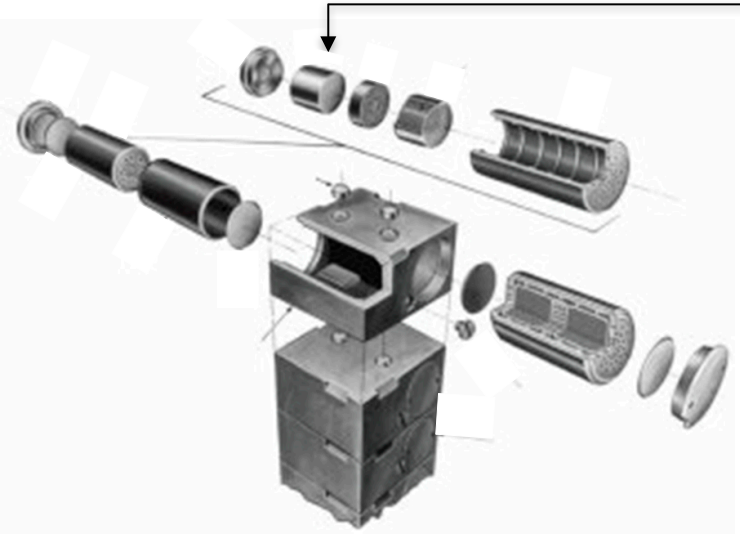
Radioisotope Thermoelectric Generators for Deep Space Science Missions

Overview of Plutonium Fuel

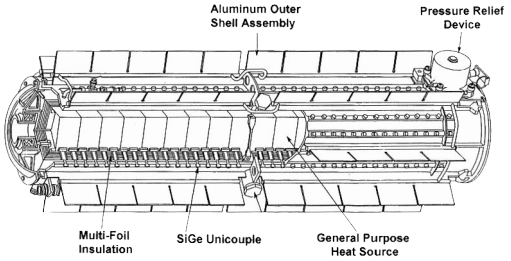


GPHSs

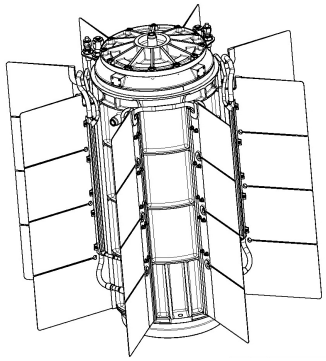
Pellets, clads, fuel capsules

RTGs for NASA – *Reference RTGs*

Acronym	Definition	Descriptions	Power/GPHS	Th, °C
GPHS-RTG	General-Purpose Heat Source RTG	This RTG was designed to operate in vacuum only. It was flown on PNH, Cassini, and other missions. Not a modular system.	290/18	1000
MMRTG	Multi-Mission RTG	Operates in vacuum and atmosphere. Flown on the Curiosity rover. Not a modular system.	110/8	530



GPHS RTG

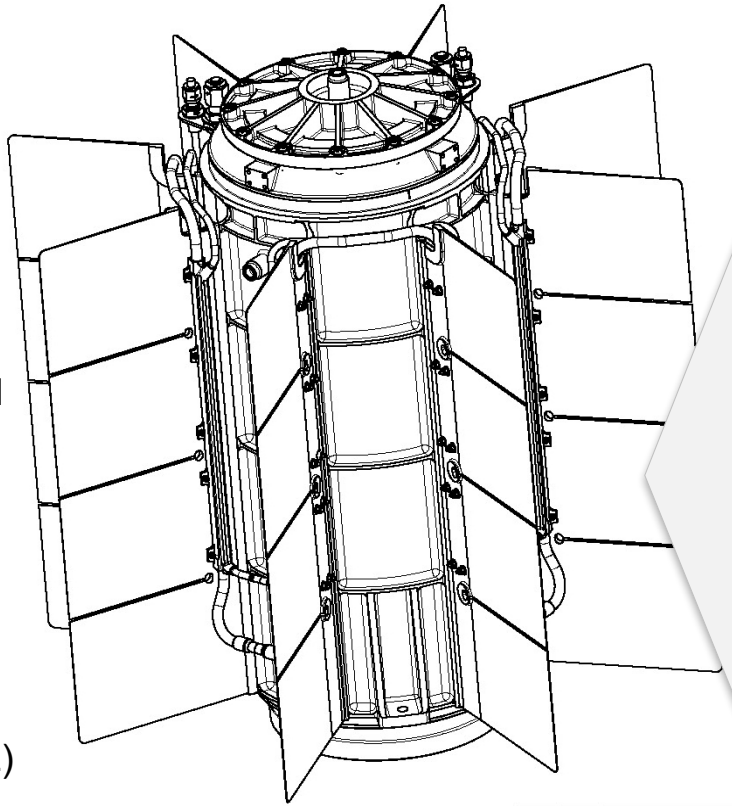


MMRTG

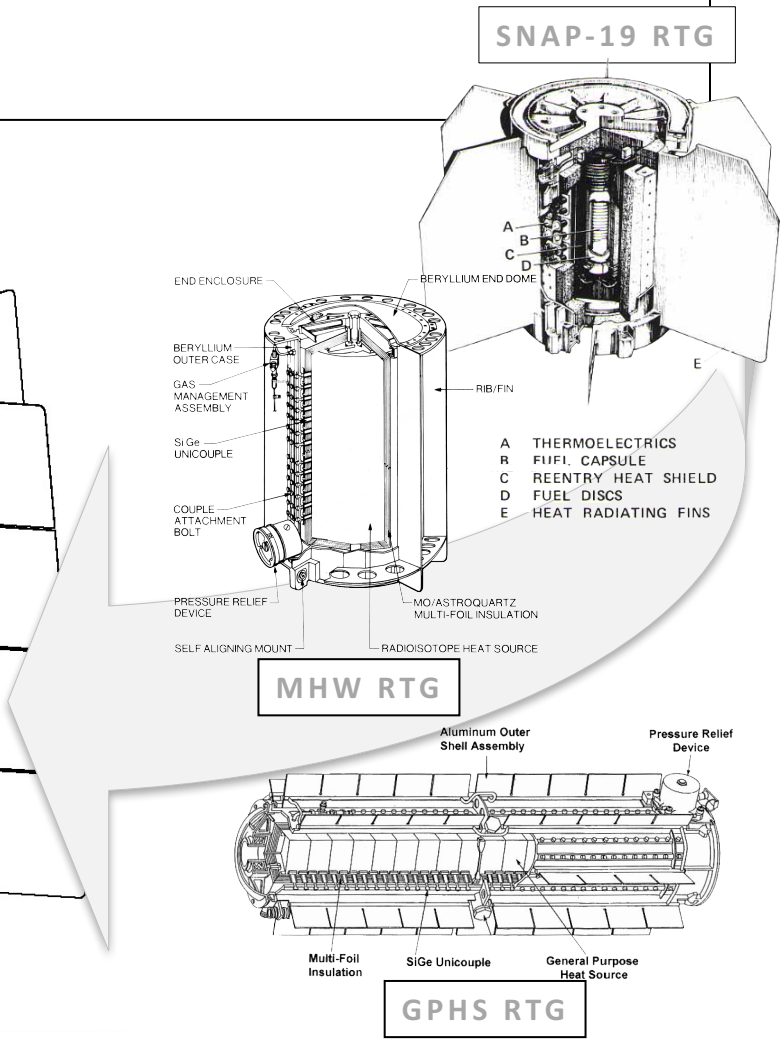
RTG Primer

- *Converts heat produced from the decay of plutonium into quiet DC power.*
- *The DOE has produced a variety of RTGs that have been designed and flown over the last 5 decades by NASA.*
- *Only the MMRTG can be procured today.*

- No moving parts
- An MMRTG weighs approximately 45 kg and produces 110W at launch.
- Operates in vacuum and planetary atmospheres.
- Thermal output is ~1880Wth, BOL.
- Estimate ~90 Welec at Europa (7 yrs. after BOL)

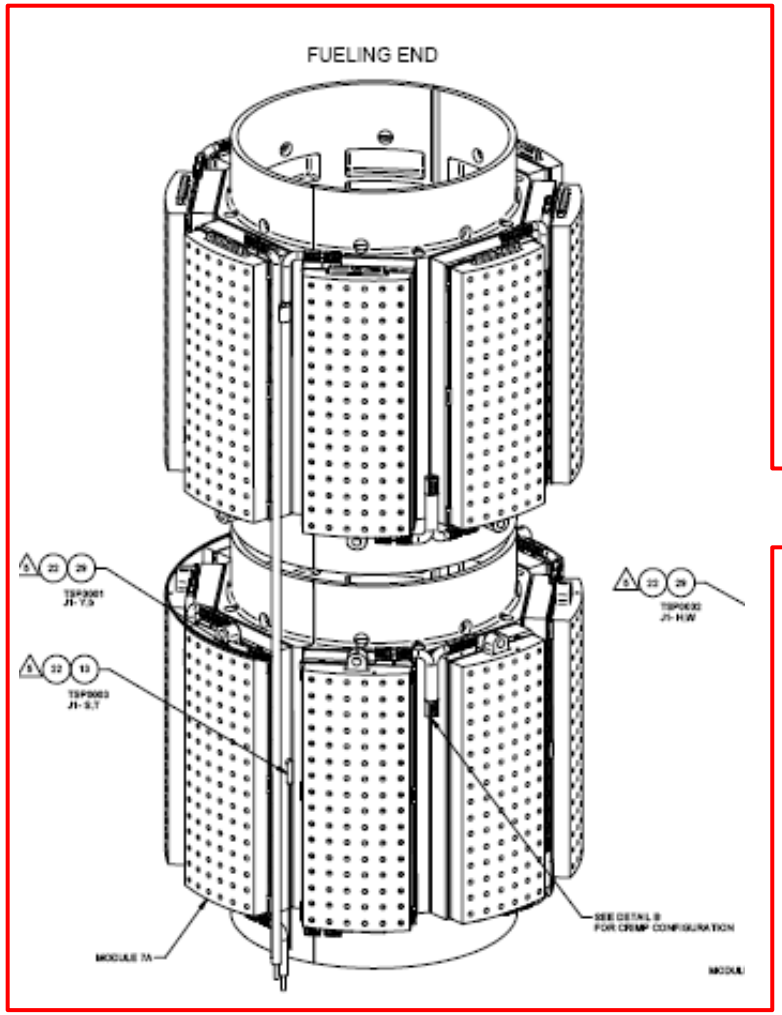


MMRTG

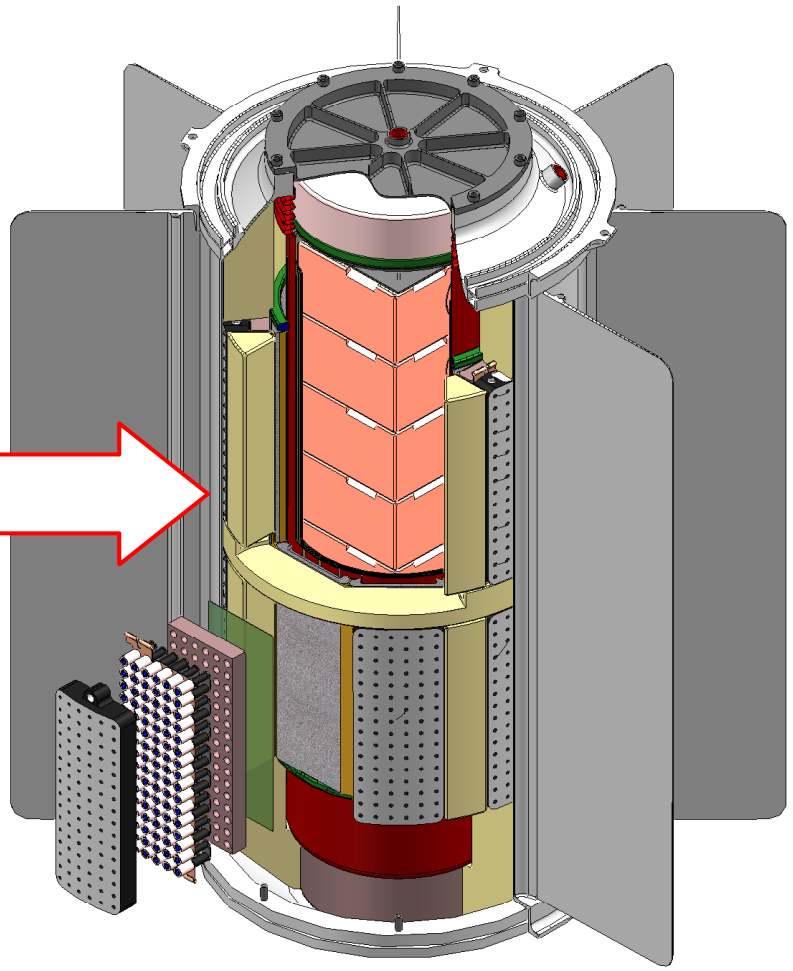


RTG – Radioisotope Thermoelectric Generator

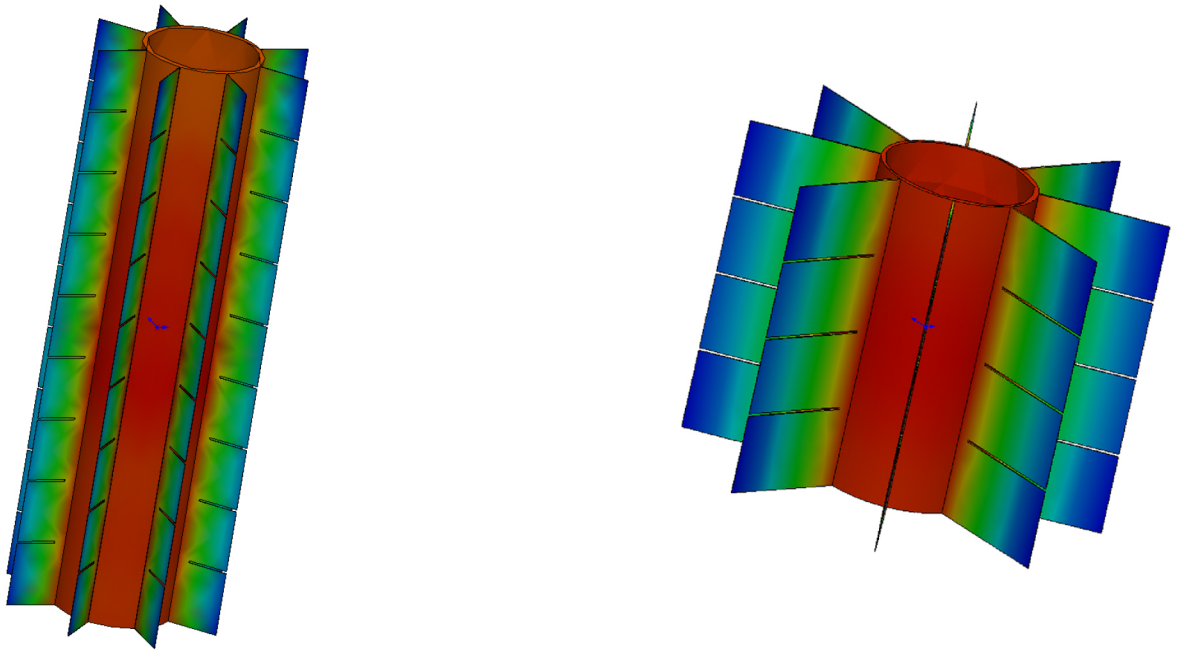
MMRTG Core



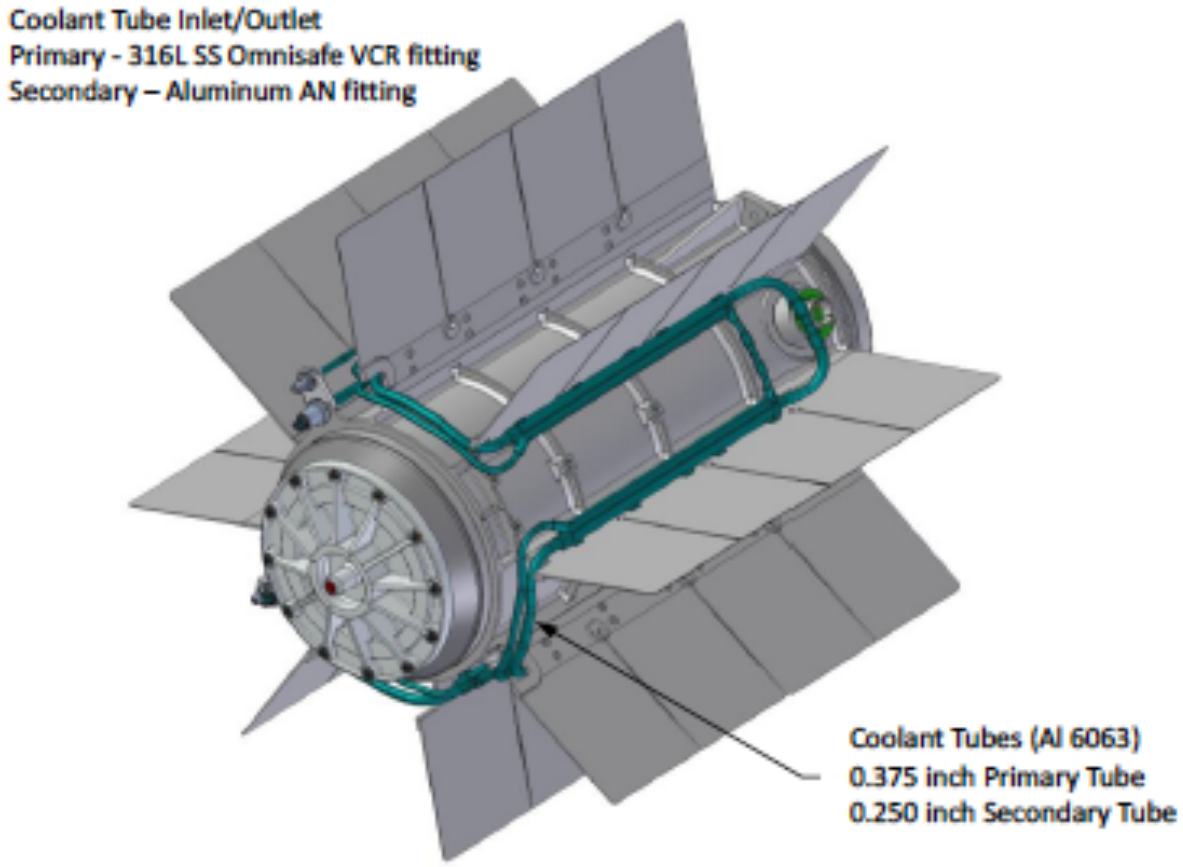
MMRTG Cutaway



RTG Heat Distribution



Thermal Loops to Move Heat



Planetary Protection

- Self-sterilizing in large part in room temperature air
  - Only coldest edges on fins are not self-sterilizing
  - These can be easily cleaned
- Housing temperature will drop below freezing within 60 years on an icy moon or ocean world such as Europa
  - RTGs will *not* provide a permanent heat source for life on icy moons or other bodies