appliance standards)	Replace old refrigerator with new Energy Star refrigerator = 0.9-1.1 Provide credit toward new energy star refrigerator when household is looking to purchase new refrigerator = 2.0-2.4	Recommend pilot program to ascertain the net economic benefits of replacement and upgrade programs. ($200K per year)
Freezers	59% of rural household sample reports a separate freezer. Appliance standards and Energy Star program continue to improve efficiency of new freezers.	The difference in energy efficiency between old freezers and new freezers is relatively modest – may be on the order of $30 per year. Simple break-evens approach 18 years.	Freezer replacement programs did not achieve a benefit/cost ratio in excess of 1.0	Incremental benefits beyond those provided by existing appliance standards appear difficult to achieve. No new program recommended at this time.

Table 2: Summary of End-Use Energy Efficiency Technologies & Initiatives

Technology	[illegible]	[illegible]	[illegible]	[illegible]
Televisions	Appliance standards and Energy Star program have relatively modest effect on this market. Rate of purchase of new more units and resale/continued use of older units is unknown.	Replacing existing sets with new Energy Star sets may save up to $37 per year.	TV replacement program may achieve a benefit/cost of slightly over 1.0	Recommend small pilot program to assess whether free riders can be limited in order to achieve net program benefits. ($50K/year)
Propane Range (Oven + Cook Top)	Unknown	Replacing electric range with propane range can yield significant energy efficiency savings depending upon kitchen cooking practices and building ability to handle increased moisture load (ventilation/vapor barrier issues). Energy savings benefits may be offset by decline in indoor air quality.	On the basis of direct energy savings, may be able to achieve benefit cost ratio on the order of 1.0	Better understanding of indoor air quality implications may be warranted prior to recommendations to replace electric ranges with propane ranges

Table 2: Summary of End-Use Energy Efficiency Technologies & Initiatives

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Direct Vent Oil-Fired Space Heaters	44% of rural sample households reported installation of high efficiency direct vent oil-fired space heaters. Vendors report brisk sales to rural Alaska.	Significant potential incremental benefits if free riders can be limited Replacement of pot burner/cook stove with high efficiency unit may save on the order of $600-700 per year Replacement of typical central boiler with high efficiency unit may save on the order of $200 per year	Replacement of pot burners, cook stoves, and typical central boilers may achieve benefit/cost ratios of between 1.1 – 1.3	Recommend pilot program to assess whether free riders can be limited and net positive benefits achieved. ($200K per year)

Table 2: Summary of End-Use Energy Efficiency Technologies & Initiatives

Technology	[illegible]	[illegible]	[illegible]	[illegible]
Replace Electric Water Heaters with efficient Oil-Fired Water Heaters	52% of rural sample households report *hot water heaters.* 43% of households with water heater report *electric* hot water heaters. Vendors report relatively slow to sales of efficient oil-fired hot water heaters	Replacing electric tank hot water heater with oil fired tank hot water heater may save on the order of $700 per year for equivalent hot water output. Risk of free riders appears relatively modest.	Replacement of electric hot water heaters with oil fired hot water heaters may yield benefit/cost ratios in the range of 3-5	Recommend electric hot water heater education and replacement program. ($2 million per year)
Insulation/Weatherization	Current program covers roughly 100-200 rural households per year New housing stock continues to improve due to higher energy efficiency standards	Difficult to assess the incremental benefit of a new program compared to existing programs Increased funding of existing program may yield net benefits depending upon quantification of house life extension value		No new program recommended at this time.

Table 2: Summary of End-Use Energy Efficiency Technologies & Initiatives

Technology	[illegible]	[illegible]	[illegible]	Comments
Water Conservation Devices	Unknown in rural Alaska. Evidence from program evaluations in lower 48 suggest a large number of water conservation devices are replaced due to customer dissatisfaction with performance	Undetermined	Undetermined	Given significant level of investment into new water systems for rural Alaska, it may be prudent to conduct a small pilot study to ascertain whether low flow devices meet customer satisfaction criteria
Model Energy Code – Schools	Conversations with SOA DOE facilities staff suggest little activity is occurring due to lack of funding	Significant potential to improve end-use energy efficiency in rural schools. Best practices in Yukon suggest energy savings on the order of 50% may be achievable.	Relatively low cost and high potential for energy savings in new facilities could yield benefit/cost ratio in excess of 2	Recommend development of a model energy code for rural schools ($100K)
Model Energy Code – Housing	HUD Model Energy Code Non-HUD homes			Unable to assess the incremental improvements that a model code would provide over HUD energy codes

Source: End-Use Efficiency Chapter

2 Policy Assumptions

The recommendations and supporting analysis of the rural Alaska energy plan are based on the following policy assumptions:

- The overall level of government funding will be sufficient to cover recommended investments that are likely to yield net economic benefits.
- Government funding is designed to complement, not displace, private sector capital.
- Without new government funding, many energy efficiency measures are currently being adopted in the marketplace today and will continue to do so – new programs are conceptually designed to cost-effectively accelerate the replacement of existing inefficient energy systems with newer more efficient energy systems.
- Supply side energy efficiency programs should be designed to accelerate market replacement of inefficient systems without creating a net efficiency loss due to a short-term reduction in system efficiency caused by decreased demand on generation systems optimally sized for larger demand.
- The economic analysis uses a 5% real discount rate and limits the time horizon to 15 years.
- The point of view of Alaskan residents is adopted for the economic analysis.
- The distribution of economic benefits includes households, utilities, and the PCE program. It is assumed that the net economic benefits that are initially distributed to utilities and the PCE program will flow through to Alaskan residents.

3 Background

3.1 Goal

The goal of the Rural Alaska Energy Plan is to identify initiatives that are likely to produce *cost-effective* improvements in the efficient and reliable delivery of electrical and heating energy in Rural Alaska markets from the point of view of the citizens of the State of Alaska.

3.2 What's Included

In this analysis, an attempt is made to capture the total quantifiable *energy* costs and total quantifiable *energy* benefits that accrue to *all* the citizens of the State of Alaska, as utility ratepayers, heating fuel purchasers, and in their role as federal and state taxpayers. Thus, costs not typically included in the *price* of electricity – the incremental costs of a new diesel fuel tank farm funded primarily by State and Federal government grants – are included in the analysis where relevant.

3.3 Who's Included

For the purposes of this report, rural Alaska is defined as communities eligible to participate in the State of Alaska Power Cost Equalization (PCE) program. Thus the addressable rural market approaches on the order of 30,000 residential households with roughly 20 million ft^2 and a total population approaching 80,000 Alaskans.[26] The addressable market also includes nearly 1700 community facilities (sewer/water facilities, outdoor lighting, community buildings) and 600 school buildings with roughly 4.1 million ft^2.[27]

The communities range in size from small villages with less than 50 people,

- Stony River 35
- Pedro Bay 36
- Umnak 39
- Karluk 41
- Platinum 43
- Red Devil 44

to communities with over 2,000 residents:

- Cordova 2435
- Dillingham 2546
- Craig 2809
- Kotzebue 2932
- Nome 4021
- Unalaska 4178
- Bethel 5471

[26] See Alaska Census 2000, by Community and Housing Stock Estimates.
[27] See State Department of Education School Inventory screened for PCE eligible communities.

4 Appendices

Rural Alaska Energy Plan
Summary

	1 2003	2 2004	3 2005	4 2006	5 2007	6 2008	7 2009	8 2010	9 2011
Investment									
Diesel System Efficiencies	$4,000,000	$4,000,000	$4,000,000	$4,000,000	$4,000,000				
Combined Heat & Power	$750,000	$600,000	$600,000	$600,000	$600,000				
Wind Energy Development	$633,000	$5,583,000	$8,584,000	$7,050,000	$7,050,000				
End Use Efficiencies	$2,300,000	$2,800,000	$2,800,000	$2,800,000					
Management, Operations & Maintenance	$250,000	$250,000	$250,000	$250,000	$250,000				
Totals	$7,933,000	$13,233,000	$16,224,000	$14,700,000	$11,900,000				
5.0% Present Value	$54,999,187								
Returns									
Incremental Efficiency Improvements:									
Diesel System Efficiencies	$0	$289,022	$[illegible]1,858	$909,006	$1,240,985	$1,588,326	$1,951,579	$2,331,313	$2,728,114
Combined Heat & Power	$0	$51,224	$101,839	$151,851	$201,266	$250,089	$298,328	$345,988	$393,076
Wind Energy Development	$0	$750,774	$1,512,846	$2,286,545	$3,072,140	$3,133,695	$3,193,176	$3,253,786	$3,315,546
End Use Efficiencies	$[illegible]1,038	$445,121	$689,240	$948,664	$1,224,129	$1,516,404	$1,627,488	$1,744,355	$1,867,269
Management, Operations & Maintenance	$100,000	$200,000	$300,000	$400,000	$500,000	$500,000	$500,000	$500,000	$500,000
Totals	$331,038	$1,736,142	$3,195,783	$4,696,067	$6,238,520	$6,988,515	$7,570,572	$8,175,442	$8,804,005
5.0% Present Value of Savings	$67,645,684								

Evaluation:

Benefit/Cost	1.23
5.0% Net Present Value	$12,646,497

Rural Alaska Energy Plan
Diesel Efficiency Improvement Program
Metering, Distribution Efficiencies, Controls, New Generating Units

		1	2	3	4	5	6	7	8	9	10
		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Investment											
		$4,000,000	$4,000,000	$4,000,000	$4,000,000	$4,000,000					
5.0%	Present Value	$17,317,907									
Returns											
	Base Case:										
2.9%	kWh sold (millions)	400	412	424	436	448	461	475	489	503	517
0.1%	kWh sold per gallon	14.10	14.11	14.13	14.14	14.16	14.17	14.18	14.20	14.21	14.23
	Gallons	28,368,794	29,162,327	29,978,056	30,816,603	31,678,606	32,564,721	33,475,623	34,412,004	35,374,577	36,364,076
$1.25	Fuel Cost	$35,460,993	$36,462,909	$37,472,571	$38,520,754	$39,598,258	$40,705,902	$41,844,528	$43,015,004	$44,218,221	$45,455,095
	Incremental Efficiency Improvements:										
	kWh sold (millions)	400	412	424	436	448	461	475	489	503	517
0.9%	kWh sold per gallon	14.10	14.23	14.35	14.48	14.61	14.75	14.88	15.01	15.15	15.20
	Gallons	28,368,794	28,931,109	29,504,570	30,089,398	30,685,819	31,294,061	31,914,359	32,546,963	33,192,006	34,037,274
	Fuel Cost	$35,460,993	$36,163,887	$36,880,713	$37,611,748	$38,357,273	$39,117,576	$39,892,949	$40,683,691	$41,490,107	$42,546,593
	Incremental Fuel Savings	$0	$289,022	$591,858	$909,006	$1,240,985	$1,588,326	$1,951,579	$2,331,313	$2,728,114	$2,908,502
5.0%	Present Value of Savings	$13,206,169									
	Evaluation:			16	17	18	19	20			
	Benefit/Cost	1.05		0.92	0.98	1.04	1.10	1.15			
5.0%	Net Present Value	$888,262									

Rural Alaska Energy Plan
Combined Heat & Power Improvement Program

		1	2	3	4	5	6	7	8	9	10
		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Investment											
	Template Agreement	$50,000									
	Design Guidelines	$100,000									
	Microgrant Incentive Program	$100,000	$100,000	$100,000	$100,000	$100,000					
	System Improvement Grants	$500,000	$500,000	$500,000	$500,000	$500,000					
	$630,000	$750,000	$600,000	$600,000	$600,000	$600,000					
5.0%	Present Value	$2,740,543									
Returns											
	Base Case:										
	Heated Space (Sq Footage)	4,000,000									
	BTU req'd/sq ft/yr	115,920									
	Heating System MMBTUs	463,680	463,680	463,680	463,680	463,680	463,680	463,680	463,680	463,680	463,680
0.2%	BTU sold/gallon	96,600	96,793	96,987	97,181	97,375	97,570	97,765	97,961	98,156	98,353
	Gallons	4,800,000	4,790,419	4,780,857	4,771,315	4,761,791	4,752,287	4,742,801	4,733,334	4,723,887	4,714,458
$1.35	Fuel Cost	$6,480,000	$6,467,066	$6,454,158	$6,441,275	$6,428,418	$6,415,587	$6,402,781	$6,390,001	$6,377,247	$6,364,518
	Incremental Efficiency Improvements:										
	Heating System MMBTUs	463,680	463,680	463,680	463,680	463,680	463,680	463,680	463,680	463,680	463,680
1.0%	BTU sold/gallon	96,600	97,566	98,542	99,527	100,522	101,528	102,543	103,568	104,604	105,650
	Gallons	4,800,000	4,752,475	4,705,421	4,658,833	4,612,706	4,567,035	4,521,817	4,477,047	4,432,719	4,38[illegible],331
	Fuel Cost	$6,480,000	$6,415,842	$6,352,318	$6,289,424	$6,227,153	$6,165,498	$6,104,453	$6,044,013	$5,9[illegible],171	$5,924,922
	Incremental Fuel Savings	$0	$51,224	$101,839	$151,851	$201,266	$250,089	$298,328	$345,988	$393,076	$439,596
5.0%	Present Value of Savings	$3,090,593									

Evaluation:

	Benefit/Cost	1.13
5.0%	Net Present Value	$360,049

Delta			
0.6%	0.8%	1.0%	1.2%
0.85	1.13	1.40	1.66

Rural Alaska Energy Plan
Wind Systems

		1 2003	2 2004	3 2005	4 2006	5 2007	6 2008	7 2009	8 2010	9 2011
	Investment									
	Detailed Site Reconnaisance	$400,000	$400,000	$400,000						
	Final Feasibility Reviews	$133,000	$133,000	$134,000						
	Design/Build RFP, Contract Admin	$100,000	$50,000	$50,000	$50,000	$50,000				
	Design/Build Contract		$5,000,000	$8,000,000	$7,000,000	$7,000,000				
		$633,000	$5,583,000	$8,584,000	$7,050,000	$7,050,000				
5.0%	Present Value	$24,405,897								
	Returns									
	Base Case:									
	Fuel Savings from Wind Without Wind Resource Development Program									
2.0%	kWh generated displaced	1,100,000	1,122,000	1,144,440	1,167,329	1,190,675	1,214,489	1,238,779	1,263,554	1,288,825
0.10%	kWh generated/gallon	13.41	13.42	13.44	13.45	13.46	13.48	13.49	13.50	13.52
	Gallons	82,034	83,591	85,178	86,794	88,442	90,121	91,831	93,574	95,350
$1.25	Fuel Cost	$102,542	$104,489	$106,472	$108,493	$110,552	$112,651	$114,789	$116,968	$119,188
	Incremental Benefit of Wind Resource Development Program									
2.0%	kWh generated displaced	1,100,000	9,100,000	17,100,000	25,100,000	33,100,000	33,762,000	34,437,240	35,125,985	35,828,504
0.10%	kWh generated/gallon	13.41	13.30	13.20	13.10	13.00	13.00	13.01	13.03	13.04
	Gallons	82,034	684,211	1,295,455	1,916,031	2,546,154	2,597,077	2,646,372	2,696,603	2,747,787
$1.25	Fuel Cost	$102,542	$855,263	$1,619,318	$2,395,038	$3,182,692	$3,246,346	$3,307,965	$3,370,754	$3,434,734
	Incremental Fuel Savings	$0	$750,774	$1,512,846	$2,286,545	$3,072,140	$3,133,695	$3,193,176	$3,253,786	$3,315,546
5.0%	Present Value of Savings	$26,784,217								
	Evaluation:									
	Benefit/Cost	1.10								
5.0%	Net Present Value	$2,378,320								

Rural Alaska Energy Plan
End Use Efficiency

			1 2003	2 2004	3 2005	4 2006	5 2007	6 2008	7 2009	8 2010	9 2011
		Investment									
		Households									
		Lighting Replacement	$350,000	$350,000	$350,000	$350,000					
		Refrigerator Replace/Upgrade Pilot	$200,000	$200,000	$200,000	$200,000					
		Inefficient TV Replacement Pilot	$50,000	$50,000	$50,000	$50,000					
		Space Heating Replacement Pilot	$200,000	$200,000	$200,000	$200,000					
		Replace Electric Hot Water Heaters	$1,500,000	$2,000,000	$2,000,000	$2,000,000					
		Subtotal Households	$2,300,000	$2,800,000	$2,800,000	$2,800,000					
		Schools									
		Lighting Replacement	$500,000	$500,000	$500,000	$500,000					
		Model Energy Code	$100,000								
		"See also CHP - Design Guidelines"									
		Subtotal Schools	$600,000	$500,000	$500,000	$500,000					
		Total	$2,900,000	$3,300,000	$3,300,000	$3,300,000					
	5.0%	Present Value	$11,320,684								
		Rural Alaska Household Market - Base Case									
	1.5%	Households	25,000	25,376	25,756	26,142	26,534	26,932	27,336	27,746	28,162
5040	2.0%	kWh/household/year	5,141	5,244	5,348	5,455	5,565	5,676	5,789	5,905	6,023
		Electricity - kWhs	128,520,000	133,056,766	137,753,659	142,616,364	147,650,721	152,862,792	158,258,848	163,845,366	169,629,128
	$0.31	$/household - kWhs	$1,594	$1,626	$1,658	$1,691	$1,725	$1,760	$1,795	$1,831	$1,867
700	1.0%	gallons/household/year	707	714	721	728	736	743	750	758	766
		Heating Fuel - gallons	17,675,000	18,119,526	18,575,232	19,042,399	19,521,316	20,012,277	20,515,586	21,031,553	21,560,496
	$2.00	$/household - Heating Fuel	$1,414	$1,428	$1,442	$1,457	$1,471	$1,486	$1,501	$1,516	$1,531
		TOTAL $/household	$3,008	$3,054	$3,100	$3,148	$3,196	$3,246	$3,296	$3,347	$3,398
		TOTAL ANNUAL EXPENDITURES	$115,032,400	$118,734,241	$122,557,734	$126,506,944	$130,586,079	$134,799,465	$139,151,657	$143,647,244	$148,291,052
		Rural Alaska School Facility Market - Base Case									
	1.0%	Square Footage of Facility	4,150,000	4,191,500	4,233,415	4,275,749	4,318,507	4,361,692	4,405,309	4,449,362	4,493,865
12.0	0.5%	kWh/sq ft/year	12.1	12.1	12.2	12.2	12.3	12.4	12.4	12.5	12.6
		kWhs/year	50,049,000	50,802,237	51,566,811	52,342,892	53,130,652	53,930,268	54,741,919	55,565,785	56,402,050
	$0.31	$/year - electricity	$15,515,190	$15,748,694	$15,985,711	$16,226,296	$16,470,502	$16,718,383	$16,969,995	$17,225,393	$17,484,635
1.20	0.5%	gallons/sq ft/year	1.21	1.21	1.22	1.22	1.23	1.24	1.24	1.25	1.26
		gallons/year	5,004,900	5,080,224	5,156,681	5,234,289	5,313,065	5,393,027	5,474,192	5,556,578	5,640,205
	$1.50	$/year - fuel	$7,507,350	$7,620,336	$7,735,022	$7,851,434	$7,969,598	$8,089,540	$8,211,288	$8,334,868	$8,460,307
		TOTAL ANNUAL EXPENDITURES	$23,022,540	$23,369,029	$23,720,733	$24,077,730	$24,440,100	$24,807,923	$25,181,283	$25,560,261	$25,944,943
		Returns									
		Incremental Benefit of End-Use Efficiency Programs							1.9%		
		Households							1.0%		
5,040	1.0%	Electricity - kWh/household/year	5,090	5,141	5,193	5,245	5,297	5,350	5,452	5,555	5,661
700	1.5%	Fuel - gallons/household/year	711	721	732	743	754	766	773	781	789
		Electricity - $/year	$39,450,600	$40,442,783	$41,459,919	$42,502,636	$43,571,577	$44,667,402	$46,198,824	$47,782,751	$49,420,982
		Fuel - $/year	$35,525,000	$36,598,743	$37,704,940	$38,844,572	$40,018,649	$41,228,213	$42,265,102	$43,328,070	$44,417,771
								0.1%			
		School Facilities						0.1%			
12.0	0.4%	Electricity - kWh/sq ft/year	12.0	12.1	12.1	12.2	12.2	12.3	12.3	12.3	12.3
1.20	0.5%	Fuel	1.21	1.21	1.22	1.22	1.23	1.24	1.24	1.25	1.26
		Electricity - $/year	$15,499,752	$15,717,369	$15,938,040	$16,161,810	$16,388,722	$16,569,162	$16,751,589	$16,936,024	$17,122,489
		Fuel - $/year	$7,507,350	$7,620,336	$7,735,022	$7,851,434	$7,969,598	$8,089,540	$8,211,288	$8,334,068	$8,460,307
		Electricity Savings	$406,038	$804,812	$1,243,718	$1,708,437	$2,200,147	$2,720,063	$2,861,419	$3,009,318	$3,164,047
		Fuel Savings	($175,000)	($359,691)	($554,478)	($759,773)	($976,018)	($1,203,659)	($1,233,93[illegible])	($1,264,964)	($1,296,778)
		TOTAL ANNUAL SAVINGS	$231,038	$445,121	$689,240	$948,664	$1,224,129	$1,516,404	$1,627,488	$1,744,355	$1,867,269
	5.0%	Present Value of Savings	$15,282,976								

Evaluation:

	Benefit/Cost	1.35
5.0%	Net Present Value	$3,962,292

SENATE COMMITTEE REPORT

DATE: 5/11/03

FURTHER: Finance

DATE TURNED IN TO OFFICE: 5/13/03

Labor and Commerce Committee considered CS FOR HOUSE CONCURRENT RESOLUTION NO. 21(FIN)

HCR 21 ALASKA ENERGY POLICY TASK FORCE

Relating to establishing the Alaska Energy Policy Task Force.

and recommends:

[ ] be **replaced** with ______ CS ______________ (________)

[ ] adopt **previous** ______ CS ______________ (________)

[ ] attached amendment(s)

[ ] adopt Letter of Intent by ______________ Committee

[ ] further referral to ______________ Committee

Senate Bill:
[ ] same title
[ ] new title

House Bill:
[ ] same title
[ ] technical title
[ ] new: SCR #_____

NEW FISCAL NOTE(S):

Department	Date	Fiscal	Zero	FN#

PREVIOUS FISCAL NOTE(S):

Department	Date	Fiscal	Zero	FN#
LEG	5/8/03	✓		1

[ ] **APPROPRIATION - no fiscal note**

SIGNATURES AND RECOMMENDATIONS:	DO PASS	DO NOT PASS	NO REC	AMEND
Davis — Bettye Davis			X	
French — [signature]			X	
Seekins — Ralph Seekins			X	
Gary Stevens — [signature]			X	
Bunde — CHAIR: C B Bunde			✓	

SENATE FINANCE COMMITTEE

SIGN-IN

HCR 21-ALASKA ENERGY POLICY TASK FORCE

NAME: LANDH BAILY Subject/Bill No: HCR21

Co./Dept./Title: Dept Revenue Phone: 465-2302

Address:____ Zip:____

Do you wis.. to testify? X Yes ___No ___Respond To Questions

NAME: ____ Subject/Bill No: ____

Co./Dept./Title: ____ Phone: ____

Address:____ Zip:____

Do you wish to testify? ___Yes ___No ___Respond To Questions

NAME: ____ Subject/Bill No: ____

Co./Dept./Title: ____ Phone: ____

Address:____ Zip:____

Do you wish to testify? ___Yes ___No ___Respond To Questions

NAME: ____ Subject/Bill No: ____

Co./Dept./Title: ____ Phone: ____

Address:____ Zip:____

Do you wish to testify? ___Yes ___No ___Respond To Questions

SITE: **MAT-LIO**

SUBJECT OF MEETING: HCR21

COMMITTEE: SFIN

UPDATE#:

DATE: 05/16/03

PLEASE SIGN IN

PRINT YOUR NAME	ADDRESS (MAILING & ZIP)	REPRESENTING	DO YOU WANT TO TESTIFY? Y or N
Eric Yould		ARECA	HCR21 Y
Email address:			
Email address:			
Email address:			
Email address:			
Email address:			
Email address:			