Project Snapshot:

Solar Photovoltaic Case Study in Alaska’s Northwest Arctic Borough

This study investigated the uses of renewable solar energy in Alaska’s Northwest Arctic Borough (NAB). Using data from existing projects in this region and performing economic analysis, this case study documents lessons learned and may aid in future decision making regarding solar installations in arctic regions.

Project Location

The Northwest Arctic Borough (NAB) borders on Kotzebue Sound in the northwestern part of Alaska. It contains 11 rural Native villages and has a population of around 7,500 residents, most of them living in the region’s hub, Kotzebue. With no road system in the region, access into and out of these villages is by small planes, with Kotzebue as the point of access.

Project Background

Power for NAB’s rural villages is produced exclusively by diesel generators. Since there is no road system on which to transport fuel for the generators, all the fuel is flown in by small plane or barged in if the river is high enough, resulting in extremely expensive electricity in these small villages. In addition, there are also environmental hazards, such as airborne pollutants and fuel spills, associated with these inefficient diesel generation systems.

Two of the largest contributors to the villages’ power consumption are the water and sewer facilities. To help reduce both the use of diesel fuel and environmental hazards, solar photovoltaic (PV) arrays were constructed in six of the rural villages in 2013. These solar photovoltaic systems, which cost roughly $55,000 each to install and were funded by a Coastal Impact Assistance Program grant, were designed to offset the power load of the water and sewer facilities in each village.

All of the installed PV arrays were stationary, with an average capacity of 10 kW. Configurations were arranged to have panels pointing east, south and west in order to generate steady electrical power through the long summer days (24 hours for most of June). The goal was to provide 100% of the water and sewer plants’ power during daylight hours.
Results

The first installation, in Ambler, has already yielded nearly two years of data. The main solar-producing months are March through August, with minimal solar production from September through February. Based on the 25-year guaranteed output of the panels, the projected lifetime energy savings is $108,205, while offsetting 12,525 gallons of fuel. Taking into account expected yearly fluctuations in solar production due to weather, the installation payback is approximately 12.5 years.

Recommendations

When implementing a solar project in a remote arctic region, there are numerous logistical challenges and considerations. Construction costs are quite high since all materials must be flown into the villages. For instance, from the estimated $55,000 cost for each NAB system, $22,000 was used to cover travel expenses, freight and labor. It is important to allow time to secure project funding since there currently is limited investment in Alaska’s solar infrastructure.

Placement of solar arrays is also important to consider. Roof mounts and circular arrays are good options for ease of installation and security, providing the roofs are strong enough and the communities have the correct installation equipment. As solar technology continues to improve and decrease in price, these types of systems may become an integral part of renewable energy initiatives in rural Alaska villages.

The initial results from the other five villages are also promising. Despite some data gaps resulting from connection issues, the total electric savings was $23,345, with 2,308 gallons of fuel offset. So far, these systems have proved to be effective in producing power during the spring and summer, lowering the cost of running the water and sewer treatment plants and also eliminating a portion of the environmentally hazardous emissions. The remaining five villages are scheduled to receive PV installations in the near future.