

03/27/13

**Presentations:
Interior Rural
Energy, and
Alaska Energy:
Problems and
Solutions**

<TARGET><BILL></BILL><SUBJECT>03-27-13 Presentations
Interior Rural Energy, and Alaska Energy Problems and
Solutions</SUBJECT><COMM>HENE28</COMM></TARGET>

Alaska Legislature

House Special Committee on Energy



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Agenda

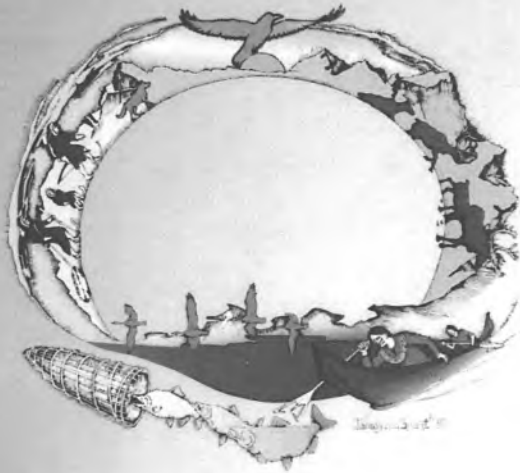
March 27, 2013

8:00 – 10:00 a.m.

Barnes Committee Room (#124)

- + Presentation: Interior Rural Energy: Opportunities to Move Forward
Julie Roberts-Hyslop, Vice President, Tanana Chiefs Conference
David Pelunis-Messier, Rural Energy Coordinator, Tanana Chiefs Conference
- + Presentation: Alaska Energy: Problems & Solutions
Bernie Karl, President, Chena Power
- * First hearing in first committee of referral
- + Teleconferenced
- = Bill previously heard/scheduled

###



TANANA CHIEFS CONFERENCE

INTERIOR RURAL ENERGY: OPPORTUNITIES TO MOVE FORWARD

Prepared for
House Energy Committee
March 27, 2013



THE ORGANIZATION

Tanana Chiefs Conference is a Tribal Consortium with 42 Members, representing 39 villages and 37 federally recognized tribes.

MISSION: "Tanana Chiefs Conference provides a unified voice in advancing sovereign tribal governments through the promotion of physical and mental wellness, education, socioeconomic development, and culture of the Interior Alaska Native people."





INTERIOR RURAL ENERGY

Some of the Highest Energy Costs in the Nation

Takotna:

\$1.02/kWh, Or 10x the rate for Anchorage large commercial

Arctic Village:

\$10/gal, that's roughly \$60/Mmbtu, almost 6x the cost in Anchorage



Infrastructure

Average Electrical Generation								
MW	Gas	Oil	Coal	Hydro-electric	Wind	Bio-mass	Solar	Geo-thermal
< 0.1	—	▲	—	—	✖	—	—	—
0.1 - 1	—	—	—	—	✖	▲	—	▲
1 - 10	▲	▲	▲	—	✖	▲	—	—
> 10	▲	▲	▲	—	—	—	—	—

Electric Transmission

> 100 kV
 < 100 kV

Electric Service Areas

- Anchorage Municipal Light & Power
- Chugach Electric Association
- Copper Valley Electric Association
- Golden Valley Electric Association
- Homer Electric Association
- Matanuska Electric Association
- Seward Electric Association

Major Pipelines

Natural Gas Pipelines
 Trans-Alaska Pipeline

Major Transportation

Roads
 Railroad

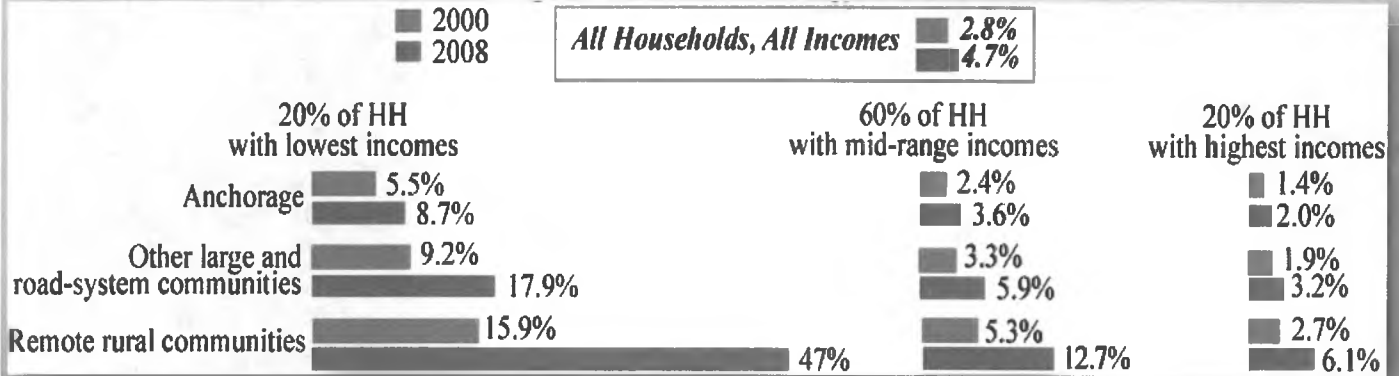


ENERGY CHALLENGES

Electrical Use:

PCE report- In 2011 over 2.5 Million Gallons of diesel used for electrical generation in the TCC Region

Estimated Median Share of Income Alaska Households Spend for Home Energy Use (ISER)





ENERGY CHALLENGES

Transportation:

- **Effects on Subsistence Activities**
- **Increase cost of travel to/from villages**
- **Increases Cost of Goods in the Village**



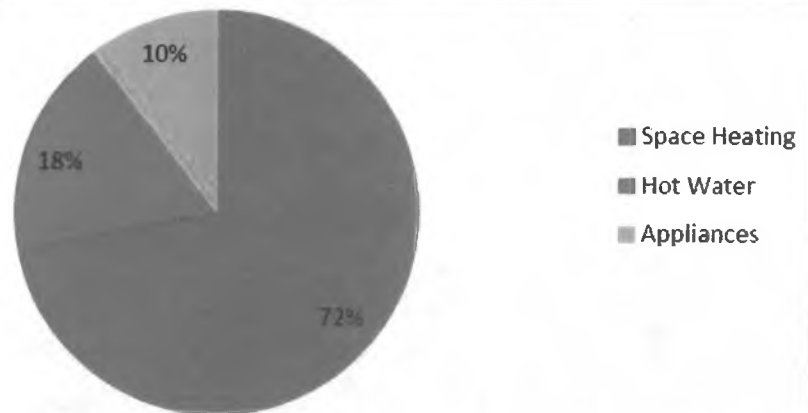


ENERGY CHALLENGES

Space Heating:

- Nearly \$.75 of every Energy Dollar goes to Heat a home
- Schools are unsustainable to run and maintain
- Economic Development is being stifled

Average Rural Residential Home Energy





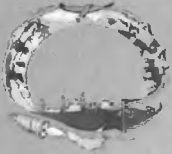
ENERGY OPPORTUNITIES

Electrical Conservation/Solar:

- AEA – Village End Use Efficiency Program (VEEP)
- AEA- Rural Power Systems Upgrade Program (RPSU)
- Inefficient fan motors, pumps, lighting
- Renewable Energy – Solar, Biomass
- Affordable Propane → Increased Efficiency



**Solar Install
Nenana Teen
Rec Center**



ENERGY OPPORTUNITIES

Space Heating Conservation:

- Tanana Chiefs Conference Resolution 2013-11 established the highest energy efficiency standards for new construction in the State of Alaska
- TCC, Interior Regional Housing Authority (IRHA) Weatherization
 - Average Home Saved \$1958/yr

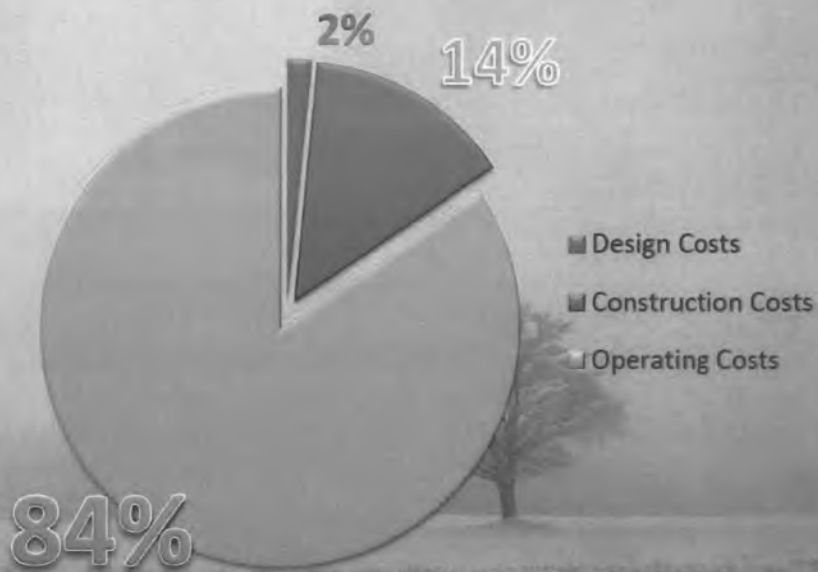
TCC RESOLUTION: "Buildings Financed with Public Money Shall Seek To Achieve the Following Efficiency Standards..."

- Roof: R-100
- Walls: R-70
- Floor/Slab: R-50



BUILDING LIFE CYCLE

TOTAL costs of Ownership in Buildings



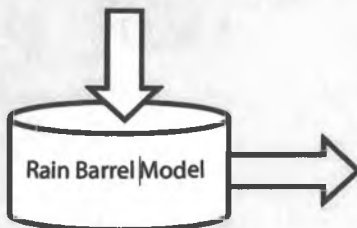


BIOMASS

Locally Produced Energy = Economic Sustainability

- **Tanana's Biomass Project:**
 - **2006: Imported 30k gal/yr @ \$5/gal = \$150k to Barge/Oil Companies**
 - **2013: Imported 12k gal/yr @ \$5/gal = \$60k to Barge/Oil Companies**
 - **2013: Purchased 150 cords @\$300/cord= \$45k/yr to local woodcutters**

Determine ways to increase dollars into the economy:



Determine ways to retain dollars in the economy by reducing the dollars leaving the economic Rain Barrel.

Figure 4. Rain Barrel Model.



BIOMASS



18,100,000 btus/cord (White spruce)
according to
www.alaskawoodheating.com



130 gallons of fuel oil
(\$552 at \$4.27/gal)



BIOMASS

Cord Wood/Oil Have been the main heat sources in Rural Alaska since Villages were established

KISS Principle – “Keep It Simple Stupid”



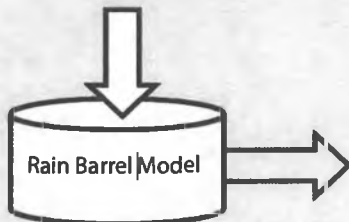


PROPANE

TCC Resolution 2013-12 Support for HB-74/SB23

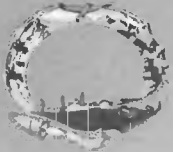
- Affordable Energy Is KEY to a Sustainable Economy
- Gas Trucking Plan could decrease the cost of Propane in Fairbanks by up to 50%
 - As cooking/water heating/dryers convert could lower microgrid baseload

Determine ways to increase dollars into the economy.



Determine ways to retain dollars in the economy by reducing the dollars leaving the economic Rain Barrel.

Figure 4. Rain Barrel Model.



PROJECT OVERVIEW

Hydrokinetics = Power Generation from flowing water
3 yrs, \$350k spent, less than 500kWhs generated
\$700/kWh

Lets be on the cutting
of technology NOT the
Bleeding edge...





NENANA REC CENTER

<u>Technology</u>	<u>5 yr \$ Savings</u>	<u>Cost of Materials/Install</u>	<u>5 yr Energy Savings</u>
Electricity	\$4,400	\$20,000	22,000 kWh
Hot Water	N/A	\$7,000	N/A
Zone Valves, Programmable Thermostats	\$19,150	\$2,000	5,000 Gallons of Diesel
TOTAL	\$25,270	\$29,000	





ENERGY MODEL

1. Collect Data & Plan!

2. Efficiency First

3. Renewable Energy
(BIOMASS! SOLAR!)



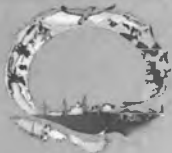
LETS PUT THAT MODEL INTO PRACTICE

Manley Hot Springs Tribal Council

- 4 Buildings
- 35kW Max Load Generator @ ~2gal/hr
- 17,000 gal/yr

\$70,000 in Diesel/yr





1. COLLECT DATA AND PLAN

- Main Electric Loads:
 1. 6kW Electric Heat
 2. 9kW Electric Dryer
 3. 4kW Lighting
 4. Double Coil 3kW Electric water heater
 5. Freezers/computers
 6. Well Pump





2. EFFICIENCY!

Main Electric Loads:

6kW Electric Heat → 92% Efficient Toyo Stove!

9kW Electric Dryer → 80% efficient propane dryer

4kW Lighting → LED lighting

Electric water heater → on Demand Propane

Freezers/computers

Well Pump

Air Compressor

New Max Load: $35\text{kW} - 19\text{kW} = 16\text{kW}$



3. RENEWABLE ENERGY

THE GOAL: Add Solar PV to the System!

Store Energy During the Day In Batteries → TURN GENERATOR OFF AT NIGHT

Potential Diesel Savings: \$40k+/yr



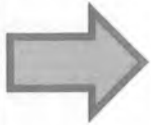


MAIN TAKE-AWAYS

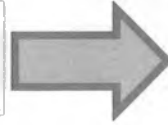
"WE CANNOT SOLVE OUR PROBLEMS WITH THE SAME THINKING THAT WE USED WHEN WE CREATED THEM"
-A. EINSTEIN-

- 1. Local/Cheaper Energy → Sustainable Communities**
- 2. Energy is Expensive, Cheaper to Conserve than to Produce**
 - Weatherization
 - Rural Power Systems Upgrade
 - Village Energy Efficiency Program
- 3. Renewables are only a part of the solution**

**1. Collect
Data and
Plan**



**2. Efficiency
First**

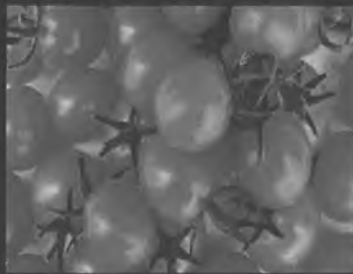


**3.
Renewable/Local
Energy**



Bernie Karl Presents

ALASKA ENERGY/ECONOMY: PROBLEMS AND SOLUTIONS



OUR VISION

Become a self-sustaining state...

one household,

one business,

one community at a time in terms of:

- Fuel sources,
- Energy delivery, and
- Food security.

RESULTS: CHEAP ENERGY/VIBRANT
ALASKAN ECONOMY

PROBLEMS

FUEL SOURCE

OIL, OUR MAJOR FUEL SOURCE IS A WORLD MARKET COMMODITY (WE HAVE NO CONTROL OVER THE COST OF OUR FUEL), IT IS SO EXPENSIVE THAT IT IS DESTROYING ALASKA'S ECONOMY

ENERGY DELIVERY

OTHER THAN OIL, NO STATEWIDE ENERGY DELIVERY INFRASTRUCTURE EXISTS, AND TO BUILD NEW DISTRIBUTION INFRASTRUCTURE IS SO EXPENSIVE THAT IT IS BEYOND OUR PRACTICAL REACH

FOOD SECURITY

WELL OVER 90% OF THE FOOD CONSUMED IN THE STATE IS IMPORTED AND SO EXPENSIVE THAT MANY ALASKANS FIND IT UNAFFORDABLE

BIGGER PROBLEM

OTHER THAN SAVINGS, THE STATE OF
ALASKA IS OUT OF MONEY

AND THE LEGISLATURE HAS NO CHOICE BUT TO CUT THE BUDGET

???????NO MONEY/NO SOLUTIONS ????????

NOT TRUE

SIMPLY PUT: THE REALITY OF LESS MONEY
REQUIRES THE NEED FOR MORE INNOVATION
AND PRACTICAL APPLICATION OF INTELLEGENGE

HOW MUCH INNOVATION DO WE HAVE?
HOW MUCH INTELLIGENCE DO WE HAVE?
HOW MUCH MONEY DO WE HAVE?



ENOUGH!

WHAT DO INNOVATIVE AND PRACTICALLY INTELLEAGENT SOLUTIONS LOOK LIKE?



- As simple as pumping water without electricity
- initial cost \$800,
 - zero operating cost

OR

Applying a simple concept to a complicated system.
Geothermal heat is energy, now make electricity.



- Research and Development cost \$2,000,000
- Capital Cost \$400,000
- Operating Result \$0.06/kWh

OR

Geothermal heat is energy, now grow vegetables year-round in Alaska.



- Research and Development cost \$1,500,000
- Capital Cost \$500,000
- Operating result: \$ 0.75/head of fresh lettuce
\$ 1.50/lb fresh tomatoes



OR

Recycle cardboard and paper to produce a fuel source which can:

- heat cleanly
- and/or produce electricity cleanly

Research and development Cost: \$4,000,000

Capital Cost: \$4,000,000

Operating result: BTU's at \approx \$1.50/gallon heating fuel
Electricity \approx \$0.10/kWh



OR

Improve the design, reduce the cost, and improve operation capacity of the **Chena Power Energy System**. This third generation system is modular, requires no foundation, produces 300 net kWh. It is synchronous and therefore requires no grid.



Research and Development Cost	n/a
Capital cost	< \$500,000
Operating result	electricity \approx \$0.10/kWh
(depending on fuel source)	

OR

Use the ash from coal, and/or recycled energy pellets, combined with recycled crushed glass to make locally produced Geopolymer Cement.

- Research and Development Cost: \$250,000
- Capital Cost: \$250,000
- Operating Result: per cubic yard cost of concrete 30% cheaper than imported Portland Cement

- 80% less CO2 emissions*
- 2 to 4 times stronger*
- More durable*
- More stable*
- Less permeable*
- Self-adherent
- Fire resistant to >1800 °F
- Acid, base & salt resistant
- Blast & earthquake resistant



* Than ordinary Portland cement

OR

Without prohibitively priced infrastructure

Utilize high temperature combustion wood gasifying, clean burning heating devices where wood is available.



- Research and Development Cost \$0
- Capital Cost < \$10,000 for single family home in rural Alaska
< \$30,000 for community buildings in rural Alaska
- Operating Result: ≈ \$ 1.40/gallon in rural Alaska

OR

Utilize clean-coal technology to provide cheap energy to community heating systems in rural Alaska.

- Research and Development Cost: \$0
- Capital Cost: \$250,000 installed in rural Alaska
- Operating Result: ≈ \$ 1.75/gallon in rural Alaska



OR

Add a combined heat/power component to community heating systems throughout Alaska



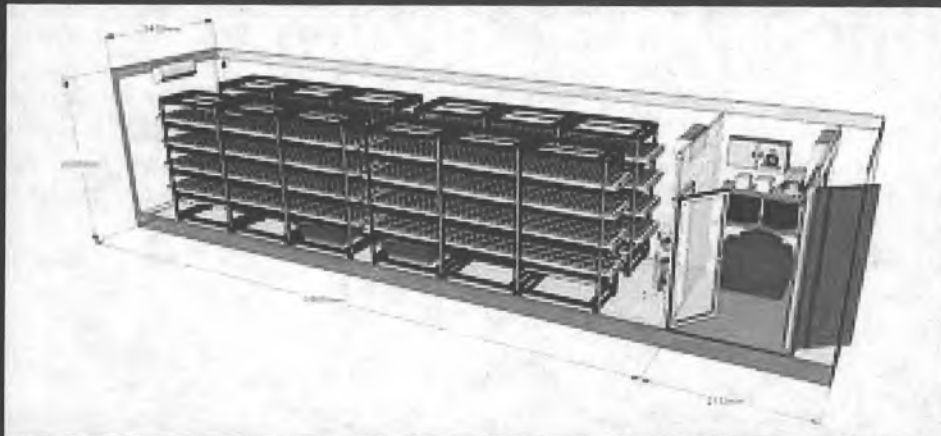
- Research and Development Cost \$ 2,000,000
- Capital Cost \$ 25,000 for community buildings in rural Alaska
- Operating Result: ≈ \$ 0.10/kWh

OR



Add modular year-round controlled-environment grow systems to provide fresh vegetables throughout rural Alaska

- Research and Development Cost: \$ 0
- Capital Cost: \$ 50,000/module
- Operating Result: \$ 1.25/head of fresh lettuce in rural Alaska



OR

Add modular year-round controlled-environment grow systems to provide animal fodder throughout Alaska

- Research and Development Cost: \$ 0
- Capital Cost: \$ 50,000/ module
- Operating Result: \approx cost of feed less than the cost of a bale of hay



OR



Utilize Air Curtain Burners to eliminate Class II or Class III municipal solid waste landfills throughout rural Alaska

- Research and Development Cost: \$ 0
- Capital Cost: \$ 48,900 - \$250,000 for communities in rural Alaska
- Operating Result: environmentally compliant community waste disposal at a fraction of current cost

OR

Add a 1,000,000 BTU FireBox Heat Capture component to the Air Curtain Burner and heat greenhouses, community centers, schools, swimming pools and other public facilities.

- Research and Development Cost: \$ 0
- Capital Cost: \$ 90,000- \$500,000 for communities in rural Alaska
- Operating Result: cheap energy and environmental compliance

* 40 CFR 1 (C) 60 EEE 60.2887(g) "air curtain incinerators in isolated areas of Alaska. Incineration units are excluded if it is used at a solid waste disposal site in Alaska that is classified as a Class II or Class III municipal solid waste landfill, as defined in § 60.2977

SO.....WE DO HAVE ENOUGH!!!!

**INNOVATION
AND
INTELLIGENCE
AND
MONEY**

**TO PROVIDE ALASKA WITH CHEAP ENERGY AND A
VIBRANT ECONOMY**

WE KNOW THIS BECAUSE.....

All of the innovative ideas and products you have just seen are being utilized or sold at:

Chena Hot Springs Resort

K and K Recycling or

Chena Power.

- We are just one of several organizations that are innovating and applying our collective intellect to:
- Dramatically lower the cost of energy in Alaska
 - Create a vibrant and growing economy in Alaska and
 - Solve Alaska's problems

We look forward to working with state agencies, regional corporations, local communities and individuals as we all move Alaska forward.

Bernie and Connie Karl

