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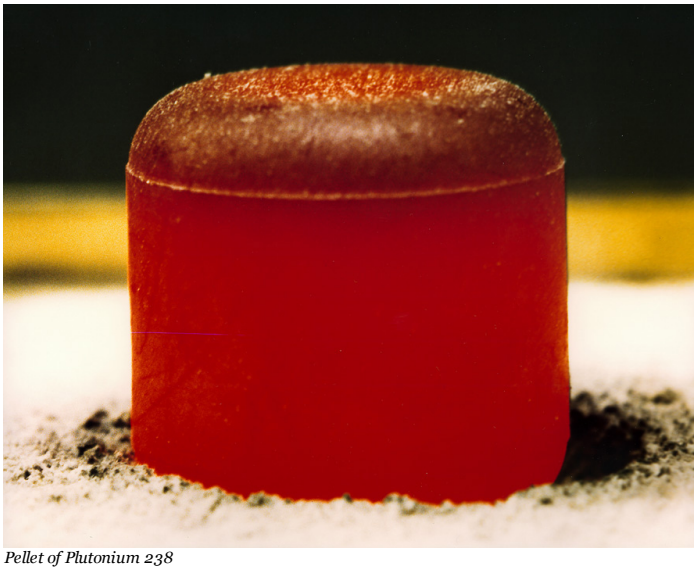
Peak Plutonium-238? U.S. Starts Making Nuclear Fuel For Deep Space Missions

In the next two or three years, the U.S. Department of Energy will begin producing small quantities of a material known as plutonium-238 at refurbished federal nuclear facilities in Idaho and Tennessee.

When fully operational, the facilities will be able to produce a little more than three pounds of plutonium-238 every year, or about enough to fill a can of soda pop. It will be the first time plutonium-238 has been produced anywhere in the world in nearly 30 years.

Plutonium-238, a special radioactive material that does not occur in nature, emits a constant level of heat for decades as it decays. It is the primary fuel source used to power more than two-dozen U.S. space missions for spacecraft and planetary probes that cannot rely on solar energy.



Pellet of Plutonium 238

Other than exploring deep space or powering decades-long experiments on the dark side of the moon, plutonium-238 is pretty much worthless. It is not suitable for use in nuclear weapons. Ditto nuclear reactors.

It was originally produced as a by-product of nuclear weapons. When the United States and Russia shuttered their nuclear weapons programs in the 1980s, the world stopped producing plutonium-238.

Not surprisingly, plutonium-238 is expensive to make – very expensive. One pound of plutonium-238 costs about $4 million to make. And that does not include the upfront investment needed to reestablish production of plutonium-238 in the United States, which is expected to cost as much as $150 million or more.

While it may be expensive to make, the value of plutonium-238 is arguably so vast that it cannot be quantified economically.

Plutonium-238 is the reason experiments deployed on the moon by the Apollo astronauts are still operating today. Deep space exploration missions like the New Horizons spacecraft that took the first close-up images of Pluto ever in July depend on plutonium-238's decay heat.
There is no other known fuel source that can take humanity to the edge of the solar system and beyond. Indeed, the Voyager 1 spacecraft, the first object created by humans to leave the solar system, runs on the heat supply provided by plutonium-238's radioactive decay. The Voyager, which departed Earth in 1977, is still sending scientific data back to scientists at NASA today.

The trouble is that the world has nearly exhausted all available supplies of plutonium-238.

In 2009, the National Research Council completed a study requested by Congress evaluating the options available for reestablishing domestic production of plutonium-238, which is also called 238Pu.

> In the past, the United States had an adequate supply of 238Pu, which was produced in facilities that existed to support the U.S. nuclear weapons program. The problem is that no 238Pu has been produced in the United States since the Department of Energy shut down those facilities in the late 1980s. Since then, the U.S. space program has had to rely on the inventory of 238Pu that existed at that time, supplemented by the purchase of 238Pu from Russia. However, Russian facilities that produced 238Pu were also shut down many years ago, and the DOE will soon take delivery of its last shipment of 238Pu from Russia . . . [T]here is [no] additional 238Pu (or any operational 238Pu production facilities) available anywhere in the world. The total amount of 238Pu available for NASA is fixed, and essentially all of it is already dedicated to support several pending missions . . . If the status quo persists, the United States will not be able to provide [238Pu as the fuel source] for any subsequent missions.

Now, six years later, the federal government is finally beginning to implement a critical program for sustaining the U.S. space program's future. That it is doing so says a lot about America and Americans. Congress and a large portion of the bureaucratic juggernaut known as the federal government has become horribly dysfunctional. It is often very difficult to secure a

consensus on how to best to address problems with immediate and obvious human consequences like health care or unemployment.

Nobody needed the government to send spaceships into interstellar space. No lives would have been lost had the Voyager mission failed. No lives were saved because it succeeded. Nobody needs the U.S. space program, but at least in the United States almost everybody wants it just the same, including me.