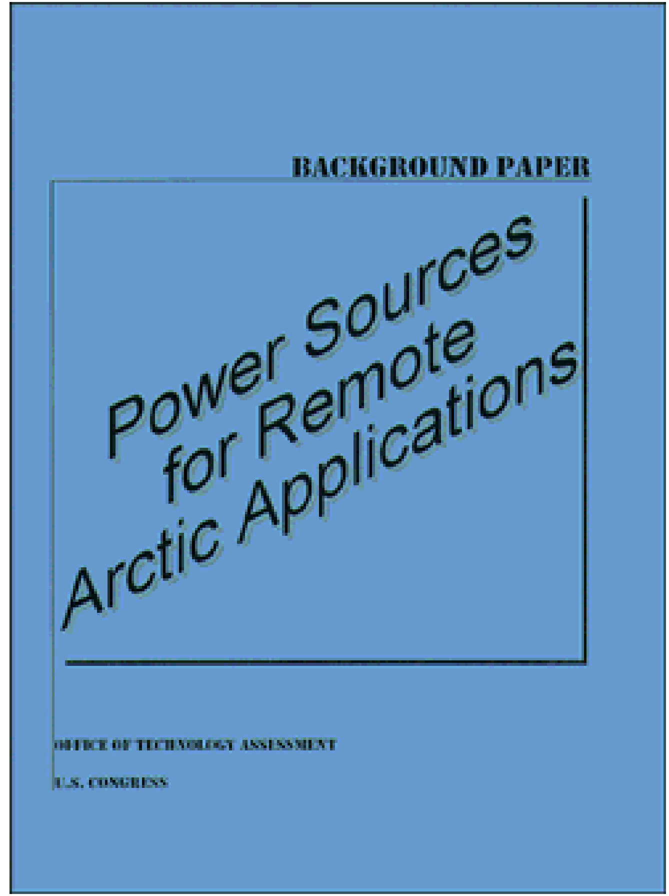
Power Sources for Remote Arctic Applications

June 1994

OTA-BP-ETI-129
NTIS order #PB94-193232



Recommended Citation: U.S. Congress, Office of Technology Assessment, *Power Sources for Remote Arctic Applications, OTA-BP-ETI 129* (Washington, DC: June 1994).

Foreword

The U.S. Air Force operates a seismic observatory at Burnt Mountain, Alaska to assist in nuclear treaty verification. This unattended station --consisting of five sites clustered within a 1.5 mile radius--is located in a remote area north of the Arctic Circle, approximately 50 miles from the nearest villages. The seismic monitoring and data communications equipment at the station require low, but very reliable, power. Currently, the power comes from 10 radioisotope thermoelectric generators (RTGs), each containing between 1.2 and 3.9 pounds of Strontium 90, a highly radioactive material.

In August and September 1992, a tundra fire at Burnt Mountain damaged some of the data cables connecting the sites. Though the fire did not impinge on the monitoring, communications, and power equipment at the sites, it raised public concern among the nearby populations about the safety of using radioactive material as the power source at the sites. Senators Stevens and Murkowski of Alaska asked OTA to evaluate alternative power technologies for the site. Senator Stevens is a member of the Senate Committee on Commerce, Science, and Technology, among others; Senator Murkowski is a member of the Senate Committee on Energy and Natural Resources, among others. OTA examined the safety of the RTGs at Burnt Mountain and assessed the viability and risks of two alternative power sources--thermoelectric generators and photovoltaic (PV) systems--for the station.

This background paper concludes that continued use of the RTGs at Burnt Mountain entails low risk for the safety of maintenance workers and local populations and for the environment. Installation of lightning protection devices and intrusion detection devices at the station would lower the risk further still. If the RTGs were required to be removed immediately, the only viable replacement power source would be a propane-fueled thermoelectric generator system. The principle risk of this type of system is the transport and storage of the roughly 5,000 pounds of propane that would be needed each year. If the RTGs could be tolerated at site for three or four more years or longer, other power technologies may prove feasible. At present, a PV system appears to be the most viable nonfuel power source. A PV prototype system would need to be tested at the site to prove the technology's cold weather and low sunlight performance. The safety and environmental risk of using PV system at the site is possible release of toxic fumes and heavy metals from the batteries.

OTA appreciates the assistance received from several individuals and organizations in the course of this study. To all of them goes the gratitude of OTA and the personal thanks of the project staff.

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