

# Alaska Climate Change Strategy Public Infrastructure Research Needs



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# Summary of ESD Policy Strategy



- **Energy Supply and Demand Technical Work Group**
  - **1. Transmission system opt. and design**
  - **2. Energy efficiency (commercial/residential)**
  - **3. Implementation of renewable energy**
  - **4. Building standards and incentives**
  - **5. Efficiency improvements**
  - **6. Nuclear, research on renewables, advanced tech**

# Summary of ESD Policy Strategy



- **Energy Supply and Demand Technical Work Group**
  - **ES&D 7, 8 & 9: ENERGY SUPPLY TECHNOLOGY RESEARCH AND DEVELOPMENT**
  - This policy is directed to establishing programmatic incentives for participation and support of public and private investment in fundamental research, demonstration and deployment of carbon-emission reduction and energy production technologies that hold promise for implementation throughout Alaska.

# Summary of ESD Policy Strategy



- **Energy Supply and Demand Technical Work Group**
  - Advanced technologies in electric power generation, both small-scale and large-scale, in fossil generation, nuclear generation, and renewables will provide greater efficiency in power supply for utility and industrial purposes.
  - A statewide emphasis on enhanced utilization of new and emerging technologies that provide the end-use benefits of electric energy with greater efficiency will provide economic and environmental benefits throughout Alaska.

# Summary of ESD Policy Strategy



- **Energy Supply and Demand Technical Work Group**
  - The policy will provide incentives and reduce barriers to implementation of advanced generation technologies using the variety of energy sources available to Alaska.
  - While emphasis may be provided on cold-climate applicability (e.g., combined heat and power) or other regional characteristics (e.g., geothermal availability) the emphasis will be on cost-effective supply and net environmental impacts.

# Summary of ESD Policy Strategy



- **Energy Supply and Demand Technical Work Group**
  - In addition to R&D on reducing CO<sub>2</sub> production, policy should encourage R&D on carbon capture and management. Such examples could include food production in greenhouses or other novel value-added carbon capture as well sequestration.

# Summary of ESD Policy Strategy



- **Issues:**
  - Allow/accommodate utility risk-taking in technology (regulatory)
  - Statewide budget and funding of R&D (legislature)
  - Agency support for systems testing (DNR, DEC, etc)
  - Permitting (agency, municipality, village, and landowner policies)
  - Exploiting vendor demonstration opportunities.
  - Using and developing capacity at the University of Alaska for R&D

# Summary of ESD Policy Strategy



- **Parties Involved:**

- The electric utilities of Alaska – private, municipal, cooperative, joint action agencies and various operating organizations among utilities.
- The Alaska Energy Authority and Alaska Industrial Development and Export Authority.
- The University of Alaska
- The Denali Commission
- The National Laboratories: NETL, INL, Oak Ridge, NREL, others
- The Regulatory Commission of Alaska
- The Alaska Department of Natural Resources
- The USDA Rural Utilities Service
- The US Fish and Wildlife Service
- Technology vendors and
- Non-governmental organizations (NGOs)

# Broader Research Strategies



## Managing Carbon

1. 66- Research is needed to better understand carbon sequestration in geologic formations.
2. 65- Research should be conducted into value added carbon capture technologies such as
  - carbon capture and use in greenhouses,
  - carbon incorporation into high-tech, such as carbon fiber or H<sub>2</sub> storage,
  - enhanced oil recovery
  - carbon addition to syngas for fuels production

# Broader Research Strategies



## Minimizing carbon emissions

1. 64 - Research is needed to improve efficiency from improved control and operation practices of existing generation capacity (e.g., diesel).
2. 63- A geothermal resource assessment is needed, in addition to research and testing of low temperature power generation designs for power and heat, mineral recovery from geothermal brines, and ground source heat pumps.
3. 62- On-going research is needed to find suitable biomass technologies for generating power in the smaller communities that could simultaneously provide space heating.

# Broader Research Strategies



## Minimizing carbon emissions

- 61- Hydropower research is needed into:
  - fuel switching (e.g., electric heat),
  - pumped storage and integration,
  - reducing adverse intake icing conditions,
  - integration schemes for integrating small hydro in village settings with other generation alternatives,
  - propeller and crossflow turbine runners to reduce manufacturing costs and advanced materials such as composite blades and others not requiring extensive metal casting,
  - utilization of heat recovery for heat load dumps used for hydro energy frequency regulation,
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# Broader Research Strategies



## Minimizing carbon emissions

- **61- Hydropower research is needed into:**
  - testing of intake screens for cold weather hydro applications, water conservation schemes for preservation of reservoir storage during frequency regulation,
  - standardized plans for small hydro applications with details on intakes, powerhouse, induction plants, tailraces, etc.,
  - Alaska –friendly fish passage designs for in and out of a lake/reservoir,
  - how best to provide for flushing flows and sediments to replenish spawning gravels in fish streams,
  - optimal winter instream flow releases for traditional hydropower projects, and
  - improving methods to predict snow melt and runoff for modeling reservoir operations.

# Broader Research Strategies



## Minimizing carbon emissions

- 60- There remains a significant need for wind power research in the areas of:
  - grid integration,
  - power storage,
  - foundations, and
  - de-, and anti-icing options for wind turbine blades

# Broader Research Strategies



## Minimizing carbon emissions

- **59-** Hydrokinetic research is needed in the areas of:
  - resource assessment,
  - the impacts of hydro on fish populations,
  - hydrokinetic device testing, and
  - optimization of hydrokinetic devices for the Alaskan environment (issues such as deployment, anchoring, ice effects etc).
  - tidal energy opportunities

# Broader Research Strategies



## Common themes

- **Applied research is needed**
- **Technology testbeds (e.g., ACEP Hydrokinetic Energy Research Center)**
  - Research on field applications
  - Pilot scale +
  - Modeling or testing of management strategies
- **State and University partnership**
  - Alaska Energy Authority – Alaska Center for Energy and Power
  - ADNR, ADFG, ADEC and UA
  - Federal partners – USDA, Denali Commission