U.S. DEPARTMENT OF ENERGY

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Prepared for the U.S. Department of Energy
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American Recovery and Reinvestment Act (ARRA)
FEMP Technical Assistance
U.S. Army – Project 276

Renewable Resource Development on Department of Defense Bases in Alaska: Challenges and Opportunities

WM Warwick

September 2010

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Pacific Northwest National Laboratory
Richland, Washington 99352

Executive Summary

The potential to increase utilization of renewable energy sources among military facilities in Alaska through coordinated development and operation of available resources, both renewable and conventional, is the premise of this task. This potential exists because Pacific Northwest National Laboratory (PNNL) previously identified significant wind and other renewable resources at two Army installations, Fort Richardson and Fort Greely that are at opposite ends of the regional transmission system (the Railbelt transmission system). Full exploitation of these resources will require transmission access to wheel power to Department of Defense (DOD) facilities connected to it. The primary focus of the task initially was identification of legal and regulatory barriers that may prohibit realization of this potential, specifically with regard to the legal ability of installations to wheel power among the various locations to optimize the development and use of renewable resources. In addition to the legal hurdles, this potential may not be realized because of limitations that are technical, economic, and mission related.

This task was premised on the understanding that coordinated operation of DOD resources across the Railbelt could only be accomplished through utilization of civilian infrastructure, including utilization of transmission capacity on the Golden Valley Electric Association (GVEA) system at minimum, and access to the bulk of the Railbelt transmission system in the ideal. At the outset of the study, it became clear that the notion of integrated operation of the Railbelt transmission system to optimize resource utilization was of interest to the Army, Air Force, Alaska utilities and state government. And that each was considering plans to pursue their vision somewhat independently. The most fully developed plans available for this study were those of the Army and the state. Fortunately, a contemporaneous study of this issue by the state provided both a parallel framework for this task and critically important data and results that were used in it. At the same time, the recommendations from the state study create new uncertainties, specifically; the interests of the state in integrated Railbelt transmission operations may preempt those of the military. That could present challenges to the notion of a "military grid" operating within the existing civilian infrastructure. By the same token, state action to implement a state-wide grid could facilitate the "military grid" objective by increasing transmission capacity, albeit on a schedule and at a cost that could differ from that of DOD. Further examination of both the state study and the larger energy context in the state revealed other parallel activities that could affect implementation of a military grid. Evaluation of these other efforts, most of which are in their early stages, indicates the military has a number of opportunities to affect the future course of energy infrastructure development in the state in a way that benefits both itself and civilian society. However, doing so will require prompt action to engage in processes over which the military has little control, subjecting its plans and aspirations to unknown schedules and outcomes. Doing nothing with respect to these other plans and proceedings will leave the military at the mercy of those outcomes; outcomes that are likely to be less favorable, especially in terms of long term costs of electricity.

Contents

Figures

Tables

Description of ARRA Program

The Federal Energy Management Program (FEMP) facilitates the Federal Government's implementation of sound, cost-effective energy management and investment practices to enhance the nation's energy security and environmental stewardship. To advance that goal and help accelerate agencies' progress, FEMP works to foster collaboration between its Federal agency customers and the U.S. Department of Energy (DOE) national laboratories.

In 2009 and 2010, FEMP has utilized funding from the American Recovery and Reinvestment Act of 2009 (ARRA) to facilitate Federal agency access to the broad range of capabilities expertise at the National Laboratories. Funds were directed to laboratories to assist agencies in making their internal management decisions for investments in energy efficiency and deployment of renewables, with particular emphasis on assisting with the mandates of the Energy Independence and Security Act of 2007 related to Federal facilities and fleets.

FEMP provided major DOE laboratories with funding that will allow them to respond quickly to provide technical advice and assistance. FEMP applied a simple vetting and approval system to quickly allocate work to each of the laboratories in accordance with FEMP-provided funding. All assistance provided by the laboratories was in accordance with the requirements of Federal Acquisition Regulation (FAR) Subpart 35.017 and the labs' designation as "Federal Funded Research and Development Center" (FFRDC) facilities.

Introduction

This report was funded by the Department of Energy's Federal Energy Management Program (FEMP). The Federal Energy Management Program's mission is to "facilitate the Federal Government's implementation of sound, cost-effective energy management and investment practices to enhance the nation's energy security and environmental stewardship." Although this document discusses legal issues it is not the intent to provide legal interpretations or advice. The discussions herein cannot be relied on as legal opinions.

The potential to increase utilization of renewable energy sources among military facilities in Alaska through coordinated development and operation is the premise of this task. This potential exists because PNNL previously identified significant wind and other renewable resources at two Army installations, Fort Richardson and Fort Greely that are at opposite ends of the Alaska Railbelt transmission system. At the time of original PNNL evaluation, the renewable resource potential was greater than the Army load. As a result, full exploitation of these resources by the Army would require access to the regional transmission system to wheel power to Army facilities served by it. The Army enjoys wheeling rights on the northern end of the transmission grid, the portion owned and controlled by the Golden Valley Electric Association (GVEA). The basis for those rights and the ability to extend them beyond the GVEA system was the basis for a request by the Army Pacific Command to FEMP for technical assistance. The primary focus of that request was more complete understanding of the context for wheeling power within Alaska, including legal and regulatory barriers that may prohibit DOD facilities from wheeling power among various locations to optimize the development and use of renewable resources.

This task was premised on the understanding that coordinated operation of DOD resources could only be accomplished through utilization of civilian infrastructure to optimize use of renewable resources developed on DOD lands in terms of economics and potential. At the outset of the study, it became clear that the notion of integrated operation of the regional transmission system was of interest to the Army, Air Force, Alaska utilities and state government, and that each was considering plans to pursue their vision somewhat independently. The most fully developed plans available for this study were those of the Army and the state. A contemporaneous study of this issue by the state provided both a parallel framework for this task and critically important data and results that were used in it.

Background

It is critical at the outset to provide a context for this study because of the complications associated with the parallel studies of the Air Force, Army, and State and the various utility entities and their inter-relationship.

Alaska Military Facilities

There are seven major DOD facilities in Alaska, as follows (see Figure 1 for a map). Fort Richardson (FRA) is the major Army facility in the southern part of the state. It is in Anchorage adjacent to Elmendorf Air Force Base (AFB). There is another cluster of facilities in the north central part of the state near Fairbanks. This includes Fort Wainwright (FWA) on the eastern edge of Fairbanks and Eielson AFB (EAFB) approximately 26 miles southeast of Fairbanks. Roughly 100 miles further southeast of Fairbanks is Fort Greely (FGA) and the training ranges for Fort Wainwright. Facilities of the Ground Missile Defense (GMD) are located on the range as well. While support to Ground Missile Defense is provided by the Army, it is a facility of the Missile Defense Agency. Approximately mid-way between Fairbanks and Anchorage is the Clear Air Force Station (CAFS). The Base Realignment and Closure (BRAC) process resulted in Fort Wainwright having greater control over the lands at Fort Greely and joint-basing of Fort Richardson and Elmendorf AFB under the control of the Air Force as Joint Base Elmendorf-Richardson (JBER). As a result of this consolidation the focus of Army operations is now primarily Fort Wainwright, while the Air Force operates three major facilities. The Air Force facilities are under the Air Force Pacific and Space Commands. Each of the services, including the Navy, operates smaller facilities in remote areas that are either not interconnected to the Alaska power grid or are too small to be of concern for this study.

Alaska Utility Infrastructure

The electrical system in Alaska is primitive in comparison to that in the lower 48 states and the rest of the developed world because of the harsh climate, large land mass and sparse population. There are two major population centers in the state, Anchorage and Fairbanks, and a cluster of smaller towns scattered across the Kenai Peninsula (see Figure 2). All three areas are linked by a single transmission circuit that is about 600 miles long. It follows the major railroad and highway linking these areas and is therefore called the Railbelt transmission system. Power exchanges along the system are limited primarily as a consequence of the nature of electricity requirements in the state and the associated history of each utility. The climate in Alaska is so harsh that a power outage of any duration can be devastating. As a result, each utility has planned to be able to operate independently of all others. They also plan to have sufficient reserve generating capacity to be able to provide power even if multiple generators are inoperable. The end result is sufficient generating capability to offset the need for integrated operations, and therefore, the need for an extensive transmission system (see Figure 3, from Doyon Utilities).

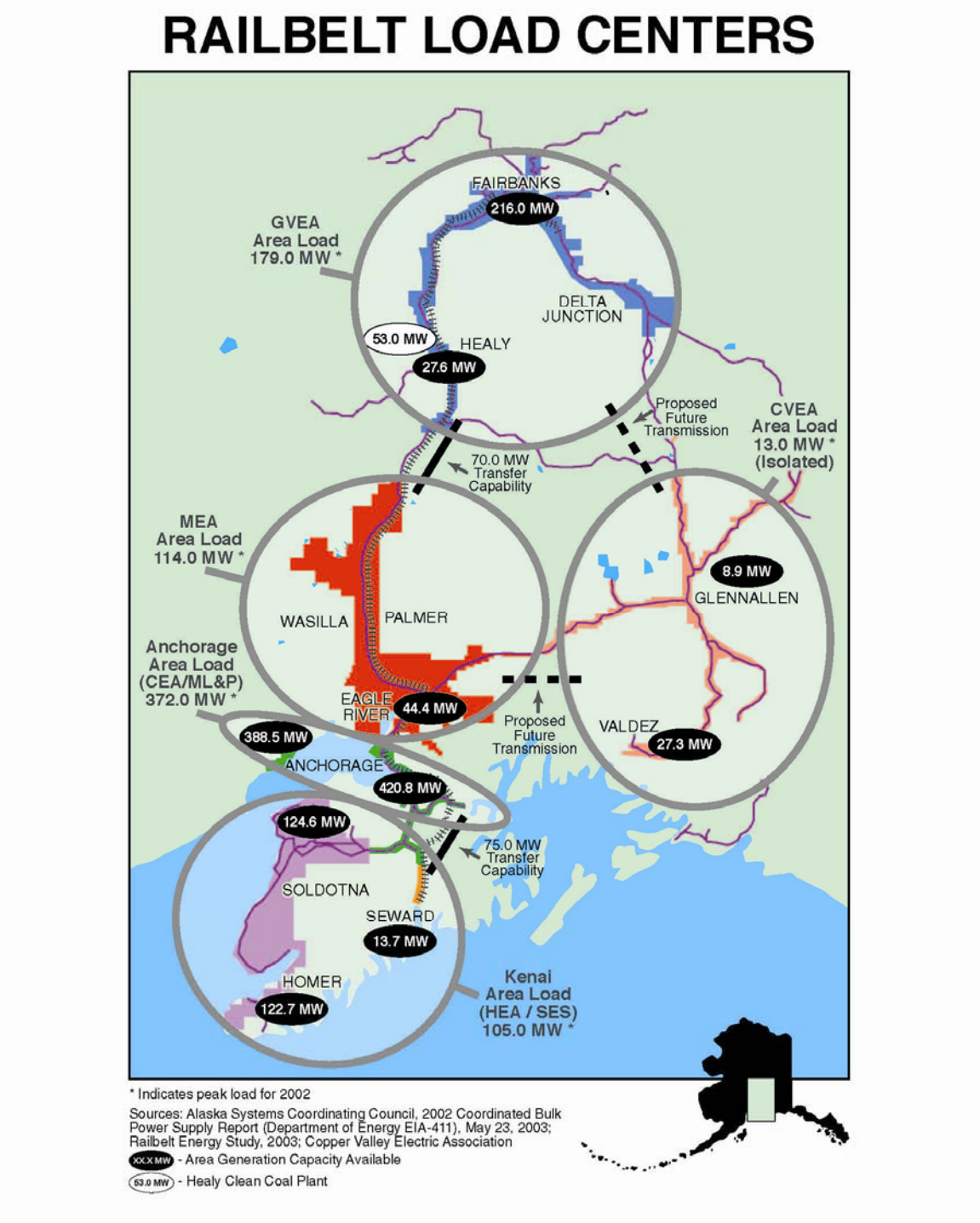


Figure 1. Installation Map (from Alaska Systems Coordinating Council 2002)

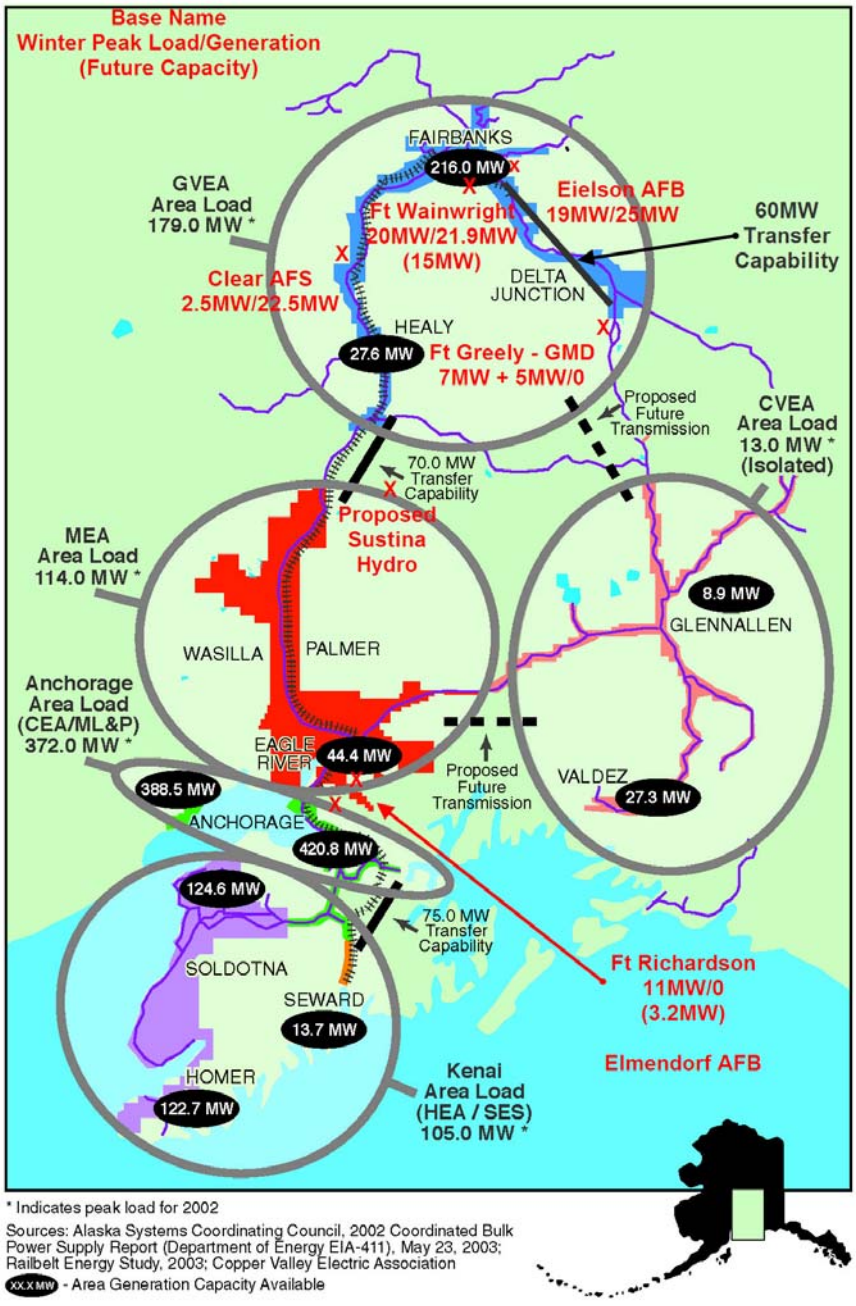


Figure 2. Utility Area Map (from Alaska Systems Coordinating Council 2002)

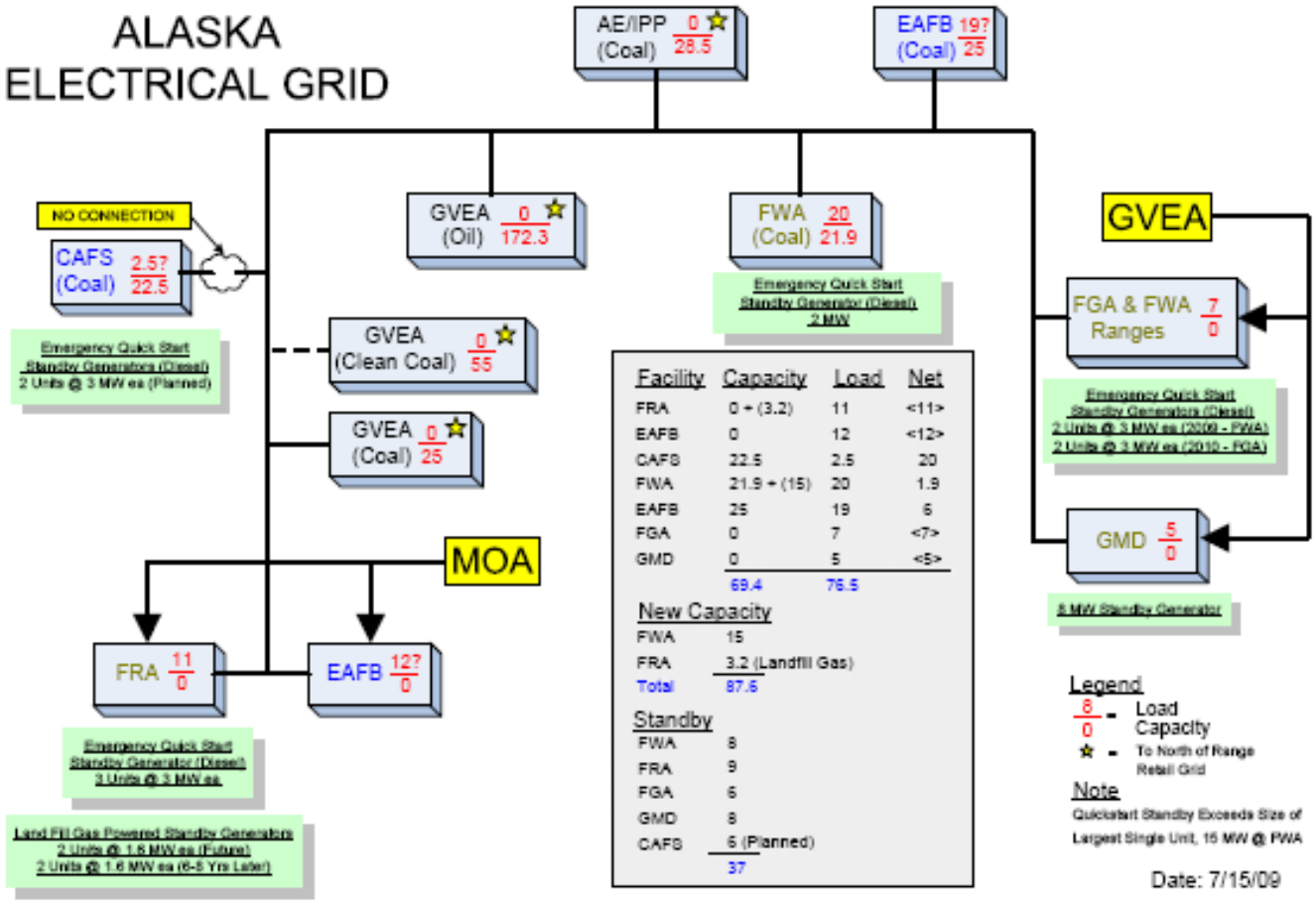
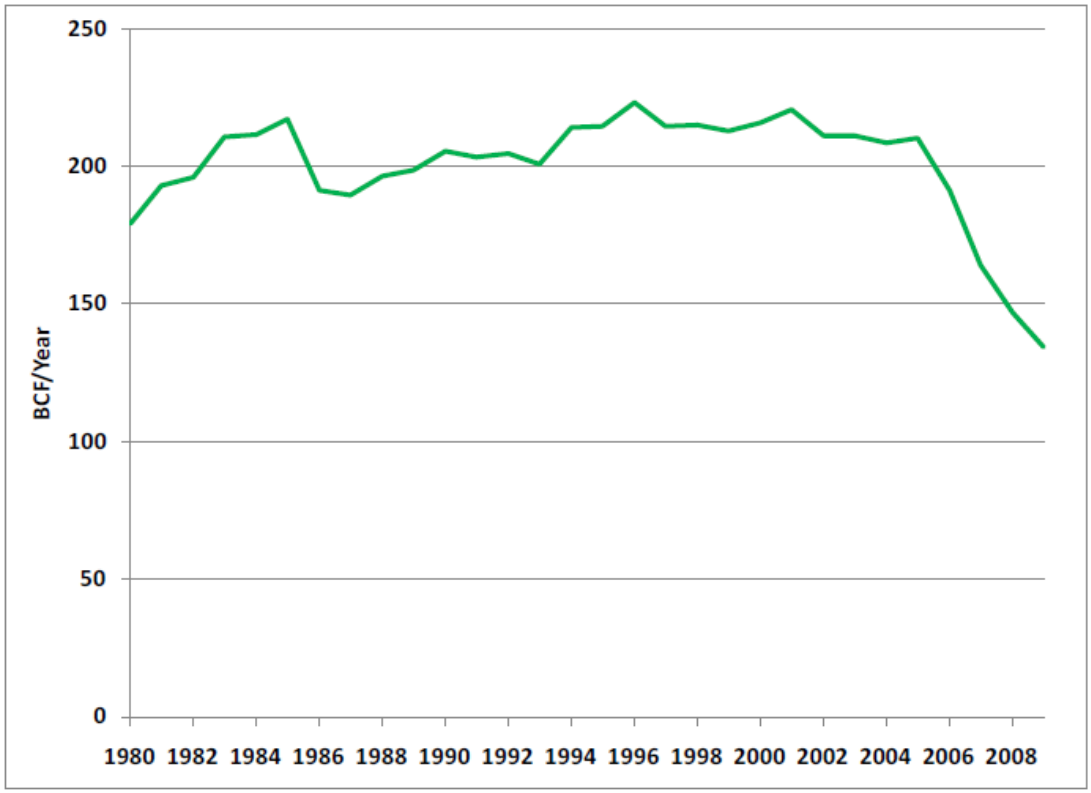


Figure 3. Alaska Electrical Grid (from Doyon Utilities)

The major interconnected utilities are Golden Valley Electric Association (GVEA), which serves the north central part of the state centered on Fairbanks. The Anchorage area has two primary utilities, Anchorage Municipal Light and Power (ML&P) and Chugach Electric Association (CEA). Matanuska Electric Association (MEA) provides power to the northern suburbs of Anchorage.

The GVEA system in the north is connected to the three Anchorage area utilities by a 170-mile transmission line, the Alaska Intertie, owned by the Alaska Energy Authority, which is a "public," meaning state-owned, corporation of the Department of Commerce (Alaska Energy Authority 1991). Access to the intertie is through an "intertie agreement." This is standard practice among utilities in regions where there is no independent system operator (ISO) to collectively manage transmission access on behalf of multiple utility owners. The California ISO (CAISO) is an example of an ISO. In this case, Alaska Energy Authority (AEA) contracts with ML&P and GVEA to manage the intertie. As noted previously, to complete the circuit between GVEA and the two Anchorage utilities, transmission has to pass through the MEA system. AEA recently constructed an extension to the intertie to bypass the MEA system and tie in to the CEA system directly.

The intertie was initially envisioned as means to distribute power from a large hydropower development project on the Susitna River. This development is north of the Anchorage area and would require connections to both the south and the north to be feasible. The generating capability from the Susitna project could equal the combined generation of Alaska's major utilities if fully developed. Like all large hydropower projects, this one is controversial and expensive, and consequently has had an on-again, off-again history. Interest in the project remains high, however, given the current dependence on fossil fuel for generation and shrinking supplies of oil from the North Slope and natural gas from the Cook Inlet near Anchorage (see Figure 4).



Source: Alaska Department of Natural Resources, Division of Oil and Gas.

Figure 4. Decline in Cook Inlet Gas (from Alaska Department of Natural Resources)

Utilities and DOD Facilities

GVEA serves Forts Wainwright and Greely and Eielson AFB. Elmendorf AFB and Fort Richardson (JBER) are served by ML&P. Power flowing between GVEA and ML&P passes through the systems of MEA and CEA because Anchorage is located on the southern edge of Cook Inlet and MEA and CEA are on the northern and eastern edges, respectively. Clear AFS is not connected to any utility power grid. It is in the GVEA territory and could be interconnected by constructing a transmission line approximately 3-miles long.

Clear AFS, Eielson AFB, Fort Wainwright, and Fort Greely have their own central plants that provide both heat and power. Therefore, they are self-sufficient and typically operate without grid power. The plants at Clear, Eielson, and Wainwright are coal-fired using low Btu content coal mined near Clear, roughly 100 miles southeast of Fort Wainwright. Coal is delivered by rail. Fort Greely and GMD have diesel-fired generation in place, however because of the cost, Fort Greely uses excess power generated at Fort Wainwright whenever it is available. Power from Wainwright is wheeled by GVEA under a standard service tariff. The wheeling service is somewhat expensive but doesn't require GVEA customers on either end of the transaction to

provide reliability reserves or ancillary services, which are typically required in wholesale wheeling transactions.

The Army privatized its central plant and associated electrical distribution infrastructure at Richardson, Greely, and Wainwright to Doyon Utilities (DU), a native Alaska corporation. As part of the privatization process, The Army requested that the Regulatory Commission of Alaska (RCA) certify Doyon as a regulated utility with rights to own and operate electrical facilities on Army property. Doyon staff and consultants include former employees of GVEA, so they are extremely knowledgeable about utility operations and issues and policies surrounding utilities in Alaska. They would also like to leverage their contract with the Army to expand their operations in Alaska, potentially to include ownership and/or operation of facilities at the major Air Force facilities. A door to that possibility is opened with the joint-basing of Richardson with Elmendorf because the Air Force will inherit oversight of the DU privatization contract on the Richardson property it is receiving.

The Army's DOD Grid Concept

In 2009 the Army contracted with CH Guernsey to evaluate the feasibility of a "DOD grid." In concept, a DOD grid would provide a mechanism for joint-operation of DOD-based generating assets to reduce power costs, on average, across the bases and potentially free up civilian generating capacity that is currently used to meet DOD loads. The end result could be a win-win, where DOD's power costs are reduced as well as those for civilian power customer. This would be possible because coordinated operation of DOD generation could produce "surplus" power. That generation would be from low-cost coal-fired generators that would displace power currently provided by higher cost utility generation. Operation of DOD generation would be centrally coordinated from a DOD controlled dispatch system, a supervisory control and data acquisition (SCADA) system. The SCADA system would also control power use on all DOD installations in coordination with local utilities, presumably through the utilities' own SCADA systems. As a result, power could be wheeled from low-cost DOD sources to other DOD bases when conditions are favorable (see Figure 5).

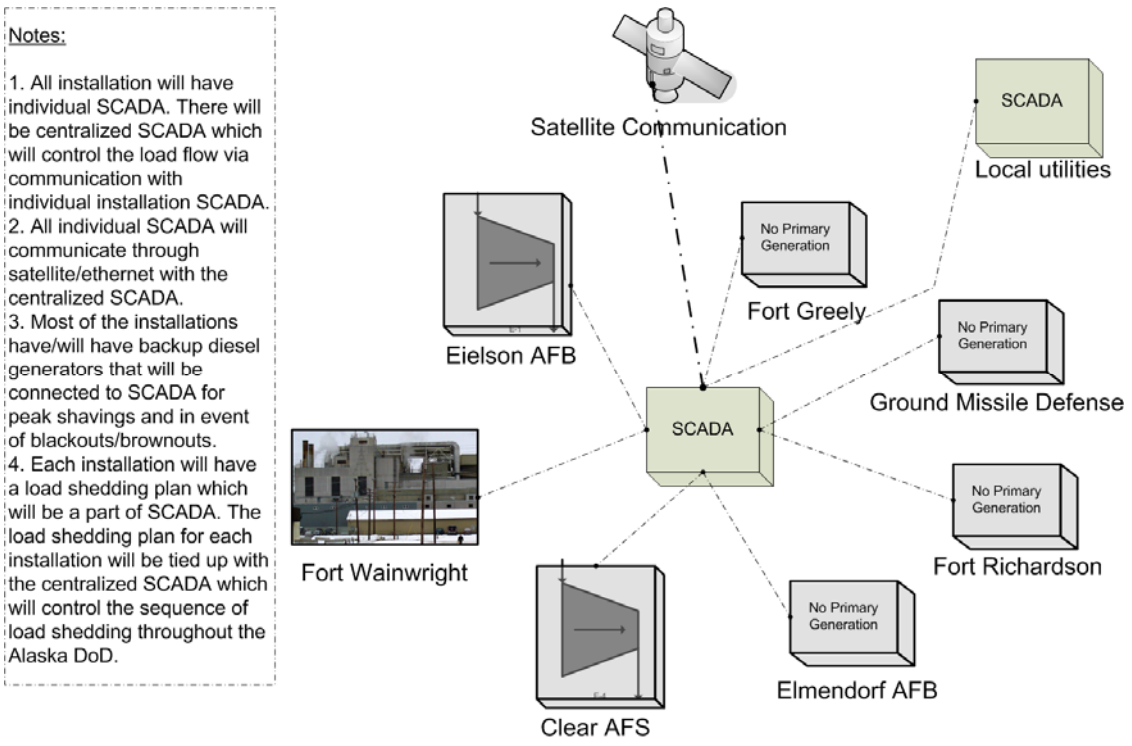


Figure 5. Operation of DOD Grid (Guersney 2009)

The Guernsey study (2009) identified a number of challenges to implementation of a DOD grid:

- At the time of the study, Air Force support was unclear at both the Alaska installation level and within higher headquarters. In addition, the Air Force Utility Management Team (UMT) had not been consulted. Involvement of the UMT could be critical because it is the primary support entity within the Air Force for utility and regulatory issues.

- Wheeling would require access to the entire Railbelt system, not just GVEA. While such access is permitted under tariff with GVEA, no such agreement is in place with the AEA for intertie access or with MEA, CEA, or ML&P to integrate Joint Base Elmendorf-Richardson with the DOD bases on the GVEA system.

- Intertie capacity between the south and the north is already constrained. There is no capacity for south-to-north transactions during constrained periods. However, power could flow from DOD generators in the north to loads in the south. That would relieve the south-to-north transmission constraint, enabling increased deliveries of low-cost generation from civilian generation in the south to GVEA for its retail customers.

- Switching from a GVEA retail wheeling customer to a generator and transmission customer will result in new requirements from GVEA, at a minimum. These new requirements may require significant investment in new facilities that could undermine potential savings.

- A significant capital investment will be required to implement this system, as well as in operating staff.

It should also be noted that increased reliance on transmission and on SCADA systems increases vulnerability of DOD power supplies to transmission outages or targeted attacks on the associated transmission and/or SCADA systems. This can be mitigated by retaining sufficient generation on-site, as well as the ability to operate that generation locally. Because the available generation is associated with central plants for heating, this should not be an issue.

The Broader Context

In the process of researching this report, a number of activities were identified that were proceeding in parallel but without coordination with the Army's interest in a DOD grid discussed previously. The most significant of these are:

- The Alaska Railbelt Regional Integrated Resource Plan (IRP) study (the Railbelt study),
- North Slope gas pipeline planning and two associated pipeline "open seasons,"
- Alaska intertie agreement renewal,
- Proposal for a Greater Railbelt Energy and Transmission Company (GRETC),
- Clear AFS evaluation of options for its central plant,
- The addition of a 15-MW turbine generator to the central plant at Fort Wainwright by DU, and
- Wind farm development planning by GVEA.

These are in addition to development of on-site generation at Fort Richardson using landfill gas from the Anchorage municipal (former Fort Richardson) landfill; on-going discussions between Fort Wainwright and Alaska Environmental Power (AEP), Mike Craft's company, about purchase of wind power from a wind farm AEP wants to develop adjacent to Fort Greely; and further work underway to develop the resources identified in the earlier PNNL renewables assessments for the Army Alaska bases.

Railbelt Studies

The Alaska state legislature has a recurring interest in better coordination among state electric utilities because it is frequently approached by individual utilities looking for funding for critically needed projects. The lack of coordination among these requests leads to less efficient investment than if there was greater cooperation and collaboration. Periodically that is reflected in legislation to merge the current Railbelt utilities into something like the GRETC. The Legislature recently commissioned Black and Veatch (B&V) to conduct a series of studies to review the challenges facing Railbelt utilities as they face the energy needs over the next 30 years. These studies include:

- ❖ The Alaska Railbelt Electrical Grid Authority Study, (the REGA study) (Black & Veatch 2008),
- ❖ The Alaska Railbelt Regional Integrated Resource Plan Study (the RIRP study) (Black & Veatch 2010)

- ❖ A refreshed Susitna Analysis, as Appendix A to the RIRP.

These interrelated studies are an effort to clarify Alaska's future electricity plans and possibly stimulate creation of the something like GRETC.

- The REGA study concluded formation of an entity like GRETC would provide that kind of coordination as well as a single entity to fund. A key consideration underlying this conclusion is that prospective investment in new facilities ranges between roughly $3 and $10 billion dollars (in 2005 terms) over the next 30 years. The equity of regional utilities at the time was roughly one-half billion dollars, which B&V thought insufficient to finance the needed system improvements without either or both external funding or significant increases in rates.

- The RIRP study concluded the needs of the region would be best met at lowest cost through development of the hydropower resources on the Susitna River. Development of resources on the Susitna has been studied for decades. While the resource is significant, the scale of development required and remote location make this a "lumpy" resource, or one with high upfront costs. The resource is sufficient to meet regional needs for decades with no fuel costs; however, it is the most expensive resource to develop. It would also ensure the state would achieve its goal of having 50% of power resources from renewables.

Implementation of the study recommendations and/or implementation of a GRETC-like utility agreement would include development of the same kind of integrated power grid envisioned by the Army DOD grid concept. It could obviate the need for investment in a separate DOD grid but may undermine the economic benefits a DOD grid might provide.

Gas Pipeline Prospects

Natural gas is a byproduct of oil production in the North Slope. There is no pipeline or export terminal for its sale, although plans for a pipeline have been under development for years. There are currently two competing proposals for pipelines, the TransCanada and Denali lines. The TransCanada proposal has won subsidies from the state and is the nominally leading proposal. Exxon recently agreed to collaborate on this proposal, which resulted in it being renamed the Alaska Pipeline Project (APP). The Denali proposal is conceived of as a privately financed project. The routes of both lines are similar because they will bring gas from the North Slope into Canada and from there through existing pipelines into the Lower 48. Both include an option for a smaller project that would route gas to Valdez, where it could be exported as liquid natural gas (LNG), although this is not the preferred option. During the course of this study both pipeline companies offered "open seasons" for prospective users to subscribe to 20-year delivery contracts. The outcome of these open seasons will determine when, which, and if one or both pipelines will be constructed. If they are constructed natural gas could be delivered to DOD facilities along the main Alaska route and could be delivered through a new in-state line to Clear AFS and facilities in Anchorage.

Intertie Agreement Status

The Alaska intertie agreement is subject to periodic renewal. This is the year for renewal discussions. The Army has expressed an interest in having DU represent DOD's interests through participation in the Agreement. Further discussions between AEA and DU and AEA and the Air Force are ongoing. If the Army's DOD grid concept or something similar is to be deployed, it would be most efficient for DOD to become a party to the Agreement. Participation will allow DOD facilities to wheel power throughout the Railbelt. It will also allow the DOD facilities in the GVEA area to wheel power at a lower rate than the current tariff. However, participation comes with a number of requirements that will have additional costs.

Additional Activities

Two developments on the generation front are also underway. The first is DU's proposal to add 15 MW of generation to its plant at Fort Wainwright. The new generating capacity will provide greater operating flexibility and improve service to Fort Greely. It could also facilitate more optimal maintenance of the central plant at Eielson AFB through resource sharing during outages. And, it may be a necessary part of the investment required for DU or DOD to join the intertie agreement. As noted, Clear AFS is not connected to the GVEA system. It has a well preserved central plant that produces more power than is currently needed at the base. If it were connected to the GVEA system that excess generating capacity could be used to supplement generation at other DOD sites (via the Army's DOD grid proposal) or provided directly to GVEA. The installation is actively considering these options, making interconnection more likely.

Alaska has a long term goal of providing 50% of its power from renewable energy sources, which includes conventional hydropower. GVEA is almost totally dependent on fossil-fired generation and would like to diversify with additional wind power. It has identified two potential sources, one near the coal plant at Healy, (near Clear on the southern edge of the GVEA transmission system), the other option is the AEP project near Fort Greely. In both cases, it is evaluating a 20-MW project, which it considers the maximum it can handle on its system. It is concerned about the impact an intermittent resource like wind may have on its system, and is also considering the addition of battery energy storage or other devices to mitigate this potential risk. GVEA's actions have implications for future DOD wind development. If GVEA purchases power from the AEP project, that power will not be available to DOD. If it develops the project near Healy, it claims it will have saturated its system's ability to absorb more wind. Regardless, it believes any addition of significant quantities of wind power will require mediation using some kind of energy storage. GVEA may express similar concerns with other generation additions by DOD.

Discussion

These parallel activities have implications for DOD's energy plans in Alaska. Let's start with the Railbelt studies. The REGA study was released 2008. It concluded a new organization was needed to oversee management of the regional power system including financing and development of new generating resources. A new organization with this responsibility would undermine the influence and importance of current utilities and therefore, it was not well received by them. The RIRP used industry standard load forecasting and power system modeling techniques and the best available data. As a result, it provides a solid foundation for evaluation of Alaska energy futures.

The RIRP study did not include DOD's loads or generating resources. In case of GVEA, DOD generation is equal to between 35 and 40% of GVEA's capacity, which is significant. If DOD resources can be operated in conjunction with both load centers (Anchorage and Fairbanks) as envisioned in the Army proposal, they are roughly 10% of the combined area generating capacity (see Table 1).

Table 1. Summary of Utility and DOD Loads and Resources

Generation	Fairbanks Area	Anchorage Area
Utility	244	809
DOD	83	3
DOD standby	20	7.5
Peak		
Utility	179	372
DOD	33.5	23

Notes to the table: Raw data provided by Doyon Utilities. Information for Air Force generation may be overstated under current operating procedures but understated under a scenario assuming maximum output per discussions with the Air Force. Tabulation of the raw data was by PNNL.

The Railbelt study looked at two growth scenarios and two resource goals. The growth scenarios were baseline (expected growth rates) and high (increased industrial power demand, mostly for mining). The resource goals were with and without the state goal of 50% renewable generation. The most critical assumption in all load forecasts is that of fuel costs, including the costs of environmental compliance, which in this case includes potential greenhouse gas (GHG) mitigation costs. B&V based oil and gas costs on world oil price forecasts and presumed GHG compliance costs. The assumptions they used are reasonable, but like all assumptions, they are based on conditions at the time they are made. Since then, the economy has continued to weaken, development of shale gas resources in the Lower 48 have changed the expected fuel source and cost of Lower 48 generation, and low-cost gas increases GHG compliance options, all of which affects

underlying assumptions about the world demand for oil, gas, and power and the associated prices for each. The most fundamental change is likely to be in future natural gas prices, which may be too high in this study because of persistent low gas prices in the Lower 48 thanks to shale gas supplies. Regardless, the "least cost" resource option in both baseline and high growth forecasts was the 50% renewable path, primarily because of the extensive hydropower resources available on the Susitna River and elsewhere in Alaska. There is sufficient potential to replace 100% of future demand, although there are economic and environmental limits that may prevent that. These resources can be developed incrementally consistent with demand growth and the economics associated with retirement of current power plants based on their individual replacement and environmental costs.

Another reason the Susitna projects fared so well is that the RIRP was based on a least cost solution for the state as a whole; in other words, it considered all the Railbelt utilities as if they were one. This is important because no single utility has sufficient need or financial capability to develop even the smallest project on the Susitna just for its own use. And that is the primary finding of the report, namely that is will be cheaper for the Railbelt utilities to collaborate on how they meet future energy needs than it will be to go it alone. A secondary conclusion that can be drawn is that coal-fired power plants were not an attractive option primarily because of their high construction costs and the fact the coal available in Alaska produces greater than average GHG emissions, mitigation of which offsets its comparatively low cost.

If low-cost natural gas were readily available, the results of the Railbelt study may be different. However, the only significant source of natural gas for power production is from fields in the Cook Inlet that are in decline (Figure 4). There is plenty of natural gas at the North Slope, but no pipeline to bring it to the major load centers at Fairbanks, Anchorage, and the Kenai Peninsula. There are two proposed pipelines currently working their way through the approval process. At this stage, each pipeline must demonstrate to the Federal Energy Regulatory Commission that sufficient demand exists for the pipeline to be "used and useful" to justify its construction and the associated impacts. This is done through an "open season" process. It isn't clear that there will be sufficient demand for both pipelines or even for one at the size proposed; however, the current open season process will provide that information. As a result, the state is on the verge of knowing if and when a natural gas pipeline will be constructed (See Figure 6).

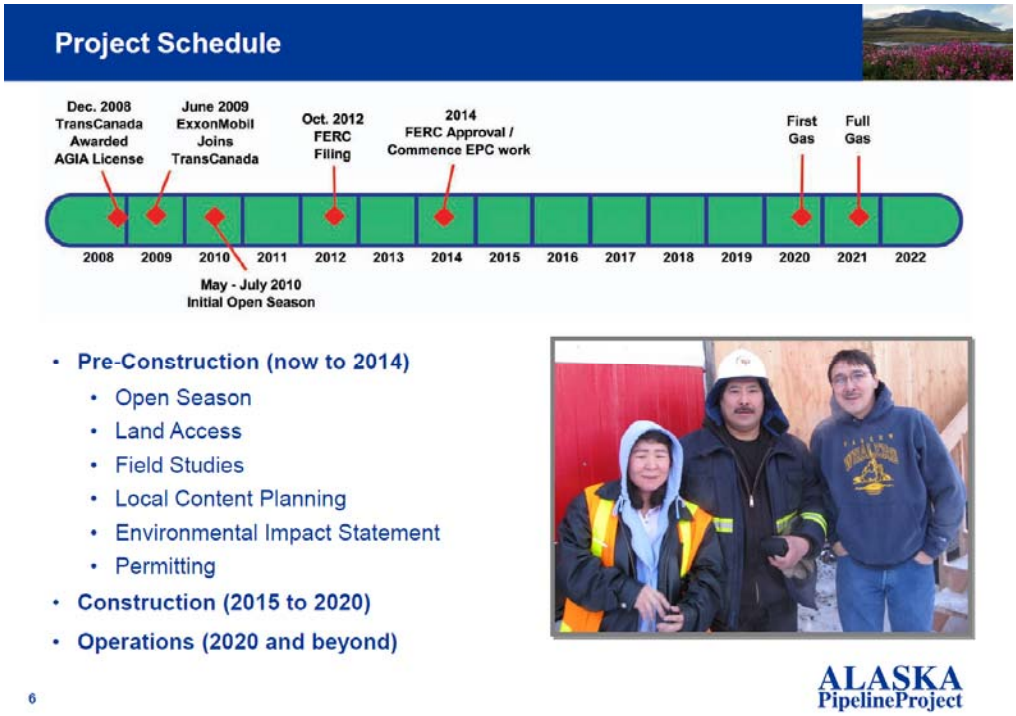


Figure 6. Gas Pipeline Timeline (from Alaska Pipeline Project, open season filing)

Both of the pipeline proposals have to demonstrate potential demand, including demand in-state. In this case, both relied on a study conducted by Northern Economics for the TransCanada Alaska Company, sponsors of the APP proposal. This study identified several "take off" locations along the proposed routes that would provide gas service to in-state customers. This included take-off points that could serve Wainwright, Eielson, and Greely, at minimum (see Table 2). Both pipeline proposals included these potential take-off points plus options that might allow supplies to Anchorage via in-state pipelines (see Figure 7).

Table 2. Potential In-state Take-off Points for Proposed North Slope Natural Gas Pipeline

	Route	
Location	Alberta	Valdez
Livengood	1	1
Fairbanks	1-2	1-2
Parks Highway spur	1	1
Delta Junction area/ Richardson Highway spur	1	1
Tok	1	NA
Glennallen	NA	1
Valdez	NA	1
Total	**5-6**	**6-7**

Source: Northern Economics, Inc.

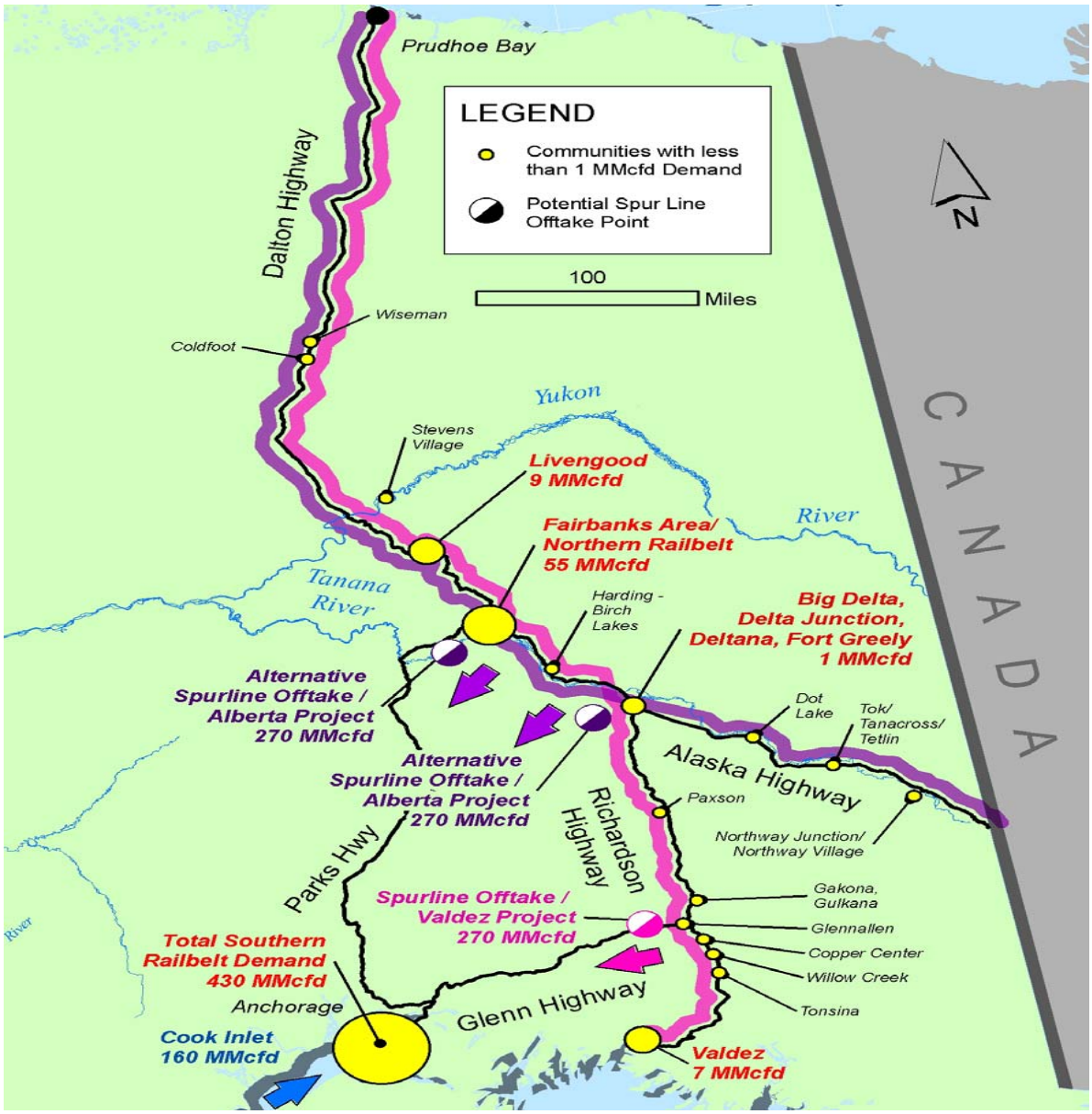


Figure 7. Take-off Points that Might Allow Supplies to Anchorage via In-State Pipelines (from Alaska Pipeline Project, open season filing)

Access to natural gas could have significant impacts on power costs in the Fairbanks area and would provide options for GVEA and Wainwright, Eielson, and Greely to switch to natural gas for heating and power generation. At that time it may be economic to embrace new gas-fired generation equipment as well, idling the current coal plants, which could be retained in reserve for energy security reasons. This would depend, of course, on the comparative costs of operations of new gas plants including the cost of natural gas. The cost of that gas will be dependent, as noted previously, on prevailing natural gas prices in the Lower 48 or in world markets for LNG if the gas is transshipped to Valdez for export. If, as expected, shale gas production costs hold US gas rates steady at prices under $10 MMBtu, then power production costs from new plants in Alaska will be competitive with current costs for DOD's coal plants, as estimated by CH Guernsey (2009), or roughly 8 cents/kWh. If power production costs from new gas-fired power plants for GVEA fall into a similar range, there would be less need for expansion of intertie capacity to deliver low-cost power from Anchorage to GVEA. In fact, if new natural gas supplies are not developed or delivered in the Anchorage area, the power flow could be from gas plants in the north to Anchorage area load centers as an alternative to development of all or part of Susitna. Obviously, this alternative would fail to meet the state's 50% renewable goal. These outcomes are, at best, speculative. They merely illustrate how affordable, abundant natural gas could be disruptive to conventional thinking about future power sources.

The key to the least-cost plan in the Railbelt study and the integrated operation of either the Army's DOD grid concept or GRETC is expansion of the intertie. At present, the primary benefit of the intertie is the flow of low-cost power from the Anchorage area to GVEA to offset its high-cost oil-fired generation. If DOD resources were operated in conjunction with utility resources the lower cost DOD resources in the GVEA area would most likely reduce demand for power transfers on the intertie from Anchorage utilities. That could facilitate wheeling of renewable resources from the Anchorage and Healy areas to Fairbanks, and vice versa, which was one of the challenges this study was asked to address. Accordingly, there are three obvious options that may be available:

- Economic dispatch of Army resources with those of GVEA,
- Adding Air Force resources to those of the Army, potentially including those at Clear with those of GVEA, and
- Coordinated operation of all DOD resources within the Railbelt system.

The first two could be implemented without expansion of the intertie or DOD participation therewith. These three options reflect essentially three levels of engagement by the Air Force in the Army's DOD grid concept based on the contribution of each of the three Air Force bases; Eielson, Clear, and Elmendorf, respectively. In other words, Eielson can participate with the Army in a GVEA-only "DOD grid" without expansion of the intertie. Clear can be added to that mix as well, although Clear may be a more valuable asset if it can access the intertie. Joint Base Elmendorf-Richardson cannot participate without expansion of the intertie and DOD access to it.

Under normal circumstances, the Railbelt and pipeline plans would suggest a future for the state that would include new natural gas supplies, collaborative development of hydropower resources, and some form of integrated operation of the power grid. However, the current environment in the state is anything by normal.

Alaska is beset by the same economic slowdown as the rest of the US economy. Contraction of world demand for mineral resources has slowed plans for development of new projects in the state. The Gulf oil spill has halted planned exploration off the North Slope, which jeopardizes future oil revenues the state depends on. Uncertain state support, caution among financiers, and utility opposition to proposals for collaborative financing and development of new power resources suggests a significant delay in implementation of the recommendations in the B&V studies. This means it is unlikely DOD will be able to count on utility investment in the Railbelt to achieve the Army's DOD grid vision. However, pressure for new resources will continue due to normal population growth and the need to replace aging infrastructure. This may create conditions that provide DOD with leverage to precipitate needed cooperative action.

Conclusions and Recommendations

There are three primary events that DOD facilities should plan for. These include:

- Integration of DOD resources into the regional power grid,
- A future where natural gas is plentiful to most if not all DOD facilities, and
- DOD participation in the Alaska intertie agreement.

(In this discussion the term "DOD facilities or generation" is used for convenience. Some of these facilities have been privatized and more may be. Those resources are not DOD's any longer, however their operation is still managed to serve DOD's needs.)

As noted, the RIRP did not incorporate either DOD loads or generating resources. The loads would be a burden on a regional power supply system that is already near its limit. However, the addition of DOD generating resources more than offsets that burden, and potentially provides regional utilities with sorely needed low-cost generation that can be used to manage the decline in Cook Inlet gas fields and enhance reliability, especially on the northern segment of the intertie. The figures in Table 1 indicate DOD may be able to provide twice as much generation as load and potentially more depending on circumstances at each base. This potential should be of value to regional utilities. How much value could be determined by using the same approach and data B&V used for the RIRP, only including DOD resources this time. That kind of analysis would provide DOD with a basis to negotiate an appropriate role with Railbelt utilities, the state, and the intertie partners that could enable development of the proposed DOD grid.

In the near-term, utilization of DOD resources will require both integration into local utility systems (primarily the GVEA system, but to the ML&P system as well), as new on-site renewable resources are developed. The intertie agreement spells out requirements for interconnection of generation to the intertie. Because the Railbelt utilities are all tied to the intertie, these are also *de facto* standards for all of the Railbelt utilities. As a result, it would be ideal if interconnection of DOD facilities at the local utility level would include participation in the intertie agreement. However, being a participant on the intertie also has specific reliability requirements in addition to local utility interconnection standards. The intertie agreement is open to "utilities" only at this time. DOD and the respective bases are not "utilities" as defined in the agreement. However, DU qualifies as a utility. At Wainwright's request, DU is developing an estimate of the required investment needed to meet intertie requirements. That is an essential piece of data needed to evaluate the benefits (and costs) of broader DOD participation with Railbelt utilities.

According to the current intertie agreement, DU and any other UP contractor may participate, but DOD cannot because DOD is not a "utility" accountable to the RCA. While it is more appropriate for UP contractors to participate for technical purposes, there may be value in DOD participation at the planning and policy level. Accordingly, DOD facilities should consider the potential benefit of having their on-site UP contractor participate in the intertie agreement and DOD headquarters staff should consider other ways to participate with the intertie group. Such an association would facilitate joint

DOD-utility investment in the intertie and other infrastructure to facilitate the "DOD grid."

In the longer term, natural gas may be available. Further information on when, where, and at what cost will develop over the next 2 to 4 years as Open Season applications are processed. DOD facilities should remain flexible in their investments in thermal plants and other thermal infrastructure in anticipation of natural gas availability. Locking in a long-term coal supply contract would be unwise, for example. If natural gas becomes available at an affordable cost, DOD facilities should consider conversion of existing central plants to natural gas. Ideally, brand new plants could replace them to capitalize on the advantages of gas-fired power generation. If so, current central plants should be privatized to serve civilian energy needs, but also to provide back-up capacity in case natural gas supplies are disrupted.

In conclusion, the list of opportunities is long and the necessary actions daunting. The benefits to DOD as well as civilian communities from DOD engagement are potentially significant. Although DOD does not consider operating utilities as a core function, there is nothing in these conclusions that cannot be done on DOD's behalf with a privateer or other contractor. In fact, that is probably preferred because private partners have greater access to capital in a timely manner. The role that is uniquely DOD's is that of a partner with the State of Alaska to provide both a sense of urgency to this effort and unbiased leadership. That is a partnership of mutual interests.

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