

**Burnt Mountain Alaska
RTG Extraction, Transport and Disposal Project - 17359**

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ABSTRACT

The Air Force Technical Applications Center (AFTAC), headquartered at Patrick Air Force Base (AFB), Florida, removed excess nuclear material from one of the center's seismic arrays on Burnt Mountain, Alaska, after nearly 15 years of inoperability, and transferred it to a the low-level waste disposal facility at the Nevada National Security Site (NNSS). Ten radioisotope thermoelectric generators (RTGs), were used as a power source by AFTAC at its array 97 kilometers (60 miles) north of the Arctic Circle. [1] Originally placed on Burnt Mountain in 1973, the first RTG was installed to power a single seismometer. Twelve years later, due to the increase in communications equipment and demand for additional power, nine more RTGs were placed at the site.

For the next 17 years, the RTGs were operated and maintained by AFTAC's Detachment 460 based at Eielson AFB near Fairbanks, Alaska, and were used because of their high reliability and low maintenance requirements to determine if regional seismic activity was caused by nuclear explosions or naturally-occurring events such as earthquakes, volcanic activity, etc. AFTAC's primary mission is to verify compliance with nuclear test ban treaties. In 1992, a tundra fire encroached on the Burnt Mountain site and damaged some of the data cables. Despite the fact the fire did not impact the generators themselves, it raised public concern among nearby inhabitants about the safety of using radioactive material as a power source at the station. The Air Force, in coordination with multiple agencies and mission

partners, made the decision to remove the RTGs and relocate them to NNSS for permanent disposal.

INTRODUCTION

The 10 RTGs were extracted from storage in Alaska and shipped to the NNSS for permanent disposal during a 3 week campaign in July 2015. The RTGs were extracted from their remote storage locations and staged at Eielson AFB where inspections and leak tests were performed and then flown to Creech AFB and transported by truck to the NNSS. A Department of Defense Certificate of Equivalency for transportation was used to transfer the RTGs from Alaska to Gate 100 at the NNSS. At Gate 100, the ownership was transferred to Department of Energy (DOE) and the RTGs were transported to Area 5 under a DOE Certificate of Compliance and transportation exemption. Sandia acted as the certified waste generator for the disposal of the RTGs. The impact of the Strontium (Sr) 90 inventory on the Area 5 RWMS long-term performance was evaluated and determined to have no significant effect. Heat management criteria was met with specified disposal conditions including spacing requirements. All 10 of the RTGs arrived at Area 5 and were permanently buried the same day.

DISCUSSION

RTGs are manufactured self-contained power sources for remote sites. Sr-90 provides the heat for power generation via the thermoelectric effect. RTGs are used in remote applications where small amounts of highly reliable, low-maintenance power are required. The first Sentinel RTG was installed at Burnt Mountain, Alaska, an AFTAC seismic monitoring outpost, in 1973 and nine additional ones were installed in 1985.

The need to remove the RTGs at Burnt Mountain arose from local concerns about the 142 square kilometer (55 square miles) tundra fire that caused damage to data cables at the facility in 1992. Although there was no damage or release of radioactive material from the RTGs, residents were alarmed and speculated about the potential for radioactive contamination should the RTGs be damaged by fire or other mishap. In response to these concerns, the Air Force installed an alternate power source at Burnt Mountain in 2000. The RTGs have been in storage at Burnt Mountain since then.

The Air Force, in coordination with multiple agencies and mission partners, made the decision to remove the RTGs and relocate them to NNSS for permanent disposal. By regulation, radioactive material determined to be excess must be moved to a facility with a mission, capability and authorization to support long-term storage, disposal or recycling of the material.

After two years of planning and a dry run in the summer of 2013, relocation operations began in July 2015 and were based out of Eielson AFB. Personnel from AFTAC's Florida headquarters, Alaska's Detachment 460, the Air Force Inspection Agency, the Air Force Radioisotope Committee, Air Force Radiological Disposal, Nuclear Regulatory Commission and Sandia National Laboratories formed the cadre that ferried the RTGs from Burnt Mountain to Eielson via U.S. Army helicopters based at Fort Wainwright in Fairbanks.

Each day, two CH47 Chinook helicopters transported the crew from Wainwright to Burnt Mountain. The chinooks were chosen because of their heavy lift capabilities. A single CH47 is able to transport 33 troops and their gear, or three pallets of cargo, or a single sling load, or a combination of the three up to 11,793 kilograms (kgs) [26,000 pounds (lbs)].

The 10 RTGs were located at five different sites within 6.5 kilometers (four miles) of each other. Much of the terrain was rocky, pitched and covered in heavy brush, making movement somewhat challenging. At two of the sites, the crew had to lay several yards of modular interlocking surfacing to help shore up the ground as the RTGs were transferred to the helicopters. The weather was the predominant issue that had to be overcome in addition to the very rugged terrain at some of the mountain sites.

Each of the RTGs contained 0.5 to 1.3 Kgs (1 to 3 lbs) of Sr-90, fashioned like hockey pucks and surrounded by tungsten and cast iron shielding. [2] With the vessels weighing 1,814 kgs (4,000 lbs) apiece, they had to be loaded on Chinook helicopters and airlifted from five locations on Burnt Mountain to Eielson for the flight to Creech.

Once all the RTGs were recovered and shuttled to Eielson, a C-17 Globemaster III was dispatched to the base for transport from Alaska to Nevada. Each pallet carrying one RTG was forklifted onto the military aircraft and carefully strapped down for safety during transport. Figure 1 shows the RTGs loaded in the C-17. The C-17, which was based out of Joint Base Elmendorf-Richardson in Anchorage, Alaska then flew to Creech AFB, Nevada, northwest of Las Vegas. The RTGs were loaded onto ground vehicles provided by Nellis AFB and driven to NNSS, where they were accepted by personnel from the U.S. Department of Energy for permanent disposal at NNSS.



Fig. 1 RTGs loaded in the C-17 for transport from Alaska to Nevada

Experts from Sandia's Waste Management and Pollution Prevention Division began working in collaboration with DOE and the US Air Force to dispose of the RTGs in 2001. While the project had been delayed for various reasons, the plan finally came together this July 2015 when the RTGs were transferred from the remote Arctic site to an underground disposal facility at NNSS. The RTG transport plan is illustrated in Figure 2.

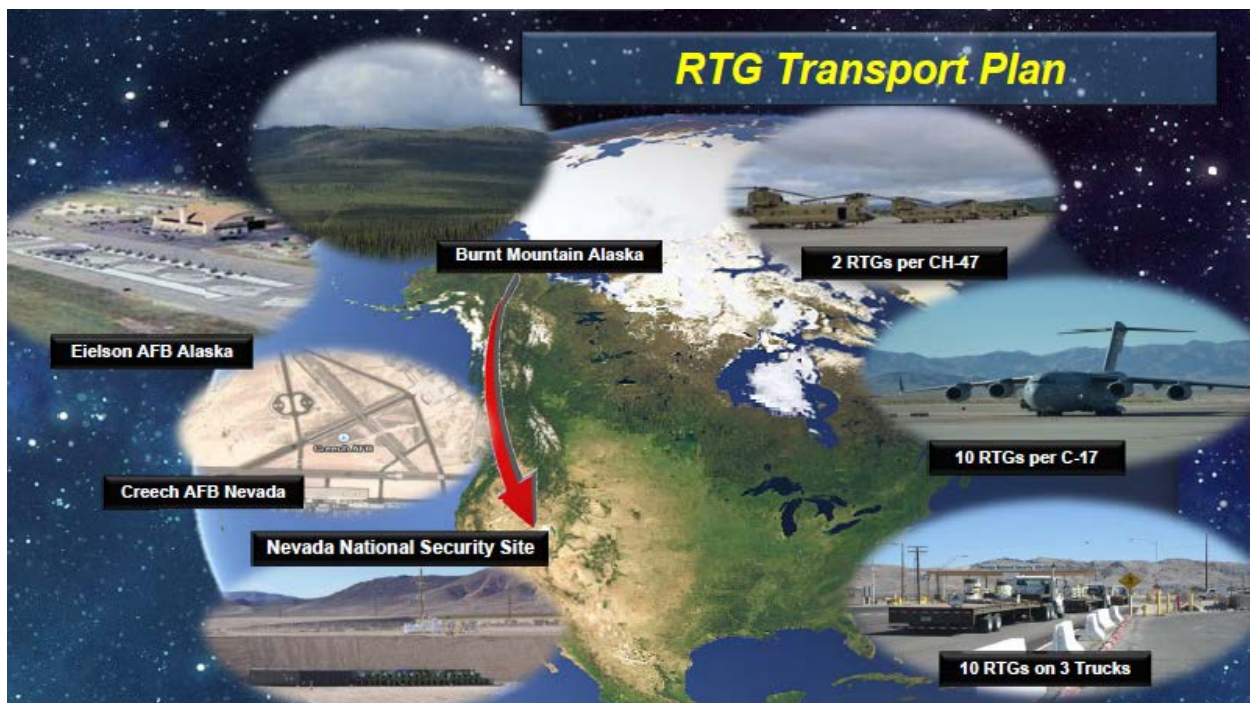


Fig. 2 RTG Transport Plan

By regulation, radioactive material determined to be excess must be moved to a facility with a mission, capability, and authorization to support long term storage or recycling of the material. The NNSS is the only DOE owned and operated facility that can accept this type of material. However, in order to ship and dispose of waste at the NNSS, you must be an entity with an approved Waste Certification Program. For the Burnt Mountain RTGs, Sandia acted as the Waste Certification Official and were the official shippers of record once DOE accepted ownership of the RTGS via the Offsite Source Recovery Project at Gate 100.

CONCLUSIONS

The Air Force, in coordination with multiple agencies and its mission partners, made the decision to remove the RTGs and relocate them to NNSS. This was a team



effort from start to finish. This was the largest movement of non-weapons grade nuclear material in the Air Force inventory. The extraction, movement and disposal was an incredibly intricate and complicated mission, requiring detailed planning and precise mission execution. The RTGs in their final disposal location at the NNSS is shown in Figure 3. The mission involved corporation and teamwork from the multiple Air Force bases in Alaska, Nevada and Florida, Department of Energy National Nuclear Security Administration and Environmental Management, Nuclear Regulatory Commission, Off-Site Source Recovery Program managed by Los Alamos National Laboratory, Sandia National Labs and National Security Technologies (NSTec). The mission was a complete success.

Fig. 3 RTGs Disposal at the NNSS

REFERENCES

1. Susan A Romano, AFTAC Public Affairs, Air Force Removes Nuclear Excess from Alaska, published July 31, 2105
2. Karli Massey, Sandia National Laboratory, Removing excess nuclear waste from Alaska, Thursday, published October 15, 2015

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