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NASA pulls plug on plutonium power source

Planetary scientists wanted to use the efficient power supply to explore the outer Solar System.

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The Advanced Stirling Radioisotope Generator would have used one-quarter of the plutonium needed for existing NASA power sources.

NASA has cancelled work on a troubled radioisotope power system that is intended to help the next generation of spacecraft reach the planets, moons and comets of the outer Solar System.

In a blog posted on 15 November, Jim Green, director of NASA's planetary science division, said that the agency is ending work on two Advanced Stirling Radioisotope Generators (ASRGs) being built by the US Department of Energy (DOE).

“Our decision is based purely on budgetary constraints,” Green told *Nature*. The move will save NASA US$170 million over three years; its planetary science budget was cut by $300 million to $1.2 billion in the 2013 fiscal year. Planetary scientists say that the generators would have enabled groundbreaking missions to parts of the Solar System where the Sun does not deliver enough energy for solar-powered spacecraft.

The cancellation is a frustration for Jessica Sunshine, a planetary scientist at the University of Maryland in College Park, who worked on the Comet Hopper, a proposed ASRG-powered mission to visit a comet. “We spent a lot of money and time on ASRGs and there was incredible new science they were going to enable,” she says. The Comet Hopper was a runner-up in a 2012 NASA competition that awarded a mission to a Mars lander that did not rely on an ASRG and is due for launch in 2016.

The cancelled ASRGs would have generated electrical power from the expansion of gas warmed by the radioactive decay of plutonium-238. NASA says that the devices have the same power output as its current generation of Multi-Mission Radioisotope Thermoelectric Generators (MMRTGs) but use four times less plutonium-238, a scarce resource. An MMRTG containing 4.8 kilograms of plutonium is currently powering the Curiosity rover on Mars.

The United States has less than 40 kilograms of plutonium-238 left, but the DOE restarted production this year. Green says he is confident that the DOE will produce plutonium-238 at a rate of 1.5 kilograms per year by 2019. He says that the stockpiled plutonium-238, along with the new supply, will be enough to send another planned rover to Mars in 2020 and to complete other missions in the following decade — without any need for the extra efficiency of the ASRGs.

The ASRG programme has been plagued with problems. According to a July 2013 paper released by NASA[1], technical issues surfaced in a design review in 2012, and the management team had to be restructured. The DOE declined to comment. Green says that NASA was confident that the DOE had overcome the problems and would have delivered the systems by 2016, a year and a half behind schedule.

In addition to conserving plutonium, the ASRGs would have been ideal for missions to cold places because they produce less heat than NASA's current power systems. "If you're in an environment that's very cold, that extra heat can warm the environment you're trying to measure," says Ralph Lorenz, a planetary scientist at Johns Hopkins University's Applied Physics Laboratory in Laurel, Maryland, who worked on a proposed mission to land an ASRG-powered raft on a sea on Saturn's moon Titan. The Titan concept was the other runner-up in the 2012 mission competition.

Green insists that, in a time of tight budgets, NASA should not be paying to develop the more efficient technology when it has an existing power system — the MMRTGs — that are tried and tested. "We have some tough decisions to make but this is not a killer," he says.

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References

1. Dudzinski, L., Hamley, J., Sutliff, T. J., Zakrajsek, J.F., & McCallum, P. W. *11th Int. Energy Conv. Eng. Conf.* http://arc.aiaa.org/doi/abs/10.2514/6.2013-3924 (2013).