Renewable Energy Seed Cluster

Southeast Cluster Initiative

Juneau Economic Development Council

March 17, 2014

SOUTHEAST ALASKA CLUSTER INITIATIVE

- Five Industry Clusters:
  - Visitor Products, Ocean Products, Mining Services & Supply, Renewable Energy, Research & Development (R&D)
- Engaged Volunteers:
  - Public & Private sector representation
- Purpose:
  - Drive forward initiatives that create viable economic benefits for each respective industry in Southeast Alaska

Renewable Energy Seed Cluster

- “Seed Cluster”
- Five Current Initiatives identified and driven by industry stakeholders
- Develop a market and industry for Renewable Energy across the region

Renewable Energy Seed Cluster

- Current Action Initiatives:
  - Market-driven RE Economic Modeling & Transmission & Storage Alternatives
  - Biomass Demand Development
  - Renewable Energy Education
  - Electric Vehicle Initiative
  - Conceive and Model an Alaskan Capitol District Heating System

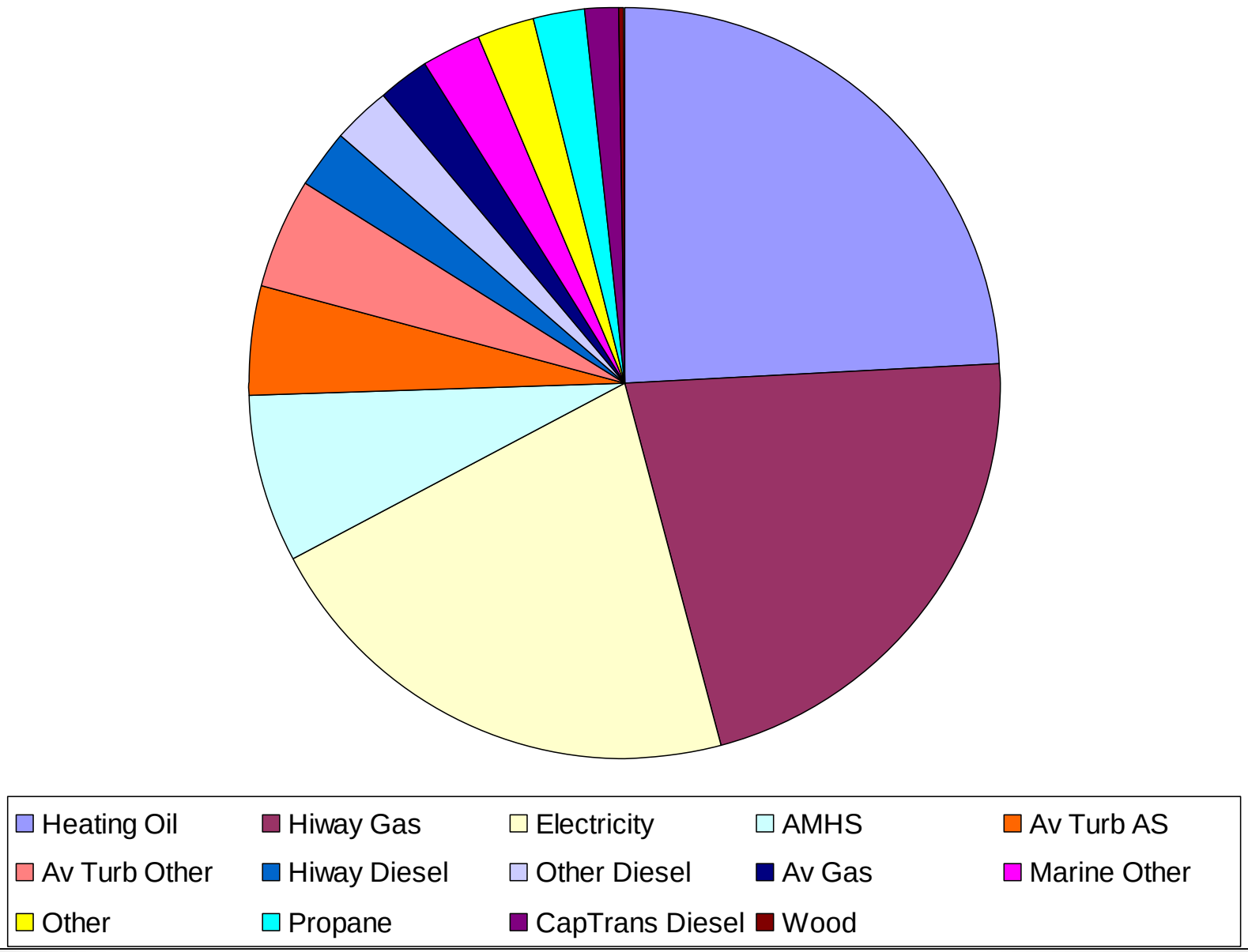
Renewable Energy Seed Cluster

- Past Action Initiatives:
  - Net Metering, Cogeneration, Small power production regulation
  - Renewable Energy Revolving Loan Fund for residences and small businesses

Context

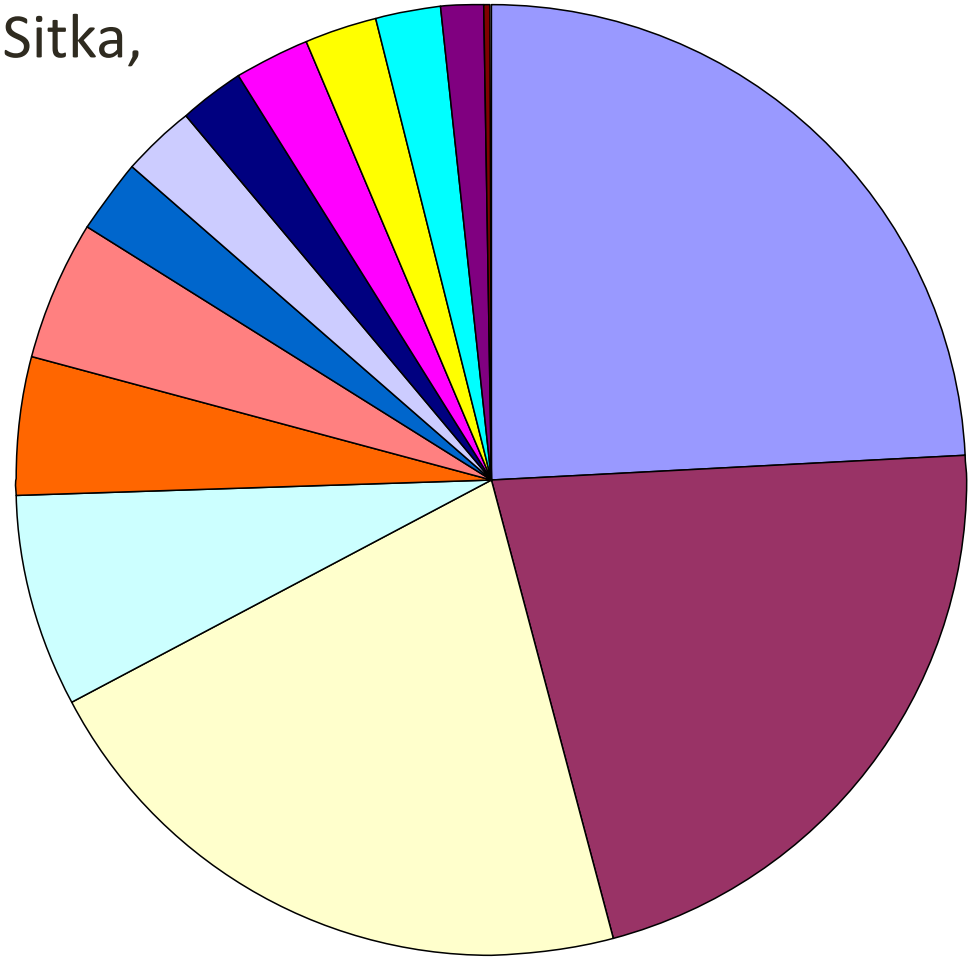
- Southeast Cluster Initiative
- Community energy economy
  - Internal
  - External
- Juneau Climate Action & Implementation Plan
- Renewable Energy Seed Cluster:
  - Background
  - Purpose
  - Action Initiatives

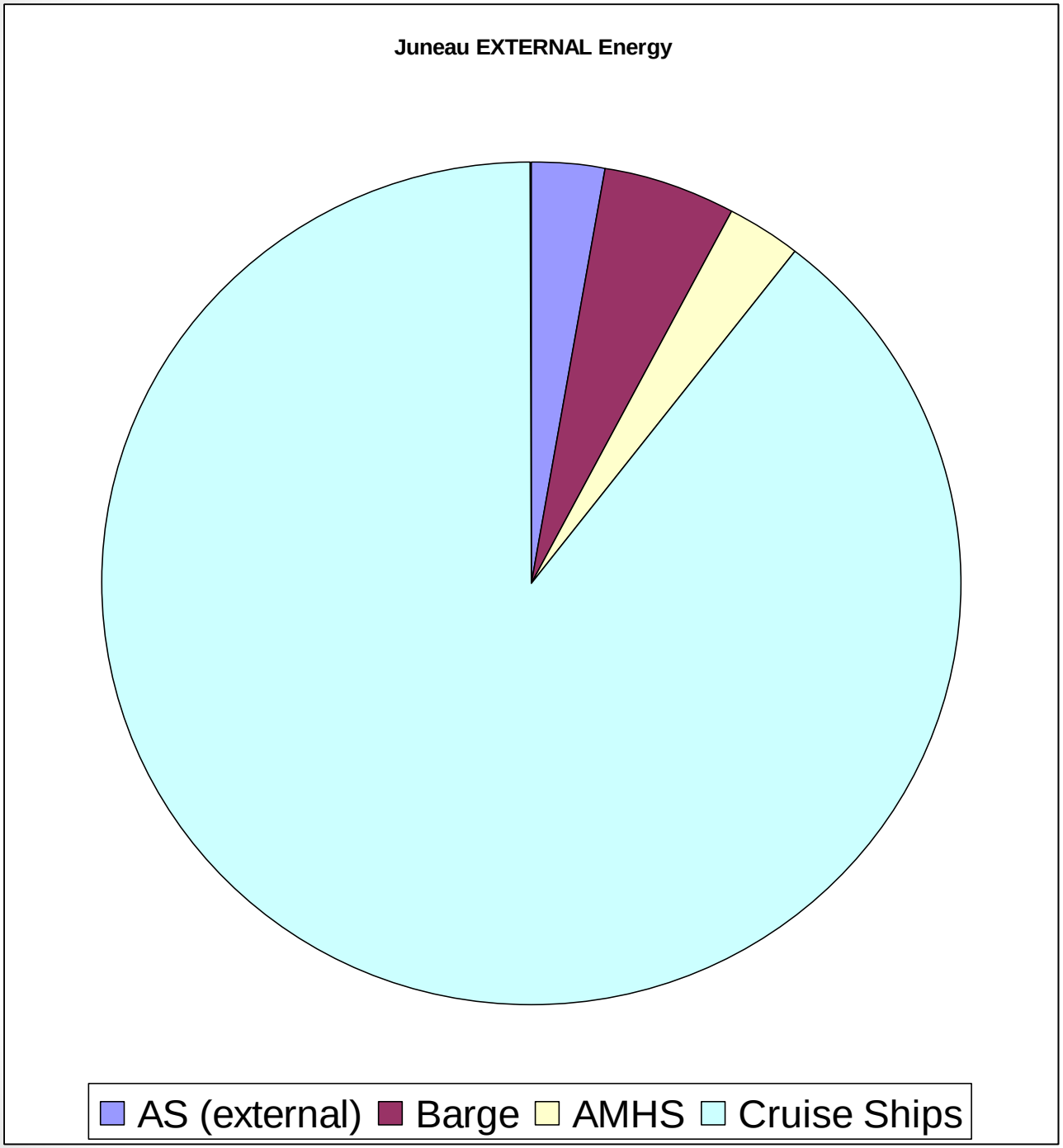
Juneau INTERNAL energy

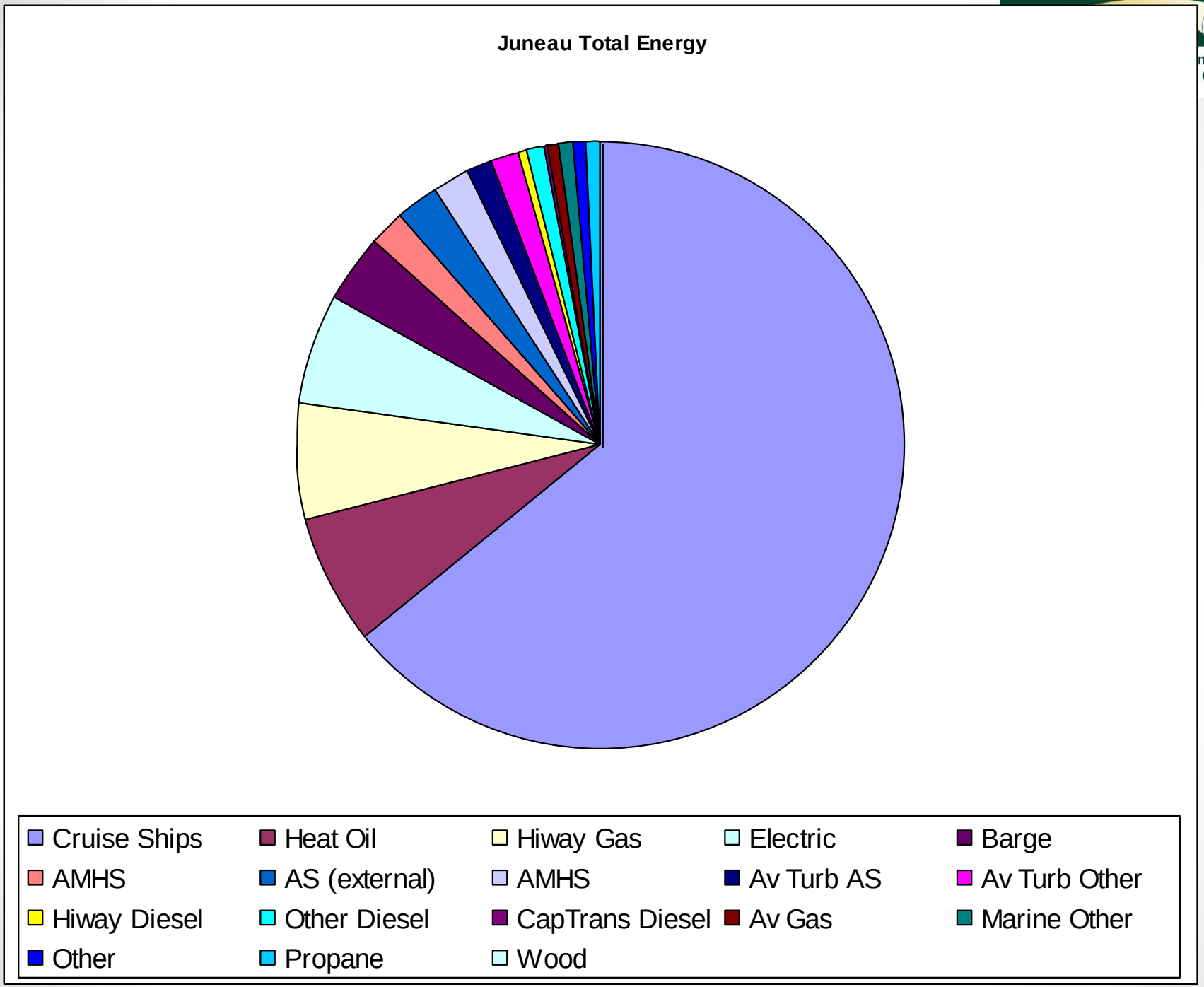


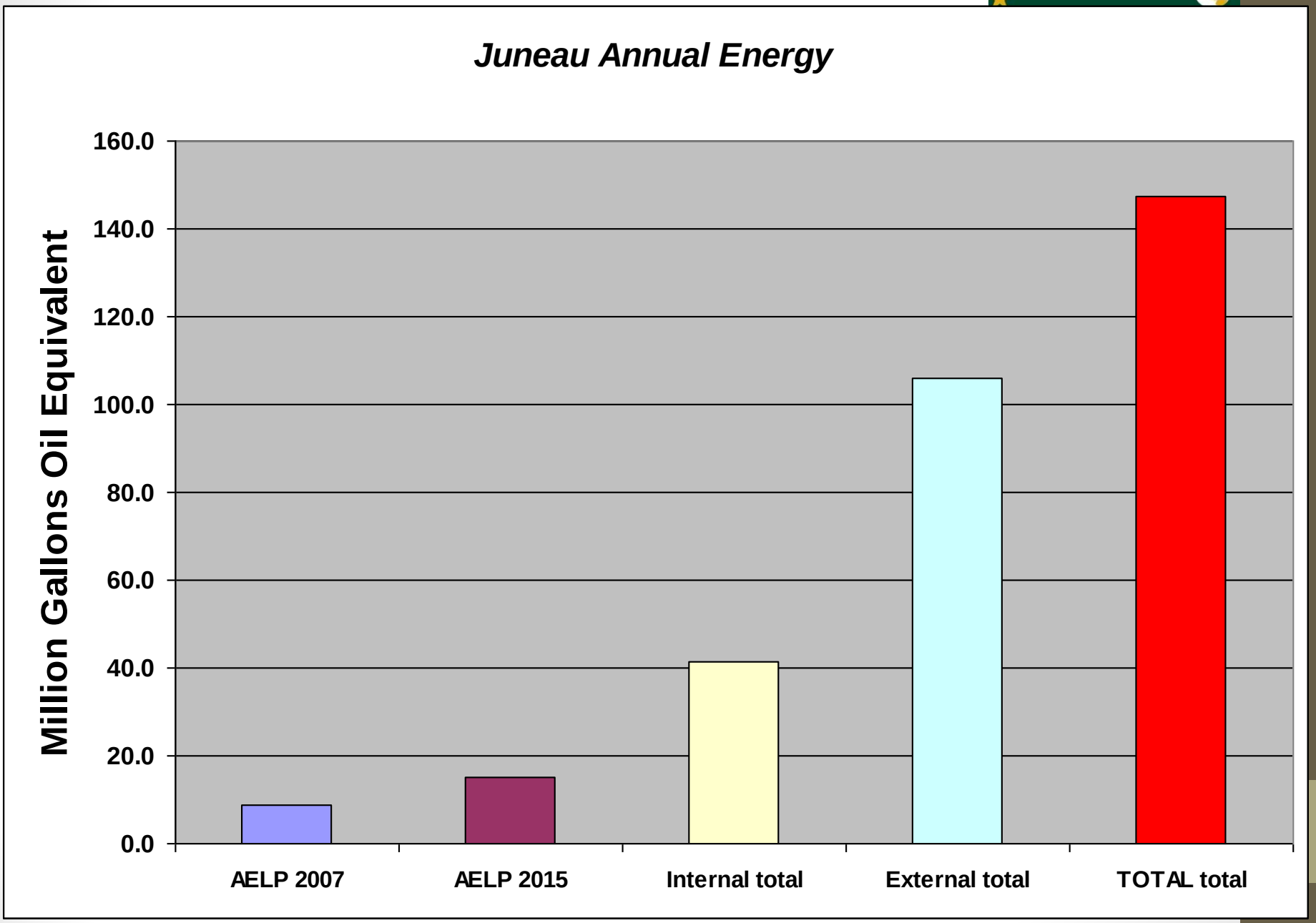
Juneau INTERNAL energy

Juneau,
Ketchikan, Sitka,
Skagway,
Gustavus




Juneau EXTERNAL Energy
AS (external)
Barge
AMHS
Cruise Ships


Juneau Total Energy
Cruise Ships
Heat Oil
Hiway Gas
Electric
Barge
AMHS
AS (external)
AMHS
Av Turb AS
Av Turb Other
Hiway Diesel
Other Diesel
CapTrans Diesel
Av Gas
Marine Other
Other
Propane
Wood


Juneau Annual Energy
Million Gallons Oil Equivalent
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
AELP 2007
AELP 2015
Internal total
External total
TOTAL total

Today's energy economy: Juneau as-we-know-it

Million gallons per year, including electricity equivalent

"Internal"	*42*
"External"	*106*
TOTAL	*148*


Diesel Fuel
Heating Oil
135, 000 Btu / gal
20 # CO_2 / gal

Today's energy economy: Juneau as-we-know-it, CO_2 emissions

- *"Internal": annual CO_2 emissions, tons*

  TOTAL 227,000

- *"External": annual CO_2 emissions, tons*

  TOTAL 1,060,000

- *"Internal" + "External"*

  TOTAL 1,287,000 tons per year

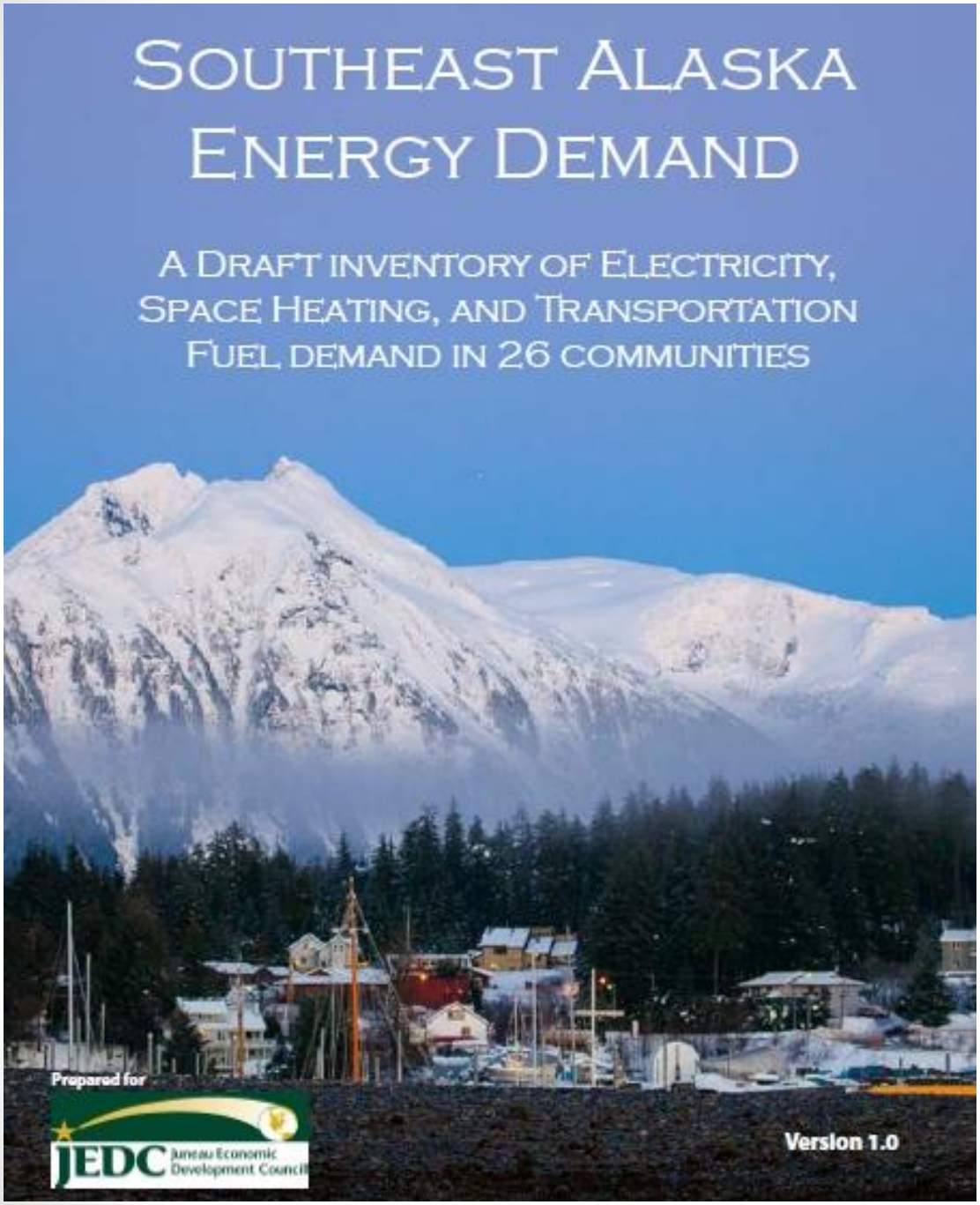
Renewable Energy Seed Cluster

- Current Action Initiatives:
  - Market-driven RE Economic Modeling & Transmission & Storage Alternatives
  - Biomass Demand Development
  - Renewable Energy Education
  - Electric Vehicle Initiative
  - Conceive and Model an Alaskan Capitol District Heating System

Action Initiative:

CONDUCT MARKET-DRIVEN RENEWABLE ENERGY ECONOMIC MODELING OF SOUTHEAST ALASKA, INCLUDING MULTIPLE TRANSMISSION AND ENERGY STORAGE STRATEGIES

Champion: Bill Leighty, The Leighty Foundation



JEDC Juneau Economic Development Council

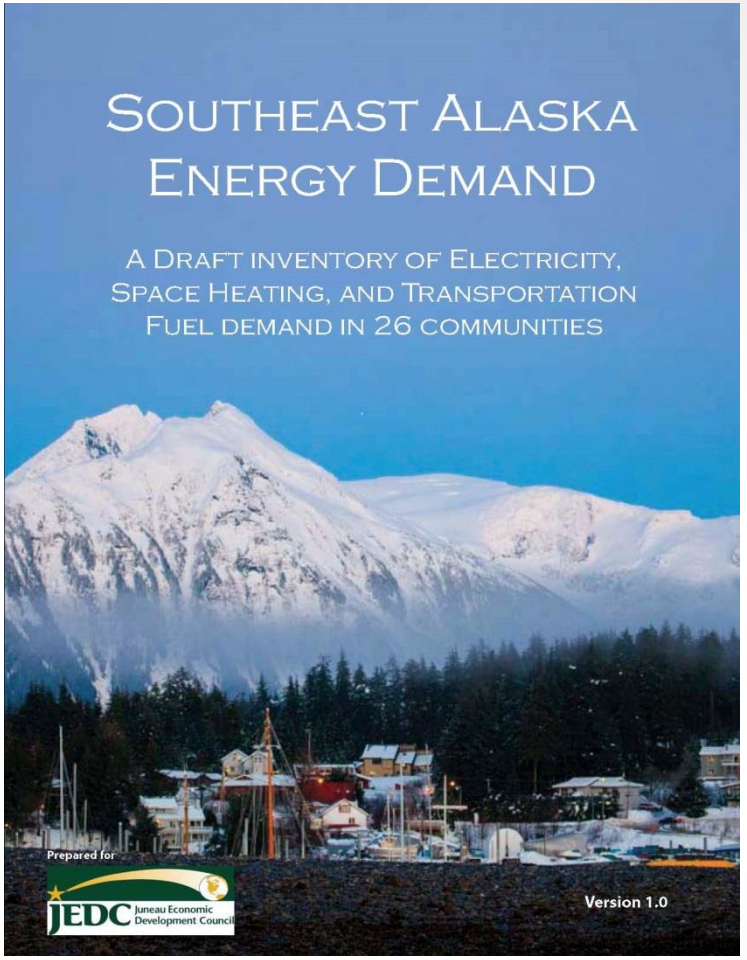
Brad Ewing
Contract to JEDC

- Borough, Census area
- 2012 – 13
- Region totals
- Future research list

March 17, 2014

Initiative Goals:

- Entice private enterprises to locate in SE AK: potential, internal + export
- Inventory energy markets of SE AK communities
- Assess and inventory renewable energy resources by type, location, production potential
- Create open cash flow model for potentially productive cases
- Build on extant “seed”



Available at:
jedc.org/in-the-news

Extant SE AK "Seed" Renewable Energy Cluster Industry

- Engineering: Haight, Murray, Rehfeld, PND, others
- Construction, rental
- Alaska Ship & Drydock
- Electric Utilities: IPEC, AELP, APT, KPU, Sitka, et al
- Juneau Hydropower, other

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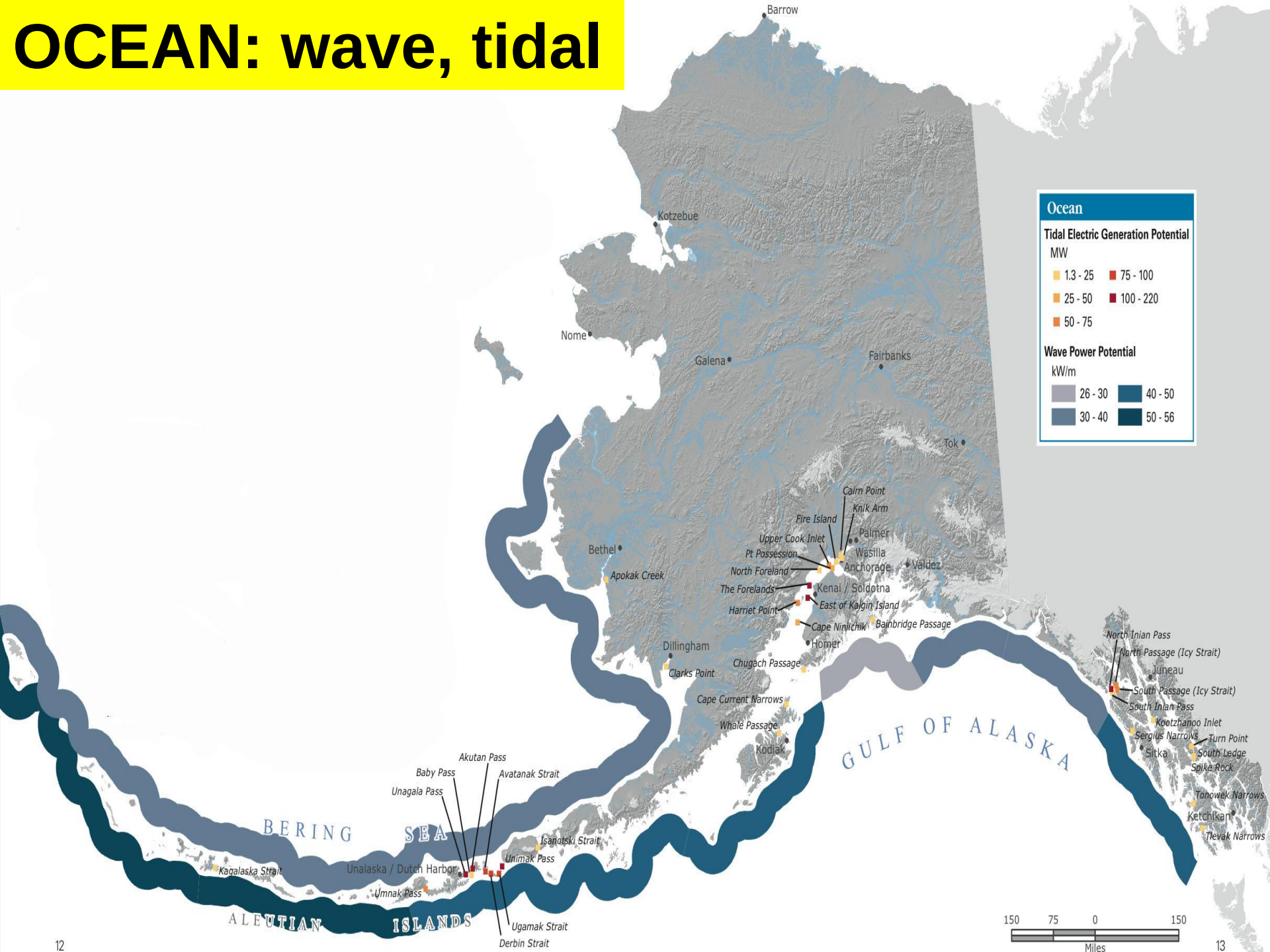
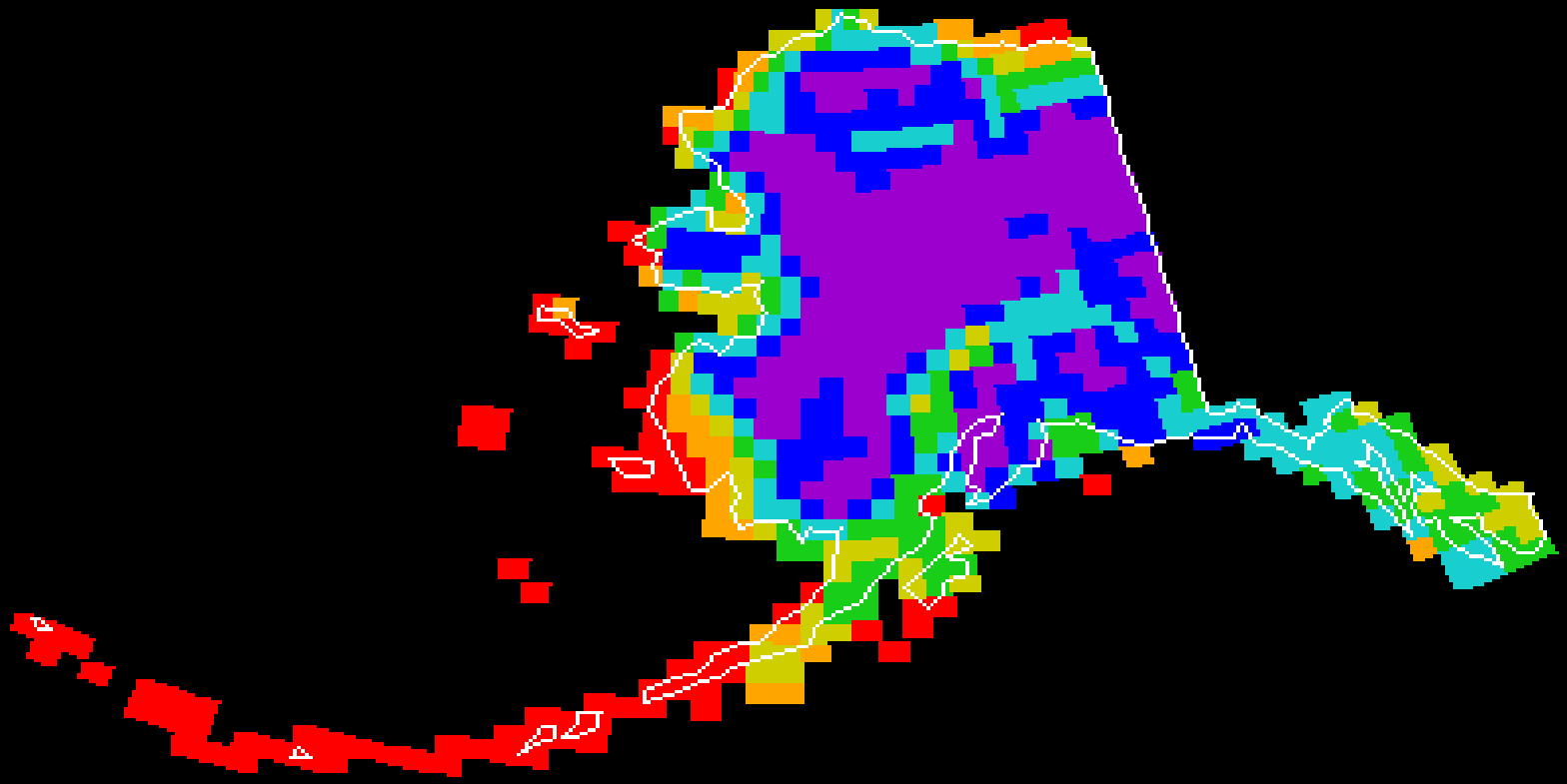
Hydro

OCEAN: wave, tidal

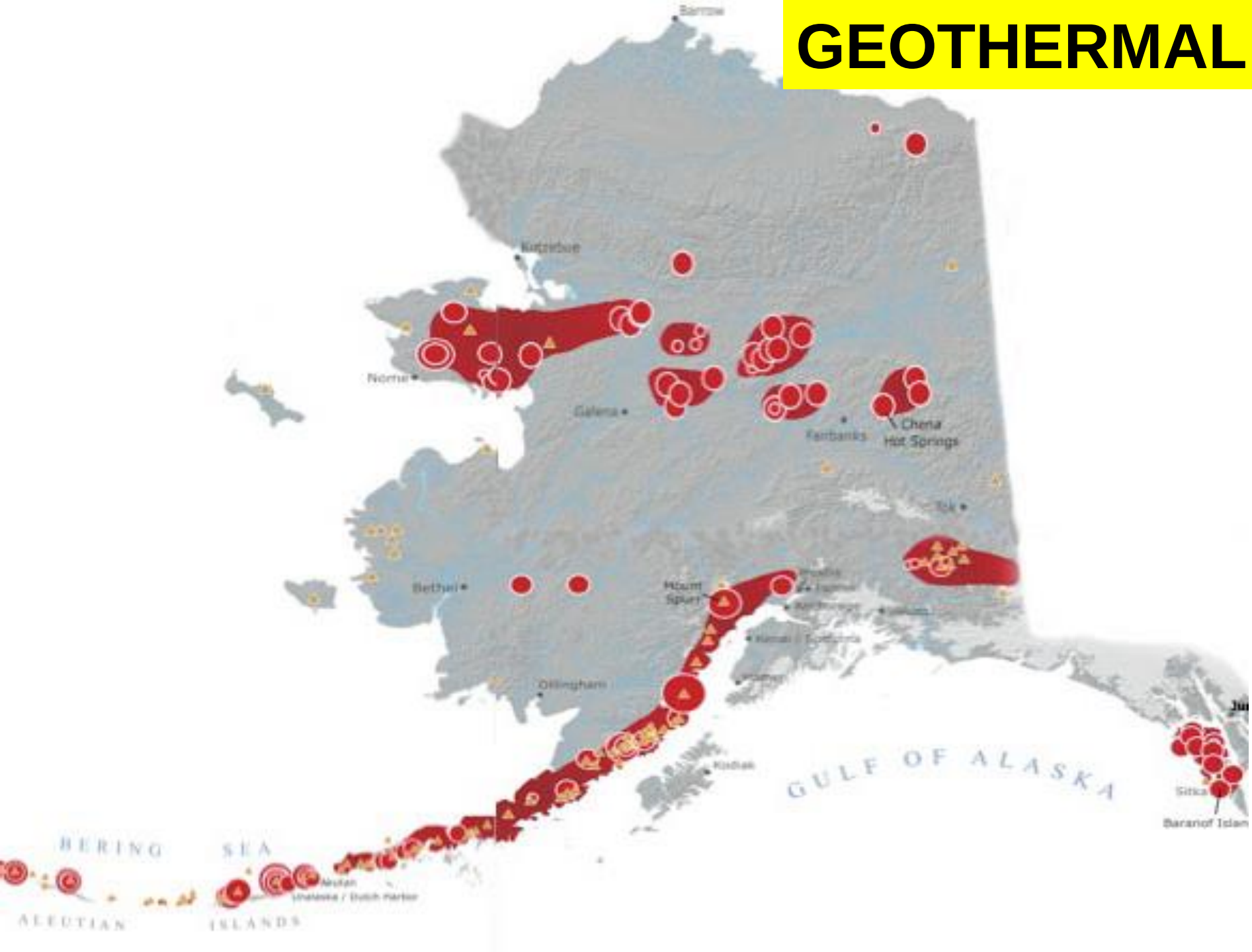


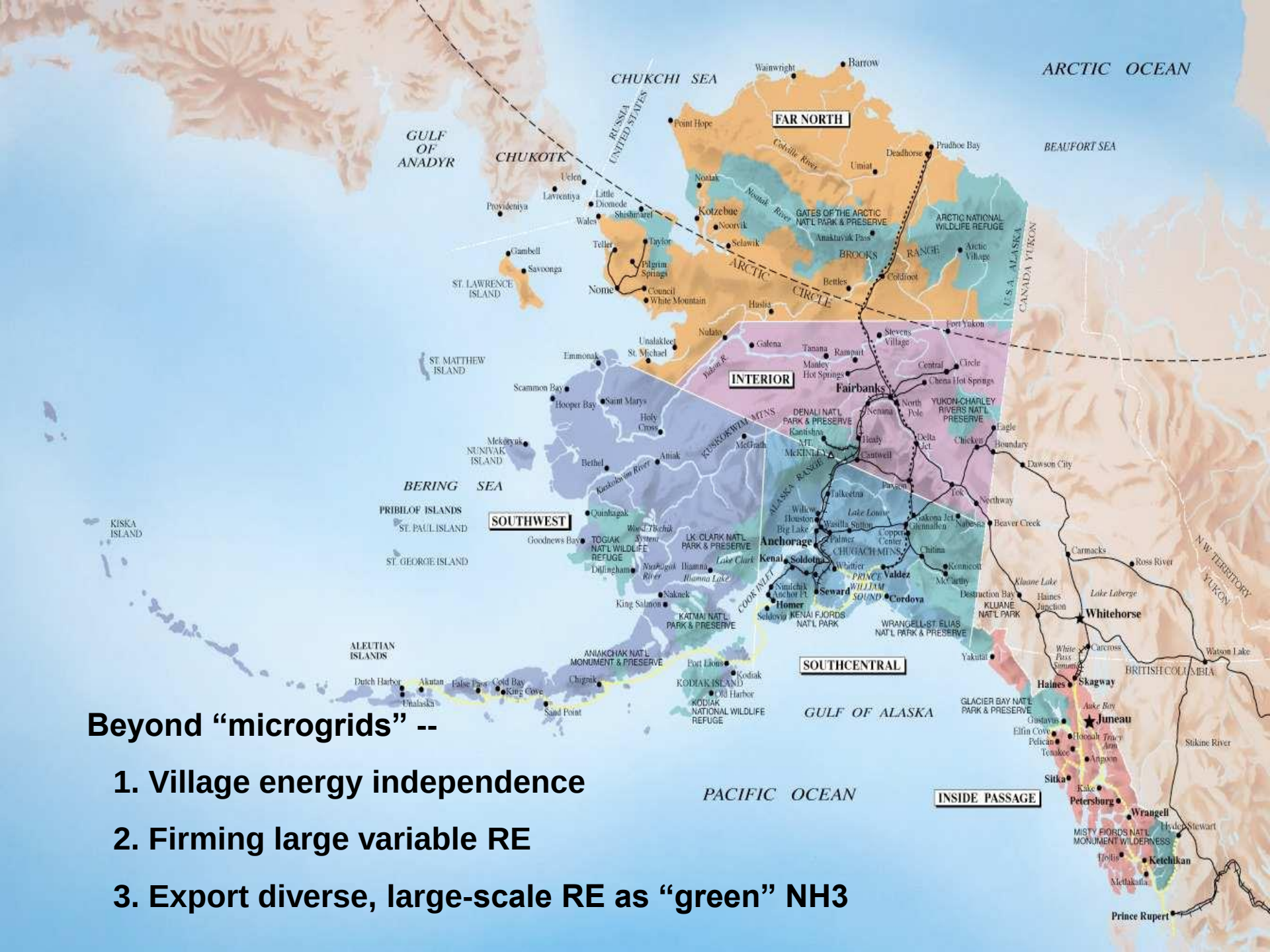
Wind Power Class



Power Class	Speed	Power Density
1	0.0-5.6m/s	0-200W/m2
2	5.6-6.4m/s	200-300W/m2
3	6.4-7.0m/s	300-400W/m2
4	7.0-7.5m/s	400-500W/m2
5	7.5-8.0m/s	500-600W/m2
6	8.0-8.8m/s	500-800W/m2
7	>8.8m/s	>800W/m2

GEOTHERMAL


Barrow
Kotzebue
Nome
Galena
Fairbanks
Chena Hot Springs
Tok
Bethel
Mount Spurr
Dillingham
Kodiak
GULF OF ALASKA
Sitka
Baranof Island
BERING SEA
Aleutian
Islands



Beyond “microgrids” --

1. **Village energy independence**
2. **Firming large variable RE**
3. **Export diverse, large-scale RE as “green” NH3**

SOUTHEAST ALASKA INTEGRATED RESOURCE PLAN

B&V PROJECT NO. 172744

PREPARED FOR

ALASKA ENERGY AUTHORITY

Alaska Energy Authority

JULY 2012

BLACK & VEATCH
Building a world of difference.

HDR Alaska

- Over 100 hydro sites catalogued
- Southeast, AK-BC Interties: Cannot afford O&M costs
- Convert to wood space heat

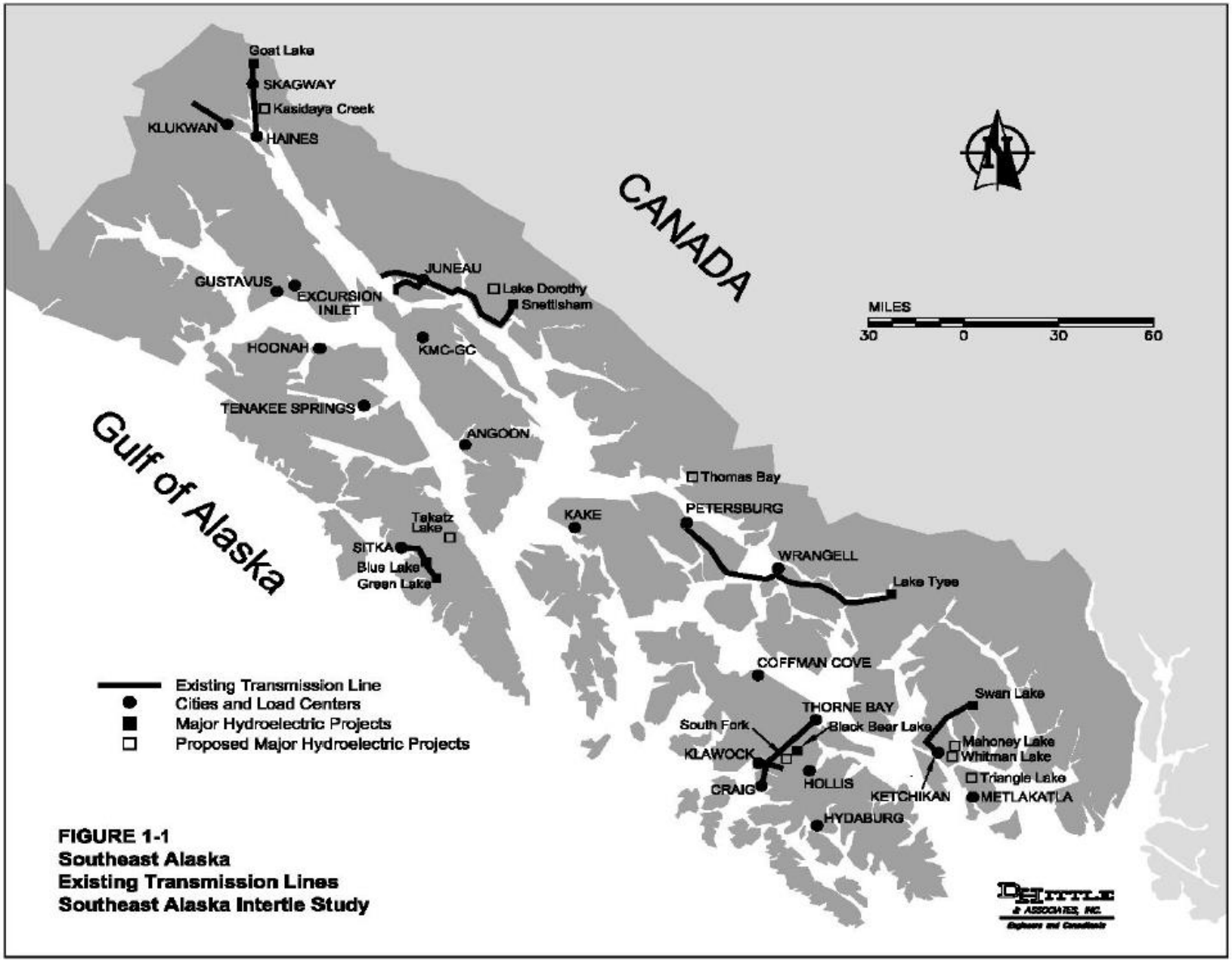


FIGURE 1-1
Southeast Alaska
Existing Transmission Lines
Southeast Alaska Intertie Study

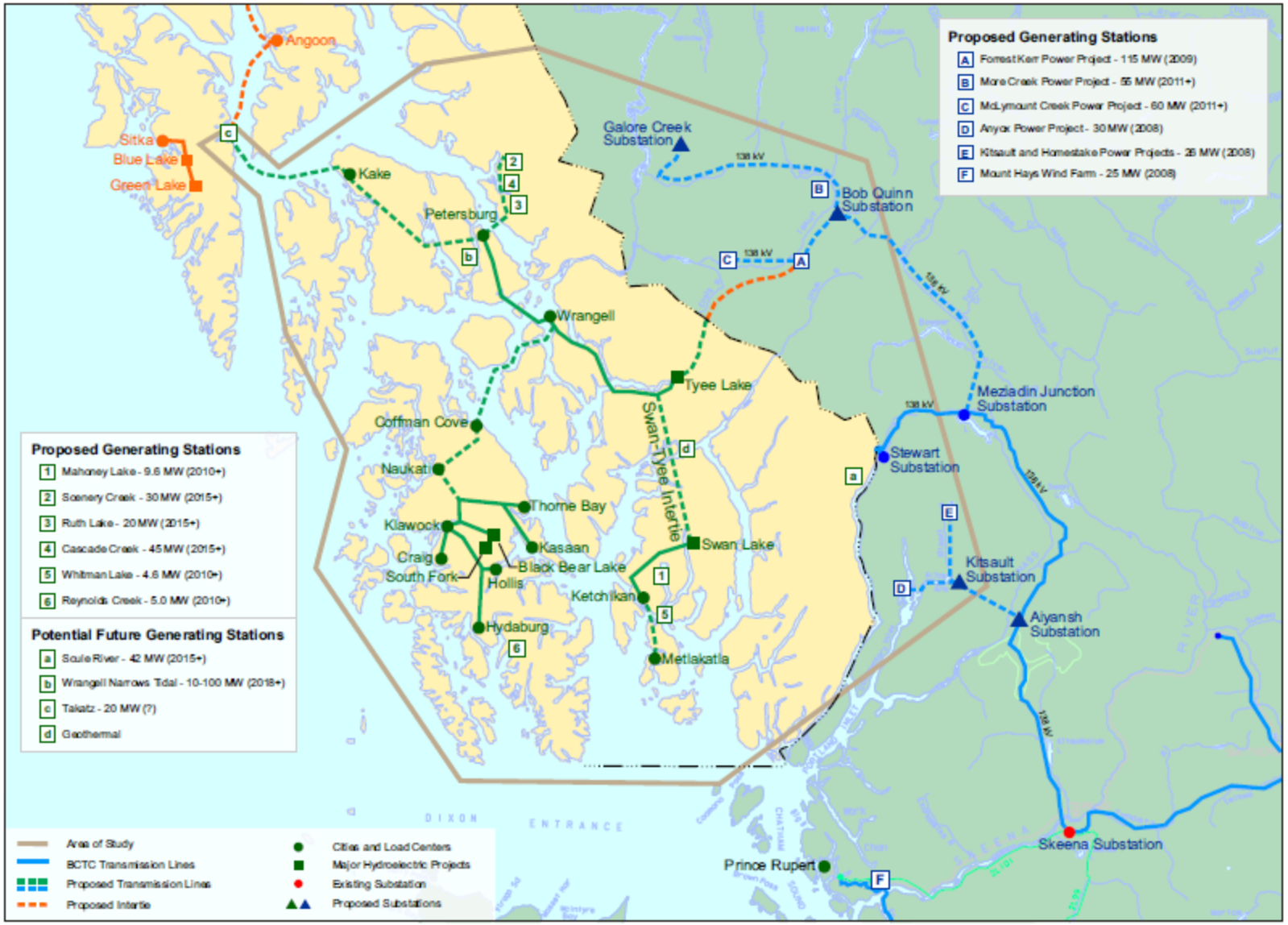
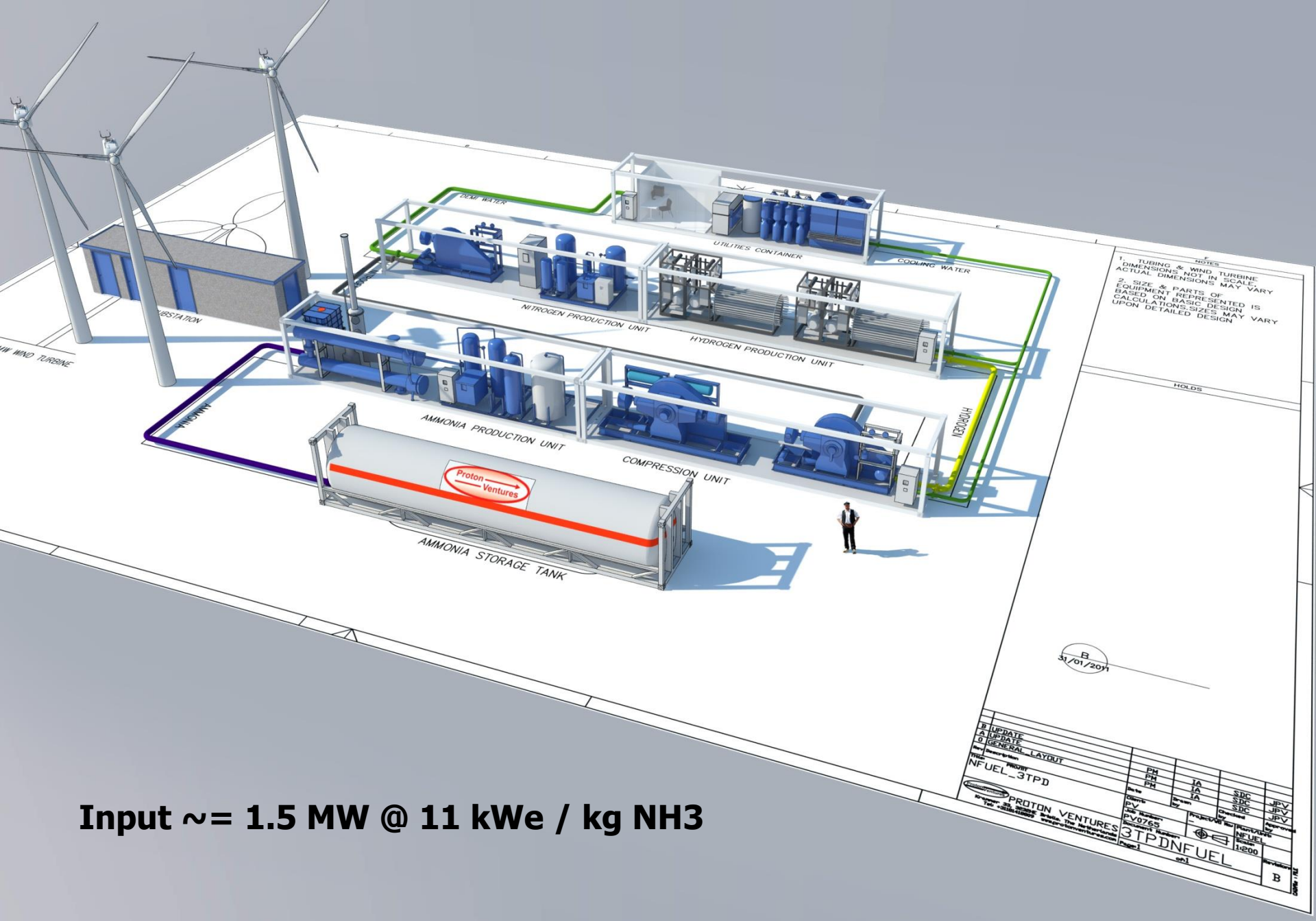


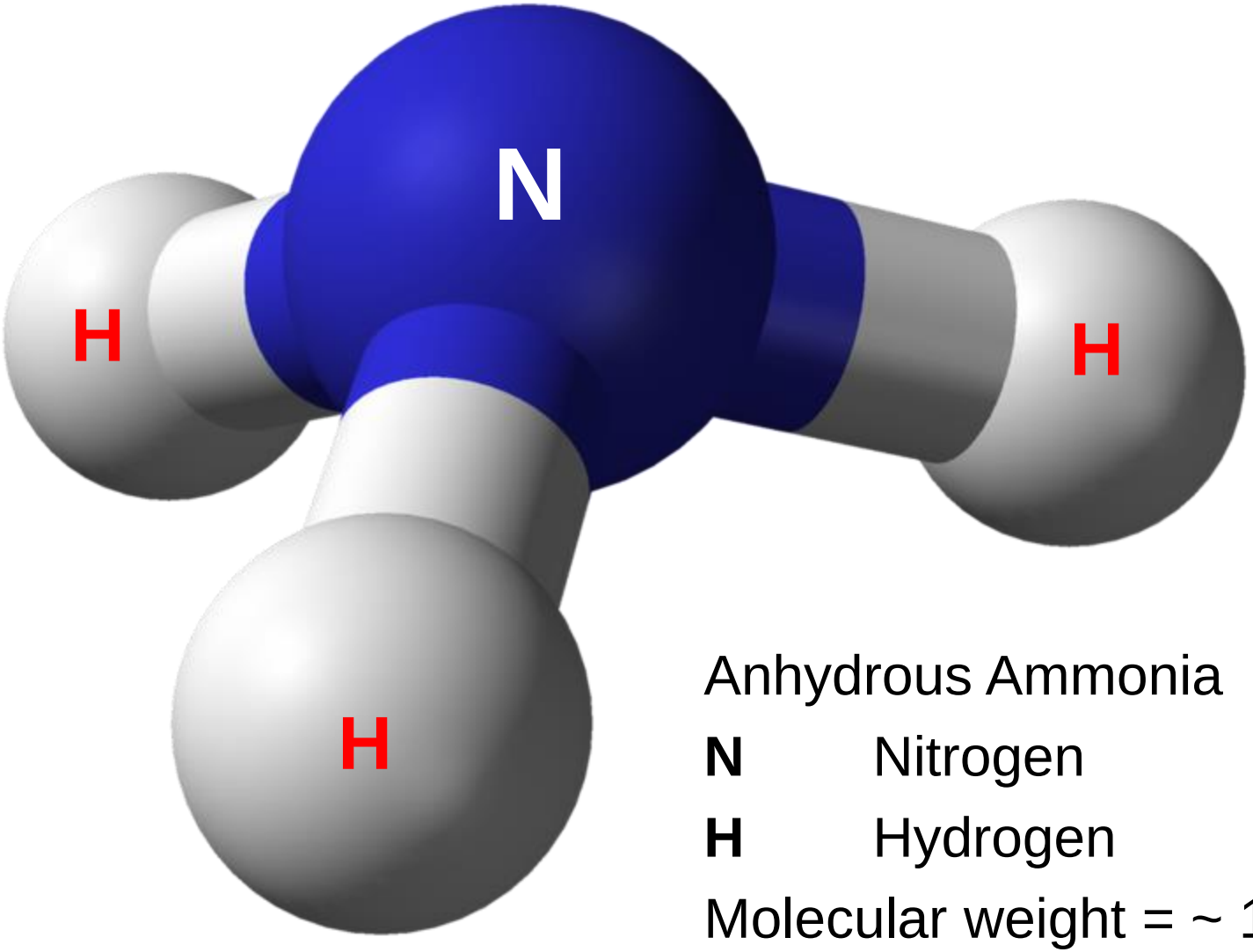
FIGURE 1.1-1
AK-BC Intertie Feasibility Study Area

HATCH™



Input ~= 1.5 MW @ 11 kWe / kg NH3

3 Mt / day Electrolysis + Haber-Bosch (EHB) NH3 plant by Proton Ventures



Anhydrous Ammonia **NH_3**

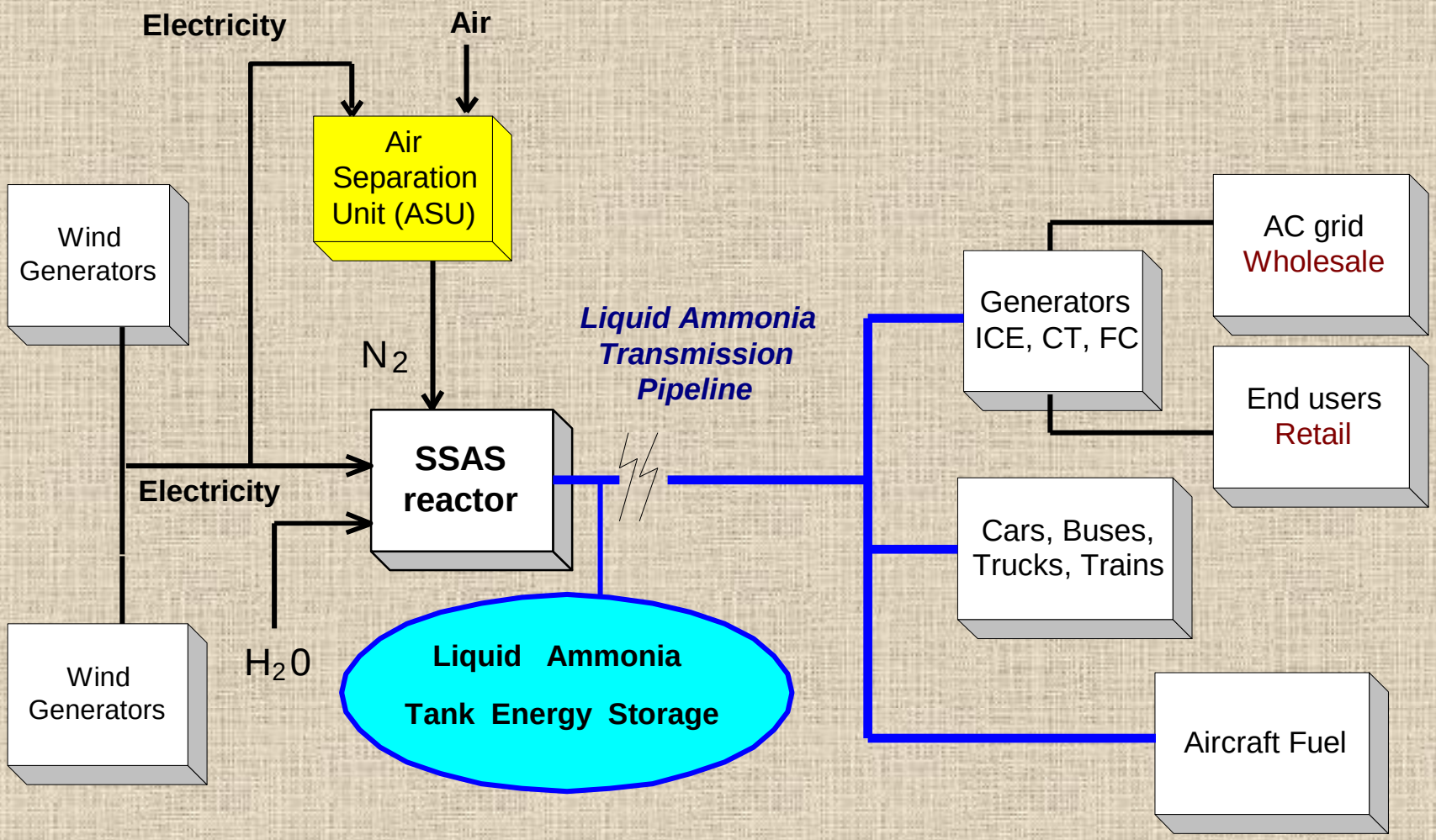
N Nitrogen

H Hydrogen

Molecular weight = ~ 17

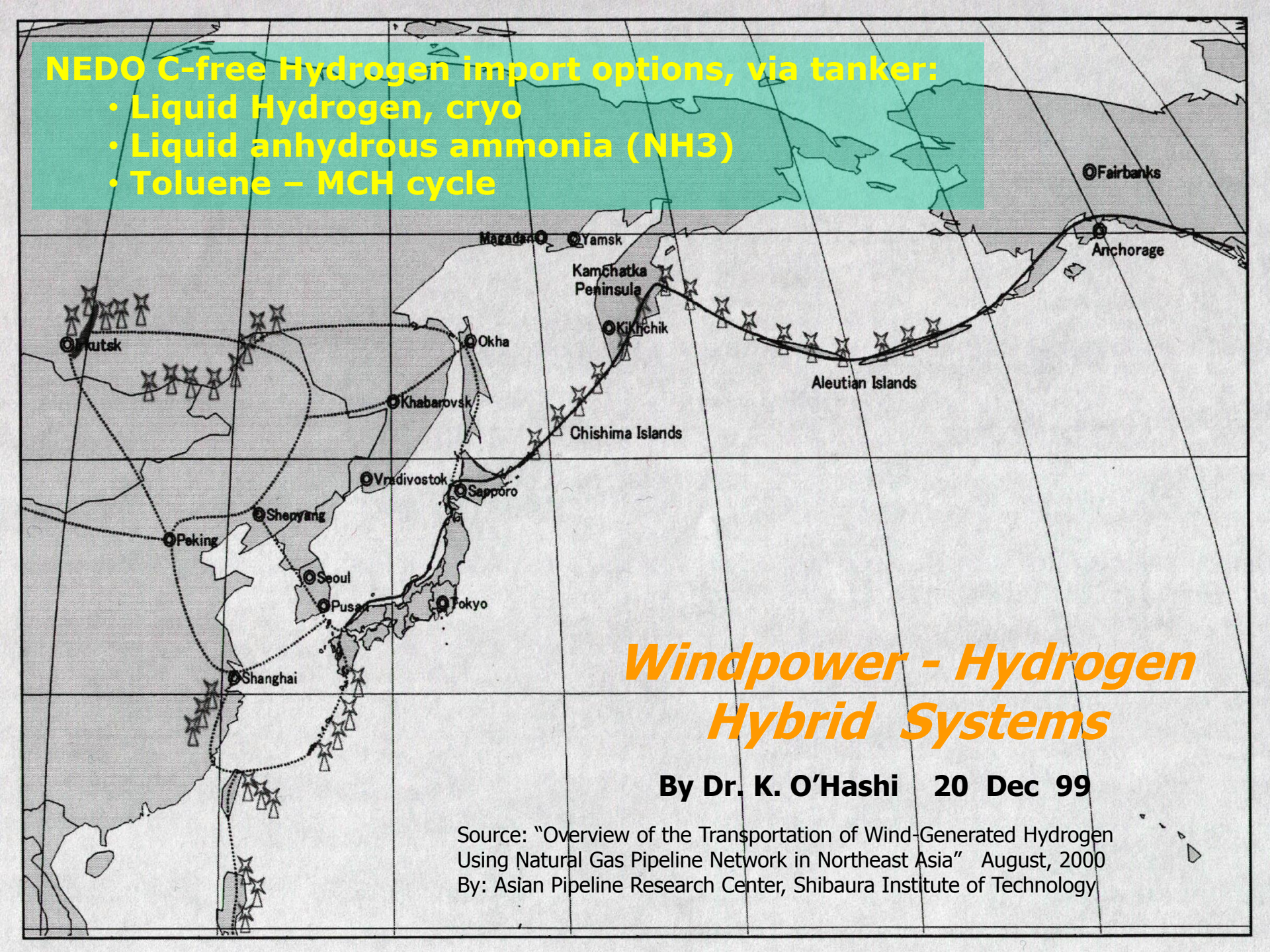
18% **H** by weight: “other hydrogen”

$NH_3 + O_2 = N_2 + H_2O$



Solid State Ammonia Synthesis (SSAS)

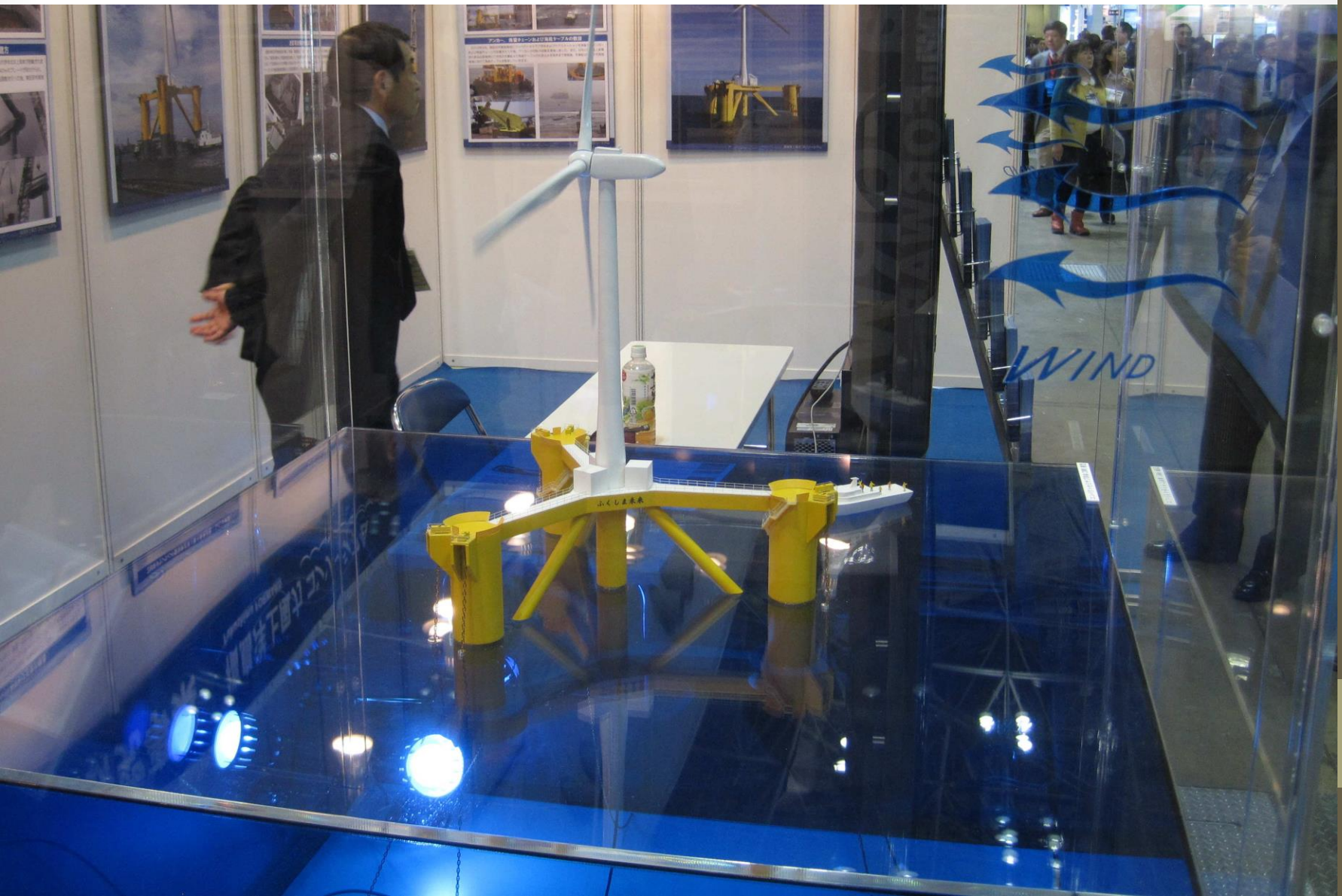
25 Feb 14, Tokyo
Japan Renewable Energy Foundation
“ Revision2014 – Global Energy Turnarounds and Japan’s Path “


NEDO C-free Hydrogen import options, via tanker:
• Liquid Hydrogen, cryo
• Liquid anhydrous ammonia (NH3)
• Toluene – MCH cycle
Fairbanks
Magadan
Yamsk
Anchorage
Kamchatka Peninsula
Kikhchik
Okha
Aleutian Islands
Khabarovsk
Chishima Islands
Vradivostok
Sapporo
Shenyang
Peking
Seoul
Pusan
Tokyo
Shanghai
Windpower - Hydrogen Hybrid Systems
By Dr. K. O'Hashi 20 Dec 99
Source: "Overview of the Transportation of Wind-Generated Hydrogen Using Natural Gas Pipeline Network in Northeast Asia" August, 2000
By: Asian Pipeline Research Center, Shibaura Institute of Technology

JEDC Juneau Economic Development Council

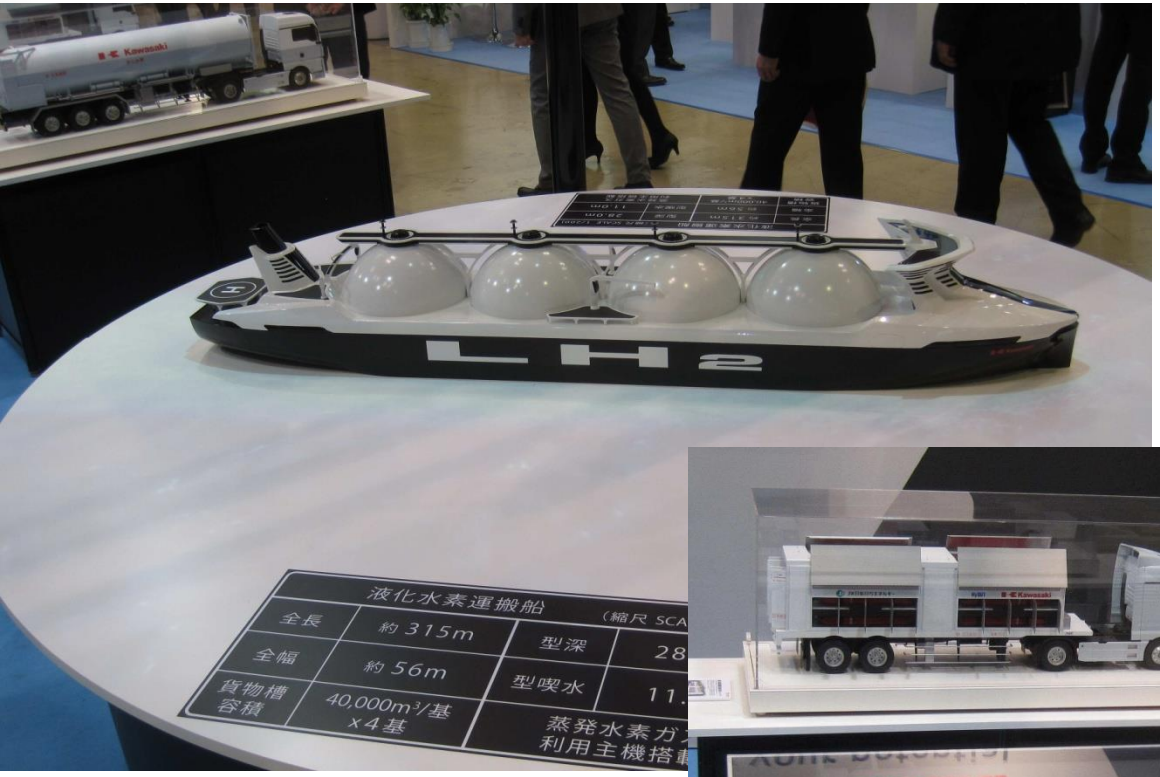
“ Fukushima Forward “, deepwater offshore wind, multi-MW

“ Fukushima Forward “, deepwater offshore wind, multi-MW



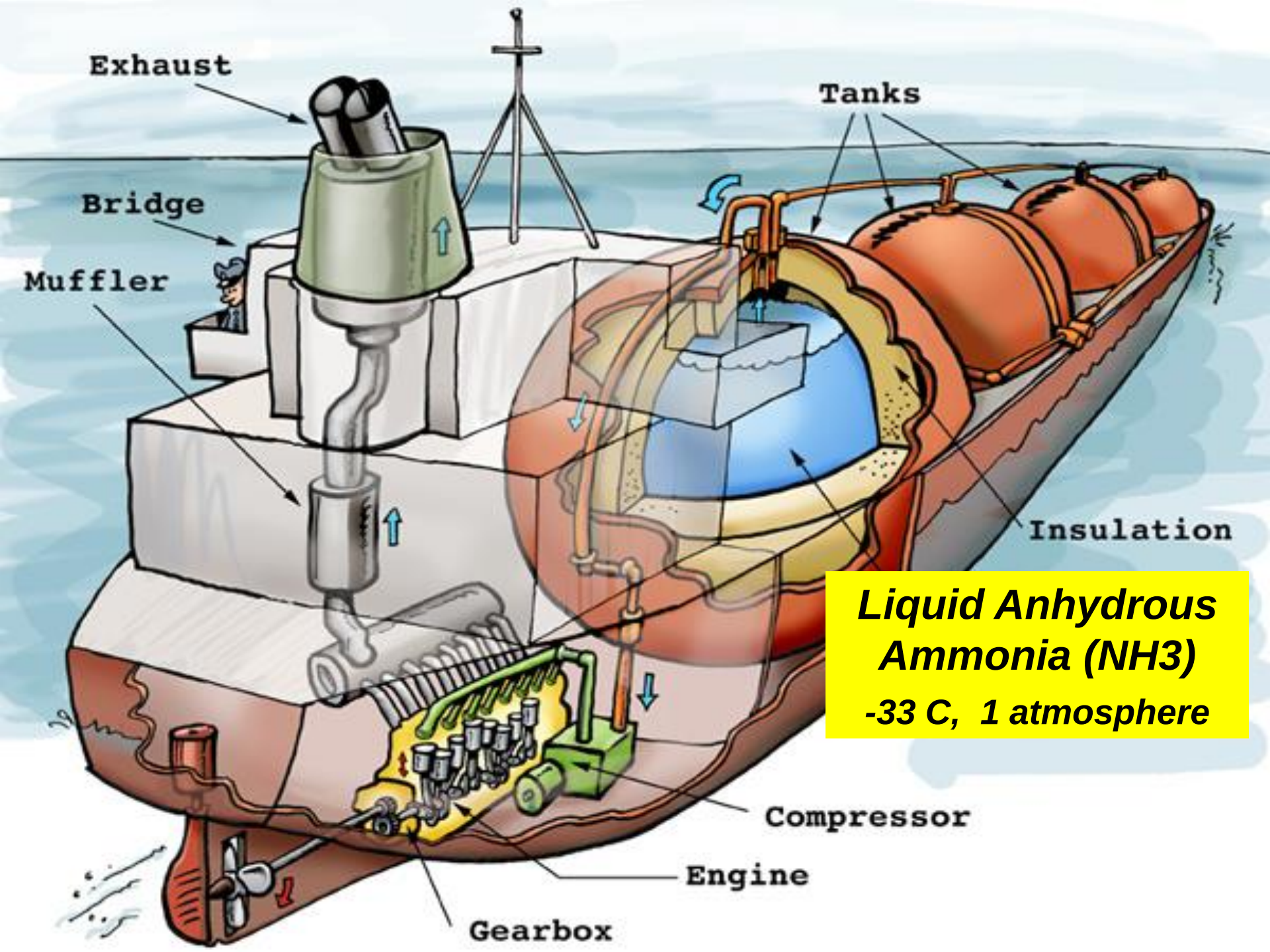
Japan: Import Carbon-emissions-free liquid Hydrogen fuel

Japan: Import Carbon-emissions-free liquid Hydrogen fuel



Military: Land + sea fuel

- USCG, Navy ships
- Land vehicles: road, rail
- Recip engines modify: multifuel, Sturman
- Mini + microgrid app’s


Exhaust
Tanks
Bridge
Muffler
Insulation
Liquid Anhydrous Ammonia (NH3)
-33 C, 1 atmosphere
Compressor
Engine
Gearbox

Action Initiative:

BIOMASS DEMAND DEVELOPMENT

Champion: Bob Deering, USFS

Initiative Goals:

- Focus on development of biomass DEMAND in Southeast Alaska
- Identify Key focus group “sectors” and hold meetings with people from those sectors to gain detailed understanding of the opportunities and challenges
- Activities:
  - Held workshop with representatives from Windhager biomass energy systems company in Juneau
  - Planning biomass webinar for schools facilities management in rural SE AK communities

Action Initiative:

RENEWABLE ENERGY EDUCATION & OUTREACH

Champion: Need New Champion, please

Initiative Goals:

- Increase awareness of Renewable Energy (RE) opportunities, costs, questions, and projects, including new and changed policy
- Coordinate with other initiatives in RE cluster to promote awareness of their goals
- Energy is complex and confusing to all
- Activities:
  - Created Electric Vehicle 1-page infographic
  - Planning biomass webinar for school facilities managers in rural SE AK communities

Action Initiative:

EXPAND THE ADOPTION OF ELECTRIC VEHICLES IN JUNEAU

Champion: Alec Mesdag, AEL&P

Initiative Goals:

- Identify & remove barriers to electric vehicle adoption through promotion of EV infrastructure and education
- Activities:
  - Awarded grant through Funders' Network to install 8 charging stations around Juneau
  - Working on developing support services for EV servicing in Juneau
- After installation, Juneau will have the highest per-capita concentration of EV charging stations in the country!

Battery Electric Vehicle (BEV) , Charger Tokyo, Feb 14

Honda BEV: Single seat, Tokyo, Feb '14

Context:

CONCEIVE & MODEL AN ALASKAN CAPITOL DISTRICT HEATING SYSTEM

Champion: James Bibb, Northwind Architects

Juneau Willoughby District Planning Concepts

District Heat Initiative Goals

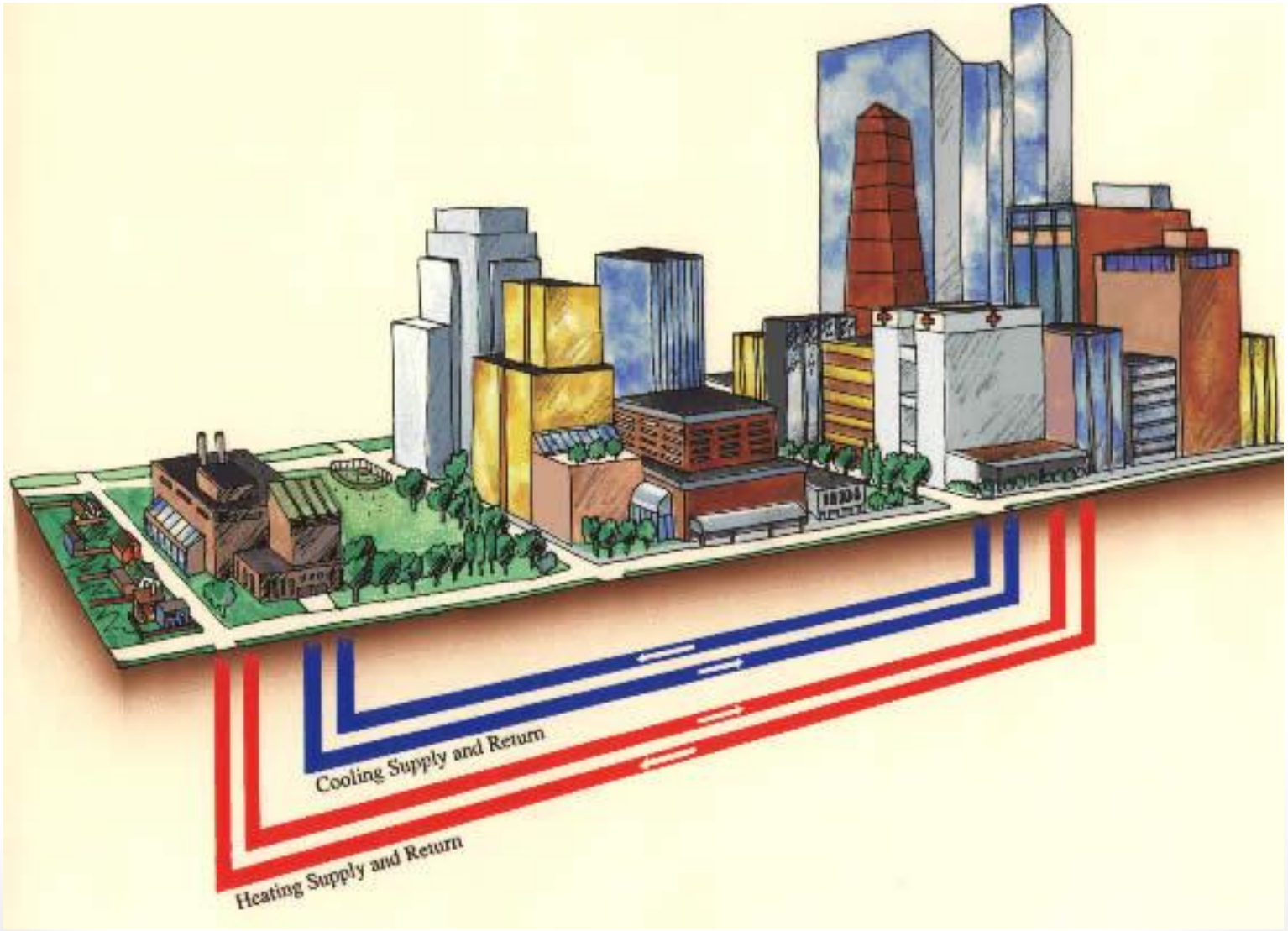
- Data Collection
  - Pre-Feasibility Study
    - Funding needed ~ $ 30,000
- Education & Outreach
  - Whitepaper available
  - Local: Willoughby District and beyond
  - Legislative
  - Industry Experts

CAPITOL DISTRICT HEATING SYSTEM

Energy source options:

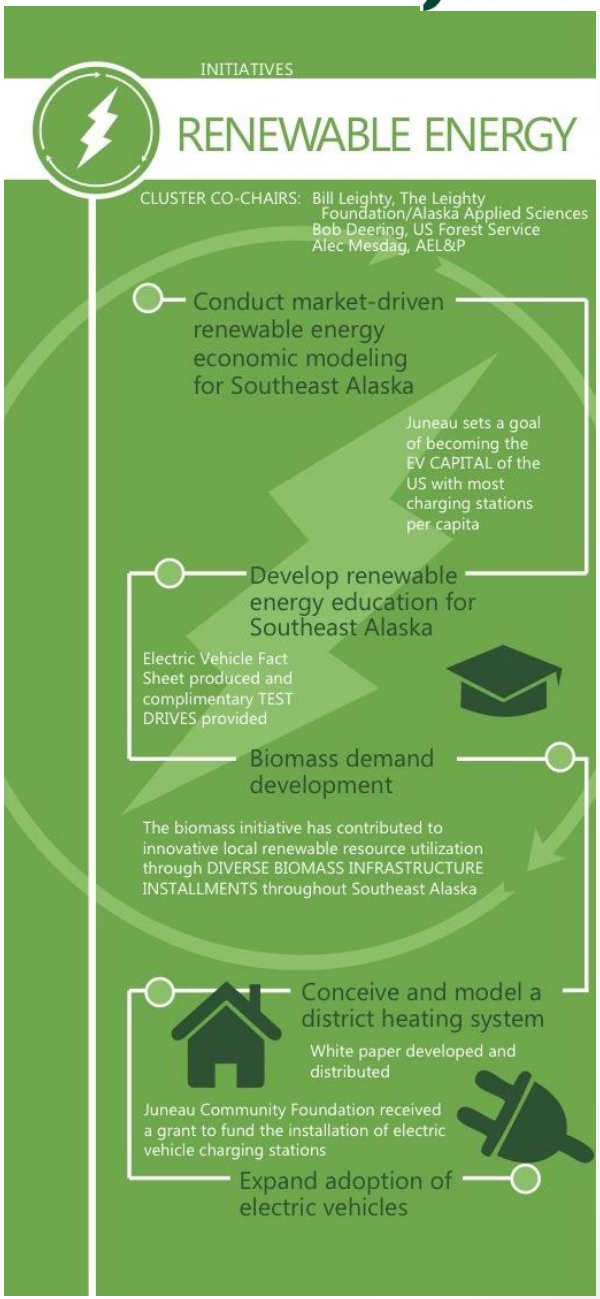
- Wood boiler: chips
- Seawater-source heat pump
  - AELP hydro
  - NOAA – NMFS, Lena point
  - Seward Sealife Center
- Geothermal: new boring method ?

CAPITOL DISTRICT HEATING SYSTEM



Get Involved!

- Region-wide Cluster
- Private business development in Renewable Energy
- Keep energy resource $$ in our region
- Join us !



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CAPITOL DISTRICT HEATING SYSTEM