Stellarators are the most efficient, steady and stable fusion devices.

Several approaches are close to demonstrating net fusion electricity. Laser fusion compresses a capsule to very high pressures by means of powerful lasers. Tokamaks and stellarators are doughnut shaped devices that magnetically levitate hot ionized gases (plasmas) and heat them to temperatures hotter than the Sun.

Stellarators have a competitive advantage over Laser Fusion

Read more

…and over Tokamaks…

Read more

…there are challenges

Instead of relying on plasma currents like tokamaks, stellarators confine the plasma by specially shaped 3D magnetic fields. Historically this translated in complicated coils of expensive and time-consuming design, modelling and manufacturing.

But not anymore, thanks to our unique technologies! Our simplifications have clear competitive advantages in the race to the first power-plant.

Renaissance Fusion's simplified stellarators

Simple coil surfaces

We are proving that simple, elegant coils can generate complex magnetic fields. In other words, we decouple engineering from physics: we build 1D or 2D coils (typically on cylindrical surfaces, not necessarily of circular cross-section) to generate the 3D magnetic fields needed in stellarators and several spin-offs.

Simple HTS Manufacturing

Only High Temperature Superconductors (HTS) can generate the high magnetic fields needed to make fusion smaller and cheaper. The benefits are impressive: a 4x increase in magnetic field reduces the plasma volume by 256x.

The problem is that these man-made materials are scarce and

Thick, flowing liquid walls

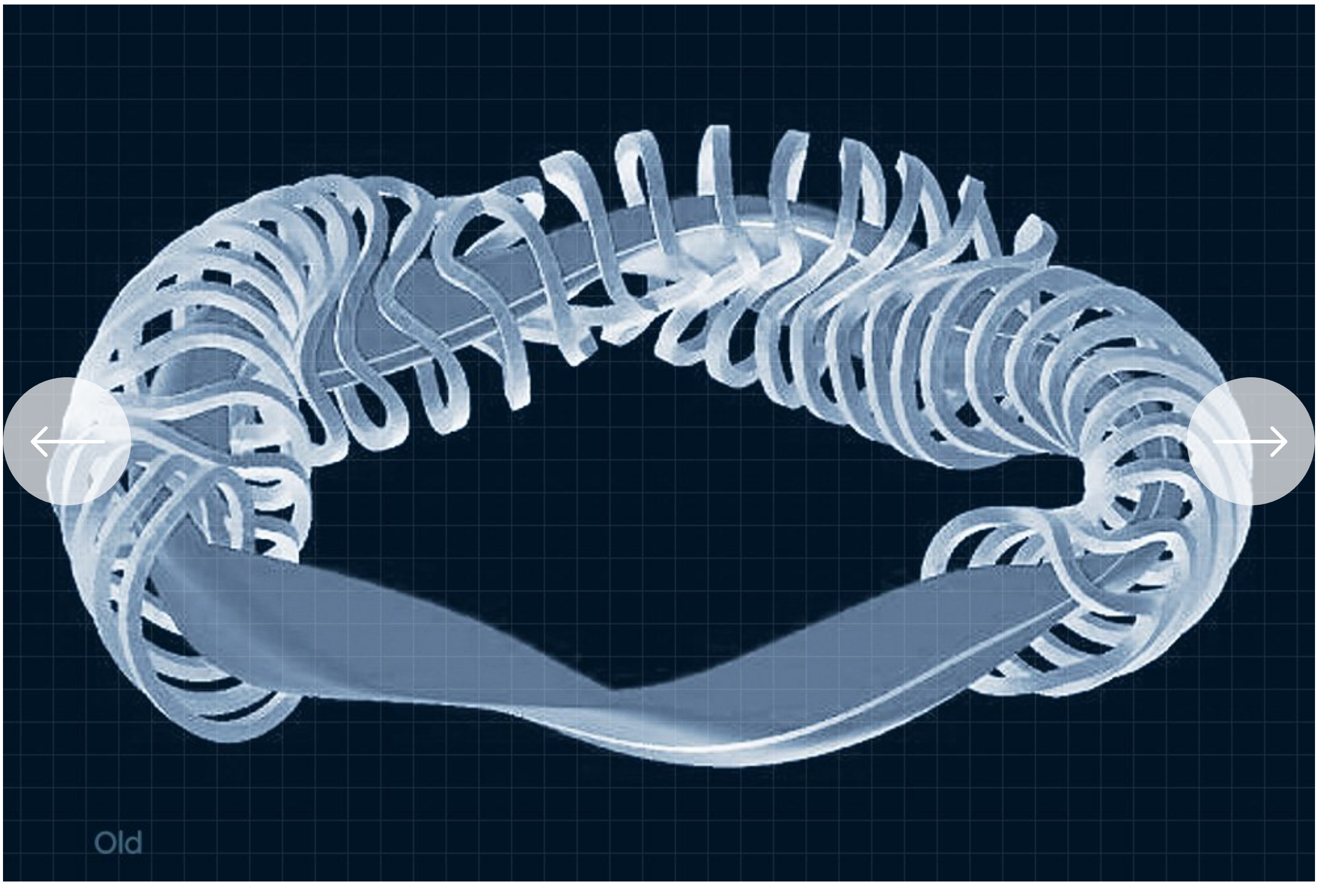
Our liquid Lithium-based walls stop 99.99% of the neutron energy before they can reach solid materials and make them radioactive. Brute force would require a 1.5 meter thick liquid wall. With clever materials, we do it in 40 cm.

The liquid metal is also the “working fluid” extracting heat from the stellarator and transferring it to expensive, but at Renaissance Fusion we are skipping some intermediate steps (tapes, cables) and directly depositing and patterning HTS on large surfaces. It's like changing paradigm from individual transistors to photolithography. We think it will be a big revolution.

turbine-propelling steam. Plus, it copes with the high temperatures and heat-fluxes of compact fusion.

Thirdly, it breeds one of the fuels: Tritium. Our liquid materials allow Li tritide extraction by simple precipitation.

Read more



From: Complex “Coil Winding Surface”

Typical stellarator design involves (1) a metric, for instance fusion gain Q, (2) a plasma shape optimizing that, (3) a surface just outside the plasma and finally (4) numerically identifying, on said surface, coil shapes and currents that accurately generate the plasma shape. There has been a tendency to adopt complex surfaces and then simplify the coils on those surfaces.

Want to learn more? Check out this video in which Francesco Volpe talks about our technology.

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Watch on YouTube

Excited about what we are working on? Join us. See our open roles in the jobs section.

Jobs

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