

02/01/13

Overview:

Interior

Electric

Supply

<TARGET><BILL></BILL><SUBJECT>02-01-13 Overview Interior
Electric Supply</SUBJECT><COMM>HENE28</COMM></TARGET>

**Alaska Legislature
House Special Committee on Energy**



Rep. Charisse Millett

Capitol Building, Room 403
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Agenda

**Friday, February 1, 2013
8:00 – 10:00 A.M.
Barnes Committee Room (#124)**

+ Interior Electric Supply

Presentation by Cory Borgeson, CEO, Golden Valley Electric Association

*First hearing in committee of referral

+Teleconferenced

=Bill previously heard/scheduled

GOLDEN VALLEY ELECTRIC ASSN.

INTERIOR ENERGY ISSUES



Cory Borgeson
GVEA President & CEO

February 1, 2013



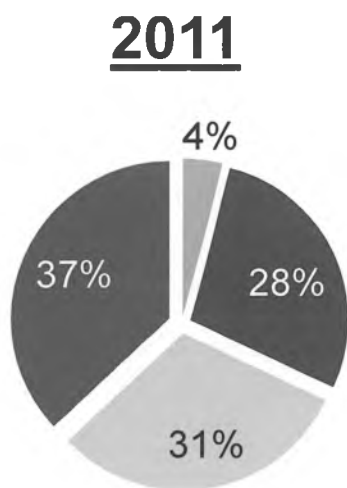
GVEA at a Glance

- Owned by 34,480 members
- 5,973 square mile service territory
- 99.97 percent reliability during 2012
 - Average member experienced less than 2.5 hours without power
- Generation capacity: 291(296) MW
- Anticipated wind generation:
78,840 MWh per year
- 2012 peak load 217.6 MW
- Annual sales: 1.33 billion kWh

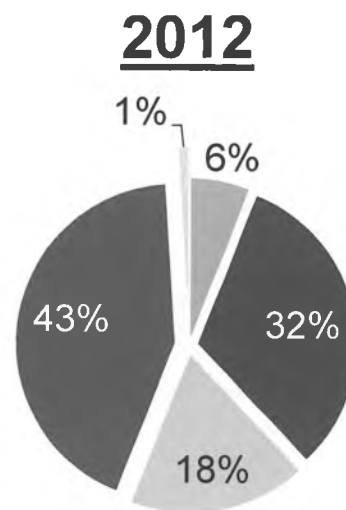


Where the Power Comes From

GVEA Fuel Supply



- Hydro
- Coal
- Natural Gas
- Oil
- Wind



Alaska Residential Electric Rates*

- Fairbanks (GVEA): 20¢
- Minto (Alaska Village Electric):
 - 22¢ (with state assistance)
 - 61¢ (without assistance)
- Glennallen (Copper Valley Electric): 33¢
- Homer (Homer Electric Assn.): 16¢
- Anchorage (Chugach Electric): 13¢

*Rates are per kilowatt-hour and do not include monthly customer charges.



Alaska Urban Space Heating Costs

Simplified Fuel Cost Comparison: Fuel Oil, Propane, Natural Gas

Location, Tariff, System	Fuel Oil, \$/gallon	Propane, \$/gallon	Natural Gas, \$/MCF
	1.00	1.12	7.96
Anchorage June 2012	1.38	1.54	11.00
	2.00	2.24	15.92
	3.00	3.35	23.88
Fairbanks, June 2012	4.00	4.47	31.84
	5.00	5.59	39.80
	6.00	6.71	47.76
	7.00	7.83	55.72

Source: Northern Economics.



Impacts to Our Community



Generation Facilities



Bradley Lake (hydro) – 15 MW



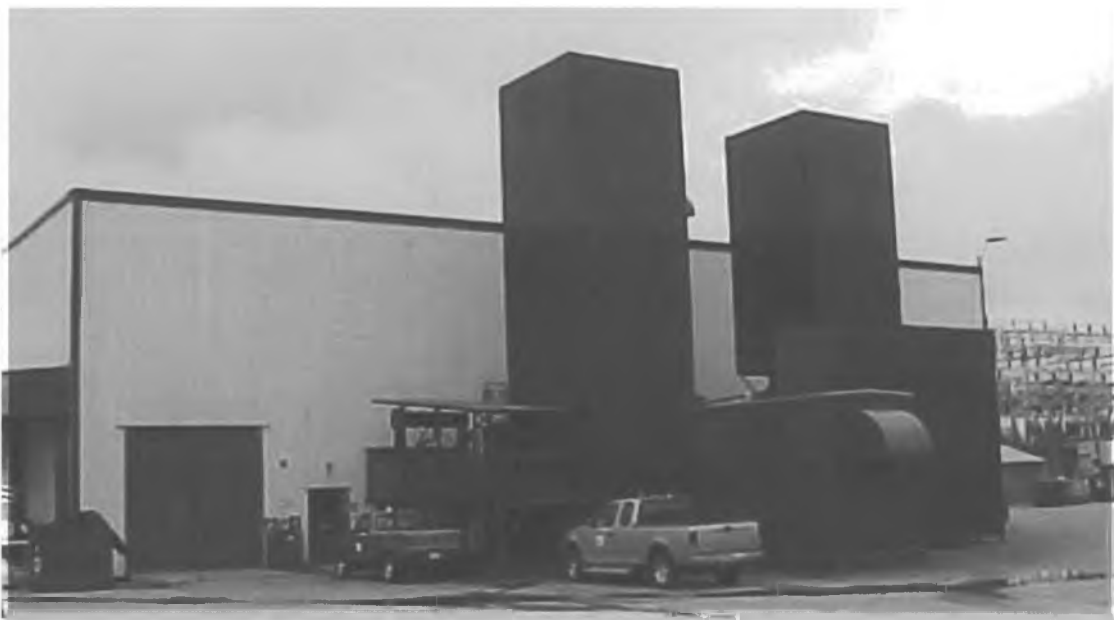
Healy Power Plant (coal) – 28 MW



Eva Creek Wind (25MW) – 78,840 MWh/year anticipated generation



Zehnder Power Plant (diesel) – 41 MW



North Pole Power Plant (diesel or HAGO) – 120 MW



North Pole Expansion Power Plant (naphtha or natural gas) - 60 MW



Delta Power Plant (diesel) – 27 MW



Power Purchases



Chugach/MEA (natural gas) – 60 MW
(intertie limited to 75/80 MW)



Aurora Energy (coal) – 25 MW



Dispatching Power



Electric Costs at GVEA

- Fuel & Purchased Power Charge:
10.802¢ kWh
- Utility Charge: 9.597¢ kWh
- Customer Charge: \$17.50

• <http://www.gvea.com/rates/rates>



Solutions

- Gas purchases via Intertie
- Healy Clean Coal Plant
- LNG Trucking
- Susitna Hydro
- HVDC Transmission
- Conservation – Power to Use Less



the
POWER
to use less



Generation Sources

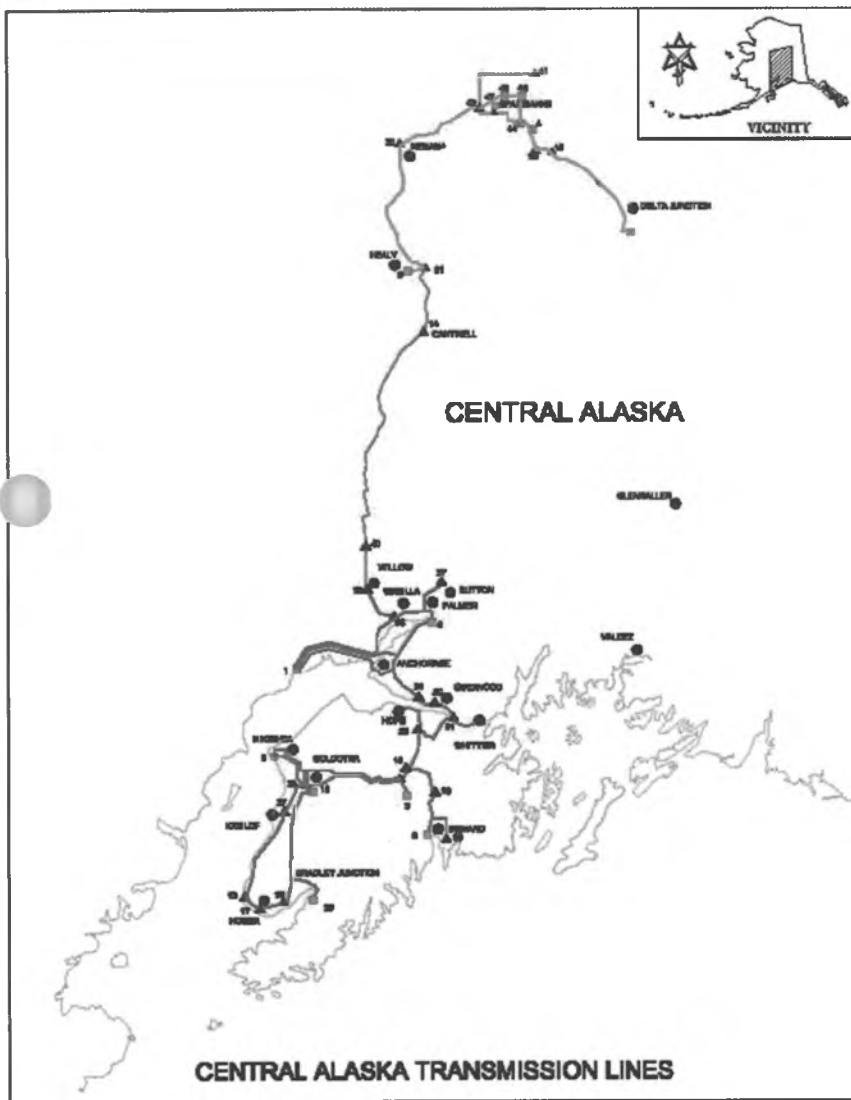
- Southeast
 - Hydro
 - Fuel Oil
- The Bush
 - Fuel Oil
 - Wind
- The Railbelt
 - Natural Gas
 - Hydro
 - Fuel Oil
 - Coal



Railbelt Electric Overview

- Six distribution utilities
- Interconnection from Homer to Fairbanks
- Three primary generating utilities
- Collection of small, dispersed generating units
- Independent operation – modified Lower-48 operating rules for Alaska Intertie

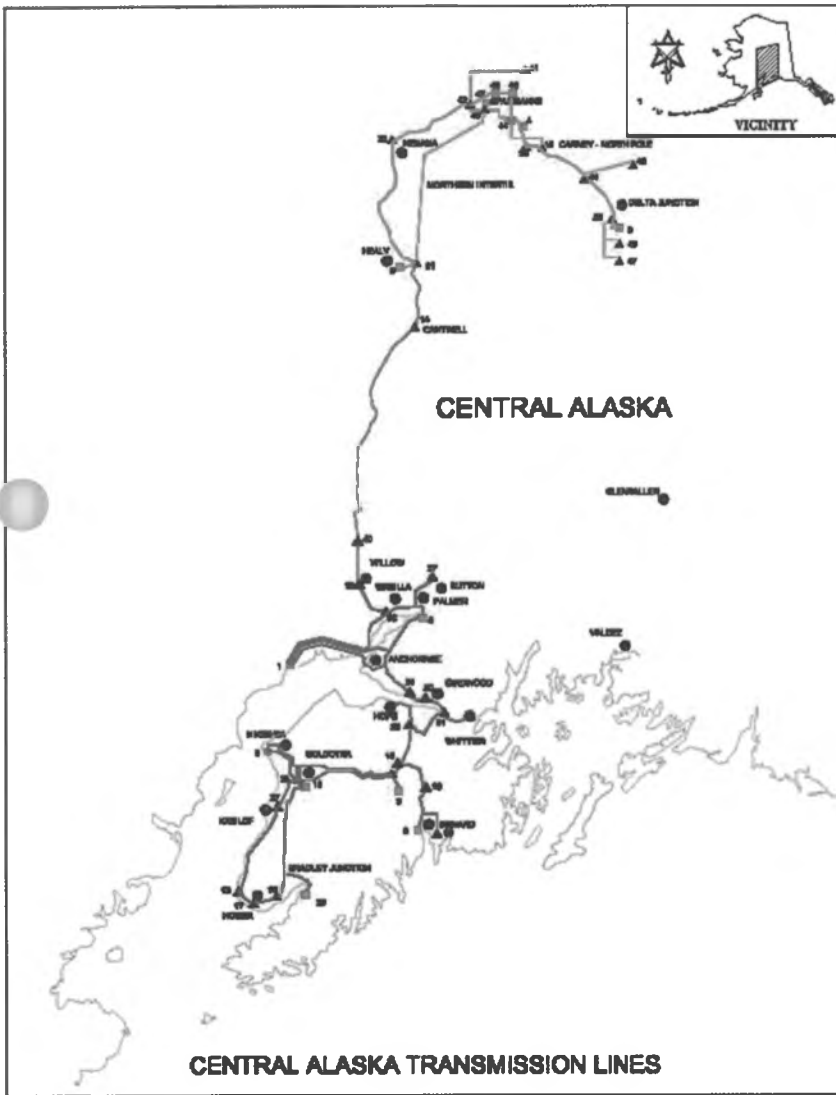




Railbelt –1990s

- Bradley Lake Hydro
- Bradley Transmission Lines

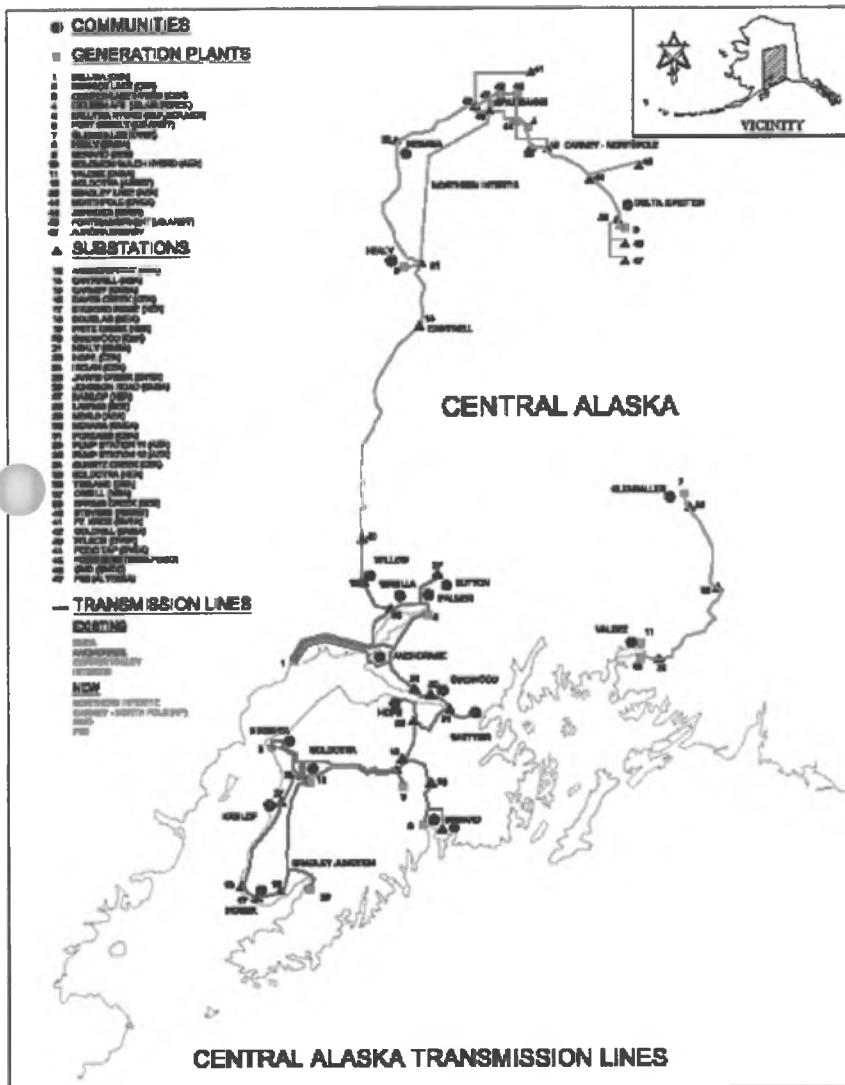




Railbelt - 2000s

- Northern Intertie
- Battery Energy Storage System





Railbelt Today

- GVEA
- MEA
- ML&P
- Chugach
- SES
- HEA



Healy Clean Coal Plant Update

- 50 MW plant adjacent to Healy I
- Air permit approved in November 2012
- Expect to take possession of plant in 2013
- Estimated online in 2015



Questions



Power to Use Less Ads

the power to use less

Smart Strips give YOU the power to use less.

Receive up to two Smart Strips with your Home Energy Audit.

Sign up today.



www.gvea.com/audit



Power to Use Less Ads



the **power to use less**



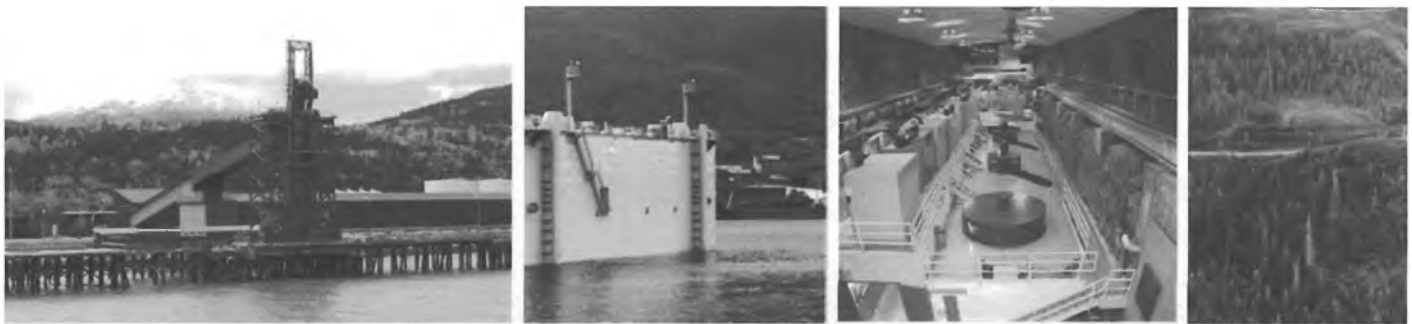
**Vehicle plug-in timers
give YOU the power to
use less.**

**Receive one –
installed – with your
Home Energy Audit.**

Sign up today.

www.gvea.com/audit





Alaska Industrial Development and Export Authority

Energy Project Overview

Ted Leonard, Executive Director
Mark Davis, Deputy Director-Infrastructure Development

February 2013

AIDEA

AIDEA's Mission

To promote, develop, and advance economic growth and diversification in Alaska by providing various means of financing and investment.

AIDEA fulfills its mission by providing Alaska businesses, projects and infrastructure with access to long-term commercial and development financing at a reasonable cost through its strong balance sheet and credit rating (S&P = AA+)



AIDEA

AIDEA's Energy Finance Tool Box

- Own all or a part of an energy project (Development Finance Program).
- Co-Invest in a Corporation or LLC that owns an energy project (Development Finance Program).
- Purchase up to 90% of a loan from a qualified financial institution up to \$20 million for a qualified energy project or transmission system (Loan Participation Program).
- Provide direct financing or guarantees on financing for 1/3 of the capital cost of a qualified energy project (SETS Development Program).
- Issue Revenue Bonds for financing of a qualified energy project (Conduit Bond Program).

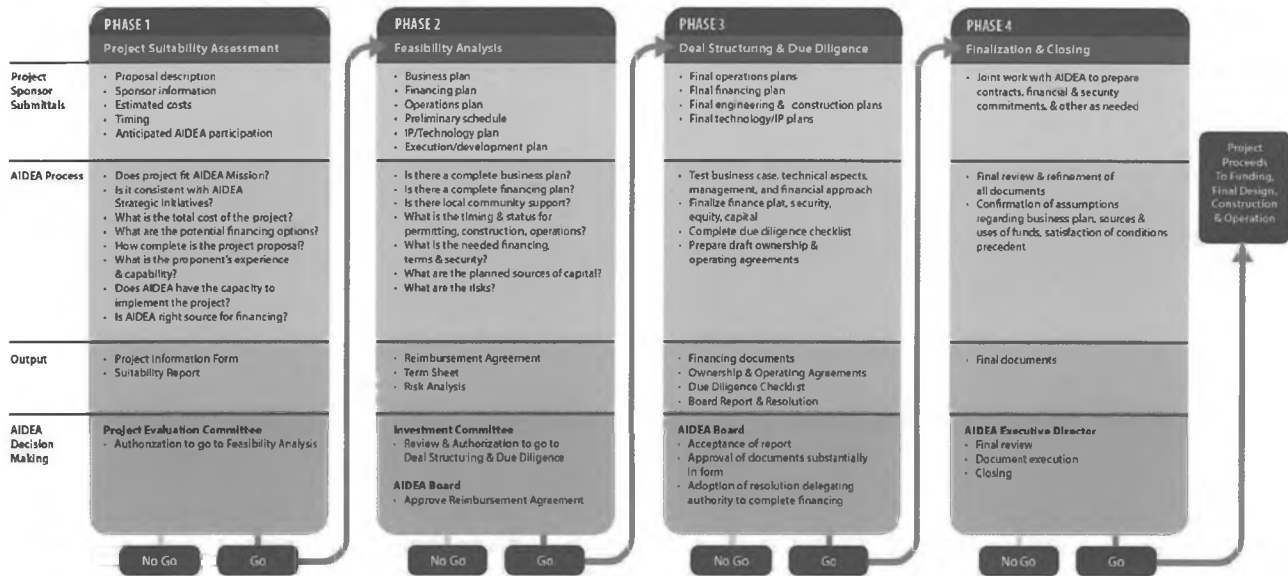
Qualified Energy Project

Qualified energy project means a project in the state that involves:

- A. transmission, generation, conservation, storage of distribution of heat or electricity;
- B. liquefaction, regasification, distribution, storage or uses of natural gas;
- C. Distribution or storage of refined petroleum products.

Project Analysis & Decision Making

AIDEA Development Project Analysis & Decision-making Process



Endeavour – Spirit of Independence

- Strategic Investment in a oil and gas jack up rig for Cook Inlet exploration.
- AIDEA investment is \$23.6 million with an ROI of 8.0% over a 5 year period through a preferred ownership interest.
- The total project cost (including refurbishment) is \$120 million.
- AIDEA's investment leveraged an additional \$96.4 million in private investment.
- Current Status – Refurbishment is being completed in Homer. The Endeavour is expected to mobilize to the Cosmopolitan Lease site in mid March. It is projected that three exploratory wells will be drilled in Calendar Year 2013.



AIDEA

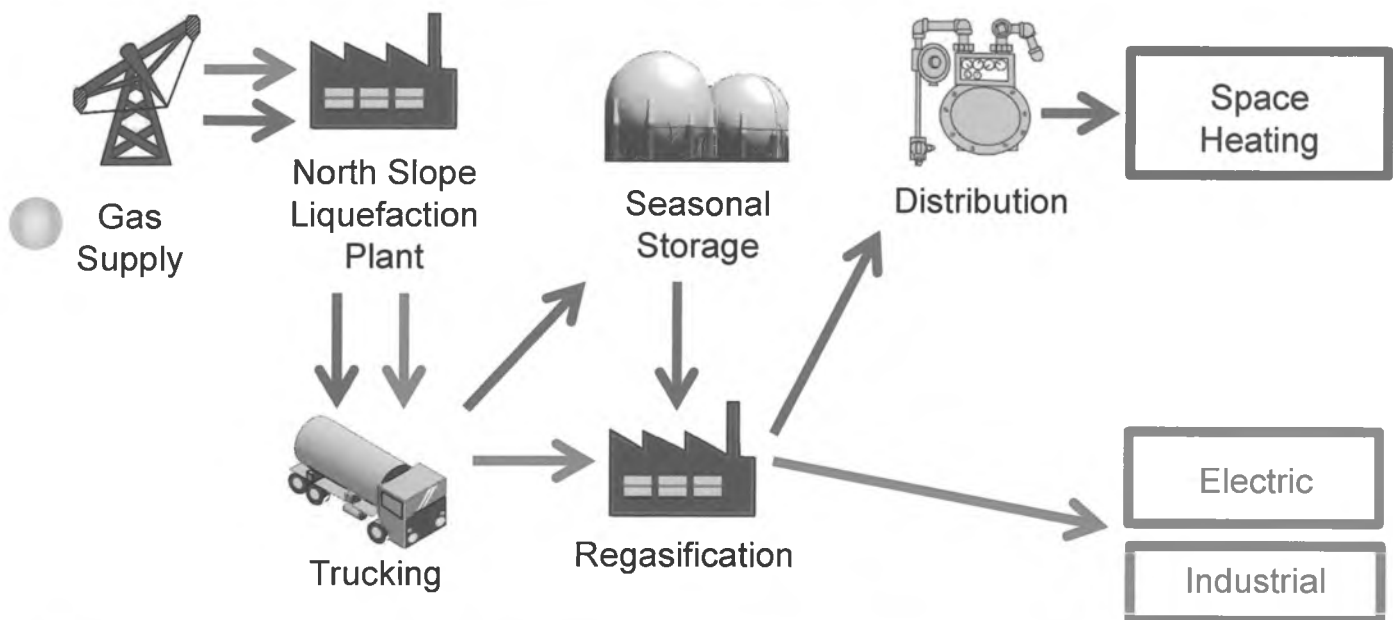
Fairbanks Gas Project

- Provide lowest cost energy to most Interior Alaska consumers as soon as possible
- Get gas first to Interior Alaska while assuring long-term access to gas from liquefaction plant for all Alaskans
- Utilize private sector mechanisms as much as possible

Project Description

- Natural gas will be liquefied on the North Slope and trucked to Interior Alaska
- Primary LNG demand anticipated to be Fairbanks and North Pole
- LNG will be temporarily stored and re-gasified in Interior Alaska
- Natural gas distribution system with storage to supply natural gas for heating

LNG Trucking Value Chain



Collaboration Structure

- AEA is leading the policy development of the project
 - Ensure that project goals are defined and consistent with the public interest
 - Engage the public, industry and elected officials
- AIDEA is developing the financing of the project
 - Examine finance options and commercial structure in collaboration with private party participants
 - Utilize available finance tools to meet project goals

Project Finance Overview

- \$355 million for project in Governor's finance plan (HB 74)
- AIDEA financing can be applied to different parts of the LNG supply chain
- AIDEA will use this finance package to leverage private investment

Governor's Finance Package

- \$50 million General Fund appropriation
 - Directly reduces the cost of LNG
- \$150 million AIDEA bonds
 - 3% interest rate (projected rate based on current market rates)
- \$125 million SETS capitalization
 - 3% interest rate
 - Flexibility to provide optimal commercial structure
- **\$325 million in Financing**
- **\$30 million natural gas storage credit**
 - \$15 million tax credit per qualifying storage tank
 - Created through previous legislative action

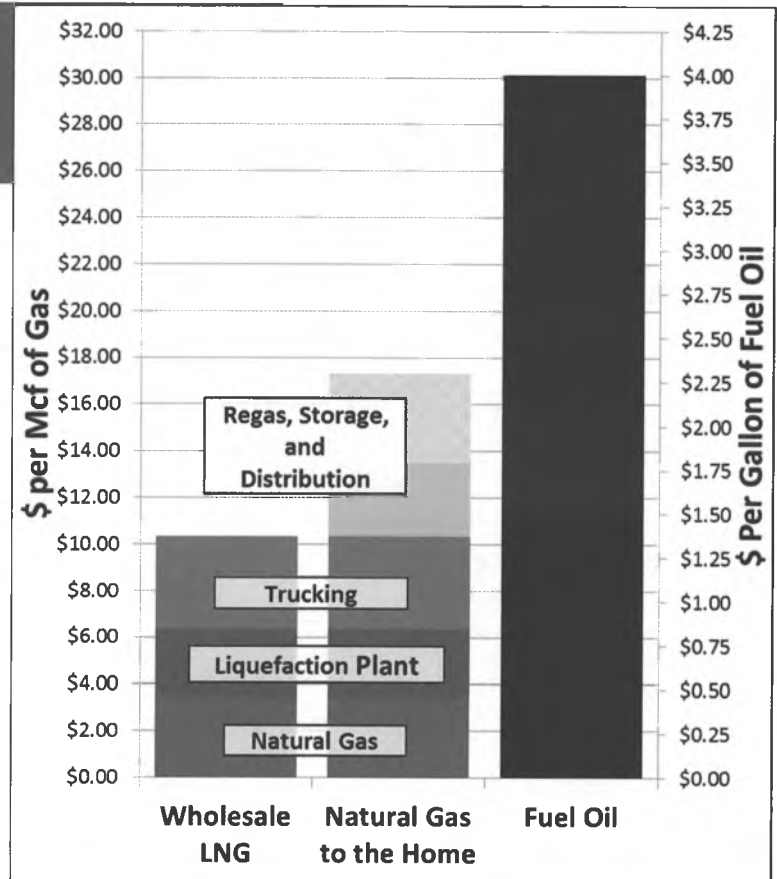
LNG Lowers Energy Costs

Key Assumptions

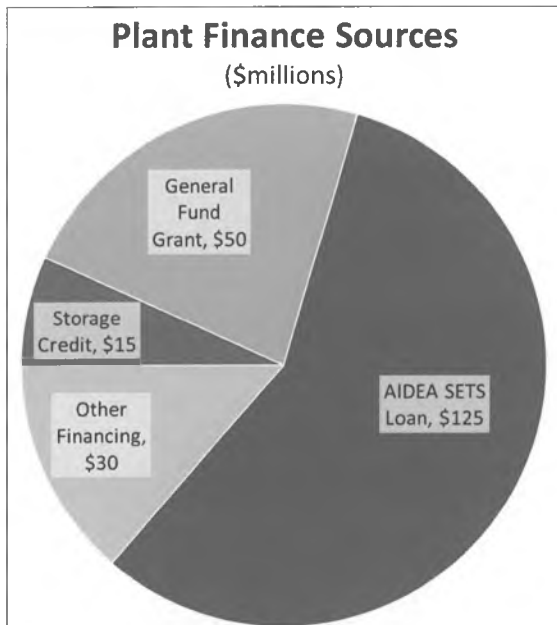
- 9 Bcf LNG Plant
- LNG plant bifurcated into two sections (industry and utility)
- \$50 million capital cost reduction applied to the 4.5 Bcf utility section
- Regas, storage, & distribution costs are presented as a range

Expected Utility Price per Mcf

- Wholesale LNG: \$10.33
- Natural Gas to Home: \$13.49-\$17.29



Financing Options for North Slope LNG Plant



- The North Slope LNG Plant may be funded from multiple sources, the example used here is just one possibility
- This analysis investigates the impact of an AIDEA SETS Loan interest rate on the final price
- The AIDEA SETS Loan is currently expected to be 3% and is compared with lower rates
- The finance payback period could be between 15 and 30 years

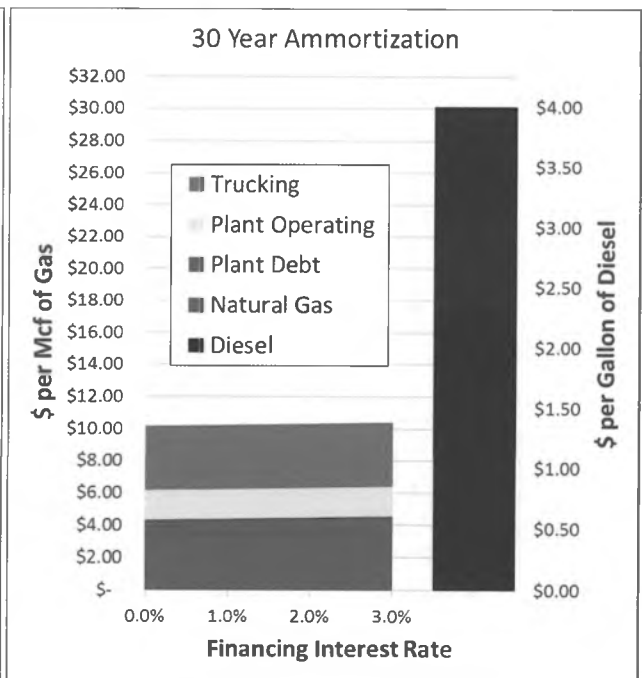
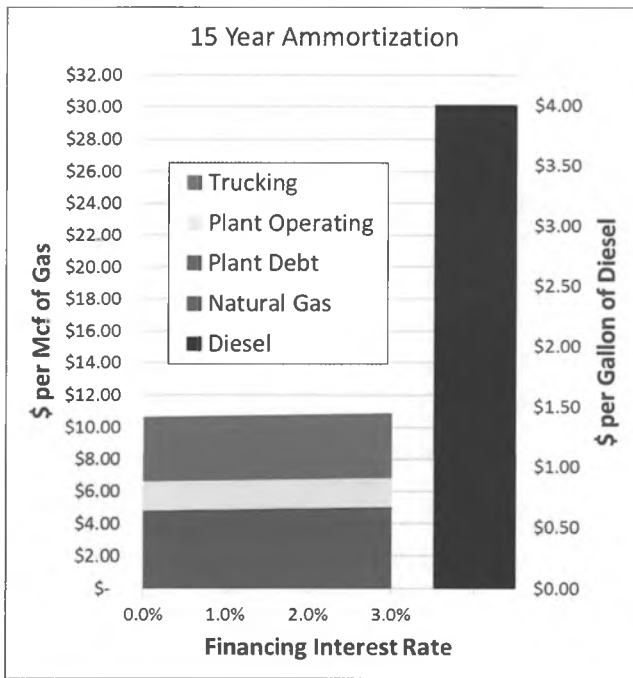
Financing Sources (\$mill)

Storage Credit	\$15
General Fund Grant	\$50
AIDEA SETS Loan	\$125
Other Financing	\$30
Plant Total	\$220

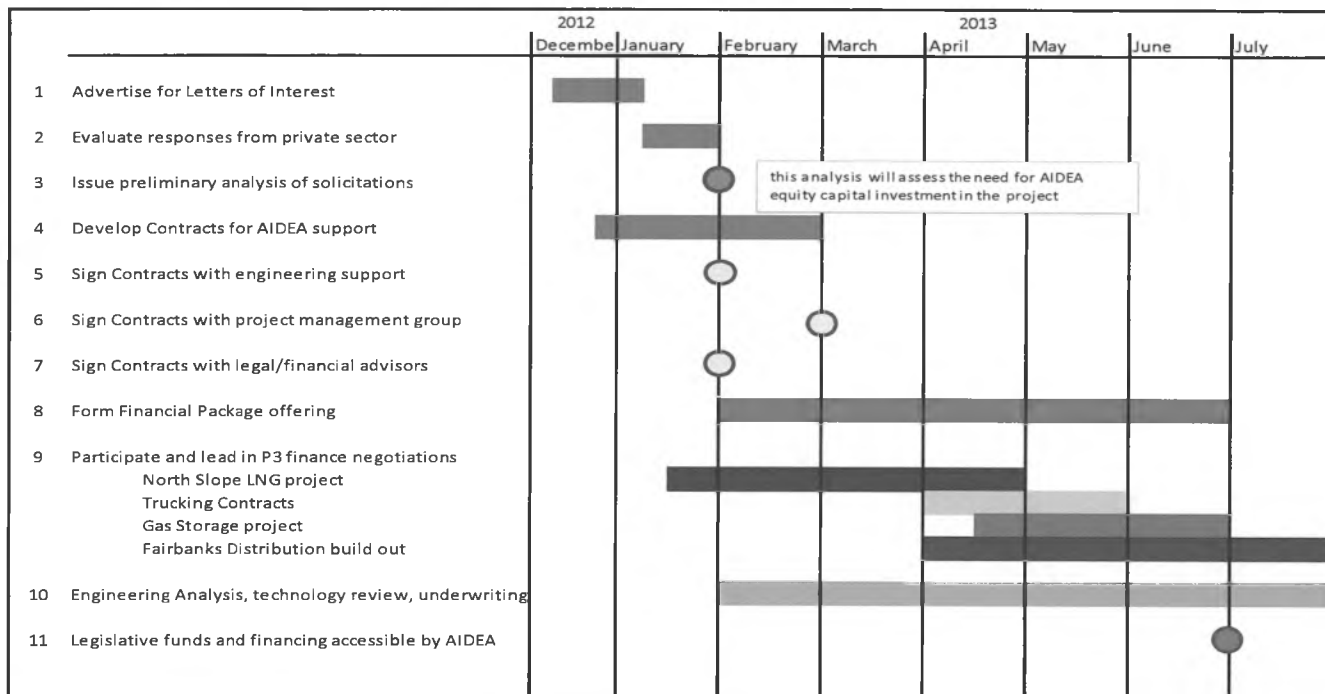
Finance Impact on Price

Amort-ization Period	Annual Payment (\$mill)	Cost, \$ per Mcf
15	\$14	\$1.51
30	\$9	\$0.95

Plant Financing



Schedules and Milestones



Other Potential Energy Projects

Other energy projects in feasibility analysis stage:

- Propane-air distribution system for small Alaskan Community
- LNG tank for Alaskan natural gas distribution company
- Petroleum storage facility for rural distribution
- Energy Efficiency improvement for Alaskan Educational Institution

AIDEA

Alaska Industrial Development and Export Authority

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www.aidea.org

AIDEA

AIDEA

ENDEAVOUR – SPIRIT OF INDEPENDENCE

Project Information Sheet

Introduction

AIDEA's strategic investment, combined with the ACES credits for Cook Inlet as well as the SB309 mission to encourage oil and gas exploration in the Inlet, has resulted in bringing to Alaska a cold weather capable drilling rig committed to work in Alaskan waters. AIDEA's investment leveraged an additional \$96.4 million in private investment.

Project Description

AIDEA invested in a limited liability company (LLC) with two partners for the purpose of owning a jack-up rig appropriate for Cook Inlet. The LLC will charter the rig to the exploration subsidiary of one of the partners, which has committed to use this rig on all of its prospective Cook Inlet developments, and to drill a minimum of four exploration wells in Cook Inlet. Additionally, as long as AIDEA remains a preferred owner, the rig will operate exclusively in Alaskan waters.

The Endeavour-Spirit of Independence (formerly "Adriatic XI") was purchased from Transocean and refurbished at Keppel FELS shipyard in Singapore and in Homer. Originally designed to operate in the cold North Sea, the rig's structural elements were built with sufficient toughness to eliminate the risk of brittle failure. The rig was also built to withstand North Sea storms. Its size allows it to operate in water depths up to 300 feet, which means the Endeavour can be used in all areas in Cook Inlet as well as in Alaskan OCS waters, such as the Chukchi and Beaufort Seas.

Economic Development Analysis

From a mission perspective, AIDEA's ownership in the Endeavour is consistent with its mandate to encourage natural resource development. AIDEA's involvement in this project not only accelerates development of Cook Inlet oil and gas resources, it stimulates job growth and helps advance the region's economy. To date, work on refurbishing the rig in Homer has been performed by the local labor force. Additionally, the operator has been staffing the rig from regional sources and is completing the staffing of two shifts for rig operation. It is estimated that approximately 108 direct Endeavour jobs will be created, plus approximately 90 support industry jobs. Using standard multipliers, AIDEA estimates that approximately 317 jobs will be created in other Kenai Peninsula Borough businesses.



Beyond these direct and indirect jobs, there is potential for significant incremental job growth with expected oil and/or gas development(s) induced by bringing the drill rig into Cook Inlet.

Partners

Using recently granted powers to participate in an LLC for the purpose of owning a project asset, AIDEA partnered with three organizations to create Kenai Offshore Ventures, LLC (KOV). AIDEA's partners include:

Buccaneer Energy/Buccaneer Alaska/Buccaneer Resources ("Buccaneer") – an Australian company and US subsidiaries. Buccaneer has working interest ownership in a number of leases in Alaska, including Cook Inlet, and is manager of the LLC.

continued...

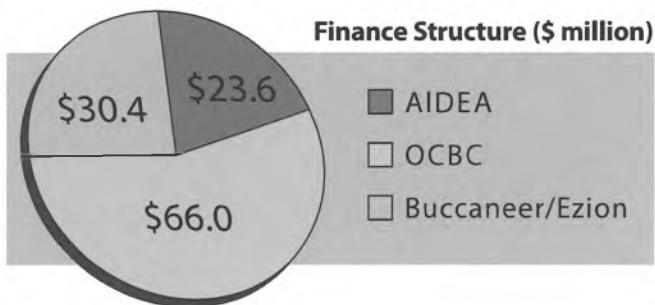
AIDEA

ENDEAVOUR – SPIRIT OF INDEPENDENCE

Partners (continued)

Ezion Holdings Limited – a large Singapore-based company that owns and operates a large fleet of support and drill vessels for the oil and gas business, currently with equipment and operations in Australia and the North Sea. The Endeavour is Ezion's first investment in Alaska.

Oversea-Chinese Banking Corporation Limited (“OCBC”) – a Singapore bank with a long term Ezion relationship. OCBC has committed a long term loan with low cost capital rates to the project, with Ezion as a corporate guarantee.



Financing Structure and Financing Sources

AIDEA is the preferred member of KOV, contributing approximately \$23.6 million towards the purchase and mobilization of the drill rig to Alaska. OCBC loaned \$66 million to KOV (guaranteed by the common members) towards the purchase and refurbishment of the rig. The common members of KOV are Buccaneer and Ezion, participating with approximately \$30.4 million of cash contributions and loan and payment guarantees for the refurbishment of the rig. The total project cost to date is \$120 million. The most recent appraised value of the rig is \$127 million.

KOV will be chartering the rig to Kenai Drilling, LLC (a Buccaneer subsidiary) via a “bareboat charter.” That agreement requires a payment of approximately \$27 million/year for the use of the rig. That revenue stream flows through KOV, paying the bank debt from OCBC first, and then AIDEA's payment second as a preferred owner. The common members are paid out of the remaining revenue stream.

Portfolio Analysis

AIDEA's strategic \$23.6 million investment in the Endeavour is approximately 2.7% of the Authority's assets under management (not including cash and securities) as of September 30, 2012. This investment has raised AIDEA's total percentage of assets under management in the Natural Resource Development category from approximately 22% to 24.6%.

AIDEA's Preferred Ownership interest in KOV will be repurchased in six annual payments using cash flow generated by contracting the rig for drilling operations. AIDEA will also receive a fixed annual dividend of 8.0% based on the outstanding balance of AIDEA's ownership investment. Additionally, AIDEA (after OCBC) has first rights to any revenue if the Endeavour is sold. AIDEA also holds a 3.5% overriding royalty interest (ORRI) on all Buccaneer Texas and Alaskan properties, including the onshore gas wells in Kenai.

Current Status

Refurbishment work on the Endeavour was completed in Singapore in late July, and the rig was transported via heavy lift vessel to Homer for final Alaskan work, necessary to meet local codes. This work was more extensive than originally anticipated and these additional costs will be borne by the common owners per the Owner's Agreement. Currently, work is being completed to finish all winterization activity (originally planned to be completed in Alaska after the 2012 summer season), and permitting for winter operation is in process. The Endeavour is expected to mobilize to the Cosmopolitan lease site in late February or early March. In 2013, the Endeavour is scheduled to drill three exploratory wells: the first by mid-March at the Cosmopolitan lease (gas, partnered with Pioneer), the second in May at the Southern Cross prospect (oil with gas), and the third in late summer at the Northwest Cook Inlet leasehold (gas).

Investing in Alaskans

Alaska Industrial Development and Export Authority



Interior Energy Project



IEP Legislative Update Week of February 10, 2014

Interior Energy Project Bringing North Slope Natural Gas to Alaskans

AGENDA

- **IEP Goals, Financing and Project Overview**
- **Project Location**
- **Project Milestones**
- **Schedule & Permitting**
- **Gas Distribution and Demand**

IEP PROJECT OVERVIEW

**North Slope
LNG Plant**
Prudhoe Bay, AK



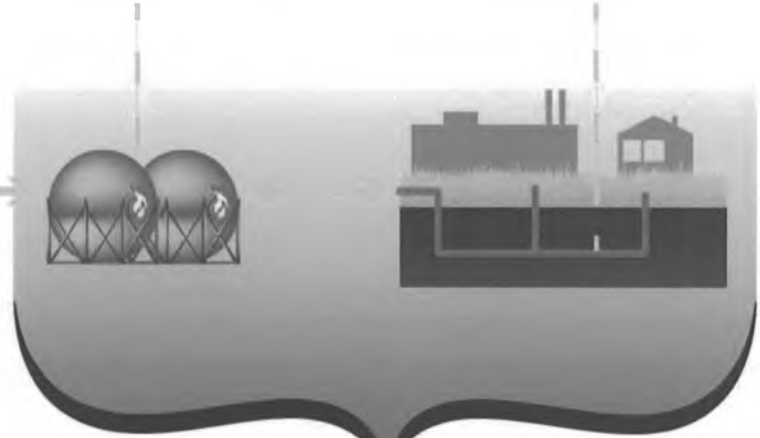
**AIDEA FINANCING
+
PRIVATE
PARTNER**

**Dalton Highway
Haul Road**
509 Miles



**PRIVATE
CONTRACT**

**Storage and
Regasification**
Fairbanks, AK



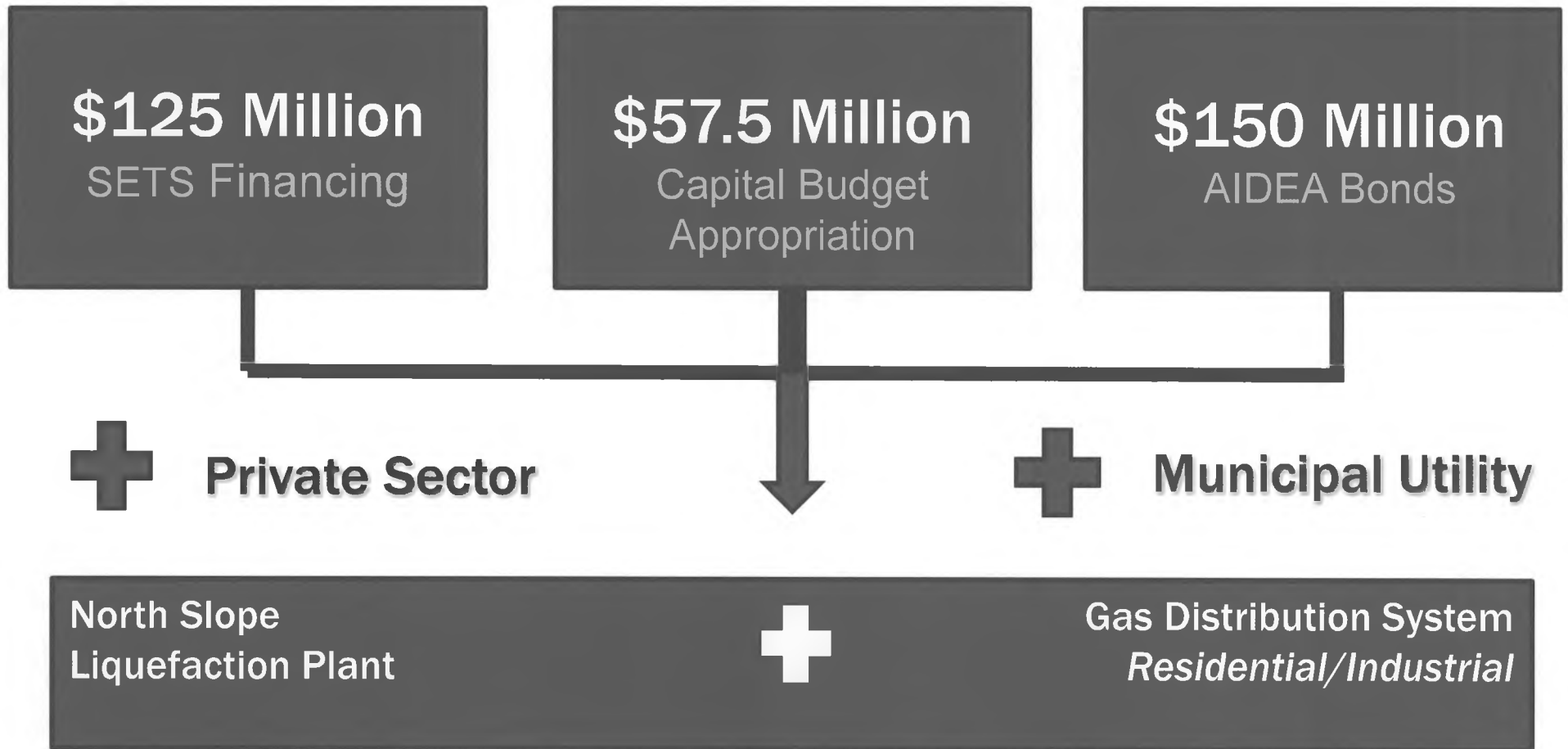
**AEA
+
LOCAL DISTRIBUTION
COMPANY**

Distribution System
Fairbanks and
North Pole

IEP GOALS

- **Supply natural gas to Interior Alaska:**
 1. **At the lowest cost possible**
 2. **As many Alaska customers as possible**
 3. **As soon as possible**
- **Provide propane from the gas stream**
- **IEP investments compliment alternative sources of gas supply**
- **Use private-sector mechanisms**

SB23 FINANCE PACKAGE



LNG AND PROPANE SALE PRIORITIES

1. Residential and commercial space heating
2. Electric utilities
3. Industrial customers
4. Other utilities
5. Open market LNG sales



COMPLETED PROJECT MILESTONES



North Slope Facility

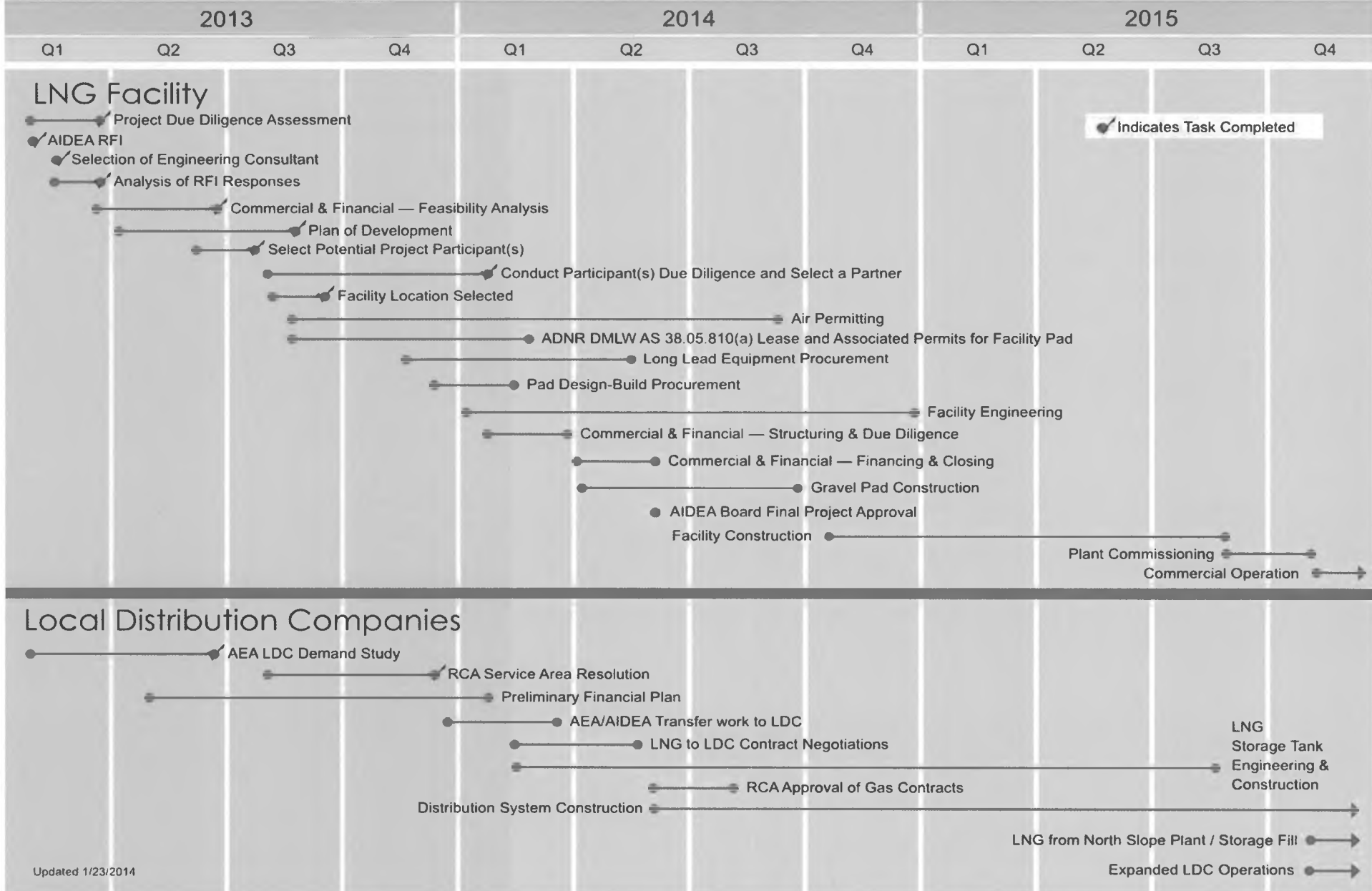
- ✓ Project Pre-Feasibility Analysis
- ✓ North Slope Plant Plan of Development
- ✓ Private Partner Due Diligence and Negotiations
- ✓ Pad Build and Design Procurement
- ✓ Long-lead Equipment Procurement

Distribution System

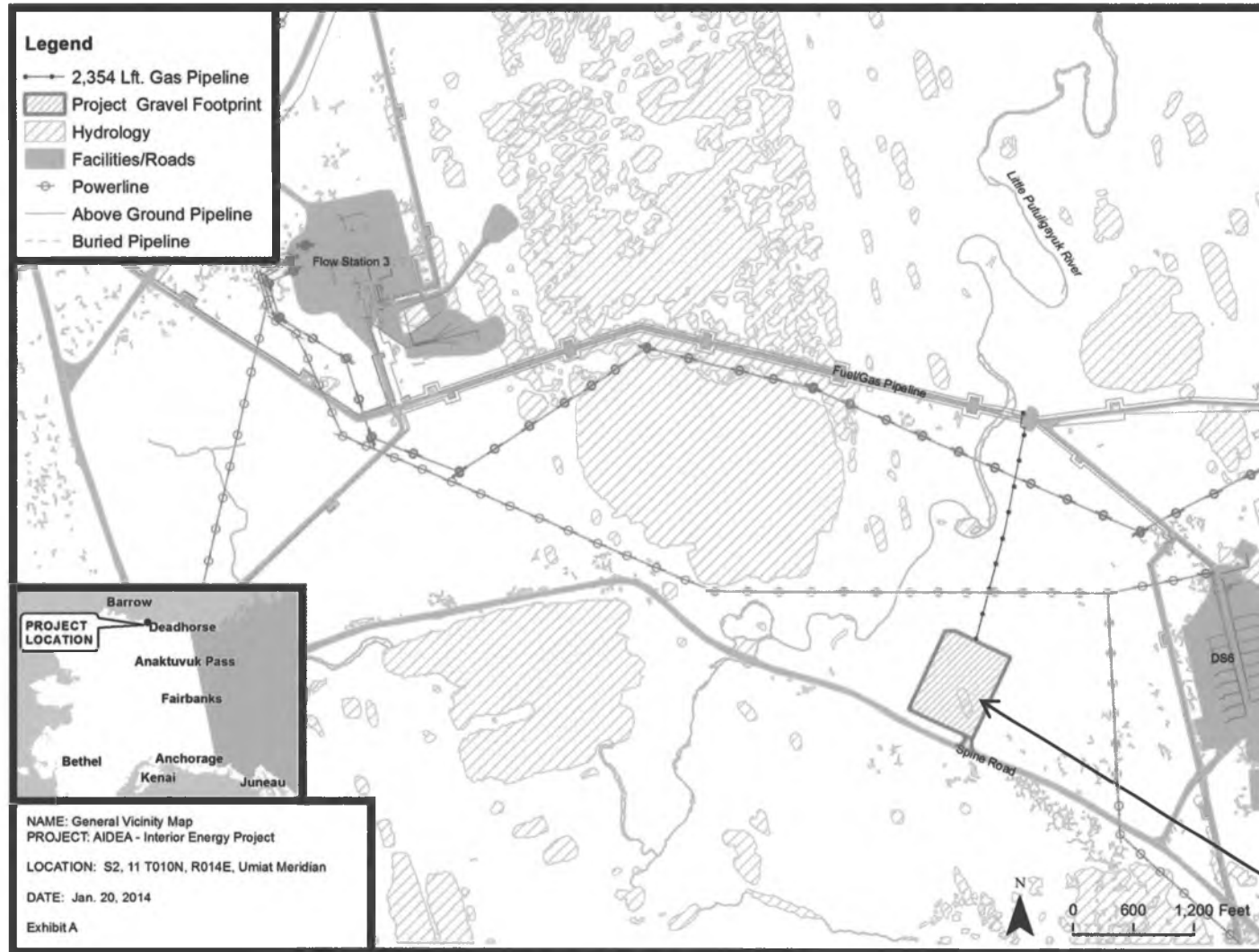
- ✓ Demand and Conversion Analysis
- ✓ RCA Service Area Resolution
- ✓ Distribution Cost Project Estimate
- ✓ FNG Storage Tank Financing (5.25MM gallon tank)

Estimated 6-year Build-Out

AIDEA Interior Energy Project - Schedule



PROPOSED PROJECT LOCATION: LNG PLANT



**Proposed
Project
Location**

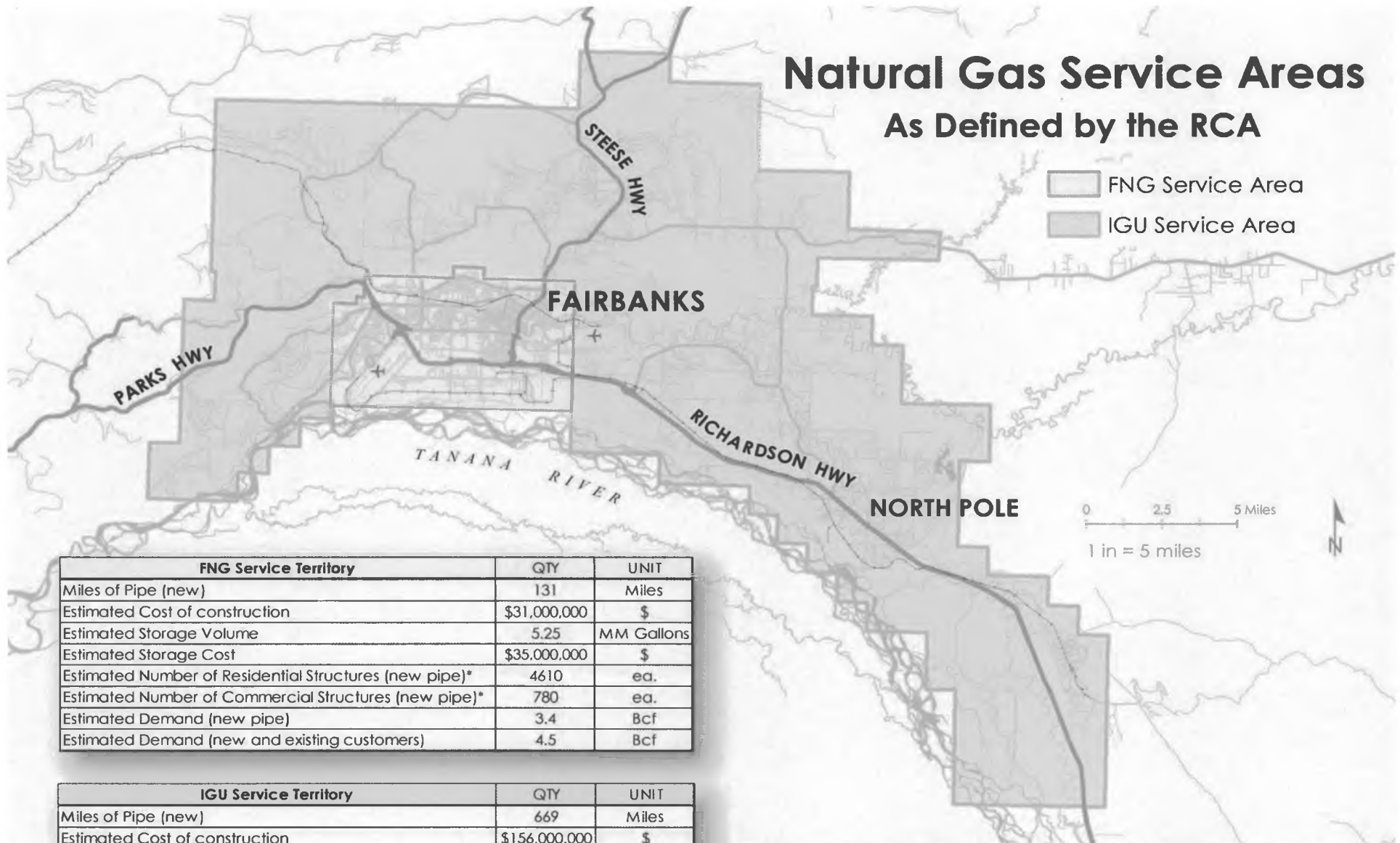
NORTH SLOPE FACILITY NEXT STEPS



- ① **Letter of Intent - executed week of February 3, 2014**
 - Establishes the basic parameters of the North Slope LNG Plant financing between AIDEA and MWH

- ② **Project Development Agreement - March 2014**
 - Negotiate and finalize a detailed Project Development Agreement with MWH (Commercial Structure)
 - Secure LNG purchase agreements with potential customers – IGU, FNG and GVEA

Natural Gas Service Areas As Defined by the RCA



FNG Service Territory	QTY	UNIT
Miles of Pipe (new)	131	Miles
Estimated Cost of construction	\$31,000,000	\$
Estimated Storage Volume	5.25	MM Gallons
Estimated Storage Cost	\$35,000,000	\$
Estimated Number of Residential Structures (new pipe)*	4610	ea.
Estimated Number of Commercial Structures (new pipe)*	780	ea.
Estimated Demand (new pipe)	3.4	Bcf
Estimated Demand (new and existing customers)	4.5	Bcf

IGU Service Territory	QTY	UNIT
Miles of Pipe (new)	669	Miles
Estimated Cost of construction	\$156,000,000	\$
Estimated Storage Volume	7.25	MM Gallons
Estimated Storage Cost**	\$46,000,000	\$
Estimated Number of Residential Structures (new pipe)*	11240	ea.
Estimated Number of Commercial Structures (new pipe)*	420	ea.
Estimated Demand (new pipe)	3	Bcf

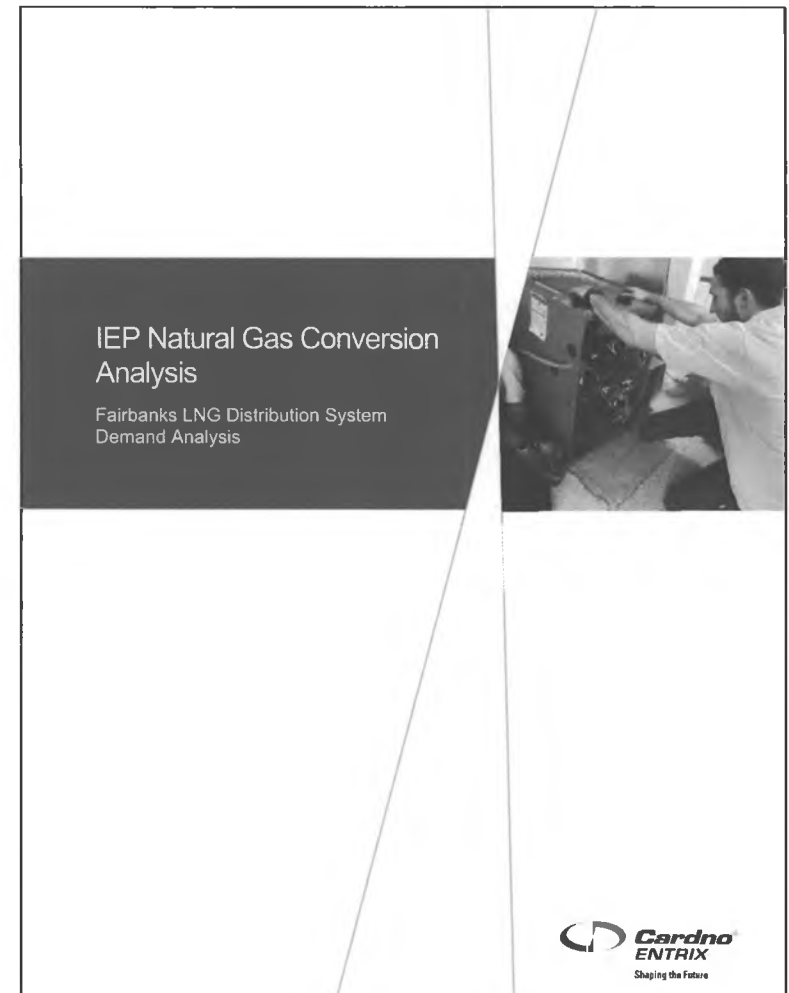
* Structure count are those "willing to convert" based on Cardno Report Tables 5.9 and 5.10

** Prorated 5.25MM gallon tank (assume \$5M is associated facilities)

ASSUMPTION: Phase I (from Tables) is entirely FNG

CONVERSION ANALYSIS STUDY

- **LNG Distribution System Demand Analysis**
- **Report complete January 2014**
- **Demographics, economics, and conversion rate forecasts**
- **Full report posted to IEP website**



NORTH SLOPE PLANT DEMAND BY YEAR (GAS DISTRIBUTION ONLY)



From Table 5.10, pg 5-19
Cardno Report
Natural Gas Demand by
Service Territory (Bcf)

Existing Customers
Newly Served Customers
Total

FNG Territory

2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
0.5	2.3	2.8	3.3	3.3	3.3	3.4	3.4	3.4	3.4	3.4	3.4	3.4
1.6	3.4	3.9	4.4	4.4	4.4	4.5	4.5	4.5	4.5	4.5	4.5	4.5

IGU Territory

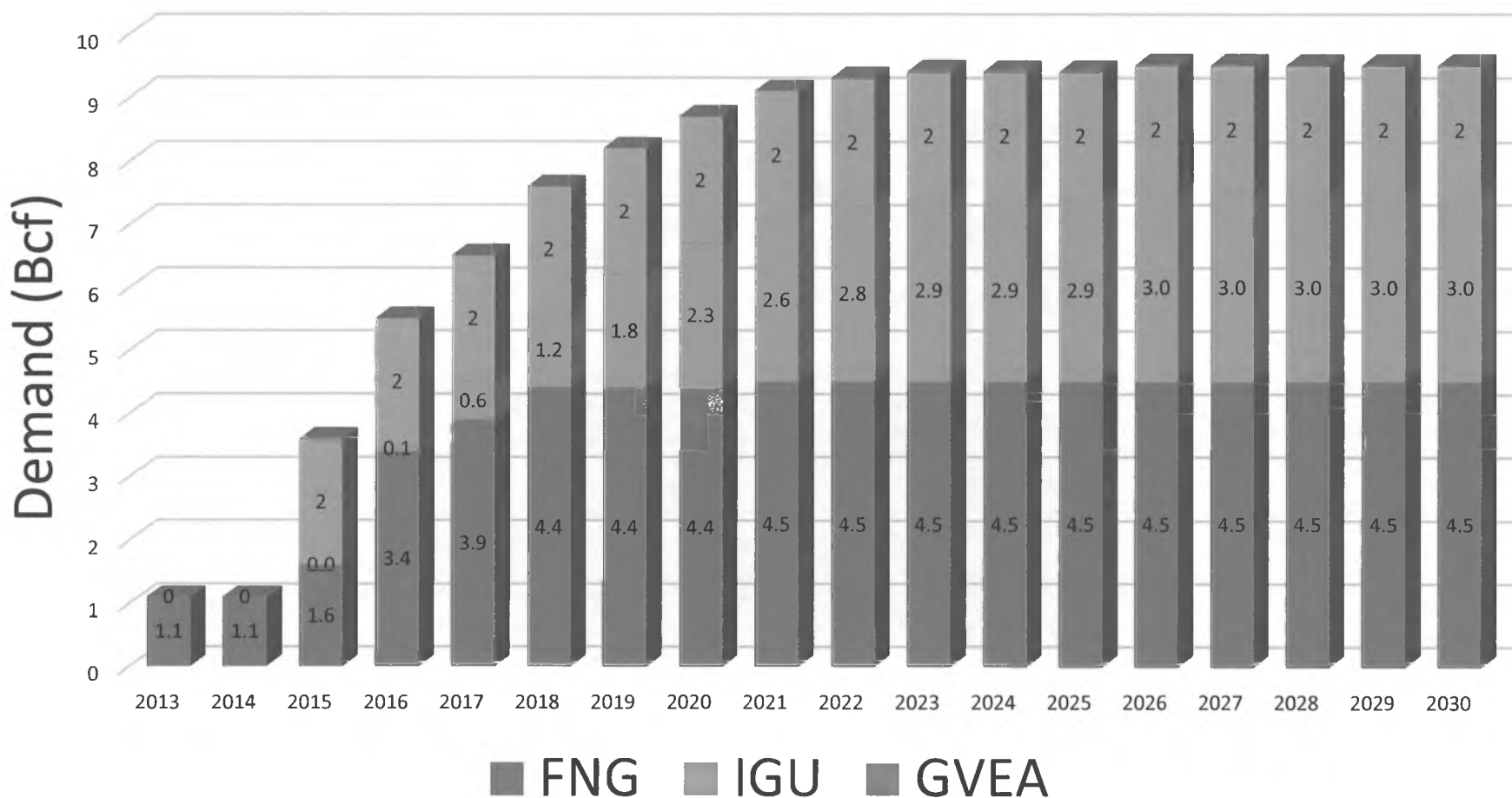
2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
0.0	0.1	0.6	1.2	1.8	2.3	2.6	2.8	2.9	2.9	2.9	3.0	3.0

NORTH SLOPE PLANT DEMAND BY YEAR (ADJUST FOR PEAK DAY)



	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Plant Demand by Year:	3.50	4.50	5.60	6.20	6.70	7.10	7.30	7.40	7.40	7.40	7.50	7.50
<i>Simplified Capacity Factor of 1.5</i>	5.25	6.75	8.40	9.30	10.05	10.65	10.95	11.10	11.10	11.10	11.25	11.25

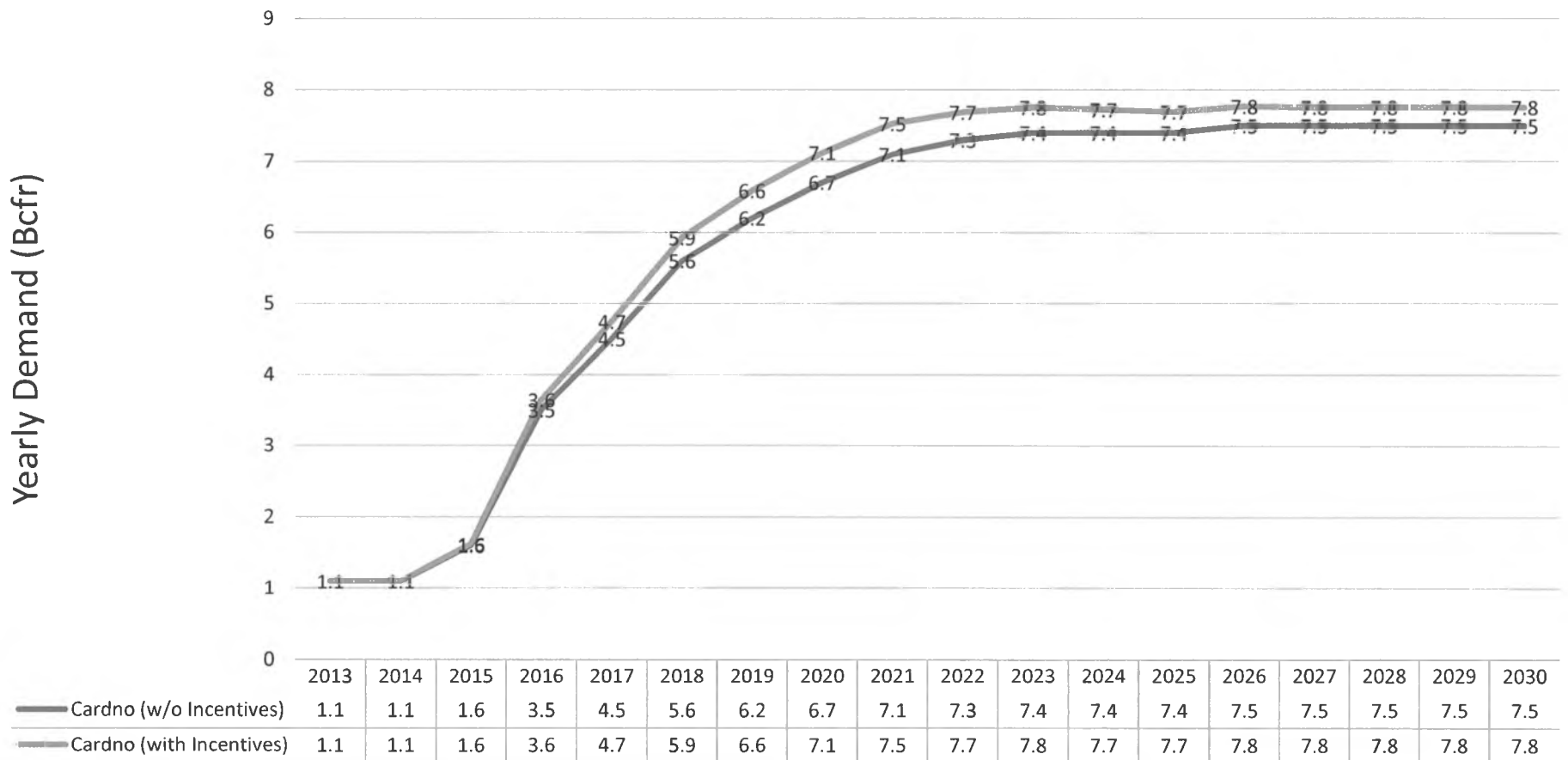
PIPELINE GAS DEMAND BY CUSTOMER



INCENTIVE DEMAND COMPARISON



DEMAND COMPARISON (without Industrials)



DISTRIBUTION SYSTEM NEXT STEPS



- **Utility discussions on distribution financing access**
- **Negotiate Take or Pay Contracts**
- **RCA Approval of Contracts**



Interior Energy Project



QUESTIONS

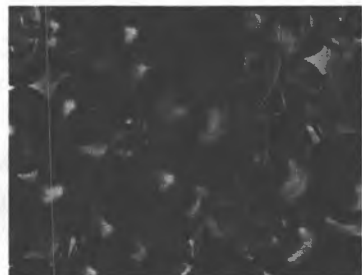
www.interiorenergyproject.com



Chena Hot Springs Resort

Renewable Energy and Sustainable communities

Bernie Karl



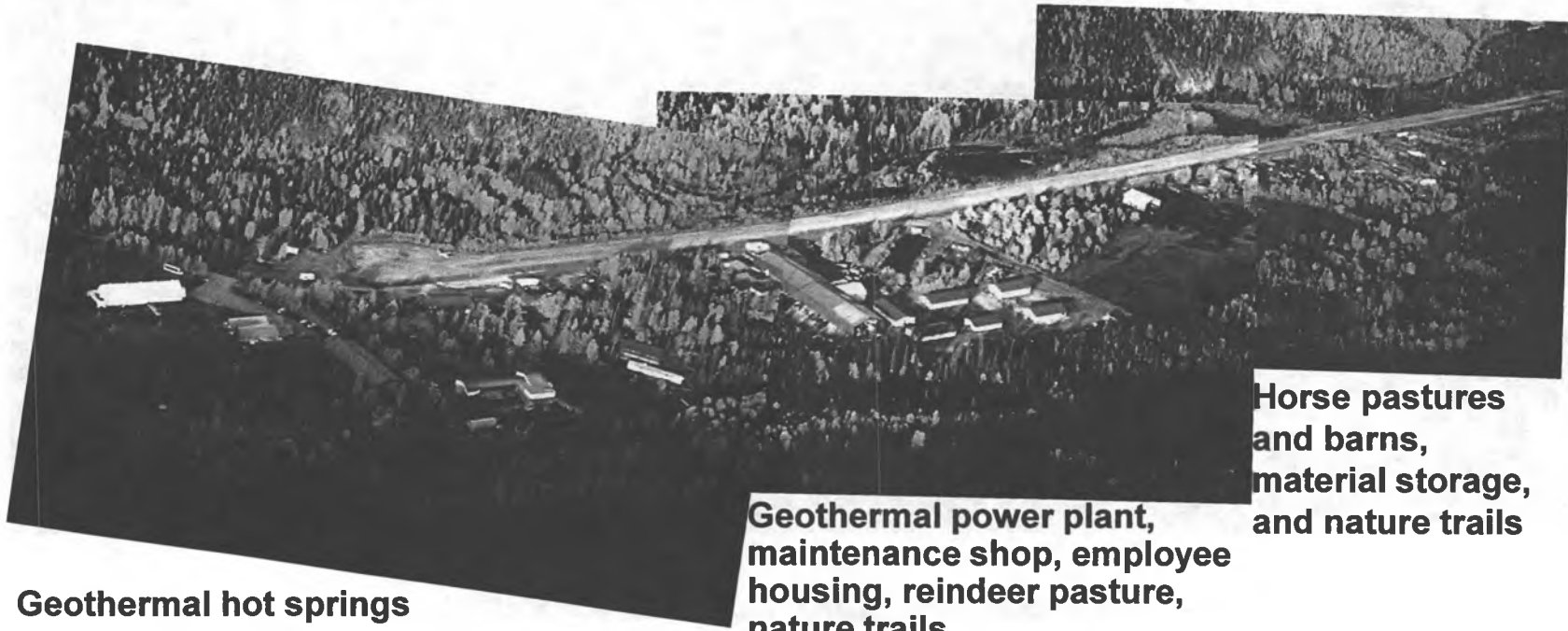
Chena Hot Springs Resort

Mile Post 56.5 Chena Hot Springs Road



CHENA
HOT SPRINGS
RESORT
FAIRBANKS, ALASKA

Chena Hot Springs Resort



**Geothermal hot springs
Lodge, restaurant, hotel, Aurora Ice
Museum, administration offices,
hydroponic greenhouse, flower and
vegetable gardens, campground, daytime
horse corals and runway**

**Geothermal power plant,
maintenance shop, employee
housing, reindeer pasture,
nature trails.**

**Horse pastures
and barns,
material storage,
and nature trails**

**CHENA
HOT SPRINGS
RESORT**
FAIRBANKS, ALASKA 3

CHENA HOT SPRINGS RESORT



Chena hot springs pool building, outdoor rock lake, hot springs ponds, high tunnel greenhouses, family suite hotel rooms and spring creek.

**CHENA
HOT SPRINGS
RESORT**
FAIRBANKS, ALASKA

OUR VISION STATEMENT CHENA HOT SPRINGS RESORT

We strive to become a self-sustaining, self-reliant community that can produce the energy, food, and fuel to meet our needs while being environmentally responsible.

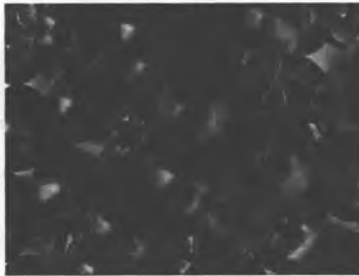


A SUSTAINABLE COMMUNITY



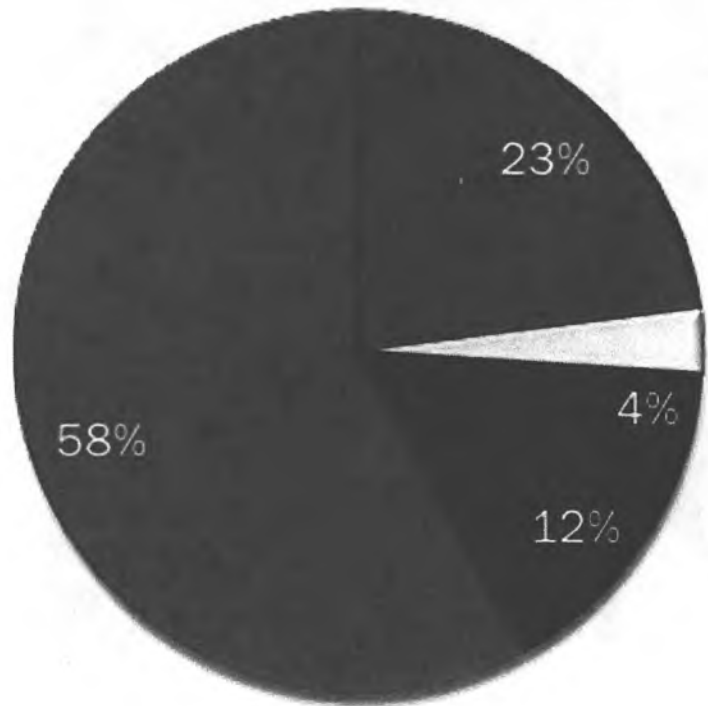
CHIENA HOT SPRINGS RESORT

FAIRBANKS, ALASKA



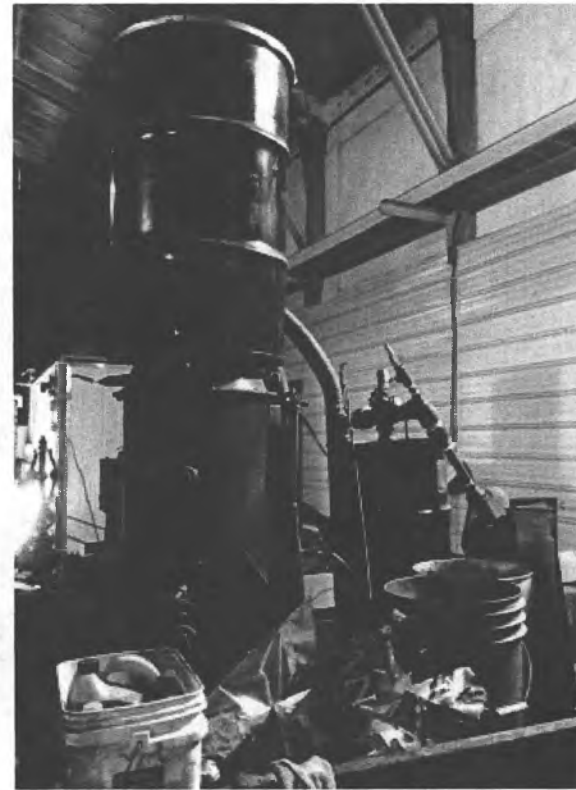
ENERGY USE AT CHENA HOT SPRINGS

(850 kW_{eq})



- Electricity
- Transportation
- Refrigeration
- Supplemental Heating
- Baseload Heating

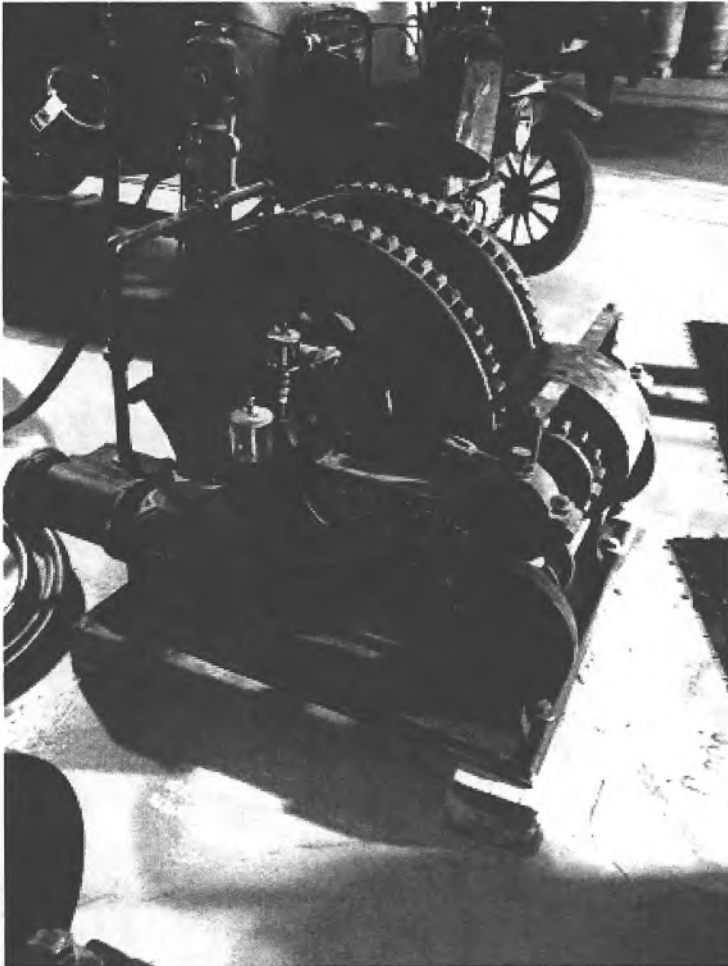
CHENA HOT SPRINGS GASIFICATION SYSTEMS



CHENA HOT SPRINGS ANTIQUUE POWER SYSTEMS



CHENA HOT SPRINGS ANTIQUUE POWER SYSTEMS



CHENA
HOT SPRINGS
RESORT
FAIRBANKS, ALASKA

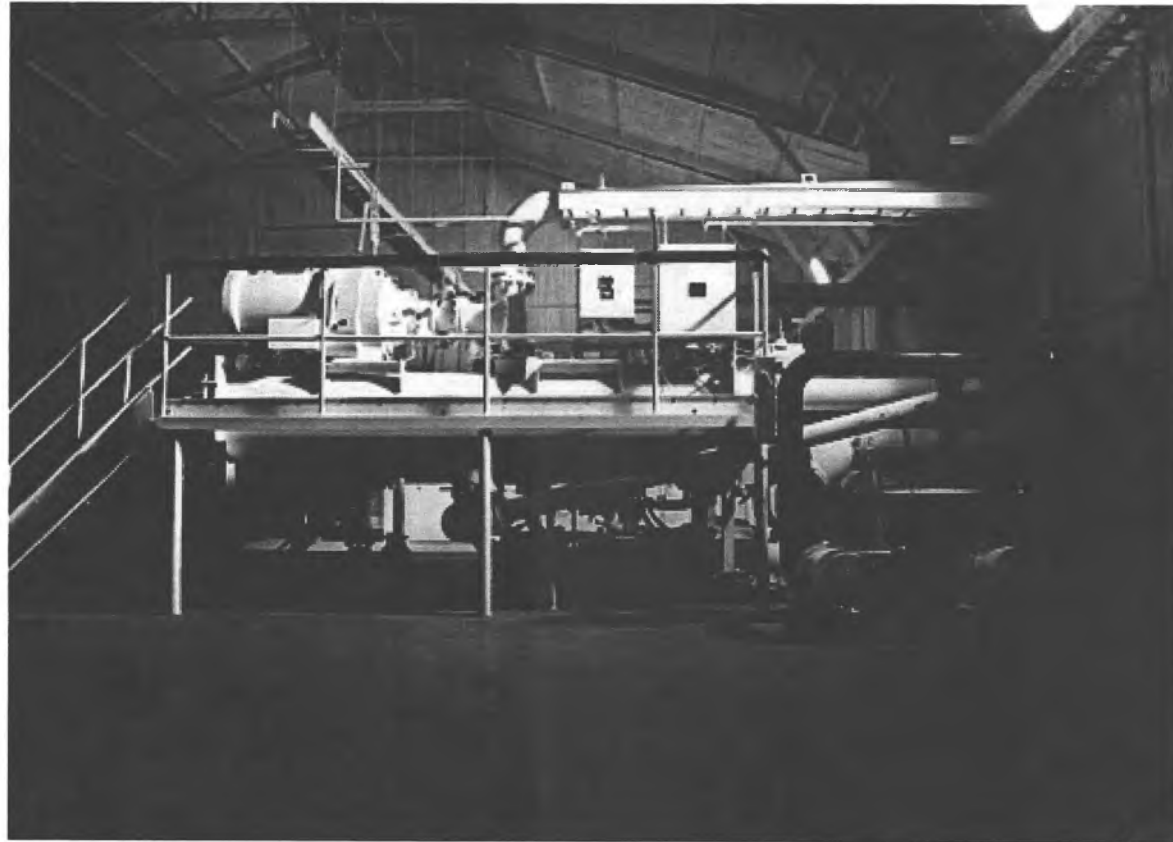
CHENA HOT SPRINGS ANTIQUUE POWER SYSTEMS



CHENA HOT SPRINGS ANTIQUUE POWER SYSTEMS

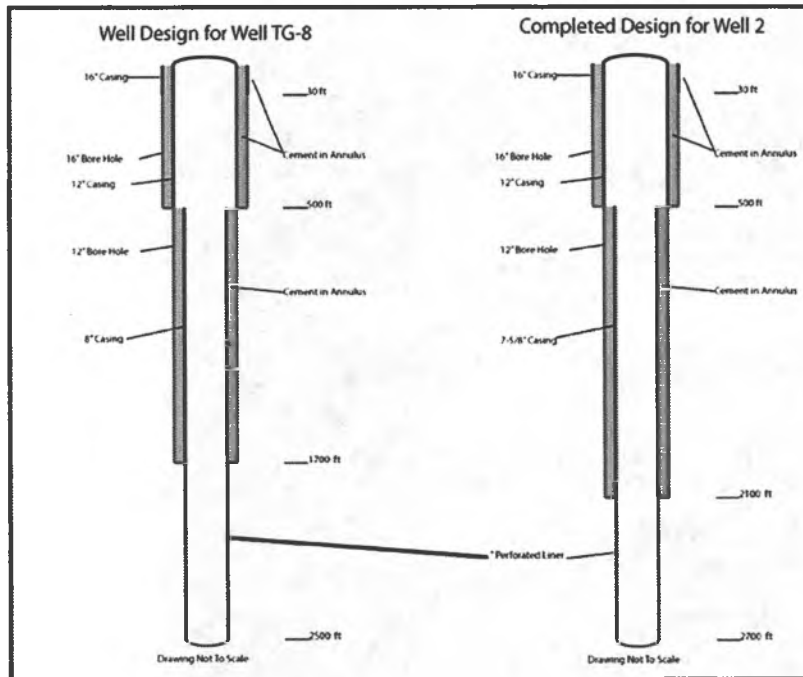


GEOTHERMAL POWER PLANT



CHENA
HOT SPRINGS
RESORT
FAIRBANKS, ALASKA

NEW GEOTHERMAL PRODUCTION WELLS



Deepening well TG-8 increased the geothermal capacity of the reservoir, and produces water at 179.8 °F

New 2500' production well reached 179.8° F

**Drilled with a JefCO 50K using a
WASSARA water hammer. 2000-2500 psi cold water.**

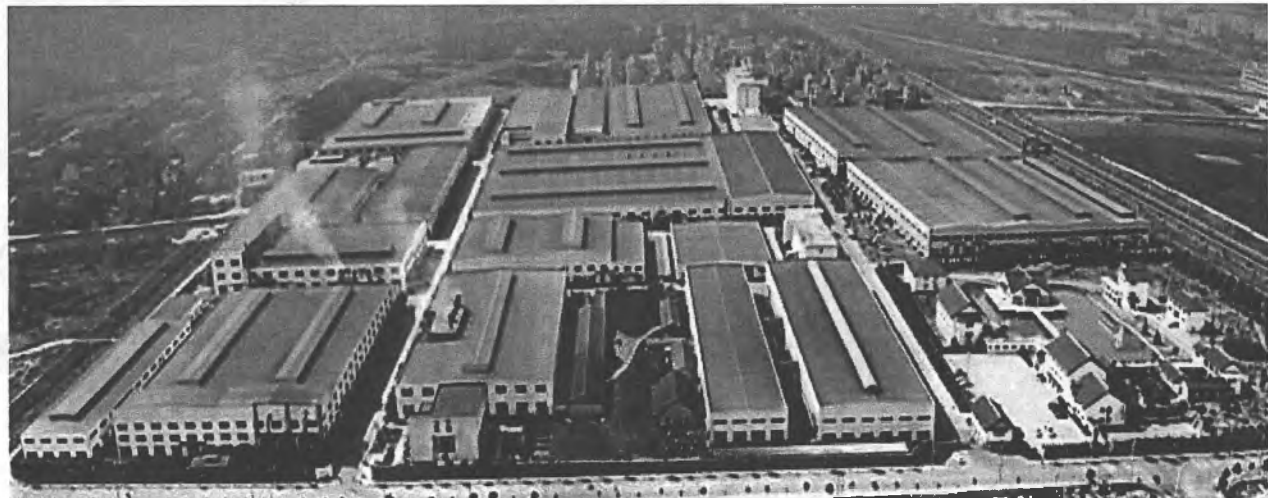




Kaishan Compressor Co., Ltd

○ Zhejiang Quzhou Site (Headquarter):

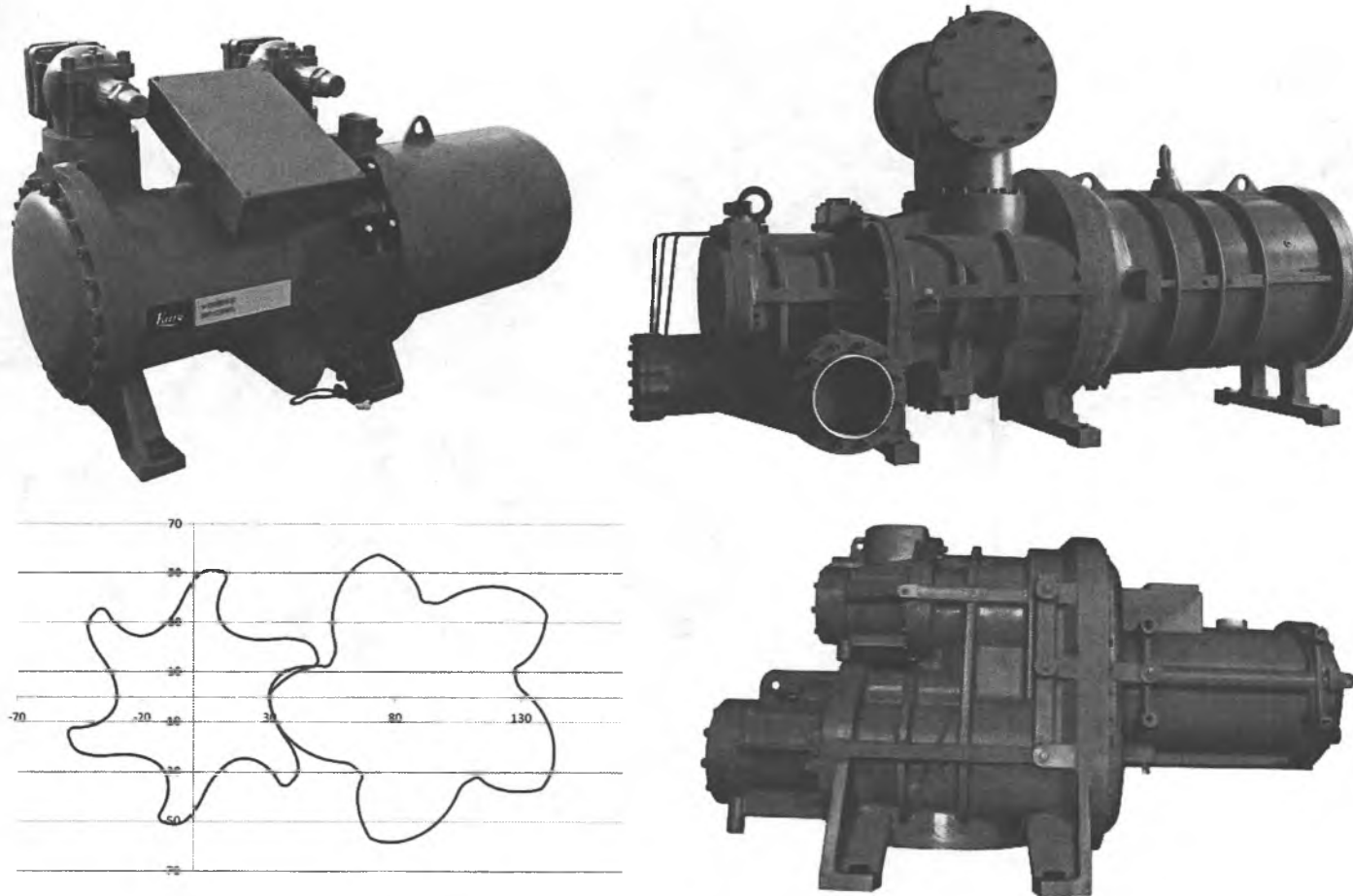
- 3 Hours by Train , 4 Hours by Driving to Shanghai**
- Foundry, Pressure Vessel, Heat Exchanger and Sheet Metal Plants**
- ORC Screw Expander Power Station**
- Small Screw Compressors**
- Reciprocating Compressors**
- Screw and Reciprocating Air Compressor Units**
- Centrifugal Compressors**

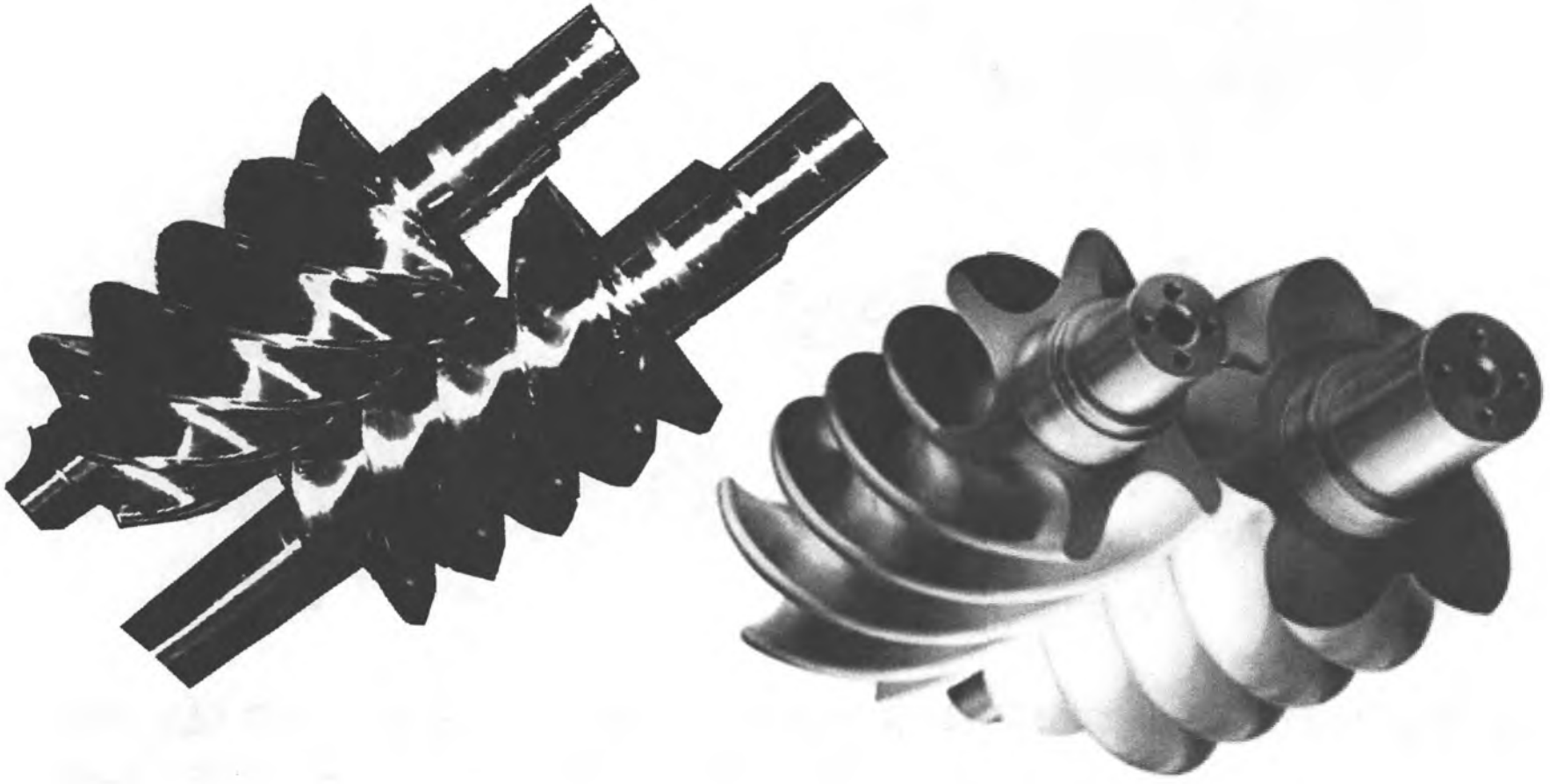




Kerry

NEW CHENA HOT SPRINGS RESORT 300 KW SCREW EXPANDER WITH A SYNCHRONOUS GENERATOR







Chena Power / Kaishan Compressors

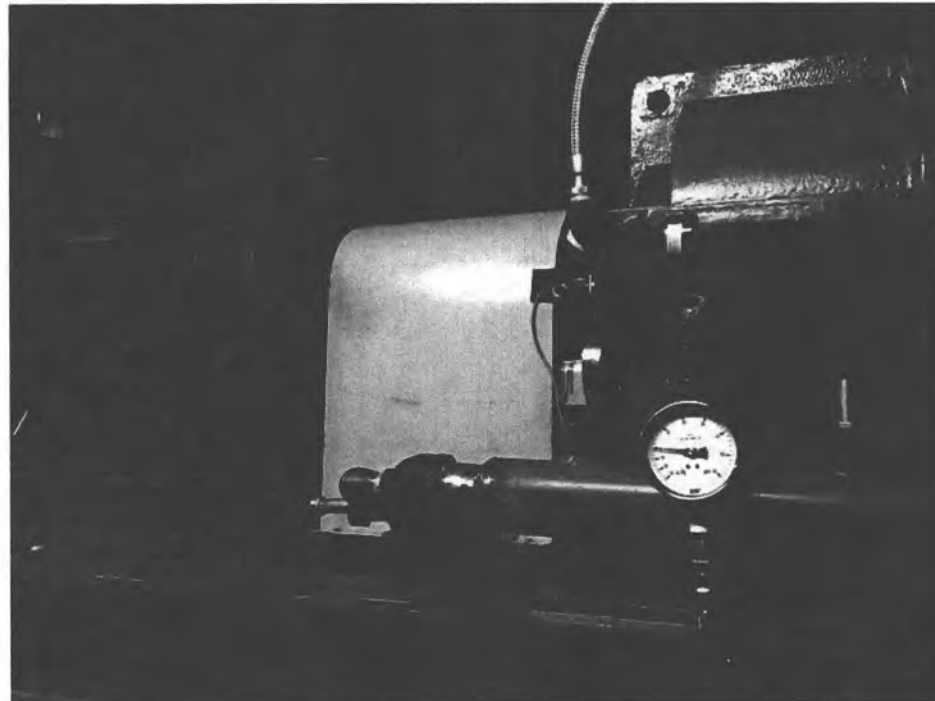




Kerry



NEW 300 KW SCREW EXPANDER WITH A SYNCHRONOUS GENERATOR





Kerry

ACHENA
POWER

NEW 300 KW SCREW EXPANDER WITH A SYNCHRONOUS GENERATOR





Kerry



NEW 300 KW SCREW EXPANDER WITH A SYNCHRONOUS GENERATOR





Chena Power / Kaishan Compressors 2.5kW screw expander for home use



CHENA POWER MOBILE ORC

The Mobile ORC in
Las Vegas, Nevada at a
Geothermal Energy
Conference.



MOBILE ORC ON LOCATION IN UTAH

The Mobile ORC is currently installed and operating on a farm property at Newcastle, Utah. The onsite geothermal resource is utilized to generate electricity for sale and for district heating. The Electricity generated is sold to the .



The Mobile ORC is currently in Newcastle, Utah set to power a large scale greenhouse.



MOBILE ORC ON LOCATION IN UTAH

The Mobile ORC built by Chena Power is currently located in Newcastle, Utah. The Newcastle site has a proven geothermal resource and ample water for cooling. The ORC is maintained by the Christensen family that owns the farm, greenhouses, and has water rights to the geothermal well.



MOBILE ORC ON LOCATION IN UTAH

The Mobile ORC is currently in Newcastle, Utah set to power a large scale, 2 acre, greenhouse growing cucumbers and tomatoes.



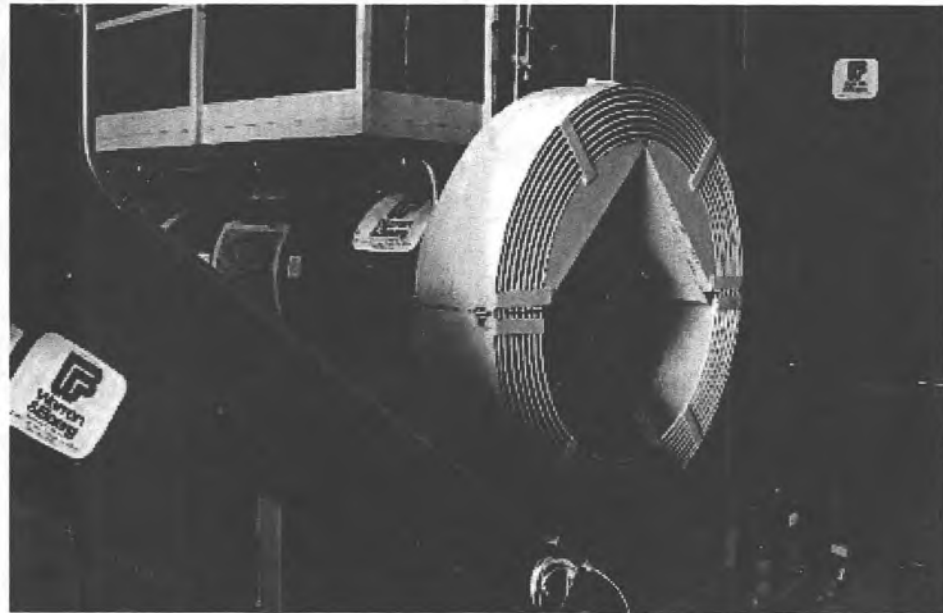
BIOMASS FUEL SOURCE: PELLETS

Waste paper is collected through recycling programs throughout the Fairbanks area and sorted. And prepared for different products



BIOMASS FUEL SOURCE: PELLETS

Specialized equipment is used to (process) shred the paper as is it fed into the machines. The shredded paper is compressed into cubed paper pellets for easy handling and used as a fuel supply in biomass furnaces and boilers



**A CHENA
POWER**

BIOMASS FUEL

SOURCE: PELLETS

Fuel pellets created on site with recycled paper and cardboard through the Chena Power and K & K Recycling programs.



BIOMASS FUEL SOURCE: PELLETS

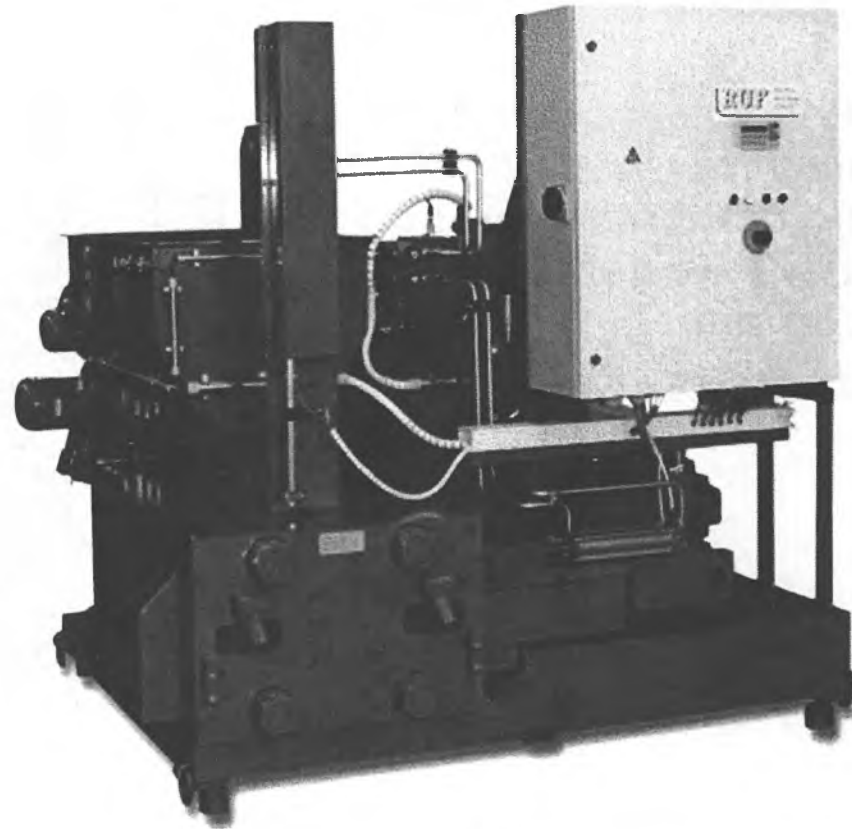
Fuel pellets created on site with recycled paper and cardboard through Chena Power Recycling program.



BIOMASS FUEL SOURCE: PELLETS

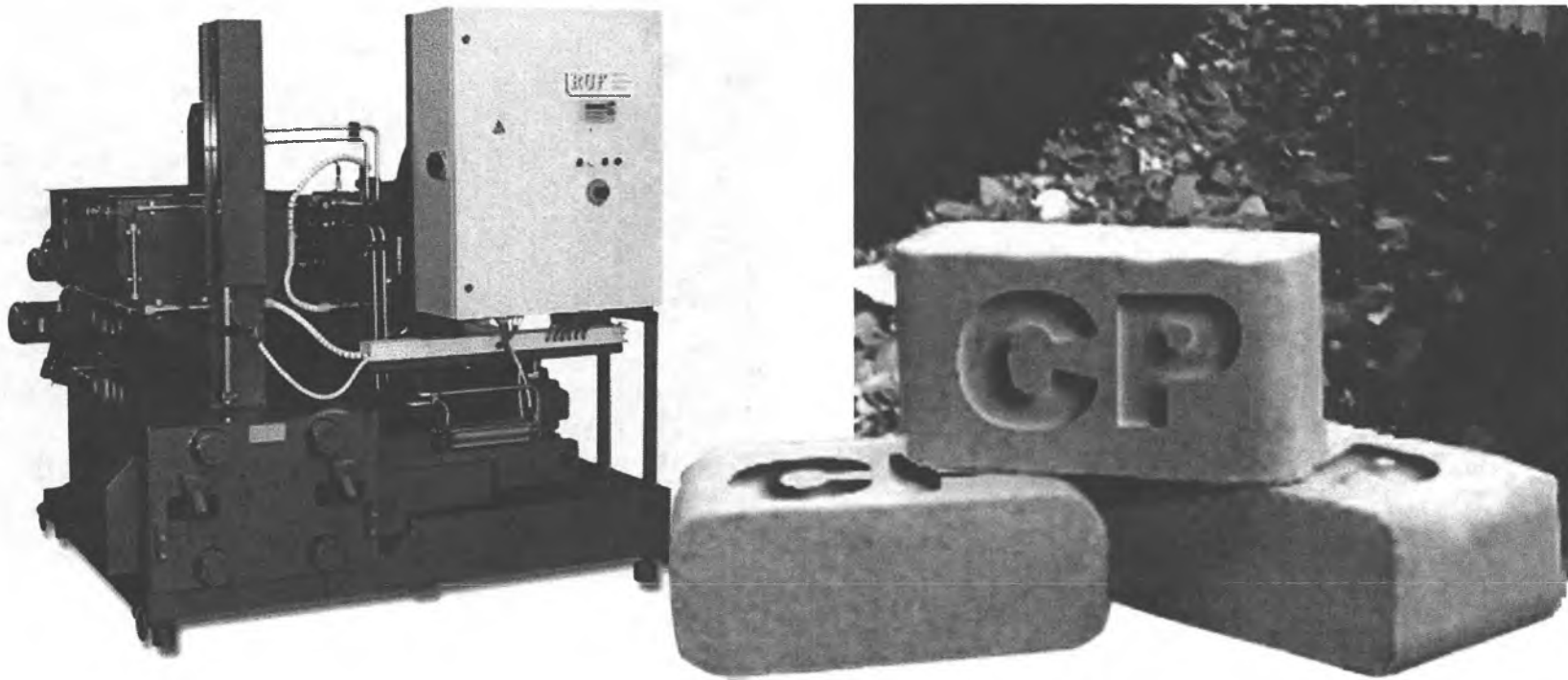
A new briquetting machine will be integrated into the recycling program. This new machine will provide an unique product utilizing the paper and cardboard collected.

We are committed, to continually seek innovative opportunities, that utilize the materials collected for recycling.



BIOMASS FUEL

SOURCE: Briquettes



Fuel briquettes will be created on site with recycled paper and cardboard through Chena Power Recycling program.



SCRAP METAL RECYCLING

K and K Recycling collects and buys several grades of scrap aluminum and aluminum cans.

The material is baled and shipped to recycling centers in the Pacific North West



SCRAP METAL RECYCLING

All Alaska communities have ample amounts of scrap metal that in the past has littered the communities and filled the landfills. There is value in these materials that are collected throughout the year.



SCRAP METAL RECYCLING

K and K Recycling collects scrap ferrous and non-ferrous metals. Materials are then prepared to be shipped to processors and recycling centers in the Pacific Northwest.

Aluminum, copper, brass, iron, stainless, tin and lead



RECYCLED MATERIAL COLLECTION

K & K Recycling has several vehicles to handle a variety of different sized collection containers, from simple dumpsters placed at residential and business locations, to large roll off dumpsters to handle large metal, wood, and other items discarded at large companies and construction



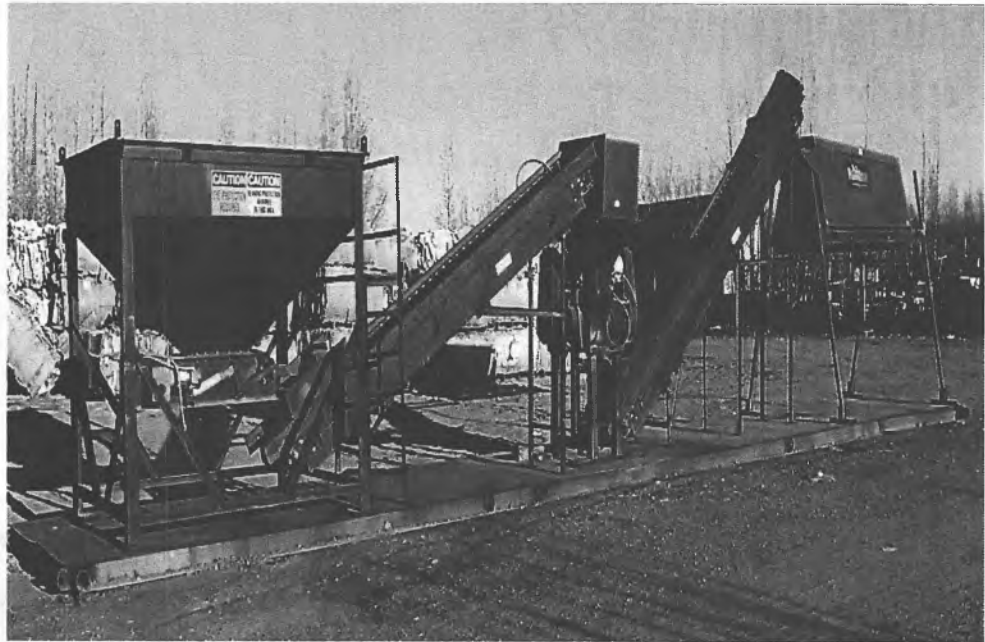
RECYCLING PROGRAM

Items originally destined to be disposed in the local landfills are being collected in the Fairbanks North Star Borough and sorted for potential products, markets, and alternative uses. This program helps to reduce the material entering the landfill and provides a resource stream for biomass, metals, and glass recycling.



RECYCLED GLASS PROCESSING

K&K Recycling has installed a glass processing system that utilizes a crusher, polisher and screening process to prepare material for further utilization in products suitable for construction, landscaping, and horticulture products.



Air Burner Heat recovery system

Chena Power is continuing to seek opportunities for creating power and heat from local resources. The Air Burner can be used as a heat recovery system utilizing waste heat for purposes such as power production and heating facilities this self-contained Biomass power generating system will produce electricity from the waste wood and other combustible materials

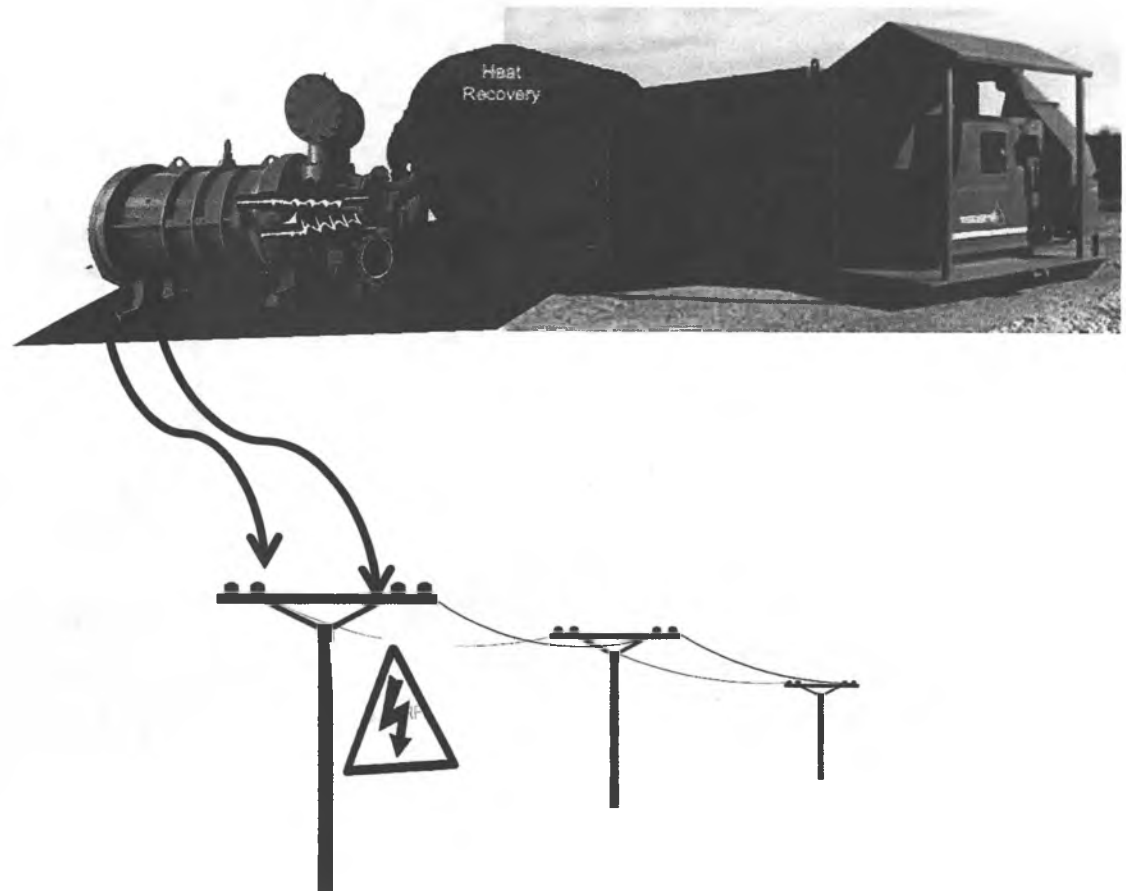


Air Burner

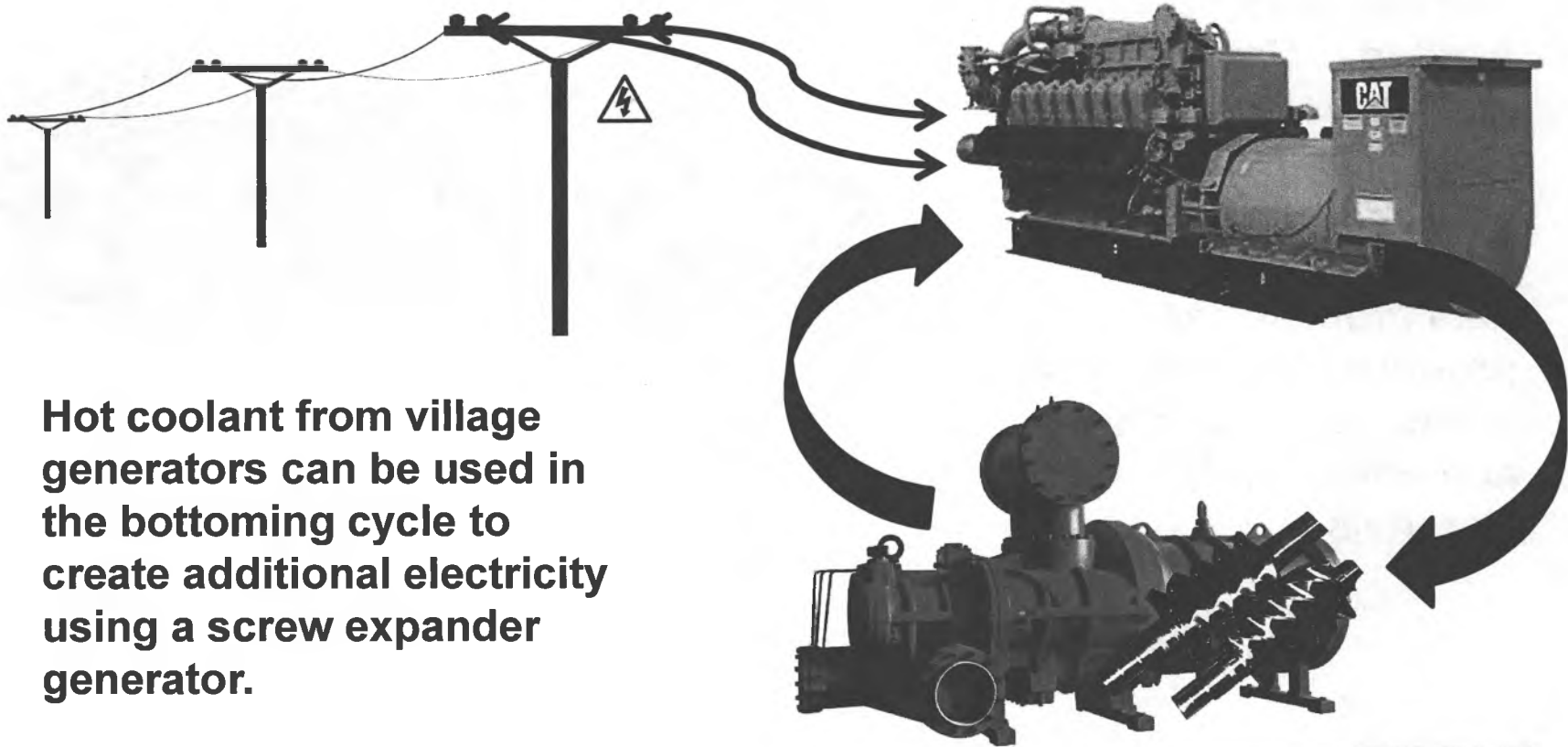
Heat recovery / Power generation

The Air Burner can be used to reclaim heat to generate electricity utilizing a screw expander system.

This process can produce electricity from waste wood, biomass, and other combustible materials.



Generation from bottoming cycle of diesel generation



Hot coolant from village generators can be used in the bottoming cycle to create additional electricity using a screw expander generator.



BIOMASS HEATING SYSTEMS

Clean, efficient and affordable, heating systems provide a constant source of heat utilizing a variety of fuels available in most Alaska communities. Biomass heating systems are individually selected for the application, including location, size of heating demand, and type of fuel available. These units range in a variety of sizes from small residential units to very large systems ideal for large commercial and industrial applications.



ACHENA
POWER

COAL FIRED MODULAR HEATING SYSTEMS

Coal fired modular heating systems are specifically designed and manufactured for each individual customers heating needs, fuels available, and site specific requirements. Each system is manufactured in North Pole, Alaska and delivered to the customers site ready to use.



COAL AND PELLET DELIVERY

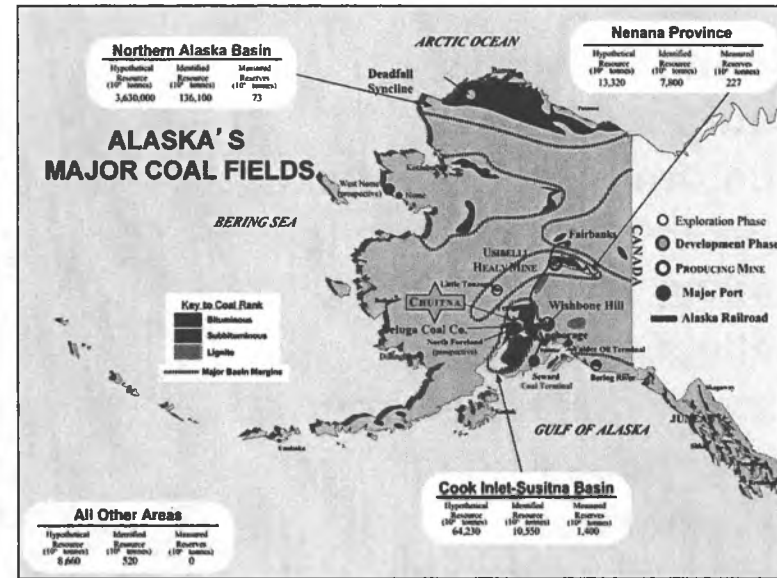
Chena Power is equipped with a custom built truck for Alaska's conditions to deliver coal, biomass pellets, and other similar materials from the processing facility to customers throughout Alaska.



COAL

Available, efficient, and clean!

- Total demand for U.S. coal reached 1.05 billion tons in 2010.
- Nearly half of U.S. electricity is generated from coal.
- 9 out of every 10 tons of coal mined each year in the U.S. is used for domestic electricity generation.
- Each person in the U.S. uses 3.4 tons of coal annually.
- Coal is the most affordable source of power fuel per million Btu, historically averaging less than one-quarter the price of petroleum and natural gas.

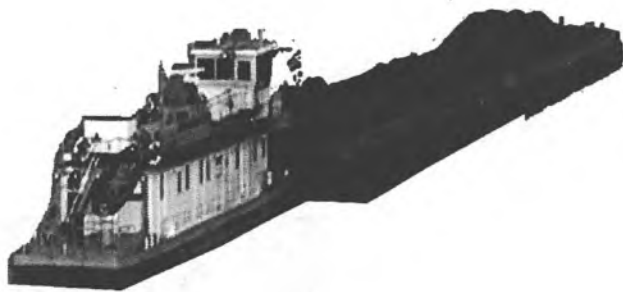


COAL

Available, efficient, and clean!

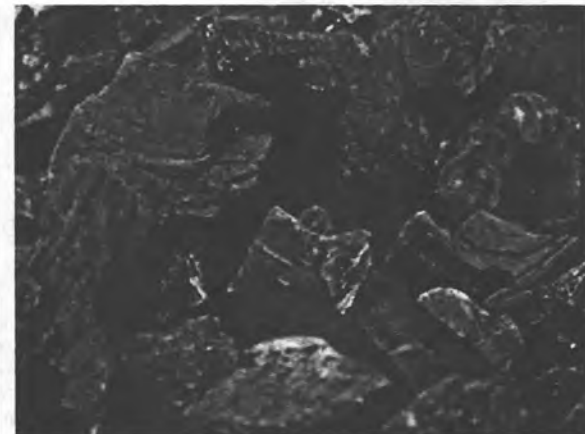
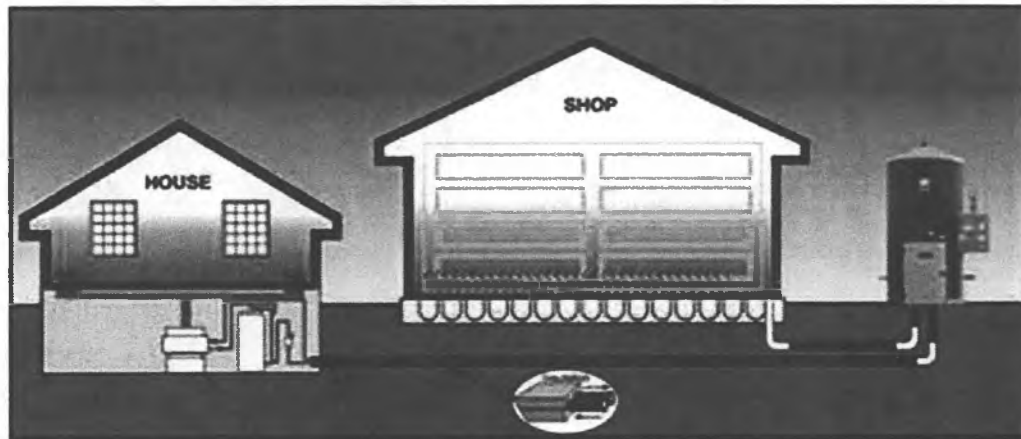


Kaltag, Alaska on the Yukon River



Alaska COAL

Available, efficient, clean and affordable!



GREENHOUSE AND HIGH TUNNELS



Chena Hot Springs has three greenhouses at the Resort. Tomatoes are a significant crop that is harvested throughout the year. There are four types of tomatoes grown; beefsteak, roma, grape, and cherry.

GREENHOUSE AND HIGH TUNNELS



The LED and hydroponic systems decrease winter energy costs and increase production. It is the largest of its kind in Alaska and the USA.

CHENA FRESH GREENHOUSE AND HIGH TUNNELS



CHENA FRESH A LOCAL FOOD PRODUCER



**Alaska's
Farmers
Feed
Alaska**



C-GRO PRODUCTION SYSTEM

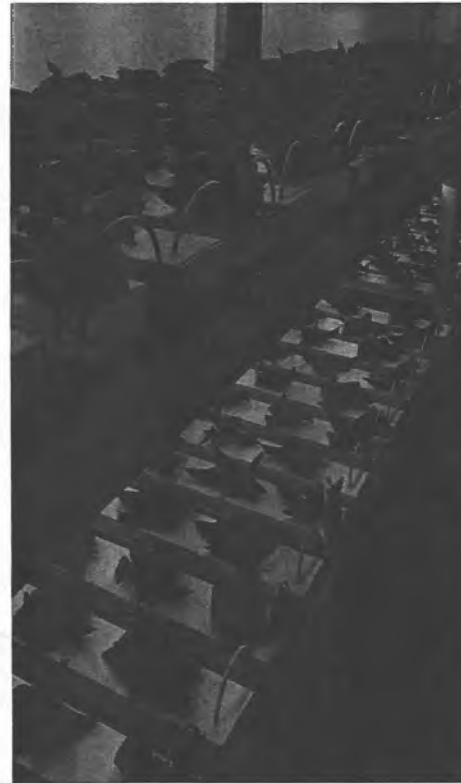
The C-GRO production system was designed with the intent to provide a local supply of fresh vegetables, primarily leafy greens to Alaska communities that have shipping challenges limiting the availability of fresh and nutritious vegetables throughout the year.

As result of several years of research and implementation, C-GRO, a self-contained controlled environment production system with a hydronic heating system was built for use in Glennallen and was placed in operation in October 2013 .



C-GRO PRODUCTION SYSTEM

The C-Gro unit was designed and built using a retired 40 foot refrigerated trailer van, once used to haul vegetables to Alaska. The trailer was selected for the ease of transport and final placement. This project required several special considerations in respect to the temperature extremes of Alaska's summers and winters. A hydronic heating system was installed to maintain optimum temperatures for growing even during the coldest winter when temperatures can drop to -50°F . A passive cooling and ventilation system was installed to handle the potentially hot ($+85^{\circ}\text{F}$) summer temperatures.



C-GRO PRODUCTION SYSTEM

The C-Gro production system has the capacity to produce up to 150 heads of lettuce a week. The productivity of the C-Gro is only the result of individuals operating the unit. For maximum production, special attention to the climatic and the nutrient needs of the plant while maintaining the proper climate and cleanliness is important. The C-Gro can successfully grow butter head lettuce, leafy-green and red lettuce types, romaine, baby greens, spinach, basil, and other plants that do not require flowering.

We look forward to work with other communities, utilizing the work that has been accomplished at Chena Hot Springs as they work toward self-sufficiency, self reliance and local food production.

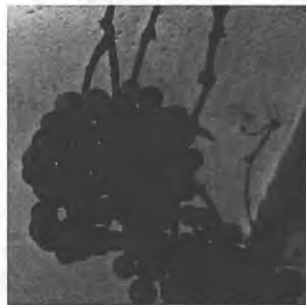


C-GRO PRODUCTION SYSTEM

The C-Gro unit utilizes proven technologies used in the Chena Hot Springs greenhouse. A significant technological concept utilized is the LED grow light system. Uniquely designed by the controlled environment specialists at Chena, this system has proven to grow lettuce, herbs and other greens. Equally important to the lighting, is the nutrient management system. The C-Gro utilizes a modified nutrient film technique watering system with a constant flow of nutrient rich water. The fertilizer and pH levels are maintained using digital controllers and peristaltic pumps that monitor and dose nutrient solutions when necessary.

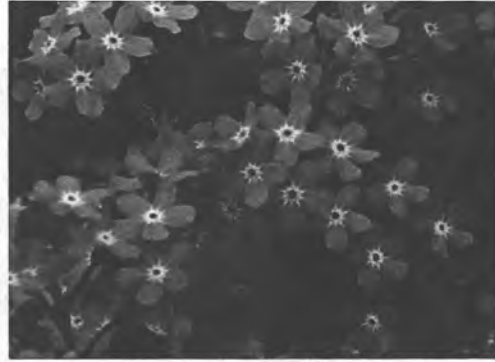


FRUITS AT CHENA



Grapes Rhubarb Bananas Strawberries Raspberries

FLOWERS AT CHENA



CHENA HOT SPRINGS WORKING LIVESTOCK



CHENA HOT SPRINGS ALTERNATIVE LIVESTOCK

Chena Hot Springs Resort is home to a developing reindeer herd.

Alaska has several alternative livestock species that are raised for commercial meat production. Elk, Bison, Yak, and Reindeer are among those that are currently in production.

It is our desire to develop this industry onsite and produce meat for local consumption.



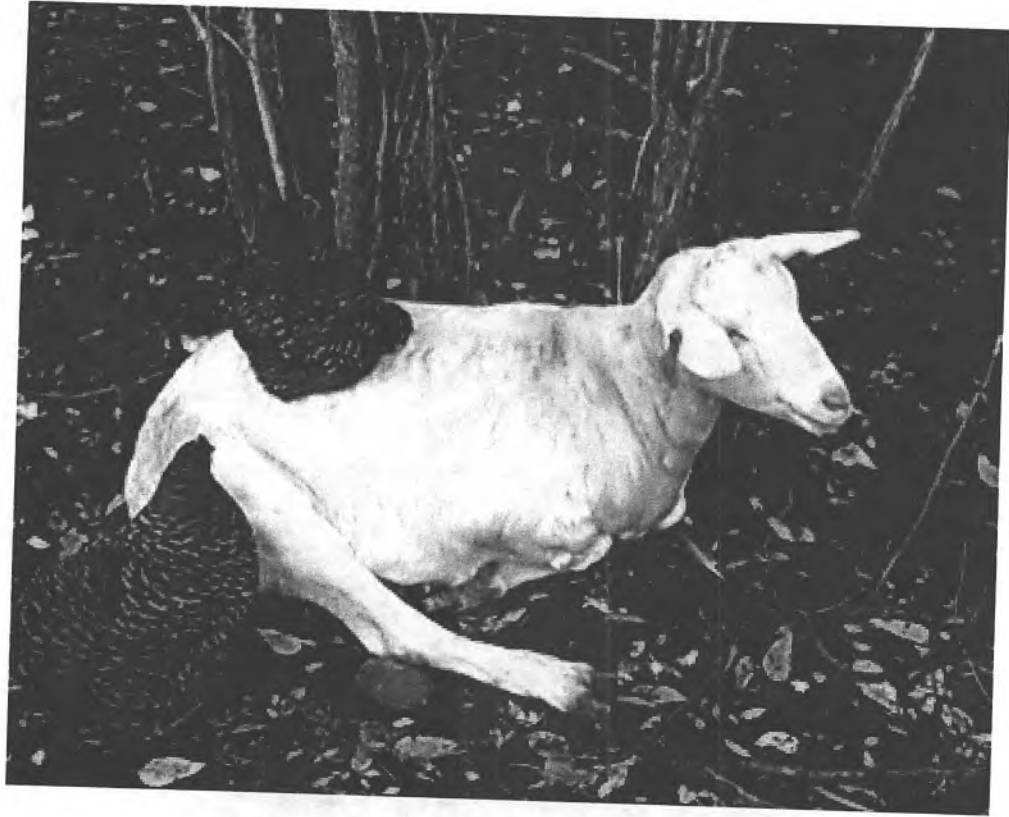
CHENA HOT SPRINGS ONSITE MEAT PRODUCTION

USDA inspected and certified pork is raised using Alaska Grown feeds and other re-processed kitchen scraps to produce quality meat products used in the dining facilities.



SMALL LIVESTOCK POULTRY AND GOAT FACILITY





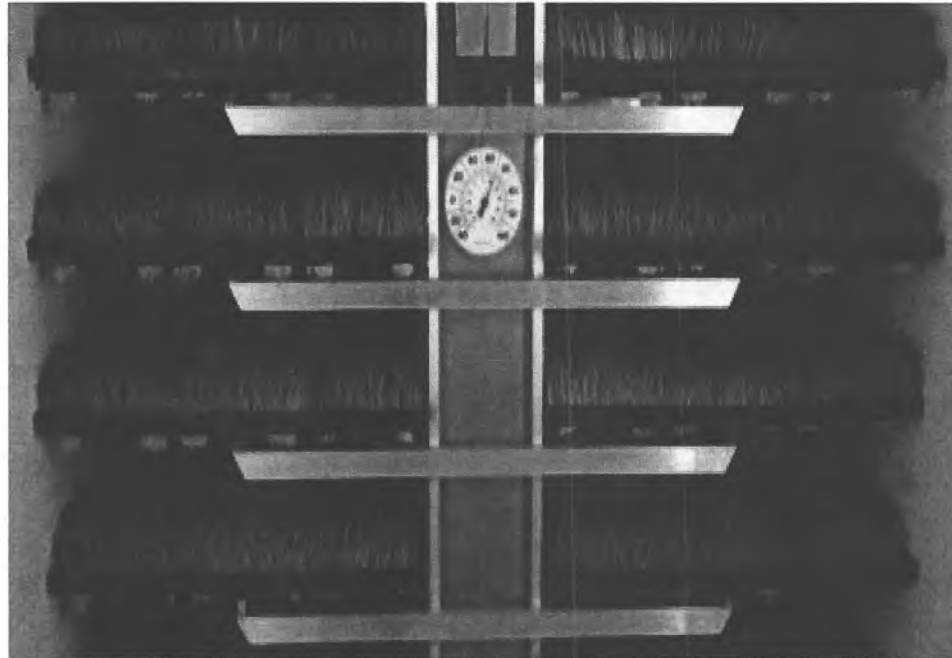
CHENA HOT SPRINGS GROWN BARLEY FODDER

Day 1: Barley seeds are placed in system



CHENA HOT SPRINGS GROWN BARLEY FODDER

Day 6: Barley seedlings are harvest and fed to livestock



CHENA HOT SPRINGS GROWN BARLEY FODDER

A Nutritious livestock feed is grown onsite
using Delta Junction Barley for a quality product



Lettuce give you a hug from the Earth...

9th Annual Renewable Energy Fair

Chena Hot Springs Resort August 17th, 2014

Key Note Speakers

Dynamic and engaging speakers are invited to speak on the immediate energy and sustainability needs of Alaska, providing insight to what is occurring locally, statewide, and nationwide. Previous years speakers include members of the US Senate, Congressmen, Presidential cabinet members, the Governor of the State of Alaska, members of the Alaska State Legislators, local area mayors, prominent industry leaders and members of the Alaska community.



Senator Lisa Murkowski, US Senate



Senator Karl Chen, Chena Hot Springs Resort



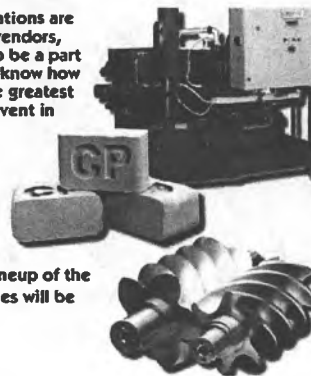
Olga Herberich, Chena Hot Springs Resort

The Renewable Energy Fair is only possible with the generous support of dedicated individuals and organizations that have a passion for renewable energy and sustainable living.

Individuals, businesses and organizations are invited to participate as sponsors, vendors, and presenters. If you would like to be a part of this exciting event, please let us know how you would like to be involved in the greatest sustainable and renewable energy event in Alaska.

Chena Power has implemented a dynamic new state of the art briquetting system for handling collected biomass and paper materials to be used in combustible fuel heating systems. A complete lineup of the new briquette products and their uses will be demonstrated at the Fair.

A new product for the biomass fuel market from CHENA POWER



Chena Power, USA and Kaishan Compressor, China
An international partnership in geothermal power generation, innovation and implementation.

Entertainment

Special Entertainment is scheduled throughout the day. Performers and activities include, but not limited to live musicians, balloon artists, sketch artists, poetry reading, pony rides, a petting zoo, and much more. Free tours of the greenhouse and power plant and nature walks will also be available for all to enjoy.

Presentations

Throughout the event, invited guest speakers conduct small group lectures and presentations on topics related to this years theme. Informational, hands-on, engaging, and inspiring is the expectation for all presentations. Local and national experts have been invited to speak on renewable energy, sustainability, self reliance, power generation, conservation and geothermal activity.

Food and Beverage

Enjoy an ice cream cone, a piece of brick oven baked bread or a fresh barley flour pretzel as you learn about sustainable food production and renewable energy. The event will begin with an "Alaska Grown" barley flour pancake breakfast prepared by members of the Fairbanks Farm Bureau. Lunch will include free hot dogs and chili for all attendees. Delicious Chena Mint Iced Herbal Tea and lemonade will be served throughout the day.

Youth Activities

There are many youth activities planned to inspire and entertain Alaska's future generations. Popular events in the past included robotics and LEGO activities, natural resource and environmental engagement activities, pony rides, hydroponic garden projects, guided berry pickings, and paper boat building just to name a few, all activities are provided FREE to event attendees.

Transportation

Chena Hot Springs Resort will provide bus transportation to and from Fairbanks for the Energy Fair departing in the morning and returning back in the early evening. Reservations for the bus are available online on the website. There is no charge for the bus.



Reduce Reuse Recycle



Greenhouse

The greenhouses and high tunnels at the Resort are filled with innovative ideas for up-to-date hydroponic production. Enjoy a fresh salad and the beautiful flowers grown on location using renewable energy.



Fodder

Explore the fodder production system and learn about the benefits of fodder production and the many opportunities for its use.



Power & Energy

Experience the latest power generation systems at Chena Hot Springs, the possibilities that may be used elsewhere throughout Alaska.



Geothermal

Witness the first in the world screw expander with a synchronous generator, generating electric from a recently drilled 178.9°F geothermal well and improved cooling system.



Hydrogen

The cleanest and easiest form of energy available known to man. Experts from around the world will demonstrate hydrogen powered equipment and generators suitable for the Alaskan sustainable lifestyle.



Draft Power

Observe draft animal farming, power production and water pumping demonstrations! Wagon rides and pony rides will be available throughout the day. Real horse and pony power!

Methane

Methane gas collected from digesters onsite will be used to demonstrate simple fuel production for a sustainable lifestyle. Cooking, heating, cooling, and electrical generation examples will be available during the fair.



A full day of exciting activities and presentations to educate, engage and inform participants on current topics involving renewable and sustainable energy, conservation, self-sufficiency, agriculture and the environment.

Sustainable & Renewable

- ▶ Geothermal Energy
- ▶ Sustainable Food Production
- ▶ Screw Expander Generation
- ▶ Conservative Living Ideas
- ▶ Biomass Utilization
- ▶ Draft Horse Power and Use
- ▶ Hydrogen Power Generation
- ▶ Methane Digestion and Use
- ▶ Natural Gas Issues for Alaska
- ▶ Energy Conservation

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PROJECT RESULTS: THE FUTURE

POWER, HEAT, FOOD



CHENA
HOT SPRINGS
RESORT
FAIRBANKS, ALASKA

CHENA
POWER