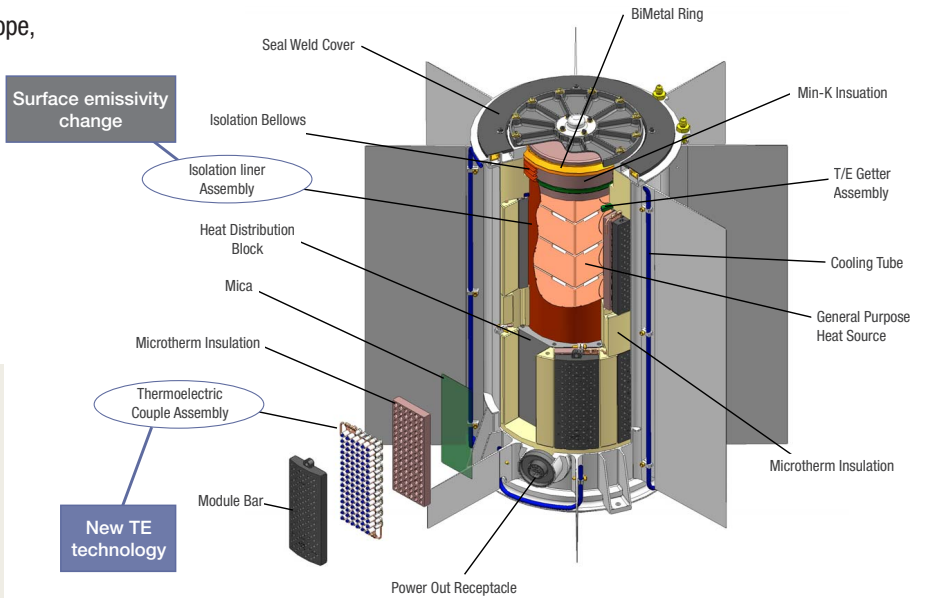


Enhanced Multi-Mission Radioisotope Thermoelectric Generator (eMMRTG) Concept

The conceptual eMMRTG would preserve all MMRTG envelope, volume, interfaces and mounting points while offering significant increases in power:

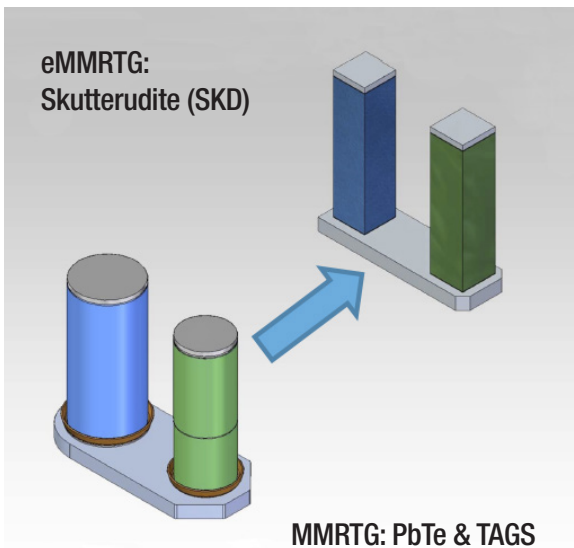
- > 25% at beginning of life (BOL)
- > 50% at end of 14-year mission (EOM)
- Multi-mission capability (vacuum and Mars atmosphere) preserved



The eMMRTG would retrofit the MMRTG with new thermoelectric (TE) couples

- Substitution of current MMRTG PbTe/TAGS couples with skutterudite (SKD) couples
 - Technology developed with NASA support at the Jet Propulsion Laboratory over the last 20 years
 - Key industry partners include Teledyne Energy Systems and Aerojet/Rocketdyne
- Addition of a surface oxidation layer to the heat source liner inner surface to allow for increased hot junction temperatures

Concept: Direct retrofit of TE couple technology into proven MMRTG



	MMRTG	eMMRTG
No. of GPHS Modules	8	
TE Type	PbTe/TAGS	SKD
No. of Couples	768	
Hot Junction Temperature (C)	530	600
Cold Junction Temperature (C)	200	
Beginning of Mission Power (W)	110	~145
Est. EOM Power (W) at 14 years*	60	>90
BOL System Efficiency	6%	8%
BOL Specific Power (W/kg)	2.8	>3.6
Mission Usage	Multi-Mission	
Development Time	In Use	~5 years
Potential Future Missions	MSL, Mars 2020	Europa, future Discovery and New Frontiers

*17 years total including 3-year storage