

3-12-09

Energy

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“Turnagain Arm Tidal Bridge Electric Generation Plan”

A Renewable Clean Energy Project For Railbelt Area,
About 70% of Alaska’s Electricity Needs

Prepared By

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In Association With
Blue Energy Canada, Inc.

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ABSTRACT

A tidal opportunity in Alaska is at hand to turn into reality. With the new ocean current generation system, the Davis Turbine Power System, Dominic S.F. Lee, P.E. of Little Susitna Construction of Anchorage and Martin Burger of Blue Energy Canada, Inc. of Vancouver, B.C. Canada have teamed up to bring a \$2.8 billion project to Anchorage to harness the cheap energy of the world's fourth highest tide location at Turnagain Arm. Not only does Dominic bring the idea to construct this project, he also brings the financing, engineering team and project management expertise to this project. The result of this project will be the production of 2,200 megawatts of peak power with a base daily average of 1,200 megawatts tidal bridge facility which can supply 70% of Alaska's electricity need, plus a surplus for future industries. The project will produce electricity in the 6 to 8 cents per kilowatt hour range. This is in contrast to the current rates of 13¢ and 30¢ per kilowatt hour in the railbelt which would cut an average household's electricity bill by 50 to 75 percent. The Turnagain Arm Tidal Bridge Power Project not only produces emission and fuel free energy, but will have a small ecological footprint, allowing marine life, nutrients, and sediments to travel through the bridge.

Another benefit of this project is its allowance of a 15 mile causeway, a two-lane highway across the Turnagain Arm from Anchorage to North Kenai's Possession Point. This causeway will let those traveling from Anchorage to Kenai enjoy a 30 minute drive rather than a 3 hour drive around the Turnagain Arm and through the Chugach Mountains. It would also save them an average of about 25 gallons of gasoline for each round trip.

The use of tidal energy eliminates the seismic risks associated with large hydroelectric dams, a constant danger in Alaska, as well as the CO₂ emissions associated with natural gas. Best of all, the tide will always be available into the future without further expense of future exploration and drilling, or failure through depleted water sources associated with hydroelectric projects. Tidal power produces far more power than windmill or solar construction without the periods of down time for weather conditions, and the construction cost per kilowatt hour is the cheapest of all types of renewable energy projects.

During construction, this project will provide 4,500 jobs for 5 years and 100 jobs after

construction for operations and maintenance. After all, this is the best renewable, sustainable, clean energy available in Alaska. The Turnagain Arm Tidal Bridge project would effectively establish Alaska as the tidal power technology seat for the Pacific Rim markets. Alaska will be the leader and academic center for renewable energy in the USA. This project will streamline the process of developing similar future projects. This will create an additional 5,000 jobs in Alaska for fabrication and support of these kinds of projects in the Pacific Rim. The Pacific Rim will be a large market that includes, but is not limited to, the Philippines, China, Japan, New Zealand and Korea. It is a very large market that will require a great deal of support on many levels. The time schedule for the total project is estimated to be six years. If this project was started now, in February 2009, by 2015 Alaska's renewable energy will come on line. What a fantastic opportunity for Alaska.



EXECUTIVE SUMMARY

Introduction

Mankind has dreamed for centuries of harnessing the abundant energy of the tides. A number of plants have been built around the world with the oldest (since 1954) being a 240 megawatt tidal power plant in LaRance, France. This French project has commercially proven that tidal projects are a large viable source of renewable, sustainable, clean, and economically cheap energy amongst all the other electricity production plants, such as oil-fired, coal-fired, nuclear, wind, solar, and biomass fuel, even the conventional hydroelectric dam project.

Tidal power is Alaska's largest source of energy and long after the oil and gas fields have been depleted the tides will still be providing clean low cost energy. The State has hundreds of billions in tidal reserves and early tidal resource development action would leverage economic developments by multiples for the Pacific Rim.

Turnagain Arm has the fourth highest tide in the world, 25 feet (7.6m) between low tide and high tide and it is a perfect location to install a tidal bridge to generate electricity according to the world experts in tidal power. The project will be less susceptible to earthquake in the water than a massive concrete dam at the Susitna River where as recently as 1964 the area experienced one of North America's strongest earthquakes. It is predicted that the probability of a high magnitude earthquake happening again in this area is significant.

Turnagain Arm Tidal Power Concept

Turnagain Arm sees the largest tidal range in the United States, with a mean of 30 feet (9.2 m), and the fourth highest in the world, behind Bay of Fundy (11.7m), Ungava Bay (9.75m), and Bristol Channel (9.6m). The ocean's natural 12-hour 25-minute tidal cycle is close to Turnagain Arm's natural resonance frequency, which then reinforces the tide similar to water sloshing in a bathtub. Tidal fluctuations in the main body of Cook Inlet, while not as extreme as the shallow and narrow Turnagain Arm, regularly reach 25 feet (7.6m) and exhibit currents in excess of 5 knots (9.3 km/h) at full tidal flow. This is a significant tidal resource that is situated just south of Anchorage, which is situated as the hub of the Railbelt region.

The Railbelt region electrical grid is defined as the areas of six regulated public utilities

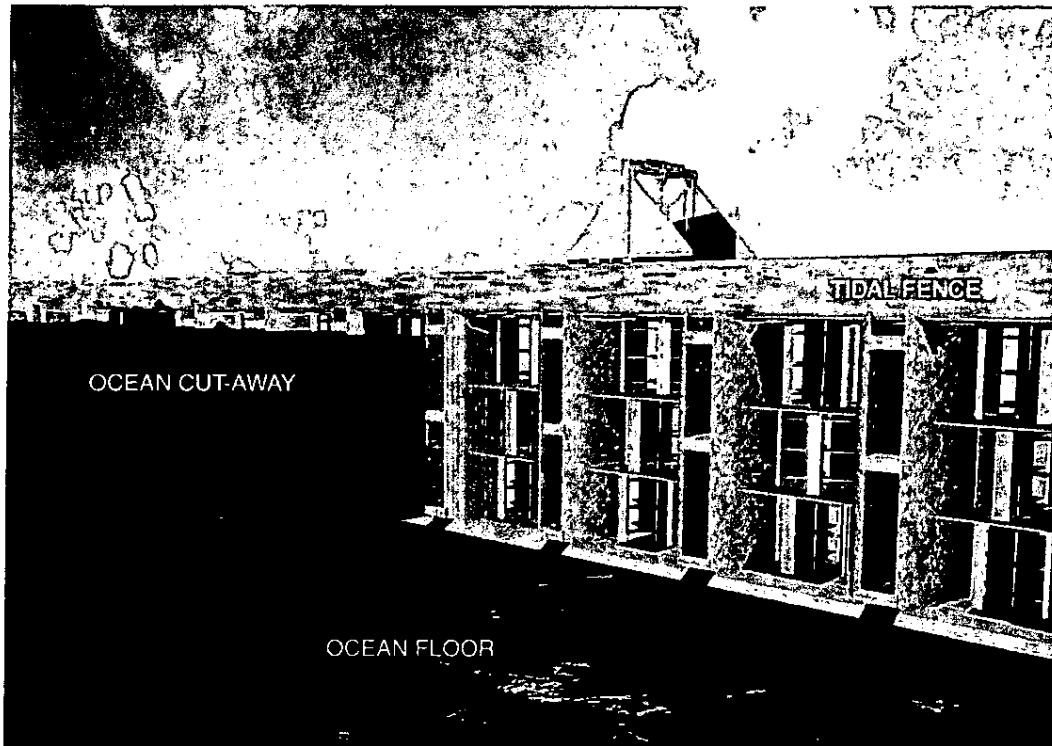
that extend from Fairbanks to Anchorage and the Kenai Peninsula. Sixty-five percent of the Alaskan population lives within the Railbelt Region.

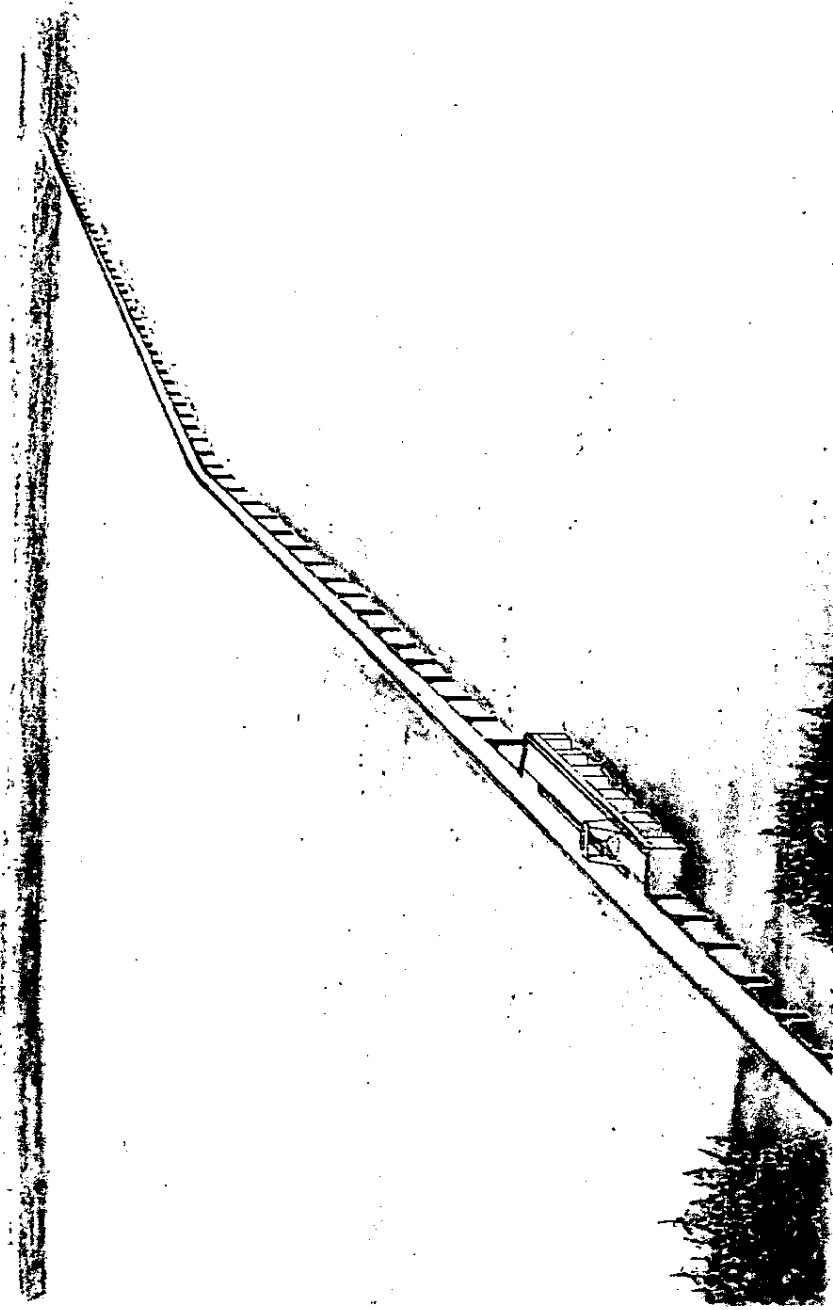
The southern portion of the Railbelt region: the Mat-Su Valley, Anchorage, and Kenai Peninsula, are highly dependent on natural gas as the source of electricity and heat, and the majority of the generation is combustion turbine generation. The Cook Inlet gas basin still yields large quantities of natural gas for power generation and space heating, but known reserves are now falling and dropping field operating pressures are causing concern that the region may not be able to depend on lower Cook Inlet for adequate gas supplies in the future. There are several proposals to construct pipelines that could bring Alaskan North slope natural gas into the Railbelt, which could even be integrated into a tidal bridge spanning Anchorage to Fire Island to the northwest corner of the Kenai. Nearly all of the thermal generating capacity from coal fired and natural gas fired power plants in the Railbelt is more than 20 years old, and much of it is more than 30 years old.

Due to the shallow, sandy bathymetric conditions a 3 mile 25 foot tall piling supported, two lane causeway will be constructed between the point to the south of the Anchorage International Airport and Fire Island. A 4 mile road along Fire Island will connect to a 8 mile tidal bridge to the northwest of the Kenai Peninsula. This route will shorten the drive to the west coast of the Kenai Peninsula significantly, though the actual benefits of this need to be further studied. For a 2200 MW project, the average daily output will be 1200 MW. In order to properly estimate the output of the tidal bridge, hydrographic resource assessments will need to be carried out.

The Turnagain Tidal Bridge Power Project is very environmentally friendly. The structure, the gear boxes, the generators, and the electrical switch gear are all located above water level while the Davis Turbine rotor is located 12 feet below the low tide line. The tidal bridge will have a blockage ratio of approximately 50%, though this will ultimately be determined with the appropriate hydrographic studies. The rotor diameter will be approximately 10.5 meters and turning at 25 rpms. Marine life access for Beluga migration will be designed into the project.

Since the turbines are installed 12 feet below low tide line, the winter ice in the Turnagain Arm will float above this level and will not damage the turbines.





Picture shows a modular Davis Turbine generator unit attached to the causeway from Fire Island to North Keral Possession Point.

The Work Plan

1. Step 1 will be to construct a two-lane highway from Raspberry Road into Kincaid Park, go west to Fire Island, then cross Turnagain Arm with a causeway to North Kenai Possession Point and connect to Kenai's road system to Kenai/Soldotna. The route would be 15 miles long with 11 miles over the water and would have an approximate \$300 million construction cost.

2. Step 2 would entail the construction of a three mile long tidal bridge with the patented Davis Turbine Power system to produce electricity from 0 MW at slack tide to 2200 megawatts at peak power with a base daily average of 1,200 megawatts of net electricity.

3. Step 3 would entail connecting this electricity to Chugach Electric Association's (CEA) electrical grid at the Raspberry Road substation. From this substation all the electricity needed could be delivered to Southcentral Alaska, the Railbelt and Fairbanks areas.

4. The current Railbelt area electricity generation peak capacity and charge per kilowatt hour is as follows:

a.	CEA	480 megawatts	16¢/Kwh
b.	ML&P	183 megawatts	13¢/Kwh
d.	Homer	90 megawatts	24¢/Kwh
d.	GVEA	223 megawatts	15¢/Kwh
e.	Ft. Wainwright, Eielson AFB	20 megawatts	N/A
	Total:	996 megawatts	

5. The availability of cheap excess electricity can be used to attract industries to Alaska such as mining, aluminum smelting, zinc smelting, and petrochemical.

6. Connecting Anchorage to North Kenai by a two lane causeway to compare to existing road system will:

- a. Save time - 30 minutes instead of 3 hours.
- b. Save fuel - 25 gallons per round trip (average of 15 mpg).
- c. Cut CO₂ emissions by 80%.
- d. Generate income through tolls per car and truck that use the causeway.

7. Utilizing this clean energy will enable the owners to sell their emission credits

worth millions of dollars for not dumping millions of tons of CO₂ into the atmosphere.

8. This project will be financed through public offerings of stocks and bonds and private investment firms from Asia.

9. After 20 years in operation, the debt service will be paid off, all the future electricity generated will be free.

The Financial Plan

The State of Alaska Department of Transportation should help pay for the 2 lane causeway (est. \$300 million), part of the construction cost can be recovered through use tolls and with Federal Highway matching funds and State money. Public financing for 80% of the \$2.5 billion cost of the tidal bridge project, can be accomplished by issuing U.S. Department of Energy guaranteed bonds for \$2 billion.

A private Asian investment firm has expressed a serious interest in investing 20%, or \$500 million, into this project in the form of stocks. This firm would then be a 20% owner of the Turnagain Arm Tidal Bridge Hydroelectric Corporation. The other 80% ownership will be held by the general public or any investment company, or perhaps even the State of Alaska.

The Organization

Little Susitna Construction Company, Inc. (Prime Consultant) is an Architectural, Mechanical, Electrical and Civil/Structural engineering and construction firm operating in Alaska since 1980. Little Susitna is also licensed by the State of Alaska as a general contractor, electrical (inside and outside) contractor, and mechanical contractor. It is an electrical union shop with a signatory agreement with I.B.E.W. Local 1547 for 27 years.

Dominic S.F. Lee, P.E., educated both in China and the United States, Dominic Lee came to the United States in 1962 and to Alaska in 1977. An American citizen, he is the founder and CEO of this company. He has earned B.S. and M.S. degrees in Electrical Engineering (Power Systems major), a M.S. in Mechanical and Aerospace Engineering, all from the University of Missouri at Columbia, Missouri. He also did graduate study in arctic, civil, environmental and wave engineering at the University of Alaska, Anchorage. He has worked in

the engineering design of electrical, mechanical, and structural renovation of the 70-year-old Bonneville Hydroelectric Dam near Portland, Oregon in 1990 for the Portland District U.S. Army Corps of Engineers. He was the engineer on record and received a citation from the U.S. Army Corps of Engineers for a job well done. Mr. Lee is currently licensed as a professional Mechanical and Electrical Engineer in Alaska and ten other states, WA, OR, HI, CA, MO, TX, LA, MS, AL and GA.

In 2005 Mr. Lee was invited to China by the Three Gorges Dam Project engineers as an expert consultant to solve some of the unexpected problems they encountered during the construction phase of the world's largest hydroelectric construction project (\$500 billion construction cost).

Mr. Lee is also an experienced project manager. He managed the construction inspection contract for 10 years with the U.S. Coast Guard for their nation-wide capital improvement construction projects totaling \$1.5 billion in construction cost. He and his engineers received over 25 citations and commendations by the U.S. Coast Guard's captains and admirals for projects well done. Mr. Lee is well qualified to manage this project.

Blue Energy Canada, Inc.. Blue Energy is a private consulting firm in ocean engineering and construction. Blue Energy is based in Vancouver, British Columbia, Canada. The firm holds the patent for the Davis Turbine Power System, which is proposed to be used in this project in Alaska.

The application of the Davis Turbine is to harness the movement of the tides in the world's oceans, which contains vast reserves of untapped, sustainable energy. With this Canadian proprietary Davis Turbine Power system, this massive new energy resource can be harnessed. The Davis Turbine is a low cost, simple mechanical device. It employs a hydrodynamic lift principle, actually causing the vertical turbine foils to move faster than the speed of the water. The system has multiple vertical axis hydro turbines with straight foils mounted in a duct structure to form a tidal fence. There are large marine structures of reinforced concrete and steel, and can be installed across an estuary with tides exceeding 1 meter or more and a tide velocity exceeding 2 meters per second or more. A typical installation across a 1 Km (.62 mile) crossing can produce more electricity than a large nuclear power plant. Or, in terms of

oil, about 100,000 barrels per day at a construction cost of less than \$1,400 per kilowatt. The tidal bridge power system can be built without the attendant pollution, maintenance, corrosion and radioactive fuel disposal problems, and produce electricity as cheap as 4¢ per kilowatt hour.

The tidal power plant mechanical equipment is designed to last for 50 years, the marine caissons for 100 years, and fuel for the system is free since it is generated from the ocean current. While power output is cyclical due to the ebb and flow of tides, sufficient flexibility exists in the country's current integrated grid to manage by either pumped storage, or by utilizing existing natural gas plans for peak demand loads.

Blue Energy Canada, Inc. is the world's leader in tidal bridge hydroelectric power generation. Their proprietary Davis Turbine was proposed for use in the Philippines for a \$2.9 billion, 2,200 megawatt tidal current project at Dalupiri Passage. Dalupiri Passage is a four kilometer stretch of water between Dalupiri Island and Samar Island of the Philippines. Blue Energy Canada also recently signed a Joint Venture Memorandum of Understanding (MOU) with India's Reliance Group out of Mumbai, India. This 100 billion dollar company has asked Blue Energy to provide them and expedited technology pathway to design and build the 22,000 megawatt tidal bridge hydroelectric project in Gujarat in the Bay Kambhat, India.

Mr. *Barry V. Davis* MRAeS, C.Eng, ASTC, and co-founder of Blue Energy Canada, Inc., is the inventor of the Davis Turbine. Mr. Davis has an outstanding record as an aeronautical and hydrodynamics engineer, having played key roles in the development of two Canadian landmark technological achievements, the Avro Arrow and the Bras D'Or. He is the inventory of the Davis Turbine that will be used in the tidal bridge. These products were developed with the help of the Canadian government.

Mr. Davis worked with DeHavilland Aircraft Company in Australia and England on the development of military and commercial aircraft, and subsequently with Avro Aircraft Limited in Toronto on development of the Avro Arrow supersonic fighter-bomber, which was recognized as the world's best when it was completed in 1958.

Subsequently, Mr. Davis joined DeHavilland aircraft of Canada as Chief Hydrodynamic Designer for the Bras D'Or high-speed hydrofoil sub-chaser, working on all aspects of the design, particularly the foils, hull and propellers. This state-of-the art craft, again a world leader,

was successfully built and tested but, like the Arrow, cancelled due to changing strategic and budgetary priorities.

After working for a number of years as an independent marine and hydrodynamic consultant, Barry founded Nova Energy Limited to develop and field test Ducted Vertical Axis Hydro Turbines which was supported by the National Research Council of Canada. During the 1980s, successful trials were conducted with several different prototypes in the St. Lawrence River near Cornwall, Ontario; the East Sheet Harbour River, a tidal site in Nova Scotia; and the Gulf Stream off Miami, Florida. These trials, together with a number of independent assessments by different authorities, confirmed the viability of the Davis Turbine.

After three-years back in the aircraft industry with Canadair working on the Challenger Business Jet and the Regional Jet, Barry (soon to be joined by Martin Burger) founded Nova Energy Ltd., the predecessor of Blue Energy, to continue development and marketing of the Davis Turbine. Although Mr. Davis passed away in 2004, his legacy of the Davis Turbine is just beginning to revolutionize our world in the capable hands of Martin Burger through Blue Energy.

Mr. Martin J. Burger - Founder & Director. From 1990 - 2000 collaborated with Barry Davis to develop and promote the Davis Hydro Turbine, evolving the turbine design from a stand-alone unit to the ocean class tidal bridge. A passionate futurist and conference speaker on sustainability and energy technology solutions, Martin has acted in an advisory capacity in matters of energy sustainability with his vision for a low cost clean energy future. He presented a tidal power technology briefing to President Ramos and his Caucus of the Philippines, was a Keynote Speaker at COFE I & II (Conference of Future Energy), and OPEC I & II. He was selected by Hazel Henderson as a keynote speaker at OPEC I visioning a future after oil, and was asked to sponsor the follow-up OPEC II conference in Vancouver, British Columbia, the home of Blue energy Canada, expanding on OPEC I and briefing delegates on high density sustainable energy opportunities.

Interested in beneficial yet stranded technology solutions, Martin has evaluated over 400 innovations in the past 20 years and brings an out-of-the-box perspective, unwavering commitment, engineering / heavy construction expertise, and visionary leadership to Blue Energy. Prior to his role with Blue Energy Martin played key roles in the success of two

technology driven companies and in the development of several world-scale construction projects in the petrochemical energy and mining sectors.

Mr. Burger is a civil engineering graduate with distinction from Northern Alberta Institute of Technology. From Cree ancestry, he has a high affinity for Mother Earth, and is sensitive to her environmental pain. Mr. Burger believes that it's important to participate in the future through children. He is a mentor on sustainable energy for the Wonder Tree School.

Jon Ellison - CEO. Mr. Ellison received a bachelor degree from the University of Chicago in 1995. He became an investor in the company in 2003, and since then has been involved in the development of the company serving as a general manager through 2007. In an emerging space where experience is almost non-existent, Jon worked closely with the founding CEO on international business developments for two years and has a visceral feel for the technology and resource developments. Jon's infectious enthusiasm and his performance in directing the company's advanced rotor design development program at UBC, lead to his promotion as Blue Energy's new CEO in January 2008.

Dr. Sergey Barmichev - Formerly from the Russian Rocket Program, Dr. Barmichev has twenty-three years of experience as a structural mechanics engineer, dynamical modeler, a computer applications support specialist, a project manager of interdisciplinary teams, and an applied mathematics consultant. He received his masters in 1974 at St. Petersburg, Russia developing numerical methods to linearize the form and development of optimal strategies for the equations of motion of navigation of missile platforms. He received his doctorate in 1989 in St. Petersburg with his thesis devoted to Finite Element Analysis methods. Dr. Barmichev was Russia's key rocket scientist on the Boeing Moscow Sea Launch Rocket Program when he moved to the United States in 1997. He is currently employed by Boeing working as an aerospace engineer on the world's first all composite airliner, the Boeing Dreamliner. Dr. Barmichev offers a wealth of knowledge concerning materials and finite element analysis, prototype development, and mathematics.

Geoff Smith - Geoff Smith has over 40 years of experience in a wide range of energy sector consulting projects and programs. He is President of NexEnergy Inc., a California-based energy consulting firm and small business. Prior to this he was conducting and managing

consulting work in a variety of areas. He gained a wealth of experience as a senior manager at Bechtel Corporation, directing the technical advisory efforts for a \$200 million international energy and environmental program sponsored by USAID in Washington DC, and a \$60 million Egyptian Industrial energy efficiency and environmental project for USAID/Cairo. Geoff is greatly experienced in energy planning; power systems planning; including solar, ocean and other renewable technologies; energy technology assessment; energy systems design; conservation and efficiency; greenhouse gas reduction and capture, energy audits; and economic and financial analysis and market studies. Geoff received his B.S. in Mechanical Engineering at McGill University as well as his M.S. in Electrical Engineering at McGill University. He received his M.B.A., Finance at Golden Gate University. He is a Registered Mechanical Engineering in California and a member of the Institute of Electrical and Electronic Engineers (IEEE) and the American Society of Mechanical Engineers (ASME).

COST ESTIMATE BY PHASE

For the purpose of planning for project costs, the project will be broken down into five (5) phases.

Phase 1 - The Preliminary Studies Phase (\$10,000,000 funded by Alaska's Renewable Energy \$100 Million Grant Program or special Legislative appropriation. Time Frame: Approx. 1 Year). Phase 1 is required to confirm the Turnagain Arm waterway's geophysics and ocean current hydrology are suitable and that this would be the best location for this project.

1. Feasibility Study - 30,334 Manhours @ \$150/Hr. = \$4,550,000
 - a) Assess the ocean resources parametrics from available marine and tide charts.
 - b) Preliminary siting investigation.
 - c) Assessing hydrographic resources.
 - d) Cross depths.
 - e) Geophysics, bottom conditions.
 - f) Geotechnical Investigation.
 - g) Environmental Impact Assessment
 - h) Examine the existing electric grid proximity and connectivity issues.
 - i) Substation and switch yard.
2. Hydrographic Computer Modeling - 3,334 Manhours @ \$150/Hr. = \$1,250,000
 - a) Computer model the tidal regime with data from existing tide gauges.
 - b) Insert a tidal fence and run model for preliminary analysis.
 - c) Calibrate the fence with tidal phasing and run model for 50 years.
 - d) Fine tune the computer model with field data.
3. Perform Field Hydrology Survey & Environmental Study - 4,000 Manhours @ \$150/Hr. = \$600,000
 - a) Install tide gauges.
 - b) Measure currents and perform bathymetry study.
 - c) Perform wetland assessment.
 - d) Using field-measured data, calibrate and confirm the hydrographic computer

- modeling.
- e) Calibrate the fence with tidal phasing and run the model forward for 100 years.
4. Preliminary Tidal Fence Design and Preliminary Engineers Analysis - 5,334 Manhours @ \$150/Hr. = \$800,000
- a) Thin Shell Concrete Caisson Design.
 - b) Foundation Design.
 - c) Size Electrical Generators and drive Line components.
 - d) Rotor Design.
 - e) Ancillary Equipment Design.
5. 3-D Numeric Hydrodynamic Computer Modeling of Tidal Fence with Performance Analysis - 4,667 Manhours @ \$150/Hr. = \$700,000
6. Small Scale Flume Tank Model to Verify Tidal Fence Design - 5,000 Manhours @ \$150/Hr. = \$750,000
7. Constructability Study - 5,334 Manhours @ \$150/Hr. = \$800,000
- a) Seabed composition.
 - b) Navigational Clearance.
 - c) Import large rock to fill the foundation to support the turbines.
 - d) Bathymetry and hydrographic survey.
 - e) Piling installation.
 - f) Turbine module installation.
 - g) Causeway constructability.
 - h) Connection to existing power grid.
8. Cost Estimation - 2,334 Manhours @ \$150/Hr. = \$350,000
- a) System engineering design.
 - b) Environmental Impact Statements
 - c) Federal regulations.
 - d) State regulations.
 - e) Right-of-Way.
 - f) Land purchase.

- g) Financing.
 - h) Construction cost.
 - i) Project management cost.
 - j) Operation and Maintenance Costs.
9. Risk Management and Risk Ranking the Project - 666.67 Manhours @ \$150/Hr. = \$100,000
- a) Insurance.
 - b) Earthquake effects.
10. Public relations to obtain commitment from utilities in Railbelt and commitment from State of Alaska and Federal Governments - 666.67 Manhours @ \$150/hr. = \$100,000

Phase 2 - Design & Development Phase (\$100 Million Funded By Public Offering. Time Frame: 1 Year)

- 1. Engineering design of tidal bridge causeway, substations and connection to existing electrical grid.
- 2. Site Survey.
- 3. Ocean Current Tide Survey.
- 4. Ice, and Winter Operation Study.
- 5. Environmental Impact Statement.
- 6. Obtain Right-of-Way Permits.
- 7. 3-D numeric hydrodynamic computer modeling of the tidal bridge performance.

Phase 3 - Construction Document Phase (\$100 Million Funded By Public Offering. Time Frame: 1 Year)

- 1. Final Engineering Design.
- 2. Final Construction Cost Estimate.
- 3. Sign Final Commitment Documents Buy/Sell Electricity With Utility Companies In The Railbelt.
- 4. Sign Funding Source Final Agreement.

5. Complete Land Acquisition.

Phase 4 - Construction Phase (\$2.6 Billion. Time Frame: 4 Years)

1. Advertise for bids for turnkey construction for:
 - a) Causeway.
 - b) Tidal Bridge Hydroelectric Plant.
 - c) Sub-station and Grid Connection.
 - d) Operation.
2. Start Up, Commissioning Equipment.

Phase 5 - Operation & Maintenance Phase (Funded by Operation Income)

1. Management.
2. Operation and Maintenance.

FINANCING PLAN

1.	Causeway (Design and Construction)	\$300 Million
2.	Preliminary Study (Phase 1)	\$10 Million
3.	Engineering Design (Design Development and Construction Document)	\$200 Million
4.	Construction of Tidal Bridge and Substation, Intertie W/Existing Grid	\$2.20 Billion
5.	Miscellaneous Finance Costs, Public Relations, Headquarters, Staffing, Construction Management, Permits	\$100 Million
		<hr/>
	Total	\$2.810 Billion

Public Finance \$2.5 Billion

20% (\$0.5 Billion) by Investment Firm in Asia.

80% (\$2.0 Billion) by Public Offing of U.S. DOE-guaranteed bonds.

Finance Breakdown

1. Phase 1 \$10 Million Preliminary Study by grant from State of Alaska under renewable energy program or special legislative appropriation.
 2. \$300 Million Causeway between Kenai and Anchorage by the State of Alaska Department of Transportation (costs can be recovered by levying tolls on cars and trucks). The State can also issue bonds for this causeway project, and use matching funds from the Federal Highway Department.
 3. \$2.2 Billion Tidal Bridge Hydroelectric Plant.
\$100 Million Substation, Connection to electrical grid system, infrastructure, misc.
\$200 Million Engineering, Design, Environmental Impact Statement.
- Total \$2.810 Billion

CONCLUSION

The new Turnagain Arm Tidal Bridge Corporation will operate as a publically owned company.

Turnagain Arm Tidal Bridge \$2.5 billion debt serviced by selling electricity to all railbelt electrical utility companies, new industries, and selling emission credits.

The State of Alaska is responsible for the causeway's \$300 million debt, which can be serviced by collecting users fees, emission credits, and Federal Highway matching funds. The state will get 70% of its electricity from this renewable energy project by 2015. This is 10 years ahead of the Governor's plan to have 50% of Alaska's energy generated by alternative sources by 2025.

After 20 years, the debt service will be paid off and all the electricity generated after 2035 will be free, renewable, clean energy. There is NO FUEL required.

The merits of the Turnagain Tidal Bridge Project are self evident. What is less evident is that timely action on this sustainable power initiative can provide a whole new forward looking economic sector in that the Pacific rim is anxiously waiting for the scale up of this technology. The principals at Blue Energy Canada Inc. are very amenable to the Alaskan lifestyle and are open to locating their Pacific Operations here in Alaska.

ALASKA COOK INLET BELUGA AREA RESOURCE DEVELOPMENT

**SYNTHETIC GAS FROM COAL & BIO-MASS
FOR ELECTRIC POWER GENERATION
FOR F-T TRANSPORTATION FUELS
ENHANCED OIL RECOVERY (EOR)
WHILE SEQUESTERING CO₂**



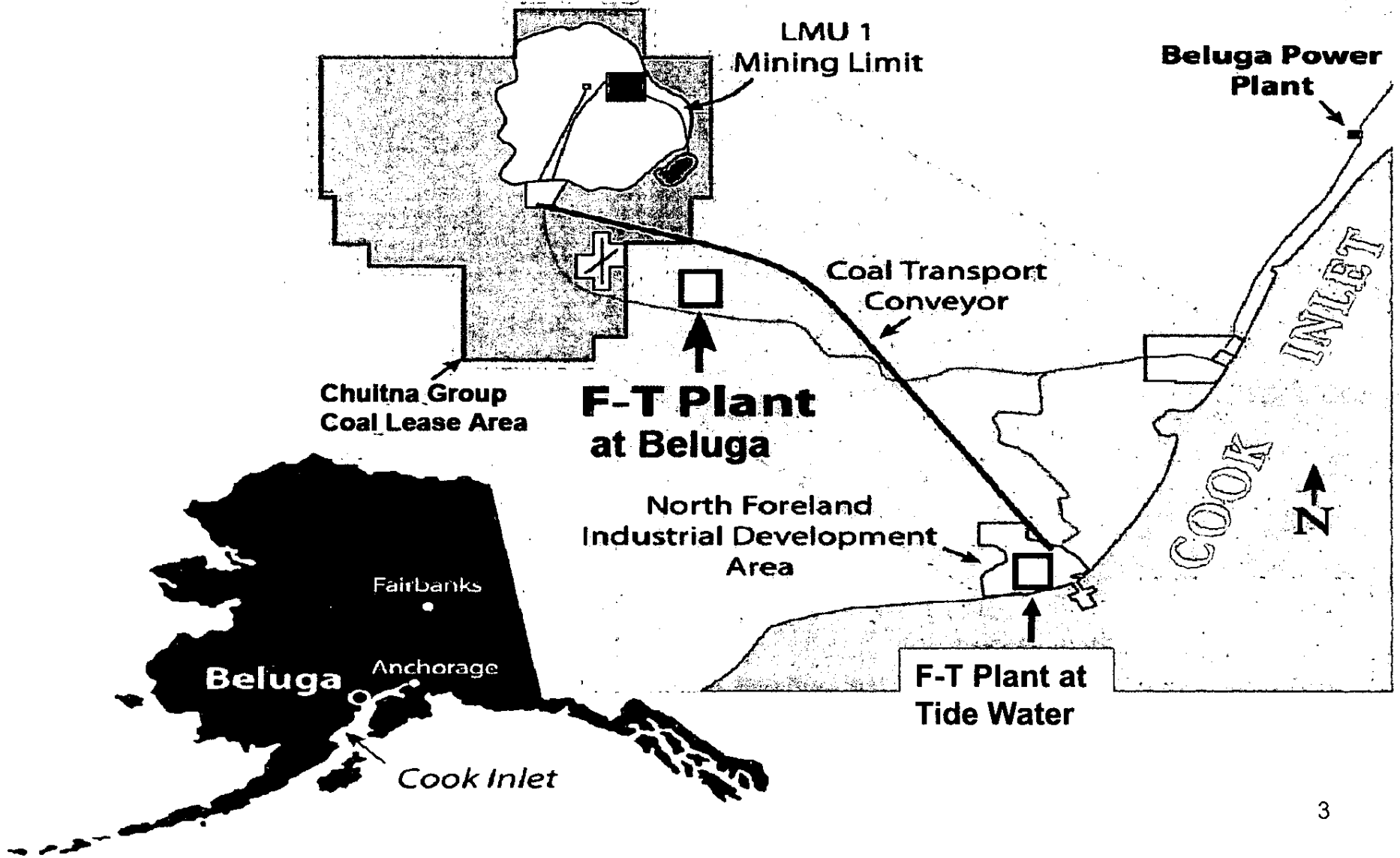
POSITIVE CHANGES FOR THE PEOPLE & REGION

March 12, 2009

ALASKA BELUGA CTL THE BEST - LOCATION

- **Long term Federal support for CTL** - *\$500 million/yr*
- **Access to local natural resource (coal)** *17 million tons/yr*
- **Access to unlimited cooling water** *Cook Inlet – no fresh water*
- **Access to electric power grid** *makes 200 to 400 MW of power*
- **Access to natural gas system** *can make synthetic pipeline gas*
- **Access to skilled labor** *1,600 direct jobs – 7,000 indirect*
- **Access to export markets** *no negative impact on local refinery*
- **Access to proven CO₂ sinks ?** *Depleted oil and gas reservoirs*
- **Tide water location reduce capital costs** *\$12 billion CAPEX*
- **Local markets that need the same products** *jet fuel*
- **Local fuel storage** *allows for fuel supply competition-lower costs*

80,000 bbl/d Coal To Liquids “Beluga CTL Plant” (Mine Mouth or Tide Water)



WHAT DOES 1.3 BILLION TONS OF WEST COOK INLET COAL REPRESENT

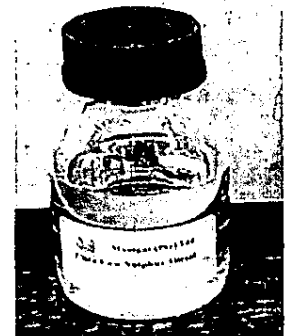
- 2 BILLION BARRELS OF FUELS
 - The SASOL F-T process will turn 1 ton of West Cook Inlet coal into 1.5 barrels of product
 - 1.5 barrels x 1.3 billion tons =
2 billion barrels of fuels



**BILLIONS OF
TONS OF
BELUGA COAL**


EQUALS

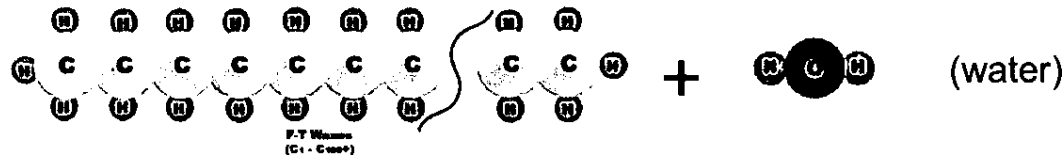
**BILLIONS OF
BARRELS OF F-T
FUELS**



Three Steps in CTL/BTL/GTL Refining to make F-T Fuels

CTL/BTL/GTL Processes use 3 distinct steps, all commercially proven to convert a gas, liquid or solid into synthetic transport fuels:

- Step 1 - Syn-Gas generation (H_2 & CO) 
- Step 2 - The F-T reaction (long paraffin chains \rightarrow wax)



- Step 3 - Product upgrading (hydrocracking of the long chain F-T paraffin to produce the desired end product – similar to a crude oil refinery)
 - Kerosene – Diesel – Gasoline - Jet Fuel – Naphtha

C₁₀-C₁₃

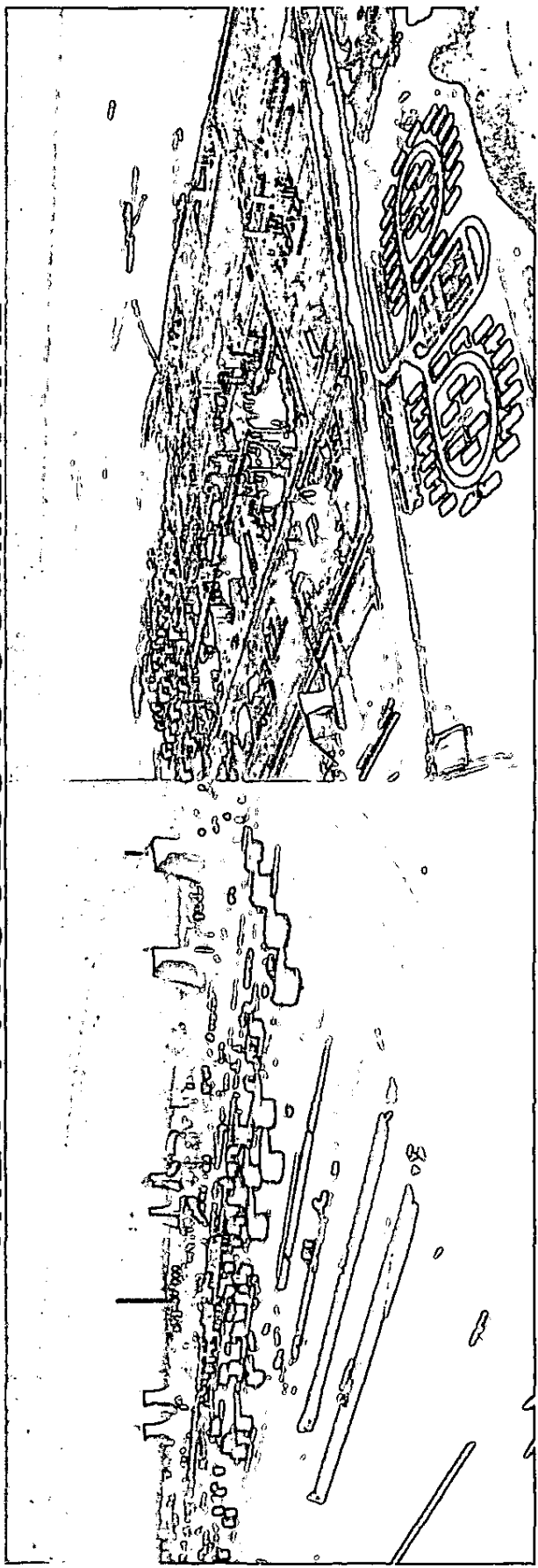
C₁₄-C₂₀

C₅-C₁₀

C₁₀-C₁₃

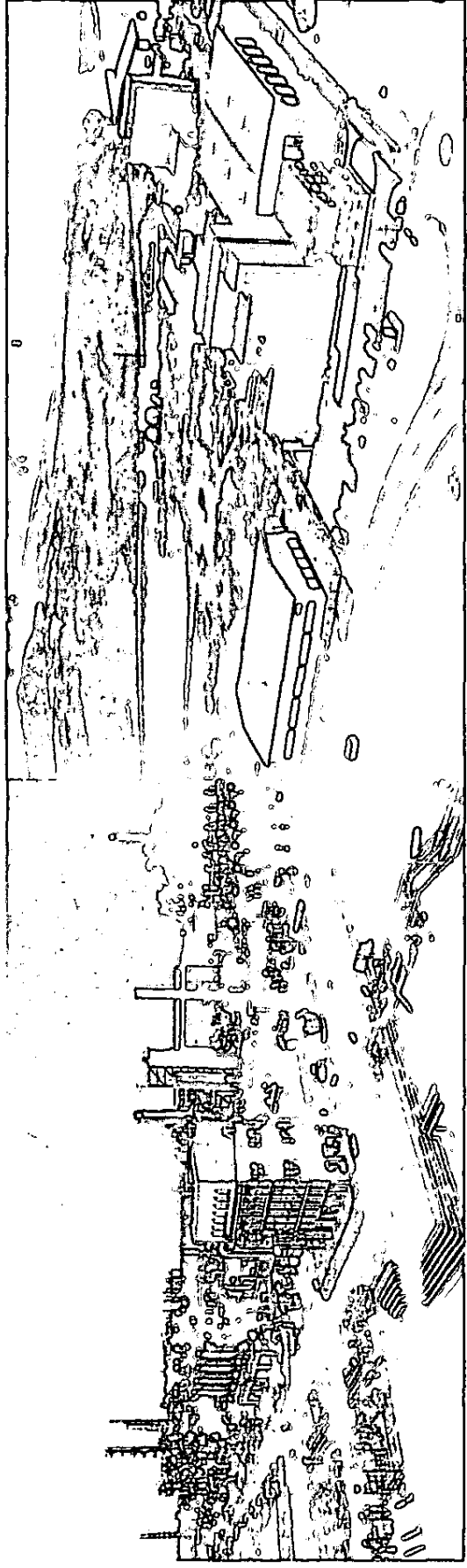
C₄-C₁₀

THE F-T PROCESS IS COMMERCIAL



South African Secunda 150,000 BPD Coal to Liquids (CTL)

South African Moss gas 47,000 BPD Gas/Condensate to Liquids (GTL)



Shell Bintulu 15,000 BPD Gas to Liquids (GTL)

CHOREN Freiberg 500 BPD Biomass to Liquids (BTL)

SYNTHETIC DIESEL

**F-T DIESEL
AS CLEAN AS CNG**

**U.S. EPA*
APPROVED
NON-TOXIC
U.S. FDA
APPROVED**



**ZERO SULFUR
ZERO AROMATICS
70 + CETANE
PM10 ≤ CNG**

*EPA Water Docket, EB 57 located at 401 M Street SW Washington DC, 20460 Reference Docket No. W-98-26 in UNOCAL data file 4.A.a.3, Vol 13

COOK INLET OIL & GAS FACILITIES

MORE THAN 75 % OF ALASKA'S POPULATION WILL RECEIVE DIRECT POSITIVE BENEFITS FROM THE CTL PLANT

Potential home for CO₂ in depleted Cook Inlet oil and gas reservoirs. Plus potential EOR program to extend life of existing oil fields and add 300 to 400 million of bbls of additional oil production.

- Idle/Abandoned Pipelines
- Platforms
- State Lands
- Federal Lands
- Oil/Gas Fields
- Watershed Boundary

Rail Belt Power Grid and Chugach 350 MW Power Plant

EXISTING 80,000 BBL/D JET FUEL MARKET 40 MILES FROM CTL SITE (60,000 BBL/D COMMERCIAL – 20,000 BBL/D MILITARY) IMPORTING 20,000 BBL/D TODAY

TYONEK NATIVE CORPORATION SET ASIDE OVER 1,000 ACRES FOR PLANT SITE

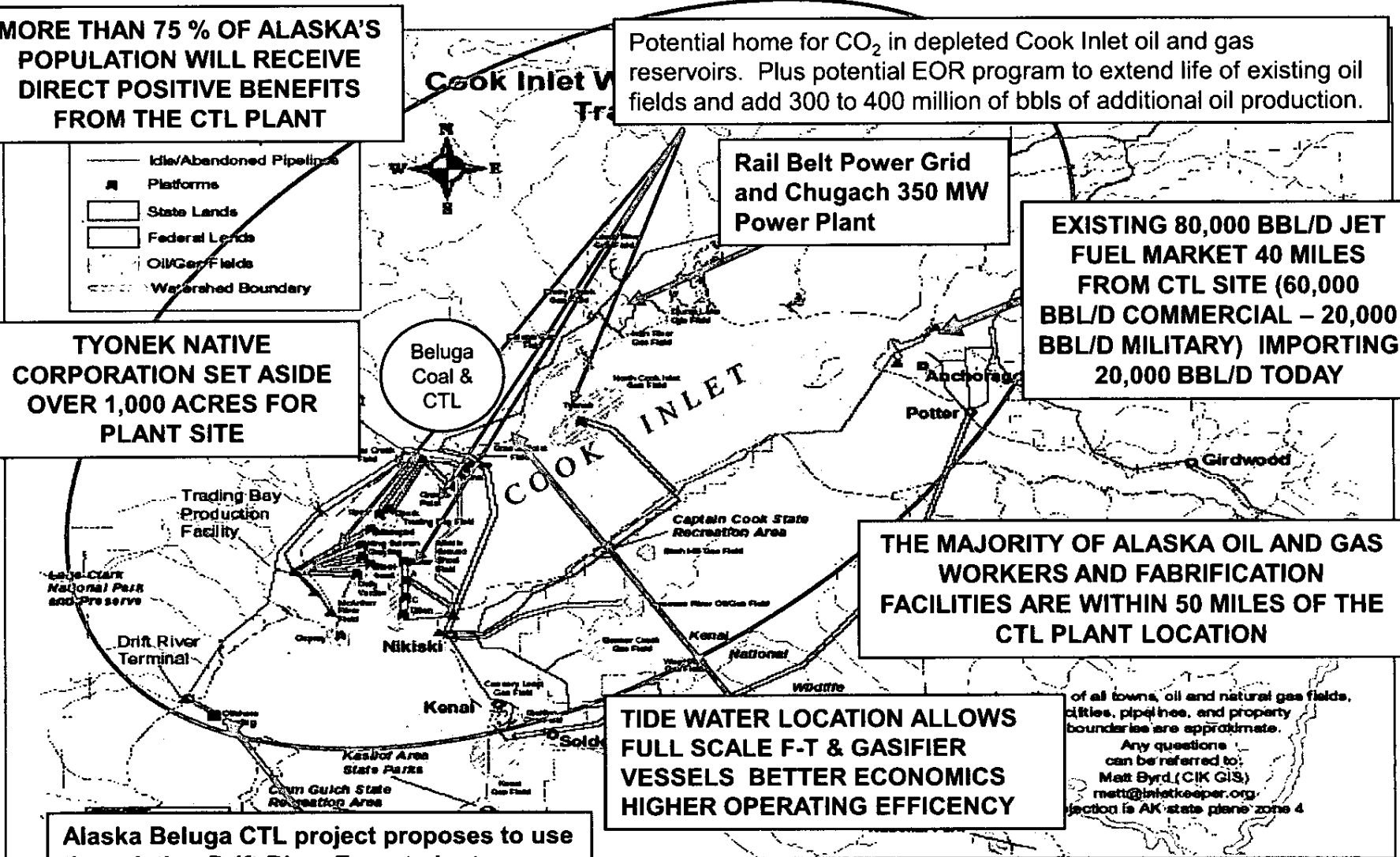
Beluga Coal & CTL

THE MAJORITY OF ALASKA OIL AND GAS WORKERS AND FABRICATION FACILITIES ARE WITHIN 50 MILES OF THE CTL PLANT LOCATION

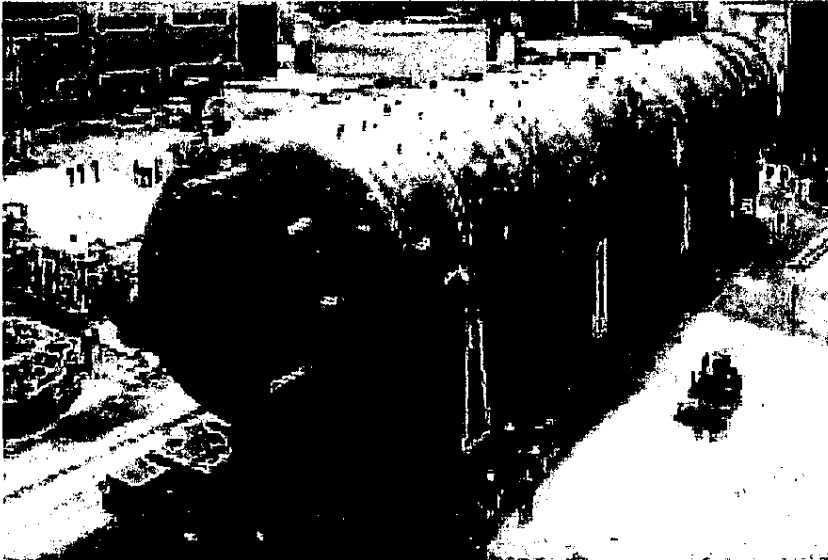
TIDE WATER LOCATION ALLOWS FULL SCALE F-T & GASIFIER VESSELS BETTER ECONOMICS HIGHER OPERATING EFFICIENCY

Alaska Beluga CTL project proposes to use the existing Drift River Export pier to move F-T products to US and Asian markets

of all towns, oil and natural gas fields, cities, pipelines, and property boundaries are approximate.
 Any questions can be referred to:
 Matt Byrd, (CIK GIS)
 matt@nistkeeper.org
 section is AK state plane zone 4

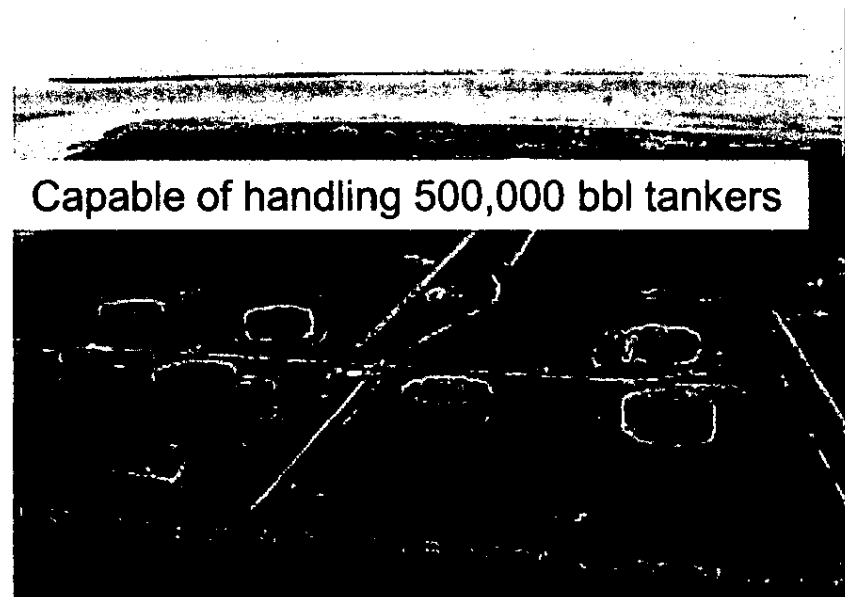


COOK INLET TIDE WATER LOCATION



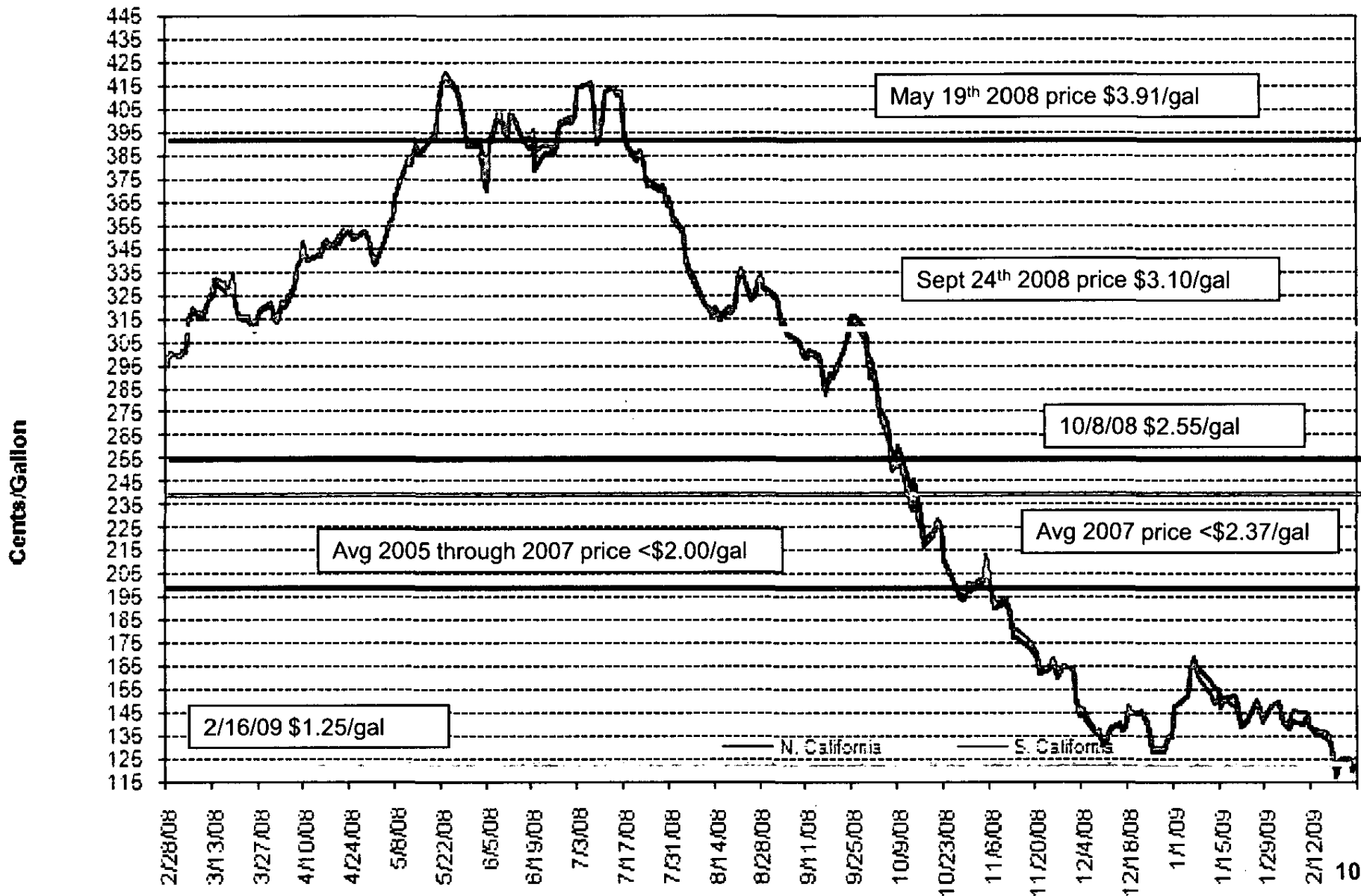
42" Diameter, 180' Tall, can only be delivered via ship/barge at a tide water location

Drift River Export Terminal - no ice issues
no new piers to permit



Capable of handling 500,000 bbl tankers

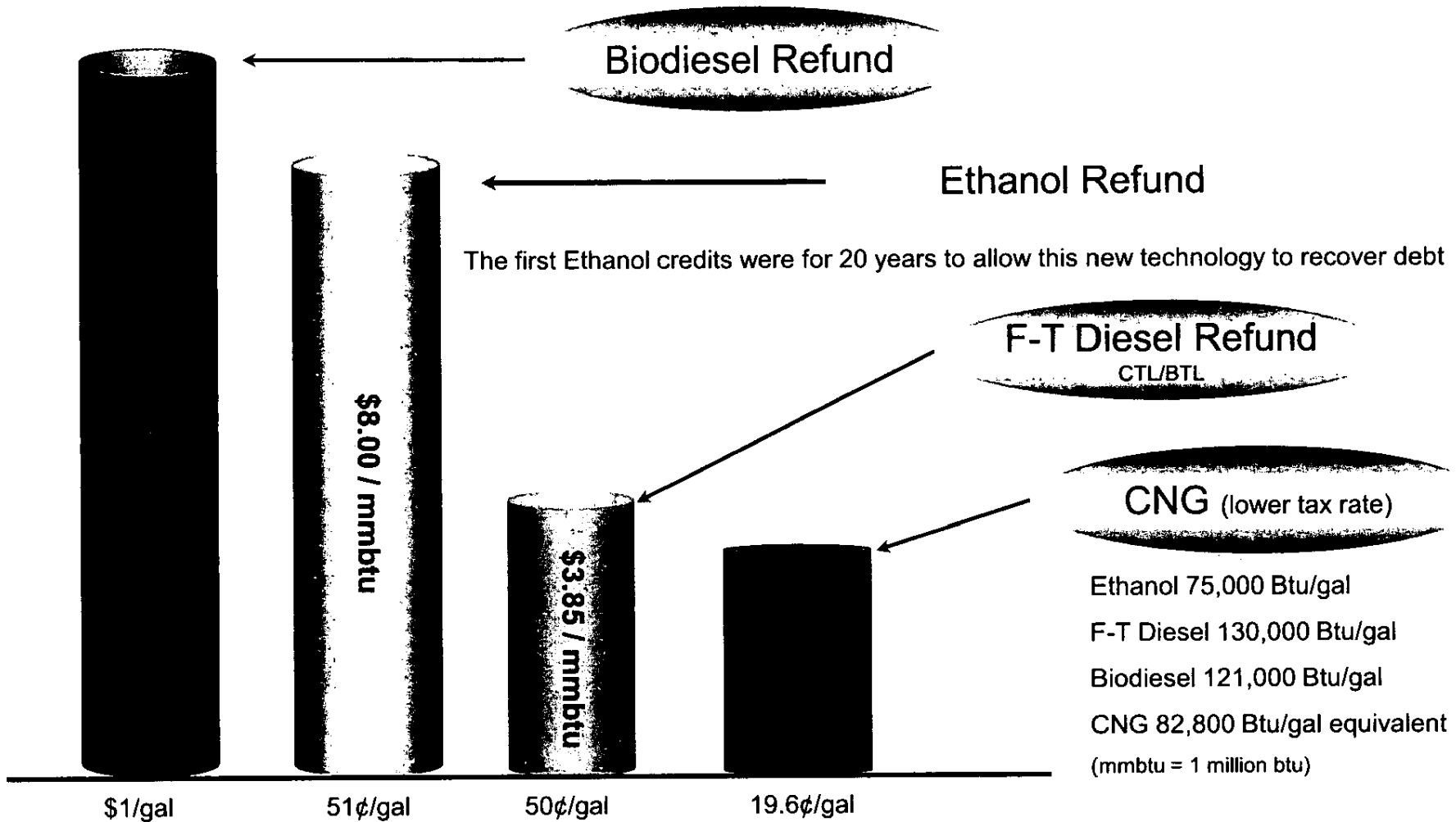
CARB Diesel Fuel Average Rack Prices (As of 2/25/09)



Source: Oil Price Information Service

Energy Credits for F-T Fuels (CTL - BTL) On a \$/million btu basis vs Biodiesel & Ethanol

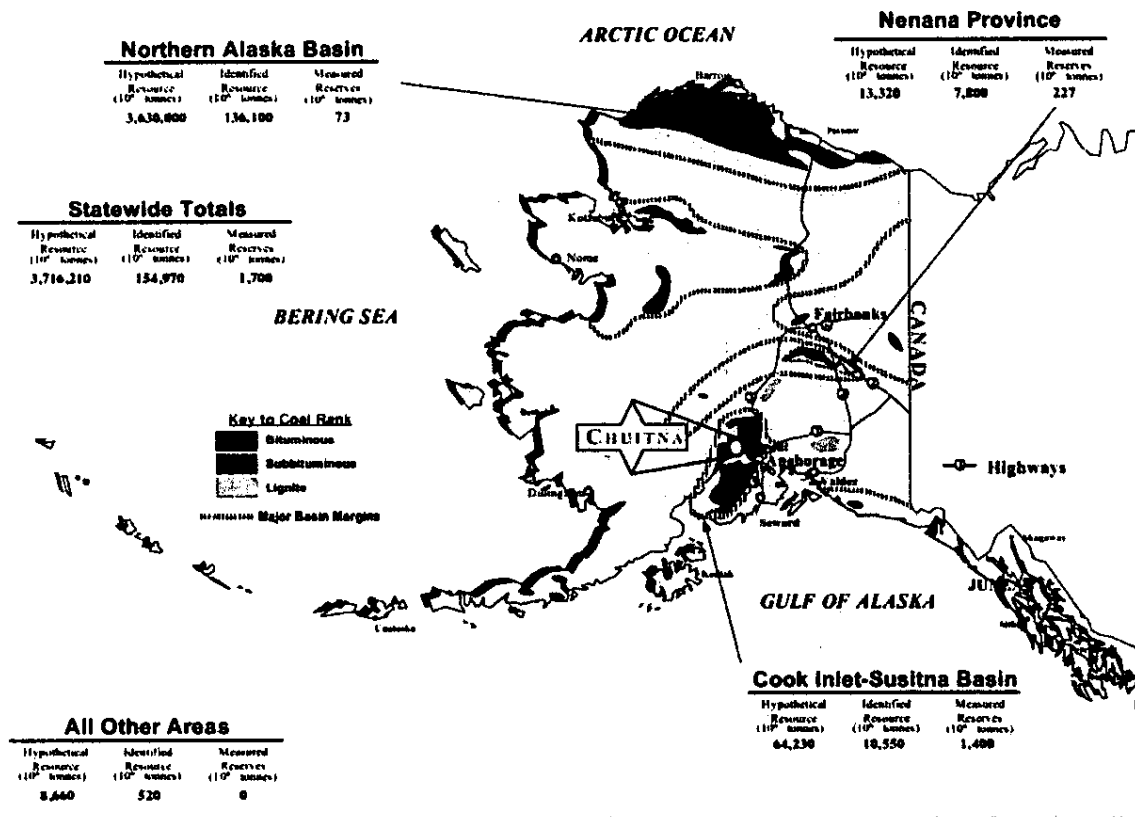
(At the Federal level only)



Energy Credits that F-T Diesel receives is less than half the Energy Credit of Biodiesel & Ethanol on a \$/million btu basis

THINK OUT SIDE OF THE BOX

Alaska's Coal Resources & Reserves



Estimated Recoverable Coal Reserves

(10⁹ tonnes)

World Total	1,038
North America	256
United States	246+Alaska
Alaska (measured)	2
Alaska Estimated	200
CHUITNA (measured)	>1

Note: The Northern Alaska Basin could potentially have upwards of 1.5 to 2.5 trillion tons of bituminous coal reserves – more coal than the total proven reserves in the world today!

ALASKA LEGACY PROJECT

FEAR OF CARBON EMISSIONS BIGGEST OBSTACLE TO ALASKA CTL

- IS EXPORT THE ONLY WAY TO AVOID CARBON CAPTURE OR SEQUESTERING?
- OBAMA ADMINISTRATION DISCUSSED CAP & TRADE COULD COST BELUGA CTL PLANT \$180 million/year
- “IS ANTHROPOGENIC GLOBAL WARMING (now called Climate Change) FACT OR FICTION”?
 - Are you a Global Warming Extremist or Global Warming Skeptic?
- GOVERNOR SIGNS AGREEMENT WITH THE CENTER FOR CLIMATE STRATEGIES (CCS)
 - CCS SAYS NO DEBATE ON CLIMATE CHANGE ALLOWED

**PEOPLE SAY
THERE IS NO SUCH
THING AS CLEAN COAL
TECHNOLOGY
THEY ARE
MISS-INFORMED**

THEY DON'T UNDERSTAND THE DIFFERENCE
BETWEEN GASIFICATION WITH CAPTURE, I.E.

BTL - CTL - GTL also called F-T
or

GASIFICATION WITHOUT CAPTURE
Integrated Gasification Combined Cycle (IGCC)

AND WORSE YET
THEY LOOK AT COMBUSTION WITH SCRUBBERS
AND THINK THIS IS THE BEST THERE IS

WE NEED TO EDUCATE THEM

See <http://www.youtube.com/watch?v=w5Y1w7708qc> or

<http://www.gasification.org/media/videos.aspx>

CTL is really clean coal technology because all of the impurities listed below if present are captured and disposed of:

Impurities that are removed from Syngas before it enters the F-T reactor in step two. This is the main reason F-T fuels cost so much and are so clean

•CO₂

•Catalyst Poisons:

–H₂S

–COS

–HCN

–HCl

–Fe(CO)₅

–Ni(CO)₄

–Hg

–Traces of Cd, Se and other metal vapors

CO₂ IS NOT A POLLUTANT !

WITHOUT CO₂ LIFE AS WE KNOW IT WOULD BE ENDED

IT HAS BEEN SHOWN THAT WITH THE
INCREASE IN ATMOSPHERIC CO₂ WE ARE
GREENING THE EARTH

CURRENT ESTIMATES ARE THAT THE EARTH
HAS INCREASED PLANT GROWTH BY 15%

LOWERING CTL'S CARBON FOOTPRINT

MSW – RDF

A SECOND RESOURCE TO MAKE F-T
FUELS AT THE TYONEK PLANT SITE

THE BELUGA CTL PROJECT REPRESENTS VALUE ADDED

LETS ASSUME THAT YOU WANT TO SELL / EXPORT
52,000 T/D OF LOCAL COAL RESOURCES

IF YOU DEVELOP THE COAL RESOURCE FOR EXPORT
THEN 19 MILLION TONS /YR ARE EXPORTED TO CHINA

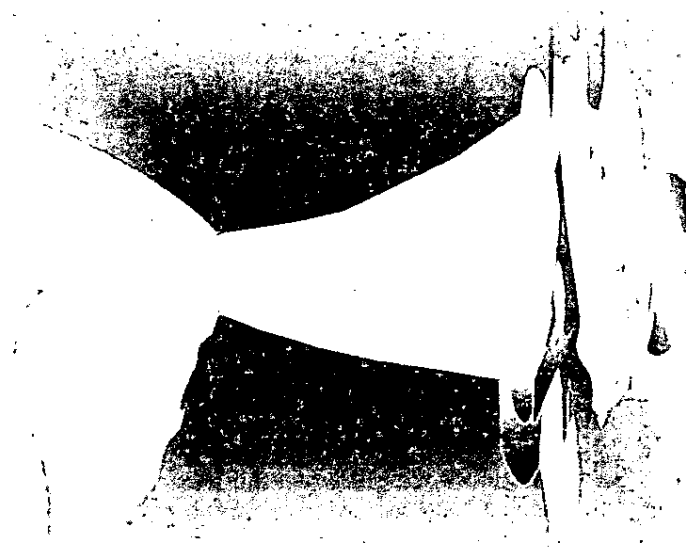
- 52,000 t/d coal sold @\$25/ton = \$475 million/yr
 - \$600 million CAPEX Mine and Export Terminal
 - 200 jobs in a camp setting
- GREAT FOR CHUITNA or is it CHUINA
BUT WHAT ABOUT ALASKA?

THE BELUGA CTL PROJECT REPRESENTS VALUE ADDED

IF YOU BUILD A CTL PLANT & USE THE SAME VOLUME OF COAL

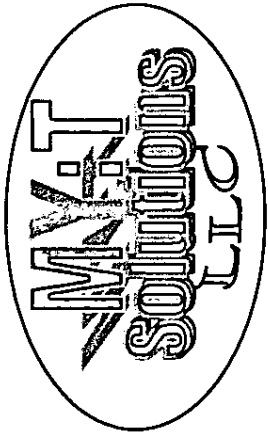
- 84,000 bbl/d of F-T Products @ \$2.5/gal = \$3 billion/yr
 - \$12.8 billion CAPEX CTL Plant and Mine
 - 1,600 + Permanent Direct Jobs at Mine and CTL Plant
 - 5,000 + Indirect Jobs supporting the CTL Project
 - Over 5,000 + during construction (3 to 5 years)
- 350 + Million Barrels of EOR Crude Oil
 - \$6 billion in State Royalty/PPT income (\$70/bbl crude)
- 350 – 500 MW of Low Cost Waste Heat Electricity
 - \$1.4 to 2.0 billion in rate payer savings over 15 yrs (3¢/kw savings)

BETTER FOR ALASKAN'S!

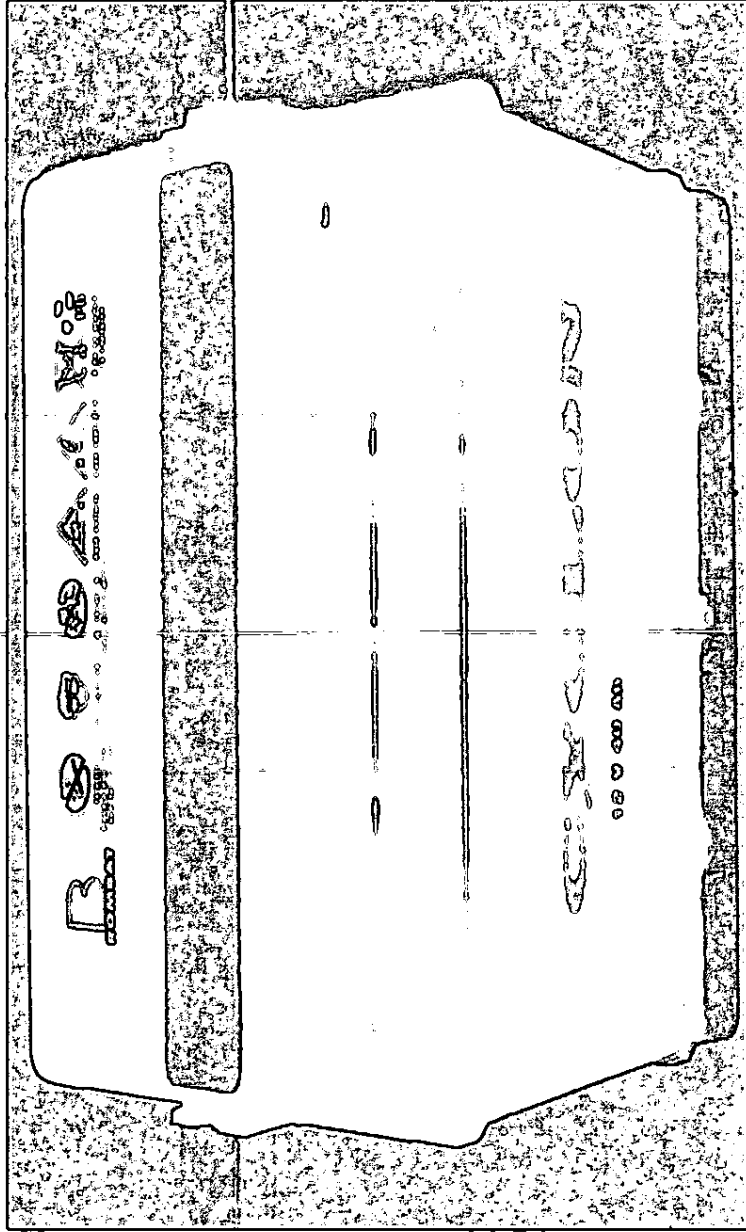


THANK YOU

Nuclear Battery

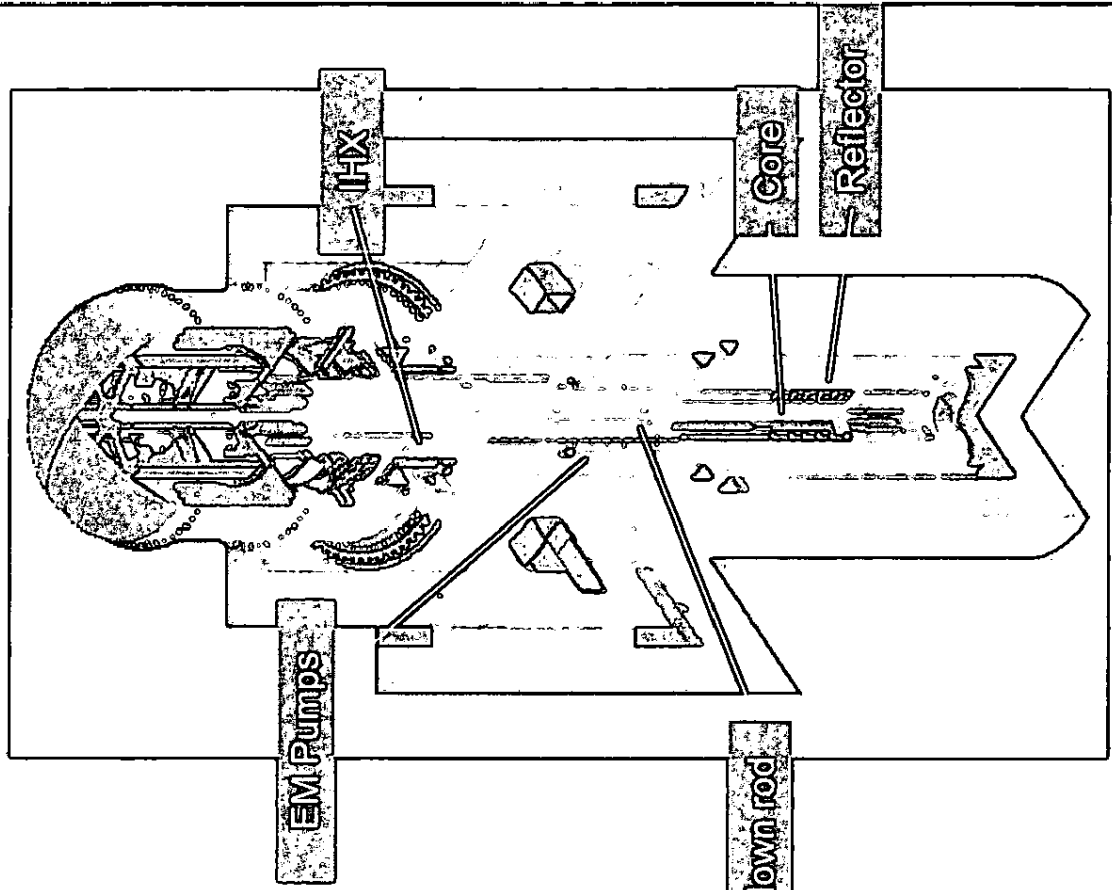


Battery



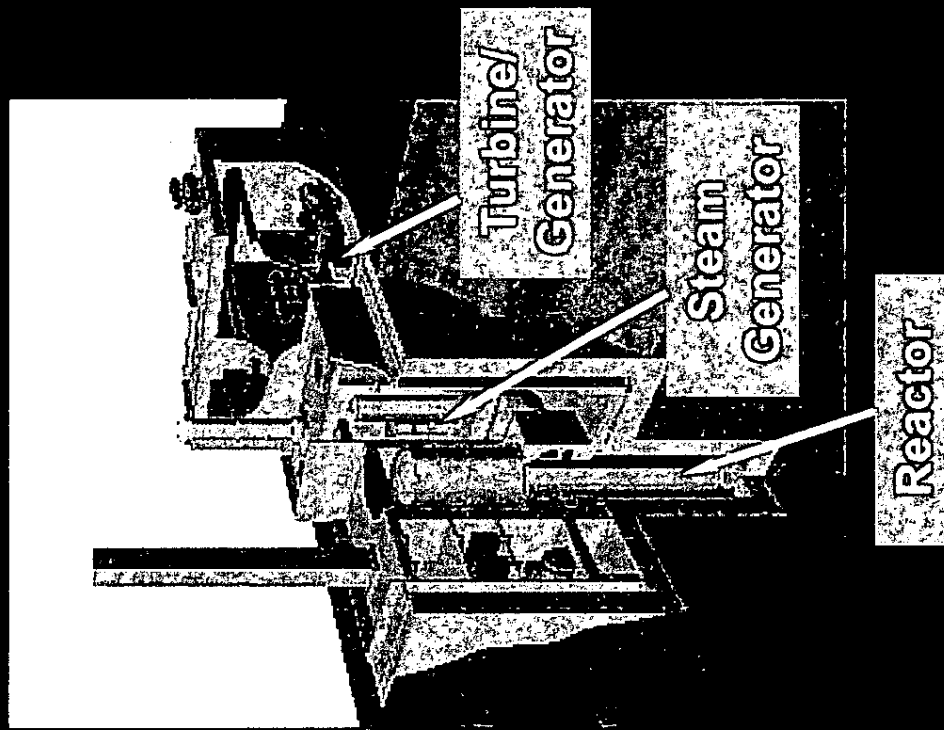
Plant Description

- ▣ Reactor
 - Core
 - Metallic fuel core (U-10%Zr)
 - Reactivity control
 - Movable reflectors
 - Shutdown system
 - Shutdown rod and reflectors
 - Primary heat transport system
 - Pumps: Annular type
 - Electro-magnetic (EM) pumps
 - IHX: Annular type intermediate heat exchanger



Overview

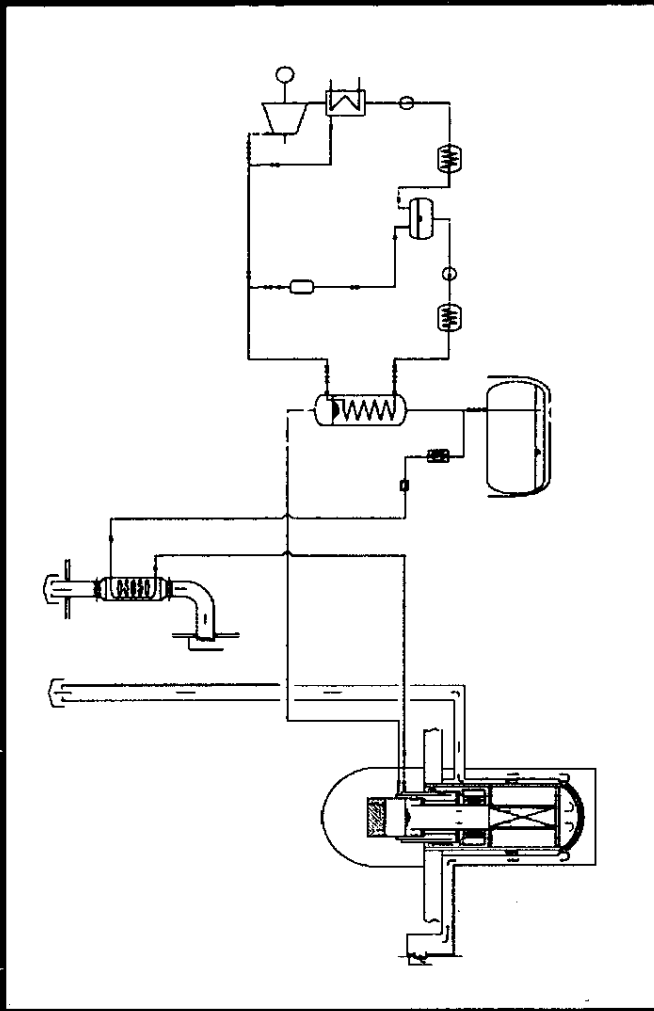
- Sodium cooled fast reactor
- 30 MWt (10MWe)
- Application
 - Remote areas of small power demand (e.g., Galena Alaska)
 - Considered a candidate for GNEP grid-appropriate small and medium reactor design
- Main features
 - Passive safety
 - No onsite refueling for 30 years
 - Low maintenance requirement
 - High inherent security



Plant Description

■ Heat transport systems

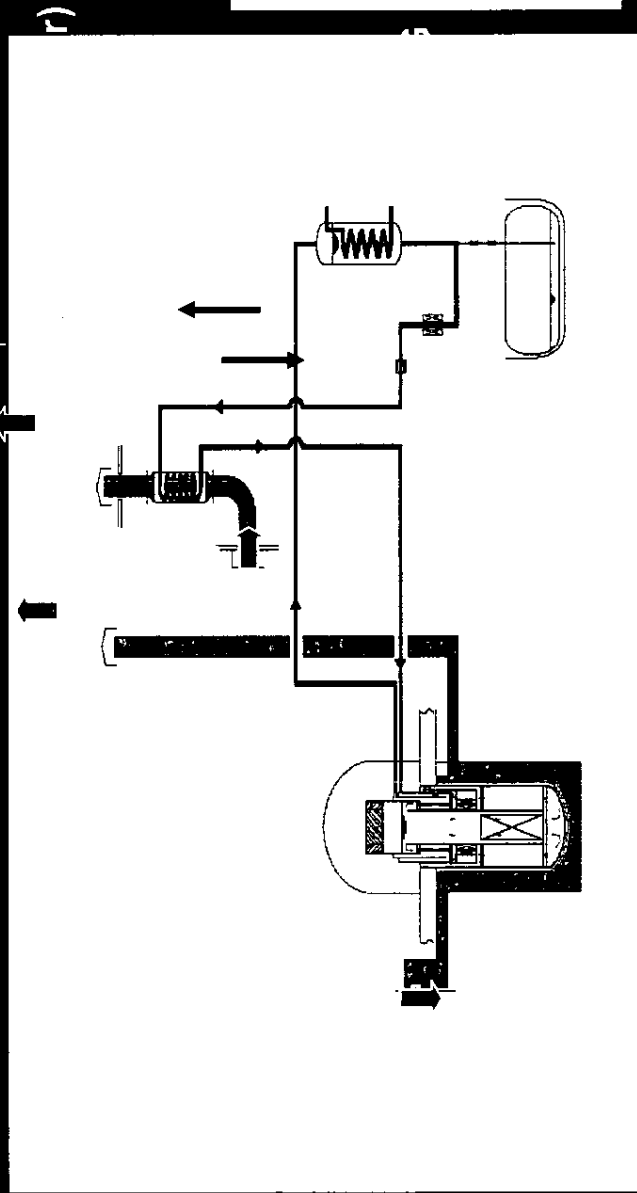
- Primary heat transport system: Inside the reactor
- Intermediate heat transport system
 - Steam generator
 - EM pump
 - Air cooler
 - Dump tank
- Water & steam system
 - Turbine Generator



Passive Decay Heat Removal

- ▣ Heat removal by natural circulation & natural air draft
 - RVACS: Natural air draft outside the guard vessel
 - Sufficient cooling capacity by only RVACS
 - IRACS: Natural circulation of sodium and air draft of air cooler

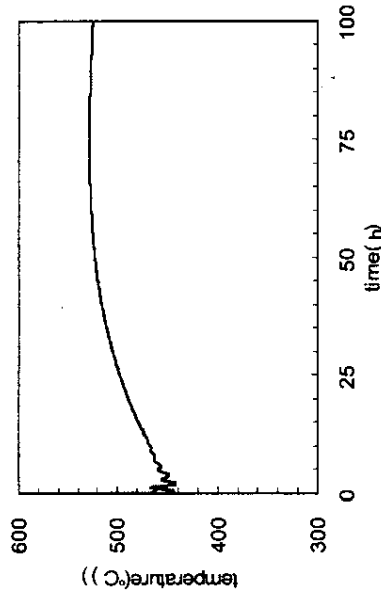
Air outlet Air outlet



RVACS

Air flow pass

Core outlet

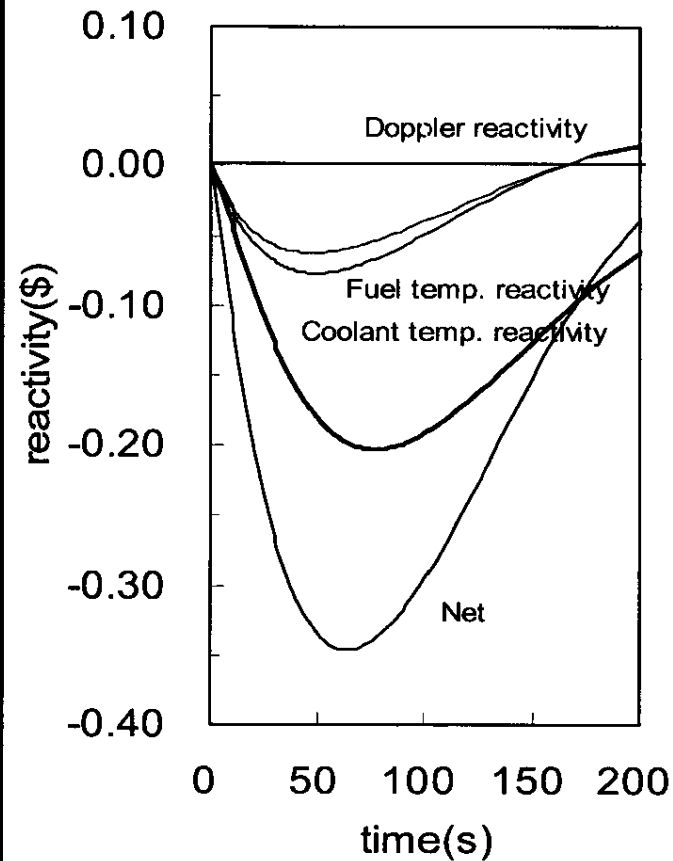
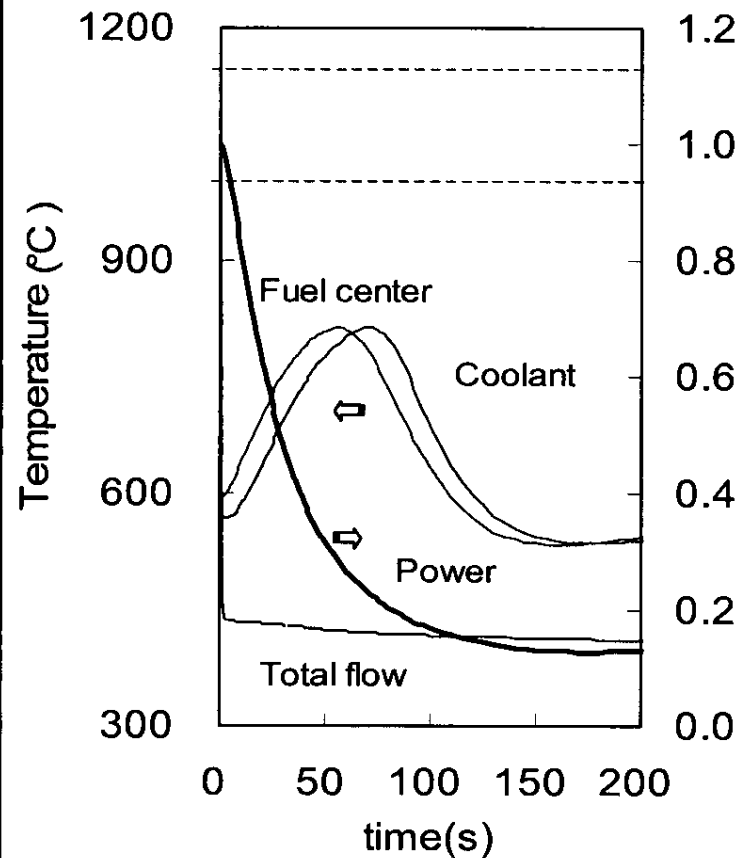


Loss of offsite power

Assumption : Heat removal by only RVACS

Passive Shutdown for Unprotected Events

- Safety Analysis of Unprotected sudden loss of flow
Large margin to coolant boiling and fuel melting



Main Design Features

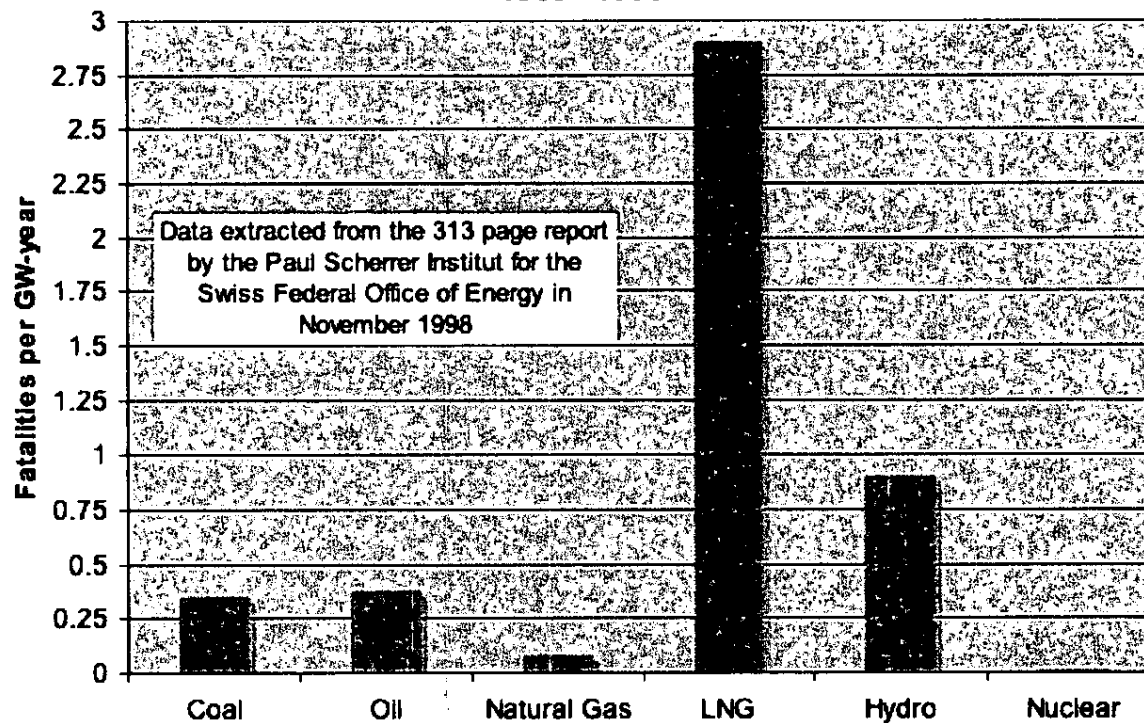
- Safety Features
- Key Features of 4S
 - Passive safety
 - No onsite refueling for 30 years
 - Low maintenance requirement
 - High inherent security

Safety Features

- Low pressure system with pool design and guard vessel
- Negative coolant temperature coefficient promotes safe, stable operation.
- Large margin to coolant boiling or cladding failure
- Reliable, redundant and diverse scram systems
- Smaller excess reactivity with metallic fuel core design – limited potential for reactivity insertion accident
- Passive, reliable, and diverse shutdown heat removal systems

Safety

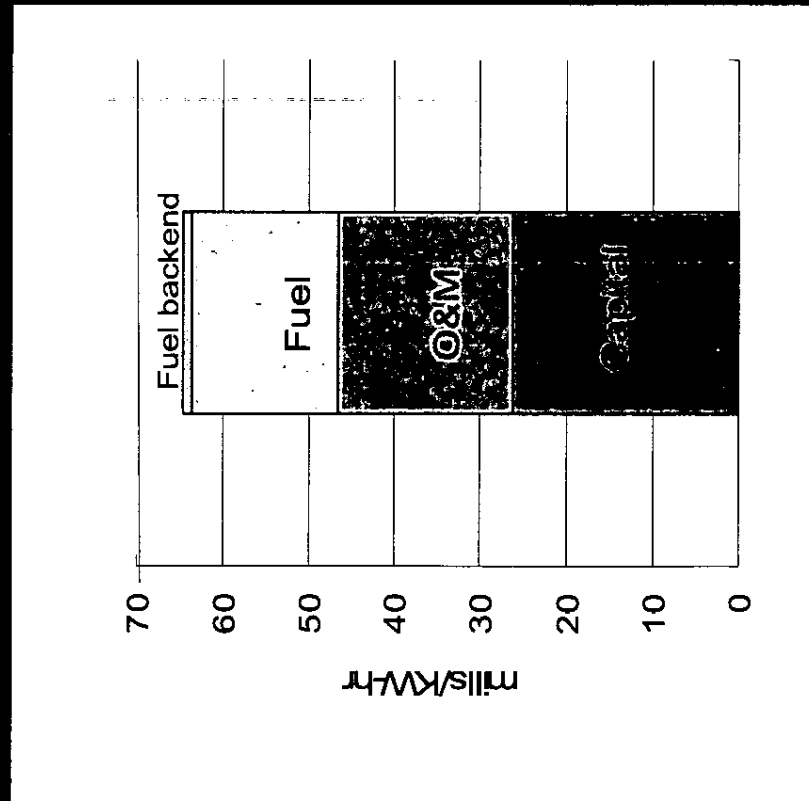
**Severe Accidents in the Energy Sector
1969 - 1996**



Tests to Support 4S Design

Design Feature	Verification Item	Required Testing	Status
Long cylindrical core with small diameter	Nuclear design method of reflector control core with metallic fuel	Critical experiment	Done
Reflector controlled core			
High volume fraction metallic fuel core	Confirmation of pressure drop in fuel subassembly	Fuel hydraulic test	Done
Reflector	Reflector drive mechanism with fine movement	Test of reflector drive mechanism	Done
RVACS	Heat transfer characteristic between vessel and air	Heat transfer test of RVACS	Done
EM pump	Structural integrity Stable characteristics	Sodium test of EM pump	Done and Planned
Steam generator (Double wall tubes)	Structural integrity Heat transfer characteristic Leak detection	Sodium test of steam generator Leak detection test	Done and Planned
Seismic isolation	Applicability to nuclear plant	Test of seismic isolator	Done

4S Preliminary Cost Estimate



50MWe (135MWt) :
10 MWE variant

Commercial_plant
(mass production phase)

Plant Construction:
\$ 2,500 \$3,000/KWe
Busbar Cost:
\$.065 mills-\$.070 /KW-hr*

Absolutely the Funniest Joke Ever...

Does anybody out there have any memory of the reason given for the establishment of the DEPARTMENT OF ENERGY during the Carter Administration?

Ready? It was very simple, and at the time everybody thought it very appropriate. The Department of Energy (located appropriately at 1000 Independence Ave) was instituted 8-04-1977 to LESSEN OUR DEPENDENCE ON FOREIGN OIL. HEY, PRETTY EFFICIENT, HUH?

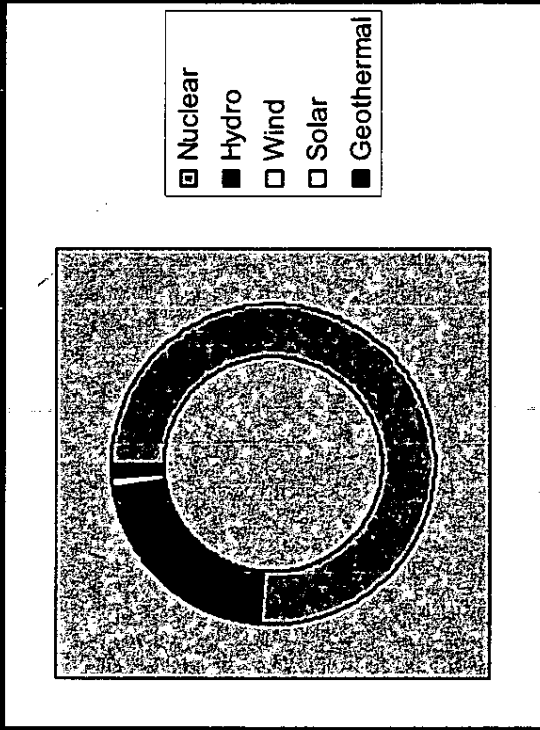
And now it's 2008, 31 years later, and the budget for this necessary department is at \$24.2 billion a year, they have 16,000 federal employees, and approximately 100,000 contract employees and look at the job they have done!

- This is where you slap your forehead and say 'what was I thinking?'

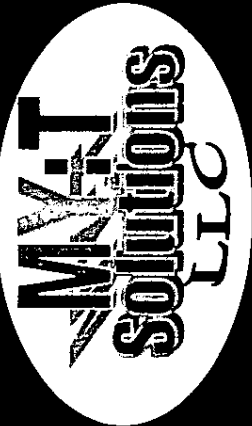
Emission Free Energy in the United States



Nuclear	Hydro	Wind	Solar	Geothermal
76.20%	21.60%	0.70%	0.10%	1.40%



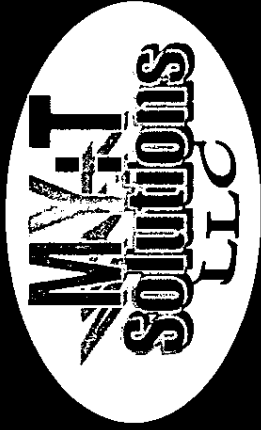
Energy Crisis



- National security; we are too dependent on foreign oil,
- Cost; the cost of energy is driving up the cost of living and damaging the economy,
- Carbon footprint; too much of energy use involves the use of hydrocarbons,
- Over consumption; Americans use too much energy and need to conserve.

Potential Solutions:

- Natural Gas
- Lower demand
- Wind and Solar energy production
- Geothermal
- Offshore Drilling/ANWR
- Nuclear power generation
- Nuclear hydrogen generation
- Coal to Liquids
- Biomass
- Hydroelectric



Toshiba 4S Project

☺ Thank You

Marvin Yoder

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