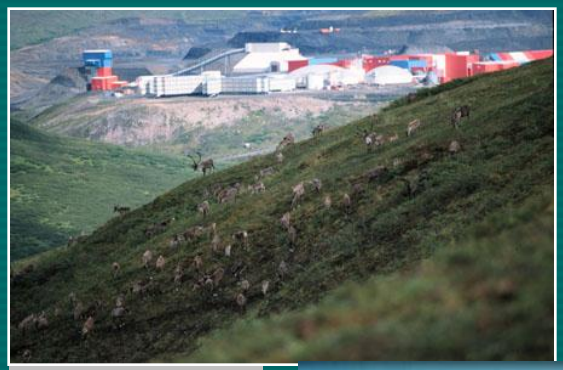


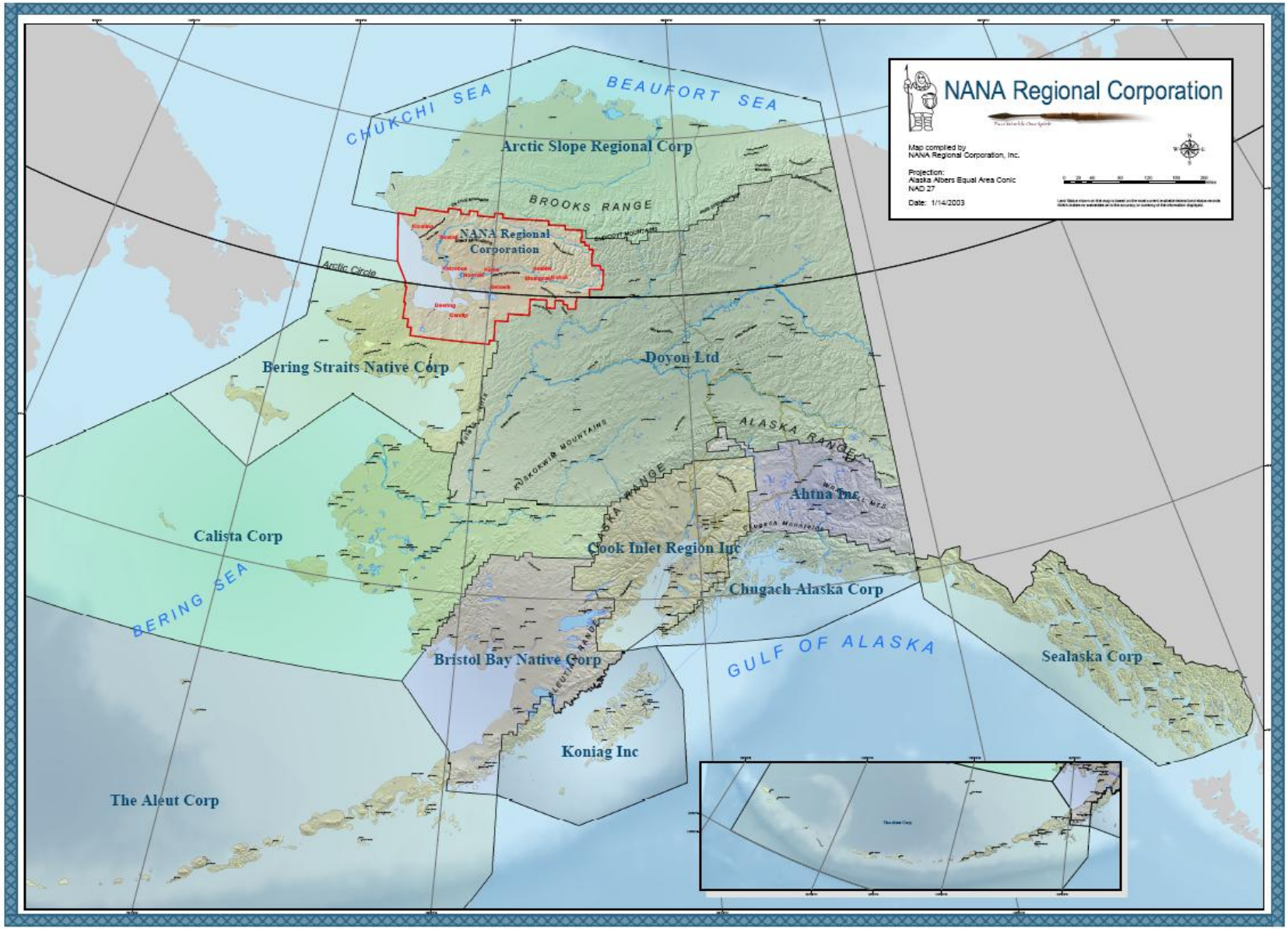
NANA/NW Alaska Regional Energy Planning and Feasibility Studies

January 11, 2008

Jay Hermanson, NANA Pacific

This is NANA | NANA Regional

- Regional Native corporation for the NW Arctic region- based in Kotzebue
- 7,200 people living in 11 communities or villages; total 11,000 shareholders
- NW Arctic Borough: governing body for the region.
- Encompasses 38,000 square miles, about the size of Indiana.
- “Tribal Members” (Inupiat Eskimos) who live the subsistence lifestyle


NANA Regional Corporation
Map compiled by
NANA Regional Corporation, Inc.
Projection:
Alaska Albers Equal Area Conic
NAD 27
Date: 1/14/2003
CHUKCHI SEA
BEAUFORT SEA
Arctic Slope Regional Corp
BROOKS RANGE
NANA Regional Corporation
Arctic Circle
Bering Straits Native Corp
Doyon Ltd
ALASKA RANGE
Ahtna Inc
Calista Corp
Cook Inlet Region Inc
Chugach Alaska Corp
BERING SEA
GULF OF ALASKA
Bristol Bay Native Corp
Sealaska Corp
Koniag Inc
The Aleut Corp

"The economic future of the NANA region is directly tied to restructuring current energy options and looking towards alternative & renewable sources."

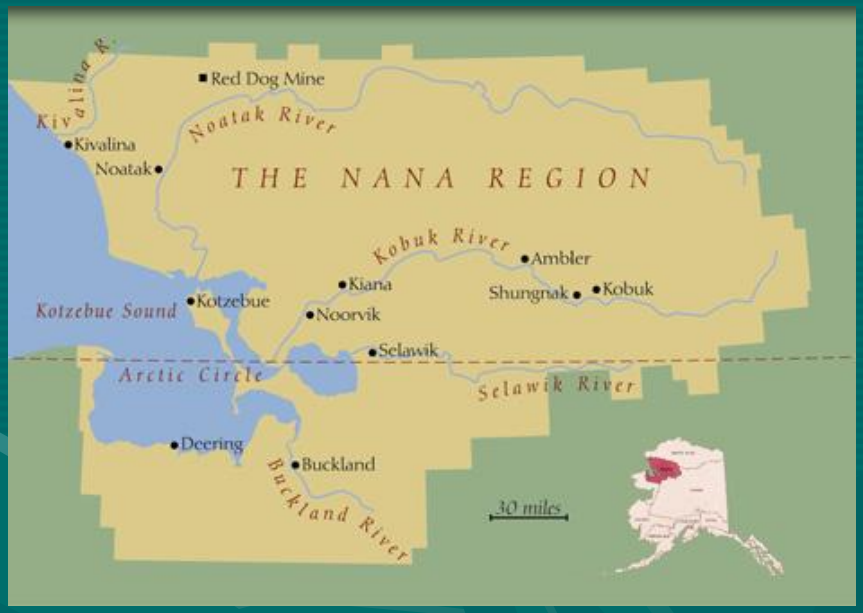
Jeff Nelson, Assistant Director of Lands

NANA Energy Security Vision: Integrated, Collaborative Efficient, Hybrid Energy Systems

Aerial view of new power plant, tank farm, cogeneration, and wind turbines at Selawik, Alaska.

NANA

NANA Region Energy Challenges



- 200 miles from the nearest road
- Barge & Air Delivery of all consumables
- Forefront of Global Warming: erosion, permafrost, & limited transportation corridors
- Small Communities

NANA

Extraordinary Challenge of Providing Energy in NW Alaska

Vision: To promote energy security in the NANA Region

Three Distinct Projects

- Strategic Energy Plan NANA SEP
- NANA Geothermal Assessment Program NANA GAP
- NANA Wind Resource Assessment Program NANA WRAP

- DOE/NREL Funded
- NANA Pacific Technical Services Contractor
- Execution Partners
  - Kotzebue Electric Association
  - Alaska Village Electric Cooperative
  - NW Arctic Borough
  - Manilaaq
  - Alaska Energy Authority

Selawik, AK

Wind Farm, New Bulk Fuel, Recovered Heat

NANA

Partners & Collaborators

In-Kind

- Anemometers- AEA
- Technical Expertise
- Communication & Outreach

NANA Energy Security: Strategic Energy Plan

- *SO 1:*Increased collaboration between NANA Region stakeholders on energy policy, program, infrastructure, and increased capacity of tribal entities for the region.
- *SO 2:*Increased understanding of energy options available to NANA Region energy stakeholders for improved energy decision making.
- *SO 3:*Increased awareness and understanding of NANA Region energy needs on the part of external stakeholders.

Northern Lights, Noorvik AK

Energy Plan & Project Development Methodology & Approach

- Community Outreach, Resolutions, & Surveying
- Energy Options Analysis
- Energy Resource Data Collection and Forecasting
- Drafting of Plan
- Energy Summit
- Finalize Plan- Evolving plan
- Project Development
  - Feasibility Studies
  - Modeling
  - Conceptual Designs
  - Secure Funding
  - Detailed Design
  - Construction
  - Commissioning & Operations

Rural Energy Planning & Project Development Timelines

Strategic Energy Planning & Energy Options Analysis	6-12 months
Feasibility Studies (concurrent w/other activities)- Financial and Technical	6-24 months
Conceptual Designs	3-6 months
Secure Funding Resources & Negotiate Power Purchase Agreements (if relevant)	3-24 months
Detailed Design	3-6 months
Construction (foundation and logistics dependent)	12-36 months
Commissioning & Operations	1-6 months

Timeline: 2-10 years Conceptualization to Commissioning

Lessons Learned

Long term visioning, planning, and continuity assurance.

Energy Security: NANA Region Energy Options

Integrated Planning

Improved Efficiencies

Cogeneration Recovered Heat

Stranded Natural Gas Deposits
Red Dog Mine Area

Economies of Scale
Bulk Fuel Joint Purchasing
Transportation Co-mobilization

Diesel Hybrid & Fossil Fuels

Biomass
Shungnak/Ambler/Kobuk

Wind
Kivalina/Noatak
Kiana/Deering
Buckland
Upper Kobuk

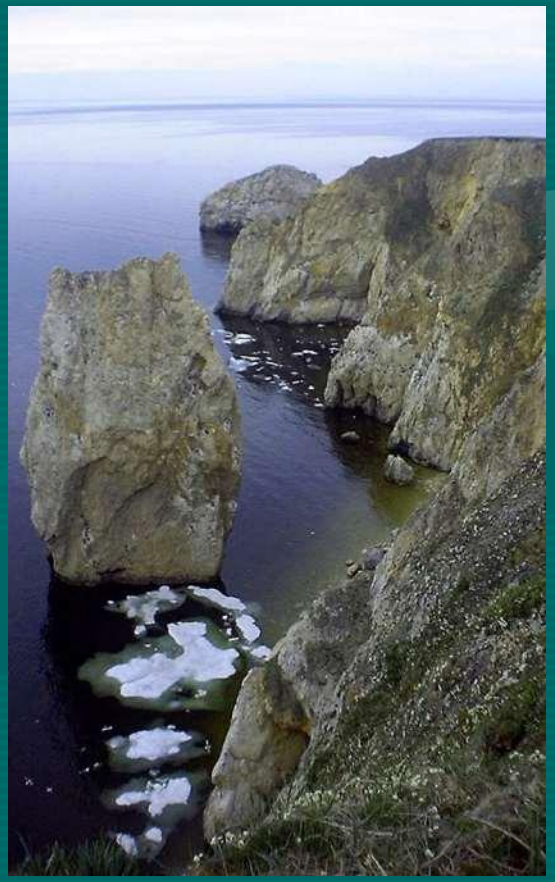
Geothermal
Kotzebue
Deering/Buckland
Shungnak/Ambler/Kobuk

Hydro
Noatak
Shungnak/Ambler/Kobuk

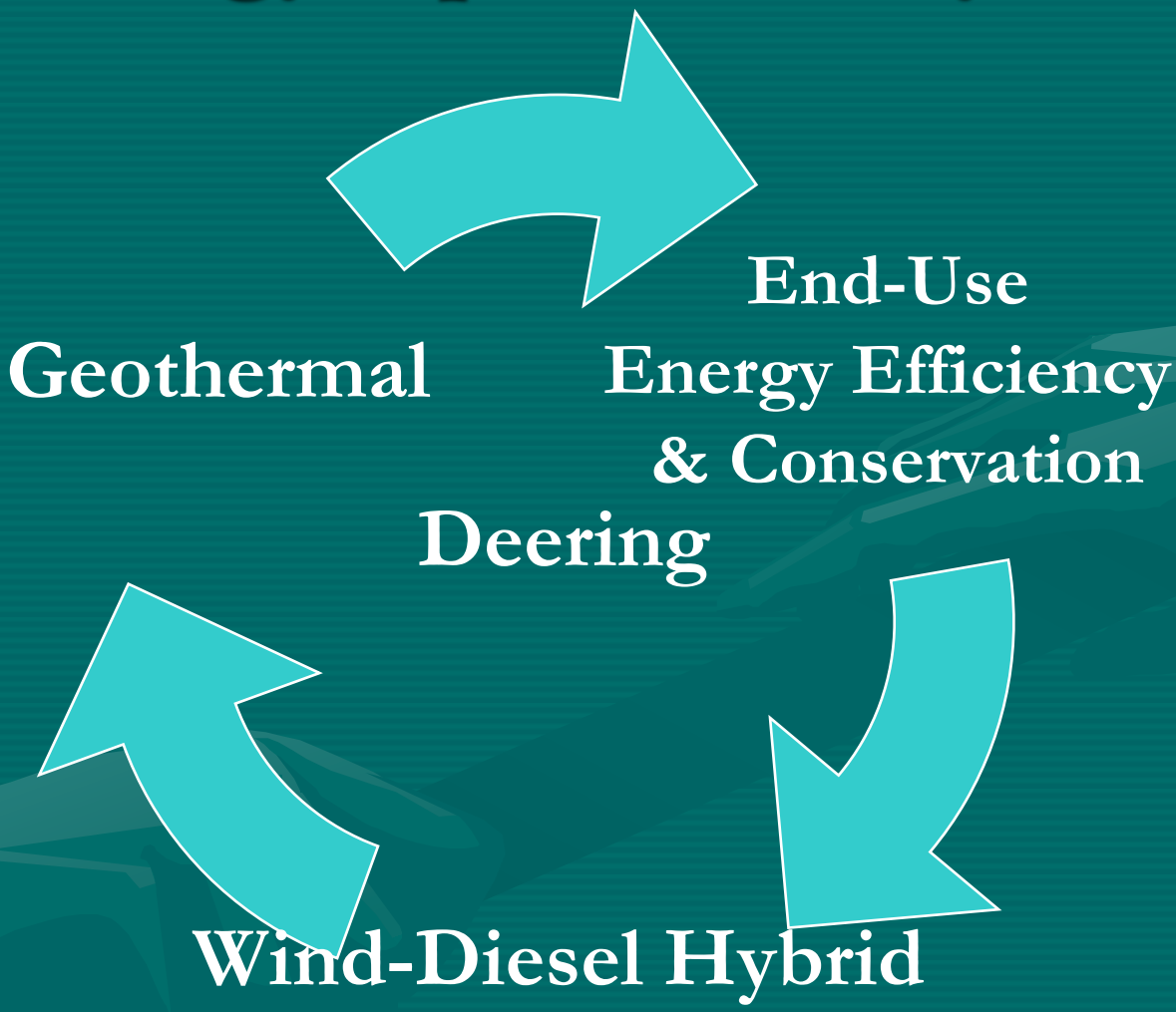
NANA

Deering Case Study

- Current Situation
  - Power Prices= $.5 /kw hr
  - Independent Power Producer- Ipnatchiaq Electric Company
  - Imports approximately 55,000 gallons of diesel fuel for generation
  - Unable to confirm home heating fuel use at this time
  - New Power Plant built by AEA in 2003 & 2004
  - Wind Resource Assessment Program Initiated
  - B/C Ratio for wind development 1.55 (AK Rural Energy Plan)



Energy Options Analysis



This is NANA | Inupiat Principles & Values

Organizational Mission

NANA improves the quality of life for our people by maximizing economic growth, protecting and enhancing our lands, and promoting healthy communities with decisions, actions, and behaviors inspired by our values and Core Principles.

Inupiaq Values

Knowledge of Language
Sharing
Respect for Others
Cooperation
Respect for Elders
Avoid Conflict
Humor
Domestic Skills
Responsibility to Tribe
Knowledge of Family Tree
Humility
Love for Children
Hard Work
Respect for Nature
Family Roles
Spirituality
Hunter Success

Public Outreach & Surveying

Community: Deering

Key Informant:_____ Title/Organization: _____

Ask these two questions only one time of each respondent. Circle the number that best reflects the respondent's opinion.

How important is each of these guiding principles in your life?	Not at all important 1	2	3	4	Extremely important 5
• Respect for Nature	1	2	3	4	5
• Hunter Success	1	2	3	4	5
• Responsibility to Tribe	1	2	3	4	5
• Assuring sufficient energy for future generations	1	2	3	4	5
• Promotion of local economic development	1	2	3	4	5
• Reducing the family energy budget	1	2	3	4	5
• Reducing cost of energy in my home	1	2	3	4	5
• Knowledge of the language	1	2	3	4	5

How much trust do you have in these organizations?	No trust at all 1	2	Neutral 3	4	Very much trust 5
• Federal government	1	2	3	4	5
• State government	1	2	3	4	5
• Tribal government (IRA)	1	2	3	4	5
• City government	1	2	3	4	5
• Regional Corporation (NANA)	1	2	3	4	5
• Environmental groups	1	2	3	4	5
• Industry	1	2	3	4	5

Ask these questions for each alternative energy source

#1. Energy Source X

How much do you know about this energy source?	Nothing 1	2	Some 3	4	A lot 5

How do you believe that your Elders would feel about this alternative?	Strongly oppose 1	2	Neutral 3	4	Strongly support 5
How do you believe that other members of your community would feel about this alternative?	1	2	3	4	5

How would this energy source impact the environment?	Harm 1	2	No effect 3	4	Improve 5
How would this energy source impact future economic development?	1	2	3	4	5
How would this energy source impact the future of this community?	1	2	3	4	5
How would this energy source impact subsistence activities?	1	2	3	4	5
How would this energy source impact traditional activities?	1	2	3	4	5

Overall, should your community pursue this alternative energy source?	Drop it 1	2	Neutral 3	4	Pursue it 5

Deering Preliminary Recommendations

Recommendations

- **Wind Resource Assessment Program.**
- **Coordinate a Geothermal Power Generation Feasibility Study for Deering.**
- **End-Use Energy Efficiency Analysis**

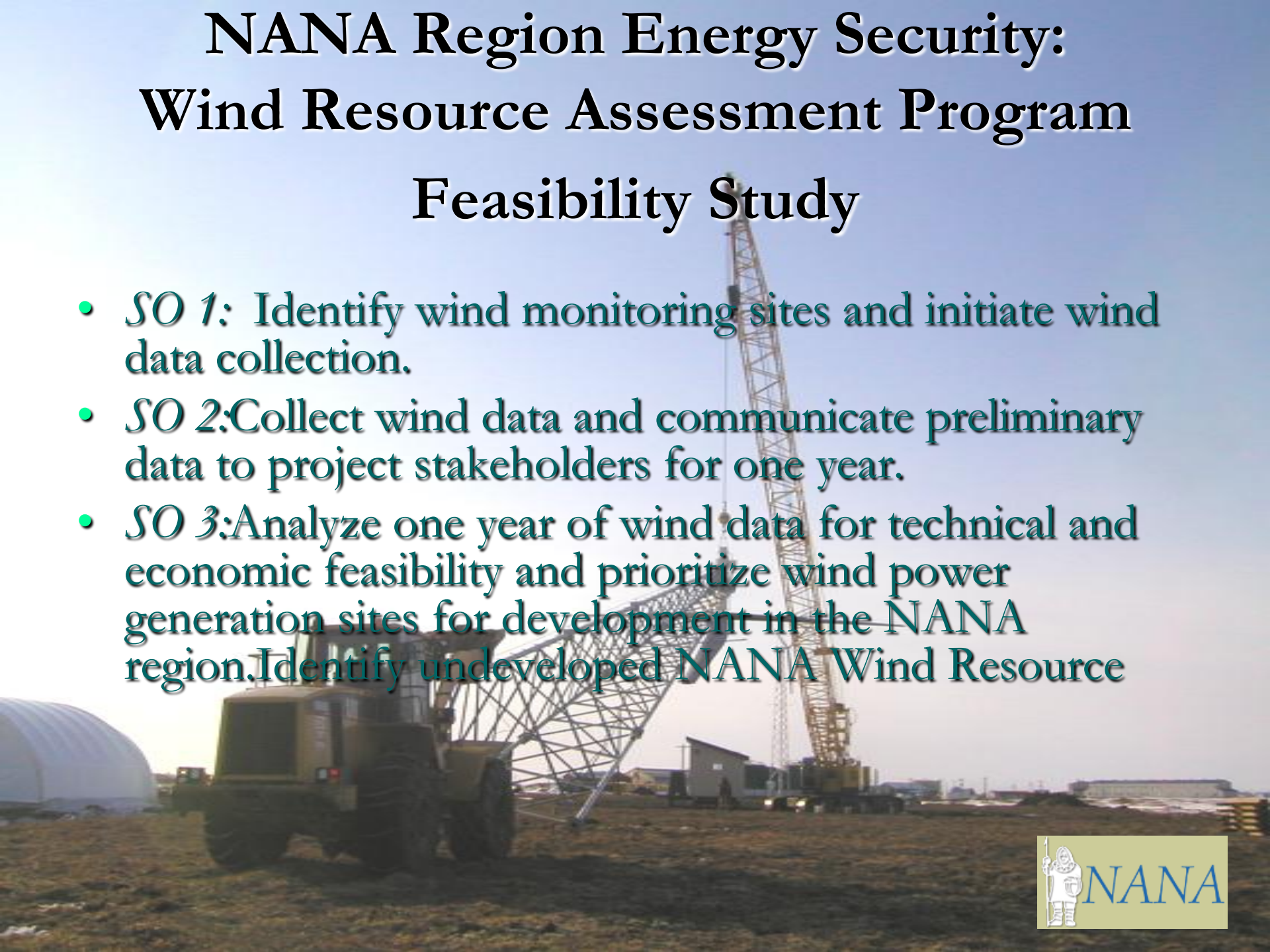
Other

- **Research Additional Home Heating Energy Options**
- Secure fossil fuel delivery status
- Small scale hydro-electric

NANA Region Energy Security: Wind Resource Assessment Program

Feasibility Study

- *SO 1:* Identify wind monitoring sites and initiate wind data collection.
- *SO 2:*Collect wind data and communicate preliminary data to project stakeholders for one year.
- *SO 3:*Analyze one year of wind data for technical and economic feasibility and prioritize wind power generation sites for development in the NANA region.Identify undeveloped NANA Wind Resource



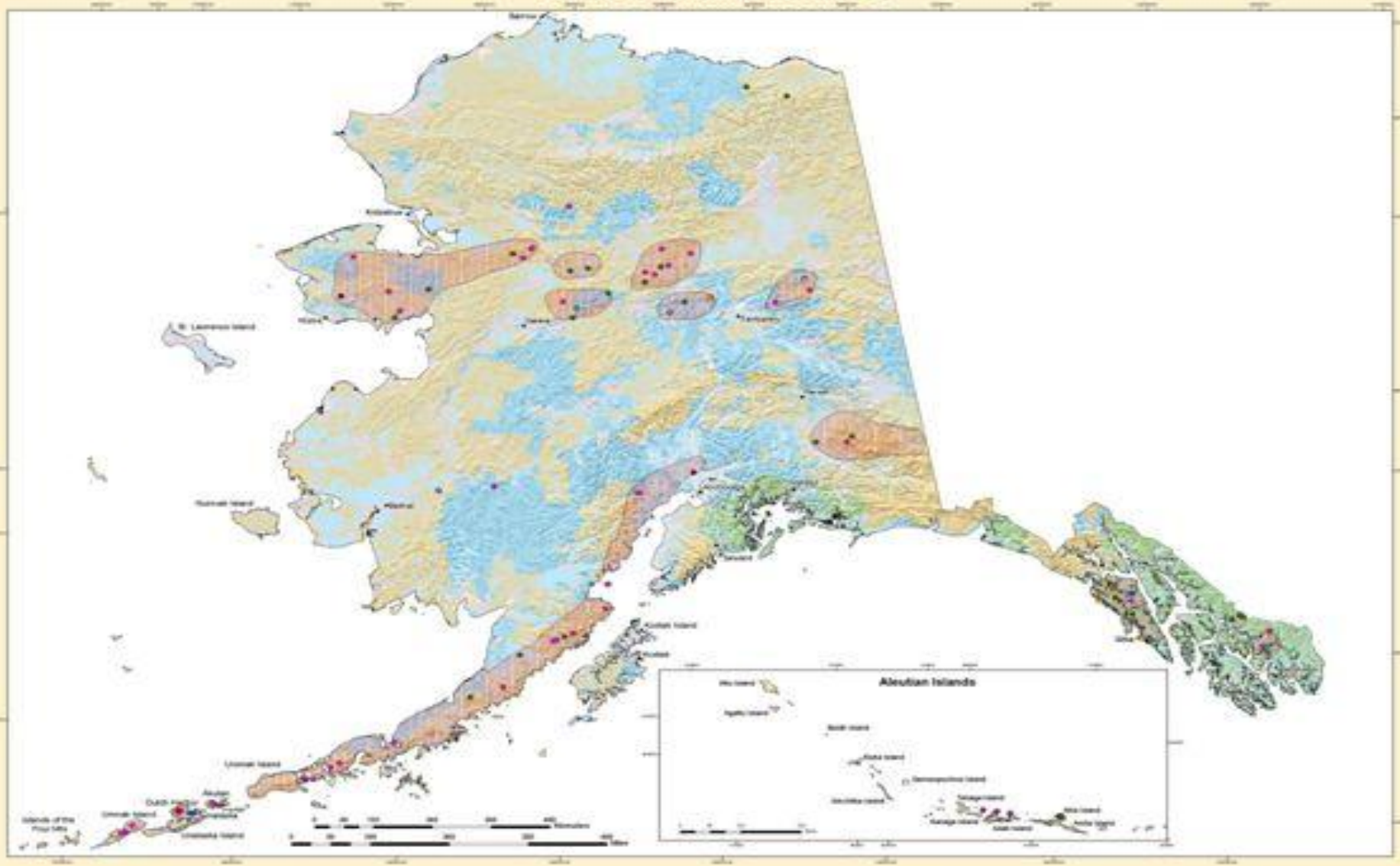
NANA WRAP Activities

- Wind Energy Regime Qualification/Quantification
- Identify energy needs of regional interests
- Technical and Economic Viability of the Proposed Project
- Assessing a Wind/Hybrid System Impact on the NANA Region
- Environmental, Archaeological, and Historical Assessment
- Leadership and Community Involvement

Geothermal Assessment Program Feasibility Study

- *SO 1:* Identify potential geothermal sites in the NANA Region.
- *SO 2:* Undertake a geological, geochemistry, and geophysical assessment of targeted sites for geothermal power generation potential.
- *SO 3:* Ascertain geothermal feasibility potential for power generation in the NANA Region.

Alaska Geothermal Resources



Legend

- Cities/Towns
- Rivers/Streams
- Lakes/Reservoirs

Geothermal Categories

- Space Heating
- Spas/Resorts/Recreation Sites
- Regions of Known or Potential Geothermal Resources

- Wells > 50 Degrees C
- Springs > 50 Degrees C
- Wells > 20 and < 50 Degrees C
- Springs > 20 and < 50 Degrees C

Ownership

- Private Lands
- Bureau of Land Management and Other Federal Lands
- State Lands
- Native American Lands
- U.S. Forest Service Lands

Map prepared by Patrick Laney and Julie Wallace at the Idaho National Engineering and Environmental Laboratory

for

The U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Geothermal Technologies Program

Geothermal Data Provided by:

1. Geo-Heat Center, State Geothermal Database. (Excepts Data) 1
2. National Geophysical Data Center, National Oceanic and Atmospheric Administration, 1993, Geothermal Resources of Alaska. Prepared for the Geothermal Technologies Division, United States Department of Energy. Map

NANA

Kotzebue Geothermal Resource

• Accessibility	0 mile
• Distance from load center	Good
• Distance from power line	0 Miles
• Land status	Private
• Environmental sensitivity	Low
• Degree of development to date	None
• Exploration status	Minimal
• Surface temperature	0
• Estimated subsurface temperature	160 degrees
• Number of wells drilled	2
• Projected use	Power
	District Heating

Source: DOE/AEA Pre-Feasibility Analysis-literature review

NANA

Pathway to Regional Energy Security

Obstacles	Pathways
"Turf Wars"	Consensus on Energy Security ; leverage steering committee.
Appropriate technology relevant for the Arctic	Technological breakthroughs
Reliability & integration	Increased collaboration with providers; promotion of the steering committee
Technical expertise	Leveraging local/state experience; increased research in key areas
Increased cost planning, design, & construction of facilities	Amalgamated, integrated facilities
Redundant and emergency generation still needed	Leverage School District and other village facilities for redundancies
Uncertain Funding Environment	Coordinate proposal; develop alternative business models.

NANA Region Energy Security:

Regional Planning, Wind, Geothermal, and other feasibility studies

- Hedge against rural to urban migration
- Hedge against future emergency events
- Hedge against increasing fuel costs
- Hedge against increasing transportation costs
- Hedge against fuel rationing
- Hedge against increase design/build costs of energy systems


Thank you!
Questions?
NANA