

State of Alaska
Alaska Energy Authority, Rural Energy Group

CONCEPTUAL DESIGN REPORT



**KIPNUK
RURAL POWER SYSTEM UPGRADES**

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EXECUTIVE SUMMARY

This report has been prepared for the Alaska Energy Authority (AEA), Rural Energy Group. Its purpose is to provide the basis for a new power system with an associated schedule and cost estimate for the community of Kipnuk, Alaska.

The report includes a review of the existing power plant and power distribution system, an analysis of future needs, review and analysis of alternative energy sources, a conceptual design for meeting future energy requirements, a proposed project schedule, and a budget level cost estimate for the project.

The grantee for the proposed Power Plant will be the Kipnuk Traditional Council (KTC).

The existing power plant has a potential power generation capacity of 635 kW from three generators with individual capacities of 250 kW, 250 kW and 135 kW. At the time this report was prepared, the 135 kW generator was not in service and one of the 250 kW generators had a slow coolant leak. These existing power generators are located in a metal-sided wood framed building on a pile foundation. The existing power generation facility has a waste heat recovery system, providing heat for the Kugkaktlik Limited, Traditional Council and Power Plant offices. The community has had to ration power in recent years. Since the existing power plant is non-code compliant, it should be replaced.

As part of the development of this report, a site investigation was performed on February 8, 2007. During this investigation power system and potential Power Plant sites were inspected, and a meeting was conducted with representatives from the Kipnuk Traditional Council, Kipnuk Light Plant, Kugkaktlik Limited, Lower Kuskokwim School District, and interested persons from the community.

The site selection process involved reviewing pertinent public documents, consulting with community leaders, and conversations with government agencies. The result of these efforts was the selection of two sites for the proposed Power Generation Facility. One is near the existing power plant and the other is near the new Bulk Fuel Upgrade project. Both selected sites are within Section 3, Township 3 South, Range 86 West, Seward Meridian, Alaska. A heat recovery system can be installed at either site to benefit the Kugkaktlik Limited, Traditional Council and Power Plant offices building.

The proposed building is a pile supported, metal structure, measuring 36 feet by 48 feet. A new, 12,000 gallon, intermediate tank would be installed inside the new Bulk Fuel Upgrade project to provide the proposed plant with fuel storage. The tank would have the overflow piping from the day tank inside the powerhouse to the intermediate tank.

A power generation capacity of 1,200 kW is recommended for the proposed Power Plant. The generators and their sizing will allow the plant to meet the power needs of the entire community for the next ten years, allowing handling of the projected peak load after losing the single largest generator loss of the total generating capacity. The plant will be designed to allow the plant's electrical generation capacity to be increased if the community's growth exceeds the estimated growth rate used to size the plant.

The total budget level cost estimate for the proposed Power Plant is \$3,226,776. This estimate includes the costs for: design, construction administration, permitting, legal and insurance costs, construction costs and a 15% construction contingency.

The total cost estimate for upgrades to the existing electrical distribution system is \$470,681. This estimate includes the costs for: design, construction costs, quality assurance during construction, facility as-built documentation and construction contingency.