



*Report July 16, 2025*

**Summary:**

- **Another Record Yield - Understanding Our Progress**
- **Cosmology Conference Paves Way Forward**
- **New Podcast on LPPFusion**
- **Focus Fusion Can Break the Turbine Bottleneck**

## **Another Record Yield - Understanding Our Progress**

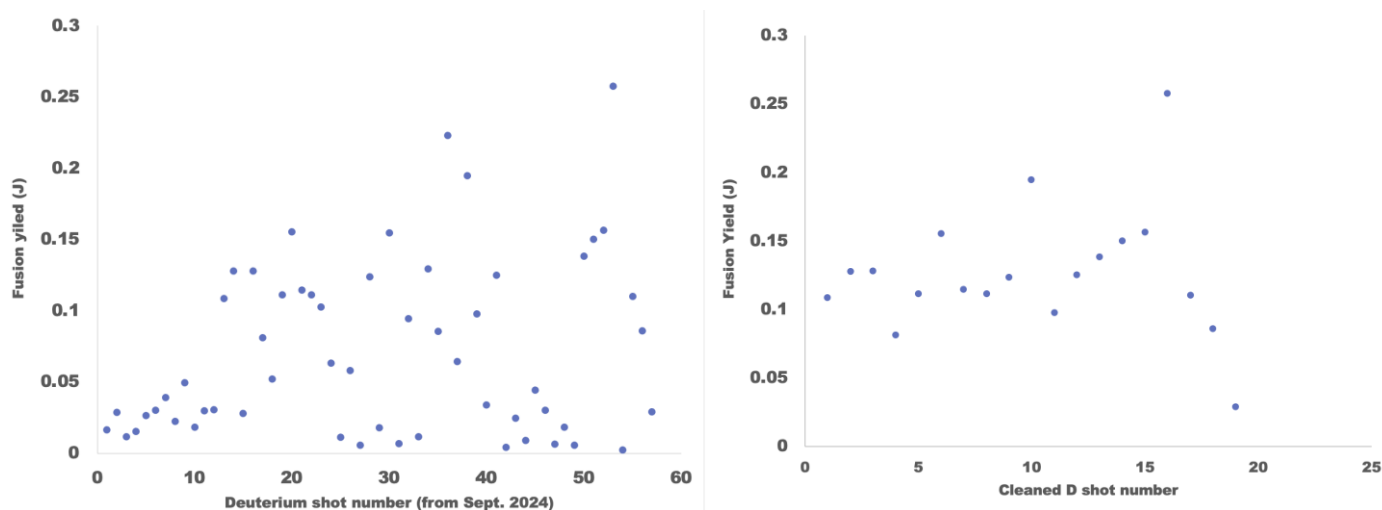
Just six weeks after announcing multi-shot records for fusion yield from our FF-2B, we achieved a new single-shot record on June 23, with a yield of 0.26 J on shot 4. While only a small increase over the 0.25 J achieved back in 2016, the new record confirms the rapid recent increase in fusion yields over the past year, as shown in Figure 1.

“But it took you 9 years to go up only a few percent,” worry some of our investors “How can you get to net energy at that pace?” This concern, while understandable, involves a fundamental misunderstanding of how research progresses. Any research project, no matter how successful, does not resemble an elevator rising steadily from floor to floor. If you know exactly how to get to the next step then, by definition, it’s not research.

Research is much more like climbing a mountain - where you don’t have a detailed map. As anyone who has climbed even the best-travelled mountain trails knows, they very rarely just go up and up. The shortest path to the summit involves climbing over many ridge lines on the way up, so you may spend almost as much time walking downward as upward. In research, without a detailed map you in addition may often take a wrong path for a while before correcting course. So, getting to a local summit may involve finding out that it is not the tallest summit that you are looking for, but gives you a clearer view of that summit - across several intervening valleys.

This has been the pattern in our fusion project. We knew back in 2016 when we achieved our earlier records that the tungsten electrodes we were then using were not the final answer that we needed. The tungsten ions, with their 74 electric charges, did help heat the plasma to our record temperatures, but the tungsten oxide coating on the electrodes made for rapid erosion and irregular compression. We knew we had to come off the peak and move to a new mountain - beryllium electrodes.

Unfortunately, at the same time we made changes in our switch design which turned out to be a wrong turn - a part that should have been Teflon was made of ceramic. Finding out our mistake and replacing the old single switches with the improved dual switches (two switches per capacitor) took us from 2019 all the way to 2023. But in the process we increased the peak current in the machine by 50%.



*Fig. 1. Our recent progress over the last 10 months can be summed up by comparing the yield of our deuterium shots (left) with the yield of only the “cleaned anode” deuterium shots (right). Hills and valleys don’t represent random variation, but a pattern of testing hypotheses with different conditions in the process of finding problems and solving them.*

Similarly, perfecting the beryllium anode design took until late 2024, with major delays for actually fabricating the anodes with one of only a few companies capable of doing this work.

In the meantime, we uncovered two new problems. We discovered that our plasma filaments carried too little current to contain the hottest ions. We needed to redesign the cathode to make fewer, but more energetic, filaments. Then we found that the higher gas densities we needed for high yield were too difficult to break down (to convert to a plasma at the start of the pulse.) We needed new cleaning techniques and preionization processes to improve breakdown. We’ve made a lot of progress on this, but we are still improving now.

Once we mitigated or solved all these problems, we started in fall of 2024 to rapidly climb out of the yield valley to the next ridgelines - optimized beryllium electrodes, and then burning our final hydrogen boron fuel. So, as in a mountain hike, people should judge our progress not by how high we are above the last ridgeline, but how rapidly we are climbing now toward the summit, which in our case is net energy. (Figure 1).

## Cosmology Conference Paves Way Forward

LPPFusion’s Chief Scientist Eric Lerner keynoted the “Beyond the Big Bang, Demysticon 2025” conference June 12-16<sup>th</sup> in Sesimbra, Portugal. The conference was the first in-person meeting bringing together critics (and some supporters) of the expanding-universe/Big Bang hypothesis since the flood of new discoveries from the JWST space telescope greatly increased the evidence against the Big Bang. It was also the first such conference since the Second Crisis in Cosmology conference back in 2008. It has already led to valuable collaborations that will accelerate research both in cosmology and in fusion energy research.

## Expansion or Not?

TEST (DATA SET)	EXPANSION PREDICTIONS	NO EXPANSION PREDICTIONS
GALAXY SURFACE BRIGHTNESS/SIZE	<b>NO</b>	<b>YES</b>
GALAXY SIZE (IMPOSSIBLES)	<b>NO</b>	<b>YES</b>
LARGE SCALE STRUCTURE	<b>NO</b>	<b>YES</b>
AGE OF STARS, CLUSTERS, GALAXIES	<b>NO</b>	<b>YES</b>
ANISOTROPY VS COSMOLOGICAL PRINCIPLE	<b>NO</b>	<b>YES</b>
NON-BARYONIC (DARK) MATTER	<b>NO</b>	<b>YES</b>
SNIa LUMINOSITY AND DURATION	<b>YES?</b>	<b>YES?</b>

## Big Bang or Not?

TEST (DATA SET)	BIG BANG PREDICTIONS	NO BIG BANG PREDICTIONS
HELIUM ABUNDANCE	<b>NO</b>	<b>YES</b>
LITHIUM ABUNDANCE	<b>NO</b>	<b>YES</b>
DEUTERIUM ABUNDANCE	<b>YES</b>	<b>YES</b>
BARYON NUMBER NON-CONSERVATION	<b>NO</b>	<b>YES</b>
HUBBLE CONSTANT AND CMB PREDICTIONS	<b>NO</b>	<b>YES</b>
RADIO ABSORPTION	<b>NO</b>	<b>YES</b>
300 TEV PHOTON	<b>NO</b>	<b>YES</b>

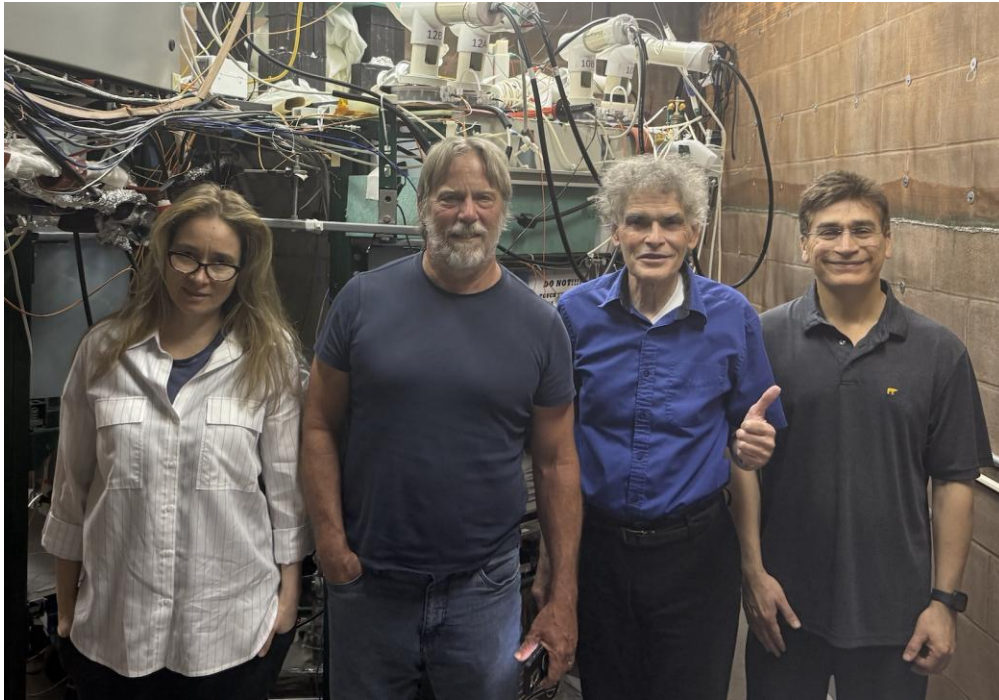
*Lerner's dozen big failures of the Big Bang hypothesis are summarized in slides from his keynote speech at the "Beyond the Big Bang" conference.*

Lerner's keynote, "Time to abandon the Big Bang/Expansion Hypothesis" kicked off the conference by describing six key predictions of the expanding-universe hypothesis and six key predictions of the related Big Bang hypotheses that are decisively contradicted by observations. The same observations confirm the contrary hypothesis, that the universe is not expanding and there was no hot-dense epoch in cosmic evolution. Only the abundance of deuterium and (possibly) supernovae durations are compatible with predictions of both expansion and non-expansion.

Among many other important contributions to the cosmological debate at the conference, Dr. André Koch Torres Assis of the University of Campinas outlined how Big Bang supporters have had a consistent history being widely wrong in their predictions - for example of the temperature of the cosmic background radiation - from the very start. However, they have "adjusted" or "tweaked" the predictions AFTER contradictory observations to fit the observations already made. Dr. Martín López Corredoira of the Astrophysical Institute of the Canary Islands described, in his presentation "The snowball effect as a sociological factor in the creation of alternative cosmologies" the sociological, non-scientific obstacles to redirecting cosmological research out of the Big Bang dead-end.

Supporters of the Big Bang, both young (Dr. Indranil Banik of the University of Portsmouth) and senior (C. S. Unnikrishnan, Defense Institute of Advanced Technology) also presented their approaches to saving the existing paradigm by modifying it. Since open debate is critical to advancing science, there was plenty of time for panel discussions and Q and A from the audience.

A number of possibilities for research and publication collaborations arose from discussions at the conference. Lerner met with one of the conference's sponsors, Jim Keller, a leading Silicon Valley engineer and investor, who has long followed Lerner's research. These discussions led to a visit by Keller to LPPFusion's lab a week later. We'll be reporting on further developments with these potential collaborations as they occur.



*Jim Keller poses in front of FF-2B with LPPfusion's CIO Ivy Karamitsos, Chief Scientist Eric Lerner and Research Scientist Syed Hassan during Keller's June visit to our lab*

## **New Podcast on LPPFusion**

The “**Superpowers for Good**” show with [Devin Thorpe](#) aired a podcast interview with LPPFusion Chief Scientist Eric Lerner on Thursday, July 3<sup>rd</sup>.

See it here: <https://s4g.biz/03jul25>. Learn what Eric thinks is his “Superpower for Good”.



## Superpowers for Good

Devin Thorpe is a bestselling author and renowned new-media journalist celebrated for his advocacy of social good. His influential show, "Superpowers for Good," has featured conversations with over 1,500 notable changemakers, including Bill Gates. With a vast readership exceeding two million unique readers across more than 500 articles for Forbes, Devin has extensively covered impact investing and social entrepreneurship, spotlighting leaders in the emerging crowdfunding industry.

## Focus Fusion Can Break the Turbine Bottleneck

Did you know that the costs of turbines needed for increasingly popular gas power plants are rising? The backlog of ordering the parts for these turbines is comparable to pandemic years, [reports NYT](#). But did you know that LPPFusion's fusion energy generators will need NO turbines? Because: direct energy conversion! – You know, from x rays, ion beam and electron beams that come out of fusion reactions.

The cost of building gas power plants has soared — so much so that in some parts of the country, solar panels and batteries are likely to be cheaper... By some estimates, it now costs two or three times as much to build a gas-fired power plant as it did a few years ago. -NYT

But fossil fuels are cheaper, no? Well... Will fusion plants be cheaper and faster to build than gas plants? We think so: without the need for massive, expensive turbines, expensive batteries and long-distance power lines, why wouldn't they be?



Gas turbines can weigh as much as a large airplane and cost hundreds of millions of dollars. Will Crooks for The New York Times

“As sales of turbines climbed, so did wait times and prices. It takes about four months for GE Vernova to assemble the turbines used in power plants. But that clock starts only after the company has received all the components, like the dense metal fins that catch hot air inside the turbine, causing a rotor to spin.

These days, the backlog is so severe as to be reminiscent of the snarled supply chains of the pandemic, which [constrained production](#) of cars, medical devices and much more. Between those delays and the time it takes to build a power plant, a company starting from scratch today would probably not have a new gas plant running before 2030. Other critical electrical equipment like transformers is also harder to get.” - NYT

If you are concerned about rising temperatures due to greenhouse gases, and about pollution, fusion is the way to go. Fusion is safer, cheaper and cleaner because there is no radioactive waste to worry about. Imagine the world in which power is cheap, pollution is gone and people are enjoying affordable housing, locally produced foods, and cheap healthcare. With fusion energy, everything can change for the better - in a heartbeat. The era of fossil fuels belongs in the 20th century. Invest in fusion energy now. Build a cleaner and more just world with us by supporting our fusion research and development operations.