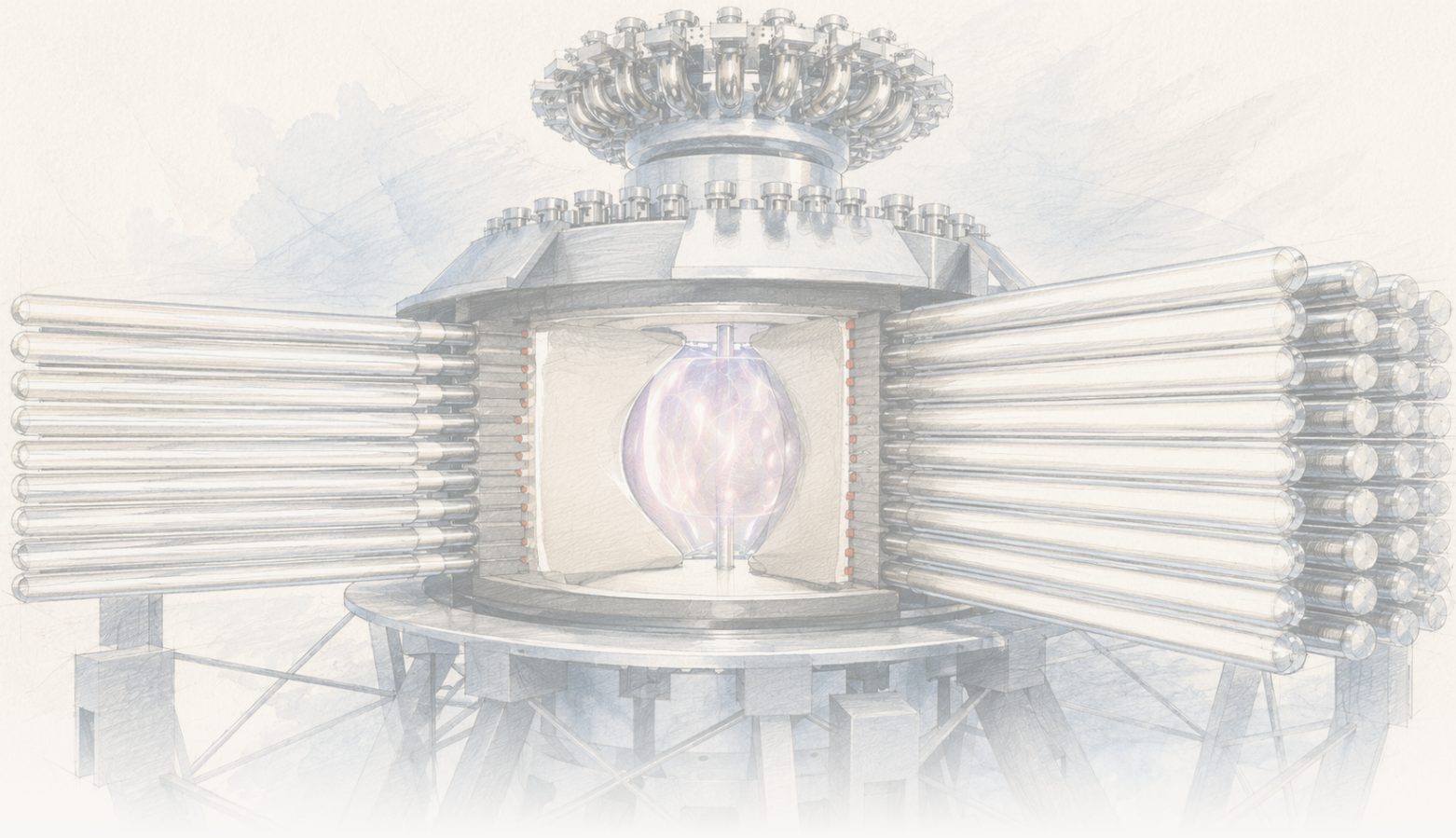




The CLEAN PAPER

WHAT THE PAPER SAYS · WHAT IT DOESN'T · WHY IT MATTERS

A fusion machine heated its plasma by squeezing it — the real step, and the power plant it is not

General Fusion's LM26 compressed a magnetized deuterium plasma with an imploding lithium liner and watched it heat up — more than tripling its electron temperature to a measured peak of about 0.72 keV (718 ± 80 eV, roughly 8 million °C), with most of the heating attributed to the compression itself, the mechanism its magnetized-target-fusion approach depends on. It is a real engineering checkpoint for that route to fusion. It is also the first 11 shots on one machine, described in a company preprint that has not been peer-reviewed, at a temperature still about ten times below what a burning plasma needs — with no net energy, no breakeven, and no electricity. A mechanism shown, not a power plant built.

Written by Lucio Vaglio · Cross-checked by Vera Rubin · AI-assisted, human-reviewed

Paper: *The science of compressional heating on the LM26 magnetized target fusion experiment*, S. J. Howard et al. (General Fusion), arXiv:2606.23974 [physics.plasm-ph] (preprint) · DOI: 10.48550/arXiv.2606.23974

A fusion machine heated its plasma by squeezing it — the real step, and the power plant it is not

For a fusion reactor to give back more energy than it takes to run, a fuel plasma has to be, all at once, hot enough, dense enough, and held together long enough — the three quantities bundled into what physicists call the Lawson criterion. Most of the field chases this with enormous superconducting magnets (tokamaks like ITER) or arrays of giant lasers (inertial confinement, as at the US National Ignition Facility). A smaller set of companies bet on a third route, **magnetized target fusion** (MTF): form a warm, magnetized plasma, then mechanically *crush* it, fast, so that the squeezing does the heating — the way a diesel engine ignites its fuel by compression rather than a spark.

In June 2026, the Canadian company **General Fusion** posted results from its **Lawson Machine 26 (LM26)** that test whether that central bet actually holds: does mechanically compressing a magnetized plasma really heat it, the way the models promise? Across the first 11 compression shots — in which a spherical-tokamak deuterium plasma was squeezed by an imploding *solid lithium liner* — the best shots showed the plasma getting markedly hotter, denser and more strongly magnetized as it was compressed, and the company's analysis attributes most of that heating to the compression itself.

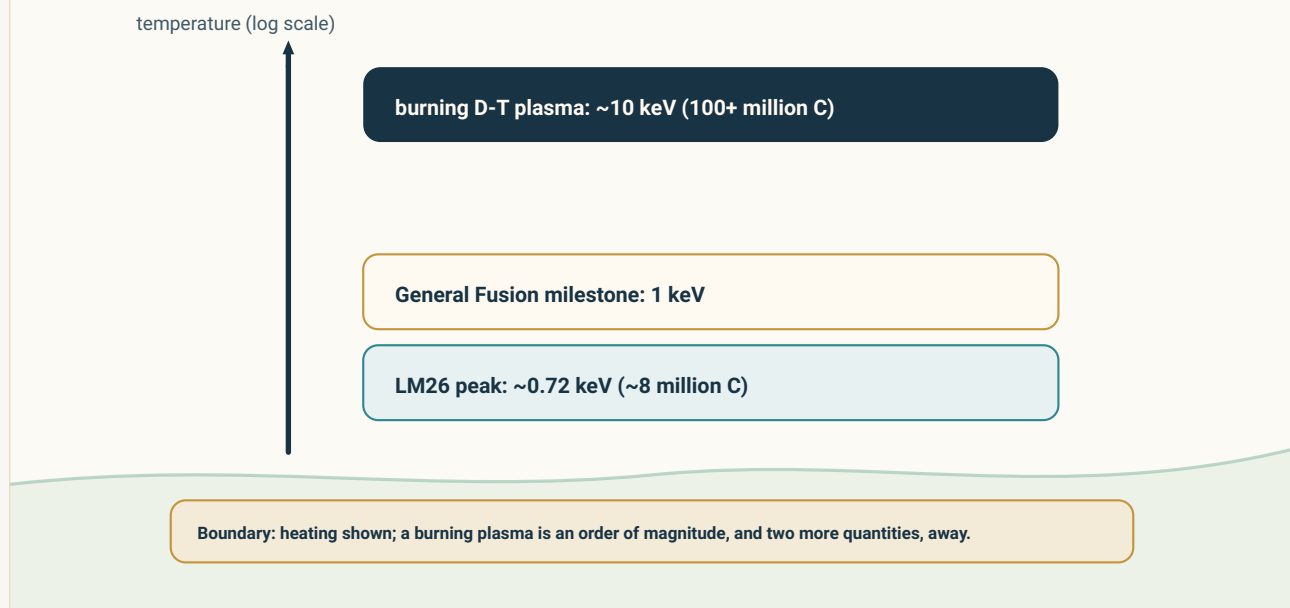
This is a real, specific engineering result for the MTF approach. It is also a first set of shots, described in a **company preprint that has not been peer-reviewed**, at a temperature still far below what a burning plasma needs — and it is not fusion energy, not breakeven, and not a power plant.

[video pending]

This is promotional footage from General Fusion, included to show what LM26 looks like; it is not independent evidence that the machine will meet its future fusion milestones.

A real heating step, far below a burning plasma

Temperature is only one Lawson quantity: density and confinement time still matter.

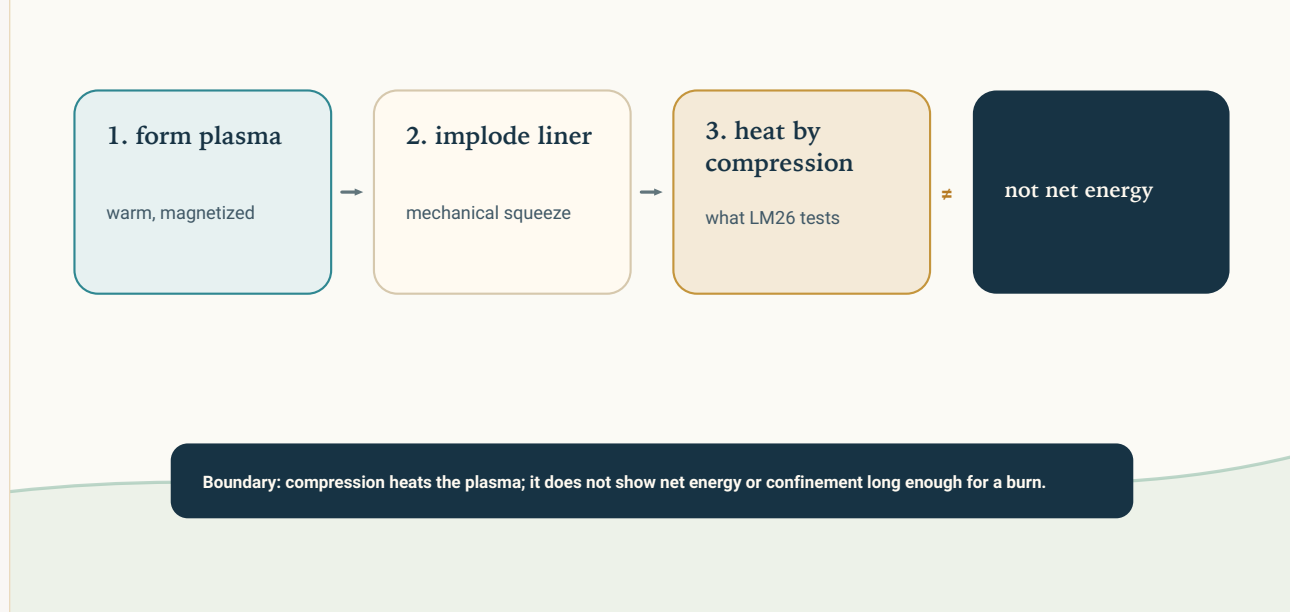


A temperature ladder: LM26's ~0.72 keV, General Fusion's 1 keV milestone, and the ~10 keV a burning deuterium–tritium plasma needs. Temperature is only one of the three Lawson quantities.

Original diagram — The Clean Paper CC BY 4.0

The magnetized-target-fusion bet

Form a warm magnetized plasma, then squeeze it so compression does the heating.



Magnetized target fusion: form a warm magnetized plasma, then compress it with an imploding liner so the squeeze does the heating — the diesel-compression bet. LM26 tested that the compression heats the plasma;

not net energy or confinement.

Original diagram — The Clean Paper CC BY 4.0

What “magnetized target fusion,” “keV” and the Lawson criterion mean

Plasma temperature in fusion is usually quoted in **kiloelectronvolts (keV)** rather than degrees: 1 keV is about **11.6 million °C**. A deuterium–tritium fuel needs to reach roughly **10 keV** (over 100 million °C) to fuse efficiently — but temperature is only one of three things that must be met at once. The **Lawson criterion** says a reactor also needs enough **density** and enough **confinement time**, usually combined into a single “triple product” (temperature $\times$ density $\times$ confinement time). Heating the plasma is necessary, but on its own it is nowhere near sufficient.

Magnetized target fusion (MTF) is a middle path between the two mainstream approaches. Instead of confining a hot plasma for a long time with huge magnets, or heating a tiny target almost instantly with lasers, MTF forms a magnetized plasma and then mechanically compresses it over microseconds. If it works, the compression both heats the plasma and raises its density — potentially reaching fusion conditions without ITER-scale magnets or NIF-scale lasers. Whether the compression really delivers that heating, in a real machine, is exactly what a test like LM26 is for.

What the authors did

- Built and fired **LM26**, a magnetized-target-fusion machine at General Fusion: a spherical-tokamak deuterium plasma is formed, then compressed by an imploding **solid lithium liner** driven inward — roughly a **3 $\times$ radial compression**.
- Ran the **first 11 compression shots** and instrumented them heavily, reconstructing the plasma’s temperature, density and magnetic field over time and recording emitted neutrons, X-rays and visible light, plus fast-camera images of the plasma–wall interaction.
- Built an **integrated physics model** that balances the heating from compression against Ohmic heating (from the plasma’s own current) and energy lost to the boundary, then compared it against the measured data to work out where the heating actually came from.

What they found

- **The plasma heated up as it was squeezed.** In the best shots, electron temperature rose by **more than 3 $\times$** , electron density by about **10 $\times$** , and the poloidal magnetic field by about **10 $\times$** , driven by the 3 $\times$ radial compression. In the best shot, the paper measures a **peak electron temperature of about 0.72 keV** (718 ± 80 eV, by Thomson scattering) — roughly 8 million °C.
- **Most of the heating is attributed to the compression.** Their integrated model concludes that a *majority* of the temperature rise came from the mechanical compression itself — the mechanism

the whole MTF approach depends on — rather than from Ohmic heating.

- **Neutron emission rose during compression**, consistent with a hotter, denser deuterium plasma.

What this does not show

- It is **not** fusion energy, breakeven, or net gain. Nothing here produced more energy than it took to run. The result is about *heating a plasma* — one step in the fusion cycle — not about the energy balance of a reactor.
- The temperature is **still about ten times short** of a burning plasma. About 0.72 keV is roughly 8 million °C; deuterium-tritium fuel needs on the order of **10 keV (over 100 million °C)** and enough density $\times$ confinement time to sustain a burn. General Fusion's own next milestone is **1 keV** — itself far from ignition.
- **"Most of the heating is from compression"** is a **model-based conclusion**, not a direct reading. It comes from an integrated physics model fit to the diagnostics; how much you trust the split between compression, Ohmic heating and losses depends on how much you trust that model.
- It is a **company preprint, not peer-reviewed**. The results are self-reported by the team that built the machine and has raised money on its promise; independent review has not yet happened.
- The neutron increase is **not** an energy-relevant fusion yield. Some neutrons are expected from deuterium at these conditions, far below anything useful for power.
- It says nothing about the separate company statement that a **future plant would deliver electricity to the grid** — a claim independent reporting has treated with heavy caution.

How strong is the evidence

- **The core claim is narrow and checkable.** "We compressed a magnetized plasma and it got hotter, mostly because of the compression" is exactly the mechanism test the MTF approach needs to pass, and the paper backs it with a heavily instrumented set of shots and an explicit energy-balance model. If it survives peer review, it is a genuine — if early — validation of the approach.
- **The caveats are structural, not cosmetic.** Eleven shots, one machine, one team, not yet reviewed, and a headline temperature an order of magnitude below a burning plasma. The load-bearing conclusion — *majority of heating from compression* — rests on a model, so the central peer-review question is whether that model's split is robust.
- **The honest status is a mechanism demonstrated, not a milestone toward energy claimed.** It nudges MTF from "the compression *should* heat the plasma" toward "the compression *does* heat the plasma," and nothing grander than that.

Why it matters

The interesting thing about magnetized target fusion is economics, not records. If mechanical compression can heat a plasma toward fusion conditions, you might get there without ITER-scale magnets or NIF-scale lasers — a cheaper, faster-iterating path, *if* it works. That “if” is the whole game, and it turns on unglamorous checkpoints like this one: does the compression actually deliver the heating the models promise? LM26’s answer, on its first shots, is a qualified yes. That is worth noting precisely *because* it is qualified — a rung on a long ladder, reported by the people climbing it, not yet checked by anyone else, and a long way below the top.

Clean summary

General Fusion’s LM26 compressed a magnetized deuterium plasma with an imploding lithium liner and showed it heating up — more than tripling its electron temperature to a measured peak of about 0.72 keV (718 ± 80 eV, ~ 8 million °C) — with the company’s analysis attributing most of the heating to the compression itself, the mechanism its magnetized-target-fusion approach relies on. That is a real, specific engineering step for this route to fusion. It is also the first 11 shots on one machine, described in a company preprint that has not been peer-reviewed, at a temperature about ten times below what a burning plasma needs, with no net energy, no breakeven, and no electricity. A mechanism shown, not a power plant built.

Sources

S. J. Howard et al. (General Fusion), The science of compressional heating on the LM26 magnetized target fusion experiment, arXiv:2606.23974 [physics.plasm-ph] (2026)

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Nature news, ‘Nuclear-fusion firm says plant will deliver electricity to grid - but big questions remain’ (2026)

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