



LPPFusion Report *August 31, 2020*

Summary:

- **New LPPFusion Video: Pandemic, Economic Crises and the Energy Density Solution**
- **New Switches Ordered**
- **New Anode Starts Manufacture**

New LPPFusion Video: Pandemics, Crisis and Fusion

A new video from LPPFusion explains why fusion energy is essential to escape the global crisis. The [video](#), “*Pandemic, Economic Crises and the Energy Density Solution*” was produced by LPPF’s CIO and Director of Communications Ivy Karamitsos. In the video, we emphasize that fossil fuels have contributed to the present pandemic. Fossil-fuel pollution weakened the disease resistance of hundreds of millions. The vast cost of fossil fuels diverted trillions of dollars away from the public health system, disabling almost all countries from preventing the pandemic. To move beyond this crisis, humanity must move beyond fossil fuels.



The video explains that the key to moving beyond fossil fuels is **increasing energy density**—the amount of energy that can be delivered from a given amount of matter. Coal, oil and gas fueled the Industrial Revolution because they had far higher energy density than wood. But now fossil fuels are too low density for our growing population and standard of living. Fourteen billion tons of fossil-fuel annual global consumption costs over \$10 trillion in direct

and indirect costs. These fossil-fuel costs are a crippling tax on the world economy, siphoning money from everyone to a few thousand billionaire shareholders—who own both oil and financial companies.

But there is another path we can take—now. Fusion is by far the densest energy source known to science. Using hydrogen-boron (pB11) fuel, fusion will produce virtually unlimited power. Trillions of dollars annually would be saved by replacing an economy based on fossil fuels with one based on fusion energy. Instead of going to the pockets of a few thousand shareholders, they would be sufficient to build new cities, infrastructures and industries.

The new video concludes that the fastest way to get fusion is a **crash program**, like the Apollo program, where the government fully funds all possible paths to fusion. At a cost of at most a few billions a year, not trillions, such a program could deliver fusion generators rolling down assembly lines in this decade. Watch the new [video](#), like and share—help get this crucial message to the widest possible audience.

New Switches Ordered

The new switches for FF-2B have now been ordered and are expected to arrive in early November. The switches are a product of a long design process by LPPFusion Chief Scientist Eric Lerner, Mechanical Engineer Rudy Fritsch and Research Scientist Syed Hassan. They are critical to the experiment being planned for late this year.

The biggest differences between the new switches and the existing switches are their number and size. Instead of one switch per capacitor as in the old design, we will now have two switches, a total of 24. And of course, each switch will be about half as big. This will create a significant boost in current. As more faucets can carry more water, so can more switches carry greater current.

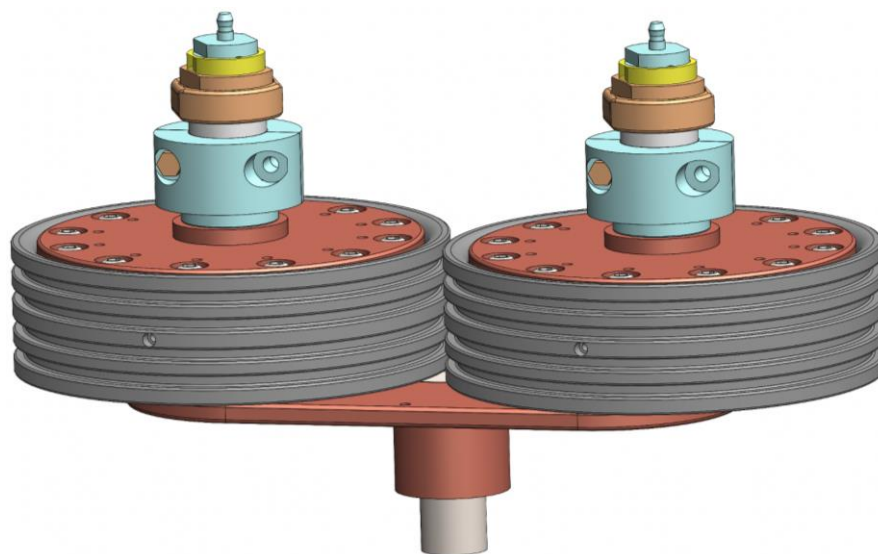


Fig. 1 LPPFusion's new dual switch design, ready to be manufactured. The switches attach to a single capacitor head (not shown) below and are triggered by cable (also not shown) attached to the top of the spark plugs.

More technically, doubling the number of switches will reduce the inductance of the circuit. Inductance is a measure of how much magnetic energy a given amount of current produces. With less magnetic energy wasted in the switches, more current can be delivered and more energy transferred to the tiny plasmoid where fusion reactions take place. The switches will be a big step in getting to our full goal of doubling current from 1.2 MA to 2.4 MA. In addition, the switches will allow a faster rise time to the pulse, which we expect will make the oscillations in the current less important. Reducing these oscillations is critical to getting good compression and high density in the

plasmoid for a fast fusion burn and high yield. The switch designs include a number of improvements that will increase their reliability and reduce maintenance, an essential goal when doubling the total number of switches.

The design of the switches was made easier and more accurate by the major software and hardware upgrades undertaken by Karamitsos (see [June report](#)). Our new project data management system allowed the team to catch a number of small errors and figure out some improvements before the parts were finally approved for manufacture.

New Anode Starts Manufacture

In a second step in our upgrade, LPPFusion has placed an order for the machining of the base of our new beryllium anode. We have also received a cylinder of beryllium that will be used for the shaft of the anode, so we now have all the beryllium metal that we need for machining. The two pieces will be joined together outside the vacuum chamber, avoiding any chance of damaging arcing.

We still are on track to get the anode finished in November, although we are still working on optimizing the design for the shaft—the part that will go into the plasma.

While preparing for our new beryllium parts, we've tested, with an outside safety lab, the dust in our lab to check our precautions against toxic beryllium dust. We were reassured, although not surprised, to learn that the lab could not find any beryllium at all, down to the detection level of $0.15\text{ng}/\text{cm}^2$. The lab also found no lead in our dust. Not only is our own safety assured, but this demonstrates that even a very small lab can handle beryllium electrodes safely.



Fig 2. Our gleaming new beryllium cylinder sits safely in its plastic seal, ready to be machined into multiple anode shafts.