



2050 Railbelt Strategic Transmission Plan

Alaska Railbelt: Planning for the Future

February 26, 2026

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Executive Summary

INTRODUCTION: The Alaska Railbelt transmission system—the primary electricity network serving nearly three-quarters of Alaskans—has evolved over the past 70 years from isolated systems into a loosely interconnected grid. A significant portion of transmission lines transmit power across the electric system using 115 kilovolt (kV) and 138 kV voltages. These lower voltage transmission lines result in capacity constraints (a limit on the amount of power that can be transferred between areas) and substantial transmission losses. The reliance on single transmission lines between major load and generation centers forces each utility to plan generation capacity independently, rather than optimizing generation across the entire Railbelt. This configuration prevents systemwide economic dispatch (using the lowest-cost power available) and hinders the coordinated use of spinning reserves (emergency power resources).

To meet current and future load-serving requirements, the transmission system requires strategic additions and upgrades. Without targeted investment, the Railbelt faces rising electricity costs, increased risk of significant outages, and missed opportunities to harness Alaska’s abundant natural resources — particularly in response to emerging demand from data centers, construction of the All-Alaska Gas line, and large U.S. Department of Defense (DOD) projects.

Although the study did not directly assess the load-serving capability of the existing transmission system, findings from the analysis [1], along with prior AEA studies [2] [3], indicated that extensive transmission investment is essential to reliably serve today’s Railbelt. The 2017 AEA Transmission Plan [3] recommended many of the same improvement projects identified in this Railbelt Strategic Transmission Plan (RSTP). Those projects were necessary in 2017 to meet existing loads, and the RSTP demonstrates that—given system load growth, proposed and approved Reliability Standards, and increased generation diversification, the need for these projects is now even more urgent.

PURPOSE: The RSTP identifies key transmission projects required to support projected or possible load growth and ensure system reliability across the Railbelt. AEA convened a Technical Working Group (TWG) with input from Railbelt utilities and the Railbelt Reliability Council (RRC) to assess transmission needs under multiple generation and

load scenarios. The team utilized load levels developed by the National Renewable Energy Laboratory (NREL) [4] [5] and the Alaska Center for Energy and Power (ACEP) [6] [7] to define the total amount of load to be served. Both the NREL and ACEP studies used native load growth and electrification to define the load-serving requirements for their studies. Given the recent load history in the Railbelt, the TWG questioned whether the native population and electrification-driven load growth assumed in those reports would materialize. The focus of the RSTP was not to develop independent load forecasts. However, the TWG determined that emerging large-scale load growth—including data centers, the Alaska gas-pipeline, and DOD development—may materialize and should be considered in assessing the system. The potential for these large loads to occur on the Railbelt would increase electricity demand to the same load levels used in the NREL and ACEP studies. Therefore, the TWG used the moderate load levels developed by NREL and ACEP in this RSTP. Additional modeling and studies would be required to determine the exact transmission needs for specific large loads based on location, reliability and service requirements, and specific demand profiles. Based on policy questions and opportunities at the time of project inception, the TWG developed three diversified generation portfolios to serve the Railbelt:

- 1) **Primarily inverter-based renewable resources (IBRs)** such as wind and solar spread across all regions of the Railbelt.
- 2) **A single large conventional generation plant** such as coal, gas, hydro, or nuclear, a few smaller conventional generators such as gas turbines, and some renewable IBR facilities.
- 3) **Multiple distributed conventional generator plants** such as gas-fired, nuclear, and hydro resources spread across the Railbelt—similar to today’s Railbelt generation—along with some renewable IBR plants.

For all three generation scenarios, the TWG assumed that sufficient transmission and transfer capability would be required to allow for optimal generation planning and operation across the Railbelt. The selected generation portfolios were designed to develop a transmission system capable of supporting a geographic and technically diverse mix of generation resources. While the TWG did not perform any production cost simulations or modeling, a transmission system that allows Railbelt-wide generation planning and operation during non-contingency periods would also enable systemwide economic dispatch. The transmission projects were prioritized by identifying

which transmission improvements best benefit the system under today's load and generation patterns at the lowest construction costs, deliver critical reliability enhancements, and support potential economic benefits for Railbelt customers—regardless of which future load and generation scenario unfolds.

FINDINGS: The diversity of generation resources precluded a single transmission plan that could serve all generation scenarios. Many projects were common to all scenarios, and these formed the high-priority projects required to serve the moderate-load scenario. Medium-priority projects include intra-regional upgrades in Fairbanks and the Matanuska-Susitna Valley, as well as projects that are only needed in specific configurations of the moderate-load scenario. Low-priority projects are mainly localized upgrades within the regions.

Since the high-load growth scenario is considered unlikely, projects required exclusively to meet that scenario were also considered a low priority. Similarly, projects needed only when all generation is removed from the Anchorage and Palmer areas were considered a low priority.

As generation options and load growth opportunities continue to evolve, further modeling will be required to validate and refine these findings under different scenarios.

The high priority projects are listed below:

- **Increase Energy Transfers between the Central and Southern Regions:** Create a reliable and resilient Anchorage–Soldotna Pathway by rebuilding the Kenai Tie to 230 kV and developing the Cook Inlet PowerLink (CIPLink)—a 38-mile subsea high-voltage direct current (HVDC) transmission line—to unlock Kenai Peninsula renewables, significantly reduce line losses, and enable economic operation across the Railbelt. **(Almost 17 percent of Bradley's annual energy is lost by the poor transmission system, and over 30 percent of its incremental energy above 90 MW.)** This project appeared in every scenario that was evaluated and has immediate benefit upon completion. The new pathway would allow participants to schedule and receive their Bradley Lake energy when it is most beneficial and eliminate conditions where an outage on a single transmission line could create widespread outages. This pathway would allow the Central and Southern regions to be treated as a unified generation planning area.

- Increase Energy Transfers between Central and Northern Regions:** Improve system reliability and resiliency by creating an Anchorage–Fairbanks Pathway by upgrading existing interties to 230 kV and constructing a new 230 kV intertie from the Central area to Healy. The time for completion of these projects is relatively short duration and low costs with immediate, long-term benefits upon completion. This ensures firm power transfers with reduced losses between regions. The improved pathway will allow increased power transfers to and from the Fairbanks area, allow the northern area to be included in Railbelt wide generation planning, and eliminate conditions where a single transmission line outage could cause major disruptions. The improvements would also enable total economic dispatch between the Northern and Central regions.
- Unlock Southern Region Resources:** Expand transmission south of Soldotna with new and upgraded 230 kV transmission creating a Bradley–Soldotna Pathway that delivers low-cost power from Bradley Lake and future energy projects to the wider Railbelt. This pathway will substantially reduce losses, eliminate a major stability constraint, and allow Bradley Lake, Cooper Lake, and future Kenai resources to be integrated into Railbelt-wide generation planning and economic dispatch. This is a long-term project with substantial benefits realized at completion.
- Improve Transmission Across Knik Arm:** Replace aging undersea cables and overhead lines with new higher-capacity conductors, reinforcing the Railbelt’s largest load center in Anchorage and the Central region’s electrical connectivity to diverse generation resources in the Northern and Southern regions. The 230 kV undersea cables will soon reach their expected life span and are a critical link in the Railbelt.
- Upgrade and Build Battery Energy Storage Systems (BESS):** Upgrade existing installations and build new facilities with advanced grid-forming controls to maintain stability, provide fast reserves, and support integration of diverse generation resources. These new BESS installations would provide grid stability required for sensitive loads such as data centers and DOD projects.

The full set of transmission improvement projects is illustrated in Figure 1; High Priority (Red); Medium Priority (Yellow); and Low Priority (Green). These classifications reflect the

systemwide value, cost-effectiveness, and reliability impact of each project under current and projected Railbelt conditions.

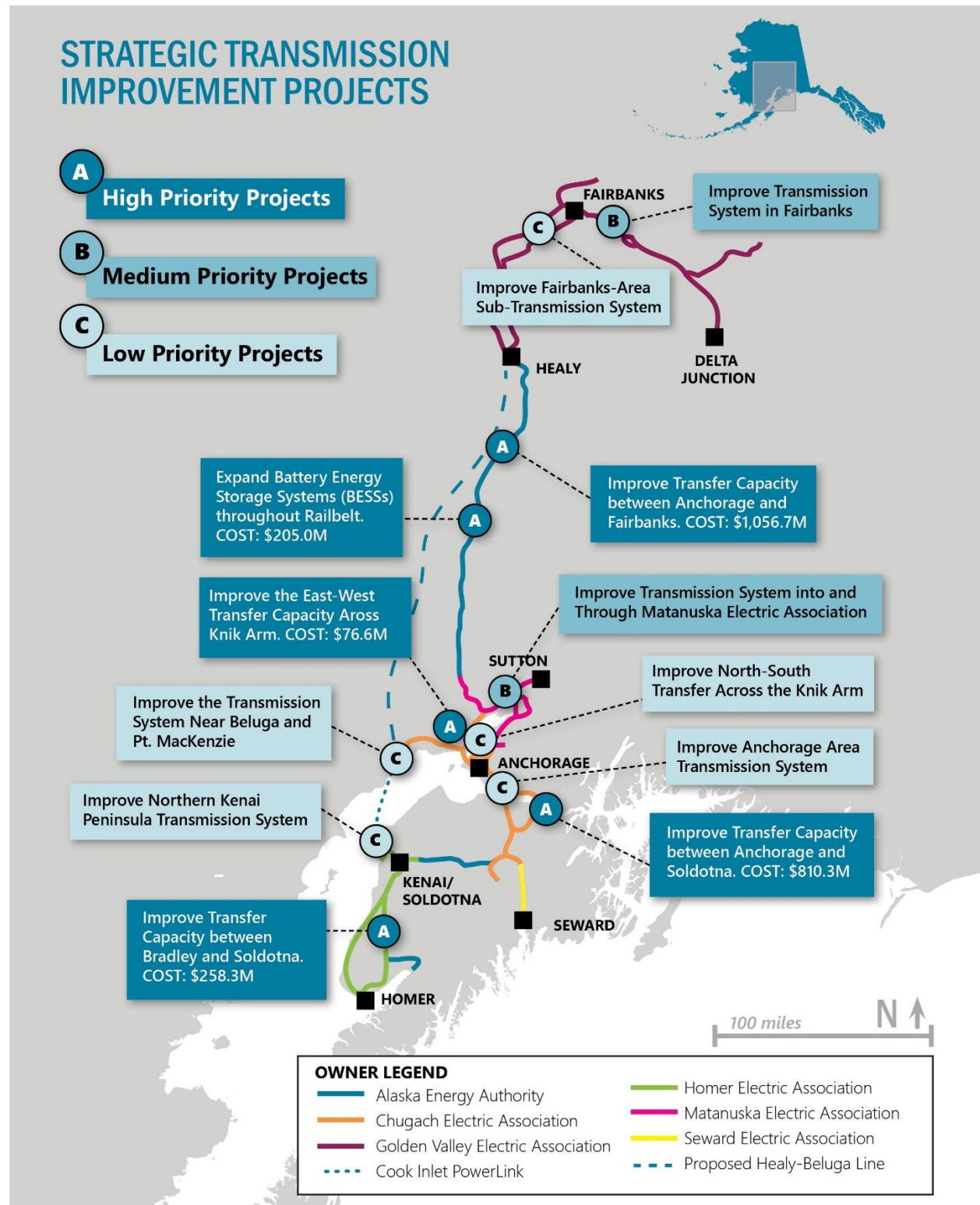


Figure 1: Strategic Transmission Plan Improvement Projects

CONCLUSIONS: A critical conclusion of this study is that major transmission upgrades are urgently needed to serve the Railbelt consumers today. Continued investment will be required by 2050 to reliably serve the load using any of the three future generation portfolios. To recover up to 25 percent of Bradley Lake’s energy during peak periods and enable the lowest-cost power to be distributed throughout the Railbelt, additional transmission is required along three critical pathways: Bradley to Soldotna, Soldotna to Southcentral, and Southcentral to Fairbanks.

Most projects identified in this RSTP were previously outlined in the 2013 and 2017 Transmission Studies, demonstrating that the majority of transmission improvement projects are needed immediately, regardless of future load growth or generation source.

Another important outcome was the realization that serving the Anchorage-Mat-Su region without Anchorage/Palmer base-loaded generation in the area may not be economically feasible. While the Anchorage–Mat-Su areas could technically be served by renewables or conventional generation from outside the region, the costs of the transmission upgrades required to support that scenario are prohibitively high.

As the transmission projects are completed, the number of required generation planning areas will sequentially decrease—from three separate areas to a fully integrated Railbelt system with regionwide planning. This transition could be used in tandem with generation planning to optimize new resource integration and improve overall Railbelt operations. These economic improvements would be difficult to achieve if the Railbelt continues to plan generation as four independent utilities.

This plan provides a strategic blueprint for serving the Railbelt loads in 2050, however the need for substantial transmission improvements exists today and will only grow as we move towards 2050. By prioritizing investment in projects with the greatest reliability and economic impact, Alaska can build a grid that is resilient to uncertainty, capable of supporting a diverse and robust generation mix, and prepared to meet the needs of the Railbelt now and into the future.

1 Introduction: Powering Alaska's Future

The Alaska Railbelt (see Figure 2) is the primary interconnected power system in the state, providing a critical service to nearly 75 percent of Alaska's population [8]. This essential electricity infrastructure comprises generation, transmission, and distribution assets serving commercial, industrial, residential, and government loads. The Railbelt network stretches over 700 miles from the Kenai Peninsula in the south, through the Anchorage Bowl and Matanuska-Susitna River Valleys, into Alaska's interior, reaching north to Fairbanks before turning southeast to Delta Junction. The reliable, resilient, economically viable operation of the Alaska Railbelt—despite harsh Arctic climate, remote and rugged terrain, and increasingly complex grid demands—is vital to Alaskans' prosperity and energy security today and into the future.

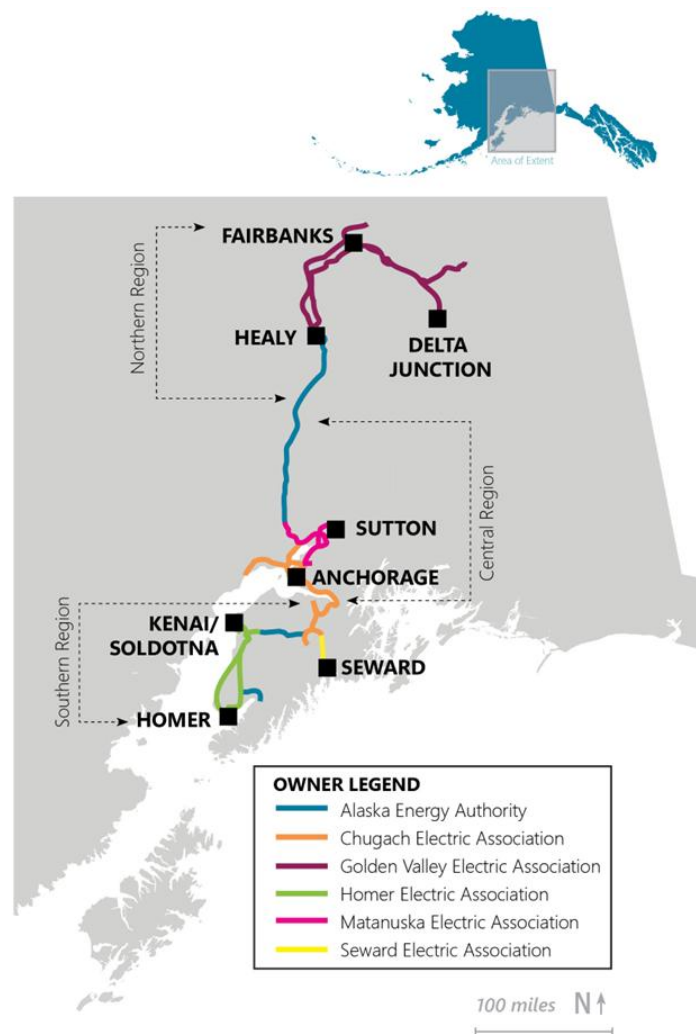


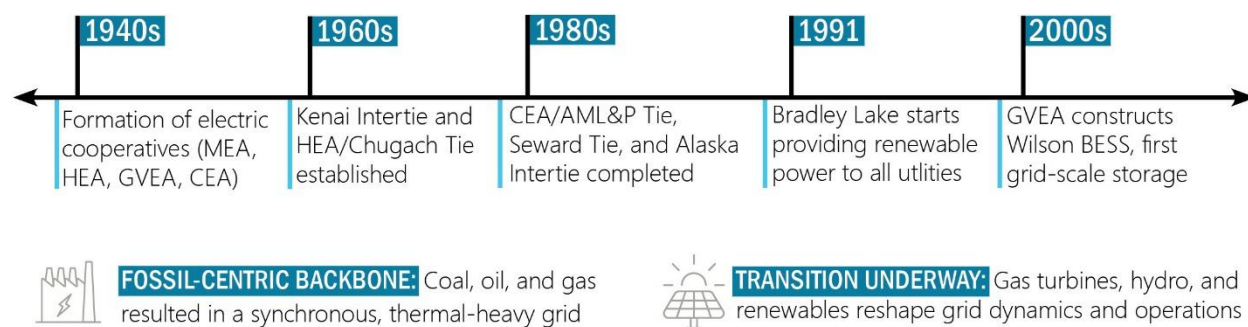
Figure 2: Railbelt Regions and Transmission Owners Overview

1.1 A History of Powering Railbelt Communities

Alaska's Railbelt power system has grown from separate, independent electrical grids serving individual areas into the interconnected system it is today. Named for the Alaska Railroad, which follows much of the same route as the transmission system, the Railbelt grid's development has been driven by coordination among the region's electric cooperatives, the state of Alaska, and the U.S. federal government to meet the evolving needs of the population [8].

The originally isolated electrical systems served only local needs. Over time, interconnecting these small grids led to lower operating costs, shared resources, improved reliability, expanded electricity access, and economic growth for Alaskans. The mission to provide reliable power and foster economic prosperity continues as existing entities and new stakeholders work to expand and strengthen the grid.

Origins To Interconnection: Key Historical Facts

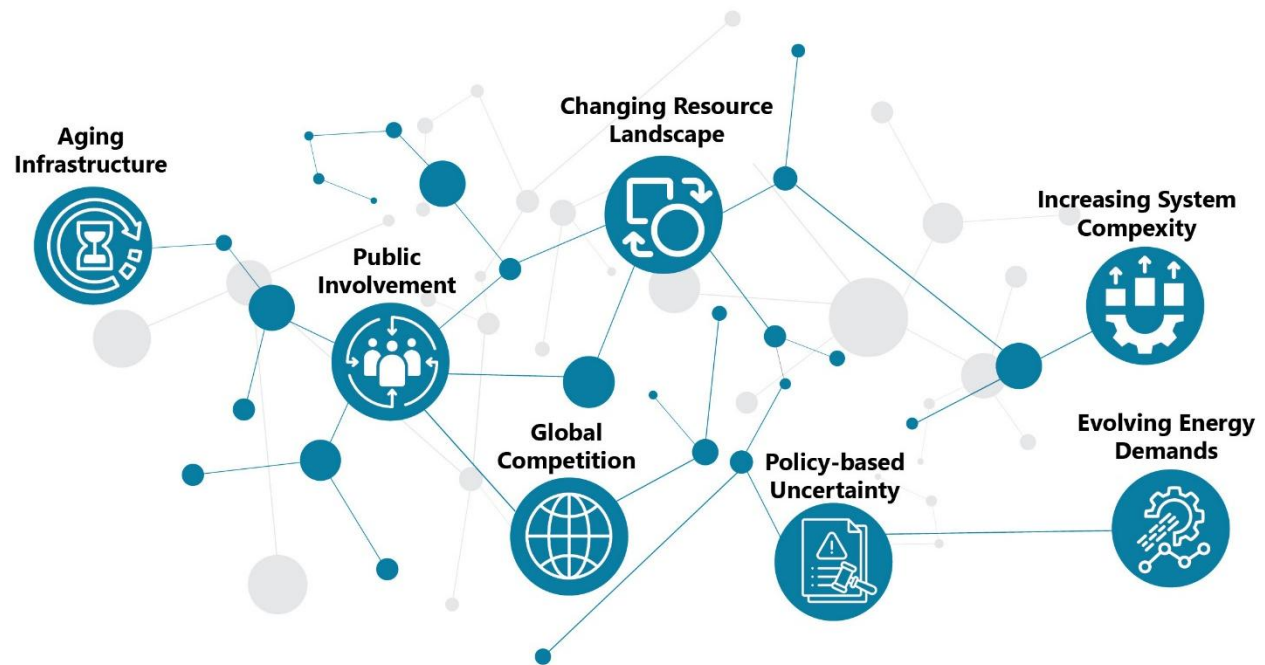


1.2 Growing Challenges: Motivation for Modernization and Improvement

The Railbelt electrical grid, a product of decades of incremental growth, now faces emerging challenges that demand a strategic, forward-looking approach to strengthen and enhance the system's reliability, flexibility, and resilience. The transmission system has seen only one significant expansion since the early 1990s. While the Railbelt grid has served Alaska for many years, it must now evolve to meet the demands of a rapidly changing energy landscape by addressing challenges and opportunities that grids worldwide are confronting [9].

The challenges that face the Railbelt are complex and interconnected. They require a proactive, coordinated transmission strategy, similar to the processes used in other regions and countries. [10], [11], [12], [13].

Growing Challenges



1.2.1 Energy Demands

Demand for greater service reliability across the Railbelt is expected to rise as existing customers seek improved performance. Emerging loads—such as data centers, DOD, and businesses supporting construction of the All-Alaska Gas Line—along with public expectations for service on par with the Lower 48, are additional drivers of this growing demand.

While the native load growth identified in previous studies may not materialize, demand from other contributors could exceed the projections used in those studies, potentially outpacing modeled electricity needs since the study did not utilize an aggressive or high-case load growth projection.

1.2.2 A Changing Resource Landscape

The Railbelt has long relied on a generation fleet supplied by natural gas from the Cook Inlet basin, together with oil and coal in the Northern region. However, with a possible decline in availability or viability of these sources [2], [5], [7], the Railbelt must prepare to transition to a diversified energy portfolio incorporating a range of generation technologies. The existing transmission infrastructure is insufficient to support this diversity, which will likely be essential to reliably power the Railbelt.

1.2.3 Policy-based Uncertainty

The transition of the Railbelt's power system—particularly in generation resources—is occurring amid volatility in public policy, especially at the federal level, related to energy development. Shifts in policy from one federal administration to the next, along with potential changes in state direction can create significant challenges for grid investment and upgrade planning [9]. Volatile policy introduces risks that can delay or paralyze grid infrastructure investment and enhancement efforts. Unlocking all the Railbelt's energy sources and reliably serving customer loads requires targeted transmission improvements in a consistent and known manner and a more robust, resilient power system. Achieving this requires steady, dependable long-term policy support from the State and local utilities.

1.2.4 Aging Infrastructure

Critical portions of the Railbelt's transmission and generation infrastructure are nearing the end of their design life. These aging assets, while well-maintained, present an escalating risk of failure and require increasingly frequent and costly maintenance. In addition, many of these assets contribute to substantial energy losses. Continuing to operate these assets without targeted upgrades and system-wide improvements may lead to reduced reliability, expose the Railbelt to more frequent and prolonged outages, and sustain loss levels that are significantly above those of comparable grids worldwide.

1.2.5 Increasing System Complexity

The energy contributions from inverter-based generation or the use of BESS technology to augment the capability of the transmission system introduces a new level of technical complexity not envisioned in the development of the existing Railbelt transmission system. The current transmission system was designed to operate with traditional generators—such as coal-fired steam units, natural gas turbines, and hydro facilities—which exhibit inherent physics-based response and stabilizing effects from mechanical inertia. These conventional resources can be directly controlled by the system operators to deliver power as needed.

IBRs, including BESS, do not exhibit classical machine behavior, relying instead on power electronics and software-based controls. IBRs have very low inertia, can complicate transmission system protection, and require regulating resources to manage variability and maintain grid balance. They also lack clearly defined operational standards. Most

IBRs currently use grid-following technology, which depends on a certain level of “grid strength” to function reliably—meaning they rely on other grid assets for stable operation. Managing a high penetration of these resources on an islanded power system like the Railbelt may be achievable, but will require a strengthened transmission network designed to operate with high IBR levels to maintain system reliability [14].

1.2.6 Public Engagement

Strengthening the Railbelt grid is not solely a technical or financial undertaking—it is also a societal one that requires public understanding and active participation. Successful implementation of large-scale infrastructure projects depends on earning a social license to operate through transparent dialogue and a commitment to sharing the benefits of grid upgrades with local communities. Additionally, the trend of consumers shaping their own energy future through distributed resources, energy efficiency measures, and other consumer-side innovations introduces new complexity. Enabling these distribution-level programs and customer involvement, while maintaining bulk power system integrity, will require a collaborative partnership between utilities and the public. Public engagement is therefore a critical component of a successful transmission upgrade strategy [13].

1.2.7 Global Competition

The Railbelt grid is increasingly influenced by global economic pressures. The largest load on the Railbelt is owned by an international company that evaluates the cost and reliability of electricity over its global footprint when determining its future plans in Alaska.

To attract data center development and other industrial investment, the Railbelt must deliver power quality (voltage and frequency control) and service reliability (outages/loss of service) beyond what the current transmission system can consistently provide.

The global demand for critical electrical equipment—such as high-voltage transformers, cables, HVDC systems, and power electronics—places Alaska in direct competition with utilities worldwide for limited manufacturing capacity. This can lead to procurement delays and cost increases [15].

Meeting these challenges requires a skilled professional workforce. There is growing competition to attract and retain individuals with the expertise to plan, engineer, construct, operate, and maintain a resilient and future-ready transmission system. These pressures could impact the execution and timeline of the improvement projects outlined in this plan.

1.3 Improvements for Today and Tomorrow: Why New Transmission?

As highlighted in AEA’s 2013 and 2017 Transmission Plans—and reinforced in this RSTP—the Railbelt transmission system requires investment to reliably serve current loads. While future load growth adds urgency, it is not the primary driver for most of the recommended projects. Without strategic transmission upgrades, the ability to diversify generation resources and coordinate Railbelt-wide generation planning will remain limited. Existing cost disparities across the Railbelt will persist, and the State’s directive to establish a unified generation planning area will be unattainable.

The current transmission system also limits the ability to support increased integration of inverter-based resources and emerging technologies. These limitations vary by region and restrict the system’s flexibility to accommodate new industrial loads and generation sources.

Building a transmission system that reliably, safely, and affordably serves the Railbelt today and into the future requires a proactive, coordinated approach. Executing this plan will take time, capital investment, and consistent policy support.

New transmission infrastructure improves reliability and is fundamental to increasing the generation diversity—including hydro, gas, coal, nuclear, tidal, and other resources that may be connected to the system. These upgrades make the grid more robust, enhancing its ability to withstand and recover from unplanned outages, severe weather, and natural disasters—events that are low in probability but high in impact. They also establish critical operational margin, enabling planned maintenance and supporting system flexibility.

Improved reliability and service quality will help attract new loads that advance the economic goals of the State and its residents.

2 The Planning Process: Envisioning the 2050 Grid

2.1 The Study Team

The 2050 RSTP [1] was the result of a year-long collaborative study involving key engineering personnel from four of the largest interconnected utilities in the Railbelt grid, state engineers and stakeholders from AEA, engineering and policy members from the RRC, and consulting engineers from Electric Power Systems (EPS)—many of whom have decades of experience planning, building, and operating the Railbelt system.

This TWG was formed to facilitate an open, transparent, and coordinated transmission planning process, *resulting in a plan that is more comprehensive and efficient than any individual utility's transmission plan*. The TWG met bi-weekly throughout the study to align on future forecasts, evaluate modeling methods, review simulation results, and adapt as needed to explore alternative solutions.

The outcome of this process is a set of targeted system improvements designed to ensure the Railbelt power system remains reliable and resilient in the near and long term, despite increasing complexity and chance. The resulting RSTP is a testament to the collaboration, expertise, and coordination among the Railbelt utilities and the leadership of AEA.

The TWG completed a detailed technical study and extensive report on the findings and recommendations of the effort which formed the development of the RSTP [1], now referred to as the RSTP for Railbelt Utility engineers. From this technical document, this report was developed to provide critical information to the public, including policy makers, developers, utility managers and governing bodies as well as state and local governments. This report provides all the key information included in the RSTP for Railbelt Utility Engineers in a less technical manner and maintains Critical Infrastructure Protection required within the electrical standards and framework.

2.2 Planning Assumptions – Developing the Base Cases

The major assumptions that formulate the basis of the RSTP are the current Alaska Reliability Standards, load scenarios, available generation resources, and target energy transfers levels between regions.

2.2.1 Load Scenarios: Diversity of Growing Electric Demand

Forecasts from recent studies—including the National Renewable Energy Laboratory (NREL) and the Alaska Center for Energy and Power (ACEP)—indicate that Railbelt loads are expected to increase over the next 25 years. While the TWG did not validate the future load growth and electrification presented in these studies, they have been widely circulated to the legislature, general public, and referenced in proposed legislation. The TWG does not endorse the projections, citing stagnant load growth experienced by each utility in recent years. However, despite disagreement with the underlying rationale for the projected growth, TWG agreed to use the magnitude of the load levels in the RSTP, believing the loads levels may be realized through other means.

The load levels used in the RSTP can be seen in Figure 3 below. However, the use of these load levels by the TWG does not reflect an endorsement of the assumption that population growth and widespread electrification alone will drive significant load increases. Rather than relying solely on institutional forecasts, the TWG acknowledged that load levels may rise due to a combination of factors—including native load growth, electric demand from data centers, the All-Alaska gas-pipeline, DOD developments, or other unforeseen drivers. These influences suggest that the same load levels projected in recent studies could still be realized. Therefore, the TWG agreed to adopt the moderate load levels for use in the RSTP.

Since the development of the load forecasts, federal policy and rapid technological changes—particularly the rise of data centers—have introduced new drivers of electric load growth higher. The expansion of data centers across the U.S. and Canada, along with Alaska’s active pursuit of such developments, should be considered in future Railbelt load forecasts. Similarly, recent global events have increased the likelihood of the All-Alaska gas-line construction, which would have a significant impact on Railbelt electric demand. These same events have also elevated Alaska’s strategic importance for the U.S. and allied defense interests, potentially leading to additional DOD-related projects.

To put the RSTP load forecasts in perspective, the difference between current peak loads and the projected 2050 peak loads is roughly equivalent to one medium-sized data center—while a large data center could exceed the load of the entire Railbelt.

Winter and Summer Peak Load Scenarios (Values in MW)

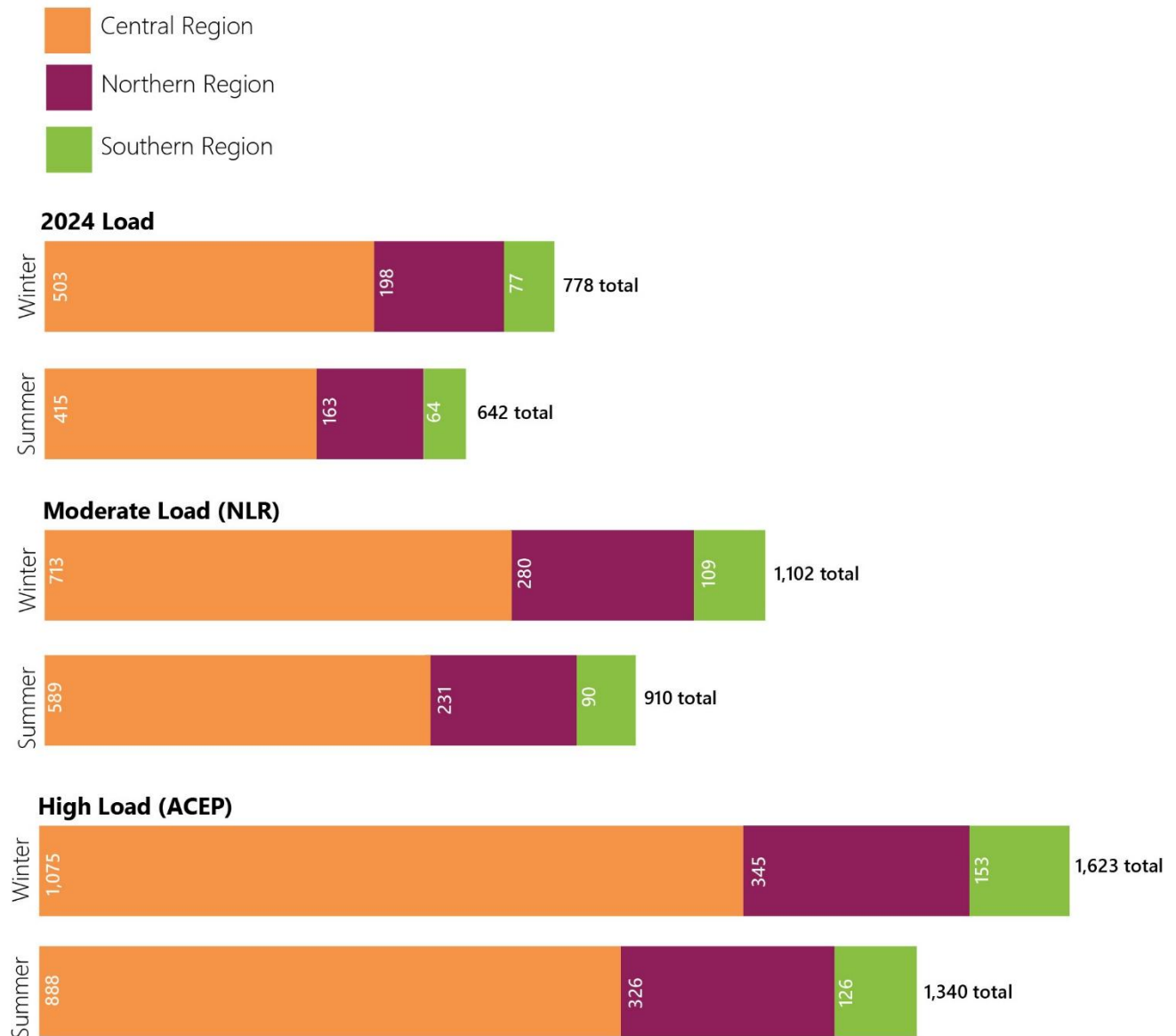


Figure 3: Winter and Summer Peak Load Scenarios (Values in MW)

2.2.2 Generation Scenarios: Accounting for Uncertainty in Resources

To develop a transmission plan that is resilient amid an uncertain energy future, the TWG established three distinct generation scenarios for the year 2050. Rather than relying on a single forecasted resource mix, these scenarios were designed to evaluate transmission needs across a range of generation types and geographic distributions.

This approach enabled TWG to identify transmission upgrades that offer system-wide benefits regardless of the future resource decisions.

The three scenarios evaluated were:

1. A high **Inverter-Based Resource (IBR)** future with significant development of non-traditional generation technologies across the three main Railbelt regions. Concerns about system reliability, operational complexity, and technical feasibility led to the inclusion of minimal conventional generation to provide stability. The scenario relied heavily on IBR generation with limited synchronous generation added for grid support.
2. A **Single Synchronous Source (SSS)** future modeling a large, centrally-located traditional power plant supported by multiple IBR facilities and several smaller conventional generators.
3. A **Multiple Synchronous Source (MSS)** future, which assumes new generation will come primarily from numerous smaller conventional power plants distributed across the Railbelt's three regions. This scenario also included expanded hydro resources and a limited number of IBR facilities to help meet projected load levels.

Figure 4 illustrates total system generation and its regional breakdown, highlighting the proportion of generation supplied by inverter-based, power-electronic sources compared with generation dispatched from synchronous sources such as combustion turbines, hydro, nuclear, coal, or geothermal (steam).

Generation Totals and Composition – High Load Winter Peak Scenarios in MW

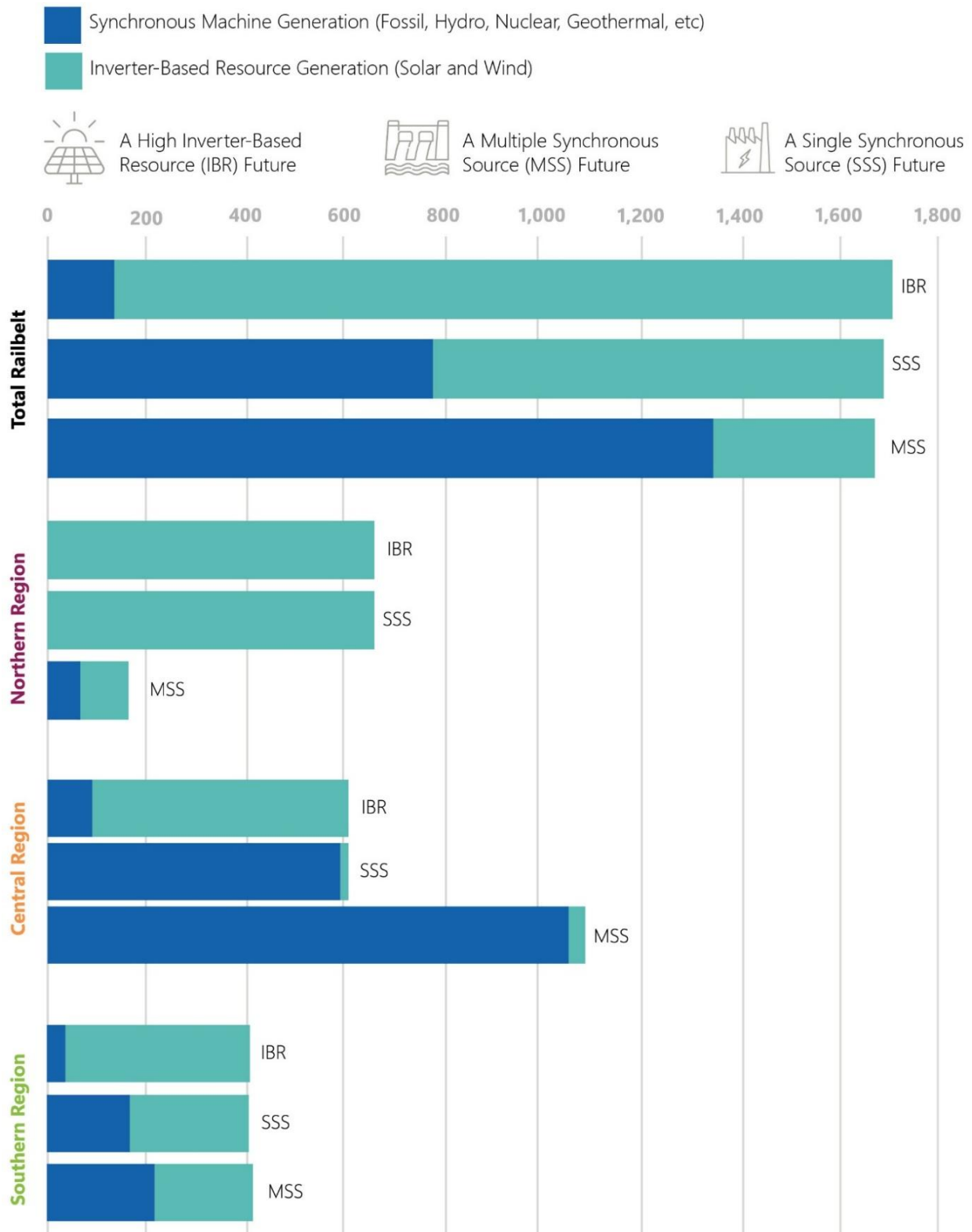


Figure 4: Generation Totals and Composition – High Load Winter Peak Scenarios

2.2.3 Regional Transfers: Understanding the Existing Intertie Constraints

The most critical constraint facing the Railbelt today is the limited transmission connectivity, which restricts power transfers between regions, prevents compliance with Alaska Reliability Standards, contributes to low system strength across all three Railbelt areas, hinders coordinated regional resource planning and results in transmission losses many times more than industry standards. The existing electrical pathways between the Central and Northern regions, and the Central and Southern regions, represent major bottlenecks for energy transfer and generation planning, while also posing significant reliability risks. Figure 5 illustrates three key electrical pathways in the Railbelt, highlighting the current and proposed interties and transmission lines that comprise these corridors.

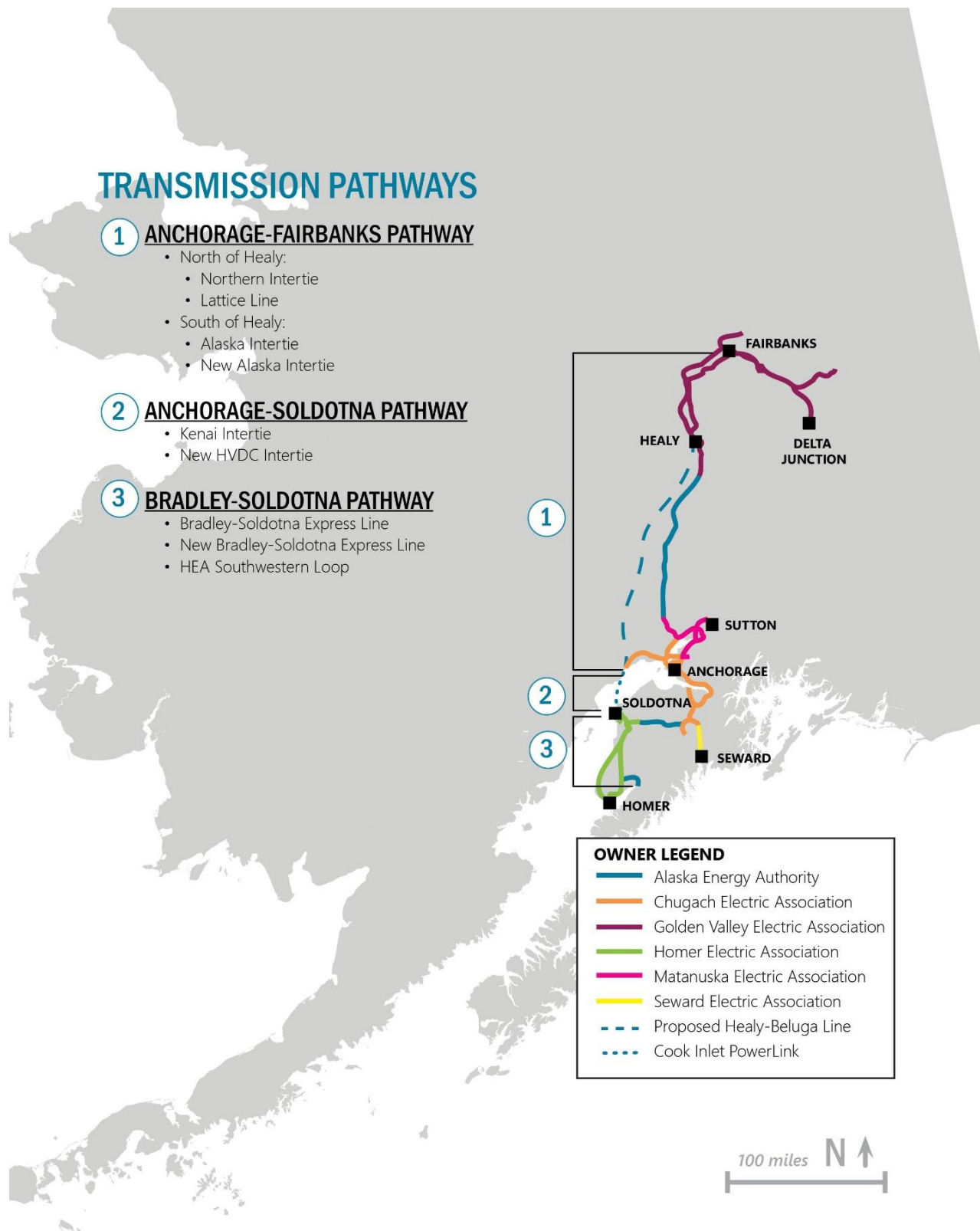


Figure 5: Railbelt Electrical Pathways - The Interties and Key Corridors of Power Flow

In the current system, generation planning is siloed by utility or region due to the absence of transmission lines between areas. This restriction limits the ability to select generation resources based on lowest cost or highest system value and creates barriers for new generation development while favoring continued reliance on existing assets.

The regional electrical pathways span hundreds of miles through harsh terrain and rugged geography, increasing exposure to routine outages and raising the likelihood of such as the 123-day outage of the Kenai Intertie caused by the Swan Lake Fire in 2019 [16].

In the existing system, an outage of either the Anchorage–Soldotna Pathway (Kenai Tie) or the Anchorage–Fairbanks Pathway (Alaska Intertie) results in system separation, isolating the southern or northern regions from the rest of the grid and halting energy transfers. The islanded region must then operate independently, while the interconnected region is forced to adjust its operations to maintain stability and load-serving capability. The act of islanding further degrades system strength in every region.

The potential for extended isolation of one region restricts the Railbelt’s ability to ensure firm energy transfers, requiring each region to maintain sufficient generation capacity and fuel reserves to serve its own load for any duration. This approach to regional resource planning and operation can lead to excessive generation investment and missed opportunities to optimize generation siting and utilization.

An outage of a regional intertie can cause severe system impacts, including loss of customer load, voltage and frequency fluctuations, system oscillations, and even cascading outages. Railbelt utilities devote significant effort to mitigating these risks by studying existing transfer constraints, enforcing operational limits, and maintaining adequate spinning reserve—online generation capacity that can respond instantly to prevent blackouts.

Historically, the Railbelt did not rely on inter-regional transfers to meet load, using transfers primarily for economic optimization with their own generation. For example, the Bradley Lake Hydroelectric Project operated for its first 20 years with minimal energy transfers across the Kenai Intertie. However, today and moving forward, over 85 percent of Bradley Lake’s energy must be transferred to load centers north of the Kenai Peninsula, incurring significant energy losses.

As the Railbelt moves toward regional generation planning, and if more energy development is outside traditional load centers or jointly owned projects between two or more utilities, the ability to optimize generation resources will increasingly depend on robust transmission between regions.

Transfer levels of 250 MW between regions were used in the NREL, ACEP reports, as well as the utilities' joint application for Grid Resilience and Innovation Partnerships. The joint application resulted in a funding award to AEA for the CIPLink project, installing an HVDC submarine cable intertie across Cook Inlet. The same transfer level was selected by the TWG to align generation resources with Railbelt loads. Alleviating current transmission constraints between the regions is a critical first step in strengthening, improving, and preparing the Alaska Railbelt system for future demands.

2.3 Planning Assessment: Evaluating the Grid's Reliability

Using the selected load levels and three generation scenarios, the three subsections below provide an overview of how this assessment was conducted using a methodical, industry-standard approach aligned with Alaskan and Lower 48 planning methodologies.

2.3.1 Contingency Analysis

A core component of the transmission system assessment is contingency analysis. A "contingency" refers to the unexpected failure or outage of a major grid component, such as a large generator, critical transmission line, or a key transformer. The TWG identified and agreed upon a set of contingencies to be evaluated in accordance with the Alaska Reliability Standards, which are similar to—but slightly less stringent than—those used in the Lower 48.

Hundreds of contingencies were simulated for each future load and generation scenario to identify any grid vulnerabilities. The final set of recommended system improvements directly addressed these deficiencies, enabling the grid to reliably serve projected loads under a wide range of future conditions.

2.3.2 Performance Criteria

For each simulated contingency, the grid's response was measured against a set of technical performance criteria adopted by the TWG. These criteria constitute the rules

that define reliable grid operation and are based on industry-accepted standards, adapted for the unique characteristics of a small electrical grid like the Railbelt. If the system's performance violates any of these criteria, it indicates a grid deficiency and an unacceptable reliability risk that must be addressed through system improvements. The key performance criteria evaluated include:

- **Maintaining Safe and Reliable Voltages:** Ensuring that voltages across the system remain within acceptable limits to prevent damage to utility equipment and customer property, and to avoid conditions that could lead to voltage collapse.
- **Preventing Equipment Overloads:** Ensuring that no outage causes remaining transmission lines or transformers to exceed their rated capacity, which could lead to equipment failure or cascading outages.
- **Maintaining System Stability:** Ensuring that the system is stable following a contingency, meaning it returns to acceptable frequency and voltage levels within a reasonable amount of time without sustained oscillations or instability.

2.3.3 Prioritization Process

All the transmission improvements identified during the contingency analysis are necessary to meet the reliability standards for the forecasted load, generation, and power transfer scenarios. However, several practical constraints must be considered: projects having varying construction timelines, labor and funding limitations prevent simultaneous execution, and there is uncertainty in future load and generation timing and outcomes.

To support the development of an implementation schedule, the TWG conducted a prioritization using a range of metrics, including:

- Potential to improve economic operation of the Railbelt
- Potential to enable jointly owned or utilized resources
- Enhancement of system reliability
- Reduction of energy losses
- Replacement or upgrade of aging infrastructure
- Improvement of operational flexibility
- Enablement of intertie transfers

- Consideration of severe contingencies not explicitly studied

Projects with significant impact on current and future (2050) system performance were designated as highest priority. This led to the categorization of system improvements into high, medium, and low priority tiers, enabling a fiscally responsible approach that directs funds to the most impactful projects offering broad benefits to the Railbelt.

3 Findings: A Blueprint for Upgrading the Railbelt

This section outlines the system improvements required to reliably support the load and generation cases assumed for 2050. Each section below explains the specific improvements identified in the RSTP, the transmission planning criteria that justify them, and the benefits they bring to the Railbelt system.

Each improvement project is organized by priority level according to the key in Figure 6. **Note that all projects within the same category (high, medium, or low) share equal priority.** The intent is to highlight the most impactful system improvements, not to prescribe a strict order of execution. Project prioritization within each category was informed by input from system users and operators, rather than solely by technical studies. Some projects identified in the previous studies (2013 and 2017) are not included in the RSTP, either due to changes in system needs or modeling assumptions. For example, Fossil Creek Station does not appear in the RSTP because of the generation dispatches selected for study. Had Anchorage/Mat-Su area generation been utilized or load increases at Joint Base Elmendorf-Richardson been modeled, it would likely have been included. Each improvement project has multiple layers of technical details, which are discussed in the RSTP for Utility Engineers [1].



Figure 6: Project Prioritization Legend

3.1 Cost Estimate Development

Due to the extreme increases in electrical equipment and construction, new cost estimates were developed for each high priority project identified in the RSTP. Pricing for large transformers, breakers, transmission towers, insulators, and substation

equipment was solicited from manufacturers as well obtaining pricing from recently completed projects in the Railbelt to develop the costs used in the RSTP.

Project costs are based on 2025 pricing levels for materials and labor.

In addition, within the construction estimate for each project, design costs were estimated for each project, a 17 percent contingency was used for each project, overhead for government or utility organizations was estimated at 15 percent, and a location adder up to 30 percent was used for remote locations.

Conceptual substation layouts and line routings were reviewed with the TWG and distributed to utility engineers.

3.2 High Priority Projects: The Key System Improvements

The analysis conducted within the RSTP identified a core portfolio of projects that are essential across all three generation scenarios serving the moderate load level. These system improvements represent the foundational investments needed to build a strengthened and resilient Railbelt grid. These projects are characterized by their high value across all regions of the power system from an economic perspective and in terms of reliability. They maximize the system's ability to integrate generation resources across the Railbelt, enabling region-wide resource planning, eliminating transmission barriers to entry for new generation, and reducing the risk of stranded assets. They also address existing and future inaccessible resource capacity, enhance reliability, and ensure capital is directed towards infrastructure that will serve the Railbelt for decades.

3.2.1 Increase Energy Transfers between the Central and Southern Regions

A	Upgrade Transfer Capacity between Anchorage and Soldotna ▾	\$810.3M	> >
A	Upgrade the Existing Intertie between Anchorage and Soldotna >	\$397.3M	
A	Upgrade the Existing Intertie between Anchorage and Soldotna >	\$413.0M	

The Anchorage to Soldotna Pathway currently consists of a single line —the Kenai Tie between Anchorage and the Kenai Peninsula. This line must be upgraded to significantly increase transfer capacity and reduce energy losses between regions. In addition, the installation of the new Cook Inlet PowerLink HVDC transmission line between the Central

and Southern regions will enable non-interruptible (firm) power transfer, in accordance with established planning and operational standards. These upgrades are essential to unlocking the Kenai Peninsula's renewable energy potential, enabling proposed hydro, and renewable resources to deliver firm power to the broader Railbelt system [1] [17] [18] [19].

Upgrades to the Kenai Tie require reconstructing the existing transmission structures between Anchorage and Soldotna to support larger conductors operating at a higher voltage of 230 kV. Additionally, voltage control assets must be upgraded to improve voltage regulation along the route. Much of the physical line construction has already been completed by the utilities and AEA, however few substations have been upgraded for 230 kV operation.

Upgrades to the existing Kenai Tie—like other proposed voltage increases and conductor enhancements—will reduce system losses. Line losses refer to the reduction of usable electrical power as it flows through transmission lines, decreasing the amount of power available to end-use customers. Reducing these losses improves the economic efficiency of the power system and supports long-term reliability.

As Dixon Diversion is developed, the annual energy losses for Bradley Lake increase significantly as the plant's annual average output rises. In the existing transmission system, nearly 17 percent of the annual energy generated at Bradley Lake is lost, meaning it is not available to Railbelt customers due to extremely high transmission losses. *When Bradley's power is needed the most and it is operated at over 90 MW, over 30 percent of the incremental power is lost.* Generation resources in the central and northern parts of the system must compensate for this lost energy to meet their local demand. These high transmission losses hinder the development of additional renewable resources on the Kenai Peninsula. In contrast, typical transmission losses in the Lower 48 range from two to five percent. Upgrading the transmission system can reduce losses to this range, effectively delivering more usable energy to northern utilities and unlocking opportunities for new generation development on the Kenai.

To provide a redundant path between the Central and Southern regions, an additional transmission line is required. Numerous historical studies have evaluated potential solutions, all of which have identified a subsea cable as the most feasible option [15].

Given the length and environmental conditions of the subsea route, an HVDC line has been recommended in this and previous studies.

3.2.2 Increase Energy Transfers between the Central and Northern Regions

A	Upgrade Transfer Capacity between Anchorage and Fairbanks ▾	\$1,056.7M >>
A	Upgrade the Existing Intertie between Anchorage and Fairbanks >	\$638.7M
A	Add New Transmission from Anchorage and Healy >	\$418.0M

Increasing energy transfer and reducing losses along the Anchorage-Fairbanks Pathway is a critical upgrade for the Railbelt [1] [2] [3] [20]. Transmission improvements between the Central and Northern regions will provide greater and more efficient transfer capacity, enable firm (non-interruptible) power delivery, reduce energy losses, and allow for Railbelt-wide planning—all contributing to a more reliable economically efficient grid.

The project involves upgrading the existing transmission network between the Anchorage area and Fairbanks from 138,000 Volts (138 kV) to 230,000 Volts (230 kV). This includes the AEA-owned Alaska Intertie and terminations, the 26-mile section of the MEA-owned portion of the Alaska Intertie, the GVEA-owned Northern Intertie, the GVEA-owned Lattice Line and the Chugach owned southern interconnection to the intertie. The lines do not require the same type of upgrades to operate at 230 kV. Some line sections will require replacement of transmission structures, while others will need terminal upgrades to accommodate higher voltage equipment.

In addition to upgrading the existing transmission lines, a second 230 kV Central–Healy Intertie—a new line that parallels the existing Alaska Intertie—must be constructed to create a redundant transmission path between the Central and Northern regions. This second line is essential for reliability and increased power transfer capability. It ensures the Northern region is not isolated from the rest of the Railbelt due to a single transmission outage, and likewise, that the Central area remains connected to key generation resources to the north. Constructing this redundant transmission path is a robust solution that simplifies grid operations, reduces energy losses, enables Railbelt-wide dispatch coordination, and supports inter-regional resource planning between the Central and Northern regions.

Increasing the operating voltage of the Central and Northern regions from 138,000 Volts to 230,000 volts, coupled with the added Central–Healy intertie, substantially increases power transfer capability between regions. However, these system upgrades will also require enhanced voltage control due to the characteristics of the higher nominal voltage and the operation of parallel transmission paths. This will be achieved by upgrading existing high-speed voltage control devices, such as the Static Var Compensators (SVCs) installed along the Alaska Intertie, and by installing new high-speed dynamic voltage control equipment and additional static voltage support devices at key substations along the route.

3.2.3 Unlock Southern Region Resources

A	Improve Transfer Capacity between Bradley and Soldotna ▾	\$258.3M	> >
A	Upgrade the Existing Bradley Lake to Soldotna Express Line to 230 kV >	\$115.1M	
A	Create a 2nd 230 kV path between Bradley and Soldotna >	\$143.2M	

The southern region of the Railbelt, on the Kenai Peninsula, has abundant renewable energy potential. The RSTP evaluated more than 450 MW of renewable generation in the region. However, the existing 115 kV transmission system is a significant bottleneck. In particular, the Bradley-Soldotna Pathway does not have the capacity to deliver the full output of existing resources like Bradley Lake Hydroelectric Project, let alone support new large-scale renewable projects [1] [17] [18].

The existing 115 kV system has a critical stability limit between Bradley Lake and Soldotna, which prevents further capacity development in that area and restricts Bradley Lake from operating at full output without reliability risk. The following upgrades are necessary to unlock this resource potential and ensure the region’s clean energy can be delivered reliably to the main load centers north of the Kenai Peninsula.

The plan recommends two key transmission upgrades. First, the primary transmission line between Soldotna and Bradley Lake will be upgraded to a higher-capacity 230 kV line. Second, a new 230 kV transmission path is required to ensure reliable power delivery to Soldotna. This second path can be created either by building a new direct connection from Bradley Lake to Soldotna, or by upgrading the existing western portion of the southern 115 kV transmission loop to 230 kV.

3.2.4 Improve Transmission Across Knik Arm

A	Improve the East-West Transfer Capacity Across Knik Arm ▾	\$76.6M	> >
A	Replace the 230 kV Undersea Cable Due to End-of-Life >	\$38.0M	
A	Reconductor the 230 kV overhead lines between Point Mackenzie and Sullivan Power Plant >	\$38.6M	

The transmission corridor across Knik Arm is a critical electrical link connecting the Anchorage Bowl to the system north of Knik Arm and to the southern end of the Anchorage–Fairbanks Pathway. The main component of this transmission corridor is a set of 230 kV submarine cables that are more than 40 years old and will likely require replacement before 2050.

The 230 kV cables are vital to the Railbelt power system for several reasons. First, this route represents one of the primary paths for serving Anchorage-area loads with regional flows from the Anchorage–Fairbanks Pathway, and the CIP Link HVDC Intertie belonging to the Anchorage–Soldotna Pathway. This makes the Knik Arm connection a key element in inter-regional power transfers. Second, given the existing gas-fired generation and the potential for new generation resources west of Anchorage across all three generation scenarios, this east-west undersea cable route requires additional transfer capacity to meet future needs. The fact that this is a common upgrade to all scenarios in this RSTP, and that the existing infrastructure is approaching end-of-life, makes this project a high-priority investment for the Railbelt.

The replacement of the undersea cables and the improvement of the overhead lines on either side of the waterway help create a robust, high-capacity electrical corridor into the Anchorage area—and from the Anchorage/Kenai area to the northern area. This ensures that the Railbelt’s largest population and economic hubs can be reliably served with power from diverse generating resources located throughout the Railbelt’s three regions.

3.2.5 Upgrade and Build Battery Energy Storage Systems (BESSs)

A	Expand Battery Energy Storage (BESSs) Throughout the Railbelt v	\$205.0M	> >
A	Modify Existing BESSs to be Grid-Forming (GFM) >	\$10.0M	
A	Build New Grid-Forming (GFM) BESS in all Three Regions >	\$195.0M	

As the Railbelt transitions from a grid dominated by traditional generators and begins to integrate more inverter-based resources (IBRs), the system will lose some of the inherent physical properties that have helped keep the system stable. Although this energy transition may involve varying degrees of IBR-based generation in the different regions of the Railbelt, all the generation scenarios in this plan use significantly more IBRs to serve load than the existing system. BESSs will help address the complexities associated with maintaining stability and reliability in an islanded power system while enabling the energy transition and modernization of the grid.

Until recently, a BESS's ability to help islanded or weak systems was limited by how much traditional generation was also operating. With the development of advanced grid-forming (GFM) inverter controls, BESSs can provide significant support to islanded and weak systems like the Railbelt. BESSs with GFM controls can provide stabilizing effects similar to conventional power plants, voltage and frequency control during disturbances, and restoration services following the loss of a generator, loss of load, or blackout. Additionally, expanded BESS capacity can enhance the operational flexibility of the grid by providing response to changes in solar/wind generation and can stabilize the grid following various contingencies [21].

This plan recommends upgrading existing BESS facilities to modern GFM capability and constructing new and expanded GFM BESS capacity. This strategy is consistent with best practices from other grids experiencing similar transitions and modernization, such as in Hawaii and Australia. New GFM BESS facilities will play a critical role in increasing grid reliability and the Railbelt should develop region-wide performance standards that clearly define the required BESS technical capabilities.

3.3 Medium Priority Projects: Targeted Upgrades for Intra-Regional Reliability

The system improvements that fall into the medium-priority category are focused on building reliability within specific regions. While the high-priority projects form the main electrical connections between the Railbelt's three regions, these projects are necessary upgrades to the individual regions' transmission networks. They address growing electricity demand, integration of new resources, and resolve reliability constraints within the Northern and Central regions. This approach is consistent with grid modernization efforts globally, which recognize that targeted regional transmission development is essential for maintaining reliability and connecting new generation resources [10] [12] [11].

3.3.1 Improve the Transmission System in and around Fairbanks



Improve Transmission System in Fairbanks ▾

>>



Add New Transmission between North Pole and Fort Knox >



Add New Transmission between Fairbanks and Delta Junction >

The transmission network serving the Fairbanks area and communities to the southeast of Fairbanks require improvements to handle future load growth and to reliably connect new energy resources. The plan identifies two key projects to meet these needs. First, a new 138 kV line connecting the Fort Knox area to North Pole is required to support the integration of new renewable energy. This line also relieves transmission congestion between Fairbanks and North Pole. Second, a new 138 kV line between the North Pole area and the Delta Junction area is required. This creates a second electrical path to improve reliability for communities along this corridor, prevents overloads on the existing network during an outage, and supports potential future load growth and new renewable generation in the region.

3.3.2 Improve the Transmission System Through MEA

- B** Improve Transfer Capacity into and Through Matanuska Electric Association (MEA) v >>
- B** Improve Transfer Capacity from Teeland East into MEA >
- C** Build/Upgrade the MEA system so that there are two 230 kV transmission paths >

As the population and electrical demand grow in the Mat-Su valley, the existing network within MEA service territory becomes a bottleneck for importing power into MEA and reliably serving the load. To address this, the plan identifies two solutions that scale according to the expected level of future growth. For moderate load growth, which the TWG believes is the more likely scenario, the plan calls for reinforcing the existing 115 kV system within MEA by adding new lines and reconductoring others to increase capacity. For an MEA future grid with high load growth—a lower probability—a more comprehensive rebuild is required. The rebuild involves upgrading key transmission corridors between CEA and MEA, creating two parallel 230 kV high-capacity paths through the MEA system coupled with the need to build a major new substation (Fossil Creek) to manage the higher power flows and potential outage scenarios [2] [3] .

3.4 Low Priority Projects: Enabling High Load Growth and New Resources

The projects in the low-priority category are required to meet the reliability standards for the high-load growth scenario. These upgrades are necessary only if the "High Load" growth forecast materializes in specific areas, or if the utilities / independent energy developers choose to build specific large-scale power plants in particular locations of the Railbelt. In addition, the low priority projects consist of those improvements that are primarily needed when large amounts of generation are located outside the core of Anchorage and Palmer areas. The TWG has determined that decommissioning large amounts of generation in the core of Anchorage is unlikely, and therefore projects that primarily enabled serving the Anchorage/Mat-Su load from generation located outside the region were a lower priority. These projects are in the long-range strategic plan at a low priority to ensure that the Railbelt is prepared for multiple possible futures without committing funds to infrastructure that may not be needed.

3.4.1 Serving High Load Growth in and Around Anchorage

 Improve Anchorage-area Transmission System >>

 Note, the following transmission and sub-transmission changes in Anchorage are only needed in high load cases to serve Anchorage-area loads.

 Increase load serving capacity of all 115 kV Lines in Downtown Anchorage >

 Add a third transformer at University substation >

 Add a Transformer at Sullivan substation >

 Upgrade Anchorage-area-sub-transmission/distribution substation and lines >

These upgrades are only required if the "High Load" forecast, which anticipates significant electrification, materializes in the Anchorage area coupled with the decommissioning of generation in the Anchorage area. The increased electrical demand would congest the downtown Anchorage transmission network. To prevent equipment overload and ensure continued reliability, the plan calls for reconductoring the local 115 kV lines to increase their thermal capacity and adding new transformers at key substations like in the south, east, and northern portions of the Anchorage area to handle the increased power flow.

3.4.2 Serving Anchorage-area Loads with Remote Generation

 Improve North-South Transfer Capacity Across Knik Arm >>

 These projects are primarily caused by the removal of generation from the core of Anchorage.

 Replace the 139 kV Undersea Cables >

 Reconductor Woronzof to International Overhead Lines >

 Add a 2nd Transformer from 230 to 138 kV at Pt. MacKenzie >

The RSTP had three diverse generation scenarios that assumed a significant amount of generation would be turned off within the core of Anchorage and Mat-Su areas. The

decrease of generation in the Railbelt's core load center(s) resulted in the need to improve transfer capacity across Knik arm and from Point Woronzof to International substations to unprecedented levels. Due to extremely high costs and changes in predictions of future resources, the TWG determined that transitioning away from generation located in the core of Anchorage and Palmer is extremely unlikely. The replacement and potential upgrades of the North-South 138 kV Knik arm crossing as well as the overhead transmission improvements of multiple lines between Point Woronzof and International and throughout the Anchorage bowl were de-prioritized due to their dependence on certain generation locations and sensitivity to high loads and HVDC termination options.

3.4.3 Serving Load-Growth in the Northern Region

- C** Improve Fairbanks-area Sub-Transmission System >>
 - C** Increase load serving capacity of the 69 kV sub-transmission system in Central Fairbanks >
 - C** Add a Transformer at Goldhill Substation >
 - C** Reconductor Fort Wainright to Carney 69 kV Lines >

The 69 kV sub-transmission network in the Northern Region is approaching the limits of how much load it can serve today. Given the moderate and high load growth scenarios forecasted for the 2050 Railbelt system, this sub-transmission network requires improvements and upgrades that will allow for higher thermal capacities either by reconductoring the existing 69 kV lines or via more significant upgrades to substations and transmission lines that increase the nominal operating voltage. Considering today's use of the sub-transmission network as alternative transmission paths, particularly under outage conditions, a higher nominal operating voltage for the existing sub-transmission network would be the most robust solution for the Central Fairbanks and Southeast GVEA portions of Northern Region.

3.4.4 Interconnecting New Renewable Facilities on the Kenai Peninsula

- C** Improve Northern Kenai Peninsula Transmission System >>
 - i** Multiple large wind and solar facilities are proposed between Soldotna and Bernice Lake near Puppy Dog Lake. The project listed below is dependent on the size and location of these proposed resources.
 - C** Build a new substation near Puppy Dog Lake >

These improvements are contingent upon the development of new, large-scale renewable projects proposed for the northern Kenai Peninsula, between Soldotna and Bernice Lake. The existing grid in this specific location does not have a suitable point of interconnection for these new generation facilities.

3.4.5 Interconnecting Large Synchronous Generation Plants Near Pt. MacKenzie

- C** Improve the Transmission System Near Beluga and Pt. MacKenzie >>
 - C** Upgrade the existing 139 kV transmission line between Beluga and Pt. Mackenzie substations >
 - C** Interconnect a large "Susitna Valley" synchronous generation plant West of Pt. MacKenzie >
 - C** Interconnect the Lake Lorraine Power Plant >

The transmission upgrades required in the Beluga and Point MacKenzie area are highly dependent on which of the 2050 generation scenarios become reality. For example, if a single, large synchronous power plant is built west of Point MacKenzie (the SSS scenario), its interconnection would require adding new 230 kV lines between the plant and Anchorage. Alternatively, if the future generation portfolio includes several distributed synchronous plants (the MSS scenario), a new substation would be needed to connect to a proposed plant at Lake Lorraine. These projects are therefore planned only in response to the specific type and location of large generation facilities that are ultimately chosen to power the Railbelt.

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Appendix – Railbelt History

- 1910-1940
 - U.S. Congress approves funds for the Alaska Railroad between Seward and Fairbanks.
 - Alaska Engineering Commission (AEC) builds 0.9 MW Steam Plant in Anchorage
 - Northern Commercial Company operates a small coal-fired steam plant in downtown Fairbanks serving mining interests in the region.
 - Anchorage Light and Power Company builds Eklutna Dam and Hydroelectric facility of about 1 MW.
- 1940-1960
 - In the decade between 1940 and 1950 Anchorage population increases from about 3,000 people to 47,000 people.
 - Matanuska Electric Association founded in 1941 to serve Matanuska and Susitna Valleys with first lines energized in 1943 served primarily by diesel generation.
 - Golden Valley Electric Association was founded in 1946 with a focus on serving rural developments and mining operation outside of downtown Fairbanks.
 - Chugach Electric Association founded in 1948 with a focus on serving outlying areas around Anchorage that the downtown utility did not already serve.
 - Fort Richardson interconnected to downtown Anchorage via a 69 kV line.
 - Department of Defense undergoes major electrification projects. 20-30 MW coal and nuclear generation plants were constructed at six major military bases throughout the Railbelt.
 - 30 MW Eklutna Hydro facility built by US Bureau of Reclamation
 - First 115 kV Transmission “Intertie” between Palmer, Anchorage, and Eklutna Powerhouse.
 - Alaska joins the U.S. as the 49th State in 1959.
- 1960 to 1980
 - Cooper Lake Hydroelectric project completed in 1961 helps serve Seward and the surrounding area.
 - Nikkels Power Plant commissioned in Downtown Anchorage (1962)
 - March 1964 – Great Alaska Earthquake (Magnitude 9.2) – Blackout and Associated utility damage stresses the importance of grid resiliency and wide-area emergency planning.
 - GVEA commissions coal-fired steam plant Healy Unit 1 (1967)
 - The 115 kV Intertie between the Kenai Peninsula and Anchorage completed. (1967)
 - First two Beluga River natural gas units online (1968)
 - Trans-Alaska Pipeline construction began in 1974 and was completed in 1977
 - Beluga Power Plant construction completed in 1974 along with transmission access – represents the largest natural gas plant in Alaska housing eight turbines and 385 MW of capacity.
 - Anchorage Municipal Light & Power commissions the first units in what is referred to today as the Sullivan Power Plant in Anchorage (1975)

- 1980 - 2000
 - Anchorage population measured at 185,000 people
 - Alaska Intertie was constructed (1984). The line was built to operate up to 345 kV and is nearly 170 miles long. The line dramatically improved the economic efficiency of the Railbelt by allowing the Northern region of the Railbelt (traditionally coal and diesel generation) access to cheap gas-fired generation in the Central region.
 - New 120 MW Bradley Lake hydroelectric plant and transmission lines energized (1991). The facility is shared by all four major electricity cooperatives that comprise the Railbelt.
 - Fort Knox Gold Mine Constructed near Fairbanks (1995-96)
 - Healy Clean Coal project (Healy Unit 2) completed (50 MW).
- 2000 – Present
 - GVEA Constructs the Wilson Battery (40 MW - 14 MWh) to improve transfer capacity along the 138 kV line(s) between Healy and Fairbanks. (early 2000s)
 - First utility scale wind farms in Alaska were constructed at Fire Island (17.6 MW) and Eva Creek (24.6 MW) (2012)
 - Railbelt utilities are beginning to replace older natural gas units with more efficient modern gas turbines at existing generation plants.
 - CEA and AML&P commission Southcentral Power Project (SPP) (183 MW) (2013)
 - MEA energizes the Eklutna Generating Station (EGS) (171 MW) (2015)
 - AML&P completed the new 120 MW Sullivan Combined Cycle Power Plant (Plant 2A) (2016)
 - Sterling to Quartz Creek Transmission Line Purchased by AEA (2020)
 - CEA purchases AML&P, and a power pool is formed between CEA and MEA (2020)
 - Construction completed on Alaska's largest solar farm to-date, Houston Solar Farm (8.5 MW) (2023)
 - Railbelt Reliability Council (RRC) established (2023)
 - CEA and MEA finish construction and commissioning of the International BESS (40 MW – 80 MWh) (2024)

Acknowledgements

This work was funded and sponsored by the Alaska Energy Authority (AEA). The report was the result of a collaborative effort between AEA and representatives from Chugach Electric Association (CEA), Golden Valley Electric Association (GVEA), Homer Electric Association (HEA), and Matanuska Electric Association (MEA). The Railbelt Reliability Council was also an integral member of the Technical Working Group.

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