186

Alyeska pipeline SERVICE COMPANY

1835 SOUTH BRAGAW STREET ANCHORAGE, ALASKA 99512 TELEPHONE (907) 278-1611 FAX 787-8611

David G. Wight
President & Chief Executive Officer

May 1, 2003

The Honorable Reggie Joule
Alaska State Capitol
Juneau, AK 99801-1182

Dear Representative Joule:

Thank you for your recent correspondence regarding the creation of a Task Force to initiate a redesign of the official seal for the State of Alaska. Your desire to include school children in the process is particularly appealing to me.

Should this legislation pass, we would be willing to offer a small donation to assist the Task Force in its work. Please keep me informed about the progress of this effort.

Sincerely,

David A Wight

Hous

Amended / Conceptual

FISCAL NOTE

STATE OF ALASKA
2003 LEGISLATIVE SESSION

Fiscal Note Number: 1
Bill Version: HCR 5
(H) Publish Date: 3/7/03

Revision Date/Time (Note if correction):
Dept. Affected: Legislature
Title "Establishing a task force to make recommendations regarding a new design for the official seal..."
BRU Legislative Council
Component Council and Subcommittees
Sponsor Representative Joule, Chenault....
Requester Representive Joule
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	21.0					
Travel	12.5					
Contractual	16.5	0.0	0.0	0.0	0.0	0.0
Supplies	3.0					
Equipment						
Land & Structures						
Grants & Claims						
Miscellaneous						
TOTAL OPERATING	**53.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
CAPITAL EXPENDITURES						
CHANGE IN REVENUES ( )						

FUND SOURCE (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF	53.0	0.0	0.0	0.0	0.0	0.0
1005 GF/Program Receipts						
1037 GF/Mental Health						
Other (Specify Type--Do not abbreviate)						
TOTAL	**53.0**	**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

Full-time						
Part-time						
Temporary	1	0	0	0	0	0

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

HCR 5 establishes a ~~six~~ member Task Force in the Legislative Branch whose mission is to gather input from the citizens of Alaska about what the official State Seal should look like and to make recommendations to the Legislature about a proposed new design for a new official State Seal for the State. The Task Force on the State Seal will be comprised of two representatives of the Department of Education and Early Development, two representatives of the Alaska Historical Commission in the Department of Natural Resources, ~~two~~ members appointed by the ~~Board of Directors of the Alaska Humanities Forum~~ Governor's Council on the Arts, and two members appointed by the Board of Directors of the Alaska Native Heritage Center.

Prepared by: Karla Schofield, Deputy Director
Phone 465-3852
Division Administrative Services
Date/Time 2/26/03 2:04 PM
Approved by: Pamela Varni, Executive Director
Date 2/26/2003
Agency Legislative Affairs Agency

(Revised 9/2001 OMB)

COMMITTEE COPY

FISCAL NOTE #1

STATE OF ALASKA **BILL NO.** HCR 5
2003 LEGISLATIVE SESSION

ANALYSIS CONTINUATION

Personal Services - It is anticipated that the Task Force on the State Seal will ask for and receive reasonable administrative services support from the Legislative Council. The services would most likely include coordinating travel arrangements, setting up teleconferences, placing advertisements if the Task Force decides to hold a contest or wishes to hear testimony and ideas from people in the State regarding the State Seal, and other duties to facilitate the work of the Task Force. This fiscal note anticipates the cost of the administrative support to be 3 months of a Range 21 equaling $21,000.

Travel - It is anticipated that the Task Force will hold two 3 day meetings requiring travel. Both meetings will be held in Anchorage. The travel costs for the 4 representatives from the DCED and DNR-Alaska Historical Commission will be absorbed within Executive Branch travel budgets. This fiscal note contains funding for the appointees from the Alaska Humanities Forum and the Alaska Native Heritage Center and the administrative support person. For the purposes of this fiscal note the appointees are assumed to be from Kotzebue, Ketchikan, Anchorage, and Juneau. The support person is assumed to be from Juneau. This fiscal note also includes funding for two people, either two Task Force members, or one Task Force member and a contest winner, to meet with the Legislature in Juneau to review the recommendations of the Task Force during the Second Regular Session of the 23rd Legislature.

Two Anchorage Meetings: Airfare $ 4,000; Per Diem $ 6,000 = $ 10,000
Juneau Meeting with Legislature: Airfare $ 1,200; Per Diem $ 1,300 = $ 2,500

All other meetings will be by teleconference. Teleconference costs will be absorbed by the Legislative Affairs Agency.

Contractual - It is anticipated that the Task Force will require a phone budget, most likely for calling cards in the amount of $150 per month times 10 months = $1,500.

As it is not known how the Task Force will decide to pursue their objective, $15,000 is included in this fiscal note which may be used for expenses relating to conducting a contest, including advertising in newspapers all over the State over several weeks, or to mail flyers to interested parties or residents in the State interested in participating in the contest or submitting ideas to the Task Force. These funds might also be used to acquire a simple scriplet program to allow children to design their own State Seal on the website. These funds could also be used to hire a graphic artist if the Task Force wished to contract with a consultant to create a new State Seal based on input from Alaskans.

The Legislative Affairs Agency will work with the Task Force to create a web site on the Legislature's home page to inform Alaskans about the activities of the Task Force and to provide an avenue for interested persons to comment about new ideas for the State Seal. Interested parties would be able to provide information to the Task Force by submitting ideas through the Legislative Information Offices around the State. These costs will be absorbed by the Legislative Affairs Agency. The Information Offices will also work with the Task Force to provide information to the schools if requested to do so by the Task Force.

Supplies - It is anticipated the Task Force will need to purchase supplies to help organize information submitted to them and may need to purchase computer software for rendering proposed designs into graphic images for presentation to the Legislature - $3,000.

If requested by the Task Force, costs to print black and white flyers or copies of the proposed new State Seal, will be absorbed by the Legislative Affairs Agency Printshop.

amended dr

23-LS0367\A

HOUSE CONCURRENT RESOLUTION NO. 5

IN THE LEGISLATURE OF THE STATE OF ALASKA

TWENTY-THIRD LEGISLATURE - FIRST SESSION

BY REPRESENTATIVES JOULE, Chenault, Foster, Gara, Gruenberg, Kapsner, Kerttula, Kookesh, Morgan, Seaton, Stevens, Weyhrauch, Whitaker, Anderson

Introduced: 2/3/03
Referred: Community and Regional Affairs, State Affairs, Finance

A RESOLUTION

Establishing a task force to make recommendations regarding a new design for the official seal of the State of Alaska.

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

WHEREAS the official seal of the state was designed in 1910 by federal and territorial officials long before Alaska became a state, and it emphasizes primarily the natural beauty of the state and its abundance of natural resources; and

WHEREAS the seal should reflect the place and people who now call it home; and

WHEREAS the seal should ideally depict not only the diversity of its natural resources but also the diversity of its human resources; and

WHEREAS the seal should include recognition of the many Native cultures of Alaska, as recommended recently by the Governor's Commission on Tolerance; and

WHEREAS, in order to ensure that the official seal represents modern Alaska and its diverse peoples, the seal should be redesigned through a process that involves many different segments of the population, including school children; and

WHEREAS the Department of Education and Early Development administers the public school system and the state's historical library, and the Alaska State Council on the

Arts operates within that department; and

WHEREAS the Alaska Historical Commission in the Department of Natural Resources includes members who have backgrounds in history, architecture, and archeology and are very familiar with both the natural and cultural heritage of the state; and

~~**WHEREAS**~~ the mission of the Alaska Humanities Forum, which is a nonprofit organization directed by a board reflective of the state's diverse cultural and geographic regions, includes encouragement of Alaskans' search for a sense of identity and a sense of place through history, tradition, and new ideas by stimulating community-based discussion of the humanities throughout Alaska; and

WHEREAS the Alaska Native Heritage Center is a nonprofit organization that is headed by a board of directors drawn from Alaska Native corporations and civic and business groups who are guided by a 30-member academy composed of Native elders and tradition bearers from diverse Native peoples, including Athabaskan, Yup'ik and Cup'ik Eskimo, Inupiaq, Aleut, Alutiiq, Eyak, Tlingit, Haida, and Tsimshian;

BE IT RESOLVED that the Alaska State Legislature establishes in the legislative branch the Task Force on the State Seal whose mission is to gather input from the citizens of Alaska about what the official state seal should look like and to make recommendations to the legislature about a proposed new design for a new official seal for the state; and be it

FURTHER RESOLVED that the Governor is respectfully requested to appoint to the task force

(1) two representatives of the Department of Education and Early Development; and

(2) two representatives of the Alaska Historical Commission in the Department of Natural Resources; and be it

FURTHER RESOLVED that the legislature respectfully requests the ~~board of directors of the Alaska Humanities Forum~~ Pioneers of Alaska to appoint ~~two~~ one members to the task force; and be it

FURTHER RESOLVED that the legislature respectfully requests the board of directors of the Alaska Native Heritage Center to appoint two members to the task force; and be it

FURTHER RESOLVED that the task force may begin its work immediately upon appointment of four of the eight members specified in this resolution, may select a chair from

among its members, may meet between sessions of the legislature, may solicit ideas for the state seal in a manner considered appropriate by the task force, and shall report its recommendations as to a proposed new official state seal to the legislature by the first day of the Second Regular Session of the Twenty-Third Alaska State Legislature; and be it

FURTHER RESOLVED that the Legislative Council shall provide reasonably necessary administrative services to the task force upon request of the task force; and be it

FURTHER RESOLVED that the members of the task force are entitled to reimbursement of travel costs associated with attending meetings of the task force; and be it

FURTHER RESOLVED that the task force established under this resolution is terminated on the last day of the Second Regular Session of the Twenty-Third Alaska State Legislature.

Testimony of Rep. Reggie Joule on HCR 5 –
Redesigning the Official Seal of Alaska
May 9, 2003
House Finance Committee

Chairman Williams, Members of the Committee, thank you for your time this morning. Time is a precious commodity so I won't take too much of yours today. However, any discussion of the Official Seal of Alaska requires a bit of history and a few visual aids. So, one of my staff (John Greely) and I have compiled a presentation that flaunts the warnings we received from the chairman's staff – that is: this early in the morning it's dangerous to turn down the lights. Nevertheless....(lights down)

Slide 1: ("The case for modernization.")

When it comes to symbols of Alaska, none is older than the official seal. A question that arises from that fact is: is it time to modernize the seal? I believe the answer is yes.

Slide 2 (Introduction to HCR 5)

The vehicle for modernizing the seal is HCR 5. It creates a task force of eight citizens to provide a focal point for public involvement in designing a new seal.

The task force will report back to the Legislature next January. The legislature will then decide whether to adopt a new design and commission its engraving.

Slide 3 (Alaska's First Seal)

Most Alaskans probably aren't aware that the seal in use today is the second one to represent the government of Alaska. In 1885, the first appointed governor of Alaska, John Kinkead, designed a seal for the military district of Alaska. Kincaid's design depicted the northern lights, icebergs and Alaska Native or two.

Slide 4 (District Seal)

Here is the seal of the military district of Alaska. It was in use for about 25 years. Today, the only place that I know of where the district seal still is in use is on the mantel of the fireplace at the Governor's House. When the House was restored in the 1980's the district seal was uncovered from under many layers of paint.

Slide 5 (Territorial Seal)

One of the first men to live in that house, Governor Walter Clark, decided in 1910 that the district seal was inappropriate for several reasons, including its depiction of icebergs, northern lights and Natives. So Clark hired a draftsman in Juneau, a man named William Rugg, to draw a rough sketch based on his directions to include more modern developments in Alaska.

Slide 6 (Official Seal of Alaska)

What we see in this slide is basically what Governor Clark sent to Washington, D.C., for approval in 1910. The first Alaska civil code of 1900 required that any official acts of the military district be approved by the Interior Department and the Attorney General. The rough sketch sent by Governor Clark for the new seal was approved by Attorney General Fowler on July 25, 1910. But sometime between then and November, 1910, somebody in the Interior Department commissioned a more refined drawing and sent that back to Alaska. Governor Clark then commissioned an engraver to cast the new seal; it was delivered to the Secretary of Alaska on Feb. 25, 1911.

Two years later, in 1913, the seal was changed again when the word "district" was changed to "territory." At statehood, this seal became the official state seal and remains so as part of statute, AS 44.08.

Slide 7 (Elements of the seal)
I turn now to the individual elements of the seal. Why did Governor Clark choose these symbols?

We don't have any extensive written documentation, but an article in the April, 1911, edition of "Alaska Yukon Magazine" announced the new seal this way: (And I quote)

"The Territory of Alaska will not permit any one to forget that development and industrial progress are its chief concern. Not even will public documents, bearing the signature of the territorial chief executive, be permitted longer to convey...the ancient conception of the country as a land of arctic temperature and the home of an unique race of aborigines.

"Governor Walter E. Clark has had prepared a new official seal for the territory that will typify modern Alaska, as he conceives it...The center of the seal shows a range of mountains in the distance, above which appears the rising sun, typifying in this instance the dawn of the commercial and industrial era in Alaska. In the middle distance on the left is a large ore mill and a wharf, with a train of ore carts and a spur track leading toward the mill.

"In the harbor adjacent is a large steamship, typifying commerce, and in another part of the harbor is a fishing vessel, representing one of the great industries. The forests also appear in the middle distance on the left, to represent the lumber industry and resources, and there is a harvest scene to typify agriculture. Around the circumference of the seal (are) a salmon (and) a fur seal in place of the conventional stars that are employed for this purpose."

Those words from 1911 explain why the official seal of Alaska looks the way it does today.

Slide 8 (Why change the seal?)

Today, however, Alaska is a far different place. And that brings us to the question: Should the official seal of the state be designed to reflect those changes?

Consider these facts:

- In 1910, Anchorage did not exist. Does urban Alaska deserve a place on the seal?

- Since 1910, Alaska has grown and outgrown several industries. Does the oil and gas industry deserve a place on the seal, perhaps in place of the fur seal industry? Are the horse and plow the best representation of agriculture in Alaska?

- In 1910, the population of Alaska was half Native. But despite that fact, any depiction of them was dropped from the seal by Governor Clark. Can't we fix that omission?

- In 1885 and in 1910, the idea of public involvement in designing a seal was overlooked. (Public involvement through the Alaska Legislature wouldn't happen until 1913). This Alaska Legislature can fix that oversight and provide a valuable learning experience for residents of all ages.

- And last but not least, HCR 5 asks us all to use our imaginations. Governor Clark looked out his window in 1910 and saw a dream of Alaska in the future. Can we not do the same today and ask: What symbols might have currency with residents of Alaska 100 years from now?

Slide 9 (Fish and Game logos)

I conclude this testimony with a quick look at some other symbols in use today – inside and outside of Alaska.

Here is the logo of the Alaska Department of Fish and Game. Actually, this slide depicts the logo that was in use from 1962 until about 1977.

Slide 10 (New logo)

Then in 1977 or 78, this black and white logo was developed for Fish and Game. It dropped the totem that was prominent in the first logo.

Slide 11 (Current logo)

The design changed again in 2001. Fish and Game altered the lines and added color to its logo.

Slide 12 (H&SS logo)

This slide shows the logo used by the Department of Health and Social Services. It was commissioned by the Department in the early 1990's after an extensive public involvement.

Slide 13 (Hawaii seal)

This slide shows the great seal of Hawaii. On the left side is an image of King Kamehameha. On the right is an image of Liberty holding the Hawaii flag. On the bottom of the seal – in the native Hawaiian language – are the words: "The life of the land is perpetuated in righteousness." This seal was adopted at the time of statehood.

Slide 14 (Montana)

This is the seal of Montana. Or rather, this is the latest version of their seal. It has been changed a dozen times since territorial days. The last time it was changed, the engraver decided to reverse the flow of the Missouri River and the Great Falls. He also changed some trees and

reshaped the mountains. He obviously didn't care what the Legislature thought; and the Legislature hasn't changed it since.

Slide 15 (Idaho)

The State of Idaho has the distinction of having the only official seal designed by a woman. Shortly after statehood in 1890, the Idaho legislature sponsored a contest for the best design. The winner was a young woman, Emma Edwards Green, who was given $100 as a prize. More than 60 years later, in 1957, the Idaho legislature updated the seal by adding symbols of the state's main industries – mining, agriculture and forestry.

Questions?

During Session:
Alaska State Capitol
Juneau, Alaska 99801-1182
(907) 465-4833
Fax (907) 465-4586
1-800-782-4833
Representative_Reggie_Joule@legis.state.ak.us

During Interim:
P.O. Box 673
Kotzebue, Alaska 99752
(907) 442-3880
Fax (907) 442-3022

Alaska State Legislature
REPRESENTATIVE REGGIE JOULE

Sponsor Statement for HCR 5, creating a special task force to redesign the state seal

By Representative Reggie Joule

The official seal of the State of Alaska was designed 93 years ago by federal and territorial officials. It is time to consider whether the seal should reflect the modern state in which we live and recognize the many diverse cultures of Alaska. This resolution would authorize a task force of Alaskans to solicit proposals for changing the seal and report recommendations to the second session of the 23rd Alaska Legislature.

The task force proposed by this resolution would be housed in the Alaska Legislature. Two representatives each would be appointed from the Alaska Historical Commission, the Alaska Department of Education and Early Development and the Alaska Native Heritage Center. (The current version of HCR 5 also includes representation from the Alaska Humanities Forum. Because of other commitments, the Humanities Forum requested not to be included on the task force. Therefore an amendment will be needed to the resolution). The task force would serve as a focal point for public involvement in the redesign of the seal, including suggestions from Alaska school children.

A final design for a new seal would be up to the full Legislature.

Alaska's Official State Seal

A case for modernization

1

Introduction

- HCR 5 Task Force on State Seal
- Focal point for citizen involvement in designing new seal
- Report to Legislature in January 2004
- Any changes to seal require approval of full Legislature

2

Alaska's First Seal

- Designed by Gov. John Kinkead in 1885
- Alaska was military district then
- Seal depicted northern lights, icebergs and Alaska Native

3

District Seal

Territorial Seal

- Adopted in 1910 by Gov. Walter Clark with approval of Interior Dept.
- Elimina. d northern lights, Iceberg and Alaska Native
- Became territorial seal in 1912 and state seal in 1959

Official Seal of Alaska

Alaska Dept. of Fish & Game

19

Alaska Dept. of Fish & Game

20

Dept. of Health & Social Services

Early 1

Hawaii State Seal

Montana State Seal

Idaho State Seal

Alaska Seal

March 19, 2003

Byron Mallott
President/CEO
First Alaskans Institute
606 E Street
Anchorage, Alaska 99501

Dear Mr. Mallott,

I am writing to inquire about the possibility that the First Alaskans Institute would help the State of Alaska initiate a redesign of the official seal. From your testimony to the Governor's Commission on Tolerance two years ago, I know this is a subject that is close to your heart.

As you may know, a dozen of my colleagues in the House have joined me in sponsoring House Concurrent Resolution 5, which creates a special citizens task force within the Legislature to serve as a focal point for citizen involvement in the redesign process. The task force would report its recommendations in January, 2004 for consideration of the full legislature.

During initial hearings on HCR 5, concern was expressed about the potential costs of organizing the redesign process, soliciting advice of experts and developing a set of recommendations on a new seal. Although I believe costs can be held to a minimum, budget constraints at the state level may be an impediment to passage of HCR 5. Therefore, I am taking an opportunity to contact interested organizations to determine if they are willing to participate financially.

As the oldest symbol of Alaska, the seal is ripe for review. Passage of HCR 5 would bring to the table a diverse group of residents from the Department of Education and Early Development, the Alaska Historical Commission and the Alaska Native Heritage Center to consider how we might make the seal more modern and meaningful.

I look forward to your reply and continue to be encouraged by reports of your improving health.

Sincerely,

Rep. Reggie Joule
House District 40

CC: Board of Trustees:
Janie Leask, Chair
William Hensley
Roy Huhndorf
Julie Kitka, President Alaska Federation of Natives
Sam Kito
Rep. Albert Kookesh
Oliver Leavitt

First Alaskans Institute

April 9, 2003

Representative Reggie Joule
Alaska House of Representatives
State Capitol, Room 405
Juneau, Alaska 99801
FAX: 907-465-4586

Dear Reggie:

On behalf of the Board of Trustees of the First Alaskans Institute, I want to thank you for including us in your invitation to participate in the process of redesigning the Seal of the State of Alaska. We will be happy to help in any way you want. Please let us know what you might need and when the process begins.

In order to understand why the current Seal requires redesign, one needs only to look at it. The Seal contains a landscape/seascape: mountains, a house on a hill, a town and its dock, stands of timber, commercial ships anchored in the harbor, a farmer harvesting wheat; and its circular border contains a fish and two seals. Anyone looking at the Seal for the first time might conclude that Native people, their communities and their cultures simply don't exist here.

We agree that it is high time to present a new design that more accurately reflects what modern Alaska is, in all its diversity.

Again, thanks for thinking of us. We're ready to work with you.

Sincerely,

Carrie Brown
Senior Vice President and CAO
for
Byron I. Mallott
President and CEO

606 E Street, Suite 200 Anchorage, AK 99501 Tel: 907.677.1700 Fax: 907.677.1780

HCR

5

SFIN

FILE

HCR 5

was referred to the Senate Finance Committee

No hearing was held on this bill

HCR

21

HOUSE COMMITTEE REPORT

(11)
Date Referred to Committee: May 5, 2003 **FURTHER REFERRALS:**

Date of Committee Action: 5/8/03

The FINANCE Committee considered: **HCR 21**

HOUSE CONCURRENT RESOLUTION NO. 21 **ALASKA ENERGY POLICY TASK FORCE**

Relating to establishing the Alaska Energy Policy Task Force.

Recommends it be replaced with [ ] HCS *or* [✓] CS for HCR 21 (FIN)
For Senate Bills with new title: [ ] Technical Title [ ] New Title: HCR_____ **[✓] Same Title [ ] New Title**

[ ] attach amendments
[ ] add new referral to _____Committee
[ ] Letter of Intent_____Committee

List of Abbrev for Depts.:
ADM
CED
COR
CRT
EED
DEC
DFG
GOV
HSS
LEG
LAW
LWF
MVA
DNR
DPS
REV
DOT
UA

***NEW* FISCAL NOTES**
*Assigned by Chief Clerk's Office

List by Dept(s):	*FN#	Fiscal	Indet.	Zero
LAA		✓		

***PREVIOUS* FISCAL NOTES**

List by Dept(s):	FN#	Fiscal	Indet.	Zero

Signing with recommendations	Printed Last Name	DP	DNP	NR	AM
	Hawker	✓			
	SMOTHERS	✓			
	FOSTER	X			
	Chenault	✓			
	MOSES	✓			
Chair: HARRIS	Harris	✓			
Chair: Williams	Williams	✓			

FISCAL NOTE

STATE OF ALASKA
2003 LEGISLATIVE SESSION

Fiscal Note Number:
Bill Version: HCR 21
() Publish Date:

Revision Date/Time (Note if correction):
Dept. Affected: Legislature
Title: Relating to establishing the Alaska Energy Policy Task Force.
BRU: Legislative Council
Component: Council and Subcommittees
Sponsor: Representative Harris
Requester: House Finance Committee
Component No: 763

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)

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

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

STATE OF ALASKA
2003 LEGISLATIVE SESSION

BILL NO. HCR 21

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.

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.

Send comments to mafa@alaska.net

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 those 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]

---

[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

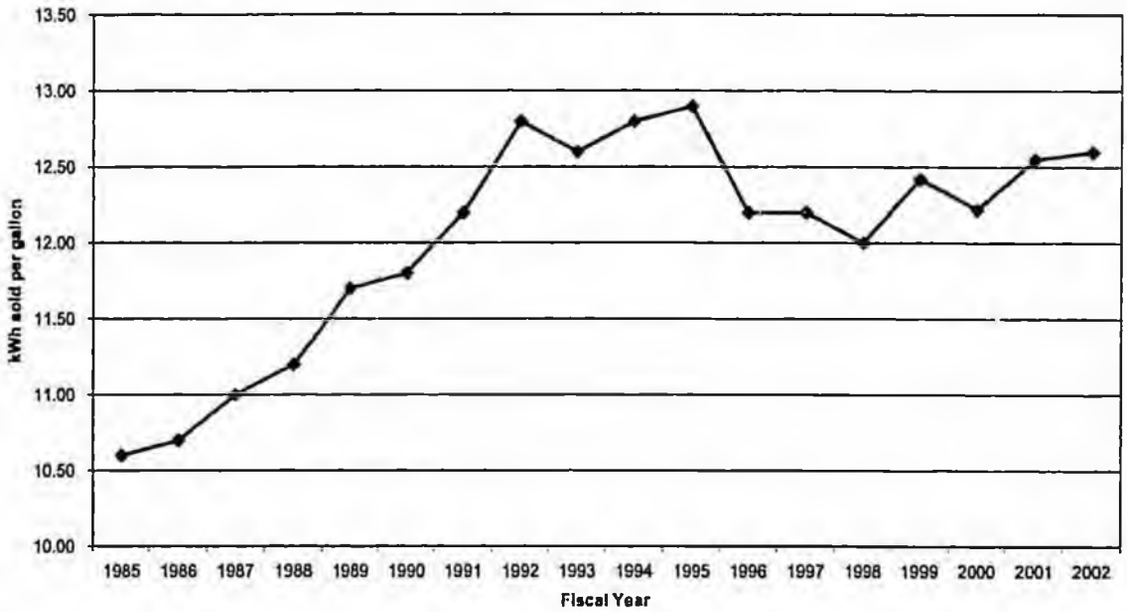
In total, the operations, maintenance and management program recommendations, §1.1.1.1 through §1.1.1.4 above (excluding capital investments which are described in the following sections) are estimated to have direct costs on the order of $250,000 per year over five years – representing $25,000 net per 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]

[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.

[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.

---

[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 desig. , 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
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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.

THE
FOLLOWING
DOCUMENT(S)
ARE
POOR
ORIGINAL
COPIES

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] Benefit/Cost	Comments
Refrigeration	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	Barriers/Market Issues	[illegible]	[illegible]	Comments
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

Technology	[illegible]	[illegible]	[illegible] Benefit/Cost	Comments
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	Existing Market	Economics	Impact	Program
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]	Preliminary Benefit/Cost	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	$16,234,000	$14,700,000	$11,900,000				
5.0% Present Value	$54,999,187								
Returns									
Incremental Efficiency Improvements:									
Diesel System Efficiencies	$0	$289,022	$691,868	$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	$231,038	$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 2003	2 2004	3 2005	4 2006	5 2007	6 2008	7 2009	8 2010	9 2011	10 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	$36,452,909	$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	31,914,369	32,546,963	33,192,086	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	$18,206,169									
	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 2003	2 2004	3 2005	4 2006	5 2007	6 2008	7 2009	8 2010	9 2011	10 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	463,630	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	4,388,831
	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	$5,984,171	$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	$350,049

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	95,360
$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	25,375	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	133,056,756	137,753,659	142,616,364	147,650,721	152,862,792	158,256,848	163,845,386	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	$126,508,044	$130,590,079	$134,709,485	$139,151,657	$143,647,244	$148,281,052
		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	4,493,855
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	51,568,811	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	$16,226,206	$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							1.0%		
		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	765	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	$36,398,743	$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	$16,038,040	$16,161,810	$18,388,722	$16,589,182	$16,761,589	$16,936,024	$17,122,480
		Fuel - $/year	$7,507,350	$7,620,336	$7,735,022	$7,851,434	$7,969,598	$8,089,540	$8,211,288	$8,334,868	$8,460,307
		Electricity Savings	$406,038	$804,812	$1,243,716	$1,708,437	$2,200,147	$2,720,063	$2,861,419	$3,009,319	$3,164,047
		Fuel Savings	($175,000)	($359,691)	($554,175)	($759,773)	($976,018)	($1,203,659)	($1,233,931)	($1,264,984)	($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								

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.

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 expensive 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/est/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 Types

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).

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 custom[illegible] Energy sales for the region in 1997 totaled 760,014 MWh, of which 296,640 MWh or 38 pe[illegible] it 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