Oil & Natural Gas Technology

DOE Award No.: DE-FC26-06NT41248

Final Report

A Compilation and Review of Alaska Energy Projects
Task 1.04.3

Submitted by:

Arlon Tussing
Institute of the North

Steve Colt
Institute of Social and Economic Research
University of Alaska Anchorage

Prepared for:
United States Department of Energy
National Energy Technology Laboratory

December 31, 2008

Office of Fossil Energy

A Compilation and Review of Alaska Energy Projects

Final Report

Starting June 1, 2004
Ending December 30, 2006

Arlon Tussing
Institute of the North

Steve Colt
Institute of Social and Economic Research
University of Alaska Anchorage

Report Issued December 2008
DOE Award Number
DE-FC26-01NT41248
Task Number 1.04.3

Submitted by:
University of Alaska Fairbanks
Institute of Northern Engineering
Arctic Energy Technology Development Laboratory
Building 814
Fairbanks, Alaska 99775

Disclaimer

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Abstract

There have been many energy projects proposed in Alaska over the past several decades, from large scale hydro projects that have never been built to small scale village power projects to use local alternative energy sources, many of which have also not been built.

This project was initially intended to review these rejected projects to evaluate the economic feasibility of these ideas in the light of current economics. This review included contacting the agencies responsible for reviewing and funding these projects in Alaska, including the Alaska Energy Authority, the Denali Commission, and the Arctic Energy Technology Development Laboratory, obtaining available information about these projects, and analyzing the economic data.

Unfortunately, the most apparent result of this effort was that the data associated with these projects was not collected in a systematic way that allowed this information to be analyzed.

Contents

A Compilation and Review of Alaska Energy Projects.....	1
Final Report	1
Disclaimer	2
Abstract	3
Executive Summary:	5
AGENCY STATUS & MISSIONS	5
AIDEA / AEA.....	5
Institutional History.....	5
Results:.....	8
Re: Contract between Institute of the North [ION] and Arctic Energy Office of the United States Department of Energy [DOE]: Final Report	8
Original Project “Plan A”	8
“Plan B”	10
“Plan C”	10
“Plan D”	11
Topic D-1: A new long-term primary energy supply for Barrow, in light of rapid maturation and decline of the Barrow gas field.	11
Topic D-2: The long-term place of Alaska in the world market for liquefied natural gas [LNG]. Considerations include	12
Appendix: List of Unfunded or Failed Projects.....	13

Executive Summary:

There have been many energy projects proposed in Alaska over the past several decades, from large scale hydro projects that have never been built to small scale village power projects to use local alternative energy sources, many of which have also not been built.

This project was initially intended to review these rejected projects to evaluate the economic feasibility of these ideas in the light of current economics. This review included contacting the agencies responsible for reviewing and funding these projects in Alaska, including the Alaska Energy Authority, the Denali Commission, and the Arctic Energy Technology Development Laboratory, obtaining available information about these projects, and analyzing the economic data.

Unfortunately, the most apparent result of this effort was that the data associated with these projects was not collected in a systematic way that allowed this information to be analyzed.

AGENCY STATUS & MISSIONS

AIDEA / AEA

Institutional History

In 1976, the Alaska legislature created the Alaska Power Authority (APA) for the primary purpose of constructing and operating power projects that would reduce consumer costs and encourage economic growth. APA was empowered to incur debt in carrying out its mission, and was required by statute to comply with an extensive reconnaissance and feasibility study process for any proposed project before authorizing its construction. Many such studies were conducted although no projects built by APA were financed by debt alone. State general fund grants were appropriated to fund, in whole or in part, such projects as the Four Dam Pool, the Bradley Lake hydroelectric project, and the Anchorage-Fairbanks intertie.

Because APA's statutes allowed the agency to construct energy projects other than electric power system components – for example, waste heat recovery and distribution projects, energy conservation projects – its name was changed in 1989 to the Alaska Energy Authority (AEA) in order to reflect this wider scope of project possibilities.

In 1993, the legislature restructured AEA as follows:

- AEA's authority to incur debt and construct projects was removed. Since AEA could no longer build new projects, the statutory requirements for conducting reconnaissance and feasibility studies were also removed. As a result, the last major project feasibility study undertaken by AEA was completed in 1994. The study evaluated a proposed transmission line be-

- tween Sutton and Glennallen, which was intended to connect the Railbelt grid with the Copper Valley electric system serving Glennallen and Valdez.
- What remained of AEA – its ownership and operation of several major projects – was merged with the Alaska Industrial Development and Export Authority (AIDEA). AEA ceased to have its own separate Board of Directors. From that time forward, the AIDEA Board served also as the AEA Board.
- AEA's rural energy functions were transferred to a new Division of Energy within the State Department of Community and Regional Affairs. For the next several years, the Division of Energy managed and/or funded the construction of rural bulk fuel storage systems, the replacement or upgrade of diesel power plants, and the construction of small hydroelectric projects. It operated other programs as well, including but not limited to the Power Cost Equalization rate subsidy program, the Power Project loan program, and the circuit rider maintenance program offering emergency response and preventive maintenance services to rural electric utilities.

In 1999, the Department of Community and Regional Affairs was abolished and its functions were parceled out to other agencies. At that time, the rural energy programs and associated personnel from the Division of Energy were merged back into the Alaska Energy Authority.

Assistance Programs and Methods of Evaluation

- Power Project Fund loan program (AS 42.45.010). Loans are available to electric utilities, municipalities, regional and village corporations, village councils, and independent power producers for reconnaissance and feasibility studies, constructing or equipping power generation projects of less than 10 MW, power transmission and distribution lines, bulk fuel storage facilities, energy conservation measures, and other purposes. AEA must determine that the project is technically, economically, and financially feasible before a loan can be approved. Interest rates are set at the average municipal revenue bond rate on 30-year bonds over the previous 12 months (currently about 5.1 percent). Interest rates can be reduced to as low as zero if such reduction is needed for the project to meet financial feasibility criteria. Loans in excess of \$1.0 million are unusual.
- Bulk Fuel Revolving Loan program (AS 42.45.250). Loans are available to "communities" and to electric utilities for the purchase of bulk fuel supplies, provided the community to be served has a population of 2,000 or less. Loans may not exceed \$300,000 and must be repaid within one year. The interest rate is typically zero the first year, 5.0 percent the second year, and the same as the Power Project Fund rate after that.

The applicant's credit history is the primary evaluation criterion. Loan applications are typically considered on a first-come, first-served basis. In the past, AEA has approved less than the full amount requested by each applicant if AEA anticipates that the aggregate demand for loans will exceed the amount available to lend.

- Rural Bulk Fuel Storage – New Facilities and Upgrades: Most recently, funding for this program has come primarily from the Denali Commission. Statutory authority is derived from the legislature's approval of AEA's capital budget submission, which states what AEA intends to build and how it intends to build it.
Several years ago, AEA created a database on the condition of each bulk fuel tank farm in rural Alaska. These condition assessments were quantified and ranked. The initial project selection criterion is the condition of the tank farm – the worst facility is at the top of the list. However, the tank farm owner must demonstrate that an effective maintenance plan and business plan is in place before funds will be released for upgrade or replacement of the facility. In other words, the owner must show that the new project will be sustainable. Since the tank farms that are in the worst condition typically have seen the poorest maintenance in the past, these two criteria tend to conflict.
- Rural Power System Upgrades: Virtually the same description provided above for the rural bulk fuel storage program applies also to the rural power system upgrade program, including: the Denali Commission has recently provided most of the funds, statutory authority is derived from AEA's capital budget submission, a comprehensive data base on the condition of electric utility systems in rural Alaska was created, these condition assessments were quantified and system conditions were ranked, and the project selection criteria were based on the system condition and consequent need for assistance coupled with a requirement for an effective maintenance and business plan needed for project sustainability.
- Energy Cost Reduction Program: This program was developed jointly by AEA and the Denali Commission, with AEA providing program management and the Denali Commission providing most of the funds. For several years, AEA solicited proposals from rural electric utilities and other eligible applicants for projects that would reduce energy costs through improved efficiencies. Each proposal determined to be technically feasible was analyzed and ranked by its expected economic benefit – cost ratio. Projects passing the economic test were further analyzed to determine the maximum amount of debt financing the project could support. Each of these project applicants was expected to provide, from its own sources or from borrowed funds,

- ½percent of this maximum level of debt financing, and grant funding was offered for the remainder of project cost
- AIDEA itself has several programs that can provide financing assistance for energy projects. Under its Development Finance program, AIDEA can participate in projects (including energy projects) for which tax exempt financing is dependent in part on project ownership by a public entity such as AIDEA. The primary example of such a project is the 50 MW Healy “Clean Coal” plant that is now sitting idle near GVEA’s Healy 1 plant. The project was built with a combination of federal grants, state grants, and tax exempt bonds issued by AIDEA. To be considered for such assistance, project proposals must meet extensive criteria for technical, economic, and financial feasibility as well as contribute to economic growth. Other financing assistance, either in the form of loan participation or conduit revenue bond financing, can be offered for energy projects that meet similar feasibility criteria.

Results:

Re: Contract between Institute of the North [ION] and Arctic Energy Office of the United States Department of Energy [DOE]: Final Report

Original Project “Plan A”

This study as originally planned was to be based on to a careful examination and quantitative (statistical and financial) analysis of a representative sample of proposals for financial or technical assistance, generated by or submitted to certain State and Federal funding agencies¹ in Alaska since 1990. The premise of this plan

¹ The agencies or data sources whose records were examined included the Denali Commission (a joint state-federal institution), the Alaska Industrial Development and Export Administration [AIDEA] and the Alaska Energy Authority, two state agencies that have been merged into one operating under the single acronym AIDEA-AEA, the Arctic Energy Technology and Development Laboratory [AETDL], an entity of the University of Alaska Fairbanks whose functions include administrations of grants and contracts on behalf of the Arctic Energy Office of the US Department of Energy, and the Alaska Resources Library and Information Service [ARLIS], a records-and-data management entity serving several agencies, most but not all of them units of the US Department of Interior.

was that such an examination might disclose classes of project proposals (1) intended to improve the accessibility or cost of energy to specific enterprises, industrial sectors, or communities, (2) that were not implemented in the past, but (3) which the researchers recommended revisiting in the light of intervening changes in prices, demand, technology, or public policy.

On April 18, 2005, we concluded and reported orally to the Institute of the North and to the study's sponsoring agency, the DOE Arctic Energy Office, that the established work plan for the study, based upon a survey of agency records, had proved unproductive, and that a further examination of project proposals from earlier years at the listed agencies would be a waste of effort.² We accordingly re-

Accompanying this memorandum is a document not previously submitted, which was produced under Work Unit 2, entitled "Agency Status and Missions", which summarizes the institutional history of AIEDA/AEA and the Denali Commission.

² The following are excerpts from our memorandum of the above date, relating to the incompatibility of the proposed method to the actual information base:

"Firstly, the time intervals for which records exist, were preserved, or made available to the researchers vary profoundly among the agencies surveyed, diminishing our ability to register the impact of project evaluation of changing costs, prices or technology . . .

"[The] Alaska Energy Authority underwent several pronounced changes in its location within the structure of State government (sometimes along with its name), its source(s) and magnitude of funding, and its statutory authority and mission.

"The Denali Commission, a significant "wholesale" source of energy funding in Alaska, commenced operation only in 1999, while AETDL, a creature of the US Department of Energy, is now in only its fifth Fiscal Year.

"The total number of individual 'project proposals' that our researchers encountered at these agency archives numbered more than one thousand, and varied in format and content in myriad directions. None of the funding agencies seems to have required a standard application questionnaire, or in many cases, a business plan of any type.

"Out of the thousand or so records encountered, less than seventy seemed to contain or allude to any quantitative estimate of intended or expected financial benefits. In all of their efforts, project researchers encountered NO proposal that was (1) sufficiently specific, (2) based on sufficiently credible information or assumptions, and (2) on its face economically promising or socially necessary.

"None of [the foregoing] observations is intended to fault either the assistance programs or the record-keeping policies [of the various entities]. What our efforts revealed as flawed is, rather, the assumption that the large number of Alaska project proposals . . . was inherently a workable data base for economic analysis."

quested that ION deem Work Unit 2 as it is described in previous reports to be complete, and indicated our intention to suspend all further effort under the contract, pending possible approval of an alternative objective and plan of work by the Alaska Energy Office.

On behalf of the research team, I hereby report that no mutually acceptable alternative plan is in prospect that is congruent with the existing contract. Accordingly, we have no objection to the Institute of the North executing termination at this time. On that assumption, this communication should be regarded as our final report.

“Plan B”

After the April meeting, project researchers subsequently conferred with the representative of the Alaska Energy Office, and officers of relevant agencies, electric utilities and industry bodies, regarding alternative ways of reexamining significant project or programmatic proposals over the last 15 years, that were (1) investigated but not executed, (2) executed in part but not completed, or (3) completed but failed. Our first proposal for an alternative approach, here tagged “Plan B”, centered on a series of structured interviews with managers of the respective agencies, utilities, and trade associations regarding their recollections and recommendations.

While some of the candidate interviewees related strong (and sometimes persuasive) opinions about specific proposals involving their own organizations, including projects which that were either implemented, rejected, or “orphaned,” we found no consensus as to what methodology or standards should be adopted for any new survey, and indeed, as to whether the Arctic Energy Office ought to be supporting such an inquiry or whether our research team should conduct it.

“Plan C”

Our third approach was to suggest a list of potential issues and initiatives worth revisiting, based primarily on the personal experience and knowledge of members of the research team, augmented by insights obtained in discussions of the Plan B approach. Our draft of such an issue list was not greeted with enthusiasm by members of our informal panel of industry discussants, or by the Arctic Energy Office representative, and we have accordingly not proposed it as the core of any revised study plan. Because we nevertheless believe that this draft might contain useful information for future researchers or for the public, it is nevertheless appended to this report as Plan C.

“Plan D”

Notwithstanding our agreement to termination of the contract based on infeasibility of the original work plan, and lack of agreement regarding any alternative approach congruent with the existing contract, the project’s professional staff (Tussing, Tichotsky, and Emerman) would be interested in devoting the remaining unexpended resources in an exploration, on behalf of the Arctic Energy Office, of one of the two following topics, including but not limited to the subtopics shown below.

These are topics of a kind about which we have special expertise and demonstrated insight and foresight, and on which there are major stakeholder groups and/or sections of the public that would support our inquiry because they have a particular confidence or interest in our findings or opinions. Our contributions on these topics typically involve “linking the dots” of market or technical information that is outside public awareness, perhaps because they are “hidden outside in plain view.”

Topic D-1: A new long-term primary energy supply for Barrow, in light of rapid maturation and decline of the Barrow gas field.

Barrow, Alaska (population in Census of 2000, about 4,500 persons, 64 percent of whom are Alaska Native) is one of the few North American communities in its size class that is effectively self-sufficient in energy, and as far as we know, the only such settlement anywhere in Alaska or the Arctic. In particular, Barrow may be the only “off-net” settlement anywhere in the Circumpolar North that does not depend primarily upon distillate fuel (diesel), but has been able to rely upon locally produced natural gas for the generation of electricity and for other stationary energy needs.

Barrow’s source of natural gas initially consisted of two small pools of about 4 and 5 bcf respectively in the Barrow field, which the US Navy discovered in 1949 and developed in 1952 to supply heat and power for Federal facilities. The Barrow field was then also authorized to supply civilian uses through a municipal utility operated by the North Slope Borough (NSB, the county-level government). Incident to a substantial shrinkage of Navy activities, the Federal government in 1984 transferred ownership and operation the now largely depleted field and production facilities to the NSB.

The Borough subsequently developed another gas field at Walapka, 20 miles SW of Barrow, and built a pipeline connecting it to the town. This field, whose initial

reserves were about 25 bcf, commenced production in 1992. Together with residual producing capacity in the Barrow field, Walapka has since then been meeting typically annual loads on the order of 1.3 to 1.5 bcf—a level which, however, it cannot long sustain. Barrow’s ability to rely on local natural gas, and its corresponding freedom from dependence on imported diesel oil or LPG—which have been signal economic, lifestyle and environmental advantages for almost half a century—now threaten to become a major handicap to the community.

We would be willing and able to make an initial pre-feasibility reconnaissance of and comparison of alternative courses of action available to the Borough for replacing Barrow’s existing gas supply.

Topic D-2: The long-term place of Alaska in the world market for liquefied natural gas [LNG]. Considerations include . . .

- Implications of the early-21st Century reversal of terms of trade in LNG between Asia and North America, which create a powerful drive to install LNG import facilities in the Lower 48 and Canada and, indeed, suggest that Cook Inlet and the Railbelt are likely to become an importer of LNG from, rather than an exporter to, the Pacific Basin.
- The preconditions for, likelihood, and likely timing of, an impending emergence of a Pacific Basin commodity (“spot”) market in LNG, and a with it a single global market for natural gas comparable to the existing world crude-oil market.
- Implications of large-scale LNG imports to North America for economics and viability of the contemplated overland natural-gas pipeline, the wellhead value of ANS gas, and the delivered cost of gas in the Alaska Railbelt.

Appendix: List of Unfunded or Failed Projects

PDF attachment.

APPENDIX II: SAMPLE OF UNFUNDED, UNFINISHED OR FAILED PROJECTS

	A	B	C	D	E	F	G	H
2		Project Type	Project / Proposal / Study	Year	Sponsor	Cost	Why Unsuccessful	Obstacle Type
3	1	Transmission (Rural)	Study: Comprehensive survey of proposed transmission lines in rural Alaska. Intent to consolidate all published information on rural intertie options and conduct economic screening to identify cost-effective proposals. 173 intertie proposals listed, none selected. Data base of results available at www.aidea.org/AEEEPublications.htm	1997	Division of Energy (now AEA)	Aggregate cost of all proposed lines not provided	Economic screening not conducted because: cost data not reliable and prospects for savings considered poor.	Poor Cost Data. Uncertain economics.
4	2	Transmission (Rural)	Proposal: Build transmission line from Bethel to villages of Kwethluk, Akiachak, Akiak and Tuluksak. Initially replace remote diesel power in villages with power imported from Bethel. Project expansion would follow.	1992	Calista Corporation	\$10 million for "single wire ground return" line	SWGR does not meet NESC standard which would cost \$30 million. Econ OK for \$10 million but not for \$30 million.	High cost to meet NESC. SWGR is controversial.
5	3	Transmission (Rural)	Proposal: Transmission line from Petersburg to Kake. Petersburg served by Tyee Lake hydro which has surplus available. Kake served by diesel. Concept to supplant diesel with surplus hydro.	1996	Division of Energy (now AEA)	\$15 million	Intertie cost exceeded diesel savings.	Economic feasibility.
6	4	Transmission (Rural)	AVEC evidently plans to build some transmission lines. Informally states that, in general, villages must be 10 miles apart or closer to realize economic benefit.	current	AVEC	??	[NEED TO ACQUIRE INFO ON THIS AND OTHER INTERTIE PROPOSALS]	
7	5	Transmission (SE AK)	Studies: AEA study in 1980s on comprehensive SE AK transmission grid. Southeast Conference published more recent study. Congress authorized \$435 million for project but appropriated very little. Most segments of the proposed grid fail economic test. Studies identified 2 most promising segments described below.	1980s and forward	AEA, then Southeast Conference	\$435 million	Economic feasibility lacking for overall grid. High gov't subsidy needed but has not been provided.	Economic and financial feasibility
8	6	Transmission (SE AK / Tyee-Swan)	Proposal: Build transmission line linking Swan Lake and Tyee Lake hydro projects. Ketchikan served by Swan Lake but must supplement with diesel. Concept is to displace Ketchikan diesel with surplus Tyee Lake hydro.	1992, + updates	AEA, + Ketchikan Public Utilities	\$73.2 million (\$ 1998)	Despite >\$25 million in gvm grants, limited early year svngs cause financing problem. Also, competing Native hydro proposal.	Financial feasibility. Political issues.
9	7	Transmission (SE AK / Juneau-Greens Crk)	Proposal: Build transmission line linking Juneau with Greens Creek mine. Concept is to displace Greens Creek diesel generation with surplus hydro from Snettisham. Preliminary economics were favorable, and both Kennicott and Juneau utility were interested.	1993	AEA, Kennicott Mining Co.	??	[NEED TO FIND OUT WHAT HAPPENED]	
10	8	Transmission (Railbelt / Anch-Kenai)	Proposal: Build second line between Anchorage and Kenai Peninsula. Route under Turnagain Arm. Intent is to reduce costs and improve reliability.	1989, + updates	AEA, + Rblt Utilities	Approx. \$100 million (need update)	Most studies, including 2004 update, show costs exceed benefits. Also environmental hurdles.	Economic feasibility.
11	9	Transmission (Sutton-Glennallen)	Proposal: Build 135 mile line north of Glenn Highway to link Copper Valley system (Valdez and Glennallen) with Railbelt. Supplant Glennallen diesels with gas-fired electricity from Anchorage area. Allison Lake hydro in Valdez might win economic test but hydro cost data only preliminary. Intertie project wins econ test vs. diesel.	1994	AEA, + Copper Valley Elec Utility	Approx. \$55 million (??)	Financial feasibility and environmental opposition were the main problems.	Financial feasibility. Environmental opposition.
12	10	Electric End-Use Conservation (Railbelt)	Proposal: AEA defined the 3 most promising electric end-use conservation programs and compared them with other Railbelt power alternatives. The conservation programs won the econ test. Budget proposal to implement was submitted to AEA Board, which turned it down. [REBATE PROGRAMS - GET SPECIFIC INFO]	1989	AEA	?? \$50 million over 5 years ?? [get info]	AEA Board uneasy about complex program to influence 000s of consumer decisions, and also about political reaction to request.	Complex to implement. Anticipated political reaction.
13	11	End-Use Conservation (Rural)	Proposal: Recent study estimates about half of rural households have hot water heaters, and 40% of those are electric. High B/C ratios estimated for replacing with oil-fired heaters. Although the study recommends govt expenditure of \$7.5 million over 4 years on this, it provides no hint on how the program should be structured.	2004	AEA	\$7.5 million	Hasn't "failed" yet but there seems to be no clear idea how to implement the recommendation.	Implementation plan has not been designed

APPENDIX II: SAMPLE OF UNFUNDED, UNFINISHED OR FAILED PROJECTS

	A	B	C	D	E	F	G	H
	2	Project Type	Project / Proposal / Study	Year	Sponsor	Cost	Why Unsuccessful	Obstacle Type
	12	Natural Gas / Coal Bed Methane	Study: Technical and economic potential of substituting natural gas or coal bed methane for diesel fuel in rural Alaska. Conclusion - given expected costs of exploration and development, typical size and density of rural communities, and assertion that capital costs are much less for diesel generators than for gas-fired generators, economic prospects for domestic use of natural gas in rural Alaska are poor. Study is available at www.aidea.org/AEEEPublications.htm .	1997	AEA	Study includes cost estimates of rural gas exploration and development	Study results were re-examined and reaffirmed in 2001 "Screening Report for Alaska Rural Energy Plan," available on Denali Commission web site.	Economic feasibility.
	13	Natural Gas / Coal Bed Methane	Study: Aerial magnetic survey of Lower Kuskokwim basin conducted to determine likelihood of finding natural gas or coal bed methane. Ak Dept. of Natural Resources concluded that accumulations of these resources in the area were unlikely.	1995	AEA / DNR Calista	No cost data	Study results argue against exploration investment in this region.	Physical conditions in the region.
	14	Natural Gas / Coal Bed Methane	Study: Naknek Electric utility retained geological consultant to study potential for natural gas to displace diesel. Based on subsurface geology, conclusion was that the closest prospect for "commercial quantities" was at least 30 miles from Naknek. Costs of pipeline or transmission line over this distance likely too high.	1988	Naknek Electric Assoc.	[DETAILS IN STUDY]	Assumed that transmission or pipeline costs, on top of exploration and dev. costs, would not meet economic feasibility requirements.	Physical conditions, economic feasibility
	15	Natural Gas / Coal Bed Methane	[NEED TO ACQUIRE ADDITIONAL INFO FROM DNR, ENSTAR, AND PERHAPS OTHERS -- Fort Yukon? Chignik Lagoon? Homer? Other locations?]					
	16	Natural Gas / Coal Bed Methane	Proposal: Deliver natural gas (as LNG or CNG) from southcentral Alaska to SE Alaska communities, which now rely on electricity and oil for space and water heat. One recent proposal asked AIDEA to finance \$50 million for pipeline distribution while the private owners would finance the rest. Distribution pipelines in place provide very little security for loan repayment in case the venture is unsuccessful - a major reason why AIDEA declined.	2001 (and before)	Private consortium proposal to AIDEA	\$66 million (\$50 million of which was for pipeline distribution)	AIDEA declined due to inadequate security for loan. No public feasibility study released for review. Unsure of project economics.	Financial feasibility. Economics uncertain.
	17	Geothermal	Proposal: Develop Unalaska geothermal resource (Makushin volcano) to supply power primarily to fish processors in Dutch Harbor. 1995 cost estimate (including well field development and all other project costs) was \$90 million. It was estimated that a \$45 million govt grant would be needed to break even with diesel.	1995	AEA	\$90 million	Low probability of acquiring \$45 million govt grant. Also, fish processors unwilling to sign long-term "take or pay" agreements needed to secure bond financing.	Economic and financial feasibility
	18	Geothermal	Proposal: Develop geothermal resource at Pilgrim Hot Springs on Seward Peninsula, 60 road miles from Nome. \$1.7 million estimate for local development, but project economics per AEA loan analysis require transmission line to Nome estimated to cost at least \$5 million.	1995	Pilgrim Springs Ltd.	\$6.7 million	Project economics require power sales to Nome but cannot survive inclusion of Nome transmission costs.	Economic and financial feasibility
	19	Geothermal	Study: Consultant to State examined prospect of developing geothermal resource at Lake Chakachamna on the west side of Cook Inlet as a potential source of power for the Railbelt. [NEED TO REVIEW INFO]	1980s	Office of Governor	??	??	??
	20	Coal (Rural)	Proposal: A small coal-fired power plant was proposed for McGrath. Coal was to be supplied from a proposed coal mine 90 miles away over a winter road. High fixed costs of coal plant (capital and fixed O&M) are difficult to overcome when built on a small scale for a small load. Small coal plant economics have also been studied for Galena and Tok (Northern Economics) and for Unalaska (Financial Engineering Co.). In each case diesel was found to be less costly. A small coal plant was also proposed for Bethel by Bettine - feasibility numbers unknown but proposal was not successful.	1997	Doyon Ltd (McGrath)	??	Not economically feasible, despite advances in technology and cost for small-scale coal plants.	Economic feasibility.

APPENDIX II: SAMPLE OF UNFUNDED, UNFINISHED OR FAILED PROJECTS

	A	B	C	D	E	F	G	H
2		Project Type	Project / Proposal / Study	Year	Sponsor	Cost	Why Unsuccessful	Obstacle Type
23	21	Coal (Railbelt)	Study: A comprehensive study of Railbelt power alternatives included detailed cost estimate and economic analysis for conventional coal-fired power plant in Healy area (prior to Healy Clean Coal proposal). Of all the alternatives, the economics of building a conventional coal plant (with no consideration of govt subsidy) were the least favorable.	1989	AEA	[NEED TO OBTAIN]	Not economically feasible. Life-cycle costs exceeded all other alternatives and scenarios.	Economic feasibility.
24	22	Coal (Railbelt)	Proposal: Usibelli Coal Mine recently proposed to construct and operate the "Emma Creek Coal Project," a 200 MW coal-fired power plant at Healy. A 2004 study by R.W. Beck for the Railbelt utilities concluded that Emma Creek was not economically feasible (though it appears to be close). However, Beck also concluded that "generic" 150 MW coal plants in southcentral and in the interior have favorable economics in 2015 if coal can be provided at the same price it is sold to Golden Valley for its existing coal plant at Healy. Unclear at this point how these conclusions are compatible.	2004	Usibelli proposal, R.W. Beck analysis	??	[NEEDS CAREFUL REVIEW OF BECK STUDY]	??
25	23	Coal (Cordova)	Proposal: Cordova Electric Coop issued an RFP for power supply in 1994. 3 proposals were submitted, including 1 by a private group offering to build a small-scale coal-fired power plant that would incorporate used equipment and burn coal from the Matanuska Valley. Cordova decided that lower costs would be realized by developing the Power Creek hydro project proposed by another developer.	1994	Bettine et al	[NEED TO OBTAIN]	Proposals were evaluated by a consultant. Economics was one factor. There may have been other concerns about the coal proposal.	Economic feasibility.
26	24	Biomass (electricity)	Study: 1994 feasibility study of building a power plant fueled by municipal solid waste (MSW) in Thorne Bay concluded that it might be cost-effective. However, the idea went no further as Thorne Bay elected instead to tie into the Alaska Power Co. (APC) grid and to purchase power from APC. Most of that power is generated by hydro. The new transmission connection to Thorne Bay was largely subsidized by federal grants.	1994	AEA (study by ISER)	[NEED TO OBTAIN]	One factor was federal subsidy for competing alternative.	
27	25	Biomass (electricity)	Study: 2001 "Screening Report for Alaska Rural Energy Plan" considered power plants fueled by biomass (wood, wood waste, MSW). It found that biomass power plants are similar to coal plants in that capital and operating costs are high relative to diesel and natural gas -- possibly higher due to heat content and quality of fuel. Conclusion was that, at least for plants scaled for rural Alaska, no amount of fuel cost savings was likely to make up for the capital and O&M cost penalty.	2001	AEA study by Northern Economics	Various	Economic feasibility	Economic feasibility.
28	26	Biomass (space heat systems)	Study: "Rural Alaska Heat Conservation and Fuel Substitution Assessment" examined, among other things, wood fuel substitution for fuel oil in space heat boilers in several rural communities, including McGrath, Tanana, Elim, Grayling, and Dot Lake. Annual fuel cost and labor favored wood but not enough to recover capital cost penalty within 20 year planning horizon.	1996	AEA (study by USKH)	Various	Economic feasibility	Economic feasibility.
29	27	Biomass (space heat systems)	Proposal: A biomass heat demonstration project was proposed for McGrath in 1999. A govt grant subsidy of \$1.6 million (out of a total capital cost of \$1.8 million) would have been needed for financial feasibility (Strandberg 1999). An update by MBA Consulting Engineers in 2000 concluded that a 30-year horizon and a favorable assumption of the cost of wood would be needed for economic feasibility.	1999	Studies by Strandberg and MBA Consulting Engineers	\$1.8 million	Economic and financial feasibility	Economic and financial feasibility

APPENDIX II: SAMPLE OF UNFUNDED, UNFINISHED OR FAILED PROJECTS

	A	B	C	D	E	F	G	H
2		Project Type	Project / Proposal / Study	Year	Sponsor	Cost	Why Unsuccessful	Obstacle Type
28		Wind (Rural)	Study: ISER study in 2001 for AIDEA evaluated Kotzebue wind project and concluded that, without subsidy, the project would have resulted in a net economic loss to local consumers. The main reason identified by ISER is insufficient wind resource. Kotzebue also purchases diesel fuel for a lower price than many smaller rural communities. Study summary can be found in the "Screening Report for Alaska Rural Energy Plan" on Denali Commission web site.	2001	ISER	Cost Details estimated in study	Study suggests that wind projects at sites with stronger wind resource and higher diesel prices could be economically feasible.	
30								
29		Wind (Rural)	Study: A rural energy plan prepared in 2004 for AEA identifies 30 rural communities in which wind power development may, upon confirmation of wind resource and other variables, provide economic benefit. (Study available at www.aidea.org/aeaRuralEnergyPlan.htm). See p. 3-3 for list. The plan proposes govt expenditure of \$29.1 million over 5 years - including \$1.6 million for site-specific wind recon and final feasibility studies, and \$27.5 million for construction financing.	2004	AEA (Energy Plan by Mark Foster & Assoc)	\$29.1 million	Study suggests possible economic benefits from wind development.	
31								
30		Wind (Rural)	[AVEC CURRENTLY INSTALLING WIND IN SEVERAL LOCATIONS. NEED INFO ON AVEC WIND EXPERIENCE, FEASIBILITY ANALYSIS AND PLANS]					
32								
31		Wind (Railbelt)	Proposal: Chugach Electric is considering a possible wind project on Fire Island. The 2004 Railbelt study by R.W. Beck modeled this as a 50 MW project and concluded in its "base case" that it would produce economic benefit, though the result is close to breakeven. (Beck study is available at www.aidea.org/EnergyTaskForce.htm). Look under proceedings on 12/2/03.	2003	Chugach Electric (study by Beck)	??	Marginal economic benefit	
33								
32		Solar	Study: See "Screening Report..." on Denali Commission web site for brief analysis of solar energy costs and issues (p. 5-24). A 12 kW solar system with battery storage was installed in Lime Village in the 1990s -- current status unknown. Study concludes that solar is not cost competitive with diesel in rural Alaska.	2001	AEA study by Northern Economics	??	Economic feasibility	Economic feasibility.
34								
33		Tidal	Study: See "Screening Report..." on Denali Commission web site for brief analysis of tidal energy costs and issues (p. 5-26). Tidal Electric of Alaska, Inc. conducted a feasibility study of a tidal power system in Cordova, and estimated a \$14 million capital cost for a 5 MW system. (Study available at www.aidea.org/AEEEPublications.htm). Cordova utility proceeded with hydro construction (Power Creek) and Tidal Energy moved on to consider alternative sites. Screening report concludes that tidal energy not cost-effective for rural Alaska.	2001	AEA study by Northern Economics	??	Economic feasibility	Economic feasibility.
35								
34		Waste Heat Distribution	Studies: AEA conducted feasibility studies in 30 rural communities in 1988-90 and, using state grants, constructed extensive systems in the 10 locations considered most cost-effective. (The systems capture excess heat from the jacket water of diesel engines and distribute that heat via insulated pipe to buildings in the area.) Unless there is one or more large heating load near the powerhouse, the systems tend to be uneconomic in rural villages due to the small size and low density of most local structures. Currently, both AEA and AVEC install waste heat systems when replacing diesel powerplants to the extent that significant heating loads are located nearby.	1988-90	AEA	Various	Economic feasibility. Technical problems with early systems [NEED UPDATE]. Also a "hassle factor" for customers -- now a hybrid rather than a simple boiler operation.	Economic feasibility.
36								

APPENDIX II: SAMPLE OF UNFUNDED, UNFINISHED OR FAILED PROJECTS

	A	B	C	D	E	F	G	H
2		Project Type	Project / Proposal / Study	Year	Sponsor	Cost	Why Unsuccessful	Obstacle Type
35		Waste Heat Distribution	Proposal: Copper Valley Electric requested a loan from AEA in 1998 for a system to supply waste heat from the Glennallen diesel generators to the nearby Glennallen school facility. If the school paid 70% of its avoided fuel cost, the utility could pay for the system and realize modest returns, according to the AEA analysis. Due to marginal financial feasibility, AEA offered the loan at 1% interest. [NEED TO DETERMINE IF CVEA BUILT THE SYSTEM OR NOT]	1998	Copper Valley Electric Assoc	\$406,000	[NEED FOLLOWUP INFO]	
37								
36		Waste Heat Distribution	Study: The 2004 Alaska Rural Energy Plan proposes \$3.1 million be spent over the next 5 years to help implement waste heat projects in additional rural communities. 27% of rural diesel plants now include a waste heat component. The study suggests that waste heat in some configuration should be cost-effective in 70% of rural communities. Primary customers would be schools and water systems. Obstacles to address include standardized contracts, informing customers on design and operating issues, and developing standardized system designs.	2004	AEA (Energy Plan by Mark Foster & Assoc)	\$3.1 million		
38								
37		Hydroelectric	Study: AEA (Div. of Energy) published a data base on existing and proposed hydroelectric projects in rural Alaska, along with an economic screening analysis to determine which, if any, potential projects appeared cost-effective on a preliminary basis. (Report available at www.aidea.org/AEEEPublications.htm). Projects in 10 communities were identified as promising candidates based on preliminary information, 4 of which were under development at the time. At least 1 of those 4 has now stalled [REASON?], while another project not on the list (South Fork on Prince of Wales island) is nearing completion.	1997	AEA (Study by Locher Interests and ISER)	N/A	[ADDITIONAL REVIEW NEEDED TO IDENTIFY OBSTACLES TO DEVELOPMENT FOR INDIVIDUAL HYDRO PROSPECTS]	
39								
38		Rural Bulk Fuel Storage Facilities	Study: AEA compiled a comprehensive data base on the configuration and condition of all bulk fuel storage facilities in rural Alaska, based entirely on site visits to each facility. This has served as the primary basis for estimating the cost to bring these facilities into regulatory compliance and for prioritizing project funding requests to the Denali Commission. Estimated that \$200-\$300 million is needed to complete the replacement or rehabilitation of these facilities. The data base has not been updated in over 5 years, and there has been no systematic follow-up on completed replacement projects to determine how they are holding up. Data base is available on the Denali Commission web site.	late 1990s	AEA	Up to \$400 million initially estimated to bring rural fuel storage into regulatory compliance		
40								
39		Rural Diesel Power Plant Upgrades	Study: AEA compiled a comprehensive data base on the configuration and condition of all rural electric utilities (with some exclusions such as AVEC), based entirely on site visits to each facility. As with bulk fuel storage, this has served as the primary basis for estimating the cost to bring each system into compliance with accepted utility standards and to prioritize funding requests to the Denali Commission. Estimated that >\$100 million (?) still needed to complete the job. Again, this data base has not been updated in over 5 years, and there has been no systematic follow-up on upgrade projects to determine how they are holding up. Data base is available on the Denali Commission web site.	late 1990s	AEA	[NEED TO REVIEW THE MATERIAL]		
41								

APPENDIX II: SAMPLE OF UNFUNDED, UNFINISHED OR FAILED PROJECTS

	A	B	C	D	E	F	G	H
2		Project Type	Project / Proposal / Study	Year	Sponsor	Cost	Why Unsuccessful	Obstacle Type
40 42		Intertie, hydro, bulk fuel storage, and rural electric data bases	Issue: It would be useful to update these data bases to gain a current grasp on existing projects, existing conditions, and needed or potentially beneficial projects or improvements.					
41 43		Package Power Plants and Fuel Storage (Rural)	"Utilitymaster" systems: During the 1990s, a now defunct company named Alaska Power Systems (APS) developed a packaged utility system intended for rural villages. Major system components included a new powerplant, bulk fuel storage tanks mounted on skids, pre-pay metering systems, plus certain O&M, management, and admin services. The Alaska Science and Technology Foundation (ASTF) provided funds for APS to develop a form of automated control for the power plant, which would be monitored and, possibly, controlled remotely from Anchorage by APS. AEA provided funds to help install 3 demonstration projects. APS asked for funds to help expand to at least 20 more villages. The 3 projects ended in failure.	mid-1990s	Alaska Power Systems, AEA, ASTF	various	Contributing factors: technical problems with Perkins diesel engines (incl spare parts); fuel storage tanks not code compliant, contracts between APS and villages unclear on service and equipment to be provided, poor service from APS, inadequate pmts from villages, APS folded.	Many problems. An evaluation report exists (possibly in AEA library).
42 44		Diesel Powerplant Efficiencies	Study: 2004 Alaska Rural Energy Plan proposes govt expenditure of \$20 million over 5 years for diesel efficiencies, 1/3 of which is for metering and SCADA systems to help locate inefficiencies and identify corresponding efficiency upgrades. These could include upgraded control systems, diesel generator replacements, distribution system upgrades, and/or O&M protocols.	2004	AEA (Energy Plan by Mark Foster & Assoc)	\$20 million over 5 years		
43 45		Diesel Powerplant Efficiencies	Proposals: Over the last several years, AVEC has submitted funding requests to AEA both for diesel engine replacements and for automated switchgear, many of which have been funded. System efficiencies have been improving for years, documented in PCE statistical reports that show annual kWh sold per gallon. [NEED ADDTL RESEARCH ON WHAT AVEC, AEA, and APC HAVE BEEN DOING TO UPGRADE DIESEL EFFICIENCY]	on-going	AVEC			
44 46		Energy Resource Development Projects						

National Energy Technology Laboratory

626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, PA 15236-0940

3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507-0880

One West Third Street, Suite 1400
Tulsa, OK 74103-3519

1450 Queen Avenue SW
Albany, OR 97321-2198

525 Duckering Bldg./UAF Campus
P.O. Box 750172
Fairbanks, AK 99775-0172

Visit the NETL website at:
www.netl.doe.gov

Customer Service:
1-800-553-7681