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RE: Small nuclear power generation reactors for Alaska cities.

Governor Palin,

AT PRESENT

I have studied the potential for Chugach Electric to use nuclear reactors to generate stream for their generators. The results were favorable, but involve a long timeline. Their board has the matter under consideration.

The town of Galena has been seeking licensing for a 10 MWe nuclear power reactor [4-S] to generate electricity and provide heat for their city for some time. The 4-S planned for Galena has a 30-year supply of fuel sealed in a volume about the size of 4.5 barrels of oil. It replaces over 500,000 barrels of oil. A 10 MWe reactor produces less than 1% of the power of the large 1,000 plus MWe reactors that are the new generation planned for the S.48. As such they are much smaller and require a great deal less attention.

IN THE FUTURE

I have started a very preliminary study to see what other Alaska cities might benefit from small reactors. The benefit to remote Alaskan communities is the fantastically smaller volume of fuel required.

I first considered cities that were off the railbelt power grid and were Galena's population or larger. I added a few smaller cities that were generating hubs for the their areas. I collected some 2001 Net Capacity figures from that year's ISER report[i] and noted the type of fuel used. This provided a potential list of 41 cities to be considered for small reactors.[ii]

Given the tremendous reduction in the fuel volumes needed, transportation costs and seasonal problems become very minor. It is easy to see that very substantial economies are possible, provided the remote site is able to use the amount of power generated. The current power reactor designs proposed for licensing are still a bit too large for most remote Alaska villages, but a number of regional centers could really benefit. The benefit is likely to be so substantial that in-migration from the surrounding countryside would undoubtedly increase.

In the table below I have selected those cities that appear to be possible initial candidates for a small reactor. Kodiak and Yakutat were added because their fuel oil consumption was quite high. Of course local interest must be the major driving force, but it appears these 13 locations might benefit.

Region	City of	Population[iii]	(MWe) Net Capacity[iv]	Type[v]
Aleutians	Unalaska	4,388	29.5	IC
Bering St	Unalakleet	741	4.1	IC
Bristol Bay	Dillingham	2,373	17.5	IC
	Naknek		20.1	IC
Interior	Tok		11.6	IC
Kodiak	Kodiak	6,138	41.6	IC, 91.9 HY
Kuskokwim	Bethel	5,899	41.2	IC
M Yukon	Galena	763	9.4	IC
NW Arctic	Kotzebue	3,076	20.9	IC
S Central	Copper Valley		16.6	IC, 50.8HY, 22.5GT
	Cordova	2,372	20.8	IC, 2.9 HY
Southeast	Yakutat	691		IC
Seward P	Nome	3,448	27.8	IC

THE ROLE OF STATE GOVERNMENT

The Alaska state government can play a big role in helping to start the implementation of this major improvement in access to electricity for non-railbelt cities specifically in the areas of licensing and security.

LICENSING

Nuclear power is generated in an intense regulatory environment in facilities that are capital intensive but use very low cost fuel. The Federal Nuclear Regulatory Commission is used to working with facilities that are 100 times larger than the 4-S proposed for Galena. Their extremely detailed control does not destroy a large reactor's cost effective generation of electricity. But it could be a "showstopper" for small reactors.

The NRC licenses a reactor design and also licenses each site through a COL (COmbined License) that guides the actual construction and operation. The detail in the COL needs to be lowered to a level that makes sense and makes these small reactors cost effective. The state could well take over this aspect.

If the state and our congressional delegation work together with the NRC to devise regulation, safety, and security standards appropriate to these small reactors they will provide a major step toward powering bush Alaska. At the very least, the state's assistance in obtaining the necessary licenses would place this expertise in one group rather than duplicating it across the state.

CURRENT POTENTIAL LICENSEES

At present it appears that 3 designs will be proposed to the Nuclear Regulatory Commission for the appropriate design license. Each produces steam for a generator. They are:

Toshiba/Westinghouse 4-S, 10 or 50 MWe.[vi]

30 year without refueling for 10MWe unit,
Sodium moderated and cooled,
No accessible parts. Unit replaced after 30 years,
Installed underground,
Has started the regulator approval process and will probably be the first to be licensed,
Size appropriate to some Alaska bush cities.

NuScale Power, a scalable 40 MWe unit.[vii]
Light water moderated and cooled,
Transportable by truck, barge or rail. 300 tons,
24 month, on-site refueling cycle.

Hyperion Power Module, 25 MWe unit.[viii]
Seven to 10 years without refueling,
Installed underground.

SECURITY ISSUES

The large amount of fuel and above-ground design of 1,000 MWe reactors [inappropriate for Alaska] generates fears of terrorist attack and nuclear proliferation. This leads to significant security expenditures.

The state could be of great service in getting these security expenditures reduced to a practical level for the small reactors, particularly since these reactors are designed to be installed well underground.

I believe providing technical and regulatory assistance to these rural communities in the acquisition of new power sources is the most important long-term benefit the state government can provide for bush Alaska.

I can be contacted via email don.anderson@softwarenorth.com or at the phone numbers provided below, and will be glad to provide your staff via regular email the Excel workbook on which this letter is based and additional information on nuclear power and waste disposal.

Best wishes,
Don

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[i] ISER 2001 report of Alaska Electrical Generation, www.iser.uaa.alaska.edu/Publications/akelectricpowerfinal.pdf
[ii] A Excel workbook containing the list of Alaska cities with associated populations, electrical capacity, fuel usage and type is available on request from: don.anderson@softwarenorth.com
[iii] 2005 Municipal Officials Directory.
[iv] ISER 2001 report of Alaska Electrical Generation
[v] IC = Internal Combustion (fuel oil), HY = Hydroelectric, and GT = Gas Turbine.
[vi] A description of the proposed Galena installation is at http://www.alaskajournal.com/stories/122604/loc_20041226003.shtml
[vii] http://www.nuscalepower.com/
[viii] http://www.hyperionpowergeneration.com/

Summary Statistics for the United States 2007

Net Electrical Generation

Energy Information Administration

http://www.eia.doe.gov/cneaf/electricity/epa/epates.html

Report Released: January 21, 2009

Table ES1. Summary Statistics for the United States [2007 extract]

	Fuel	Thousand megawatthours	Percent
1	Coal[1]	2,016,456	48.51%
2	Natural Gas	896,590	21.57%
3	Nuclear	806,425	19.40%
4	Hydroelectric Conventional[4]	247,510	5.95%
5	Other Renewables[5]	105,238	2.53%
6	Petroleum[2]	65,739	1.58%
7	Other Gases[3]	13,453	0.32%
8	Other[9]	12,231	0.29%
9	Pumped Storage[8]	-6,896	-0.17%
	All Sources	4,156,746	100.00%
Other Renewables			
1	Wood and Wood Derived Fuels[6]	39,014	0.94%
2	Wind	34,450	0.83%
3	Other Biomass[7]	16,525	0.40%
4	Geothermal	14,637	0.35%
5	Solar Thermal and Photovoltaic	612	0.01%

[1] Includes anthracite, bituminous, subbituminous, lignite coal, waste and synthetic coal.

[2] Distillate fuel oil (all diesel and No. 1, No. 2, and No. 4 fuel oils), residual fuel oil (No. 5 and No. 6 fuel oils and bunker C fuel oil), jet fuel, kerosene, petroleum coke (converted to liquid petroleum, see Technical Notes for conversion methodology) and waste oil.

[3] Blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels.

[4] Conventional hydroelectric power excluding pumped storage facilities.

[5] Other renewables represents the summation of the sub-categories of Wind, Solar Thermal and Photovoltaic, Wood and Wood Derived Fuels, Geothermal, and Other Biomass.

[6] Wood/wood waste solids (including paper pellets, railroad ties, utility poles, wood chips, bark, and wood waste solids), wood waste liquids (red liquor, sludge wood, spent sulfite liquor, and other wood-based

[7] Biogenic municipal solid waste, landfill gas, sludge waste, agricultural byproducts, other biomass solids, other biomass liquids, and other biomass gases (including digester gases, methane, and other biomass

[8] The generation from a hydroelectric pumped storage facility is the net value of production minus the energy used for pumping.

[9] Non-biogenic municipal solid waste, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, tire-derived fuels and miscellaneous technologies.