First Light Fusion's Machine 3 Fully Operational

OXFORD, England, Feb. 12, 2019 /PRNewswire/ --

- World's largest device dedicated to researching inertial fusion energy

- Commissioning completed on budget and on schedule

- First Light Fusion aims to demonstrate fusion using Machine 3 by mid-2019

- Targeting 2024 to achieve gain – generating more energy than is used to spark a reaction

First Light Fusion, the University of Oxford spin out researching energy generation via inertial fusion, has successfully completed building and testing of its unique pulsed power device, dubbed Machine 3.

The machine was built to advance the Company's work exploring fusion – the ultimate source of energy. Machine 3 has now been fully commissioned following successful testing at the end of 2018. It is the biggest pulsed power machine in the world dedicated to researching fusion energy.

Machine 3 is capable of discharging up to 200,000 volts and in excess of 14 million ampere – the equivalent of nearly 500 simultaneous lightning strikes – within two microseconds. The £3.6m machine uses some 3km of high voltage cables and another 10km of diagnostic cables. Similar to a railgun, it will use electromagnetism to fire projectiles at around 20km/s (enough to travel from London to New York in 4 minutes). Now fully operational Machine 3 will be used to further research First Light Fusion's technology as the company seeks to achieve first fusion, which it expects to deliver in 2019.

The next step in the technological development will be to achieve 'gain', whereby the amount of energy created outstrips that used to spark the reaction. Fusion is the ultimate source of the universe's energy and is the same process that powers stars, including the Sun.

Nicholas Hawker, Founder and CEO of FLF said:

"This is another major milestone for First Light Fusion. Commissioning of Machine 3 has been completed and performance has been confirmed to meet the design specification. We have now started our experimental campaigns. These will culminate in the first demonstration of fusion from one of our target designs. These targets have many elements and we are holding ourselves to a very high scientific standard, verifying operation of each element in isolation and

cross-comparing with simulation predictions at all stages. We are confident we will show fusion this year. After fusion, the next phase is to show energy gain, which we aim to complete by 2024.

"In parallel we are working on the reactor concept and on the commercial aspects of the technology. Our technology is uniquely scalable and we believe we can see a clear pathway to the first reactors producing power. We must be led by the science and there is still a lot to do, but if we can find the target that works with our reactor design, fusion would not be 'always 30 years away' – we could make it happen much faster than that"

About First Light Fusion

First Light Fusion was founded by Professor Yiannis Ventikos, who is currently the Head of the Mechanical Engineering Department at University College, London, and Dr Nicholas Hawker, formerly an Engineering lecturer at Lady Margaret Hall, Oxford.

The company was spun out from the University of Oxford in July 2011, with seed capital from IP Group plc, Parkwalk Advisors Ltd and private investors. Invesco and OSI provided follow-on capital.

The business has developed from a research-focused university project to a fully-fledged company that has developed not only a strategy for how to make fusion energy work, but also a sustainable business model based on the technology.

The team comprises experts in relevant scientific and engineering fields plus the management experience necessary to address the challenges which lie ahead.

The company has been able to attract a world class advisory board, meaning it can benefit from decades of relevant experience to help it streamline the path towards realising its vision.

Inertial Confinement Fusion

First Light uses a high-velocity projectile to create a shockwave to collapse a cavity containing plasma inside a 'target'. The design of these targets is First Light's technical USP.

The company's approach was inspired by the only example of inertial confinement found on Earth – the pistol shrimp, which clicks its claw to produce a shockwave that stuns its prey. The only other naturally occurring inertial confinement phenomenon is a supernova. The reaction created by the collapsing cavity is what creates energy, which can then be captured and used.

Fusion has already been demonstrated by other approaches. The two most advanced are the tokamak and laser-driven inertial fusion. ITER, being built in the south of France, will be the world's largest tokamak, aiming to demonstrate gain. The National Ignition Facility (NIF) in California is the world's most energetic laser and is also aiming to demonstrate

gain. Both these projects have encountered substantial difficulties, both relating to the fusion process itself but also the complexity of the engineering required. First Light must demonstrate fusion before then undertaking an equivalent gain-scale experiment. However, if First Light succeeds in the fundamental demonstration of fusion, the pathway to gain and a power plant is potentially much simpler, quicker and cheaper than these mainstream approaches.

First Light's approach to fusion, which is safe, clean and virtually limitless (with the source of energy drawn from the deuterium contained in sea water), has the potential to transform the world's energy supply when it will be applied successfully to power generation. Unlike existing nuclear power, there is no long-lived waste and raw materials can be found in abundance. As demand for alternatives to carbon-based energy grows, mainstream scientists and research institutions are looking to fusion power to answer the world's energy requirements.

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