

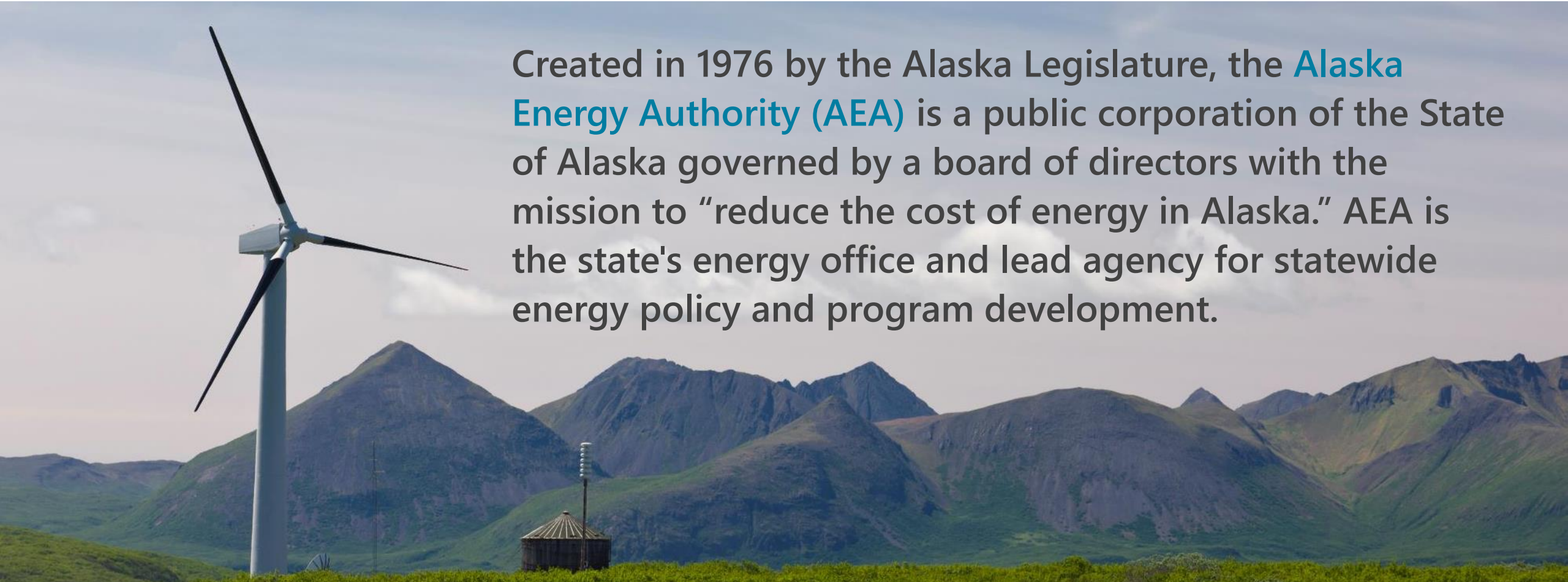
ENERGY 101

Curtis W. Thayer
Executive Director

Senate Resources Committee
March 24, 2021



WHO WE ARE

A photograph of a white wind turbine on a grassy hill, with a small dark structure and a range of rugged, green mountains in the background under a cloudy sky.

Created in 1976 by the Alaska Legislature, the [Alaska Energy Authority \(AEA\)](#) is a public corporation of the State of Alaska governed by a board of directors with the mission to “reduce the cost of energy in Alaska.” AEA is the state's energy office and lead agency for statewide energy policy and program development.

WHAT WE DO



Railbelt Energy – AEA owns the Bradley Lake Hydroelectric Project and the Alaska Intertie. These assets benefit Railbelt consumers by reducing the cost of power.



Power Cost Equalization – The Power Cost Equalization Program reduces the cost of electricity in rural Alaska for residential customers and community facilities.



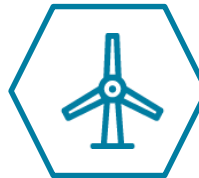
Rural Energy – AEA constructs bulk fuel tank farms, diesel powerhouses, and electrical distribution grids in rural villages. AEA supports the operation of these facilities through circuit rider and emergency response programs.



Renewable Energy – AEA provides renewable energy and energy efficiency grants, analysis, and expertise to benefit Alaskans. These include hydro, biomass, wind, solar, and others.

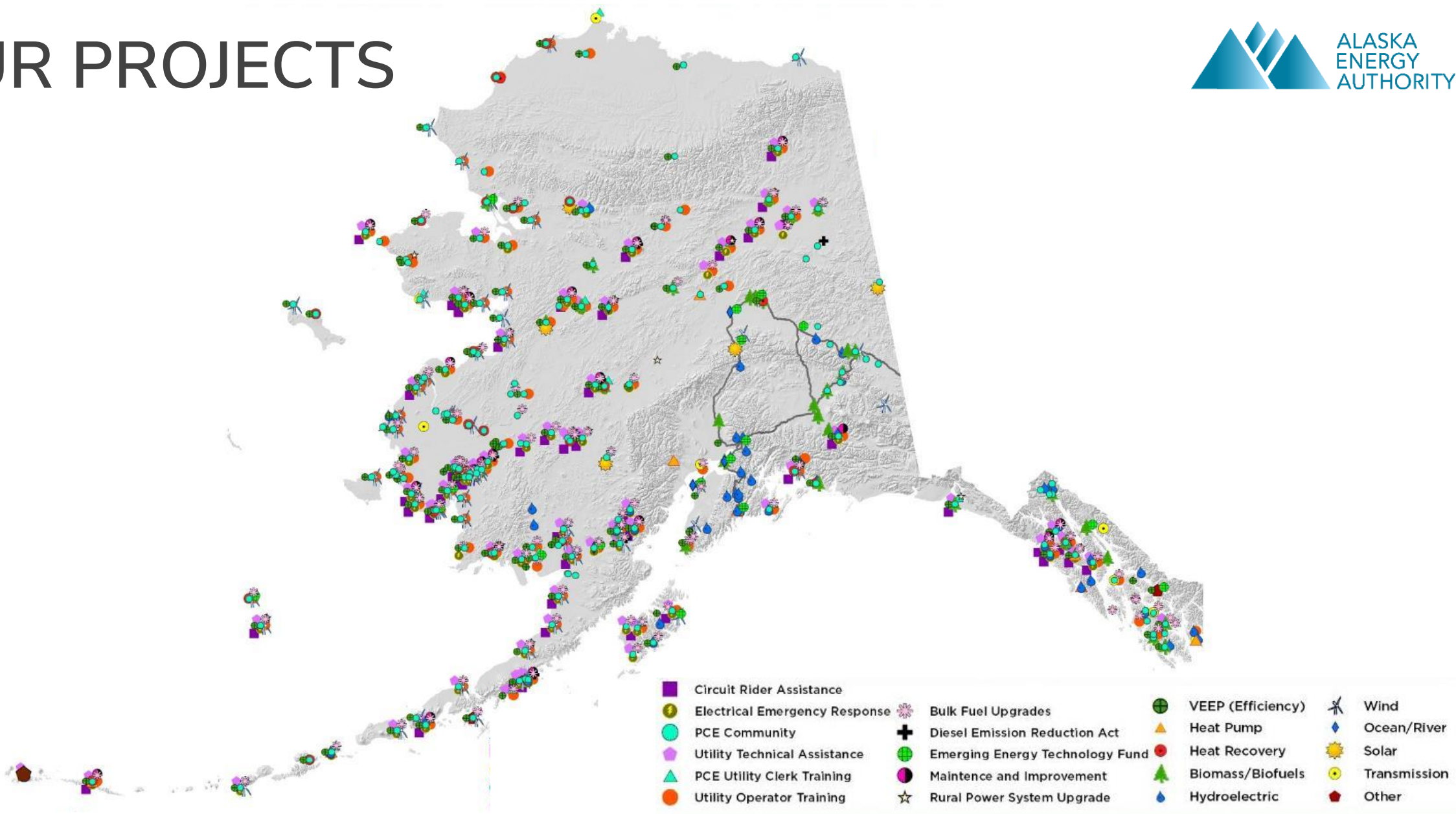


Grants and Loans – AEA provides loans to local utilities, local governments, and independent power producers for the construction or upgrade of power generation and other energy facilities.



Energy Planning – In collaboration with local and regional partners, AEA provides critical economic and engineering analysis to plan the development of cost effective energy infrastructure.

OUR PROJECTS





ENERGY 101

What is energy?



“Simply put, energy is the capacity to do work.”



ENERGY UNITS

W

kW

MW

GW

1 watt =



1 kilowatt =
(1,000 watts)



1 megawatt =
(1,000,000 watts)



1 gigawatt =
(1,000,000,000 watts)



POWER AND ENERGY



Power

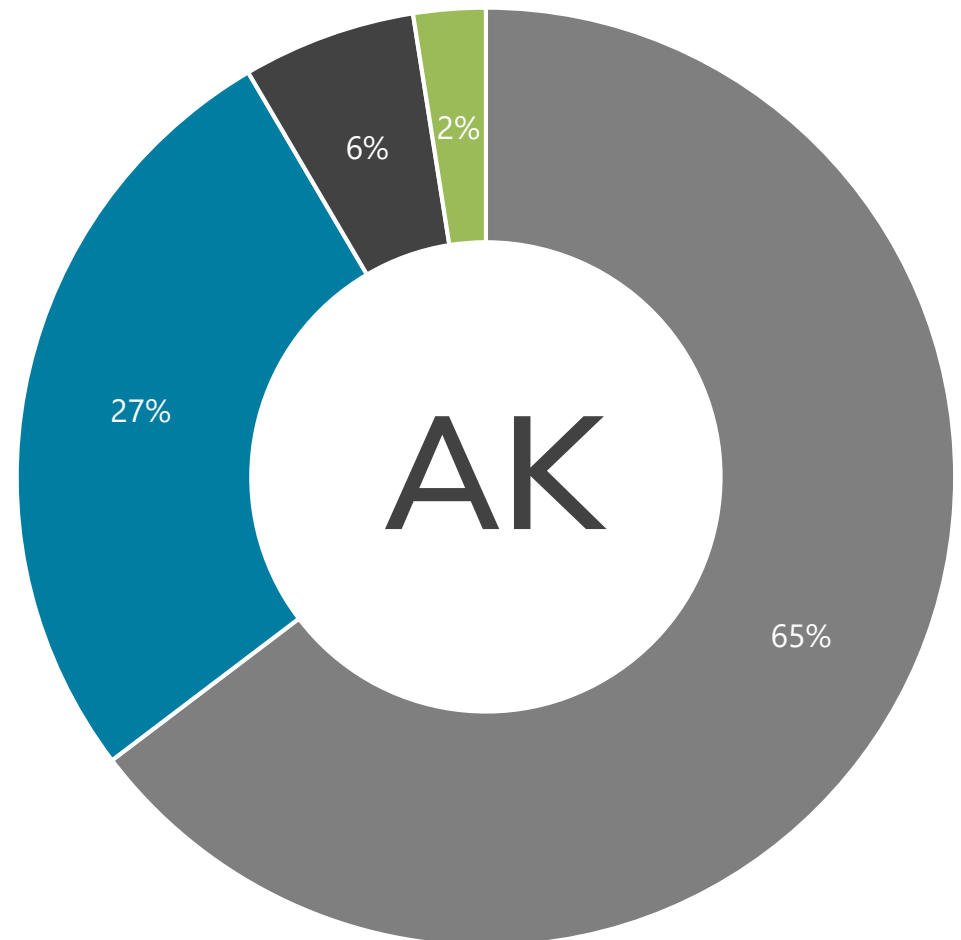
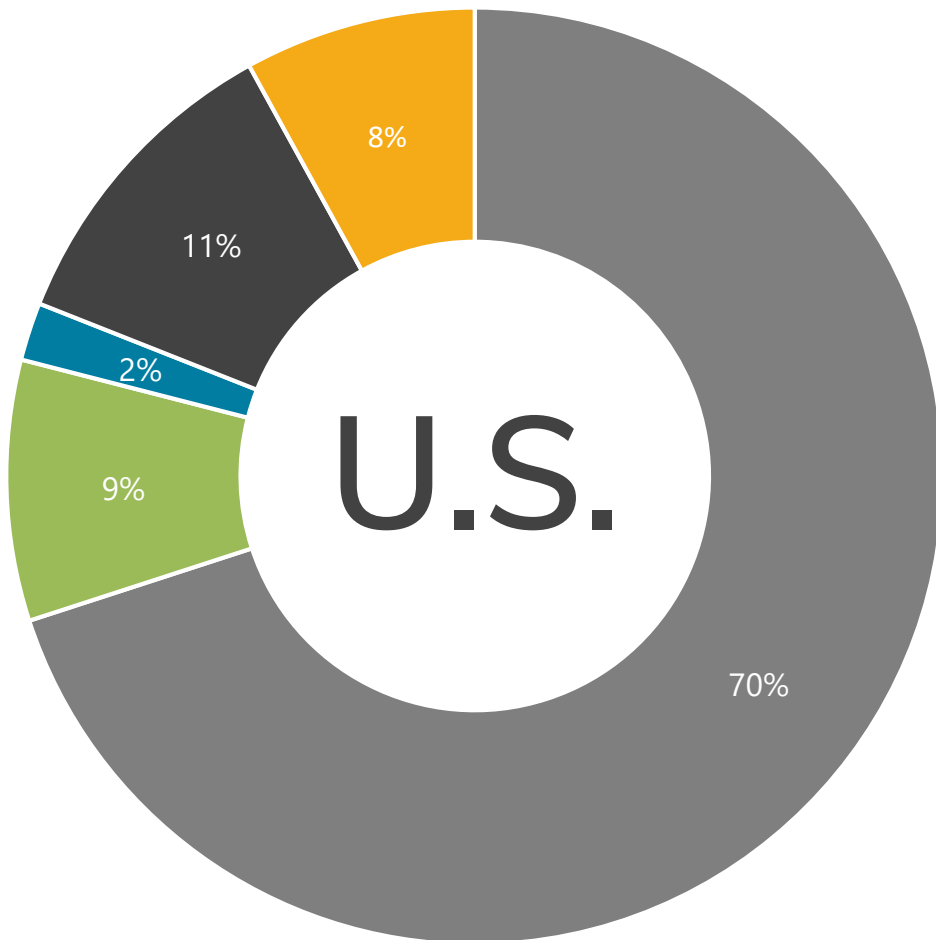
Watts or kilowatts is like the flow rate of the water

Energy

Watts or Watts-hours or kilowatt hours is like the amount of water that ends up in a bucket



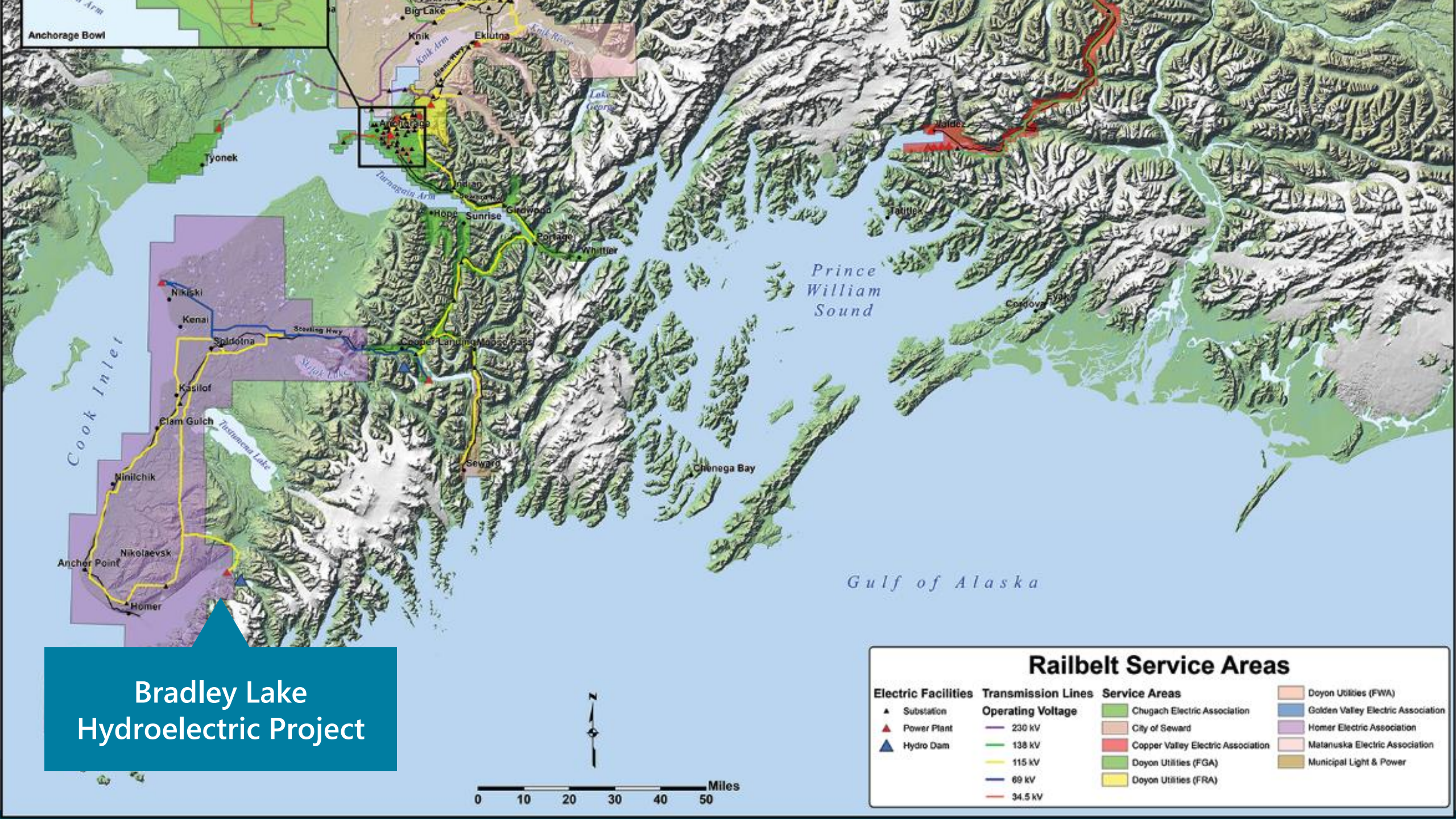
U.S. AND ALASKA ENERGY PROFILE (%)



■ Oil and Gas ■ Coal ■ Renewable Energy ■ Hydroelectric ■ Nuclear Power

URBAN ENERGY



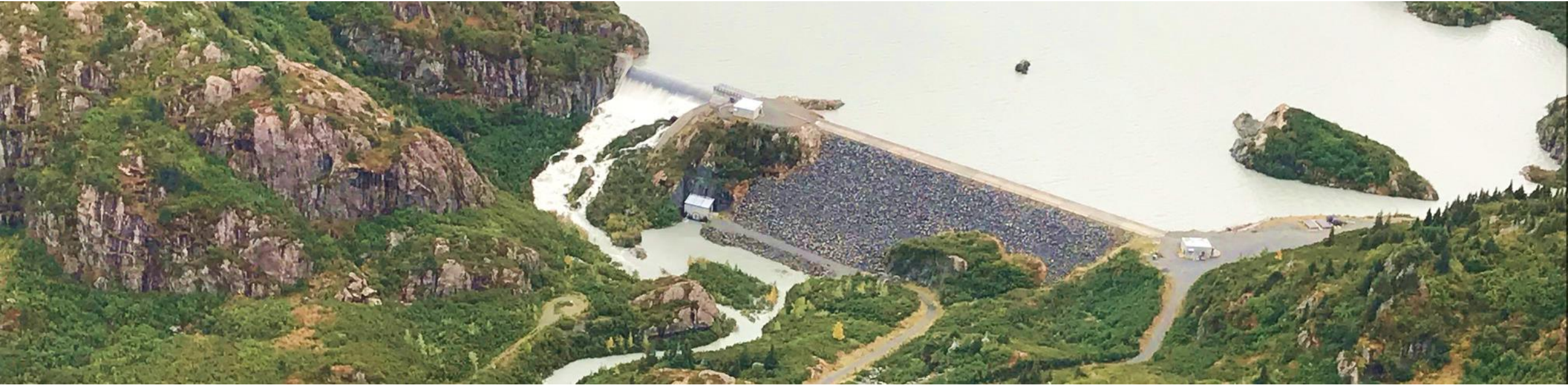


Bradley Lake Hydroelectric Project

Railbelt Service Areas

Electric Facilities	Transmission Lines	Service Areas	
▲ Substation	Operating Voltage	Chugach Electric Association	Doyon Utilities (FWA)
▲ Power Plant	— 230 kV	City of Seward	Golden Valley Electric Association
▲ Hydro Dam	— 138 kV	Copper Valley Electric Association	Homer Electric Association
	— 115 kV	Doyon Utilities (FGA)	Matanuska Electric Association
	— 69 kV	Doyon Utilities (FRA)	Municipal Light & Power
	— 34.5 kV		

BRADLEY LAKE HYDROELECTRIC PROJECT

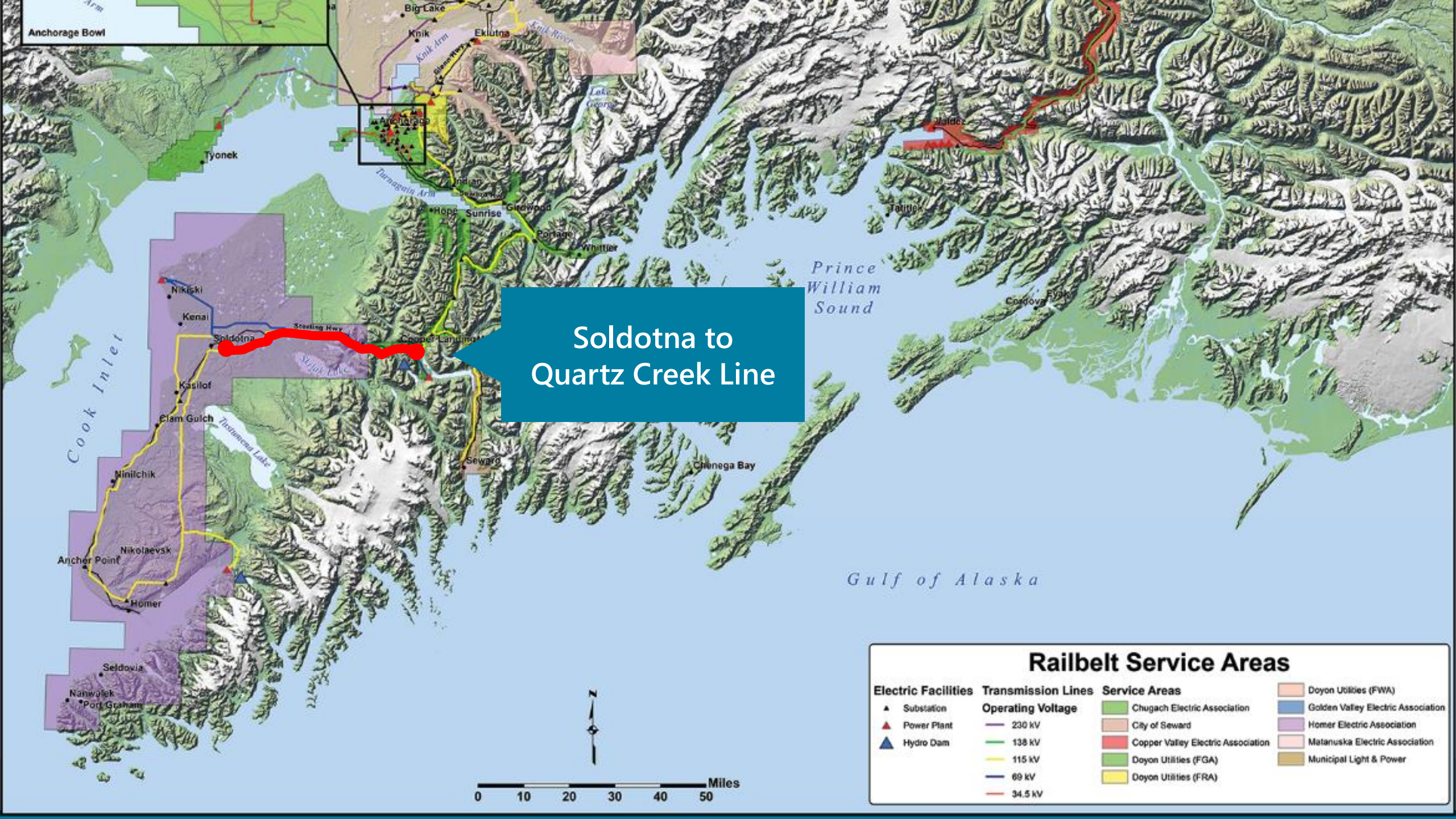


- Benefits 500,000+ members of Chugach Electric Association, City of Seward, Golden Valley Electric Association, Homer Electric Association, and Matanuska Electric Association
- Produces ~10% of Railbelt electricity at 4.5 cents/kWh or ~54,400 homes/year
- Over \$20 million in savings per year to Railbelt utilities Bradley Lake versus natural gas

WEST FORK UPPER BATTLE CREEK DIVERSION



- Project cost \$47 million, will add ~10% energy or ~5,100 homes in a year
- Substantial completion on July 2020
- Project diverts runoff from Battle Creek into Bradley Lake expanding the state's largest hydroelectric facility
- Includes three miles of road, concrete diversion dam, and a five-foot diameter pipeline under the road to carry water from its source to Bradley Lake
- More energy at lower cost can be produced and delivered to ratepayers



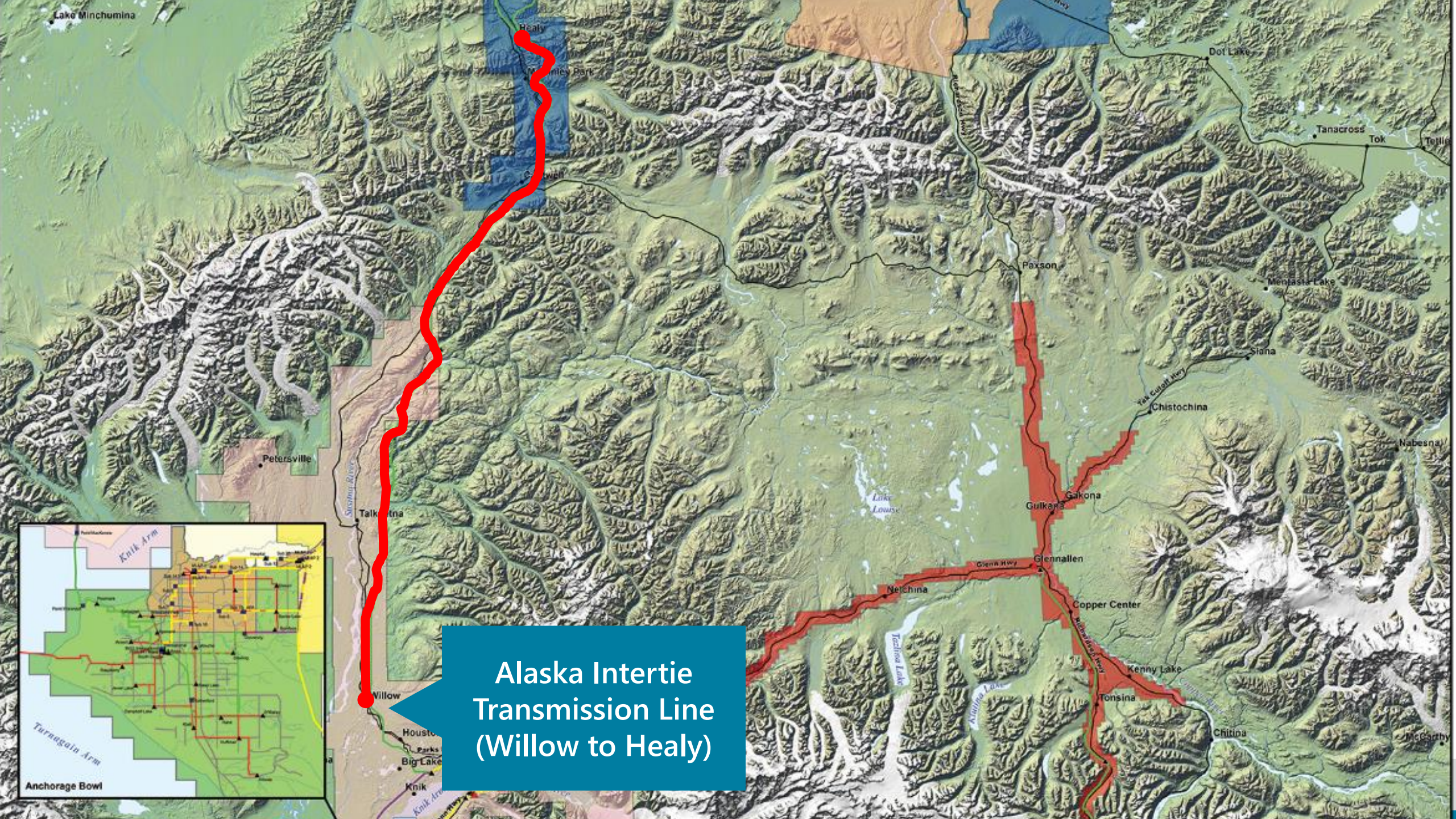
Soldotna to
Quartz Creek Line



SSQ TRANSMISSION LINE

- 39.3 miles of 115-kV transmission line delivers Bradley Lake hydroelectric generated power
- AEA's recent purchase allows for better cost alignment, increased reliability, and future prospect for upgrades to the line, which would decrease line losses and allow for increased power transmission north, and unconstraining Bradley power
- Schedule begins with preliminary design with 6 months, 24 to 36 month estimate to finalize construction





Alaska Intertie
Transmission Line
(Willow to Healy)

ALASKA INTERTIE



- 170 mile-long transmission line from Willow to Healy
- Allows Golden Valley Electric Association (GVEA) to connect to and benefit from lower cost power
- Improves reliability within Railbelt system
- Operated by AEA and Railbelt utilities
- Between 2008 and 2018, the Intertie provided an average annual cost savings of \$40 million to GVEA customers

MAXIMIZING CLEAN ENERGY FOR RAILBELT

- Soldotna-Quartz Creek (and Substation) – \$70 Million
- Dave's Creek-University 230kV – \$58 Million
- Bradley-Soldotna 115kV Line – \$66 million
- Bradley Lake Expansion (Spillway Raise) – \$4 Million
- Bernice Lake-Beluga HVDC – \$185 Million
- Grid Stabilization HVDC – \$115 Million



RURAL ENERGY



POWER COST EQUALIZATION



- Power Cost Equalization (PCE) provides electric power to rural residential customers and community facilities at costs similar those in Anchorage, Fairbanks, and Juneau
- 194-eligible communities see the benefits of PCE credits
- In Fiscal Year 2020, \$29.6 million was disbursed
- PCE Endowment Fund created capitalized in Fiscal Year 2001 — now ~\$1.1 billion

DIGITAL TWIN (3D MODEL WITH INFORMATION)



RURAL POWER SYSTEM UPGRADES



- ~197 communities eligible for Rural Power System Upgrade (RPSU)
- Goal — improve power system efficiency, safety, and reliability
- Aging infrastructure and Operation and Maintenance
- Active projects — 7 full and 16 Maintenance and Improvement/Diesel Emissions Reduction Act
- Deferred maintenance \$327 million

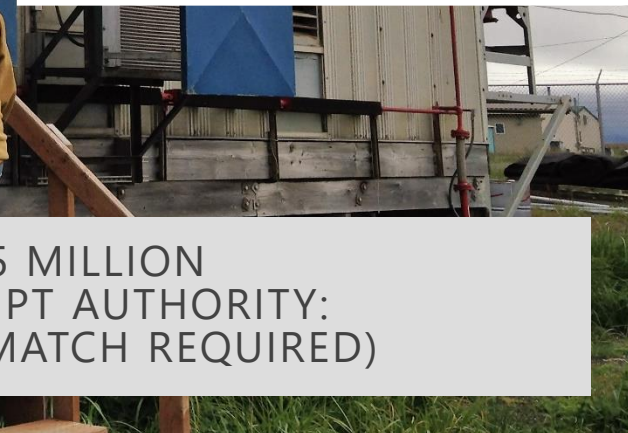
RPSU PROJECTS REQUIRING FUNDING

FY2022 RPSU Capital Requests

- Napaskiak
- Nelson Lagoon
- Nikolai
- Rampart

Next RPSU Priorities

- Beaver
- Buckland
- Chefnak
- Chenega Bay
- Chuathbaluk
- Crooked Creek
- Elfin Cove
- Golovin



BULK FUEL UPGRADES



- ~400 rural bulk fuel facilities
- Goal — code compliant fuel storage facilities and prevention of spills and contamination
- Aging infrastructure, erosion, and catastrophic failure
- Active projects — 8 full and 18 Maintenance and Improvement No funding for two years
- Leveraging Coast Guard regulatory efforts to capture BFU assessments to prioritize projects
- Deferred maintenance \$800 million

BFU PROJECTS REQUIRING FUNDING

FY2022 BPU Capital Requests

- Ekwook
- Marshall
- Shageluk

Next BPU Priorities

- Minto
- Noatak
- Nondalton
- Shungnak
- Togiak
- Tuluksak



CAPITAL
REQUEST:

STATE: \$5.5 MILLION
FEDERAL RECEIPT AUTHORITY:
\$7.5 MILLION (MATCH REQUIRED)

GRANTS AND LOANS



RENEWABLE ENERGY FUND



- Renewable Energy Fund (REF) helps Alaskans reduce and stabilize the cost of energy
- \$268 million invested in REF by the State
- 99 operational projects, 27 in development
- Round 13 recommendation submitted to Legislature January 2021
- REF program will sunset on June 30, 2023
- Approximately \$6.5 million available for Round 13

POWER PROJECT FUND



- Dedicated to power projects, the Project Power Fund (PPF) is available to for qualified borrowers
- PPF is critical as grant funding is eliminated
- Requires review for technical and fiscal viability
- \$31 million in outstanding loans
- \$10.7 million uncommitted cash balance available for lending
- 8 applications pending for a total of \$10.4 million
- Low interest rates to encourage innovative power project applications

ADDENDUM



SUSITNA-WATANA PROJECT ANIMATION



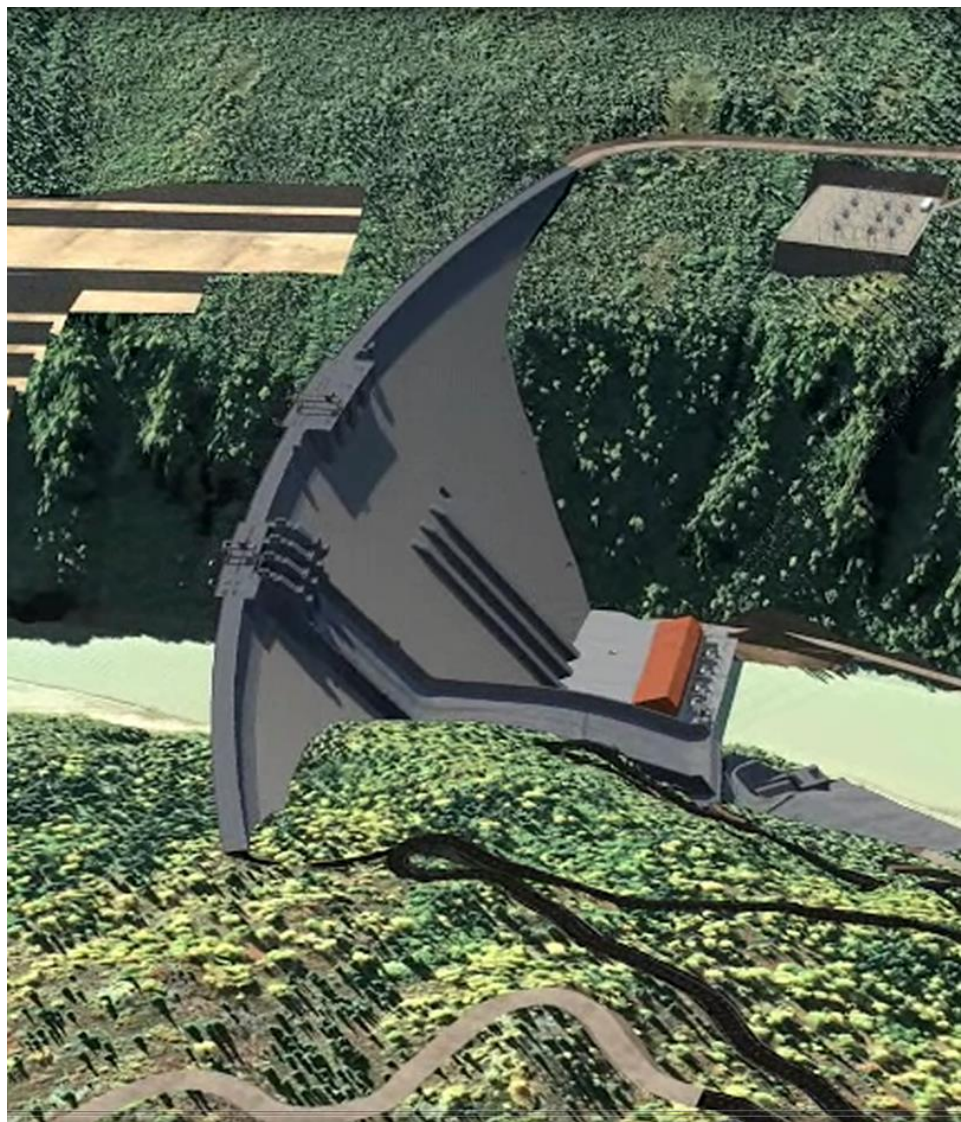
SUSITNA-WATANA HYDROELECTRIC PROJECT



- Dam Height – 705 feet
- Dam Elevation – 2,065 Feet MSL
- Reservoir Length – ~42 miles
- Reservoir Width – ~1.25 miles
- Maximum Installed Capacity – 618 MW
- Annual Energy – 2,800,000 MWh or ~389,000 homes
- Cost – ~\$5.655 billion (2014\$)

SUSITNA-WATANA ECONOMICS

- Benefit-Cost and Economic Impact Analyses completed in 2015
 - Based on 2014 projection of natural gas prices:
 - Benefit-cost ratio of 2.39 from energy savings alone
 - \$11.2 billion (2014\$) in energy savings over first 50 years
 - \$4.7 billion (2014\$) in capital and O&M costs over first 50 years



SUSITNA-WATANA STATUS



- Integrated Licensing Process
- 2/3 of the way done; \$193 Million invested
- Cost to complete ~\$100 million for license
- 58 FERC-approved studies:
 - Implemented 2012-2017
 - 19 studies completed
 - 39 significant progress made
- Initial Study Report filed with FERC

AEA provides
energy solutions
to meet the
unique needs and
opportunities of
Alaska's rural
and urban
communities.

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