HB

56

Alaska State Legislature

House of Representatives

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Representative Harry Crawford
District 21

SPONSOR STATEMENT FOR HB 56

House Bill 56 establishes a hydrogen energy partnership within the Department of Community and Economic Development. The partnership is tasked with facilitating the development of a hydrogen fuel industry in Alaska.

Hawaii has already established a similar commission in preparation for potentially using their geothermal energy resource for producing hydrogen for dispersal throughout the Pacific Rim. If Alaska is going to remain competitive in the field of energy in the United States and throughout the world, we must prepare for the possibility that hydrogen will become a viable fuel.

House Bill 56 addresses this eventuality and establishes the structure necessary for the State of Alaska to accept funding for a hydrogen project in the state.

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MEMORANDUM January 17, 2007

SUBJECT: Section Summary of HB 56 (Work Order No. 25-LS0291)

TO: Representative Harry Crawford

FROM: Brian J. Kane BJK
Legislative Counsel

You have requested a sectional summary of HB 56, a bill establishing the Hydrogen Energy Partnership in the Department of Commerce, Community, and Economic Development; requiring the commissioner of Commerce, Community, and Economic Development to seek public and private funding for the partnership.

Please note that a sectional summary of a bill is not an authoritative interpretation of a bill. The bill itself is the best statement of its contents.

Section 1 of the bill lists the legislative findings regarding hydrogen research.

Section 2 of the bill establishes the Hydrogen Energy Partnership in the Department of Commerce, Community, and Economic Development (DCCED) and lists the entities that will be represented in the partnership. Subsection (c) states that the members will serve without compensation but will receive travel expenses and a per diem. Subsection (d) states the means by which the partnership will facilitate the development of a hydrogen fuel industry in Alaska.

Section 3 of the bill amends AS 44.33.020(a) by adding a paragraph relating to the department's obligation to provide staff support for the Hydrogen Energy Partnership and to the assistance to be provided by the University of Alaska.

Section 4 of the bill states that the commissioner of DCCED shall seek funding from federal and private sources for the costs of establishing and operating the partnership.

Section 5 of the bill states that sections 2 and 3 of the bill only take effect if sufficient funding is obtained.

Sections 6 and 7 of this bill state that if sections 2 and 3 have not taken effect by June 30, 2012, then sections 1 - 5 and 8 of the bill are repealed.

Section 8 of this bill states that sections 2 and 3 of the bill will take effect 30 days after the commissioner of DCCED informs the revisor of statutes that funding has been obtained.

Section 9 of this bill provides an immediate effective date for the provisions in the bill directing the commissioner to seek funding to make the part ership operative.

BJK:ljw
07-015.ljw

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Hawaii Hydrogen Partnerships

In 2000 the Hawaii Legislature passed a joint House-Senate resolution tasking the Department of Business, Economic Development & Tourism (DBEDT) to conduct a feasibility study to assess the potential for large-scale use of hydrogen, fuel cells, and renewable energy in Hawaii. HNEI, in collaboration with Sentech Inc., presented preliminary results to the Legislature in January 2001. The final report, " Nurturing a Clean Energy Future in Hawaii: Assessing the Feasibility of the Large-Scale Utilization of Hydrogen and Fuel Cells in Hawaii," was completed in June 2001. In addition to identifying areas where hydrogen and fuel cells have the potential to contribute to Hawaii's energy mix, the study recommended the development of public-private partnerships to develop the necessary hydrogen infrastructure. The means to move forward with these partnerships was benefited by the passage of Act 283 by the 2001 Legislature, providing initial funding for the development of hydrogen partnerships in Hawaii.

HNEI, in collaboration with our state energy office (DBEDT) and other government and industrial partners, has made significant progress in identifying projects and partnerships to move forward with the development of hydrogen infrastructure in Hawaii. Partnerships will involve relationships with UTC Fuel Cells, Stuart Energy Systems, Hawaiian Electric Company, Hawaii Electric Light Company, Sentech, Inc., The Gas Company, Sunline Services Group, the California Energy Commission, and National Renewable Energy Laboratory. Initial successes include the selection of the Hydrogen Power Park proposal by the U.S. DOE for funding under the State Energy Partnership program. Another partnering project under development is the Photovoltaic Energy Park. In August 2002, a Hydrogen Partnering Meeting, attended by DOD, DOE, industry, and local utilities, was held on the Big Island to provide additional focus and coordination. The partners are actively seeking several multimillion-dollar systems application projects in the areas of hydrogen, fuel cells, and renewable energy. These projects are designed to take advantage of Hawaii's unique energy situation, including a vast array of potential renewable energy resources and high costs for conventional energy. Generous State of Hawaii research and development tax incentives contribute to the positive climate for developing new energy technologies and products.

Hydrogen Power Park

The Hydrogen Power Park is an effort to bring hydrogen systems into the marketplace by establishing a hydrogen infrastructure and concurrently advancing the goals of the U.S. Department of Energy's (DOE's) hydrogen program. Project plans call for deployment and demonstration of an integrated system comprising electrolysis for hydrogen production, hydrogen storage, and a 50 to 75kW grid-connected fuel cell. Phase 1A has already been funded for $150,000 and will involve design of the hydrogen production and storage infrastructure. Phase 1B will focus on installation of the hydrogen production and storage systems, and the second phase will combine a fuel cell with these systems.

The project is slated to be located on one of the Hawaiian Islands, where a

renewable energy source would be used for hydrogen production. The entire system will be portable, so it can be tested in various sites on the original island or transported to other islands. Later phases will consist of experiments for system optimization, market development activities, and expansion of the state's hydrogen outreach and education efforts.

Participants include local and national industry and government partners, including the California Energy Commission, Stuart Energy Systems, Sentech, Inc., SunLine Services Group, UTC Fuel Cells, The Gas Company, Hawaiian Electric Company, and Hawaiian Electric Light Company. Funded by DOE under the State Energy Partnership Program, the Hawaii Department of Business, Economic Development & Tourism serves as the lead agency with HNEI serving as the implementing partner and providing technical coordination and support.

Contact: Richard E. Rocheleau, HNEI Director

Photovoltaic Energy Park

HNEI is joining the Hawaiian Electric Company, the Office of Naval Research, and Navy Hawaii to develop a photovoltaic (PV) energy park. Initial plans call for development of a 200-kilowatt solar-powered generation system. The Navy selected a 34.5-acre plot in the Ewa plains as the potential site, one large enough to accommodate a 2-3 megawatt, utility-scale PV facility. Future efforts will seek to develop related hydrogen and fuel cell projects.

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Key text

Which way ahead for hydrogen cars?

Published by Australian Academy of Science

Sponsored by Commonwealth Foundation

Rising petrol prices and diminishing oil supplies may drive motorists to demand alternative forms of fuel – such as hydrogen.

BACK TO BASICS

You will get more from this topic if you have mastered the basics of energy – this link will take you to an annotated list of sites with helpful background information.

Printer-friendly version of complete topic

Competitors in the men's and women's marathons at the 2000 Sydney Olympics had an exciting glimpse of the future. The pace vehicle that led them round the 42-kilometre circuit looked like a typical family wagon, but looks were deceptive. Under the bonnet was a stack of fuel cells, not an internal combustion engine. And as the car glided silently forward it emitted no smelly fumes or greenhouse gases – just a little water vapour.

The car was powered by hydrogen, the simplest and most abundant of all chemical elements. The fuel cells under the bonnet converted the hydrogen directly into electricity.

Many experts think hydrogen will replace petrol, diesel and natural gas as the main fuel for cars, buses and trucks over the next few decades. Already car manufacturers around the world have invested billions of dollars in research and development.

The advantages of hydrogen are enormous: no more smog-forming exhaust gases, no more carbon dioxide emissions that contribute to global warming, no more worries about diminishing oil supplies and rising prices.

But some tricky questions need to be answered before mass-produced hydrogen cars start appearing on the streets:

- Where will the hydrogen come from?
- How will motorists fill up?
- How will cars store the fuel?

And there's also the question of how best to tap the energy in the fuel for

good on-road performance.

The choice – combustion or fuel cells?

Two kinds of engines can use hydrogen as a fuel – those that have an internal combustion engine converted to use hydrogen and those that are made up of a stack of fuel cells.

Internal combustion engines

Internal combustion engines have powered cars since they first began to replace horse-drawn carriages more than 100 years ago. These engines can be converted to run on a variety of fuels, including hydrogen. When hydrogen burns, the only by-product is water – not the polluting cocktail given off by burning petrol and other fossil fuels.

BMW successfully demonstrated this technology in a fleet of 15 sedans used to ferry people to and from EXPO 2000, the world fair in Hanover, Germany. The fact that no major changes need to be made to the basic internal combustion engine design is a major attraction.

Fuel cell engines

However, most car makers think that fuel cells powering an electric motor offer a better alternative. Electric cars are hardly a new idea, but the need to recharge heavy stacks of batteries after relatively short journeys has stopped them becoming popular. Now fuel cells have made electric cars practical.

Unlike batteries, which store electricity, fuel cells make electricity as they go. Recent developments in technology have greatly increased the amount of power that a stack of cells – small enough to fit under a car's bonnet – can provide. This has opened up the prospect of non-polluting electric cars with the levels of performance we expect from conventional vehicles.

Fuel cell technology sounds simple. The hydrogen fuel reacts with oxygen from the air to produce water and electricity – the reverse of the familiar electrolysis process that releases oxygen and hydrogen from water. In reality it's much more complicated. Box 1 outlines how fuel cells will power our cars.

The big advantage of a fuel cell engine over an internal combustion engine running on hydrogen is its greater efficiency. The same amount of hydrogen will take a fuel cell car at least twice as far as one with a converted internal combustion engine.

Fill 'er up please

Hydrogen has many advantages as a fuel for vehicles, but a big disadvantage is that it is difficult to store. This is because at normal temperatures hydrogen is a gas. The hydrogen must be packed tightly into a car's tank, otherwise a filling stop will be needed every few kilometres.

The obvious solution is to strongly compress the hydrogen, or liquefy it. However, large amounts of energy are needed for this – an estimated 20–40 per cent of the energy content of the fuel. Also, tanks designed to hold hydrogen at extremely high pressures, or at temperatures approaching absolute zero, are heavy and expensive.

A futuristic filling station kept EXPO 2000's fleet of converted BMWs running. Drivers pulled up at the pump, pressed a button on their dashboard, and watched from inside the car as a laser-guided robotic arm connected the store of liquid hydrogen to their tank. Filling took about 3 minutes. It was wise to keep well out of the way – at minus 253°C, liquid hydrogen is unimaginably cold.

The special insulated tanks in the BMWs held 140 litres of hydrogen, enough to drive at least 300 kilometres. (That's a reasonable range, although a 95 litre tank of petrol would take the same cars twice as far.) The hydrogen-powered marathon car at the Sydney Olympics also ran on liquid hydrogen. Its much smaller tank (75 litres) gave it a range of about 400 kilometres, a sign of the greater efficiency of fuel cell cars.

High cost and the large amount of energy needed to liquefy the fuel are likely to be the main problems with refuelling with liquid hydrogen. Filling up with compressed hydrogen gas will probably prove more practical, even though it may reduce the distance between fills. Cars could store the hydrogen in high pressure tanks similar to those used for compressed natural gas. Or, if current research proves successful, some high-tech alternatives could be employed.

Scientists have found that various metals can absorb up to a thousand times their own volume of hydrogen gas. Specially treated carbon may also hold large amounts. These discoveries could shape the fuel tanks of the future (Box 2).

But where will the hydrogen come from?

There's no risk that we'll ever run out of hydrogen, it's by far the most plentiful element in the universe. On Earth, however, it exists naturally only

in chemical compounds, not as hydrogen gas. Water and the main components of coal, oil and natural gas are prime examples of these compounds.

Natural gas currently provides most of the hydrogen used in industry. The relatively simple technology employed – **steam reforming** – could also produce hydrogen gas for cars at central plants or filling stations. Alternatively fuel tanks could be filled with petrol or methanol, with the cars using on-board 'reformers' to generate hydrogen for their fuel cells. This shows promise as a transitional measure while research proceeds on the problems of storing hydrogen.

In steam reforming the hydrocarbon fuel reacts with water at high temperatures to produce hydrogen gas. A major drawback is that carbon dioxide and smog-causing gases such as nitrogen oxides are given off too, although emissions per kilometre of car travel would be less than from petrol-burning vehicles.

An alternative approach now under development, **autoreforming**, should increase the attractiveness of on-board hydrogen production. Use of a catalyst will allow the reforming to occur at much lower temperatures – too low for the production of nitrogen oxides.

Water is the only potentially pollution-free source of hydrogen. Researchers are looking at new ways of producing hydrogen – using algae, bacteria or photovoltaic cells to absorb sunlight and split water into hydrogen and oxygen. But the technology most likely to be adopted on a large scale is electrolysis, which uses an electric current to split water into oxygen and hydrogen.

Is it safe?

'Remember the Hindenburg' – that's a phrase often heard when hydrogen is discussed. This German passenger airship, kept aloft by hydrogen, crashed in flames as it came in to land at Lakehurst, New Jersey, USA in May 1937. Thirty-five people died. Nowadays helium, which can't burn, is the gas of choice for lighter-than-air craft.

Hydrogen is highly flammable, but recent research has indicated that the airship's fabric, not hydrogen, was the culprit in the Hindenburg disaster. Properly handled, there's no reason to think hydrogen is any more dangerous as a fuel than petrol, the explosive liquid now carried safely in the tanks of untold millions of motor vehicles.

Looking forward

Recent technological advances, particularly in fuel cell design, have made hydrogen-powered cars a practical proposition, and car makers expect to start mass-producing them within the next decade or so. Their power and acceleration should match those of today's petrol-powered vehicles, but they may have to be refuelled more often.

The best ways to produce, distribute and store the hydrogen still have to be sorted out. In the short term fossil fuels may remain in demand as a hydrogen source. However, the idea that in the not too distant future most of us will be driving non-polluting cars fuelled by hydrogen from a clean, renewable source is no longer a flight of fantasy.

Boxes

1. Plenty of power from fuel cells

2. Alternative hydrogen storage systems

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Hydrogen Cars May Hit Showrooms by 2005

Janet Ginsburg
for National Geographic Today
January 29, 2003 (Originally published on October 16, 2001)

Viewers of National Geographic Today *in the United States can watch an update on hydrogen-car technology in tonight's broadcast, which follows yesterday's announcement by President Bush that he proposes U.S. $1.2 billion in funding for this research over the next few years.*

In the clean, "green" future envisioned by energy expert Amory Lovins, cars not only get 99 miles per gallon emissions-free, but they may also play a key role in providing electricity to a power-hungry world.

The solution, according to Lovins, is a "hypercar"—a lightweight vehicle powered by a hydrogen fuel cell, with enough style and space to compete with luxury sport utility vehicles (SUVs). Lovins is with the Rocky Mountain Institute, a think tank in Colorado, and chairman of its corporate spin-off venture Hypercar, Inc.,.

Some of the giant car companies are also designing hydrogen-powered cars. Hypercar Inc. hopes to have its first model

Future Tra

The Revolution, a lightw powered by a hydrogen fu as much as eight times as as most standard according to its d

Photograph Clasen/Hypercar I

National Geograph

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ready to roll off the production line by 2005.

Today, an estimated 210 million vehicles are stuck in traffic on America's roadways. Collectively they spew nearly a billion and a half tons of greenhouse gases into the atmosphere each year. According to a recent EPA report, the latest conventional models average a little more than 20 miles per gallon—the worst showing since 1980.

While some blame America's love affair with the fuel-hungry SUVs, Lovins says the problem comes down to design.

A decade ago, Lovins was asked to address a National Academy of Sciences meeting about how to build cars with greater fuel efficiency. The general thinking was that fuel efficiency could be increased by only 10 percent because otherwise the car would become too expensive, says Lovins.

He was unconvinced of that assertion, however, and set up an informal team to rethink the automobile from the tires up. "I'm not a car guy, which actually was a bit of an advantage because I didn't know too much about how it ought to be done," said Lovins.

The result is a car that is as much as eight times as efficient as most standard models.

Lightweight Parts, Heavy Results

How did the Lovins team do it? They began by "light-weighting" the car.

They started with the body, which is made from a composite of carbon fibers set in a plastic matrix. It's a stronger version of the material used in skis and tennis rackets—and, per pound, five times as strong as steel.

Although carbon composites are a lot more expensive than steel, a smaller quantity is needed. Even more important, Lovins pointed out, "it's cheaper to manufacture."

While the Hypercar weighs less than 2,000 pounds (907

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Hydrogen Safe
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kilograms), it is still tough enough to meet federal safety standards, based on a computer-simulated 30-miles-per-hour fixed barrier crash. In a cyber smash-up with a Ford Explorer—a vehicle twice the weight—all the damage to the Hypercar occurred in the front end.

There are other, less obvious, ways to lightweight. Special low-rolling resistance tires developed with Michelin, not only cut down on friction—which can use up to a third of a car's fuel energy—but are also designed to run flat. If a tire blows, the car can still be driven for another 100 miles, more than enough to get to a gas station. The need to carry a spare is eliminated, further reducing weight.

Soon the savings in weight starts to snowball. A lighter car requires a smaller engine to power it, less braking to stop it, and less suspension to hold it up. And because the Hypercar runs on an electricity-producing fuel cell rather than an internal combustion engine, certain parts, including the starter, alternator, clutch, and transmission, are eliminated.

"The car gets radically simplified. And then it costs less to make," said Lovins.

David Cole, president of the Center for Automotive Research in Ann Arbor, Michigan, said it's important to be cautious about expectations. "The potential on paper looks awfully good," he said. "But getting it into production—things don't necessarily turn out as you might expect."

"If you think of this as a ten-step program, the first step is showing technical feasibility," said Cole. "They still need to do this. Then it's nine more steps to commercial feasibility."

"Brains," Not Bulk

Brains replace bulk in a Hypercar. "Think of it like a computer with wheels, not a car with chips," Lovins explained.

The car can diagnose, upgrade, and, to a certain extent, fix itself. It can also be programmed for a variety of new features, such as recording everything that happened at the time of a

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crash, like an airplane's "black box."

Two years ago, Hypercar,Inc., was spun off from the Rocky Mountain Institute. The nine-person start-up team, based in Basalt, Colorado, intends to "create the DNA of the next generation of vehicles," according to Hypercar's Michael Brylawksi.

To do that, they're trying to sell not only the Hypercar itself, but also the ideas that make it run so efficiently—the "intellectual property." By working with automakers and suppliers, the company hopes to get the technologies on the road faster.

While none of its fuel-efficient, smart features are unique to Hypercar, what's special is how they're combined and optimized.

For example, at least half a dozen automakers, including Ford, Daimler-Chrysler, and BMW, are developing fuel cell-powered cars. But because those vehicles are still fairly heavy, they need fuel cells, which are about three times bigger and heavier—and three times more expensive—as that used by the Hypercar.

Cole thinks the Hypercar is "a huge step" in the right direction. "My guess is where they [Hypercar Inc.] would make the most contribution is in a few of the ideas," said Cole. "The real role of the Hypercar is unleashing the imagination—that's one of the real values of it."

Double Duty

Perhaps the biggest hurdle to overcome with fuel cell-powered cars is setting up a distribution network to supply the hydrogen gas that runs them.

A fuel cell works by combining hydrogen with oxygen from the air in a chemical process to generate electricity. The only by-products are heat and pure water. Hydrogen can be extracted from natural gas, using a device called a reformer, or through a process called "electrolysis," which splits water

into hydrogen and oxygen atoms.

While there are only a handful of hydrogen gas stations in the world, Lovins has a plan for making it easy to fill up. "Many people assume that before you can sell the first hydrogen car, you have to put in $100 billion worth of hydrogen generating and delivery stations and pipelines," said Lovins. "That's not correct."

He says the first Hypercars should be leased to people who work in buildings where fuel cells have already been installed. The Hypercars could tap into the buildings' supply of hydrogen to refuel. But they could also be hooked up to the grid.

As "portable power plants on wheels," the cars' fuel cells could be put to work during the day when they're parked, generating—and selling—electricity.

"It doesn't take many people wanting to be paid to park, rather than the other way around...to put the coal and nuclear people out of business," said Lovins. And of course, using fuel cells would dramatically decrease the need for oil.

Cole disagrees with Lovins' conclusions, arguing that the hydrogen infrastructure would take billions of dollars to establish. But he does support the direction of the project. "I say, 'More power to them.' My only reservation is to be careful about generating unrealistic expectations," he said.

"It does get people to think out of the box," said Cole. "You don't want to clamp down on these people who are dreaming at the edge."

Eventually, the Hypercar could change ideas about what people come to expect from automobiles. Fittingly, the first model to come off the drawing boards is called the Revolution.

Watch continued television coverage of this event on National Geographic Today, *only on the National Geographic Channel, at 7 p.m. ET/PT in the United States. Click here to request it.*

Related Websites

- Hypercar
- Rocky Mountain Institute

• National Hydrogen Association

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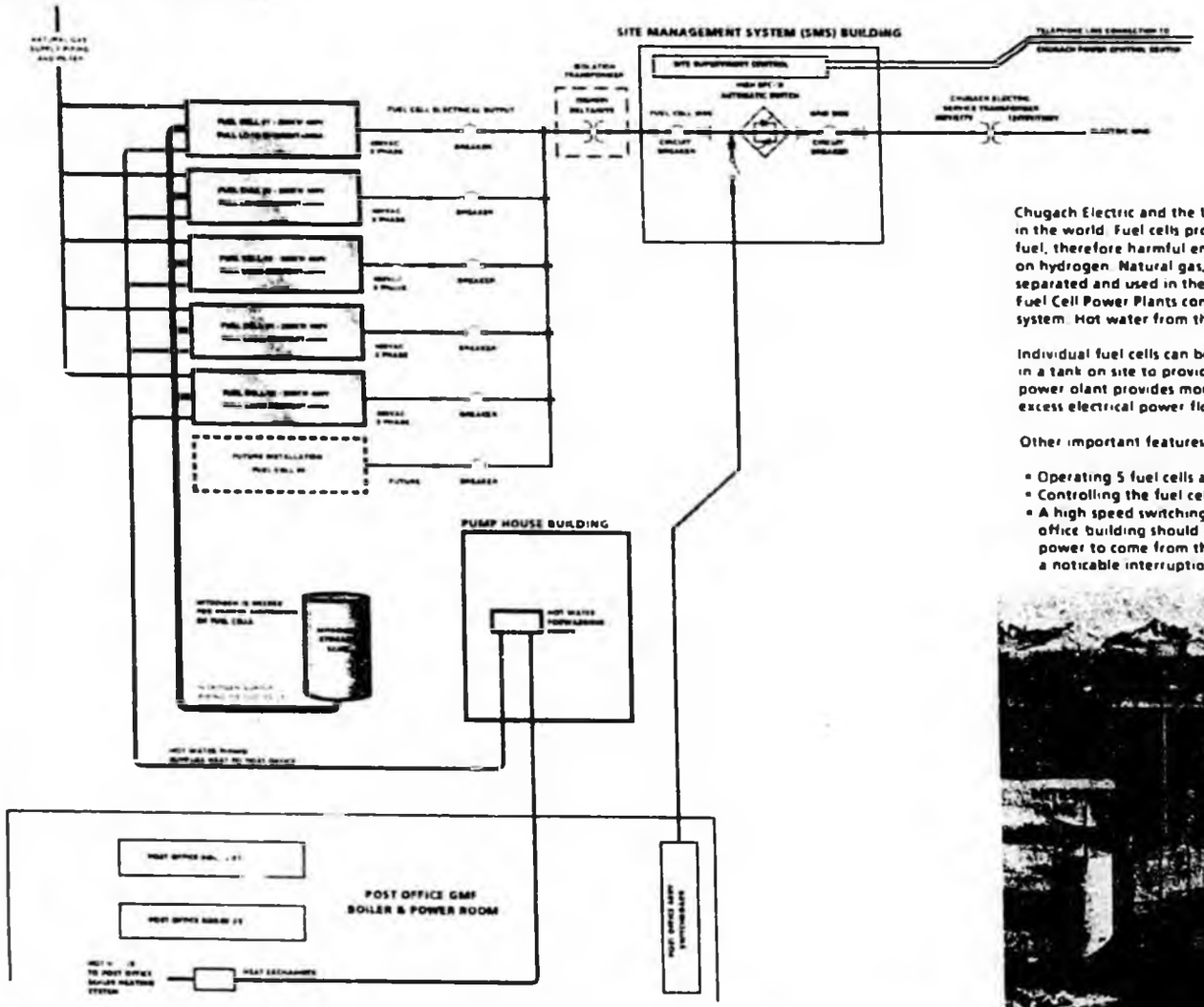
CHUGACH
POWERING ALASKA'S FUTURE
Chugach Electric Association, Inc.

1 Megawatt Fuel Cell Demonstration Project

Chugach Electric and US Postal Service

UNITED STATES POSTAL SERVICE.



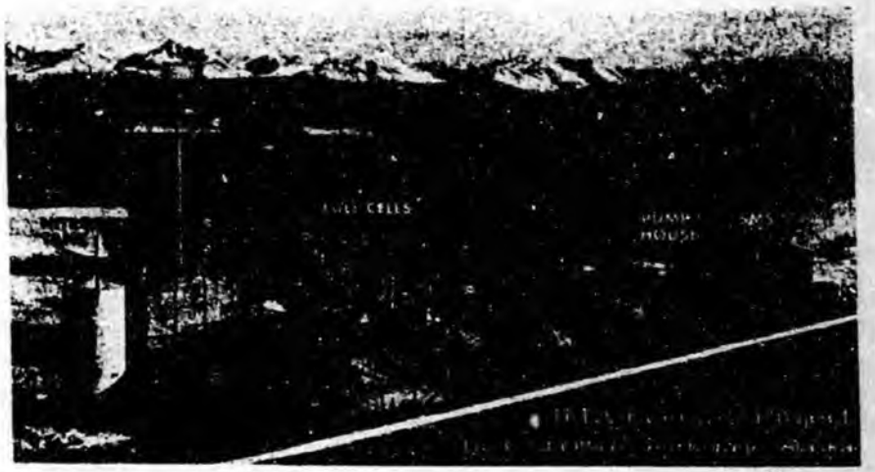
1 MW FUEL CELL PROJECT - JUNE 2000

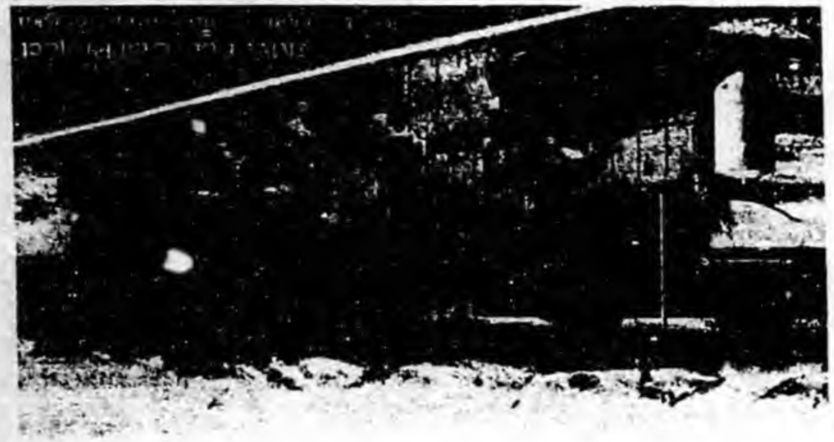
Chugach Electric and the US Postal Service have teamed to install one of the largest fuel cell projects in the world. Fuel cells produce electricity and heat with few moving parts and virtually no burning of fuel, therefore harmful emissions released into the atmosphere are very low. Fuel cells actually operate on hydrogen. Natural gas, a hydrogen rich fuel, is supplied to the fuel cells where the hydrogen is separated and used in the fuel cell process. This fuel cell system includes 5 IFC/ONSI PC25™ Model C Fuel Cell Power Plants connected to the Chugach electric grid and the post office 480V building power system. Hot water from the fuel cells is pumped to the post office building heating system.

Individual fuel cells can be isolated for maintenance one at a time. Nitrogen, an inert gas, is stored in a tank on site to provide proper shutdown of the fuel cells for maintenance. Currently the fuel cell power plant provides more electrical power than the Post Office general mail facility will use, so excess electrical power flows to the Chugach electric grid.

Other important features of this project include:

- Operating 5 fuel cells as a single unit
- Controlling the fuel cell power plant from Chugach's power control center
- A high speed switching system that allows the fuel cell power plant to continue to carry the post office building should grid power be unavailable. The high speed switching system allows electric power to come from the Chugach grid or from the fuel cell power plant seamlessly. That is, without a noticable interruption in power to the post office building.





Congratulations to the Sponsors of the Project:

- US DOD
- US DOE
- US Army Corps of Engineers, CERL
- US Postal Service
- Chugach Electric Association, Inc.
- Electric Power Research Institute
- NRECA, Cooperative Research Network

Suppliers:

- IFC / ONSI, supplier of fuel cells

Sub-Contractors to IFC / ONSI:

- Magnetek, supplier of fuel cell controller
- GE Zenith Controls, supplier of site control system
- PDI, supplier of static switch

Chugach Electric Association, Inc.

UNITED STATES POSTAL SERVICE

One Megawatt Fuel Cell Project

Anchorage, Alaska

One of the world's largest fuel cell projects is in operation in the service territory of Chugach Electric Association, Inc. The project is located at the US Postal Service general mail facility in Anchorage, Alaska. This project includes many features never offered in an onsite fuel cell system and required several years of significant effort on the part of the sponsors and engineers responsible for its development.

PC25™ Fuel Cell Power Plant Description

The PC25™ Model C is a packaged, self contained, 200 kW fuel cell power plant which operates unattended using pipeline natural gas fuel and provides on-site electricity and heat in connection with the utility grid.

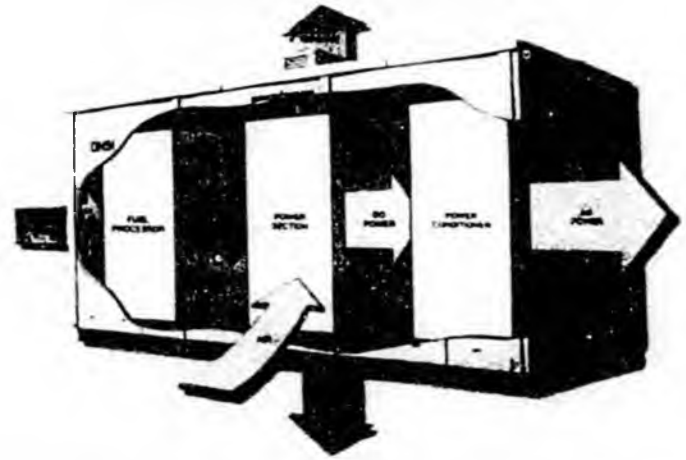
The power plant consists of three major subsystems:

1) The Fuel Processing section converts natural gas into a hydrogen rich fuel gas. The process, known as steam reforming, passes a mixture of natural gas and steam through a heated catalyst bed that promotes the reaction to hydrogen. Hydrogen is the actual fuel source used by the fuel cells.

2) The Power Section is where the fuel cell reaction occurs, similar to that in a battery. The process reacts hydrogen atoms from the fuel gas and oxygen atoms from air to produce electricity and pure water. This direct, electrochemical conversion of energy generates electricity without combustion and is clean, quiet and efficient.

3) The Power Conditioner converts the direct current (DC) power from the power section to regulated, three phase, AC power. This conversion process uses solid state DC to AC inverters to provide high quality AC power output suitable for use in typical commercial and industrial buildings, including electronic computer equipment power loads.

Basic Fuel Cell Schematic



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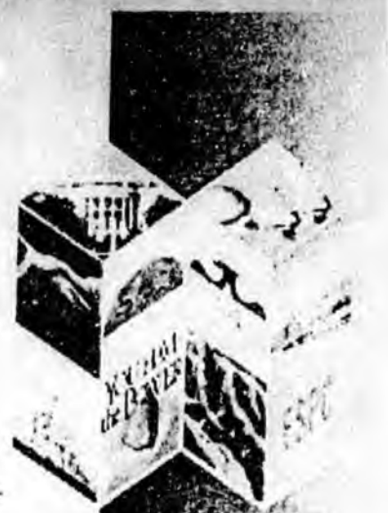
Fuel Cells Provide Reliable Power to U.S. Postal Service Facility in Anchorage, Alaska

Combined heat and power project provides reliable power at reduced cost



Combined Heat and Power

Case Study

Overview

Working together, the U.S. Postal Service (USPS) and Chugach Electric Association, partnering with the Department of Defense (DOD), Department of Energy (DOE), US Army Corps of Engineers Construction Engineering Research Laboratories (USA CERL), Electric Power Research Institute (EPRI), and National Rural Electric Cooperative Association (NRECA), developed and installed one of the largest fuel cell installations in the world.

The one-megawatt fuel cell combined heat and power plant sits behind the Anchorage U.S. Postal Service Mail Processing and Distribution Facility. Chugach Electric owns, operates, and maintains the fuel cell power plant, which provides clean, reliable power to the USPS facility. In addition, heat recovered from the fuel cells, in the form of hot water, is used to heat the USPS Mail Processing and Distribution Facility. By taking a leadership role, the USPS will save over $800,000 in electricity and natural gas costs over the 5½-year contract term with Chugach Electric

> **"Fuel cells solved a handful of problems."**
>
> ***—Cathe Grosshandler, Alaska District Environmental Coordinator, U.S. Postal Service***

Background

The U.S. Postal Service Mail Processing and Distribution Facility, adjacent to the Anchorage International Airport, serves as the postal hub for all of Alaska. The facility processes, on average, over one million pieces of mail every day, operating 24 hours per day, 365 days per year. Annual energy costs for the 270,000-square-foot facility exceeded $300,000 for electricity and $35,000 for natural gas.

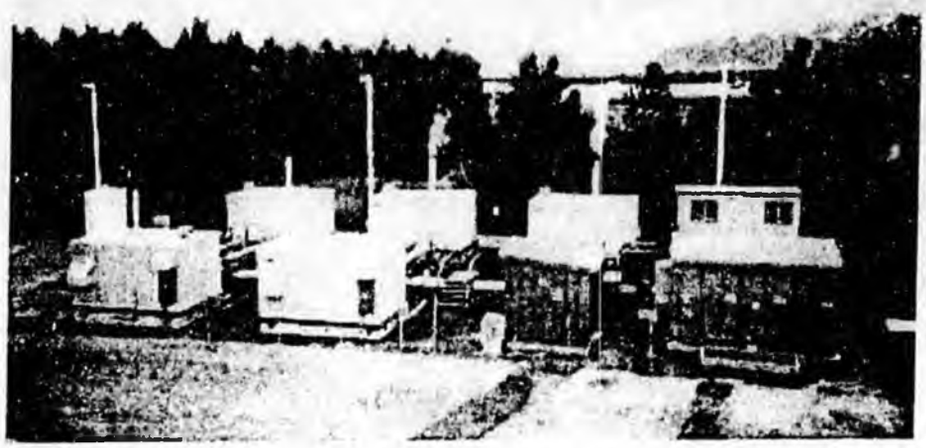
The facility faced a series of issues that needed to be addressed. To meet new environmental codes, the facility needed to upgrade an existing underground fuel oil tank serving the facility's 600-kW emergency generator. As a result of an expansion to the facility and adding new optical mail processing equipment, the facility's peak electric demand had grown larger than the existing emergency generator could support. Upgrades were also needed to the UPS (uninterruptible power supply). In addition, the two 80-horsepower boilers (2,700,000 Btu/h), which heat the facility, also needed some improvements.

The Mail Processing and Distribution Facility, adjacent to the Anchorage International Airport, is key to the Alaska hub system.

Rather than solving each issue separately, the District Environmental Coordinator wanted a comprehensive solution. The answer seemed to lie in a highly reliable, highly efficient combined heat and power plant.

Project Summary

Initially, a combined heat and power plant using natural gas engine generators was proposed. However, after attending a local energy technology show, the USPS began to consider fuel cells. By coincidence Chugach Electric Association, the serving electric utility, was developing expertise in fuel cell technology and supported the USPS interest in the emerging technology.



Set against the Chugach Mountains, five fuel cells supply reliable and clean power to the USPS facility.

Fuel cells produce electricity through an electrochemical reaction rather than combustion. While more expensive than conventional power generating equipment, fuel cells provide efficient, reliable power with minimal emissions. (For more information on fuel cells, see FEMP's Federal Technology Alert, "Natural Gas Fuel Cells," at http://www.eren.doe.gov/femp/prodtech/fed_techalert.html.)

To increase overall reliability, the combined heat and power plant consists of five fuel cells with room for a future sixth unit. Thus, the system can meet the facility's peak 800-kW demand even when one fuel cell is off-line. The resulting one-megawatt (1,000-kW) combined heat and power plant consists of five fuel cells, a nitrogen tank, heat recovery equipment, a pump house, and the site management system (SMS).

The fuel cells, manufactured by International Fuel Cells, Inc. (formerly ONSI), are rated at 200 kW each and are fueled by natural gas. Nitrogen is used to purge the fuel cells during startup and shutdown cycles. The pump house is used to move the heat generated by the fuel cells to either the facility for space heating or to the cooling modules, where the excess heat is rejected.

What makes the system a success is the site management system. The SMS includes fuel cell load control, grid interconnection, and a high-speed switching system. The SMS allows the multiple fuel cell system to transfer between grid-parallel and grid-independent in under 4 milliseconds (¼ cycle in a 60-Hz system), fast enough that the highly sensitive computer systems in the USPS facility are not interrupted by the transfer. Normally, the fuel cells operate in parallel with the Chugach electric grid. Excess power generated by the fuel cells flows out into the Chugach grid. However, in the case of a grid outage, the SMS identifies the outage, isolates the USPS facility from the grid and allows the fuel cells to transfer to grid-independent mode seamlessly. The SMS was developed under this project but is now commercially available and being specified for use in other fuel cell power systems.

The entire project cost $5.5 million, including the research and development for the SMS. Funding for the project came from the many partners involved in the effort. What made the project work economically for the U.S. Postal Service is a special contract between the USPS and Chugach Electric. Chugach Electric owns, operates, and maintains the fuel cell power plant, which is located on the USPS property. The plant is remotely operated by Chugach Electric. The only cost to the USPS was the $1 million up-front cost as part of a 5½-year contract for baseline electrical service. In return, Chugach Electric provides electricity to the mail processing facility for the 5½-year term. If electricity requirements at the USPS facility grow above the set baseline, which the USPS believes is unlikely, additional electricity is purchased at standard rates.

In addition, the USPS facility owns the use of the heat recovered from the fuel cells. Heat energy from the fuel cells is available in the form of hot water at two temperatures: 240°F and 140°F. At this time, the higher temperature water is used for heating the facility. The lower temperature heat is rejected through the cooling modules.

Benefits

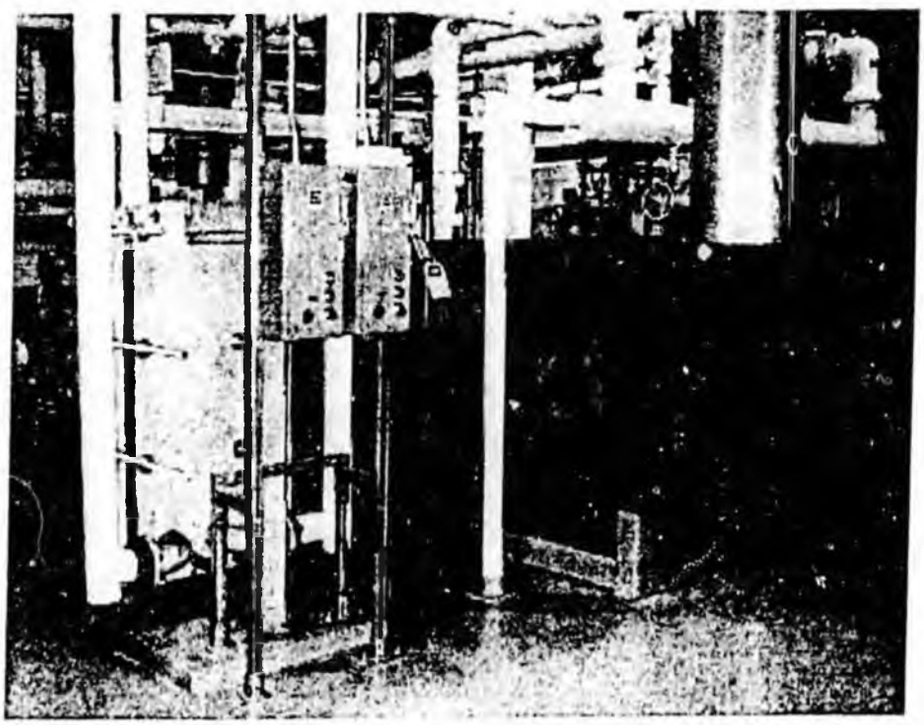
The fuel cell CHP plant provides a number of benefits to the USPS. The most significant benefit has been the increased reliability of electric service.

Restarting the mail processing equipment after a power outage requires a significant level of effort. The increased reliability results in fewer power outages, thereby avoiding unscheduled shutdowns and restarts. The fuel cell and SMS have worked flawlessly since commissioned. In fact, the week before Christmas, on one of the busiest days of the year, construction at the airport caused a local power outage. The entire area was without power for over 4 hours. All, except the U.S. Postal Service, that is. The SMS system automatically switched the facility to operate grid-independent with no interruption. The USPS facility went on to set records, processing over 1.4 million letters and parcels that day, while the neighbors were sitting in the dark.

While the combined heat and power project does not reduce electricity consumption at the USPS facility, it does significantly reduce USPS energy costs. The contract between the USPS and Chugach Electric provides baseline electrical service to the USPS facility for 5½ years at a cost of $1 million. Previously, electricity for the USPS facility averaged over $300,000 per year.

Heat recovered from the fuel cells is being used for space heating in the mail processing facility, thereby displacing the load on the original boiler heating system. In fact, savings have exceeded the original estimate. Initially, it was determined that the fuel cell heat energy could meet around 50% of the total facility space heating needs. During the first year of operation, the heat recovered has satisfied all the space heating needs. Although the winter of 2000-2001 was milder than average, heat recovered from the fuel cells has exceeded expectations.

Some capital cost reductions were also achieved. The demonstrated reliability of the fuel cell and site management system has eliminated the need to upgrade the existing emergency generator. However, the old 1000-gallon, single-wall, below-grade fuel oil tank still needed to be replaced. A new dual-wall, 500-gallon, above-ground fuel oil tank was determined to be sufficient because of the increased reliability of the new power supply system. In addition to the cost reduction from the less expensive, smaller tank, the environmental code features were also less expensive for the smaller tank size. Avoiding the need to upgrade the emergency generator and installing a smaller fuel oil tank saved the USPS an estimated $500,000 in capital costs.



Heat recovered from the fuel cells offsets heat supplied by the boiler system. The boilers were not needed during the winter of 2000-2001.

Lessons Learned

The USPS recommends that any site thinking about a similar project should consider the following:

- Projects of this nature require "champions." Each of the parties involved in the project recognized the value of local champions who could think outside the box, overcome barriers, and push the project through.
- Consult with the local utility, DOE regional office, and other organizations to investigate potential partnerships. Both the USPS and Chugach Electric Association believe a more effective solution was achieved as a result of the partnership.
- Take a holistic approach to solving facility needs. The USPS had to address a series of issues. Although each facility need could have been solved individually, the fuel cell combined heat and power plant solved several of the needs simultaneously and at a lower cost.

Being the largest fuel cell installation of its time made this a distinctive installation. However, it will not remain unique. The development of the SMS will lead to more multi-unit fuel cell power plants with high-speed reliability.

Looking Ahead

The USPS facility is looking for additional uses for the heat recovered from the fuel cells. While the high temperature heat recovered is perfect for space heating, there is still significant heat energy available at 140°F, which has yet to be utilized. The USPS is still investigating several potential uses for this valuable heat energy.

The SMS has additional capabilities that the USPS may use in the future. In addition to controlling fuel cell operation, the SMS is also capable of controlling peak electrical demand through load shedding. This feature could be used to prevent overloading the power plant when the electric grid is down and the fuel cells are operating independent of the electric grid. The ability to load shed while operating grid-independent could prevent a shutdown of the fuel cell power plant as a result of an overload condition.

At the end of the contract period, the USPS and Chugach Electric will renegotiate the future of the fuel cell combined heat and power plant. No one knows what the future may bring, but all agree the project has been a success.

For More Info

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Produced for the U.S.
of Energy (DOE) by
Northwest Nation

PNNL-SA-35038

February 2002

D. Recommendations

1. Workforce

Provide proper and focused workforce training to meet the challenges of 21st century energy industries.

Executive:

Perform an assessment of the opportunities for Alaska workers in the resource development and energy sectors and, based upon these opportunities, examine the deployment of a portion of Alaska's resources toward training and retraining of the workforce in these sectors.

Amend Department of Labor/Workforce Development (DOL/WD) regulations to facilitate the ability to develop training and internship programs, with an emphasis on jobs for Alaskans.

Fund education to ensure that Alaska workers have the education and skills required to maintain the vital role energy plays in our economy.

Update certificate of fitness requirements for utility linemen to enhance workforce availability and better track the successful practices of the other 49 states.

Ensure that Alaska workforce regulatory practices conform to national practices.

Private Sector:

Work with the DOL/WD in its assessment of opportunities for the Alaska workforce in the energy and utility sectors.

Maximize internship programs that will allow entry into the Alaskan workforce.

Encourage development of new energy and energy related businesses in Alaska.

2. Energy Generation

Alaska must be active in its pursuit of improving existing technologies and developing new generation technologies to increase efficiencies of present and future energy generation facilities.

Assist the private sector in its efforts to develop energy generation capacity

Executive:

Enhance the ability of public bodies, such as the Denali Commission and the Alaska Energy Authority (AEA), to assist the private sector and communities in efforts to develop adequate energy generation capacity, funded through conduit bonds and grants, to provide cost-effective electricity for all Alaskans.

Explore utilization of Alaska's abundant renewable resources in the production of hydrogen, which is a fuel for the emerging fuel cell technology

Executive:

Convene a workshop to discuss the potential for Alaska's leadership in hydrogen production. Such a workshop could serve as an educational tool and a platform for discussion between public, university research and private sector individuals and organizations.

Direct the University of Alaska and executive agencies to inventory ideal locations for future renewable energy generation sites that could be used as a source of hydrogen for in-state use and export.

3. Energy Infrastructure

The Task Force's goals and strategies focused on matters including, but not limited to: (1) generation infrastructure; (2) transmission and distribution; and (3) economic efficiency. As the electrical system ages, there will be increased concerns about reliability, sustainability and stability. Technology-driven system improvements will be required. There must exist within the State the capacity to deliver resources and energy to end-users.

Stimulate private-sector participation in Alaska's energy infrastructure to allow greater energy export capability to meet state, regional, and national energy demands.

Executive:

Provide tax-exempt bonding to fund projects, with the State retaining only the obligations that cannot be transferred to the participating utilities.

Work with Alaska's Congressional delegation to provide financing or economic incentives to promote energy infrastructure development.

Encourage adequate transmission infrastructure to increase economic development activity.

Conduct an assessment to identify the State's energy infrastructure security needs.

Executive:

The RCA should include in their deliberations the issue of cyber-security.

Private Sector:

Continue in the joint planning process to identify the State's energy infrastructure needs.

Encourage adequate and secure transmission infrastructure to increase economic development activity.

Continue to promote adequate fuel delivery infrastructure.

Assess the potential for the development of a locality into a sustainable energy community that utilizes novel distributed and/or renewable energy systems for residences and commercial enterprises.

Executive:

Examine the potential for the development of an Alaska locality into a sustainable energy community.

Legislative:

Examine opportunities to provide support for the development of such a community.

Alaska regional transmission planners should work to become leaders in energy infrastructure development.

Establish energy infrastructure development projects that will promote the reliable transportation of electricity throughout the entire State that meets the State's energy, environmental and economic needs.

CSHB 56 (CRA) 2.15.07

Revised by Bill Leighty, The Leighty Foundation, 15 Feb 07

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HOUSE BILL NO. 56

IN THE LEGISLATURE OF THE STATE OF ALASKA
TWENTY-FIFTH LEGISLATURE - FIRST SESSION
BY REPRESENTATIVES CRAWFORD AND DOLL, Nelson, Gara

Introduced: 1/16/07
Referred: Community and Regional Affairs, Resources, Finance

A BILL FOR AN ACT ENTITLED
"An Act establishing the Hydrogen Energy Partnership in the Department of Commerce, Community, and Economic Development; requiring the commissioner of commerce, community, and economic development to seek public and private funding for the partnership; providing for the contingent repeal of an effective date; and providing for an effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:
* Section 1. The uncodified law of the State of Alaska is amended by adding a new section to read:

LEGISLATIVE FINDINGS. The legislature finds that

(1) scientists recognize hydrogen as a potentially-useful energy carrier and energy storage medium;

Deleted: potential source of fuel;

(2) with further research and development, hydrogen could competitively serve as an alternative fuel for vehicles and for generating electricity;

Deleted: source of energy for fueling

Deleted:

(3) if the hydrogen is produced from renewable, non-carbon-emitting, energy sources it eliminates greenhouse gas emissions and helps reduce dangerous rapid climate change from global warming;

Deleted: ¶

(4) there is significant federal government and private sector investment in hydrogen research and development programs; and

Deleted: 3

(5) Alaska is an excellent site to attract federal government and industry investment in hydrogen because of the following advantages:

Deleted: 4

(A) the availability of indigenous, large-scale, stranded, renewable energy resources, including sufficient geothermal energy for producing hydrogen at an industrial scale;

Deleted: ¶

Deleted: processing

(B) a source of zeolites for gaseous hydrogen storage; and

Deleted: and handling

(C) Alaska's location for export of hydrogen and valuable products produced from hydrogen, such as anhydrous ammonia (NH3) and Fischer-Tropsch Liquid (FTL) fuels, around the Pacific Rim;

Deleted: hydrogen transport

(6) with its traditional high fuel costs and significant, diverse, renewable energy resources, Alaska could attract advanced technology development companies for research and development, testing, and deployment of hydrogen and products produced from hydrogen; these factors can lead to the development of a hydrogen industry resulting in job growth and a more robust long-term state economy.

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* Sec. 2. AS 41.98 is amended by adding a new section to read:

Sec. 41.98.190. Hydrogen energy partnership. (a) There is established in the Department of Commerce, Community, and Economic Development the hydrogen energy partnership.

(b) Members of the partnership shall be appointed by the commissioner of commerce, community, and economic development to represent

(1) the federal government;
(2) state government;
(3) the University of Alaska;
(4) political subdivisions of the state;
(5) tribal organizations of the state;
(6) the electric utility industry;
(7) the fossil fuel industry;
(8) nonfossil fuel energy industry; and
(9) non-profit environmental conservation and protection groups.

Deleted: private

(c) The partnership members shall serve without compensation but are entitled to transportation expenses and per diem as authorized for members of boards and commissions under AS 39.20.180.

(d) The hydrogen energy partnership shall facilitate the development of a hydrogen fuel and hydrogen-source products industry, based on non-carbon-emitting energy sources, in Alaska by means including

(1) meeting with hydrogen energy interests to plan hydrogen energy research and development and demonstration projects;

(2) proposing policy to promote federal and private industry investment in hydrogen energy research and development and demonstration projects;

(3) evaluating the market for hydrogen energy and hydrogen-source products production, Alaska utilization, and export;

(4) proposing tax incentives for investment in a hydrogen energy infrastructure; and

(5) reporting annually to the legislature on or before the 20th day of each regular session on the development of hydrogen energy and hydrogen-source products production in the state.

* Sec. 3. AS 44.33.020(a) is amended by adding a new paragraph to read:
(45) provide staff support for the hydrogen energy partnership established under AS 41.98.190, and the University of Alaska shall provide assistance to the commissioner on request.

* Sec. 4. The uncodified law of the State of Alaska is amended by adding a new section to read:

FUNDING FOR HYDROGEN ENERGY PARTNERSHIP. The commissioner of commerce, community, and economic development shall seek federal and private sources of funding to cover the costs of the establishment of and operation of the hydrogen energy partnership established in sec. 2 of this Act.

* Sec. 5. The uncodified law of the State of Alaska is amended by adding a new section to read:

CONDITIONAL EFFECT. Sections 2 and 3 of this Act take effect only if the Department of Commerce, Community, and Economic Development obtains sufficient funding under sec. 4 of this Act.

* Sec. 6. If secs. 2 and 3 of this Act have not taken effect under sec. 5 of this Act by June 30, 2012, secs. 1, 2, 3, 4, and 5 of this Act are repealed June 30, 2012.

* Sec. 7. If secs. 2 and 3 of this Act have not taken effect under sec. 5 of this act by June 30, 2012, sec. 8 of this Act is repealed on June 30, 2012.

* Sec. 8. Sections 2 and 3 of this Act take effect 30 days after the commissioner of commerce, community, and economic development notifies the revisor of statutes that sufficient funding required under sec. 4 of this Act has been obtained.

* Sec. 9. Section 4 of this Act takes effect immediately under AS 01.10.070(c).

LARGE STRANDED RENEWABLES:

the International Renewable Hydrogen Transmission Demonstration Facility (IRHTDF)

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A pilot-scale gaseous hydrogen (GH2) transmission pipeline system optimized to bring large-scale, remote, diverse, dispersed, stranded, renewable resources to distant markets, in "renewables-hydrogen service"

- No pipelines for renewables-hydrogen service exist.
- Major new industrial processes require pilot plants like IRHTDF.
- Electricity lines and GH2 pipelines are comparable in capital and O&M cost.
- GH2 transmission provides valuable storage, in the pipeline and in geologic formations.
- New underground GH2 pipelines may be more secure, socially acceptable, permittable, and bankable than new overhead electric lines.

Global Energy Strategy Challenge

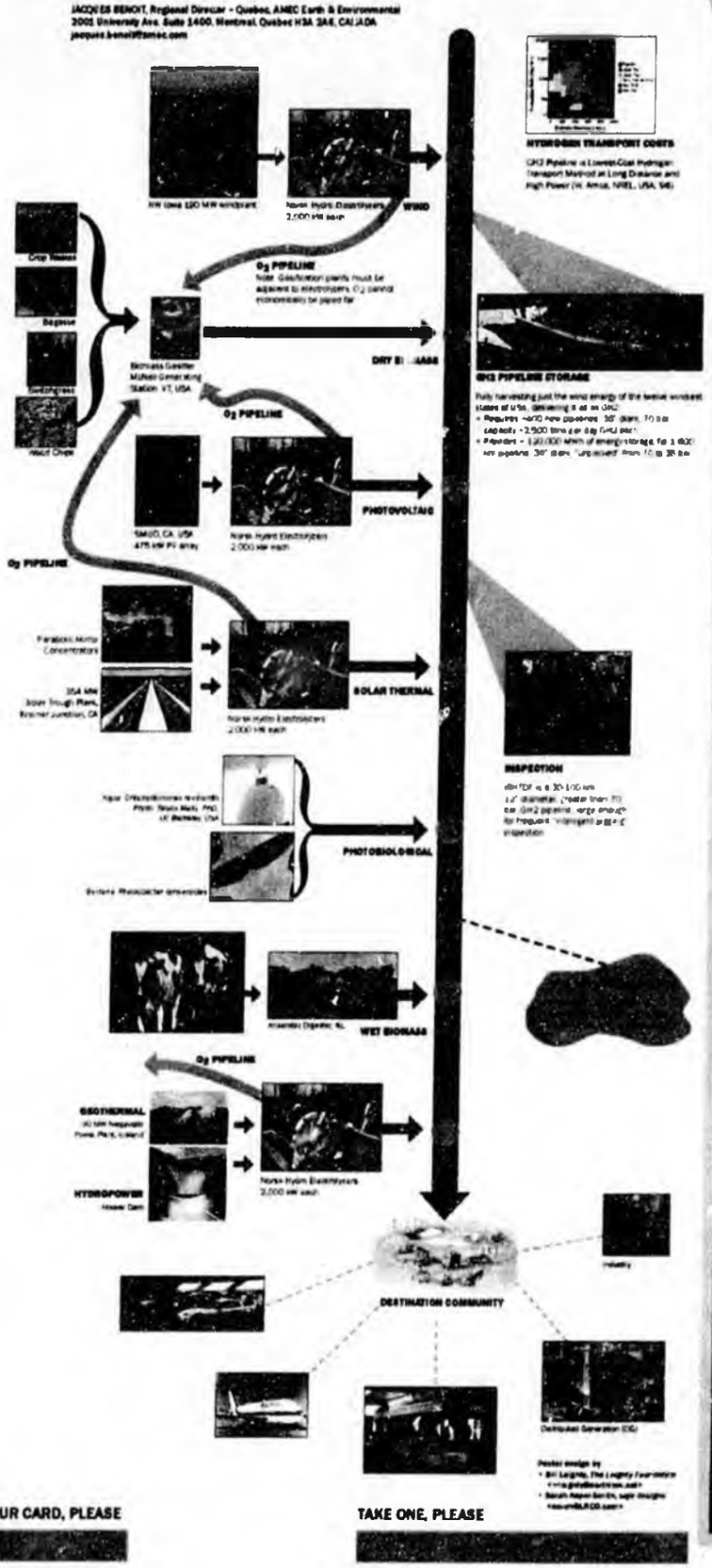
- How shall we bring Earth's large, stranded, renewable resources to distant markets? Transmission options for large-scale stranded renewables:
  - New high voltage direct current (HVDC) electric lines
  - New gaseous hydrogen (GH2) transmission pipelines
  - Synthetic liquid hydrocarbons, with net-zero C emissions
  - Superconducting "Energy Pipeline" (EPRI, USA concept)
- Pipelining GH2 is costly, ~ 1.5 ~ 2 x that of natural gas:
  - Low volumetric energy density of hydrogen, one-third that of natural gas
  - Pipeline systems must be safe from hydrogen attack: corrosion, cracking, embrittlement
  - Special compressors, valves, and meters required
- Will gaseous hydrogen (GH2) transmission pipelines be a major part of humanity's sustainable energy future? Under what circumstances? Can pipelined renewable-source hydrogen compete with hydrogen from other sources?
- To discover, quantify, and demonstrate answers, we should begin, now, to:
  - Assemble and fund an international consortium
  - Design, build, and operate the IRHTDF
  - Operate IRHTDF first as an R&D lab, then as a test facility, then as a demonstration facility
  - Guide our global energy strategy

Rationale, purpose

- We need to rebuild humanity's energy system for all renewable resources
- Earth's largest, richest renewable resources are stranded:
  - Far from population and load centers
  - Without gathering and transmission systems to deliver their energy
- Many costly, new, high-capacity transmission systems will be needed worldwide, for these large, remote, stranded resources
- GH2 pipelines compete with HVDC electric transmission lines, in capital and O&M costs, conversion and transmission losses
- GH2 pipeline is the lowest-cost hydrogen transport mode for long distance and high power (flowrate)
- GH2 pipeline transmission systems must be optimized for renewables-hydrogen service:
  - High capacity, high pressure, large diameter, long distance
  - Accommodate frequent, large pressure cycles
  - Avoid hydrogen attack: corrosion, cracking, embrittlement
  - Provide storage in pipeline and in geologic formations
  - Deliver renewable-source GH2 at competitive cost
  - Add value from synergies among diverse renewable resources
  - Use valuable O2 byproduct of electrolysis for adjacent dry-biomass gasification plants
- No GH2 pipelines for renewables-hydrogen service exist; the extensive extant industrial GH2 pipeline system is not capable of renewables-hydrogen service
- All major new processes require pilot plants:
  - Benefits, costs, synergies, technical obstacles must be identified and quantified; IRR and NPV predicted for full-scale facilities
  - IRHTDF is the ideal test and demonstration facility for renewables-hydrogen service, for GH2
- Will GH2 pipelines have a major role in humanity's sustainable energy future? Under what circumstances? IRHTDF is on the critical path to finding these answers.

IRHTDF status

- Concept only; no detailed engineering or economics studies
- No funding or consortium in place; now a leadership opportunity
- Probable $US 50 ~ 100M cost, 5 years, requires international effort
- Ideal project for:
  - IPHE (International Partnership for the Hydrogen Economy)
  - IEA Hydrogen Implementation Agreement (HIA)
  - EC, PATH (Partnership Advancing Transition to Hydrogen)



Opportunity: Proposed Northeast Asia Natural Gas Pipeline

Japan asks:

- Shall we build the large, new, natural gas pipeline system of hydrogen-capable pipe, so that we may transition to 100% GH2 transmission, from abundant renewable sources along the pipeline route, as the natural gas is depleted?
- What is the incremental cost, if any, of building a new natural gas pipeline as 100% hydrogen-capable?
- What line pipe materials are capable of renewables-hydrogen service?

Opportunity: Great Plains, North America

Total annual wind energy, fully harvested on half the land area of the twelve Great Plains states, would equal the TOTAL annual energy consumption of the USA. Delivering all the energy as GH2 would require ~ 400 new pipelines, 36" diameter, 70 bar.

Abundant wet and dry biomass, and other radiant solar-driven energy conversion, could supply more GH2 to these transmission pipelines, in temporal and technical synergy.

Opportunities: Global

Every continent has large, diverse, dispersed, renewable resources, enough for humanity's needs, but stranded and time-varying in output. How shall we bring the energy to distant markets, at large scale, at competitive cost?

YOUR CARD, PLEASE

TAKE ONE, PLEASE

Dist. Rep. Crawford

Proposal for a Northeast Asian Hydrogen Highway
From a Natural-gas-based to a Hydrogen-based Society

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M. Hirata, D. Eng.
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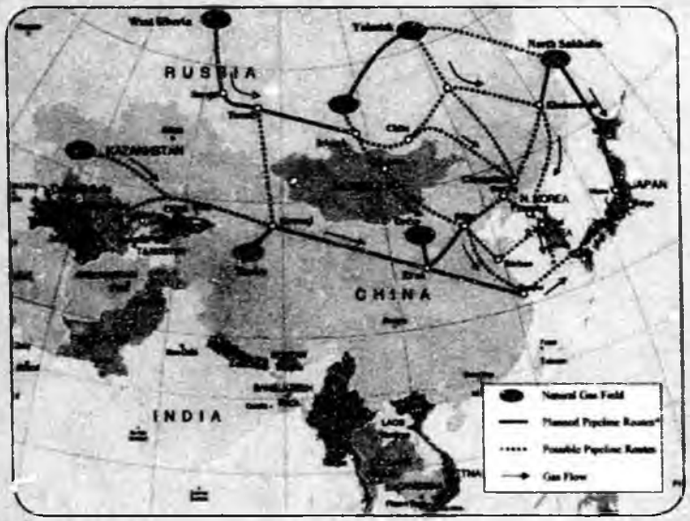


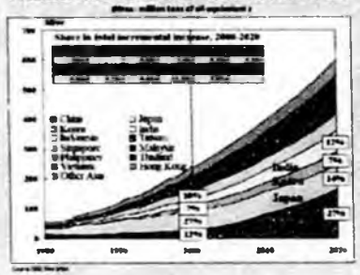
Capacity of Gaseous Hydrogen (GH2) Pipelines

- Without input or midline compressors
- At 100 bar pipeline input pressure, 35 bar delivery pressure

Distance km	Nominal Diameter Inches	Capacity GW	Capacity MMscfd	Capacity Million Nm3 / day	Capacity Tons per day	Storage Capacity MMscf	Storage Capacity Tons
320	20	2.8	702	18.1	1,869	141	374
320	36	12.3	3,100	80.1	8,253	450	1,199
480	20	2.3	573	14.8	1,526	211	562
480	36	10.2	2,580	66.7	6,869	675	1,798
800	20	1.8	444	11.5	1,182	352	936
800	36	7.9	1,998	51.7	5,319	1,126	2,997
1,600	20	1.2	313	8.1	833	703	1,872
1,600	36	5.6	1,413	36.5	3,762	2,251	5,994

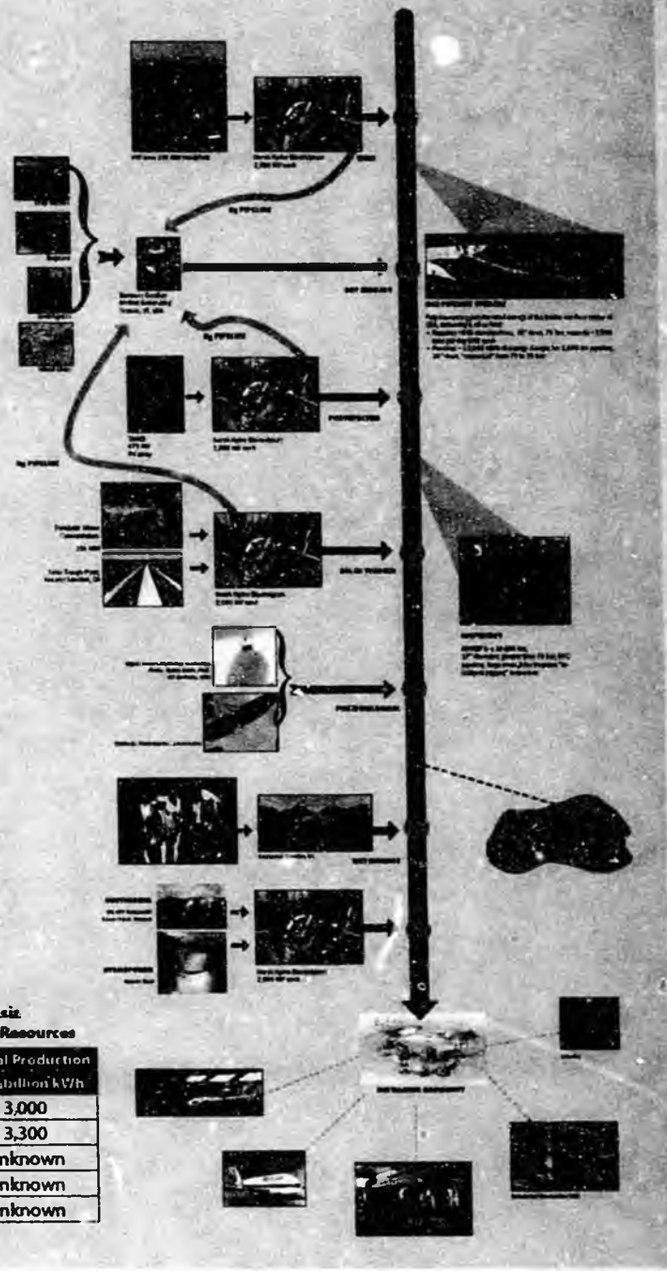
- Diverse, large, rich, renewable energy resources can be synergistically generated, converted, transmitted, and stored at seasonal scale as GH2 in pipelines, and perhaps stored in geologic formations
  - East Siberia and Sakhalin are rich in natural gas
  - Most of Russia's untapped hydroelectricity is in East Siberia
  - Kamchatka, Chishima (Kuril) islands, and Sakhalin have rich coastal and offshore wind
  - West China has abundant solar
  - Kamchatka has large geothermal
  - The extent and intensity of these renewables has not been accurately assessed
- Northeast Asia's environmental protection and energy security require a large, new pipeline system to gather and transport, throughout the region, natural gas in the short term and renewable-source hydrogen in the long term
- European Commission's (EC) "Naturalhy" program is assessing technical and economic aspects of adding renewable-source GH2 into Europe's extant natural gas pipeline system

Predicted Asian Countries Demand for Natural Gas



Estimated Asia Renewable Energy Resources

Renewable Resource	Annual Production TWh /billion kWh
Hydro	3,000
Geothermal	3,300
Wind	Unknown
Solar	Unknown
Total	Unknown



Dist by Rep. Crawford

LEGAL SERVICES

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LEGISLATIVE AFFAIRS AGENCY
STATE OF ALASKA

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State Capitol
Juneau, Alaska 99801-1182
Deliveries to: 129 6th St., Rm. 329

MEMORANDUM February 23, 2007

SUBJECT: Draft CSHB 56(CRA) (Work Order No. 25-LS0291\C)

TO: Representative Gabrielle LeDoux
Co-Chair of House Community and Regional Affairs Committee

FROM: Jack Chenoweth
Assistant Revisor

With your decision to shift the lead responsibility for the proposed Hydrogen Energy Partnership from the line agency, the Department of Commerce, Community, and Economic Development, to a public corporation, the Alaska Energy Authority, we have made significant, although largely nonsubstantive, amendments to the bill. The changes are identified in this memo.

We've made the language changes and insertions that your office specifically requested based on language provided in the February 21 memo of Representative Harry Crawford.

In addition,

-- the principal operative provision of the measure, bearing the section catchline "Hydrogen Energy Partnership," has been renumbered and relocated out of AS 41.98 and into AS 44.83, the chapter that sets out provisions of law applicable to the Alaska Energy Authority; this renumbering necessitates a reordering of the bill sections to maintain numerical order of codified provisions and conforming changes to cross-references;

-- bill section 2 of the accompanying bill draft adds a new subsection, AS 14.40.040(c), to pick up and locate appropriately the University of Alaska's obligation to support the proposed project; in the last previous version, the only reference to the University's obligation to be involved in the project appears as a tag on to a paragraph adding to the duties of the Department of Commerce, Community, and Economic Development; had that remained the only reference, in our judgment, the obligation might have been too easily overlooked by University officials, faculty, and students;

-- sections have been renumbered and material common to *former* sections 7 and 8 has been combined in bill section 7 of the accompanying draft.

I trust that the version that accompanies this memo well serves the committee's purposes.

JBC:med
07-122.med

Enclosure

25-LS0291\C
Kane
2/23/07

CS FOR HOUSE BILL NO. 56(CRA)

IN THE LEGISLATURE OF THE STATE OF ALASKA

TWENTY-FIFTH LEGISLATURE - FIRST SESSION

BY THE HOUSE COMMUNITY AND REGIONAL AFFAIRS COMMITTEE

Offered:
Referred:

Sponsor(s): REPRESENTATIVES CRAWFORD AND DOLL, Nelson, Gara

A BILL

FOR AN ACT ENTITLED

"An Act establishing the Hydrogen Energy Partnership in the Alaska Energy Authority and relating to assistance and support for the partnership; requiring the executive director of the Alaska Energy Authority to seek public and private funding for the partnership; providing for the contingent repeal of an effective date; and providing for an effective date."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

* **Section 1.** The uncodified law of the State of Alaska is amended by adding a new section to read:

LEGISLATIVE FINDINGS. The legislature finds that

(1) scientists recognize hydrogen as a potentially useful energy carrier and energy storage medium;

(2) with further research and development, hydrogen could competitively serve as an alternative fuel for vehicles and for generating electricity;

(3) there is significant federal government and private sector investment in hydrogen research and development programs; and

(4) Alaska is an excellent site to attract federal government and industry investment in hydrogen because of the following advantages:

(A) the availability of indigenous, large scale, stranded renewable energy resources, including sufficient geothermal energy for producing hydrogen at an industrial scale;

(B) a source of zeolites for gaseous hydrogen storage; and

(C) Alaska's location for export of hydrogen and valuable products from hydrogen around the Pacific Rim;

(5) with its traditional high fuel costs and significant diverse renewable energy resources, Alaska could attract advanced technology development companies for research and development, testing, and deployment of hydrogen and products produced from hydrogen; these factors can lead to the development of a hydrogen industry resulting in job growth and a more robust state economy.

*** Sec. 2.** AS 14.40.040 is amended by adding a new subsection to read:

(c) The University of Alaska shall provide assistance to the executive director of the hydrogen energy project established under AS 44.83.540 upon request.

*** Sec. 3.** AS 44.33.020(a) is amended by adding a new paragraph to read:

(45) provide staff support for the hydrogen energy partnership established under AS 44.83.540.

*** Sec. 4.** AS 44.83 is amended by adding a new section to read:

Article 5A. Hydrogen Energy.

Sec. 44.83.540. Hydrogen energy partnership. (a) There is established in the Alaska Energy Authority the hydrogen energy partnership.

(b) Members of the partnership shall be appointed by the board of directors of the authority to represent

(1) the federal government;

(2) state government;

(3) the University of Alaska;

(4) an Alaska regional development organization;

(5) tribal organizations of the state;

(6) the electric utility industry;

(7) the fossil fuel industry;

(8) nonfossil fuel energy industry; and

(9) nonprofit environmental conservation groups.

(c) The partnership members shall serve without compensation but are entitled to transportation expenses and per diem as authorized for members of boards and commissions under AS 39.20.180.

(d) The hydrogen energy partnership shall facilitate the development of a hydrogen fuel and hydrogen-source products industry, based on noncarbon-emitting energy sources, in Alaska by means including

(1) meeting with hydrogen energy interests to plan hydrogen energy research and development;

(2) proposing policy to promote federal and private industry investment in hydrogen energy research and development and demonstration projects;

(3) evaluating the market for hydrogen energy and hydrogen-source products production, Alaska utilization, and export;

(4) proposing tax incentives for investment in a hydrogen energy infrastructure; and

(5) reporting annually to the legislature on or before the 20th day of each regular session on the development of hydrogen energy and hydrogen-source products production in the state.

* **Sec. 5.** The uncodified law of the State of Alaska is amended by adding a new section to read:

FUNDING FOR HYDROGEN ENERGY PARTNERSHIP. The executive director of the Alaska Energy Authority shall seek federal and private sources of funding to cover the costs of the establishment of and operation of the hydrogen energy partnership established in sec. 4 of this Act.

* **Sec. 6.** The uncodified law of the State of Alaska is amended by adding a new section to read:

CONDITIONAL EFFECT. Sections 2, 3, and 4 of this Act take effect only if the

Alaska Energy Authority obtains sufficient funding under sec. 5 of this Act.

*** Sec. 7.** If secs. 2, 3, and 4 of this Act have not taken effect under sec. 6 of this Act by June 30, 2012, secs. 1, 2, 3, 4, 5, 6, and 8 of this Act are repealed June 30, 2012.

*** Sec. 8.** Sections 2, 3, and 4 of this Act take effect 30 days after the executive director of the Alaska Energy Authority notifies the revisor of statutes that sufficient funding required under sec. 4 of this Act has been obtained.

*** Sec. 9.** Sections 5 and 6 of this Act takes effect immediately under AS 01.10.070(c).

Alaska State Legislature
House of Representatives

Alaska State Capitol
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Representative Harry T. Crawford, Jr.
East Anchorage District 21
E-mail: Representative_Harry_Crawford@legis.state.ak.us
Website www.akdemocrats.org

MEMORANDUM

To: Legal Services
From: Rep. Harry Crawford
Re: Blank CS for HB 56
Date: February 21, 2007

Please draft amendments to HB 56 (Work order 25-LS0291/A) based on the following conceptual amendments. Should any of the proposed amendments conflict with existing statute, please contact me for further clarification.

Conceptual Amendment #1:

Page 1, Lines 1-3
Delete "Department of Commerce, Community, and Economic Development; requiring the commissioner of commerce, community and economic development" and insert "Alaska Energy Authority; requiring the executive director of the Alaska Energy Authority"

Conceptual Amendment #2:

Page 1, Line 10
Delete "potential source of fuel" and insert "potentially-useful energy carrier and energy storage medium;"

Conceptual Amendment #3:

Page 1, Line 12
Delete "source of energy for fueling vehicles and" and insert "fuel for vehicles and for"

Conceptual Amendment #4:

Page 2, Line 4
After "indigenous" insert ", large-scale, stranded,"

Conceptual Amendment #5:

Page 2, Line 4
After "renewable" insert "energy"

Conceptual Amendment #6:
Page 2, Line 5
Delete "processing" and insert "producing"

Conceptual Amendment #7:
Page 2, Line 6
After "for" insert "gaseous"

Conceptual Amendment #8:
Page 2, Line 6
Delete "and handling"

Conceptual Amendment #9:
Page 2, Line 7
Delete "hydrogen transport" and insert "export of hydrogen and valuable products produced from hydrogen"

Conceptual Amendment #10:
Page 2, Line 8
After "and" delete "a"

Conceptual Amendment #11:
Page 2, Line 8
Delete "source of" and insert ", diverse,"

Conceptual Amendment #12:
Page 2, Line 10
Delete "as a fuel source;" and insert "and products produced from hydrogen;"

Conceptual Amendment #13:
Page 2, Line 11
Delete "fuel"

Conceptual Amendment #14:
Page 2, Line 15
Delete "Department of Commerce, Community, and Economic Development" and insert "Alaska Energy Authority"

Conceptual Amendment #15:
Page 2, Line 17-18
Delete "commissioner of commerce, community, and economic development" and insert "board of directors of the Alaska Energy Authority"

Conceptual Amendment #16:
Page 2, Line 22
Delete "(4) political subdivisions of the state;" and insert "(4) an Alaska Regional Development Organization"

Conceptual Amendment #17:
Page 2, Line 27
Delete "private" and insert "non-profit"

Conceptual Amendment #18:
Page 3, Line 1
After "fuel" insert "and hydrogen-source products"

Conceptual Amendment #19:
Page 3, Line 1
After "industry" insert ", based on non-carbon-emitting energy sources,"

Conceptual Amendment #20:
Page 3, Line 3
After "development" insert "and demonstration projects"

Conceptual Amendment #21:
Page 3, Line 5
After "development" insert "and demonstration projects"

Conceptual Amendment #22:
Page 3, Line 6
After "energy" insert "and hydrogen-source products"

Conceptual Amendment #23:
Page 3, Line 6
After "production" insert ", Alaska utilization, and export"

Conceptual Amendment #24:
Page 3, Line 10
After "energy" insert "and hydrogen-source products"

Conceptual Amendment #25:
Page 3, Line 14
Delete "commissioner" and insert "executive director"

Conceptual Amendment #26:
Page 3, Line 17-18
Delete "commissioner of commerce, community, and economic development" and insert "executive director of the Alaska Energy Authority"

Conceptual Amendment #27:
Page 3, Line 24
Delete "Department of Commerce, Community, and Economic Development" and insert "Alaska Energy Authority"

Conceptual Amendment #28:

Page 3, Line 30-31

Delete "commissioner of commerce, community, and economic development" and insert "executive director of the Alaska Energy Authority"

Cc: Representative Anna Fairclough,
co-chair House Community & Regional Affairs Committee
Representative Gabrielle LeDoux,
co-chair House Community & Regional Affairs Committee
Sara Fisher-Goad, AIDEA Legislative Liaison

FISCAL NOTE

STATE OF ALASKA
2007 LEGISLATIVE SESSION

Fiscal Note Number: HB56-COM-AIDEA-02-14-07
Bill Version: HB 56
() Publish Date:

Revision Date/Time (Note if correction):
Dept. Affected: Commerce
Title: Hydrogen Energy Research Program
RDU: AIDEA (125)
Component: AIDEA Operations
Sponsor: Crawford, Doll, Nelson, Gara
Requester: House Community and Regional Affairs
Component No.: 1234

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

OPERATING EXPENDITURES	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Personal Services	100.0					
Travel						
Contractual		*	*	*	*	*
Supplies						
Equipment						
Land & Structures						
Grants & Claims						
Miscellaneous						
TOTAL OPERATING	**100.0**	*	*	*	*	*
CAPITAL EXPENDITURES						
CHANGE IN REVENUES ( )						

FUND SOURCE (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF						
1005 GF/Program Receipts						
1037 GF/Mental Health						
1007 Interagency Receipts	100.0	*	*	*	*	*
TOTAL	**100.0**	*	*	*	*	*

Estimate of any current year (FY2007) cost: 0.0
Check this box (X) if funding for this bill is included in the Governor's FY 2008 budget proposal:

POSITIONS

Full-time	1	*	*	*	*	*
Part-time						
Temporary						

ANALYSIS: *(Attach a separate page if necessary)*

This legislation creates the Hydrogen Energy Partnership to facilitate the development of a hydrogen fuel industry in Alaska. The partnership would consist of nine members and be housed in the department. The department is charged with securing federal and private funding sources to cover the costs of establishing and operating the partnership. The department does not currently have sufficient resources to actively seek funding. If funding is secured, the department would appoint partnership members, and RSA funds to the Alaska Energy Authority (AEA). AEA would provide support to the partnership; AIDEA provides staff support for AEA programs.

Prepared by: Sara Fisher-Goad, Deputy Director - Operations
Phone: 907.269.4623
Division: Alaska Industrial Development and Export Authority
Date/Time: 2/14/07 2:54 PM
Approved by: Emil Notti, Commissioner
Date: 2/14/2007
Agency: Commerce, Community, and Economic Development

FISCAL NOTE

STATE OF ALASKA
2007 LEGISLATIVE SESSION

Fiscal Note Number: SB56-COM-AEA-02-14-07
Bill Version: HB 56
() Publish Date:

Revision Date/Time (Note if correction):
Dept. Affected: Commerce
Title: Hydrogen Energy Research Program
RDU: Alaska Energy Authority (453)
Component: AEA Rural Energy Operations
Sponsor: Crawford, Doll, Nelson, Gara
Requester: House Community and Regional Affairs
Component No.: 2600

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

OPERATING EXPENDITURES	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Personal Services						
Travel	15.0					
Contractual	100.0	*	*	*	*	*
Supplies	6.0					
Equipment						
Land & Structures						
Grants & Claims						
Miscellaneous						
TOTAL OPERATING	**121.0**	*	*	*	*	*
CAPITAL EXPENDITURES						
CHANGE IN REVENUES ( )						

FUND SOURCE (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF						
1005 GF/Program Receipts						
1037 GF/Mental Health						
11087 Statutory Designated Program Rcpts	121.0	*	*	*	*	*
TOTAL	**121.0**	*	*	*	*	*

Estimate of any current year (FY2007) cost: 0.0
Check this box (X) if funding for this bill is included in the Governor's FY 2008 budget proposal:

POSITIONS

Full-time						
Part-time						
Temporary						

ANALYSIS: *(Attach a separate page if necessary)*

This legislation creates the Hydrogen Energy Partnership to facilitate the development of a hydrogen fuel industry in Alaska. The partnership would consist of nine members and be housed in the department. The department is charged with securing federal and private funding sources to cover the costs of establishing and operating the partnership. The department does not currently have sufficient resources to actively seek funding. If funding is secured, the department would appoint partnership members, and RSA funds to the Alaska Energy Authority (AEA.) AEA would provide support to the partnership.

Prepared by: Sara Fisher-Goad, Deputy Director - Operations
Phone: 907.269.4623
Division: Alaska Energy Authority
Date/Time: 2/14/07 2:54 PM
Approved by: Emil Notti, Commissioner
Date: 2/14/2007
Agency: Commerce, Community, and Economic Development

STATE OF ALASKA
2007 LEGISLATIVE SESSION

BILL NO. HB 56

ANALYSIS CONTINUATION

AEA estimates needing a Development Specialist II ($100.0) to secure the federal or private funding sources and begin organizational work for the partnership. Because responsibilities could not be absorbed by existing staff, one new FTE would be required along with funds ($6.0) for a computer and supplies. Travel funds ($15.0) are included for partnership members to meet up to three times annually and to cover cost of in-state and out-of-state travel for the Development Specialist for organizational purposes and to secure federal grants. After FY08, federal and/or private funding sources, if obtained, would fund partnership operations and staff. In the event funds are not obtained, provisions would be repealed as outlined in the bill.

FISCAL NOTE

STATE OF ALASKA
2007 LEGISLATIVE SESSION

Fiscal Note Number:
Bill Version: HB 56
() Publish Date:

Revision Date/Time (Note if correction):
Dept. Affected: University of Alaska
Title: HYDROGEN ENERGY RESEARCH PROGRAM
RDU
Component
Sponsor: Representative Crawford
Requester
Component No.

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

OPERATING EXPENDITURES	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Personal Services						
Travel						
Contractual						
Supplies						
Equipment						
Land & Structures						
Grants & Claims						
Miscellaneous						
TOTAL OPERATING	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
CAPITAL EXPENDITURES						
CHANGE IN REVENUES ( )						

FUND SOURCE (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF						
1005 GF/Program Receipts						
1037 GF/Mental Health						
Other (University Receipts)						
TOTAL	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Estimate of any current year (FY2007) cost: 0.0
Mark this box (X) if funding for this bill is included in the Governor's FY 2008 budget proposal:

POSITIONS

Full-time						
Part-time						
Temporary						

ANALYSIS: *(Attach a separate page if necessary)*
The University of Alaska would participate in the hydrogen energy partnership. To the degree projects are proposed that require additional expertise, facilities, equipment or other resources, additional funding would be required. It is the University of Alaska's understanding non-state revenue sources would be sought by the hydrogen energy partnership.

Prepared by: Michelle Rizk
Phone 907-450-8187
Division: University of Alaska
Date/Time
Approved by: Pat Pitney
Date 2/14/2007
Agency: University of Alaska