Green Energy Revolution - Focus Fusion Generator.mp4 (10m 0s) 2 speakers (Speaker 1, Speaker 2)

[0:00:05] Speaker 1: Energy from the powers almost all life on Earth. The source of the sun's energy is nuclear fusion, the fusing of hydrogen into helium. Since nuclear fusion reactions produce more energy than any existing energy source, the governments of the world have been trying since the 1950s to bring fusion down to Earth to create a fusion energy generator, but none have succeeded despite billions of dollars in funding. Frustrated with this slow progress, many scientists in green energy's borders have, in the past decade, decided to do something about it by trying different approaches. We at LPPFusion are researching, developing a focus fusion device that is small and cheap. It will produce power that is far cheaper than any existing energy source. We call our technology Focus Fusion. Focus Fusion is powered by hydrogen and boron fuel, also called pB11, which produces no neutrons. This means no radioactive nuclear waste, so Focus Fusion is clean and safe for the environment and for all life on the planet. There is zero pollution, so the whole ecosystem can finally detox from the industrial pollution that has been poisoning our environment for centuries.

[0:01:37] Speaker 2: Why do we need a new source of energy? Why nuclear fusion? Many recent natural disasters have left Americans without power for weeks or months, but to a quarter of the world population, a blackout is a way of life. At home, we are financially stressed over high cost of living, education, and healthcare related debts. On average, we spend one-third of our incomes on all of our energy needs, and when natural disasters hit, we often face long blackouts, homelessness, and bankruptcies. Even when weather conditions are normal, our outdated electrical grids represent the national security weakness for squirrel and hacker attacks alike. Grid repair and maintenance can cost hundreds of billions. The grid aside, all of the energy sources combined today are simply not enough to support our current energy consumption levels. To keep up with our growing energy demands, energy production would have to triple. Historically, our main sources of energy have been coal, oil, and gas. The energy comes from fossilized plants and animals millions of years ago. It had been captured from the sun by plants through photosynthesis and then cycled through endless food chain and biogeochemical cycles, ultimately forming fossil fuels. Therefore, fossil fuels are an indirect derivative of the energy from the sun. We are burning through them thousands of times faster than it took them to form. They continue to poison all life in our biosphere causing high human and wildlife mortality. This is why the popularity of solar, wind, and hydropower is on the rise today. They get their energy from the sun more directly than fossil fuels, but they're even more expensive than fossil fuels that have drained the economy of trillions of dollars. In addition, they're too reliant on unpredictable weather. Their energy is often wasted unless batteries are attached to store it. What are some benefits of Focus Fusion? Let's look at them one by one. First, pB11 stands for hydrogen-born where P is a hydrogen proton. Both hydrogen and boron are found everywhere. Hydrogen comes from water and there is enough boron in sea salt and soil to last for billions of years. It is easily accessible, no searching, no expensive drawing, and no poisonous fracking. Hydrogen-boron or pB11 is continuous source of energy. It does not depend on weather like solar and wind power. Second, pB11 has highest energy density, more energy per gram than any other energy source. Five kilograms of this fuel can supply five megawatts of power for a whole year. It has 200 times the energy density of uranium and a million times the energy density of oil. This will eliminate oil spills and the need for costly and environmentally dangerous fuel distribution networks such as oil pipelines and tankers. Third, Focus Fusion is safer and cleaner than any existing energy technology because it will create no pollution. Hydrogen-boron reacts to produce harmless and useful helium gas. Dangerous production and storing of radioactive waste is completely eliminated. The amount of fuel reacting at any instant is tiny, so there is no possibility of meltdowns as in nuclear fission. Fourth, a Focus Fusion generator will convert power directly to electricity from x-rays and ion and electron beams without going through expensive hundred-years old steam and water turbine technology. In addition, because pB11 is continuous energy supply source, no batteries are needed like with solar or wind energy sources. Fifth, because of direct conversion to electricity and because the fuel produces no destructing neutrons, a Focus Fusion generator can be far smaller and cheaper, cheaper than hydro, coil, coal, and gas facilities. It is small enough to fit in a garage. Solar and wind generators that supply the same power are far larger and therefore, more expensive. Sixth, Focus Fusion power will be decentralized with small independent generators making long distance power grids obsolete. This will eliminate massive blackouts completely. Simultaneous catastrophic collapses of centralized electricity, gasoline, and oil like what has happened in New York after Sandy and then Puerto Rico after Hurricane Maria could never happen again. In summary, Focus Fusion power will be cheaper, cleaner, and safer than any existing energy source. Cheaper energy leads to a better life. Money now used for oil costs could be reallocated for better schools, sustainable housing, organic farming, and better infrastructure. The existing plasma torch technology would be cheap enough to destroy all industrial pollutants and garbage before they enter our environment. Finally, with power so cheap, resource wars may end altogether.

[0:07:17] Speaker 1: If fusion's still 30 years away, why don't we have fusion yet? The key reason is that government projects are focused for 40 years on a single extremely expensive approach, the . That was an unwise and very premature decision when no one knew what was the best route to fusion. People ask us, how can a small firm like ours succeed when the big government projects have failed so far? The answer is that we use the natural instabilities of plasmas to our advantage, instead of fighting them like most other researchers. LPPFusion has achieved rapid advances in fusion yield over the last few years. Predominantly $6 million in funding compared with billions in government funded research projects over the last 60 years. There are three steps to make fusion a reality, and we've already achieved two of them. We've achieved the highest confined ion energy of any fusion device in the world equivalent to temperatures 200 times hotter than the center of the sun. We are number two in the race to produce more energy out of our device than those into it. We've published our results in peer reviewed journals and we are way ahead of many projects with billions behind them, way ahead of any other privately financed fusion project.

[0:08:43] Speaker 2: A former director of the U.S. Fusion Energy Program, Dr. Robert Hirsch chair the committee of researchers who confirmed that our project deserved a much higher level of investment based on their considerable progress to date. Our work is being aided by our new collaboration with the Centre for Energy Research of the University of California San Diego, and with fusion researchers around the world.

[0:09:08] Speaker 1: The money we raise will go to hire more researchers to speed us to our current goal, getting more energy out of the device than we put in. After that will come engineering development, turning a lab device into a working prototype generator that can be mass produced within a decade. Many revolutionary technologies that we take for granted today have been developed by small groups of persevering researchers.

[0:09:39] Speaker 2: To get clean fusion energy, someone needs to fund the research. That someone is you. The governments of the world are too busy funding their military might. The clean energy revolution has started. It's up to us to complete a shift over to truly sustainable way of life. [0:09:54]

How Focus Fusion Works.mp4 (5m 14s) 1 speaker (Speaker 1)

[0:00:03] Speaker 1: The core of our device is two concentric electrodes, separated by an insulator. The outer one is called a cathode. It's the negative. The inner one is the anode, positive. There's an insulator in between. Energy from capacitors is dumped on these electrodes, which are inside a vacuum chamber that contains the fusion fuel. Current starts to flow from the cathode to the anode. What happens is a series of instabilities, driven by the pinch effect, each one of which makes the plasma denser and hotter. The first one, which is illustrated in this animation, is the filamentation instability. You start out with a smooth plasma. The plasma comes together in what are called filaments, which are dense vortices of current pulled together. That makes the plasma ... That's the first step in making it hotter and denser. Now the friction of the electrons moving through the filaments start to heat the plasma up, just like the electrons in a light bulb filament heat it up. The electromagnetic forces on these currents force them to move to the end of the anode. The anode is designed to be hollow. It has a hole in the middle, so the current actually fountains together inside the hole in the anode. People, including us, have taken pictures to show exactly how this happens. Well, as that happens, a second instability develops, because these filaments are all close to each other and moving in the same direction, so they attract each other. That produces what people call the pinch, even though this is sort of the second pinch effect. They're all drawn together, and they merge into a single filament. The next thing that happens is that filament starts to twist up. It becomes coiled, and these coils start to attract each other, because they're moving in the same direction, so it becomes more and more coil. It's called the kinking instability. Eventually, just like a land-line, if any of you still have land-lines, it becomes twisted, becomes twisted up in a little knot. That knot, which is illustrated in this animation, we call the plasmoid. Inside that plasmoid, temperatures can reach extremely high, because the plasma has been compressed so much that its frictional forces heat it up. In addition, another instability produces the acceleration of an ion beam of one direction, an electron beam out of the other. What that means is that a lot of the energy in a fusion reaction actually ends up in a directed ion beam. If you have a directed ion beam, and you take essentially a sophisticated form of coil, you can induce a current in the circuit, as the beam is passing. With adequate switching, you can make sure that that energy stays in the current and doesn't return to the ion beam. [0:04:37]

Focus Fusion Direct Conversion to Electricity.mp4 (1m 8s) 1 speaker (Speaker 1)

[0:00:03] Speaker 1: Most of the fusion energy, and most of the energy originally fed into the device, is emitted in an ion beam traveling away from the electrodes. This beam is fed through a type of induction coil. The ion beam generates changing magnetic fields, which in turn generate current in the coil. This pulse of current is fed to capacitors. Some of that energy is recycled to provide energy for the next shot, and the rest is fed out to the grid. An additional part of the fusion energy is emitted as a pulse of x-rays. This is captured in an onion-like photoelectric device. X-rays collide with electrons in thin metal films, causing the electrons to be emitted with high energy. Electrons are captured on charged electrical grids, generating a current that is also fed to the grid. [0:01:00]

Why is Focus Fusion Moving Faster than much bigger Fusion Research Projects.mp4
(3m 0s) 1 speaker (Speaker 1)

[0:00:03] Speaker 1: How do we do better by certain objective measures than projects that have hundreds of thousand times more resources and staff? I don't think the answer is we're much smarter than they are. I think the answer is we've chosen an easier route. And the key to understanding that is how we're trying to control the plasma. Because to get fusion, you have to be able to control the plasma in some way. And basically, the dominant approach of almost all the other efforts in fusion is to get the plasma to sit still. To behave. "Good dog." And the problem is plasma does not want to sit still because of the pinch effect. A pinch effect is what we're using. You can't avoid the pinch effect when you have plasmas. It means that plasma wants to form currents that go in the same direction. They attract. They repel the currents going in the other direction. They form filaments. You basically get a can of worms. Almost, if you can imagine the filaments as worms. What we're trying to do is to use the instabilities. To say, "Okay, the plasma wants to form these instabilities, so we will use the filamentation to compress the plasma. And in doing that we're basically imitating nature. Nature doesn't produce . But nature does produce filaments. It does produce plasmoids. It produces them at all sorts of scales. We observe them in solar flares. We observe them in what are called herbic harrow objects, which are the beams coming out of start that are in the process of formation. We observe them in quasars. We even observe them in the formation of our own spiral galaxies in extreme astronomical scales. Here on earth, we certain observe some of the same phenomena in some of the phenomena in lightening. For example, people may have heard of these things called sprites, which are lightening bolts. They go upward into space, far above thunderstorms. And we observe filamentation in the aurora. So this is a basic organizing principle of nature. By using that organizing principle. By saying we want to guide the instability rather than fight the instability, I think we end the with a much easier path, and that's why we can get results with far less resources [0:02:55]