Shovel-Ready Energy Infrastructure Projects in Alaska

April 22, 2021

ALASKA ENERGY AUTHORITY

OVERVIEW

Created in 1976, 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. Statutory responsibilities are outlined in Alaska Statute (AS) 44.83.070.

The purpose of AEA is to promote, develop, and advance the general prosperity and economic welfare of the people of the state by providing a means of financing and operating power projects and facilities that recover and use waste energy and by carrying out the powers and duties assigned to it under AS 42.45 (assistance to rural utilities).

This document is a catalog of Shovel-Ready Energy Infrastructure Projects in Alaska within AEA's capability to manage. Each project provides significant benefits to the communities in which they are targeted. Infrastructure projects of larger scope provide a corresponding greater benefit to more than a single community and have long-term positive impacts on the state economy.

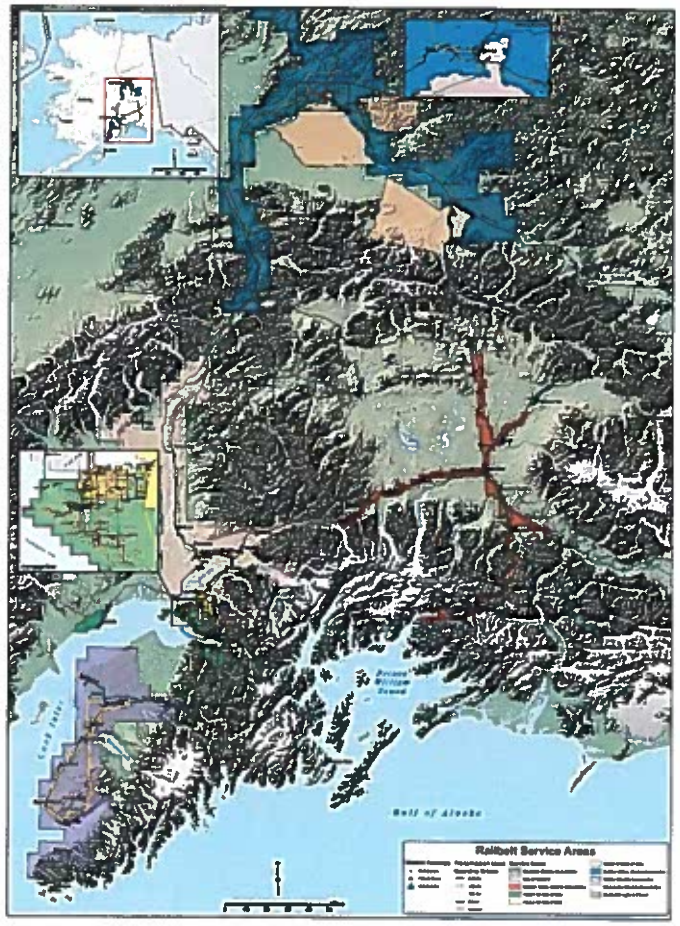
Projects are aggregated into "by category of energy" spheres and are prioritized within each sphere. Our listing of these projects within each sphere will be able to advance to construction as expediently as practical. Project completion is harder to calculate but sooner construction completions are rated more positively for priority.

PROGRAM SUMMARY

CATEGORY	NUMBER OF PROJECTS	COST
Railbelt Infrastructure Upgrades	3	$1.1 Billion
Susitna-Watana Hydroelectric Project	1	$5.6 Billion
Rural Power System Upgrades	115	$403 Million
Rural Bulk Fuel Upgrades	33	$132 Million
Statewide Renewables: Hydroelectric	8	$413 Million
Statewide Renewables: Biomass/Heat	6	$9.5 Million
Statewide Renewables: Wind	8	$39.2 Million
Renewable Energy Fund	NA	NA
Totals	**174**	**$7.7 Billion**

RAILBELT INFRASTRUCTURE UPGRADES

SUMMARY **3 PROJECT GROUPS, TOTAL $1.1 BILLION**



Map of Alaska's Railbelt service areas.

The Railbelt region of the State has undergone significant changes in the last 10 years to its energy infrastructure, and in the process has become more congested. To transition to clean energy and fully realize the benefits of low-cost power, this congestion must be reduced. Adding to this need to act is the age of this critical infrastructure: the majority of the transmission lines in the Railbelt were constructed more than 40 years ago. Fortunately, with the Regulatory Commission of Alaska's rapidly developing plans to create a Railbelt Electric Reliability Organization and the recently adopted Railbelt Reliability Standards, it has become apparent that a redundant and resilient Railbelt transmission system is not only achievable but also necessary to provide the maximum cost savings to the consumers of electricity in the region.

The Bradley Lake Hydroelectric Project, which was completed in 1991, generates the lowest-cost electricity on the Railbelt. It provides power to more than 550,000 Alaska residents. There is now a unique opportunity to leverage past investments in the Bradley Lake Hydroelectric Project. Through further utility investment in specific shovel-ready capital projects, Alaska can optimize Bradley Lake's value without incurring significant additional costs to Alaskans. AEA, in partnership with the five Railbelt utilities Chugach Electric Association, Golden Valley Electric Association, Homer Electric Association, Matanuska Electric Association, and Seward Electric Association, has identified several opportunities to remove transmission constraints that will enhance the Bradley Lake Hydroelectric Project's benefit by increasing its ability to deliver more

energy throughout the system and enhance our ability to utilize that power most flexibly and cost-effectively.

The proposed projects are intended to remove transmission constraints and allow for better use of Bradley Lake's potential on behalf of Railbelt electric customers. Significant work has been completed to determine the impact of the projects on ratepayers. Aggregate project savings were found to yield a positive benefit-cost ratio range of 1.08 to 2.27, which equates to a potential savings of $1.6 billion to $3.3 billion over the first 50 years. Reducing the cost in Southcentral Alaska also has the added benefit of lowering the cost of energy in rural Alaska through the Power Cost Equalization formula.

LEVEL 1 PROJECTS (BRADLEY LAKE DECONGESTION)

BRADLEY-SOLDOTNA 115-KV TRANSMISSION LINE – $66 MILLION

Two 115-kiloVolt (kV) transmission lines deliver power from the Bradley Lake Hydroelectric Project around the north end of Kachemak Bay to Bradley Junction. From there, one-line travels north to the Soldotna Substation and one-line travels southwards towards Homer and from there travels near the western shore of the Peninsula to Soldotna. The western loop and the single line 115 kV line connecting directly to the Soldotna Substation limit the amount of energy that can be transported from the Bradley Lake project to the Soldotna Substation, and from Soldotna to the other Railbelt utilities.

This project will allow for increased power flow from Bradley Lake through the construction of a second 115-kV transmission line from Bradley Junction to the Soldotna Substation. The project will replace the existing line, adding a second set of conductors on a new set of structures. The additional 115-kV transmission line will increase capacity to the north and will also provide system redundancy. Building a second line requires the construction of a 115-kV switchyard at the junction.

SOLDOTNA-QUARTZ CREEK (AND SUBSTATION) – $70 MILLION

A second project to increase power delivery from Bradley Lake is the upgrade of the transmission line between the Soldotna and Quartz Creek Substations from 115 kV to 230 kV. This project includes approximately 50 miles of a transmission line. It would also upgrade the switchgear in the Soldotna, Sterling and Quartz Creek Substations to 230 kV. AEA recently purchased the Soldotna-Quartz Creek line from Homer Electric Association.

DAVE'S CREEK-UNIVERSITY 230-KV TRANSMISSION LINE – $58 MILLION

A 77-mile 115-kV transmission line between the Dave's Creek and University Substations was built in 1962 and originally designed to carry 25 megawatts (MW) of power from the Cooper Lake Hydroelectric Project to Anchorage. During its construction, the line was connected to substations serving communities along the Seward Highway. With the 1991 commissioning of the 120 MW Bradley Lake project, increased power delivery capability was needed from the Dave's Creek-University transmission line and additional system assets were added to the line to achieve this goal.

The transmission line traverses terrain from sea level to over 3,000 feet in mountainous passes. Due to age and weather exposure, it is nearing the end of its useful service life. Over the last 10 years, Chugach Electric Association has completed several upgrade projects replacing five to ten-mile sections of the line while constructing these new sections to 230 kV standards. Currently, 35 miles of the line have been upgraded to 230 kV standards and 32 miles remain to be upgraded. The line is currently energized at 115 kV.

To realize the full potential of the University transmission line, the whole southern transmission system needs to be energized to 230 kV. This requires upgrades of all the substations along the path of the University Transmission Line to support a higher transmission voltage. Between its terminal points, the communities of Indian, Bird, Girdwood, Portage, Whittier, and Hope are all supplied electrical energy by this line from their respective substations. Included in the scope of this project is upgrading the balance of the transmission line, approximately 32 miles, to 230 kV standards. This improves the transfer capacity and stability of the system. The project scope also includes upgrades of the substations to the higher voltage.

GRID STABILIZATION BATTERIES – $115 MILLION

To fully realize the benefits of a 230-kV bulk power system, Battery Energy Storage Systems (BESS) will be required for stabilization and response to system disturbances in the most economical way. These projects consist of upgrades to existing BESS systems and also new BESS systems throughout the Railbelt at locations to be determined based on power flow studies.

These BESS' will stabilize the electrical system during oscillation events between operating areas. They will also respond to system events more quickly than gas generators. Additionally, BESS will provide storage for hydroelectric energy to reduce water spillage, and facilitate peak shaving and shifting. They will help prevent power outages on the Railbelt. In this program of projects, this type of storage system is particularly important.

BERNICE LAKE-BELUGA HVDC – $185 MILLION

A second transmission line to export energy from the Kenai Peninsula is critically important to the bulk power system. To fully realize the economic benefits of a 230-kV system, redundant paths for transmission of power will ensure energy security and resiliency for the region and allow for firm power transfers thus reducing the cost to the end-users and promote economy energy sales between regions. A High Voltage Direct Current (HVDC) connection between the Bernice Lake Power Plant in Nikiski on the Kenai Peninsula and the Beluga Power Plant on the Northern shore of Cook Inlet will transmit power to existing transmission lines connected to the Railbelt. The transmission infrastructure in Beluga has ample capacity to move energy to communities north of the Kenai Peninsula. The scope of this project is to construct a submarine HVDC transmission line across Cook Inlet and AC-DC converter stations at either end of the line.

UNIVERSITY-DAVE'S CREEK SUBSTATIONS – $34 MILLION

This project will upgrade the substations at both ends of this critical transmission segment (see Dave's Creek to University Transmission Line description) to accommodate the increased voltage level and power transfer capability of the transmission lines entering and exiting these substations.

DAVE'S CREEK-QUARTZ CREEK – $15 MILLION

Similar to the University to Dave's Creek Transmission Line project, this segment will increase capacity on this 13-mile segment to 230 kV to ensure a continuous interconnected system rated to 230 kV from Bradley Lake into the Anchorage area is completed.

LEVEL 2 PROJECTS (SOUTHCENTRAL DECONGESTION)

FOSSIL CREEK SUBSTATION – $10.7 MILLION

Located in Anchorage, this project will upgrade the Fossil Creek Substation to allow for 230 kV transfer capabilities when the interconnected transmission system is up-rated and operated at this higher voltage rating.

EKLUTNA SUBSTATION – $9.7 MILLION

This project will upgrade the Eklutna Substation to allow for 230 kV transfer capabilities when the interconnected transmission system is upgraded and operated at this higher voltage rating.

LEVEL 3 PROJECTS (NORTHERN RAILBELT DECONGESTION)

LORRAINE-DOUGLAS – $129.3 MILLION

This project will extend the current Alaska Intertie to a point near Lake Lorraine at a voltage level of 230 kV. This extension will remove any remedial action schemes currently in place through the service territories connected to the Intertie and allow for increased transfer capability. When constructed in concert with the Douglas-Healy Line identified below, it will allow for a more reliable interconnected system and firm transfer capabilities between Southcentral Alaska and the Fairbanks region. The length of this extension is approximately 42 miles. This project also includes a new substation at the Lake Lorraine termination point of the extension.

DOUGLAS-HEALY – $243.6 MILLION

This project includes the construction of a 171-mile, 230-kV (operated at 138-kV) transmission line from the Douglas Substation in Willow to the Healy Substation in Healy. The construction will facilitate firm transfer capability and provide a fully redundant system between the southcentral region of the State (natural gas-fired generation) and the Fairbanks region. This second line will reduce outages in the Fairbanks area.

HEALY-FAIRBANKS – $106.8 MILLION

This project will convert the existing Healy to Fairbanks transmission line from 138 kV to 230 kV allowing for increased power transmission to Fairbanks.

COMMUNICATIONS UPGRADE – $15 MILLION

To ensure the current dispatch centers within the electrically interconnected transmission system in the Railbelt are built to standards allowing for real-time dispatch protocols between service territories, the existing disparate communications systems throughout the region must be upgraded. Given that cyber-attack efforts worldwide are increasing and bulk power systems are critical targets, these upgrades will increase cybersecurity throughout the Railbelt region of the state as well.

SUSITNA-WATANA HYDROELECTRIC PROJECT

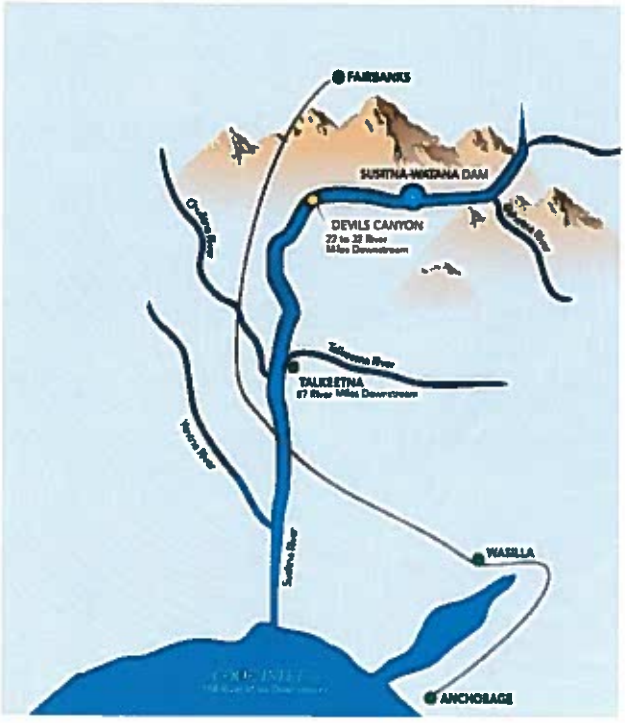
Animation still photo of the project dam for the proposed Susitna-Watana Hydroelectric Project.

In 2010, the Alaska State Legislature adopted a renewable energy goal for Alaska to generate 50 percent of Alaska's electricity from renewable sources by 2025. In 2011, AEA was directed to pursue a Federal Energy Regulatory Commission (FERC) license for the Susitna-Watana Hydroelectric Project to provide clean, reliable, and stable-priced energy for 100+ years and meet the state's renewable energy goal. In 2017 due to the state's fiscal constraints, licensing activities were suspended, following FERC's issuance of its updated Study Plan Determination on the work completed on the 58 FERC-required environmental studies. The project was subsequently put into abeyance, allowing the State to preserve the investment already made. On February 22, 2019, the admin order was rescinded by the Governor. The first step would be to complete the licensing process. The second step would be to develop a construction strategy and build the project.

- **First Step** – $100 million to complete FERC license application.
- **Second Step** – $5.6 billion to construct the project.

The Susitna-Watana Hydroelectric Project is the most reasonable and economical project identified that would allow the State to exceed its renewable energy goal. Thus far, the State has completed:

- **Licensing** – Approximately two-thirds of the Federal Energy Regulatory Commission (FERC) Integrated Licensing Process. The FERC Study Plan Determination (SPD) provides the State with certainty on what is needed to file a comprehensive FERC license application.
- **Engineering** – The engineering feasibility report contains the information necessary for a license application and demonstrates that the project is technically feasible.
- **Economics** – A benefit-cost and economic impact analysis concluded that if constructed, the project would generate billions of dollars in energy savings for the Railbelt and would provide a significant long-term benefit to the economy.



The proposed Susitna-Watana Dam would be located at river mile 184, 39 miles above Devils Canyon.

The dam would consist of a curved concrete gravity dam approximately 705 feet tall, creating a reservoir approximately 42 miles long with an average width of 1.25 miles. The anticipated maximum capacity of 618 MW could power the entire Railbelt region of Alaska. The annual energy of 2,800,000 megawatt-hours (MWh) would provide clean, renewable energy to about 75 percent of the state's population at an estimated wholesale cost of 6.5 cents per kWh. In contrast to natural gas price volatility, hydro provides long-term stable energy prices.

The anticipated project cost is estimated at $5.6 billion (2014$). The economic impact report estimated a benefit-cost ratio from energy savings as 2.39. The energy savings alone over the first 50 years would be $11.2 billion. Along with the energy savings, the project will generate thousands of direct and indirect jobs in Alaska. Direct and in-direct pre-construction and non-construction activities over the licensing and construction period were estimated to create 8,870 jobs. Construction employment would require 23,305 direct and indirect jobs over nine years. The reduction of carbon dioxide emissions from displaced coal and natural gas-fired generation would amount to 1.3 million tons a year, which equates to removing approximately 250,000 cars from the road.

To date, the State has invested $193 million in the licensing of this project. The cost to complete the licensing effort is estimated to be $100 million.

RURAL POWER SYSTEM UPGRADES

SUMMARY **115 PROJECTS @ $3.5 Million = $403 MILLION**

Typical non-code compliant powerplant that requires replacement.

Electricity powers lighting, communications, heat, and is necessary to operate infrastructure that supports safe and healthy living conditions. In Alaska's rural communities electricity is often generated by a small local "system" (generation and distribution) using diesel fuel. Such rural power is three to five times more costly than power in urban parts of the state.

AEA's Rural Power Systems Upgrade (RPSU) program builds and retrofits facilities in communities of less than 2,000 people, providing stable and reliable power. The typical efficiency improvement in diesel generation is between 10 and 20 percent. Upgrades may include efficiency improvements, powerhouse upgrades or replacements, line assessments, demand-side enhancements, heat recovery, and repairs to generation and distribution systems.

Due to funding reductions, it has not been possible to maintain an optimal replacement schedule of powerhouses. Such deferred maintenance increases the risk of catastrophic failure. To return to a more normal schedule for maintenance and necessary repairs, a one-time total of $327 million is necessary to fund all deferred powerhouse maintenance.

There are almost 200 communities that meet the eligibility requirements of Alaska Administrative Code (AAC) 3 AAC 108.110, which requires that a community not be on the road system, have a population of >20 but <2000. AAC also requires that AEA prioritize those communities needing assistance, which is reflected in the following lists.

RPSU-Eligible Communities (In order of priority) – ~$3.5 Million Each

1. Chignik Lake
2. Chenega Bay
3. Arctic Village
4. Takotna
5. Chefornak
6. Bettles
7. Aleknagik
8. Venetie
9. Manokotak
10. Tuntutuliak
11. Platinum
12. Kwigillingok
13. Unalakleet
14. McGrath
15. Metlakatla
16. Ouzinkie
17. Coffman Cove
18. Naukati Bay
19. Thorne Bay - Kasaan
20. Aniak
21. Hydaburg
22. Kipnuk
23. Chalkyitsik
24. Chitina
25. Newhalen
26. Akiak
27. Beaver
28. Twin Hills
29. Karluk
30. Chuathbaluk
31. Napakiak
32. Pilot Point
33. Craig
34. Healy Lake
35. Manley Hot Springs
36. Hughes
37. Koyukuk
38. Kongiganak
39. Levelock
40. Hollis
41. Klawock
42. Pelican
43. Eagle
44. Chignik
45. Stony River
46. Crooked Creek
47. Takotna
48. Takotna
49. Anaktuvuk Pass
50. Craig
51. Northway
52. Hooper Bay
53. Golovin
54. Sleetmute
55. Koliganek
56. Whale Pass
57. Slana
58. Stevens Village
59. White Mountain
60. Port Alsworth
61. Hoonah
62. Kobuk
63. Skagway
64. Angoon
65. Naknek
66. Tanana
67. Buckland
68. Mosquito Lake
69. Haines
70. Lutak
71. Mud Bay

The following communities are a part of an electrical cooperative and are not ranked by need:

- Alakanuk
- Ambler
- Anvik
- Chevak
- Eek
- Ekwok
- Elim
- Emmonak
- Goodnews Bay
- Grayling
- Holy Cross
- Huslia
- Kaltag
- Kasigluk
- Kiana
- Kotlik
- Koyuk
- Lower Kalskag
- Marshall
- Mekoryuk
- Minto
- Mountain Village
- New Stuyahok
- Nightmute
- Noatak
- Noorvik
- Nulato
- Nunapitchuk
- Old Harbor
- Pilot Station
- Quinhagak
- Russian Mission
- Saint Mary's
- Scammon Bay
- Selawik
- Shageluk
- Shaktoolik
- Shishmaref
- Teller
- Togiak
- Toksook Bay
- Tununak
- Wales
- Yakutat

RURAL BULK FUEL UPGRADES

SUMMARY **33 PROJECTS @ $4 Million = $132 MILLION**

Rural Alaska depends on liquid fuels for most of its energy needs: diesel for power generation and heating, and gasoline for transportation. A vast number of rural villages are located along rivers or on the coast, so fuel is delivered primarily by barge. Delivery is often limited by season or weather resulting in many communities receiving barge fuel deliveries just once or twice a year.

Typical non-code compliant bulk fuel tank that requires replacement.

Many of rural Alaska's bulk fuel facilities were built in the mid-1900s and do not comply with present-day regulation. Yet they typically continue in service until they are upgraded or replaced no matter how hazardous or technically non-compliant they are.

AEA's Bulk Fuel Upgrade (BFU) program repairs or upgrades fuel storage facilities in communities with fewer than 2,000 residents. These facilities help decrease the per-unit cost of fuel by allowing the community to purchase fuel in bulk quantities. In recent years, AEA's BFU program has shifted emphasis from new construction to repairs. In many cases, existing bulk fuel tanks can be re-used if they are appropriately refurbished. Repair projects focus on minimizing risk, using local workers, and replacing piping, pumps, valves, and tanks when necessary.

Lack of funding for bulk fuel upgrades in rural Alaska means that bulk fuel tanks are not repaired or replaced timely. As a result, communities are left with aging fuel tanks that may not meet the capacity needs of the community or are at risk of leaks, soil contamination, and/or catastrophic failure.

Many rural tank farms have serious deficiencies that often include:

- Inadequate dikes to contain fuel spills;
- Inadequate foundations, which could cause gradual tank movement and fuel leakage;
- Improper piping systems and joints, which are the most common source of fuel leaks;
- Improper siting near wells, beaches, and buildings, or within a flood plain;
- Tanks that are rusted or damaged beyond repair;
- Electrical code violations; and
- Inadequate security.

A one-time total of $800 million is necessary to fund all deferred maintenance for bulk fuel facilities.

BFU-Eligible Communities (In order of priority) – $4 Million Each

1. Tuluksak
2. Nondalton
3. Togiak
4. Noatak
5. Shungnak
6. Scammon Bay
7. Minto
8. Goodnews Bay
9. Birch Creek
10. Nulato
11. Chalkyitsik
12. Venetie
13. Allakaket
14. Rampart
15. Russian Mission
16. Fort Yukon
17. Klawock
18. Hydaburg
19. Ambler
20. Kivalina
21. Beaver
22. Mountain Village
23. Craig
24. St. Paul
25. Togiak
26. Coffman Cove
27. Noatak
28. Eek
29. Oscarville
30. Thorne Bay
31. Platinum
32. Hughes
33. Kobuk

STATEWIDE RENEWABLES

SUMMARY **3 PROJECT TECHNOLOGIES, TOTAL $462 MILLION**

With one of the largest concentrations of renewable energy resources in the country, Alaska has the opportunity to invest locally in sustainable infrastructure, saving communities millions of dollars in energy costs each year. Hydroelectric power, Alaska's largest source of renewable energy, supplies nearly a third of the state's electricity in an average year. There is growing interest in developing the state's potential renewable resources, including wind, hydro, geothermal, tidal, wave, biomass/biofuels, and solar energy. With a relatively small population and a myriad of potential energy sources, Alaska is well-positioned to further incorporate renewable energy sources into its energy portfolio.

A) HYDROELECTRIC – TOTAL $413 MILLION

As Alaska's largest source of renewable energy, hydropower supplies 27 percent of the state's electrical energy in an average water year. AEA's hydroelectric program assists approximately 51 utility-scale hydroelectric projects throughout the state, the majority of which are located in the Southeast and Southcentral regions of Alaska. Projects range from conceptual design to operational hydroelectric facilities. The hydroelectric program focuses on improving efficiency and quality in development, lowering the cost of construction, and coordinating with State, federal, local municipalities, tribal entities, and private investors in analyzing, planning, and generally assisting hydroelectric project development.

LEVEL 1 PROJECTS

BRADLEY LAKE SPILLWAY RAISE – $4 MILLION

Raising the Bradley Lake Spillway would increase the storage capacity of the Lake. By increasing the spillway crest between four and seven feet, engineering estimates project that an additional 5,200 MWh to 9,200 MWhs could be produced annually. This capacity upgrade would result in additional low-cost energy for consumers. This project will require that the Project's license from the Federal Energy Regulatory Commission be amended.

DIXON DIVERSION HYDROELECTRIC PROJECT (BRADLEY LAKE) – $125 MILLION

The Dixon Diversion Hydroelectric Project would divert an outflow stream of a glacier through a tunnel. This project would increase the size of the largest hydroelectric project in Alaska, the Bradley Lake Hydroelectric Project. This project is currently in the conceptual design phase.

ELFIN COVE CROOKED CREEK HYDROELECTRIC PROJECT – $5.5 MILLION

Elfin Cove Crooked Creek Hydroelectric Project would be a 105-kW run-of-river project serving the community of Elfin Cove. The project would replace powerplant diesel usage. The estimated annual fuel savings is $160,000. This project is in the design and licensing phase.

THAYER CREEK HYDROELECTRIC PROJECT – $24 MILLION

Thayer Creek Hydroelectric Project would be an 850-kW run-of-river project on Thayer Creek serving the community of Angoon. The project would replace power plant diesel usage and a substantial amount of community heating oil. The estimated annual fuel savings is approximately $1.2 million. This project is in the design and licensing phase.

LEVEL 2 PROJECTS

GRANT LAKE HYDROELECTRIC PROJECT – $53 MILLION

Grant Lake Hydroelectric Project would be a 5 MW storage project serving the Railbelt region. The estimated equivalent annual fuel savings is $4 million. This project has a license from FERC and is in the final design phase.

SWEETHEART LAKE HYDROELECTRIC PROJECT – $188 MILLION (2014$)

Sweetheart Lake Hydroelectric Project would be a 19.8 MW storage project serving the Juneau region. The estimated annual fuel savings is $20.8 million. This project has a license from FERC and is in the final design phase.

LEVEL 3 PROJECTS

INDIAN RIVER HYDROELECTRIC PROJECT – $6 MILLION

The Indian River Hydroelectric Project would be a 180-kW run-of-river hydroelectric project serving the community of Tenakee Springs. The project would replace community diesel generation with hydroelectric. The estimated annual fuel savings is $150,000. This project is ready for construction.

KNUTSON CREEK HYDROELECTRIC PROJECT – $7 MILLION

The Knutson Creek Hydroelectric Project is a 150-kW run-of-river hydroelectric project serving the community of Pedro Bay. The project will replace community diesel generation with hydroelectric. The estimated annual fuel savings is $125,000. This project is in the design and licensing phase.

B) BIOMASS – TOTAL $9.5 MILLION

Lettuce grows in biomass-heated greenhouse in Southeast Island School District on Prince of Wales Island, Alaska.

Alaska's primary biomass fuels are wood, sawmill waste, fish by-products, and municipal waste. Wood remains an important renewable energy source for Alaskans. More than 100,000 cords of wood are burned in the form of chips, cordwood, and pellets annually. Wood-heating systems in Alaska are creating local jobs and reducing the cost of building heat in rural communities.

LEVEL 1 PROJECTS

HAINES SCHOOL AND POOL (CHIP) – $1.8 MILLION

The proposed biomass district energy system is designed to provide heat to the Haines School and Pool, Administration Building, Library, Vocational Education building, Garage, and future Greenhouse. The school and pool are serving as the baseline scenario. The project is estimated to save $47,000 annually and is ready for construction.

KAKE (CHIP) – $3.5 MILLION

The proposed biomass system is designed to provide heating to the Public Safety Building, Boys and Girls Club, Health Clinic, Senior Center, Kake School, future greenhouse, a future building at the Bingo Hall location, and the Community Center. The project is estimated to save $68,000 annually and is ready for construction.

LEVEL 2 PROJECTS

CRAIG HIGH SCHOOL (CHIP) – $770,000

This project is to construct a wood chip heating plant at Craig High School. The wood heating system is expected to include a wood fuel delivery system, biomass boilers, and heat exchangers to be integrated with the existing heating system of Craig High School. The project is estimated to save $23,000 annually and is ready for construction.

KLAWOCK MALL (CORDWOOD) – $845,000

This project involves the construction of a cordwood heating system, including a large woodshed to heat two-thirds of the Klawock Bell Tower Mall. The other one-third is the local Grocery store and uses heat from the refrigeration units. The biomass system could provide backup heat for the grocery store. This project is in conceptual design.

NORTHWAY SCHOOL BIOMASS – $1.32 MILLION

This project will construct a woodchip heating system for the Northway School, the garage, and the teacher housing duplex. The project is estimated to offset approximately 90 percent of the fuel use. This project is estimated to save $56,000 annually and is ready for construction.

LEVEL 3 PROJECTS

KETCHIKAN HIGH SCHOOL (PELLET) – $1.25 MILLION

This project will construct a pellet heating system for the new clinic, tribal office, community building, and water treatment plant. The project design was completed through a grant from the United States Forest Service. This project is estimated to save over $200,000 annually and is ready for construction.

C) WIND – TOTAL $39.2 MILLION

Pillar Mountain Wind Farm located on Kodiak Island, Alaska.

In Alaska, there are abundant wind resources available for energy development. High costs associated with fossil fuel-based generation and improvements in wind power technology make this clean, renewable energy source attractive to many communities. Today wind energy accounts for 2.4 percent of the state's total energy production and that percentage is growing. Since 2012, Alaska's wind energy capacity has increased 400 percent.

LEVEL 1 PROJECTS

CHEFORNAK, KIPNUK, AND PILOT POINT BATTERY ENERGY STORAGE – $2.4 MILLION

Chefornak, Kipnuk, and Pilot Point have high penetration wind energy systems installed. The addition of battery energy storage in these communities would increase diesel fuel offset, and reduce wasted excess wind power. This project would double the fuel displacement at the power plant and reduce curtailment, which would eliminate the need to invest in additional bulk fuel storage capacity. This project is ready for construction.

IGIUGIG WIND – $1.0 MILLION

Installation of two 25 kW turbines. The turbines will be used in conjunction with the community in-river hydrokinetic turbine. Fuel offset will be 7,044 gallons of diesel per year or $42,264 of annual fuel cost savings (based on average 2020 Regulatory Commission of Alaska (RCA) Calculated Fuel Prices). This project is in the design and licensing phase.

KONGIGANAK, KWIGILLINGOK, AND TUNTUTULIAK TURBINE UPGRADES – $4.8 MILLION

This project incorporates more efficient rotor and nacelle upgrades for 15 wind turbines to increase the efficiency and power output of existing turbines. This project would also add a 500 kW solar array to each system. This project is in the design and licensing phase.

KWETHLUK WIND AND SOLAR WITH ELECTRIC THERMAL STORAGE UNITS – $4.2 MILLION

Install three 100 kW wind turbines, a 500 kW solar array, and 50-70 electric thermal storage units. The projected diesel displacement for this project is 70,000 gallons of diesel fuel at the power plant and 20,000 gallons of heating fuel, or $280,000 annual fuel cost savings (based on average 2020 RCA Calculated Fuel Prices). This project is in the design and licensing phase.

LEVEL 2 PROJECTS

DUTCH HARBOR AND UNALASKA WIND-DIESEL PROJECT – $11.6 MILLION

Install 2 MW capacity wind turbines and battery energy storage near the water treatment plant. Dutch Harbor is the largest fishing port in North America with a very high industrial load. This project would offset 270,000 gallons of diesel per year. This project is ready for construction.

KOTZEBUE ELECTRIC ASSOCIATION WIND FARM EXPANSION – $7.0 MILLION

The utility will install two 1MW EWT 900 kW wind turbines and expand battery energy storage. This project is expected to displace 400,000 gallons of diesel fuel annually, which is $988,000 of annual fuel cost savings (based on average 2020 RCA Calculated Fuel Prices), thus lowering the cost of energy in the community. Presently, KEA is saving fuel by reducing diesel genset power output. With the addition of two additional turbines, KEA will be able to power the community at times with 100 percent renewable power (diesel free). The utility currently operates two 900 kW EWT wind turbines, which displace approximately 300,000 gallons of diesel fuel annually. Two additional wind turbines would increase the utility's renewable energy generation to 50 percent. This project is ready for construction.

NOME WIND TO HEAT – $400,000

The Banner Peak Wind Farm in Nome was originally funded through the State of Alaska's Renewable Energy Fund. The City of Nome is currently producing more power from wind than they can use. The excess wind energy being produced by the wind farm is currently going to waste. Nome will purchase an electric boiler to utilize excess wind produced from their Banner Peak Wind Farm. The boiler will be used to heat the school and potentially the hospital and rec center in the future. The expected cost savings for the school district would be $71,000. This project is ready for construction.

STEBBINS AND ST. MICHAEL WIND FARM EXPANSION – $7.8 MILLION ($2021)

Installation of a single 900 kW turbine. Fuel offset will be 160,000 gallons of diesel per year, or $508,800 of annual fuel cost savings (based on average 2020 RCA Calculated Fuel Prices). The project will also include the installation of an electric boiler in the St. Michael pump house and will account for another 5,000 gallons of diesel displacement. The wind farm expansion project will serve both Stebbins and St. Michael. This project is in the design and licensing phase.

EV CHARGING INFRASTRUCTURE CORRIDOR

SUMMARY **4 PROJECTS, TOTAL $11.3 MILLION**

Much of Alaska except for its capital city Juneau, lacks adequate and conveniently accessible EV charging infrastructure. This fact has been identified as a significant impediment to EV market expansion. There is currently only one fast charger, 16 non-Tesla Level 2 chargers, and seven Tesla Level 2 chargers publically available in Alaska.

AEA has developed a phased EV charging infrastructure plan for the state that includes the development of a direct current fast charging (DCFC) network along the state's highway system, including the Marine Highway, and connecting Alaska to the Canadian road system and the contiguous 48 states, as well as the establishment of community-based Level 2 EV chargers.

The development of EV charging infrastructure will resolve a critical barrier to EV market adoption (range anxiety) and inform utility planning regarding grid impacts and ratemaking. The proposed project includes the procurement of equipment, siting, engineering, electrical supply upgrades (as needed), installation, operation, customer support, and maintenance of the charging infrastructure for a minimum of five years. DC fast-charging sites would be located along the highway system 50 to 100 miles apart. As a safety net for EV drivers, Level 2 chargers may be installed at communities along the highway system between fast-charging sites.

EV DCFC NETWORK PHASE 1 – CONNECT KENAI PENINSULA TO FAIRBANKS ($6.3 MILLION)

The first phase of the plan is to develop a fast-charging corridor along the most populated and traveled area of the state, from the Kenai Peninsula north to Fairbanks. It is anticipated that the Phase 1 corridor will consist of approximately 18 fast-charging sites. From south to north, the following communities have been identified as geographically suitable: Homer, Ninilchik,

Soldotna/Sterling, Cooper Landing, Seward, Girdwood, Anchorage (2), Chugiak, Palmer, Wasilla, Houston, Trapper Creek, Talkeetna, Cantwell, Healy, Nenana, and Fairbanks.

EV DCFC NETWORK PHASE 2 – CONNECT PHASE 1 EV DCFC CORRIDOR TO CANADA AND LOWER 48 ($2.5 MILLION)

The second phase of the statewide DCFC network plan would connect the fast charging corridor established under Phase 1 to Valdez and Skagway, Alaska located at the northern tip of the Southeast Alaska panhandle. Connection through Skagway will enable EV travel between Alaska and Canada's overland highway system to the Alaska Marine Highway System communities including Haines, Juneau, and ultimately to Prince Rupert, BC or Bellingham, WA and the rest of the Lower 48. The Provincial Government of Yukon Territory (YT) constructed 3 DCFC sites along this route in 2019, two in Whitehorse and one in Carcross. YT has secured funding and equipment to expand its network and is interested in choosing routes that complement construction in Alaska. The following seven strategically located communities have been identified as suitable charging sites: Fairbanks, Delta Junction, Tok, Paxson, Glennallen, Valdez, and Haines.

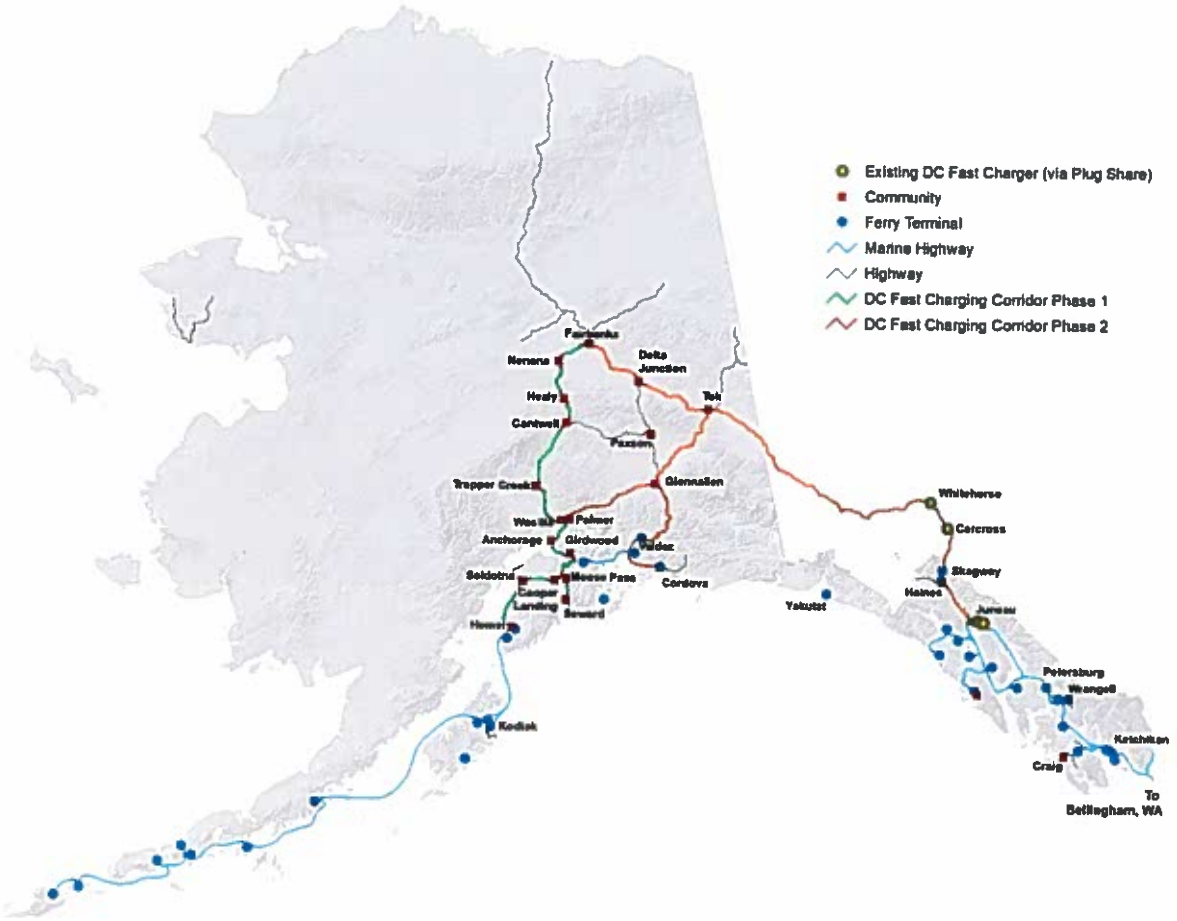
EV DCFC NETWORK PHASE 3 – CONNECT MARINE HIGHWAY COMMUNITIES TO CANADA, ALASKA, AND LOWER 48 ($1.4 MILLION)

The third phase of the EV plan is to create an EV charging corridor in the port communities of the Alaska Marine Highway System. Fast charging installations would initially occur at Ketchikan, Sitka, Juneau, and Kodiak.

COMMUNITY-BASED EV CHARGING INFRASTRUCTURE ($1.1 MILLION)

To promote EV adoption and use, a robust Level 2 program would be established at 75 to 100 destination locations or areas with islanded road systems throughout the state, including but not limited to: North Prince of Wales Island, Wrangell, Petersburg, Haines, Kodiak, Cordova, Valdez, Seward, and Homer. In large urban areas, such as Anchorage, the program would also include multi-unit residential dwellings.

EV FAST-CHARGING CORRIDOR MAP



Alaska's EV direct current fast-charging network project area:

- Phase 1, in green above, extends from the Kenai Peninsula to Fairbanks.
- Phase 2, in orange, connects Phase 1 corridor to Alaska's highway system and Canada.
- Phase 3, in blue, connects many Alaska Marine Highway communities to the rest of the state.

RENEWABLE ENERGY FUND

SUMMARY **ROUND 13: 11 PROJECTS, TOTAL FUNDING REQUEST: $4.75 MILLION**

Kongiganak, a remote Kuskokwim Bay community on the Kongiganak River and home to around 430 residents installed five 95 kW wind turbines with support from AEA's Renewable Energy Fund.

AEA's Renewable Energy Fund (REF) is a competitive grant program that was established by the Alaska State Legislature in 2008 per AS 42.45.045, extended to 2023 by the Legislature in 2012, and is now in its thirteenth annual funding cycle (solicitation round). The program was established to help fund cost-effective renewable energy projects throughout the State of Alaska. The program is intended to help communities across Alaska, with a statutorily required focus on a statewide balance of awarded grant monies, reduce their dependence on fossil fuels in order to stabilize the costs of both heat and electricity through the integration of renewable energy based resources with local power grids.

The REF program also creates jobs within the local communities, provides vocational learning opportunities, utilizes local energy resources, keeps money circulating within the local economies, and fosters economic development. The displacement of diesel-fueled power production insulates local communities and their ratepayers from volatile diesel-fuel prices, reduces the prevalence harmful diesel fuel emissions, and provides for long-term, safe power production necessary for the provision of an array of necessary basic services. Additionally, monetary savings from the offsetting of diesel-fuel power generation assists in reducing the long-term cost of energy in communities, furthering the mission of AEA.

As statutorily required per program statutes and as guided by those REF program regulations as set forth in 3 AAC 600-695, the REF program is an effective program for evaluating the impacts of renewable energy projects and their benefits to the local communities. The REF program is also unique in its nature as a State grant program for renewable energy infrastructure, and for which projects of various phases are eligible. Projects eligible for REF funding include those in reconnaissance, feasibility and conceptual design, final design and permitting, and construction phases. The amount of grant funding available for award is contingent on those phase(s) being applied for and whether the project is located in a community deemed to be of high or low energy cost as per the program regulations.

All project applications submitted for REF funding consideration are assessed according to a robust, four-stage evaluation process which assesses applicant and project eligibility, applicant qualifications and experience, economic feasibility, technical feasibility, financial feasibility, and matching funds and local support. In an effort to ensure a statewide balance of REF monies allocated throughout the State, the AEA administered REF program is required to solicit feedback and advice regarding program processes and current round project recommendations from the statutorily established nine-member Renewable Energy Fund Advisory Committee (REFAC). Upon due review and consideration by the REFAC, AEA submits its recommendations to the Legislature who has the exclusive authority and sole discretion to appropriate REF funds for the funding of those AEA/REFAC recommended projects.

Owing to State of Alaska's budgetary constraints, for the most recent 2020 (Round 13) REF funding solicitation, some final applications were recommended to the Legislature for partial funding as the current REF fund balance is insufficient to cover all recommended applications at their requested funding levels.

As a State funded and administered grant program, the REF serves as a unique renewable energy project funding program, especially for those fiscally constrained rural communities whom otherwise may not have access to such funds for renewable energy infrastructure development opportunities.