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Cheap, green and sustainable energy: Australia to lead a new approach to laser-boron fusion electricity generation

A method of generating electricity using a fusion reaction that is free from any radioactive fuels or nuclear waste could be less than ten years away, and is already more advanced than other fusion approaches.

Today a roadmap was published by Cambridge University Press in the peer reviewed scientific journal *Laser and Particle Beams* bringing together recent breakthroughs that have made a hydrogen-boron fusion approach to energy generation viable, detailing how far advanced it is relative to other fusion approaches, and what research is needed over the coming years to make it a reality.

The fusion reaction is between hydrogen and boron, a reaction previously dubbed to be too hard as the conditions required to initiate the reaction would be 100,000 times more difficult than the more well-known hydrogen-hydrogen (deuterium – tritium) fusion reactions responsible for the sun's energy, and other fusion programs (e.g. the USA's National Ignition Facility, and ITER).

Heinrich Hora, lead author and Emeritus Professor from the University of New South Wales predicted in the 1970's that a reaction between elements hydrogen and boron could be viable in non-thermal equilibrium conditions. This has been the focus of his career ever since. Rather than heat the fuels up to the temperature of the sun, hydrogen-boron fusion could be achieved using two laser approaches that apply precise non-linear forces to bring the two nuclei together and create the fusion reaction. More recently, laser technology has caught up making these two laser approaches viable. Since then several research groups around the world have observed the hydrogen-boron fusion.

"It is a most exciting time to see these reactions actually work, not just because it proves some of my earlier theory, but they have also measured the laser initiated chain reaction to create 1-billion fold higher energy output than predicted" said Hora.

"This puts our approach ahead of all other fusion energy technologies."

Hora has secured intellectual property on a fusion energy generator ([link](#)) and has recently started HB11 Energy in Australia to lead the commercial development of the technology. Over the next five years HB11 plans to lead several international collaborations to solve remaining scientific challenges outlined in the Roadmap paper

Managing Director of HB11 Energy, Dr Warren McKenzie, said "If the next few years of research don't uncover any major engineering hurdles, we could have a prototype reactor within the next decade."

"Development costs will be miniscule relative to the tens of billions funding projects such as ITER, the National Ignition Facility and TAE Technologies. From an engineering perspective, our approach will be a

much simpler project because the fuels and waste are safe, the reactor won't need a heat exchanger and steam turbine generator, and the lasers we need can be bought off the shelf."

"We estimate that we will be able to produce completely safe, clean and green energy at 1/4 of the cost of coal fired power."

Roadmap paper: DOI: 10.1017/S0263034617000799

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