GOLDEN VALLEY ELECTRIC ASSOCIATION

GREEN POWER ADVISORY COMMITTEE

2006

Report to the Board of Directors

January 2007

2006 Report to GVEA Board of Directors on Green Power

Section 1. Background

INTRODUCTION

"Green is the New Red, White and Blue,"
Thomas Friedman, Journalist

The Green Power Advisory Committee (GPAC) hereby submits its March 2007 Report to the Board of Directors (BOD) of the Golden Valley Electric Association (GVEA) for the ongoing purpose of identifying and reviewing progress on Green Power Programs as implemented by the GVEA BOD. Green Power comprises renewable energy programs in Alaska, conservation measures, a Renewable Energy Pledge, alternative energy possibilities for use by GVEA customers (the so-called SNAP or Sustainable Natural Alternative Energy Power program) and other programs. This current document is the 2007 report on an initiative which started in March of 2004 based upon the customer interest in green power expressed through a GVEA survey in February 2003. GPAC was formed from local citizens to address these concerns, inform the BOD of these developments on an ongoing basis, and provide information on the implementation and development of Green Power Programs. GPAC had its first meeting on October 15, 2003.

This report will update and provide recommendations to the GVEA BOD on the following topics:

- Renewable Energy Pledge and benchmarks for measuring progress into the future: A 10% reduction in nonrenewable resource power production in 2007 and 20% by 2014. It is possible that current benchmarks are not being met but need to be.
- Wind power generation at Eva Creek and Fire Island: Development of wind resources in the Anchorage region could be transmitted eventually to Delta and involve upgrades of transmission lines. Geographic variability of wind power may require energy storage devices or hydro-power. This is a serious source of alternative power in the Borough.
- Programs for improving energy efficiency and conservation in Fairbanks: These could include conservation measures as the quickest way to meet the Renewable Energy Pledge, promotion of the Home*$ense* and Builder*$ense* programs for residential units, and the Business*$ense* program for commercial structures.
- Interior appliances such as water heaters, energy using appliances and metering in programs with the U.S. Department of Energy's ENERGY STAR programs will promote improvement in home energy use and should be promoted.
- SNAP, or Small Scale Renewable Energy Programs, has 7 producers of small scale electrical energy for connection to the Fairbanks grid and 360 purchasers. Over $23,000 has been contributed to the program. Work at GVEA should continue to simplify Power Purchase Agreements and encourage more participation on this innovative approach.
- The potential for Biomass electrical generation is real and specific. A 400 kW biomass power plant is planned for use at the Fairbanks North Start Borough Landfill which would contribute, along with SNAP, to meeting GVEA's energy

reduction objectives. This is a valuable and innovative use of landfill which satisfies several needs.

- Potential independent power generation projects, such as the above biomass project, could be incentivised by a green power premium paid out of a fund provided by a system benefit charge.
- The Chena Hot Springs Geothermal System Project represents an outstanding self supporting energy generation capability in collaboration with the United Technologies Corporation. The power plant has wide ramifications in use in Alaska in rural communities and should be applauded and promoted.
- The anticipated use of fossil fuels by the world at large is either a major constraint or encouragement on the energy system in the Borough. This GPAC report presents a close tracking of developments, volumes, prices and the political situation which is the broad context for our deliberations.
- Education: A continuous and ongoing effort is being made, and should continue to be made, in educating the customer base of GVEA to the possibilities. The education should focus on the connection between the broad discussion of energy prices, generation, etc., and specific changes, improvements and savings in the home. The serious and growing threat of global warming must be heeded in our preparations for reduced energy use.
- Marketing: There is nothing quite as difficult as presenting a technical argument or case to the general public. More effort should be exerted on this front by the GVEA BOD and by the GPAC.

EXECUTIVE RECOMENDATIONS

- Continue to promote several incremental phases of wind turbine installation, with the first phase coming online in 2009.

- Meet specific targets for conservation as recommended in this report.

- Evaluate realistic power PRODUCTION versus installed capacity. Come up with annual production numbers.

- Determine the safest and most secure approach for GVEA alternative energy involvement for the long term.

- Continue to support delivery of natural gas from the North Slope with savings used to fund current and future Renewable Energy generation.

- Support mid-size Renewable Energy projects that are over 25 kW through premium price for power. Explore funding through several mechanisms such as SBC and institute real-time pricing.

Section 2. Renewable Energy Pledge

In 2005, the GVEA BOD adopted a ‘Renewable Energy Pledge’ which outlines goals toward meeting specific milestones in renewable energy generation as a percentage of overall peak generation. Dates for meeting these milestones were established as the end of 2007 (10% of peak generation), 2014 (20%) and 2050 (50%).

Adopting this pledge has been a milestone in itself for electric utility renewable energy policy in the state of Alaska, and as a result GVEA has received widespread publicity. However, as the 2007 date approaches, it is necessary to take a closer look at what it will take to meet those milestones.

Meeting the 2007 Objective (10%)

GVEA’s peak generation for 2006 was 207.1 MW. A new peak of 208 MW was reached on January 8, 2007. This was slightly below the predicted peak of 211.4 MW. In 2007, there are a number of additional loads which may come online, the largest being Alyeska Pump Station 9. Previous estimates suggest peak generation for 2007 with these new loads could be as high as 230 MW. If this is the case, it will be difficult to meet the 10% pledge by the end of 2007. However, the most likely scenario is that some, but not all, of these additional loads will come online and 2007 peak generation will fall somewhere between 207.1 (2006 peak) and 230 MW (predicted peak for 2007).

The Bradley Lake project supplies an average of 20 MW of power. With the exception of 12 (pending plus existing) SNAP producers, Bradley Lake is the only green power generation currently feeding the GVEA grid. An additional 3 MW would be required to meet the pledge if all anticipated additional loads actually come online in 2007, and the new peak is 230 MW.

If the proposed 400 kW biomass power plant is brought online at the Fairbanks North Star Borough Landfill, this would add to GVEA’s green power portfolio. Even if the 10% pledge is not quite achieved in 2007, this project, along with the SNAP program, would show continued forward movement on increasing renewable energy generation on the GVEA grid. What is also exciting about this project is that it was not even under consideration at the time of writing of the 2005 GPAC report, which shows the need to continually re-evaluate opportunities for renewable generation.

Continuing to meet the 10% objective (2007-2013)

By 2013, GVEA would require 7 MW of additional green power generation to continue to meet the 10% goal, assuming an annual average growth rate of 2.5%. This is depicted graphically in Figures 1 and 2 on the next page. These figures are not intended to be absolutely accurate, because they do not take into account future fluctuations in demand from large customers such as Fort Knox Gold Mine. Instead, these figures are meant to illustrate quantitatively what the Renewable Energy Pledge requires in terms of increased generation from renewables over a long term trend to meet the stated milestones for 2007 and 2014.

While the SNAP program is beginning to make a contribution, it is quite small and even in Chelan County generates only 90,000 kW hours annually (10.3 kW average). The SNAP program alone cannot close the gap. GVEA may need to explore ways to encourage independently owned moderate sized renewable energy projects (see Section 5, page 12), and consider installing wind capacity in several phases over the next several years (see Section 3) to continue to meet the Renewable Energy Pledge. The graph below shows the additional renewable energy generation required to meet the pledge.

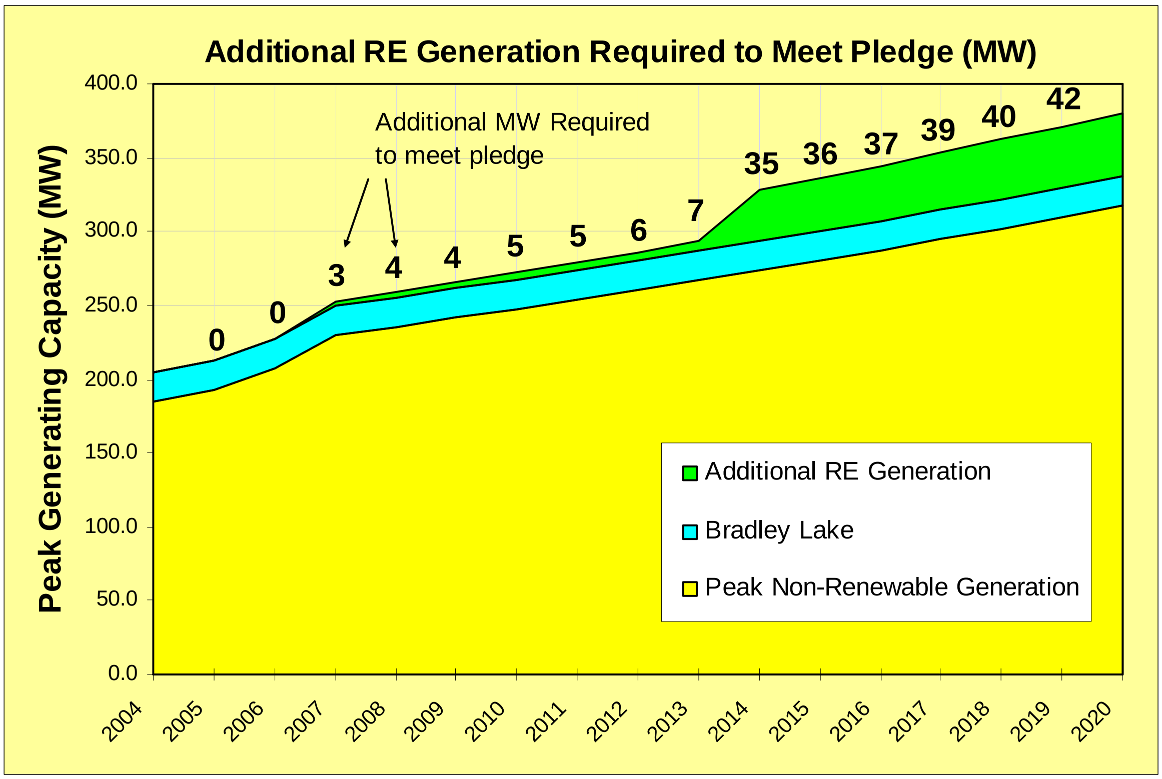


Figure 2.1: GVEA Peak Generating Capacity versus Time
(Note: Non renewable capacity retirements and replacements have been ignored in the graph above)

Meeting the 2014 Objective (20%)
GVEA's peak generation could climb as high as 273 MW by the end of 2014, assuming a continued 2.5% growth rate. This would require 35 MW of renewable generation capacity over today's levels. Clearly, this will require the installation of one or more large scale renewable projects, with the leading candidate being wind (Section 3).

Section 3. Update on Wind Power Generation

In our 2005 annual GPAC report to the GVEA BOD, we recommended that GVEA bring developers up to look at the Eva Creek site in order to assess commercial feasibility and produce a timeframe for wind energy production. We also recommended that GVEA continue to monitor the possibilities of developing Fire Island as a wind generation site, because multiple generation sites have the advantage of stabilizing the total resource through geographical diversity.

Since wind resources are transient, we also recommended GVEA look at the influence of this fluctuating resource on system stability as well as storage issues. The European Wind Energy Association has reported that wind energy can meet up to 20% of electricity demand on a large electricity network without posing any serious technical or practical problems. In the western Energinet (Denmark), wind energy covers some 25% of electricity demand in a normal wind year and it is not a technical problem to handle more. GVEA should also consider technologies that may become commercially available in the future, such as the use of flow batteries (as costs decline and reliability increases) to store excess wind energy. Such devices convert chemical energy into electrical energy with the electrolyte stored in a separate tank until needed. The process can be reversed to regenerate the electrolyte.

Because of ongoing uncertainties concerning Fire Island, our group has focused most of our recent discussions on Eva Creek, including reviewing critical issues such as logistics, avian and archeological considerations, and land rights. The two years of data collected for this site indicates a capacity factor of approximately 32% net, which is similar to the Fire Island Project. At this point, it appears Eva Creek may be the more economically viable of the two projects, especially when considering the expenses for the barge dock and undersea cable required for the Fire Island project. However, GVEA will need to work with developers to address cold climate specific issues, including: 1) icing, 2) snow getting inside nacelle, 3) lubricant viscosity, and 4) thermal stress.

We also support GVEA's efforts to look for additional sites in 2007. When met towers are no longer needed at Eva Creek, they can move on to these locations. It is important not to "put all our eggs in one basket". This is important both because Eva Creek may prove not viable for reasons other than simply the adequacy of the wind resource, and because geographical diversity can provide a more stable resource. As working through the above issues can be very time consuming, we encourage GVEA to continue these efforts so that site development could be quite rapid once the financial and business considerations for a potential project fall into line. A thorough analysis of risk and cost factors, and amassing data to permit rapid development of future projects, is important for the energy security of this community as well as to provide a buffer against price fluctuations of fossil fuels.

With these considerations in mind and in the interest of meeting the Renewable Energy Pledge both in the near and far-term, the GPAC supports the practice of new wind projects being installed in several phases with the first generation to be brought online in 2009. Moreover, the damage costs associated with greenhouse gas emissions linked to the use of fossil fuels in electric power plants, could be of the order of the price of electricity. With the likelihood of future prices incorporating these costs, GVEA could minimize these "indirect" costs by expanding its renewable portfolio sooner rather than later.

RECOMMENDATIONS:

- Consider developing a plan to install wind capacity in multiple phases over a number of years. This will allow some technical and logistical issues to be resolved on a smaller scale, and the milestones laid out in the Green Power Pledge to be met.
- Continue to look for additional sites to diversify the current and future potential wind portfolio.
- Address cold climate specific issues with developers.

Section 4. Enhanced Energy Efficiency and Conservation

The Renewable Energy Pledge

The Green Power Advisory Committee is very concerned that GVEA is not on track to meet the GVEA BOD's Renewable Energy Pledge of 10% by 2007 and 20% by 2014. Available data suggests that GVEA will fall short of the 2007 goal by about 3% and will fall short of the 2014 goal by about 7%. We believe that the fastest and least costly means to make up this shortfall is to immediately implement a major energy conservation effort to deliver enough "Negawatts" to reduce energy use system-wide in the GVEA distribution area by 3%. We recommend that the Energy$ense programs be greatly expanded to meet targeted energy reductions. All homes, commercial buildings, and public buildings, such as the Borough Administrative Center, fire stations, schools, the Carlson Center and the University of Alaska, should receive energy audits to provide direction for community wide, cost effective energy savings. Last year wind energy was the leading candidate for meeting GVEA's Renewable Energy Pledge in 2007. We believe that a greatly expanded Energy$ense program will help to meet our renewable energy goals in the near future. This year energy conservation is the recommended means for GVEA to meet its renewable energy goals in 2007. The BOD is encouraged to look further into the future and establish long range goals to reduce carbon emissions by 30% by 2020 and 50% by 2030.

Contributions through 2006 of the Energy$ense Programs the Renewable Energy Pledge

- Over $2.043 million spent on direct demand side management since 1992.
- Over 5,086 members served (1992 – 2006).
- An estimated 1.1 Mw of demand reduction through 2006.
- An estimated 4,210,000 kWhs of energy saved through 2006, saving over $437,000 to GVEA members[1].

  (Note: "Cumulative Kw Reduction" and "Cumulative kwh Savings" are determined by lifetime of products installed. The lifetime of products installed is set at five years. Thus, the significant use of Energy$ense programs has resulted in a noticeable increase in "reduction" and "savings" reversing a previous trend.)
- In all Energy$ense programs (Home$ense, Builder$ense and Business$ense), the formulated program cost to reduce electric load at the end of 2006 is $926 per kW; the formulated program cost per kilowatt-hour is $0.051 per kWh.
- Spending and participation levels in all combined Energy*$ense* programs (Home*$ense*, Builder*$ense* and Business*$ense*) exceeded planned expectations by the end of 2006 for the third straight year in a row.
- The Sustainable Natural Alternative Power program (SNAP) had enrolled 358 supporting contributors funding a production account for $23,088 per year at the close of 2006. There were seven SNAP producers connected and producing electricity. Several producer applications are pending.

[1] At current energy charge of $.10387 per kWh

The Current Contribution in 2007 to the Renewable Energy Pledge of the Energy$ense, Home$ense and Builder$ense Programs

Since 1992 and to the end of December 2006, GVEA has spent over $2 million on direct electrical energy efficient measures and related demand side management service contracts supporting the **Energy*$ense* programs**. Over 5,000 residential and general service customers within GVEA's service region have accessed and participated in one or more of the Energy*$ense* programs.

The **Home*$ense*** program is GVEA's electrical energy efficiency audit, which services residential account customers. The primary goal of the Home*$ense* program is to offer a broad-based and effective client education program focusing on electrical energy efficiency, understanding electric use patterns and demand side management. Home*$ense* continues to attract interest primarily through word-of-mouth, but also through higher energy costs. The program has an excellent reputation and GVEA continues to receive many favorable comments about the service. Participation outreach is through GVEA's web site, print media, broadcast advertising and public presentations. Educating members and recommending best practices about electrical use, practices, and energy efficiency are the most effective features of the Home*$ense* program. Besides the electrical energy efficiency devices installed in each in-home visit, additional educational material includes in-house publications, "*Understanding Your Electric Usage*" and *"Why is the electric bill So High?"* and the U.S. Department of Energy-published booklet, "*Energy Savers: Tips on Saving Energy and Money at Home*."

The Home*$ense* program participation lost momentum by the end of 2006 and ended 37 percent lower than 2005 (which boasted the highest participation level since 1997 – 51 percent higher than 2004). A new "name awareness" media campaigned is currently in the planning stage to address and increase the Home*$ense* program visibility within the service areas.

The **Builder*$ense*** program rebates residential customers who install eligible energy efficiency electrical measures into their homes during new construction, major housing rehabilitation, renovation or addition projects. Builder*$ense* targets homeowners, builders, realtors and electrical supply vendors through GVEA's web site, print media, broadcast advertising and public presentations. The program rebate is a credit to the account, with a few exceptions. Local builders promote Builder*$ense* as it is valued by homeowners as reducing home operating costs.

Participation in the Builder*$ense* program reached an all time high for the second year in a row.

The **Business*$ense*** program is GVEA's lighting retrofit rebate program. It is offered to most eligible general service accounts. Business*$ense* participation continues to grow and meet or exceed expectations each year. At any time there are usually several Business*$ense* proposals in the planning and process stages. Business*$ense* marketing focuses on businesses and organizations primarily through public presentations, word of mouth and through partnering with licensed electrical contractors.

Business*$ense* program participation was double what was anticipated. The estimated kilowatt load reduction from projects completed and the rebates issued to participating businesses in 2006 surpassed the expectations for projects this year.

Future Considerations

Participation in the **Home$ense** program is expected to grow as the price of all fuels continues to rise. The partnership between GVEA and its Home$ense auditing contractor, CNC Power Plus, continues the delivery of the Home$ense program. As in other areas, print and broadcast advertising and specially priced direct marketing will likely continue to increase the awareness of and participation in the Home$ense program within GVEA's service area. Interior Weatherization, the local low-income weatherization provider, continues to deliver the Home$ense program to its eligible clients at no cost to the recipients.

Selectively targeting the potentially high use residential groups – such as those with electric heat, electric water heaters, large families, newly arrived residents, etc. – and identifying high-need areas – such as mobile home parks – will continue the effectiveness of our marketing objectives. In general, the Home$ense program continues to ensure that GVEA's policy of energy conservation reaches the greatest number of people who are most affected by high use. Future considerations include offering client education about operation and maintenance of high use residential appliances, and understanding voltage fluctuations and the use and limits of surge protectors. Basic safety information will be continued to be provided as well.

Familiarity with the **Builder$ense** program continues to increase among builders in residential construction throughout the service area, and participation continues to rise according to current housing market conditions and residential construction activity. Awareness about the program will proceed as conventional outreach methods (i.e., radio, newspapers, public presentations, etc.) are supplemented with the direct contact of builders, realtors, homebuyers, and building supply vendors. An emphasis on notifying contractors, realtors, and homebuyers in the outlying regions of the service area to participate in the program will continue.

It is expected that more businesses will continue to take advantage of the **Business$ense** program. Participation in this program is affected somewhat through advertising, but the significant contributing factor in participation results from word of mouth, especially the direct encouragement of electrical contractors who are knowledgeable about the program and who promote the benefits of participation in the Business$ense program to their clients. Again, an emphasis on notifying more businesses in the outlying regions of the service area to participate in the program will continue. Information flyers about the Business$ense program will continue to be inserted in targeted newsletters, such as the Greater Fairbanks Chamber of Commerce's.

Presently, GVEA is working on developing a future utility partnership with the joint U.S. Department of Energy and Environmental Protection Agency program, ENERGY STAR. The ENERGY STAR-utility partnership program is primarily a marketing and education program to promote energy efficiency in the commercial and residential markets, including setting energy performance targets, promoting accomplishments, and promoting ENERGY STAR brand awareness. This work is currently in the development phase.

Section 5. Small Scale Renewable Energy (SNAP Program)

2006 has been a year of growth for the SNAP program. There are now seven SNAP producers (five more pending) and more than 360 purchasers. Over $23,000 has been contributed to the program as of this writing. Although it can be said that SNAP is a success, more can and should be done to ensure the long term viability of the program.

RECOMMENDATIONS:

- Extend the termination date to 2045 for the SNAP program. Power Purchase and Interconnection Agreement, Section 17 uses the following language regarding the length of the program:

  "…and continue in full force and effect until terminated by either Party pursuant to other provisions of this Agreement or December 31, 2015, whichever is earlier."

  Having an end date in 2015 discourages members from becoming producers. Changing the year to 2045 would cost nothing and would show members that GVEA thinks of SNAP as a long term program worth supporting.

- Encourage businesses to participate. Consumers want to trade with "green" businesses. There are acres of roofs and south-facing facades in Fairbanks, and many sites with good wind resources in GVEA's service area.

  GVEA could publish a flyer to educate business members regarding tax credits for businesses – 30% federal tax credits for solar electric systems and 10% tax credit for small scale wind power studies (http://www.dsire.org) showing the marketing value businesses gain from installing RE on their buildings (http://www.usgbc.org and others). The flyer could provide information on Timberland and other companies that are using renewable energy to lower their operating costs while advertising the fact that they are good corporate citizens

  To encourage businesses to become purchasers, GVEA could publish their names in the Ruralite. Decals or other signage could be made available for businesses to display in store windows, as well as SNAP graphics for the company website.

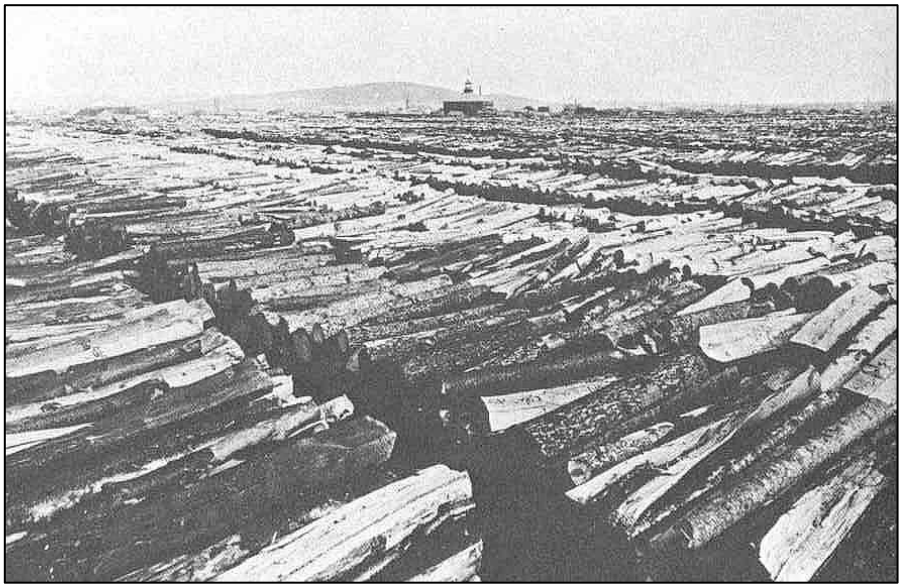
- Simplify the application paperwork and process for SNAP producers. When members contact GVEA for information on being a producer they receive 26 pages of documents requiring hours of review and several signatures. This paperwork needs to be edited specifically for unnecessary requirements and redundant language. The current documentation could be made clearer and more concise without sacrificing safety or liability issues.

- Eliminate wording that discourages battery use in SNAP connected systems. Some members have battery based renewable energy systems with UL 1741 approved grid tie inverters from the days before GVEA served their area. Other members want to purchase a SNAP system but want it to serve as a battery back-up during power outages. Battery based SNAP systems are being installed, but the advertising indicates against this.

- Improve the SNAP section of the GVEA website. Make SNAP information more visible and easily accessible to the membership. Publish the power generated by each SNAP system on the GVEA website. This could be updated monthly or whenever the SNAP meter is read. SNAP producers' names or addresses shouldn't be published, but perhaps the size of the system and some particulars could be mentioned. A map of GVEA's covered area with "clickable" icons would work. A click would give information on the system size, type of equipment, etc. Add a link to <u>become a purchaser or become a producer</u> on GVEA's SNAP homepage. Finally add a SNAP logo in the form of a clickable link on the GVEA homepage.

Section 6. Biomass Project from Waste Paper and Cardboard, and GVEA Support of Medium-Sized Renewable Energy Projects

Biomass was not considered as an option for utility-scale power generation in the original GPAC report (2004), or in last year's annual report. This is ironic given Fairbanks' roots in wood fueled power generation, where wood was burned as a primary fuel source until 1927 (prior to the formation of GVEA).



Northern Commercial Woodpile, circa 1927

After the successful installation of the Chena Hot Springs Geothermal Power Plant, the manufacturer, United Technologies Corporation (UTC), turned their attention toward increasing the cycle efficiency of their modular power plant for biomass power generation applications. They have committed $500,000 to installing a pilot project in the Fairbanks area, in partnership with Chena Power[2]. The power plant is designed for use in rural communities with the goal of potentially providing inexpensive base load power to a vast number of rural Alaskan villages located in diverse regions of the state. The demonstration power plant would be installed at the Fairbanks North Star Borough landfill. The landfill option is attractive due to availability of feedstock and its compatibility with Borough recycling efforts. Since the Eielson Air Force Base waste paper cubing facility burned down in early 2007, no paper has been recycled in Interior Alaska. This is compared to the national average of 45% of paper and cardboard diverted from landfills for recycling purposes.

The main goal for redesign of the UTC geothermal power plant system for biomass is to increase the efficiency of the unit to 20%. This will be accomplished by using an organic working fluid, such as a ketone, for a topping cycle coupled with their standard PureCycle 245fa ORC as a bottoming cycle. Heat to run the power cycle will be generated with a Wellons thermal oil heater system, using paper, cardboard and brush to supply 5000 tons of

[2] Chena Power is the utility formed to install and operate the Chena Hot Springs Geothermal Power Plant.

biomass per year as feedstock. The system will be designed and tested as a stand-alone system for village applications, but will feed power (estimated at 300 kW net) onto the GVEA grid. This power qualifies as green power because only wood and wood-based products will be burned. Construction is expected to begin in May 2007, and the plant should be online by October 2007. If this installation is successful and a sufficient fuel stream is available, an additional 1 MW in generation could be added in late 2009.

Green Power Pricing for Medium Sized Renewable Projects

One strategy for meeting the Renewable Energy Pledge over the next few years is to develop a mechanism with which to support mid-size renewable energy projects, such as the proposed biomass plant at the Borough landfill. These projects are greater than 25 kW, but smaller than 1.5 MW, and would be installed by an entity independent of GVEA. At this time, such a project would be offered a power sales agreement offsetting GVEA's avoided fuel cost (per PURPA) and currently paid to all independent power producers including SNAP producers. If GVEA does not offer an additional premium for this type of green power generation, these mid-size projects will look to alternative green power funding streams to recoup their investment. The most obvious route is to sell the renewable energy credits (RECs), or green tags, from the project. These green tags represent the environmental benefits of green power and can be sold separately from the electric power sales, provided that power is not initially sold at a premium as green power. If this occurs, GVEA could not count the generation from that project toward their renewable energy pledge. Instead, the purchaser of those green tags, whether they live in Fairbanks or Bangladesh, could claim those benefits. This is how most large companies that buy green power do it – through the purchase of green tags, not by actually generating the power themselves.

Since the goal stated by GVEA is to increase renewable energy as part of its overall generation portfolio, this would be counterproductive. There are a number of measures that could be taken to avoid this. The most obvious would be to negotiate a premium price for power with the owners of the project, with the understanding that the power is green, and as such, the purchase price includes the social and environmental values associated with that green power. No green tags could later be sold from the project. Typically, green tags are purchased for $20 per MWh (one tag). The producer will see anywhere from $3 to $20 of this amount. This represents a value on a kW basis of 0.3¢ to 2¢ per kWh produced. Therefore, GVEA should match that amount as a premium for green power purchases. In the future, with more widespread implementation of real time pricing, there should be additional financial incentives provided to those producers who can help meet demand during times of peak loads (wintertime). Presumably, this would include biomass projects.

Under the co-op structure, it may be necessary to pursue this through the RCA, or through a resolution asking the membership to pay a small premium for green power, such as .01¢ per kWh. (This amounts to 7 cents per $100 of their electric bill.) This would generate a small sum which could fund premium power purchases from independent renewable energy power producers and possibly to fund some of GVEA's renewable development projects as well.

RECOMMENDATION:

- The GPAC recommends that the GVEA BOD request permission from RCA and/or put a resolution to a vote of the general membership asking the members if they are willing to pay a premium of .01¢ per kWh to support local renewable energy production. This premium would be paid through power purchase agreements with producers of renewable energy and would also fund future projects.

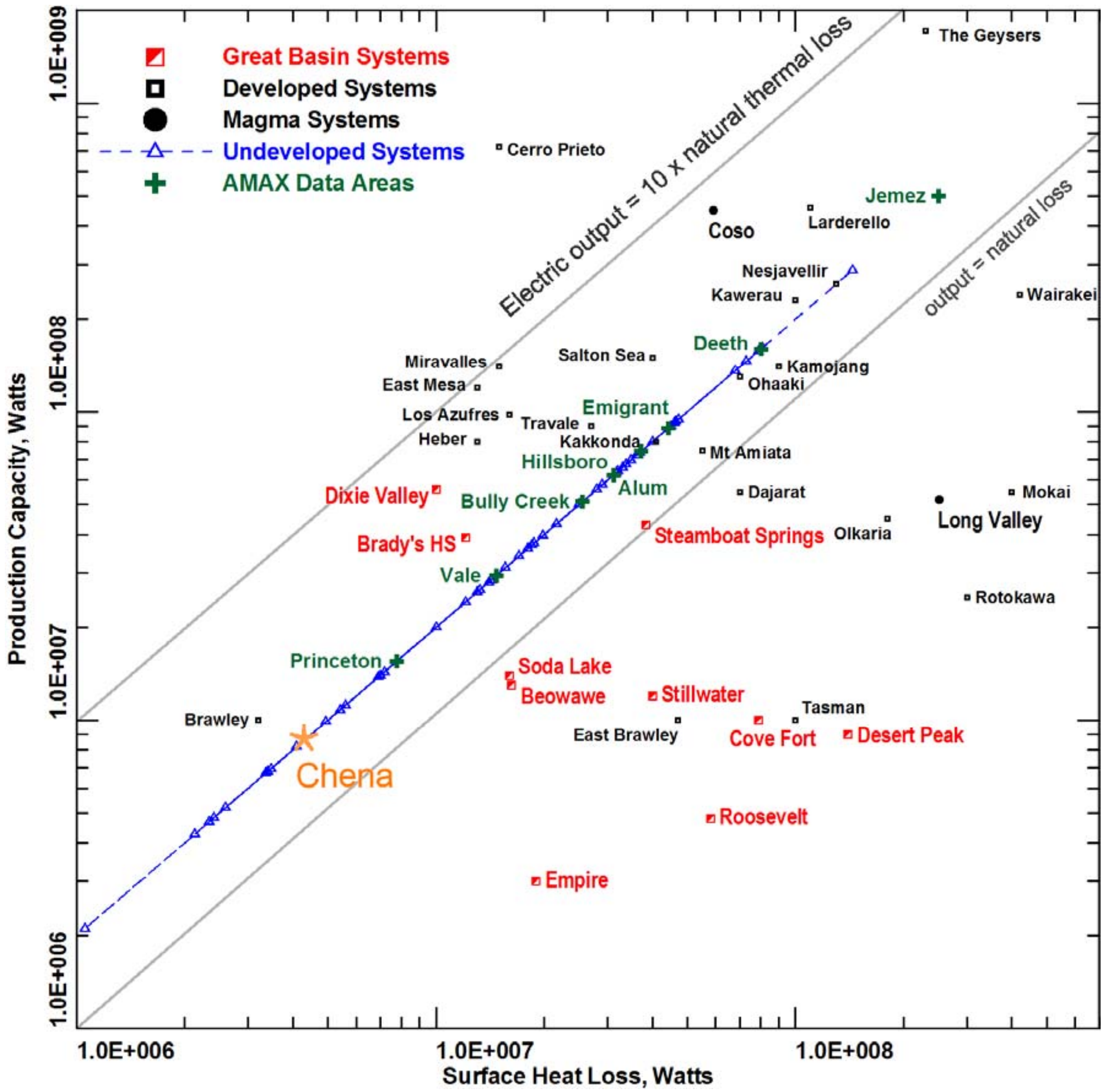
Section 7. Chena Hot Springs Geothermal Power Generation and Renewable Energy Fair

Between July and December 2007, Chena Hot Springs commissioned two 200 kW geothermal power plant modules manufactured by United Technologies Corporation (UTC). These power plant modules generate power from 165ºF water from the shallow geothermal system at Chena. This is by far the lowest temperature resource ever tapped for power generation in the world. The project has generated world-wide interest and was recently awarded Project of the Year in the Renewables category by Power Engineering Magazine. Additionally, Chena Hot Springs was the first Alaskan company to receive a Green Power Leadership Award from EPA and DOE.

Chena Hot Springs Geothermal Power Plant Modules, installed July and December, 2006

All the water used for power generation is re-injected back into the geothermal reservoir after being further cooled for space heating applications. The power plant modules are both air and water cooled to take maximum advantage of the cold ambient temperatures in winter and the cold local ground water in summer.

Chena Hot Springs recently completed Phase I of their DOE-funded GRED III project. The results were published in January 2007 (Holdmann et al.) and predict 5 MW of sustainable generation at Chena based on experience at other geothermal sites (see Figure below). In 2007, a deep hole of 2550 to 4000 ft is planned as Phase II of the project to tap the deep geothermal reservoir and verify maximum power generation capacity. Preliminary estimates indicate a minimum of 10 MW of generation would be needed to offset the cost for building a transmission line. Results from the drilling program will be available in late 2007. This is contingent upon funding being restored to the U.S. DOE Geothermal Technologies Program. The program was unfunded in the House budget, and only partially funded by the Senate budget. Chena Hot Springs is working with Alaska's Congressional delegates to restore funding for the geothermal program, which



Predicted Production Capacity at Chena Hot Springs based on surface heat flow estimates

would go toward the second Phase of the Chena GRED III project, as well as other potential geothermal exploration and development in the state.

Chena Hot Springs also hosted the first Renewable Energy Fair in Interior Alaska. 1400 people and 40 vendors participated in the event. GVEA participated with a booth and donated $250 to sponsor the event. Several GPAC members also participated.

RECOMMENDATION:

- GPAC recommends that GVEA continue to sponsor the Chena Hot Springs Renewable Energy Fair in 2007. This event is an excellent outreach opportunity to educate local residents, most of whom are also members of GVEA, about renewable energy technology.

Section 8. Alaska Renewable Energy Grant and Loan Fund Legislation

The GPAC would like to applaud GVEA's continued leadership and support for renewable energy development in Alaska by passing Resolution 102-07 at the January 29th meeting supporting the concept of a renewable energy fund for Alaska.

Fourteen states currently have some form of renewable energy fund to promote the development of renewable energy technologies, and these funds have obligated a total of $400 million to support 234 projects 2249 MW of generation.[3] Twenty-two states have also adopted a renewable portfolio standard (RPS). Because many utilities in Alaska are actively pursuing voluntary increases in renewable energy generation, and because of Alaska's relatively small, isolated transmission grid even along the railbelt, the general consensus has been not to support the creation of an RPS in Alaska.

RECOMMENDATION:

- GPAC recommends that the Board continue to support the renewable energy fund for Alaska.

[3] From the Clean Energy States Alliance 'Case Study of State Support for Renewable Energy – The Impact of State Clean Energy Fund Support for Utility-Scale Renewable Energy Projects' published May, 2006

Section 9. Fossil Energy Forecasting for Fairbanks Electric Power Generation

Alaska, as an oil producing province, has a depletion curve just as do all other oil provinces in the historical record. Oil and gas depletion in the Cook Inlet Basin is well-advanced, with negligible oil production today and a gas production shortfall which is limiting industrial use of natural gas as feedstock for fertilizer production this year; there is a predicted shortage of natural gas there for heating and electric power generation as soon as the year 2011.

Meanwhile, the trans-Alaska pipeline is operating at about 30% of its design capacity, and the oil flow is declining each year due to the depletion of the two major oilfields at Prudhoe Bay, despite the positive increments of the new small fields on the North Slope being brought on-stream each year. Reduction of pipeline operational costs can only be taken to a limiting value, after which the world oil price at that unknown future time will determine the time frame for the shutdown of the trans-Alaska pipeline.

Alaska North Slope natural gas remains as a huge undeveloped resource and represents the next phase of petroleum resource development for Alaska. However, this gas needs to be delivered to Alaskan consumers including those in Fairbanks and Anchorage, as well as be exported from Alaska. Construction of a new pipeline takes several years and so the initiation and implementation of a gas delivery strategy must take place as soon as possible.

Global General Considerations

The global price of oil and gas has increased from the $20/bbl range to the $70/bbl range in just three years. The 2006 increase is widely and correctly attributed to the demand from China, where population demographics and consumer economics have combined to produce a young adult generation with enough income to afford an automobile and the fuel for it. Population demographics in China and India, the major components of the former third world, have been known for a decade, and the growth rate of 2% per year assumed in the past by petroleum forecasters has been shown to be conservative, as the actual growth rate was 2.13% per year (1973-2004).

With the rise in oil prices into an unpredicted range, economic forecasters at consumer-oriented agencies such as OECD, IEA, and EIA, as well as conservative forecasters at OPEC, have chosen to use demand growth rates in the range of 1.5% to 1.8% in their recent publications without any serious justification. A rate of 2% per year growth in demand seems still to be justified however, in the absence of major global catastrophe.

There are fundamental forces at work which drive demand for petroleum. These include electricity demand increase due to population growth, industrial and economic growth, and consumer product acquisitions. More young consumers can afford automobiles. In some countries, more older consumers are also reaching the stage of being able to finally afford an automobile.

Coal-fired production of electricity is not growing in proportion to demand increases; hydroelectric power is growing only slowly in a few lesser-developed countries (e.g.

China); and the recent attempted rush to nuclear-generated electricity in many countries is being delayed by the environmental approval processes and the typical 5-7 year construction time for a nuclear electric generating plant. Wind power is becoming popular and is growing rapidly, but cannot totally fill the void in electric demand, nor in the transportation needs, although worthwhile attempts in that direction are being made.

Several major inflection points in the supply side will impact Alaskan petroleum, as well as world petroleum. First, the expansion of the Saudi Arabian and other OPEC production will reach a maximum at some point in the future, perhaps in 2012-2014. Oil production will reach an all-time maximum from conventional sources at that time. Second, the rapid growth of natural gas liquefaction and exports to the world will help to offset demand growth, but production of liquid transport fuels from natural gas seems stalled by artificially-high conversion facility prices imposed by equipment and system fabricators who wish to participate in the "oil/gas economic boom". Third, there is a limit on the rate of expansion of tar-sand oil production set by the availability of natural gas to heat the tar sands for extraction, or for deposits close to the surface to produce a synthetic crude for pipeline delivery. From the Alaskan perspective alone, there are two other important factors, namely, the date of shutdown of the trans-Alaska pipeline and the date of delivery of North Slope natural gas to market; these are interlinked through the production of gas liquids from gas reservoirs, which may be blended into the oil pipeline flow.

Mindful of these factors, let us also recall that a 7% depletion in oil deposits each year, and a 2% growth in demand each year, mandates that the oil supply be increasing from new fields, new pipelines, and new offshore installations at an average global rate of 9% each year. At a production of 81.3 million bbl/d, a contemporary value, this means that 7.3 million bbl/d of new oil must be brought into the world production stream each year in the short term, and more in the longer horizon. Typically, a new oil field brings 0.5 to 1.0 million bbl/d on-stream, as does a new pipeline. It is difficult to find as many as 7 to 14 examples of such new oil production facilities being connected to the world markets each year. According to OPEC (December 2006) the year-on-year growth of OPEC production was 2.0 million bbl/d last year, while the non-OPEC year-on-year growth for 2007 is predicted at 1.8 million bbl/d. Thus, there is a shortfall in the order of 3.5 million bbl/d in growth that must be accommodated by major natural gas production to fill electrical and industrial needs which are now filled by oil. Since about half of the world oil production is used for transport fuels, the growth in demand for those fuels alone will tend to absorb the oil production growth in the world over the next several years.

It is of interest to examine the inflection points in future oil supply growth. Among OPEC, only Saudi Arabia, Kuwait, UAE, and Algeria were able to increase production in the interval 2004-2006. The most significant was Saudi Arabia, increasing from 8.9 to 9.4 million bbl/d over that period, or 5.6%. The production growth in Saudi Arabia is barely matched by the combined increments of the other OPEC producers mentioned. Saudi Arabia has asserted that they can reach 12.5 million bbl/d production, increasing at about 0.5 million bbl/d each year. Thus, by the year 2012, this production capacity will be reached. Longer-term production increases may be possible from yet-to-be-discovered fields in the Empty Quarter, but the time frame for these developments is uncertain. An ultimate Saudi Arabian production rate of 15 million bbl/d seems to be the maximum predicted.

Oil production in USA, Russia, Norway, UK, Mexico, and other major non-OPEC producing countries seems to be steady or slightly on the decline. Offshore production in Africa is increasing somewhat. The prospect of world oil demand increasing at 2% implies that about 91.5 million bbl/d will be needed in 2012, and 107.3 million bbl/d will be needed in 2020. However, the increase in supply by 2012 will bring production to about 88 million bbl/d, and increase in supply by 2020 will bring production to about 94 million bbl/d. The production shortfalls will be accompanied by higher oil prices and by increased reliance upon natural gas as piped product, LNG, and synthetic oil, and by unconventional oil production such as from tar-sands. (Typically however, tar-sands production growth increments have been in the range of 0.1 million bbl/d for each year, for the entire industry.)

Political uncertainty prevents oil industry expansion in many countries, such as Venezuela, Nigeria, Russia, Iran, and Iraq. Similar political risks cause irregular supply interruptions in several locations around the world, leading to a "risk premium" added onto the price of crude oil, which increases oil price fluctuations during the year. Specific risks are difficult to predict, but the existence of a random sequence of risk events is almost inevitable, which will have a tendency to raise the crude oil price beyond values associated with supply and demand.

Alaskan Factors

The trans-Alaska oil pipeline operational costs will not decrease in the future, but rather, are likely to increase as technical problems associated with aging become more evident. Eventually, the pipeline operational costs will rise so that the wellhead price available at the North Slope for the two largest reservoirs will be too low to make oil extraction profitable for one of the major operators. Prior to that point, the major operator will sell its holdings to a smaller company which has lower overhead costs and thus the possibility of operating the oilfield profitably in its final years. It is likely that this will happen before the year 2016.

Production of North Slope natural gas could take several possible avenues. The one most discussed is through the completion of a natural gas pipeline. Another is by converting North Slope natural gas to LNG and delivering it by road to Alaskan customers, while also deploying a (possibly barge-mounted) synthetic petroleum liquids manufacturing plant at Prudhoe Bay and delivering its products in the trans-Alaska oil pipeline in slugged segments. Only a full-sized gas pipeline can provide export gas from Alaska to national or international markets, earning appreciable revenue for the State. On the other hand, synthetic petroleum liquids could be delivered to Alaskan destinations on the trans-Alaska oil pipeline for many decades, meeting Alaskan needs for liquid fuels and possibly allowing for some export from Alaska as well. These possibilities await detailed economic analyses.

It is clear that the world oil price will be increasing over the next two decades, even with increases in alternative fuels, natural gas, synthetic liquid fuels, tar-sand oil, wind power, nuclear reactor construction, geothermal power, and any other energy supply alternatives.

RECOMMENDATIONS:

- The present economic advantages of conversion of electric generation to non-oil-driven strategies, such as wind power and natural gas, should be even more obvious in the future.

- It is in the interest of the people of Alaska to make sure that the North Slope natural gas, in some form, is delivered to consumers in Alaska and elsewhere as soon as possible. Long term stable pricing would be beneficial for Alaskan consumers. The construction of an Alaska natural gas pipeline as soon as possible should be a priority.

- A strategy should be devised for the extension of the economic life of the trans-Alaskan pipeline for as long as possible before its final shutdown in order to: enable the maximum extraction of the last fractions of oil in the Prudhoe Bay and Kuparuk reservoirs; maximize the oil extracted from the other North Slope reservoirs; and deliver the gas liquids from the known gas fields. Research into exploitation of unconventional resources like gas hydrates should continue to be pursued.