A Nuclear Reactor Just Flew Across America.

Here's why that matters to all of us.

Jeff Jackson, 2/22/26

@Valar Atomics @NuScale Power @X-energy @BWX Technologies

Military C-17 carrying a SMR as imagined by Midjourney

On February 15, 2026, three U.S. Air Force C-17 Globemaster III cargo aircraft lifted off from California on a mission unlike any in aviation history.

Their cargo: a complete nuclear reactor.

Not a training mockup. Not a decommissioned shell. A fully functional, next-generation nuclear microreactor — the Ward250, built by @Valar Atomics — disassembled into eight discrete modules, containerized, and loaded as standard military cargo by the 62nd Airlift Wing, the same unit certified to transport U.S. nuclear weapons. The aircraft flew to Hill Air Force Base in Utah, landed without incident, and the modules were offloaded exactly as they were loaded — as cargo.

Operation Windlord: *Mission complete*.

I watched this story surface and then, almost immediately, disappear from public attention. A few defense publications picked it up. A handful of energy industry newsletters. And then the news cycle moved on.

But I couldn't just let it disappear in the news cycle.

Because the facts surrounding this incident are simply amazing. Once you learn the pieces, you'll see they fall together and create a picture of *nothing we've ever seen before.* Except, maybe…*powering the starship Enterprise?*

A brief word about why it's me writing this…

My professional world is medical ghostwriting. I help health and wellness practitioners — functional medicine doctors, integrative health coaches, neuroscience-informed therapists — communicate their expertise to the patients and clients who need them.

But I have other credentials that most people don't carry, and this story sits squarely inside them.

For decades, I've done other things. Along the way, I received extensive training and certification in radiation safety, HAZMAT response, and radiological incident command. I haven't just read about these protocols. I've held the certifications, commanded the responses, and worked directly with radioactive materials in scientific settings.

I also spent two years in graduate medical training and 12 years in neuroscience research, where — like many researchers — I worked with radioactive isotopes as standard laboratory tools.

I'm telling you this not to impress you, but because I want you to understand the lens I'm bringing to what follows. I'm not a nuclear industry advocate. I have no financial stake in any of the companies or technologies I'm about to describe. I'm not writing from a political position — and I want to be explicit about that, because nuclear energy has somehow become politically tribal, which is both unfortunate and completely beside the point.

I'm writing as a ***scientist***, a safety officer, an emergency manager, and a writer who believes that an **informed public makes better decisions than an uninformed one.**

So…let's talk about what's actually happening. You've got to see ***all*** of this!

What Is a Microreactor, and how did we get here?

I know a 'nuclear reactor flying across the US' sounds crazy, and even dangerous. But if you understood how much it has evolved since we heard about melt-downs on the news…well, you'd be curious, and even amazed.

Most people's **mental image** of nuclear power was formed somewhere between 1979 and 1986 — Three Mile Island, Chernobyl, the cold war anxiety of a generation. That image involves massive cooling towers, exclusion zones, and the ever-present fear of catastrophic meltdown. It's understandable.

It's also about forty years out of date.

Modern nuclear reactor design has been quietly, methodically transformed by decades of engineering refinement, materials science breakthroughs, and hard lessons learned from every incident in the historical record. **Each piece of the picture: the reactor, the cooling, the fuel…*is completely different from before.***

The reactors being developed and deployed today — particularly the category called Small Modular Reactors, or SMRs, and the even smaller subset called microreactors — bear about as much resemblance to Chernobyl's RBMK reactor as a modern commercial airliner looks like the "Wright Flyer."

Here's the basic taxonomy, because the ***terminology matters*.**

- A **conventional nuclear power plant** typically generates around 1,000 megawatts of electrical power. It requires a massive purpose-built facility, years of on-site construction, a large dedicated workforce, and an extensive emergency planning zone around it.

So, lots of massive structures, with a lot of extended space around them.

On the other hand,

- **A Small Modular Reactor (SMR)** generates up to 300 megawatts per unit — roughly a third of a conventional plant — and is largely factory-built rather than constructed on-site. This is what flew by our military.
- Multiple units can be combined to scale output up or down as needed.

NuScale Power's VOYGR design became the first SMR to receive full design certification from the U.S. Nuclear Regulatory Commission, and the Tennessee Valley Authority has already contracted to build a six-gigawatt NuScale plant at its Clinch River site in Tennessee.

- A **microreactor** generates 20 megawatts or less — sometimes as little as one megawatt. It's designed to be entirely factory-assembled, transported by truck, rail, or aircraft, installed rapidly, and operated with minimal staffing.

The Ward250 that flew to Utah last week generates five megawatts — is an **SMR**. It generates enough power for approximately 5,000 homes.

Or… a forward military base, or a remote community, or a hospital complex. These are ***facilities that cannot afford for the lights to ever go out. Or to lose power*. Ever.**

The military application that drove Operation Windlord is illustrative of *why-this-matters beyond defense.* ***Right now, every domestic U.S. military installation depends on the civilian power grid.***

That grid can be disrupted by extreme weather, cyberattack, infrastructure failure, or deliberate sabotage.

Overseas bases depend on diesel generators requiring *constant fuel resupply* — and ***fuel convoys in conflict zones*** have historically been among the most dangerous and frequently targeted missions in any deployment.

But—a microreactor changes that equation entirely.

- ➢ Years of reliable power from a single fuel load.
- ➢ No supply chain vulnerability.
- ➢ No grid dependency.
- ➢ No convoy.

The civilian implications are equally profound — but before we get there, we need to understand where this technology *actually came from.*

Because it didn't emerge from a corporate laboratory or an energy policy initiative.

It came from…

…well, space! 🚀🛰️

The Space Connection: Where this stuff was born

For decades, NASA faced a problem that has no elegant solution: how do you power a spacecraft exploring the outer solar system, where sunlight is too faint for solar panels, for missions lasting years or decades, with zero possibility of maintenance or repair?

The answer, developed starting in the 1950s under the Atomic Energy Commission's Systems for Nuclear Auxiliary Power program, was the Radioisotope Thermoelectric Generator — RTG for short. The concept is elegant in its simplicity. Take a radioactive material that generates heat as it decays. Surround it with thermocouples — devices that convert a temperature difference directly into electrical current.

No moving parts. No cooling systems. No operator.

Just physics, doing what physics does.

Reliably, for years.

RTGs have powered some of humanity's most extraordinary achievements. The Apollo lunar surface experiments. Pioneer 10 and 11 on their journeys beyond the solar system. The Voyager spacecraft, both of which are still transmitting data from interstellar space more than 47 years after launch. The Mars rovers Curiosity and Perseverance, both operating right now on the Martian surface. All of them powered by nuclear decay heat, converted to electricity through the Seebeck effect, with no moving parts and no human intervention required.

But here is the design principle that connects RTGs directly to today's microreactors, and it's *the one you almost never hear discussed:*

NASA designed these systems to *survive their own destruction.*

The fuel in an RTG is plutonium-238 in the form of plutonium dioxide — a ceramic oxide. Not metal. Not something that can burn or scatter. The ceramic pellets are clad in iridium, enclosed in graphite sleeves, and encased in a carbon-fiber aeroshell. The entire assembly is engineered specifically so that if the launch vehicle explodes on the pad, if the spacecraft reenters the atmosphere uncontrolled, if it crashes into the ocean or a distant planet — **the fuel stays contained.**

> ***It cannot burn, cuz it's already oxidized!***
>
> ***It cannot disperse. And it's already encapsulated in an inert material.***

The safety is built into the physical form of the material itself, not into external systems that could fail.

If that design philosophy sounds familiar, it should. It is the direct philosophical ancestor of TRISO fuel — and the institutional connection is not coincidental.

> In 2015, NASA and the Department of Energy's National Nuclear Security Administration jointly launched the Kilopower project — an effort to develop actual fission reactors small enough for space and planetary surface use.
>
> The centerpiece was a prototype called KRUSTY: the Kilowatt Reactor Using Stirling Technology. In March 2018, KRUSTY ran at full power for 28 continuous hours at the Nevada National Security Site, successfully completing a test that included simulated failure scenarios — Stirling engines shut down, heat removal disabled, the reactor pushed to its limits. It passed everything.
>
> NASA's chief reactor designer at Los Alamos National Laboratory, David Poston, said his team "threw everything we could at this reactor" and KRUSTY passed with flying colors.
>
> **It was the first successful operation of a new nuclear reactor concept in the United States in over 40 years.**

(If you're wondering about a familiarity between NASA's KRUSTY and "Krusty the Clown" from "The Simpsons," yes indeed, the engineers were fans of the show, and named various other experiments and even instruments after characters and elements from the show!)

The key design principle that NASA built into KRUSTY was the same one now found in every serious microreactor design: negative thermal feedback as the primary safety mechanism.

That means, as the reactor heats up, the physics of the reaction *naturally slow it down!*

— without any human intervention, without any powered system, without any moving parts except a single control rod. The laws of physics ***are*** the safety system.

The institutions and researchers who developed Kilopower — Los Alamos National Laboratory, NASA Glenn Research Center, NASA Marshall Space Flight Center, Idaho National Laboratory — are the same institutions whose alumni and active researchers now populate the advanced microreactor industry.

And, Westinghouse's eVinci microreactor, currently in development for both lunar surface power and terrestrial applications including remote communities and defense facilities, is a direct descendant of the space fission power program.

The Ward250 that flew to Utah carries the same passive safety DNA that NASA engineers developed because, in space, there is no margin for active safety systems to fail.

So…when you understand this lineage, the safety story of modern microreactors becomes not so much a promise made about the future…

…but instead, a ***track record that extends back decades*** — tested in the most unforgiving environment imaginable.

The Fuel: Where the real revolution is happening

Now let’s get to the fuel. This part is just as awesome…

To understand why this generation of reactors is genuinely different from everything that came before, you need to understand the fuel. And to understand the fuel, you need to meet TRISO.

TRISO stands for Tristructural Isotropic — a name that only an engineer could love, describing something that is, I would argue, one of the most elegant pieces of materials engineering ever devised for civilian use. It is *literally* accident-proof.

Here's how it works. At the center of each TRISO fuel particle is a tiny kernel of uranium oxycarbide — roughly the size of a poppy seed. That kernel is then encased in four successive protective layers: a porous carbon buffer that absorbs the mechanical stress of fission, a dense inner carbon layer, a silicon carbide ceramic layer that acts as the primary pressure vessel, and a final outer carbon layer.

The end result is a particle about a millimeter in diameter — and it functions as its own complete, self-contained containment system.

What does that mean in practice?

It means the fission products — the radioactive byproducts of the nuclear reaction — are physically trapped inside each individual fuel particle. Not trapped by an external vessel that could crack or fail under stress. Trapped inside the particle itself, by layers of material engineered specifically for that purpose at the microscopic level, using the same encapsulation philosophy NASA developed for RTG fuel pellets decades earlier.

It’s leak-proof *and* crush-proof. Even melt-proof.

The Department of Energy's Advanced Gas Reactor testing program reported particle failure fractions below one in one hundred thousand at temperatures of 1,700 degrees Celsius — double the safety margin required for conventional light-water reactor fuel. Independent research has suggested TRISO particles are robust enough to remain intact even during explosive fractures. Individual particle failures, when they occur at all, result in a small radiation release into the surrounding fuel matrix — where it stops. It does not reach the coolant. It does not reach the environment.

X-energy, one of the leading TRISO fuel developers, states it plainly: ***“Our fuel cannot melt. Period. That is not marketing language. That is a statement grounded in material physics.”***

The fuel form used in the Ward250 takes TRISO particles and forms them into pebbles — spherical fuel elements fed into the reactor via a hopper, cooled by helium gas at operating temperatures around 750 degrees Celsius, continuously cycling through the core.

So, the spent pebbles can be identified, removed, and replaced without shutting the reactor down. T he helium coolant is inert — it doesn't react with anything, it doesn't become dangerously radioactive, and if it leaks, it simply disperses harmlessly into the atmosphere.

These reactors run on HALEU — High-Assay Low-Enriched Uranium, enriched to between five and twenty percent uranium-235. For context: conventional reactor fuel is enriched to about five percent. Weapons-grade uranium requires enrichment to ninety percent or above. HALEU sits well below any weapons threshold, but its higher energy density is what allows microreactors to run for years without refueling, in a package small enough to be loaded onto a cargo aircraft.

To be clear, **TRISO is the actual, physical form the HALEU comes in.**

On the manufacturing side, the economics of TRISO fuel are actively improving. Automated production lines at BWX Technologies in Lynchburg, Virginia can now press and coat 20,000 fuel pebbles daily at 96% dimensional conformity.

This is a 40% reduction in production waste compared to earlier methods. X-energy is building the first commercial-scale TRISO fabrication facility in the United States. The technology that began as a specialized product for research reactors is scaling into an industrial supply chain.

The Safety Engineering: Physics as the Safety System

I want to spend some time here, because this is where I think the public conversation is most distorted — in both directions.

Nobody can forget about the Fukushima disaster. An earthquake, followed by a tidal wave, causing a meltdown.

The anti-nuclear argument tends to invoke Chernobyl and Fukushima as permanent indictments of all nuclear technology. The pro-nuclear argument sometimes waves those events away too casually.

But neither serves the goal of genuine understanding.

So… let me try to explain what actually changed, from the perspective of someone trained in both the underlying science and the emergency response side.

- Chernobyl failed because of a reactor design with a **fundamental physical instability** — it could enter a runaway positive feedback loop where increased heat accelerated the reaction rather than slowing it.

  Combined with the ***human decision*** to disable safety systems during a late-night test, and *operators who didn't fully understand the reactor's behavior under those conditions,* the ***result was catastrophic.***

- Fukushima failed because the backup cooling systems — which ***required active electrical power to operate*** — were **destroyed by the tsunami**. When the power went out, the cooling stopped, and the cores overheated over the following days.

Both failures, at their root, were failures of **active** safety systems. **Systems that required power, human intervention, or both — and didn't get them.**

The engineering response to those lessons, developed across the thirty-plus years since, has been to ask a **fundamentally different question:**

> ***'What if we design reactors that are safe because of physics, rather than despite their operators?'***

The answer is what engineers call **passive** safety systems. In the best current microreactor designs, the safety isn't a system at all in the conventional sense. **It's a property of the design itself.**

The Ward250's helium cooling operates by natural convection — heat rises, cooler helium descends, ***circulation continues indefinitely without pumps or external power.***

The TRISO fuel's self-regulating physics mean the reaction automatically slows as temperature rises.

The ceramic containment of each individual fuel particle means **there is no scenario** — not loss of coolant, not loss of power, not operator error — **in which the fuel itself can release fission products into the environment** through normal accident pathways.

The IAEA describes it precisely: passive systems rely on physical phenomena — natural circulation, convection, gravity, and self-pressurization.

No human intervention required. No external power required. The laws of physics are the safety system.

In other words, "physics" itself would have to fail first.

This isn't a theoretical claim.

NASA's KRUSTY experiment in 2018 deliberately disabled the heat removal systems during testing — and the reactor responded exactly as passive physics predicted, safely reducing its own output without any intervention.

The same self-regulation principle has been validated across multiple reactor concepts and testing programs over the past two decades.

> *I want to be precise here, because honesty demands it:*
>
> *Passive safety features are not magic. They are designed to function within specific parameters, and extreme events — a major earthquake, catastrophic flooding, conditions far outside the design envelope — can theoretically stress even passive systems.*
>
> *The engineering community takes these scenarios seriously, and the testing and licensing processes require rigorous analysis of them.*
>
> *But the baseline safety margin of these designs, compared to the reactors of the 1970s and 1980s, is not a **marginal** improvement. It is a **fundamental***

> ***architectural change** — the same kind of change that separates a car with passive crumple zones and automatic braking from one with neither.*

The NRC completed its design review of one advanced microreactor design in just 18 months — nine months ahead of schedule and 11% under budget. That is not an agency rubber-stamping anything. The NRC is internationally recognized for the rigor of its standards. Speed in this case reflects design quality, not regulatory shortcuts.

The Open Questions: What we still need to get right

I promised you honesty, and honesty requires this section.

Stay with me here! You got this far—this is important, too!

Progress is real. The engineering is extraordinary.

There are things that still need to be resolved — not reasons to walk away, but reasons to engage seriously.

- **Nuclear waste volume.** This is the most legitimate concern raised about microreactors, and it deserves a direct answer. Because of their smaller cores and higher neutron leakage relative to their size, microreactors generate more spent fuel per unit of electricity produced than large conventional reactors — estimates suggest potentially up to five times more by volume. TRISO's ceramic-encapsulated spent particles are inherently safer to store and handle than conventional spent fuel rods, and their small size simplifies logistics. But the long-term storage infrastructure for this waste stream isn't fully built yet. Any community or facility hosting a microreactor needs to plan for on-site spent fuel storage for the foreseeable future. This is a solvable engineering and policy problem — but it needs to be solved, not wished away.
- **The HALEU supply chain.** Until very recently, only Russia and China had industrial capacity to produce HALEU at scale — a national security vulnerability that is only now being seriously addressed. The DOE's HALEU Availability Program, Centrus Energy's domestic enrichment cascade in Piketon, Ohio, and the Fuel Line Pilot Program launched in July 2025 are all direct responses. In January 2026, the first HALEU feedstock was delivered to Standard Nuclear in Oak Ridge, Tennessee — enough material for a full first reactor core load for Radiant's 2026 demonstration. Progress is accelerating. But the domestic supply chain is still being constructed, and deployment timelines depend on it maturing on schedule.
- **Economics at scale.** TRISO fuel costs more per pound than conventional reactor fuel, though the comparison is somewhat misleading — microreactors use far less fuel, refuel far less often, and some designs run for years without any refueling at all. The economics are viable and improving rapidly as manufacturing scales up. But viable and improving is not the same as solved, and the levelized cost of energy from microreactors — currently estimated at $80 to $150 per megawatt-hour — remains higher than utility-scale solar and wind in ideal

conditions. For remote locations, energy-secure military bases, and critical infrastructure where reliability is the primary value, the economics already make sense. For grid-scale civilian power, the cost curve still needs to come down.
- **Uranium supply — the long view.** A 2025 analysis estimated approximately 150 years of uranium reserves at current consumption rates. Widespread microreactor deployment would accelerate that consumption. This is a legitimate long-term planning consideration — though 150 years is a substantial runway for developing alternative fuel cycles. Some next-generation designs are already exploring thorium-based fuels, which are significantly more abundant than uranium and produce less long-lived waste.
- **Ecological footprint of production.** The manufacturing process for TRISO fuel — particularly the high-temperature ceramic coating steps and the HALEU enrichment process — is energy-intensive. The lifecycle carbon footprint of nuclear power is substantially better than fossil fuels by every serious analysis. But it is not zero, and honest accounting requires acknowledging the embedded energy and material costs of building and fueling these systems.

None of these open questions are disqualifying.

Every energy technology has unresolved challenges — including the ones we already rely on. These are engineering and policy problems of the kind that get solved by sustained investment, rigorous research, and honest public conversation.

They are *certainly* not reasons to dismiss the technology. They are reasons to take it seriously enough to demand those answers.

What this actually means—the bottom line

Let me close with what I genuinely feel when I look at this landscape — not as an advocate, but as someone who has spent a career thinking about what happens when systems fail, when power goes out, when communities are cut off, when the infrastructure we take for granted suddenly isn't there.

I've been in those situations professionally. I know what it costs when the lights go out in a hospital. I know what it means for a remote community to spend a winter dependent on diesel that has to be flown in at extraordinary expense and ecological cost. I know what happens to a military operation when its power supply is a vulnerability. I know how emergency management professionals think about single points of failure — and right now, nearly every domestic military installation, hospital, and data center in America has exactly one: the civilian power grid.

➢ That’s why I am excited about this development!

Just think about it:

A reactor that fits in a cargo aircraft, runs for years without refueling, requires no grid connection, relies on the laws of physics rather than human operators for its safety, and contains its radioactive fuel at the particle level — that isn't just an interesting technology development. *It’s kind of a dream come true!*

And it’s a direct answer to some of the most persistent and consequential vulnerabilities in modern civilization. Vulnerabilities I've spent a career preparing to respond to.

It’s what some of us call a real “game changer.” *(I don’t throw that term out casually.)*

- ✓ The Army's Janus Program is mandated by executive order to have commercially operated nuclear microreactors running at up to nine domestic military installations by September 30, 2028.
- ✓ The Ward250 that flew to Utah is expected to be operational by July 4th of this year.
- ✓ The Tennessee Valley Authority is contracting for a six-gigawatt NuScale SMR plant in Tennessee.
- ✓ The United Kingdom has committed £2.5 billion to SMR deployment by the mid-2030s.
- ✓ The International Atomic Energy Agency has raised its global nuclear power projections for five consecutive years running.
- ✓ NASA is actively designing microreactors for the lunar surface, using the same passive safety principles now being deployed on Earth.

Such big progress.

From the first RTG launched into space in 1961, to KRUSTY running at full power in the Nevada desert in 2018, to a complete microreactor loaded onto three C-17s and flown across the country last week — there is a through-line here.

It’s a ***continuous, disciplined accumulation of knowledge*** about how to harness nuclear energy safely, reliably, and in progressively smaller and more deployable packages. Built by some of the most rigorous engineers and scientists this country has produced. Tested in the most demanding environment imaginable: space, where there are no second chances and no repair crews.

We have come a very long way! I’m excited & encouraged by this news.

I hope you are, too!

Whether you've always been skeptical of nuclear energy, or you've believed in its potential but wondered if the technology would ever catch up to the promise — I think the honest answer, right now, in February 2026, is…

Look again.

It has.

#NuclearEnergy, #SMR, #Microreactor, #EnergyInnovation, #EnergySecurity, #CleanEnergy, #NationalSecurity, #OperationWindlord, #TRISO, #AdvancedNuclear

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Jeff Jackson writes about health, medicine, and the science of human performance as The Renaissance Writer. Experienced in various industries for 40+ years, the views expressed here are his own.

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