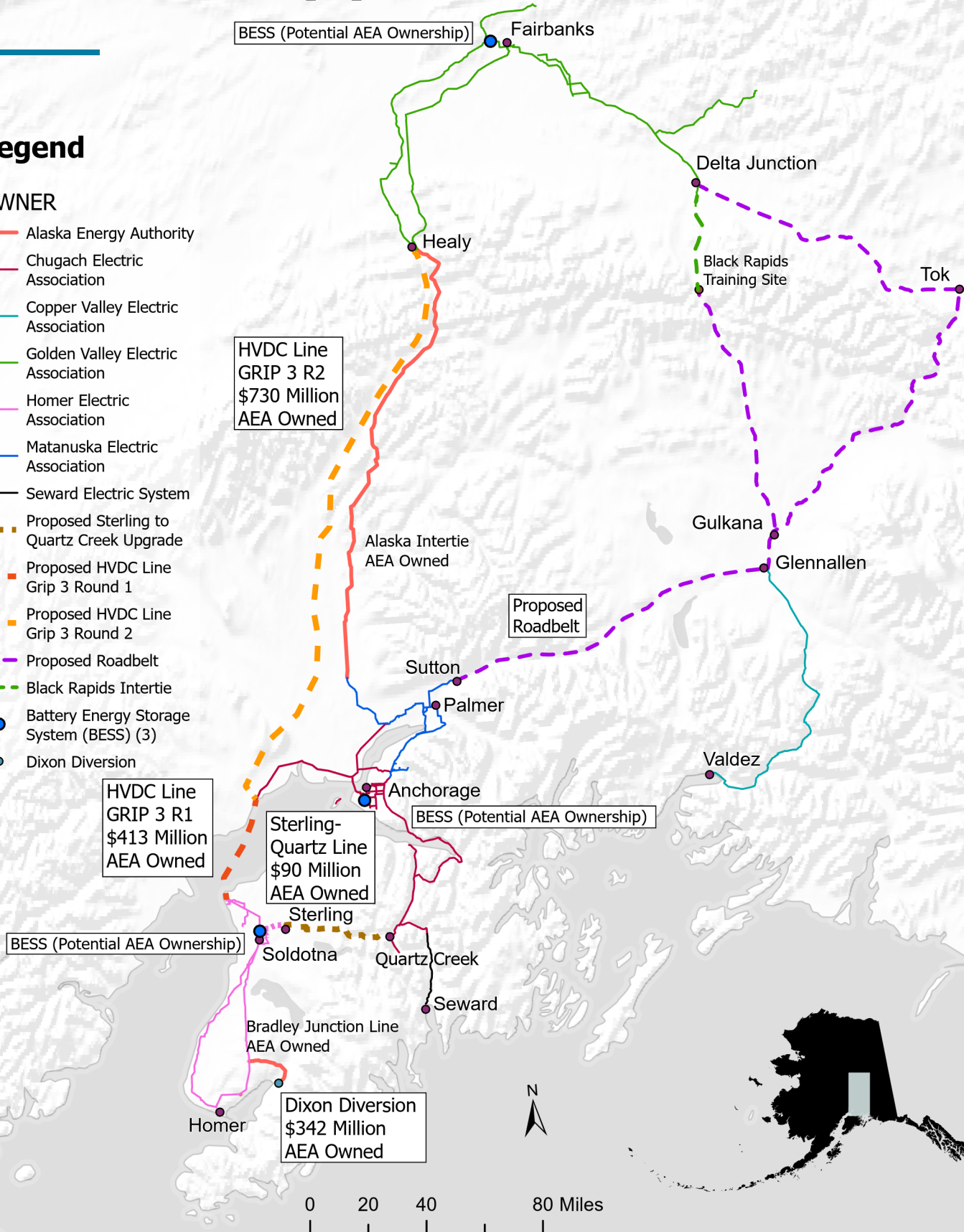


Railbelt Opportunities

Legend

OWNER

- Alaska Energy Authority
- Chugach Electric Association
- Copper Valley Electric Association
- Golden Valley Electric Association
- Homer Electric Association
- Matanuska Electric Association
- Seward Electric System
- Proposed Sterling to Quartz Creek Upgrade
- Proposed HVDC Line Grip 3 Round 1
- Proposed HVDC Line Grip 3 Round 2
- Proposed Roadbelt
- Black Rapids Intertie
- Battery Energy Storage System (BESS) (3)
- Dixon Diversion



BATTERY ENERGY STORAGE SYSTEMS

Enhancing Railbelt Capacity and Resilience

PROJECT SUMMARY

Status: Railbelt Region:

Southern (Kenai Peninsula)

- Completed in 2022

Central (Anchorage)*

- Completed in October 2024

Northern (Fairbanks)*

- To Be Determined

**Potential option for GRIP funding*



PROJECT OVERVIEW

The Railbelt is transmission constrained so we can only move 10 percent or less of our peak load between regions. Further, Railbelt utility engineers have observed several increasingly concerning trends on the Railbelt over the past decade. These challenges include degradation of frequency regulation, decreasing system frequency response to generation trip disturbances, increasing the magnitude and duration of natural frequency power oscillations, and occasional large power swings impacting the entire Railbelt.

Based on studies performed by Railbelt utilities, three regional battery energy storage systems (BESS) units were proposed in each of the Southern, Northern, and Central regions. These units in the three regions would provide significant reliability and economic benefit to the Railbelt transmission system. Additionally, studies found that BESS would help stabilize non-dispatchable renewables' output by smoothing energy fluctuations and controlling their release to the grid. (Continued on back)

Benefits

- Improved oscillation damping
- Enhanced disturbance response rate
- Increased transfer capability between regions
- Less constrained economic dispatch

Opportunities

- Reduced fuel burn
- Lower carbon emissions
- Greater ability to integrate variable generation such as wind and solar power into the grid

BESS CAPACITY

47 MWhs

Southern (Kenai Peninsula)

40 MWhs

Central (Anchorage)

TBD MWhs

Northern (Fairbanks)

PROJECT OVERVIEW (CONT)

A BESS can successfully fulfill the required energy response to a loss of generation in as quickly as less than one second, improving system frequency. Furthermore, the study showed that a BESS could participate in balancing generation and load, thereby improving frequency regulation.

After careful analysis, it has been determined that a BESS and a high-voltage direct current line can significantly enhance system performance and reduce operational limitations in power systems. The proposed integrated BESS will bring benefits to the Railbelt grid. Homer Electric Association in the Southern region has installed a BESS. Chugach Electric Association and Matanuska Electric Association in the Central region are in the process of installing a BESS. Golden Valley Electric Association in Fairbanks is planning a BESS installation.

The combined BESS system will be a valuable addition to the Railbelt grid's power infrastructure.

FUNDING PLAN (\$MILLIONS)

LOCATION	AEA BONDS (EXISTING)	FUNDING SOURCE TBD
Southern (Kenai Peninsula) BESS	7.41	33.00
Central (Anchorage) BESS	39.96	45.00
Northern (Fairbanks) BESS	9.63	33.00
Subtotals	57.00	111.00
Total	168.00	

Total Project Cost: Estimate \$168 million

Secured Sources of Funding Match: \$57 million AEA bonds (existing)

Potential Sources of Funding: GRIP 3 Round 1 funding if available after HVDC line, Railbelt utilities, tax credits for BESS depending on timing

Please note project costs are estimates and are subject to change.

BELUGA TO HEALY OVERHEAD HVDC

Enhancing Railbelt Reliability and Resilience

PROJECT SUMMARY

Status: AEA and Railbelt Utilities were encouraged to apply for DOE's second round GRIP program. Applications due April 17, 2024.

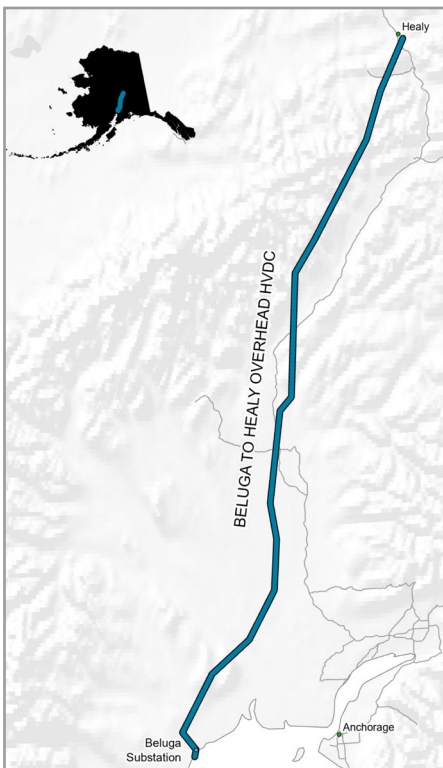
Capacity: 230kV

Length: 240 miles

Right of Way: Adjacent to the existing AKLNG Right of Way

Construction: 6-8 years

Cost: \$730 Million



PROJECT OVERVIEW

The Railbelt Innovative Resiliency (RIR) Project, Phase 2 is a crucial initiative to build a clean, smart, and affordable grid in Alaska. This project consists of constructing a 240-mile high-voltage direct current (HVDC) overhead transmission line from Beluga (west of Cook Inlet) to Healy. Coupled with the RIR Phase 1 project (Subsea cable from the Kenai Peninsula to Beluga) this will provide a redundant connection between the Bradley Lake Dam and Fairbanks. The Beluga to Healy overhead line will allow northern region customers on the Railbelt to experience the benefits of expanded renewable energy in southcentral Alaska and the southern region to receive power from renewable resources from the northern region. This HVDC line will add critical resilience and redundancy to the Railbelt. Currently, there is only one transmission line, the Alaska Intertie, which transmits power north and south along the Railbelt. The Alaska Intertie is capacity-limited. This HVDC line will provide an alternate route if the Alaska Intertie energy is interrupted by maintenance or failure. (Continued on back)

Benefits

- Increased resilience and redundancy of the Alaska Intertie
- Additional conduit for power to transmit between regions
- Reduced line losses
- Allow additional energy to be delivered to consumers

Opportunities

- Increased capacity to bring on utility-scale renewable projects
- Development of renewable resources in an area of the state that were previously uneconomical due to lack of proximity to transmission

SCHEDULE

2025-2026
Initial Design,
Permitting

2026-2027
Engineering,
NEPA Process

2027-2031
Construction



PROJECT OVERVIEW (CONT)

The Beluga to Healy Overhead HVDC line is proposed to run along the Alaska Gasline Right of Way, west of the current Alaska Intertie. One of the primary objectives of the RIR is to address various challenges facing the Railbelt grid, which serves 75 percent of Alaska's population. These challenges include decreasing system frequency regulation, slowing frequency response to disturbances, and increasing natural frequency oscillations. To overcome these challenges, the project emphasizes the need for BESS and new transmission lines between the northern, central and southern regions of the Railbelt.

PROJECT STATUS

In January 2024, AEA and the Railbelt Utilities submitted a concept paper to the Department of Energy (DOE) for the project. In late February, we were encouraged to submit a full application; 50 percent of the concept papers were advanced to the full application phase. The full application is due on April 17, 2024, and we expect notification in early third quarter of this year.

FUNDING PLAN (\$MILLIONS)

FISCAL YEAR	POTENTIAL FEDERAL SHARE	SOURCE TBD
2025	9.50	9.50
2026	34.50	34.50
2027	36.50	36.50
2028	74.50	74.50
2029	82.00	82.00
2030	102.00	102.00
2031	26.00	26.00
Subtotals	365.00	365.00
Total	730.00	

Total Project Cost: \$730

Secured Funding Sources: None

Potential Sources of Funding: DOE grant for up to 50 percent of the project cost, Railbelt utilities, state appropriations, revenue bonds

AEA is submitting grant application to DOE GRIP 3 Round 2 for \$365 million federal share that would require a \$365 million match

Please note expenditure estimates are preliminary and subject to change.

DRAFT



DIXON DIVERSION PROJECT

Expanding Alaska's Largest Hydropower Project

PROJECT SUMMARY

Status: Preliminary studies and engineering

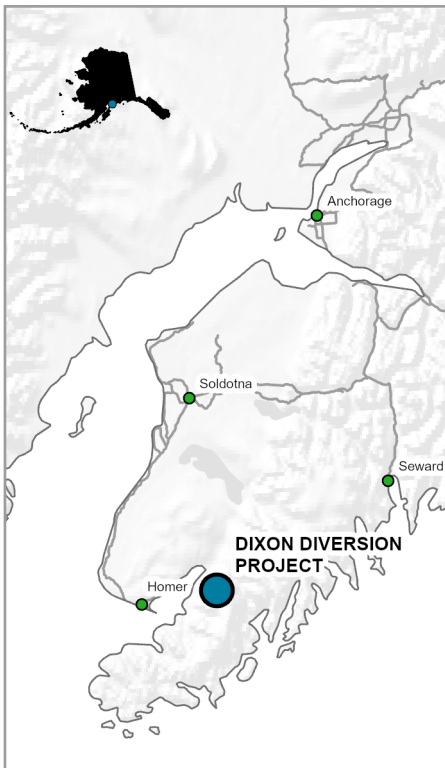
Dam Modification: 14 ft raise

Tunnel: 4.7 miles, 14 ft diameter

Annual Energy: 190,800 MWh

Natural gas offset: 1.5 to 1.6 bcf/yr

Cost: \$342 Million



PROJECT OVERVIEW

The Dixon Diversion project is a significant expansion of the Alaska Energy Authority (AEA)-owned Bradley Lake Hydroelectric Project (Bradley Lake). The project will convey water from the toe of the Dixon Glacier via a diversion dam and a 4.7-mile-long tunnel into Bradley Lake. Diverted water will flow through the existing hydroelectric power plant connected to the Railbelt. This project also includes modifications to the Bradley Lake Dam to raise the full pool height by 14 feet. The combination of additional water diverted from the Dixon Glacier Basin and additional storage capacity in Bradley Lake will lead to an increase in energy of 190,800 megawatt hours (MWh) annually (over a baseline of ~400,000 MWh/yr). (Continued on back)

Benefits

- Reduction in Cook Inlet Natural gas demand by 1.5 bcf/yr
- 190,800 MWh/yr of additional energy (increase Bradley Lake by 50 percent)
- Additional stored energy to regulate non-firm renewables
- Power Sharing Agreements with Railbelt Utilities provide stable long-term returns via revenue stability and market risk mitigation
- Lower long-term energy costs

Opportunities

- Storage hydro is dispatchable year-round, allowing utilities to regulate additional renewable resources
- Utilizing existing Bradley infrastructure allows for development of a huge resource on an extremely small footprint

Funding Options

- Revenue Bonds
- Climate Pollution Reduction Grants

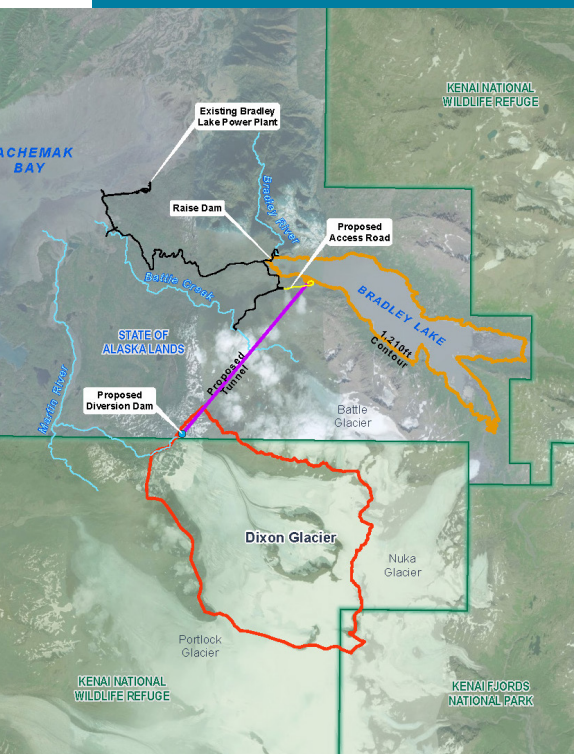
April 8, 2024

SCHEDULE

2024-2025
Studies

2026-2027
Licensing

2027-2030
Construction



PROJECT OVERVIEW (CONT)

This would equate to an approximately 50 percent increase in energy from Bradley Lake, which currently supplies ~10 percent of the Railbelt's electric demand. By utilizing existing infrastructure, this large renewable resource can be developed with a very small footprint. The Dixon Diversion project will construct only one mile of new road, utilize less than five acres for the diversion dam, convey water through an underground tunnel, and inundate less than 200 acres of land from higher lake levels.

PROJECT STATUS

AEA continues to assess the Dixon Diversion project, which would fortify Alaska's energy security by increasing overall renewable generation and mitigating exposure to fuel price volatility and supply-side disruptions. The project could be operational by the end of the decade and **will offset the equivalent of approximately 1.5 to 1.6 billion cubic feet (bcf) per year of natural gas consumed for electricity production. An offset of this magnitude is equal to about 7.5 percent of the Railbelt's unmet natural gas demand projected for 2030.** Hydroelectric power is cheap and reliable energy that will lower the cost of electricity for all Railbelt consumers (75 percent of Alaska's population), and indirectly lower the cost of energy for Power Cost Equalization (PCE) recipients. The storage component of this project allows Railbelt utilities to reliably dispatch renewable power year-round.

FUNDING PLAN (\$MILLIONS)

FISCAL YEAR	FUNDING SOURCE TBD
2024	7.00
2025	7.00
2026	14.00
2027	305.00
2028	3.00
2029	3.00
2030	3.00
Total	342.00

Total Project Cost: \$342 million

Potential Sources of Funding: United States Environmental Protection Agency Climate Pollution Reduction Grant (award selections expected July 2024), Revenue bonds, Railbelt utilities, tax credits depending on timing and eligibility

ROADBELT INTERTIE PROJECT

Enhancing Railbelt Reliability and Resilience

PROJECT SUMMARY

Status: Conceptual

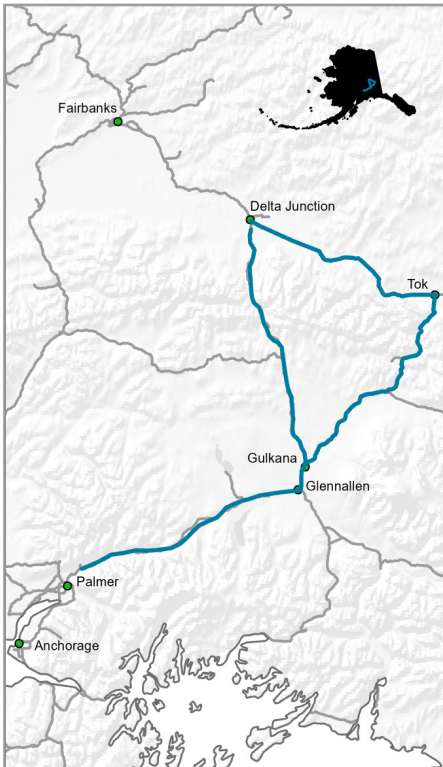
Capacity: 230kV

Length: 388 miles

Right of Way: Near existing roads

Construction: 6-8 years

Cost: \$566 Million (2020\$)



PROJECT OVERVIEW

The Roadbelt Intertie Project would construct a new 230 kilovolt (kV) transmission line from Sutton to Glennallen (135 miles) to Tok (142 miles) to Delta Junction (111 miles), interconnecting island road system power utilities and creating a parallel path between the two most populated roadbelt areas. Alternative utility interconnection configurations with 230 kV lines between Glennallen and Delta Junction and a smaller 138 kV radial line to Tok from either Glennallen or Delta Junction are possible. Eastern interior has undeveloped hydroelectric, wind, and solar resources that could be developed if a larger market (Railbelt region) was interconnected. The Roadbelt Intertie Project line would provide a conduit of at least 75 megawatts firm power from the Central load region of Anchorage and the Matanuska Valley to the eastern interior communities and the Northern load center of Fairbanks. The Roadbelt Intertie allows additional communities to share the benefits of expanded hydroelectric, wind, and solar renewable energy in Southern, Central, and Northern Regions. (Continued on back)

Benefits

- Increased resilience and redundancy of the Alaska Intertie
- Additional conduit for power to transmit between regions
- Reduced line losses
- Allow additional energy to be delivered to consumers

Opportunities

- Increased capacity to bring on utility-scale renewable projects
- Development of renewable resources in an area of the state that were previously uneconomical due to lack of proximity to transmission

BUDGET

2024-TBD

PROJECT OVERVIEW (CONT)

Natural gas energy will replace diesel energy during periods of low renewable energy. This line will add critical resilience and redundancy to Railbelt transmission. There is only one transmission line, the Alaska Intertie, which transmits power north and south along the Railbelt. The Roadbelt Intertie is capacity-limited. This line would provide an alternate route if Intertie energy is interrupted by maintenance or failure.

PROJECT STATUS

The Roadbelt Intertie Project is conceptually designed and cost estimated.

AEA OVERVIEW

AEA provides energy solutions to meet the unique needs of Alaska's rural and urban communities. Established by the Alaska Legislature in 1976, its mission is to reduce the cost of energy throughout Alaska. As Alaska's lead agency for statewide energy policy and program development, AEA collaborates with utilities, private companies, legislators, local governments, and Alaskan energy innovators to diversify the state's energy portfolio increasing resiliency, reliability, and redundancy.



SSQ TRANSMISSION UPGRADE

Enhancing Railbelt Capacity and Resilience

PROJECT SUMMARY

Ownership: AEA Owned

Status: Constuction

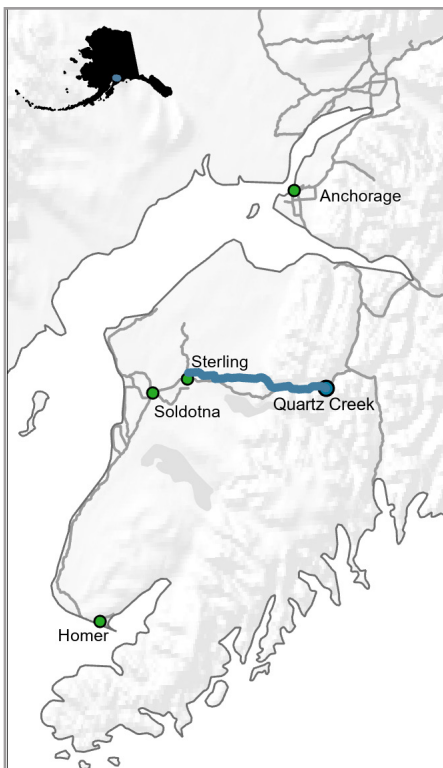
Capacity: 230kV (Currently operating at 115kV)

Length: 54 miles

Right of Way (ROW): Utilizing existing SSQ ROW

Construction: 2024-2028

Cost: \$90 Million



PROJECT OVERVIEW

The Soldotna Substation to Quartz Creek (SSQ) Substation transmission line plays a vital role in Alaska's Railbelt electric grid, which serves over 75 percent of the state's population. About 87 percent of the energy from Bradley Lake Hydroelectric Project (Bradley Lake) crosses this section going to the central and northern utilities. The 115 kilovolt (kV) transmission line is 50 years old and will require replacement as many of the support structures are approaching the end of their useful life. This section represents some of the highest line loss per mile of Bradley Lake energy. The upgrade will size the conductor, insulators, and poles/towers to 230 kV standards. A fiber-optic communication line will also be installed along the route. (Continued on back)

Benefits

- Reduced line losses
- Greater secure communication and control of system
- Increased resilience to wildfires and other unplanned events

Opportunities

- Allows for development of new renewable energy projects on the Kenai Peninsula by eliminating capacity constraints along Railbelt
- Additional capacity for increasing energy during peak periods

SCHEDULE

Project 1
Q1 2025

Project 4
Q1 2025

Project 2
Q1 2027

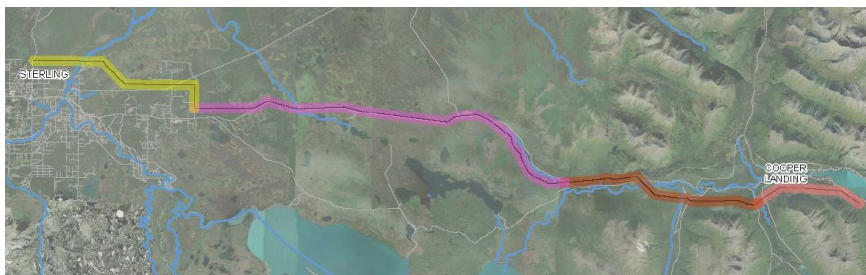
Project 3
Q1 2028

PROJECT OVERVIEW (CONT)

Once all transmission lines have been upgraded from Anchorage to Soldotna then transformers will be upgraded to 230 kV and the line will operate at 230 kV. Because of constraints on how long the transmission line can be out-of-service and the various land ownerships the line crosses, the effort has been divided into four projects, each with an independent utility. The projects are as follows:

- Project 1: Sterling Substation to Kenai National Wildlife Refuge (8 miles)
- Project 2: Kenai National Wildlife Refuge (17 miles)
- Project 3: Kenai National Wildlife Refuge and Chugach National Forest to Cooper Creek (9 miles)
- Project 4: Cooper Creek to Quartz Creek Substation (5 miles)

The project schedule is based on outage constraints, permitting, and seasonal construction. *The project's schedule is subject to change based the above criteria.* The majority of work is over wetlands and can only occur during the late winter months. Outages cannot occur concurrently with other transmission projects because that would island communities from power and prevent Bradley power from moving north during critical periods.



Projects 1 through 4 are shown above from left to right.

FUNDING PLAN (\$MILLIONS)

FISCAL YEAR	FUNDING SOURCE
2024	25.00
2025	2.00
2026	30.00
2027	30.00
2028	3.00
Total	90.00

Total Project Cost: \$90 million (secured)

Secured Sources of Funding: \$90 million AEA bonds (existing)

SUBMARINE HVDC LINE & BESS*

Improving Railbelt Resiliency and Transfer Capacity

PROJECT SUMMARY

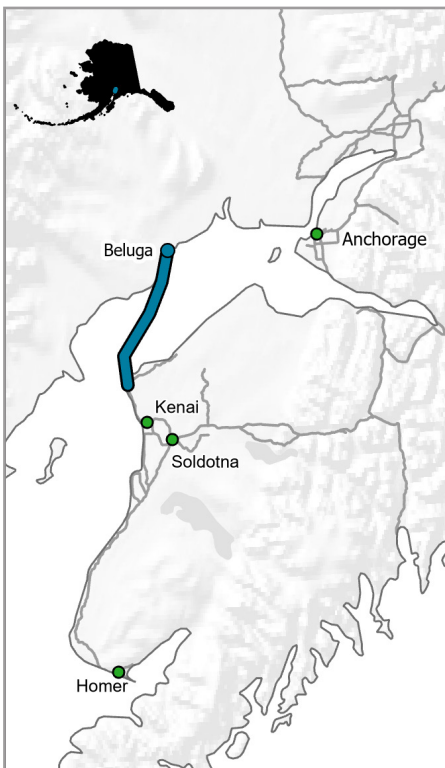
Status: In grant negotiations with DOE; anticipated award Q2 2024.

Scope: Subsea HVDC Line between the Kenai Peninsula and Beluga with AC/DC converters.

2 BESS Units: Central (Anchorage & Mat-Su) and Northern (Fairbanks)

Cost: \$413 Million

**BESS, if feasible, after HVDC.*



PROJECT OVERVIEW

The Alaska Energy Authority (AEA), in collaboration with the Railbelt utilities, has been selected for a \$206.5 million grant from the Department of Energy (DOE) through the Grid Resilience and Innovation Partnerships (GRIP) Program. The grant requires a dollar-for-dollar match and will fund the construction of a high-voltage direct current (HVDC) subsea line across Cook Inlet from the Kenai Peninsula to the Beluga substation to connect the converter station with Soldotna. Two converter stations will be constructed at the terminal ends of the HVDC line, to convert alternating current to direct current, and vice versa at the other end. In addition, if feasible, build a battery energy storage system (BESS) in Fairbanks and expand the Anchorage BESS.

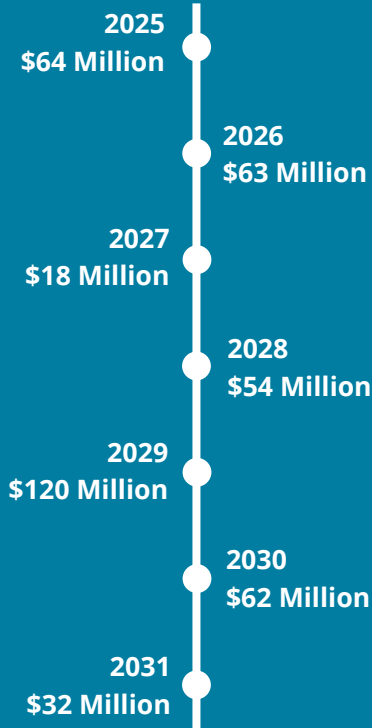
Benefits

- Adds redundancy along the Railbelt by creating an alternate path for generation to flow north and south along Railbelt
- Decreased line loss will contribute to lower energy prices
- Increases resilience of the grid (BESS able to support load for a couple hours)
- Reduction of natural gas generators spinning

Opportunities

- Potential for development of renewable resources in an area of the state that were previously uneconomical due to lack of proximity to transmission
- BESS will enhance resiliency and eliminate small signal instability events and increase frequency control
- Increases effectiveness of additional renewable resources

DRAFT BUDGET



Total \$413 Million



PROJECT STATUS

This project is expected to take eight years to complete (including design, permitting, and construction) and will provide an alternative path between the Central and Southern regions of the Railbelt, increasing transfer capability and improving resilience along the Railbelt. The addition of an alternative path of electricity will also relieve the burden of the existing capacity-constrained transmission lines which enables the construction of additional renewable resources on the Kenai Peninsula and reduces the occurrence of transmission disruptions during maintenance or construction activities on the existing line. As Alaska's grid brings on more renewable resources, the incorporation of BESSs are vital for utilities to regulate and manage the energy load. Many renewable resources, such as solar and wind, are non-firm (unpredictable) sources of energy that may not provide power to the grid when required. BESS's increase resiliency and allow utilities to store renewable energy and deploy at a later time to follow the natural demands of the grid.

FUNDING PLAN (\$MILLIONS)

FISCAL YEAR	FEDERAL SHARE	STATE FUNDS OR SOURCE TBD	EXISTING AEA REVENUE BONDS
2025	32.70	12.70	20.00
2026	31.50	6.50	25.00*
2027	8.80	8.80	-
2028	26.80	21.80	5.00*
2029	60.00	60.00	-
2030	30.95	30.95	-
2031	15.75	15.75	-
Subtotals	206.50	156.50	50.00
Total	413.00		

Total Project Cost: \$413 million (\$206.5 million federal share and \$206.5 million match)

Secured Sources for Match: \$20 million AEA bonds (existing) and \$12.7 million FY2025 appropriation

***Other Sources for Match:** Potentially \$30 million from AEA bonds (existing) for BESS depending on timing, Railbelt utilities, additional state appropriations, tax credits, and bond covenants