

Contents

Chapter 1- Summary 1

Air Force Findings 2

OTA Findings 3

Conclusions 5

Chapter 2- Background 7

Equipment and Operations 8

Radioisotope Thermoelectric Generators 11

Strontium-90 Fuel 12

Location and Climate 13

Chapter 3- Evaluation Criteria 17

Reliability 17

Safety and Environment 18

Cost 18

Chapter 4- Power Source Equipment: Cost and Reliability 19

Radioisotope Thermoelectric Generators 19

Propane-Fueled Thermoelectric Generators 20

Photovoltaics 23

 Stand-Alone PV Power System (PV/Battery) 26

 Hybrid Power System (PV/TEG) 27

 Reliability 27

Summary of Costs and Reliability 28

Chapter 5- Power Source Equipment: Safety and Environmental Assessment 31

Radioisotope Thermoelectric Generators 31

 Licenses and Emergency Plans 32

 Accident Scenarios 34

Propane-Fueled Thermoelectric Generators 37

 Accident Scenarios 38

Photovoltaics 39

Conclusions 39

(Continued on page vii)

(Continued from page vi)

Figures

- Figure 1-1 Timeline of Power Options for the Burnt Mountain Seismic Observatory 4
- Figure 2-1 Layout of Burnt Mountain Seismic Observatory Showing Distances Between Equipment 9
- Figure 2-2 Configuration and Measured Power Requirements of Equipment at Burnt Mountain Seismic Observatory 10
- Figure 2-3 Map of Alaska Showing the Location of the Burnt Mountain Seismic Observatory and Nearby Communities 14
- Figure 4-1 Schematic of a Typical RTG Used for Terrestrial Applications 21
- Figure 4-2 Solar Balance for a Hypothetical PV Array in an Arctic Location 25

Tables

- Table 2-1 RTG Models, Power Demand, and Estimated Replacement Dates 12
- Table 2-2 Climate Conditions at Fort Yukon 15
- Table 4-1 Characteristics of the RTGs at Burnt Mountain 22
- Table 4-2 Examples of Photovoltaic Power Systems Used in Cold Regions 24
- Table 4-3 Summary of Costs of TEG and PV Power Sources as Estimated by the Air Force 29

Appendix A - Acronyms 42