NATIVE VILLAGE OF KOTZEBUE
Nikaitchuat Iḷisaġvait and Administrative facility
Project Proposal

The Native Village of Kotzebue's new facility represents a significant advancement in sustainable design, tailored to the harsh Arctic environment of Northwest Alaska. Here's a breakdown of the key aspects:

Geographic Location

- **Region:** Northwest Alaskan coast, above the Arctic Circle.
- **Access:** Limited to barge transport during the short summer season and air travel during the severe winter months.
- **Climate:** Extreme Arctic conditions with very cold winters, limited daylight in winter, and high energy needs due to low temperatures.

Project Purpose/Risk/Need

1. **Purpose:**
    - **Energy Independence:** Achieve Net Zero energy usage to significantly reduce reliance on oil for heating and electricity.
    - **Sustainability:** Minimize environmental impact through renewable energy sources and advanced energy-efficient technologies.
    - **Cost Efficiency:** Reduce high energy costs associated with diesel-powered utility systems in the region.
2. **Risk/Challenges:**
    - **Extreme Cold:** Designing for efficient heating with severe Arctic temperatures.
    - **Limited Resources:** Challenges related to transporting materials and maintaining the facility due to limited access during winter.
    - **Energy Supply:** Ensuring reliable energy sources in a region where sunlight and wind availability vary significantly.
    - **Operational Costs:** Mitigating the high costs of traditional energy sources and reducing reliance on diesel generators.
3. **Needs Addressed:**
    - **Energy Efficiency:** Incorporating technologies like a comprehensive solar panel array and waste heat recovery from local diesel generators.
    - **Heating:** Utilizing advanced thermal insulation and heat pumps to maintain comfort and efficiency.
    - **Environmental Impact:** Using renewable materials and environmentally friendly features to align with the community's sustainability goals.

Summary

The facility's design addresses the unique challenges of its Arctic location through a combination of innovative energy solutions, sustainable practices, and a focus on self-sufficiency. By

prioritizing energy independence and efficiency, the project aims to provide a model for adapting to extreme environmental conditions while minimizing ecological impact and operational costs.

The Native Village of Kotzebue's new facility represents a pioneering effort in sustainability and energy efficiency, specifically designed to meet the extreme Arctic conditions of the Northwest Alaskan coast, above the Arctic Circle. This state-of-the-art building aims to achieve Net Zero energy usage, dramatically reducing reliance on oil for both heating and electricity amidst the unique logistical challenges of the region.

In this remote location, where access is limited to barge transport during the brief summer months and air travel during the harsh, frigid winter, the facility has been engineered to maximize energy independence. To address the high costs of electricity, which is primarily generated by diesel-powered utility systems, the building is equipped with a comprehensive solar panel array. This renewable energy source is strategically placed to harness as much sunlight as possible despite the limited daylight hours in winter.

Heating is a critical consideration given the extreme cold. The facility will predominantly rely on waste heat from the nearby power plant’s diesel generators, situated across the street. This waste heat will provide an efficient and cost-effective solution to maintaining warmth during the long Arctic winters. Additionally, the building features advanced thermal insulation with R-60 insulated walls, an R-100 insulated roof, and arctic-grade windows to ensure minimal heat loss.

To complement these systems, highly efficient heat pumps will serve as a backup heating source. These pumps will be utilized when the local utility’s wind turbines are operational, taking advantage of wind-generated electricity and reducing dependence on generator waste heat. This approach not only optimizes energy use but also aligns with the community’s goal of minimizing fossil fuel reliance.

The facility’s commitment to self-sufficiency extends to its use of renewable building materials, LED lighting, low-flow water fixtures, and highly efficient electrical motors for mechanical equipment. These environmentally responsible features collectively support the building’s Net Zero energy objective, contributing to substantial reductions in operating costs and environmental impact. By integrating these diverse strategies, the facility sets a new standard for sustainable development in Arctic regions, demonstrating how innovative design and technology can overcome extreme environmental challenges while fostering long-term resilience and independence.

I. Objectives

1. **Achieve Net Zero Energy Usage**: Design and construct a facility that produces as much energy as it consumes over the course of a year, reducing dependence on fossil fuels and minimizing operational costs.
2. **Enhance Heating Efficiency**: Utilize waste heat from the nearby diesel generators and efficient heating systems to maintain comfortable indoor temperatures during the extreme Arctic winter.

3. **Maximize Renewable Energy Integration**: Incorporate solar panels and wind turbine-generated electricity to offset the high cost of diesel-generated power.
4. **Ensure Sustainability in Design**: Implement best practice energy-saving measures and use renewable materials to minimize environmental impact.
5. **Adapt to Arctic Conditions**: Address the unique logistical and environmental challenges of building in a remote Arctic location.

II. Methods

1. **Energy Generation and Storage**:
    - Install a comprehensive array of solar panels to capture renewable energy.
    - Integrate a system to harness waste heat from the adjacent power plant's diesel generators.
    - Utilize heat pumps as a backup heating source, especially when wind turbine-generated electricity is available.
2. **Building Envelope and Insulation**:
    - Construct walls with R-60 insulation and a roof with R-100 insulation to maximize thermal efficiency.
    - Install arctic-grade windows to reduce heat loss.
3. **Sustainable Features**:
    - Use renewable building materials where possible.
    - Implement LED lighting, low-flow water fixtures, and highly efficient electrical motors for mechanical equipment.
4. **Logistical Considerations**:
    - Plan for barge delivery of materials during the summer months and air transport during winter to accommodate the remote location.
    - Design for durability and energy efficiency in extreme cold and limited daylight conditions.

III. Timeline

1. **Planning and Design Phase** (Months 1-3):
    - Conduct site analysis and finalize design plans.
    - Obtain necessary permits and approvals.
2. **Procurement and Preparation Phase** (Months 4-6):
    - Order materials and equipment, considering transportation logistics.
    - Prepare construction site and infrastructure.
3. **Construction Phase** (Months 7-15):
    - Begin building construction, focusing on the building envelope and energy systems.
    - Install solar panels, insulation, and other key components.
    - Integrate renewable energy systems and efficient heating solutions.
4. **Testing and Commissioning Phase** (Months 16-18):
    - Test all systems for functionality and efficiency.
    - Conduct performance evaluations to ensure Net Zero energy goals are met.
5. **Final Adjustments and Handover** (Month 19):

- Make any necessary adjustments based on testing results.
- Officially hand over the facility for use.

IV. Deliverables

1. **Completed Facility**:
   - A fully constructed, energy-efficient building designed for Net Zero energy usage.
   - Installation of solar panels, heat pumps, and other energy systems.
2. **Documentation**:
   - Detailed design plans and energy models.
   - Records of material procurement and construction processes.
   - Performance testing results and energy usage reports.
3. **Operational Guidelines**:
   - Manuals and guidelines for maintaining and operating the building's energy systems.
   - Training materials for facility staff on energy management and system use.

V. Expected Results/Resilience Benefits

1. **Reduced Operating Costs**:
   - Significant decrease in energy expenses by minimizing reliance on expensive diesel fuel and maximizing renewable energy sources.
2. **Enhanced Energy Independence**:
   - Lower dependence on external energy sources, contributing to energy security and stability in the remote Arctic location.
3. **Improved Environmental Impact**:
   - Reduction in greenhouse gas emissions and environmental footprint through the use of renewable energy and sustainable materials.
4. **Increased Resilience to Arctic Conditions**:
   - A building designed to withstand extreme cold and limited daylight, ensuring reliable performance and comfort year-round.
5. **Community Leadership**:
   - Positioning the Native Village of Kotzebue as a leader in sustainable building practices and environmental stewardship in Arctic regions.

Feasibility

I. Preparedness Level

1. **Site Assessment and Design Readiness**:
   - **Site Analysis**: Comprehensive analysis of the building site, including geological, environmental, and logistical factors. This ensures the design accommodates Arctic conditions and maximizes energy efficiency.
   - **Design Plans**: Finalized architectural and engineering designs that incorporate energy-saving measures, renewable energy systems, and climate-resilient materials.

2. **Resource Availability**:
    - **Material Procurement**: Identified and secured suppliers for renewable building materials and energy systems. Consideration of the remote location ensures that materials are either available locally or can be transported efficiently.
    - **Logistics Planning**: Detailed logistics plan for transporting materials by barge during the summer and by air during the winter, addressing potential delays and supply chain issues.
3. **Technical Readiness**:
    - **Technology Integration**: Selection of proven technologies for solar panels, heat pumps, and insulation materials that are suited to Arctic conditions.
    - **Training**: Preliminary training plans for facility staff on operating and maintaining energy systems, ensuring that the team is ready for the facility's commissioning.

II. Project Management Capacity or Plan

1. **Project Team**:
    - **Leadership**: Experienced project manager with a track record in managing large-scale construction projects, particularly in remote or challenging environments.
    - **Specialized Expertise**: Inclusion of specialists in energy efficiency, Arctic construction, and renewable energy systems.
2. **Project Plan**:
    - **Detailed Schedule**: A comprehensive timeline that outlines each phase of the project, including planning, procurement, construction, testing, and handover.
    - **Budget Management**: Clear budget with contingencies for unexpected costs, ensuring financial control throughout the project.
    - **Risk Management**: Identification of potential risks related to the remote location, such as supply chain disruptions and extreme weather conditions, with mitigation strategies in place.
3. **Stakeholder Engagement**:
    - **Community Involvement**: Regular communication with local stakeholders, including the Native Village of Kotzebue and other relevant parties, to ensure alignment with community needs and expectations.
    - **Partnerships**: Collaboration with local contractors, suppliers, and experts to leverage regional knowledge and resources.

III. Permitting

1. **Regulatory Requirements**:
    - **Local Permits**: Securing necessary permits from local authorities for construction, environmental impact, and energy systems. This includes compliance with codes and regulations specific to Arctic conditions.
    - **Environmental Impact Assessment**: Completion of an assessment to evaluate and mitigate the environmental impact of the construction and operation of the facility.
2. **Utility Approvals**:

- **Energy Systems**: Obtaining approvals for the integration of renewable energy systems, including solar panels and heat pumps, from local utility providers and regulatory bodies.
- **Waste Heat Utilization**: Ensuring that the use of waste heat from the adjacent power plant is approved and coordinated with the power plant operators.

3. **Logistical Approvals**:
   - **Transport Permits**: Arranging for permits related to the transportation of materials by barge and air, considering the remote and seasonal access limitations.
   - **Construction Access**: Coordinating with relevant authorities to ensure access to the site for construction equipment and personnel, especially during challenging weather conditions.