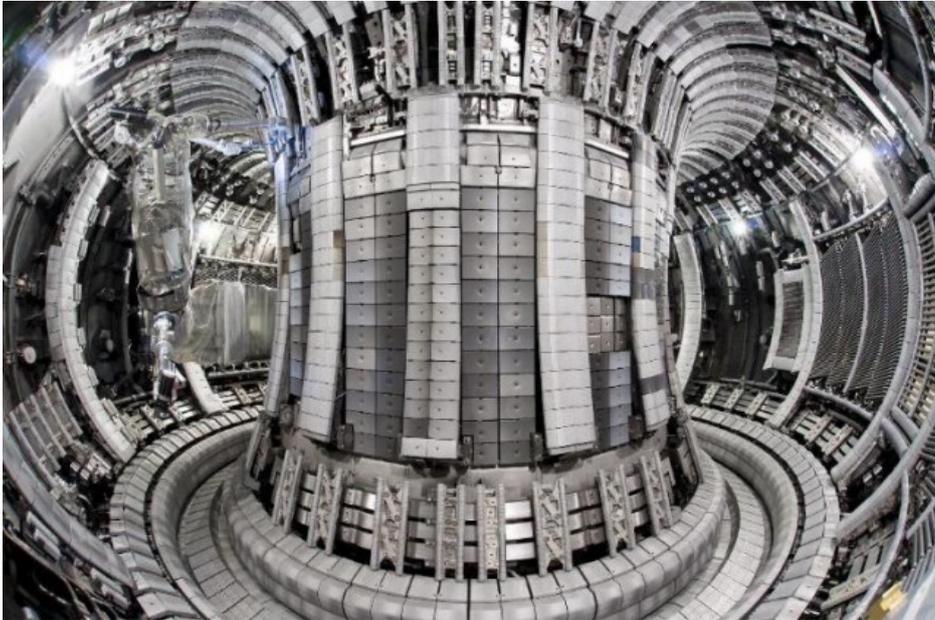


## Clean, Limitless Fusion Power Could Arrive Sooner Than Expected



Good news, denizens of Earth: If the findings from two premier research labs are to be believed, commercial nuclear fusion is feasible — and could arrive sooner than expected.

The first breakthrough comes from Sandia National Laboratories (the same engineers who brought us [the fanless heatsink](#) [1]). At SNL, a research team has been working on a new way of creating fusion called magnetized liner inertial fusion (MagLIF). This approach is quite similar to the National Ignition Facility at the LLNL in California, where they fuse deuterium and tritium (hydrogen isotopes) by crushing and heating the fuel with [500 trillion watts of laser power](#) [2]. Instead of lasers, MagLIF uses a massive magnetic pulse (26 million amps), created by Sandia's Z Machine (a huge X-ray generator), to crush a small cylinder containing the hydrogen fuel. Through various optimizations, the researchers discovered a MagLIF setup that [almost breaks even](#) [3] (i.e. it almost produces more thermal energy than the electrical energy required to begin the fusion reaction).

Probably more significant is news from the Joint European Torus (JET), a magnetic confinement fusion facility in the UK. JET is very similar to the ITER nuclear fusion reactor, an international project which is being built in the south of France. Whereas NIF and Sandia create an instantaneous fusion reaction using heat and pressure, ITER and JET confine the fusing plasma for a much longer duration using strong magnetic fields, and are thus more inclined towards the steady production of electricity. JET's breakthrough was the installation of [a new beryllium-lined wall and tungsten floor](#) [4] inside the *tokamak* — the doughnut-shaped inner vessel that

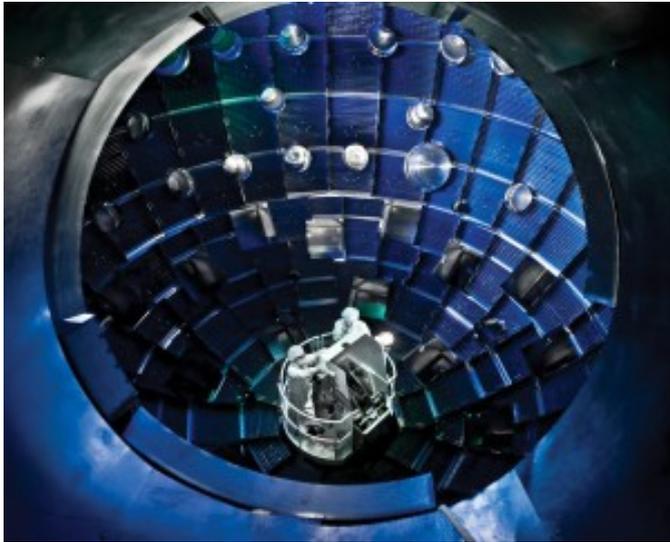
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confines 11-million-degrees-Celsius plasma (pictured above).

Carbon is the conventional tokamak lining (and the lining that had been chosen for the first iteration of ITER) but now it seems the beryllium-tungsten combo significantly improves the quality of the plasma. Hopefully this information will allow ITER to skip the carbon tokamak and jump straight to beryllium-tungsten, shaving years and millions of dollars off the project.



[5]Moving forward, JET will actually try full-blown fusion with the optimum mix of deuterium and tritium (16 megawatts, for less than a second). At this point, JET is practically an ITER testbed, so its results from the next year or two will have a large impact on the construction of ITER's tokamak, which should be completed by 2019.

Before today, magnetic confinement fusion was generally considered to be more mature and efficient than inertial confinement fusion — but Sandia's new approach might change that. ITER is one of the world's largest ongoing engineering projects (it's expected to cost around \$20 billion), and yet critics are quick to point out that we still don't know if it will actually work. ITER isn't expected to fuse D-T fuel until 2027 (producing 500 megawatts for up to 1,000 seconds) — and an awful lot can happen in 15 years. Still, the main thing is that we're actually *working* on fusion power — when we're talking about limitless, clean power, it's probably worth investing a few billion dollars, even if it doesn't work out.

Fusion reactors are some of the most beautiful constructions you'll ever see, so be sure to check out our galleries of [the National Ignition Facility](#) [2] and [the Princeton Plasma Physics Lab](#) [6].

[Read More](#) [7]

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### **Links:**

[1] <http://www.extremetech.com/extreme/89710-the-fanless-spinning-heatsink-the-heatsink-is-the-fan>

[2] <http://www.extremetech.com/extreme/101277-inside-californias-star-power-fusion-facility>

[3] <http://prl.aps.org/abstract/PRL/v109/i13/e135004>

[4] <http://www.efda.org/2012/10/new-jet-results-tick-all-the-boxes-for-iter/>

[5] <http://www.extremetech.com/wp-content/uploads/2011/10/nif-target-chamber-2.jpg>

[6] <http://www.extremetech.com/extreme/123837-500mw-from-half-a-gram-of-hydrogen-the-hunt-for-fusion-power-heats-up>

[7] <http://www.extremetech.com/extreme/137520-clean-limitless-fusion-power-could-arrive-sooner-than-expected>