



TECHNOLOGY SOLUTION

Power Generation and Storage



Nuclear Thermionic and Thermoelectric Energy System

[Alternative method for harnessing nuclear energy](#)

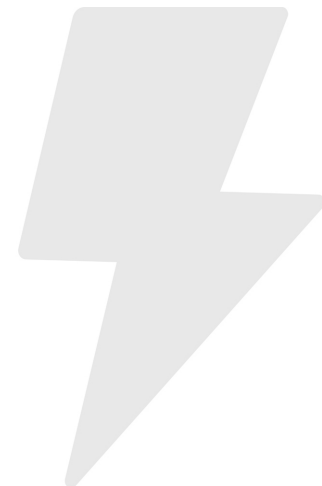
Nuclear Thermionic Avalanche Cells with Thermoelectric (NTAC-TE) offers direct conversion of energy carried by gamma radiation and beta particles into electricity, as well as direct energy conversion of the heat byproduct without steam driven turbines. This process is considerably more efficient, especially with the addition of Cobalt-60 and sodium-22, than traditional nuclear power generation. In the NTAC-TE system, even the Cesium byproduct of Uranium 235 fission contributes additive energy for more power output.

Upgrading, or using NTAC-TE in conjunction with nuclear power plants increases power derived from the fission process. NTAC-TE cells can also use up all radioactive emission energy from radioactive materials without allowing any radioactive emission from the device.

NTAC-TE can even use existing fission waste as a viable fuel and operate as a safe and mobile remote energy source.

BENEFITS

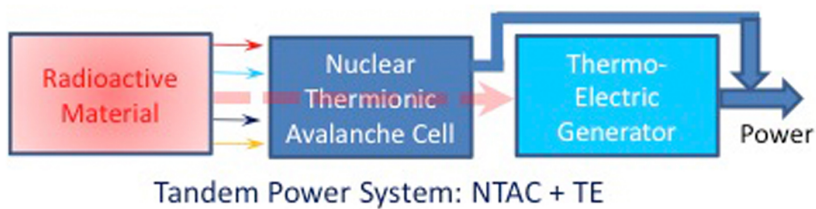
- Extremely high energy and power density
- Long term operation between "refueling"
- Provides a significant increase to energy conversion rate vs standard fission
- Can utilize nuclear "waste" as fuel
- Does not require a steam turbine or any thermodynamic cycles to convert the heat energy to electrical energy



THE TECHNOLOGY

The NASA patented NTAC-TE system is a promising technology for power generation from radioactive isotopes that generate gamma rays. This will reduce the mass of unusable radioactive waste products, as NTAC-TE can use what is normally waste and harmful in order to generate electric power.

The patented integration of Cobalt-59 into fission process, which will be transmuted into Co-60, with NTAC-TE elevates the efficiency well beyond current energy harvesting methodologies considering NTAC-TE can also harness energy from Cesium-137. The gamma radiation energies from these three sources combined together are 7 MeV from the prompt fission reaction, 0.6617 MeV from the Cesium by-product of the fission process, and 1.3325 MeV from Cobalt.



Block diagram of tandem NTAC TE system. Image credit: NASA/Sang H. Choi

APPLICATIONS

The technology has several potential applications:

- Utility-scale electric power generation facilities
- Electric propulsion for automobiles and airplanes
- Remote stand-alone operations power supply
- Conversion or addition upgrade to nuclear power plants
- Low level localized power supply without transmission infrastructure

PUBLICATIONS

Patent No: 10,269,463; 11,037,687; 11,094,425; 11,063,198; 10,886,452; 11,004,666; 10,985,676; 11,257,604; 11,646,679; 11,670,432

Patent Pending

technology.nasa.gov

More Information

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NP-2016-09-2208-HQ

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LAR-17981-1, LAR-18762-1, LAR-18860-1, LAR-18866-1, LAR-18925-1, LAR-18926-1, LAR-19112-1, LAR-19420-1, LAR-19112-1-CON, LAR-19420-2, LAR-TOPS-227