Power the World: Global Fusion Initiative

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Abstract

In a world so close to an energy crisis, new technologies are needed to sustain our way of life. Nuclear fusion seems as one of the last hopes for energy, as it produces extreme amounts of energy from a little amount of matter that is abundant on Earth. The only problem is that scientists have not been able to construct a fusion reactor that can sustain a nuclear fusion reaction; therefore all fusion reactors today are inefficient. Power The World is a non-profit competition set on benefitting humanity through new forms of energy (mainly nuclear fusion). The goal in constructing Power the World was to obtain the most cost/energy efficient fusion reactors and have them built around the world in order to produce gratuitous amounts of energy, to cease the world's dependence on non-renewable resources. Power the World gained its roots from organizations such as X-prize and DARPA, and competitions such as the Grand Challenge and the Ansari X-prize Power the World seek to revolutionize the world's energy plans. Power The World offers participants the incentive of a cash prize, funds for a research institute, and an international contract to build their reactors. Unlike DARPA and the X-prize foundations, Power the World is an international competition without a limit on countries or the amount of teams participating.

Summary of Fusion

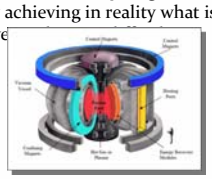
Fusion, simply put, is the combining of different atomic nuclei to form a single nucleus. There are different types of possible fusion reactions involving light elements, (Mainly hydrogen and helium) that are being researched. In no specific order these reactions include the Deuterium-Deuterium reaction, the Deuterium-Tritium reaction, the Deuterium-3Helium reaction, and others. The most common reaction, and right now the most practical in terms of energy produced, is the deuterium-tritium reaction (D-T for short). The formula for the D-T reaction is:

$$^{2}H + {}^{3}H \rightarrow {}^{4}He + n$$

Deuterium and Tritium are both isotopes of hydrogen, deuterium containing 1 proton and 1 neutron, and tritium containing 1 proton and 2 neutrons. The D-T reaction holds a potential of 17.6 MeV of stored energy. Deuterium is not very common in retrospect, but in sea water deuterium is plentiful considering the amount of energy that can be harnessed from the D-T reaction. Tritium on the other hand, is even less abundant in nature since it is radioactive and quick to decay. Fortunately tritium can be manufactured, and the products of the fusion reaction itself can be used to make tritium. Escaped neutrons can interact with lithium to form helium and tritium.

$$n + {}^{6}Li \rightarrow {}^{4}He + {}^{3}H + 4.78\ MeV$$

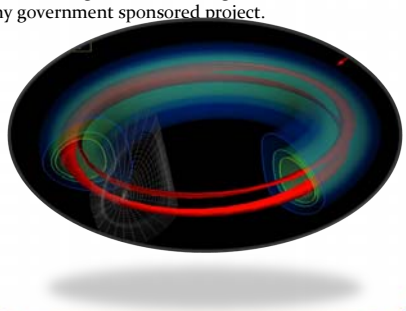
What this means, in a more basic sense, is that the fuel for what could become the solution to the energy crisis is as abundant on Earth as water. The science of fusion is absolutely magnificent; the problem is that actually achieving in reality what is written on paper has prove



Methods/Process

Since this is a contest the rules are an essential part of our project. The contest itself is pretty open ended, after all this is a contest addressing the research of a technology that has not been perfected. This allows the opportunity for a very large number of possible solutions to the problem in question. So we needed a way to mandate all these possibilities while at the same time leaving the contest open ended. The main purpose of the rules themselves is to serve as a way to eventually determine a winner. Thus we had to define what a winning reactor would have to be capable of. Also, as in all contests, we had to set rules that would prevent misconduct, in other words, to punish people who would hinder the process of research for personal gain. The most important aspect of the contest is to advance technology, and so any actions that are taken to mitigate that advancement must be met with appropriate repercussion. To summarize, the rules are instated to ensure that technology moves forward and to reward those who move it the furthest.

The most important thing to understand about this proposal is its scope. This is not the X-Prize, where the prize is around $10 million and the goal can be completed with a few months of research. This is an initiative on the same scale as the Hubble Telescope, but with the potential for a far greater payoff. The prize is about $1 billion, and the goal of the project itself has yet to be accomplished by any organization whether government or private. Though a project of this scope sounds impossible, we believe it is possible based on Hubb;e's budget of close to $1.5 billion. The X-Prize model was chosen because government projects often get hung up on bureaucracy and red tape, while a competition between corporations not only produces more money invested in the technology than was put in, but also prevents stagnation and budget woes common with any government sponsored project.



The Prize

The prize for the reactor design that best meets the goals set forth by the judgment committee as decided by the judgment committee is 700 million dollars in a cash lump sum, with an additional $300 million grant specifically for the construction and operation of a state-of-the-art nuclear fusion research facility. The total prize worth is offered free from taxation within the United States of America.

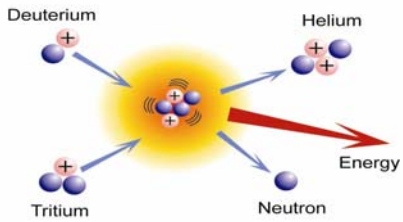
In addition to the monetary prize, a United States patent will be issued for the winning design to all of the team members jointly or to the controlling corporation of the team if applicable. The patent is also to be joint with the United States government, in such a way as to generate a small portion of government profit from the implementation of the reactor on domestic soil. The team and or controlling corporation will retain full right of use for the patent.

Conclusion

The Power The World contest we have designed offers a powerful way to stimulate world private industry into working towards what has the potential to be the answer to mans' energy needs. Foundations like DARPA and X-Prize have proven to be effective means for technological development, so scaling it up to a project on the same level as the Hubble Telescope could only produce greater advancement than what has already been done.

DARPA

The DARPA Grand Challenge is a national competition for driverless cars. Sponsored by the United States Department of Defense, the Grand Challenge is an incentive-based competition with money being the main prize. Competitors in the Grand Challenge must design and fabricate an unmanned vehicle able to cross the desert remotely. Competitors form teams, all privately sponsored and managed. Teams compete of their own free will for a cash prize; the Idea is to entice many teams to compete, in order to acquire new technologies faster than normal research. The teams are basically mini, independent, think tanks sponsored by private corporations. Teams hope to develop new technologies, and gain a large cash prize, and contract for their technologies in the process. In a competition like this, both parties win; DARPA, gets the technology it so desperately needs, and the winners get contracts, endowments, and recognition for their achievements and technologies.



The X-Prize

The X-prize is similar to DARPA in the respect that it is a competition and a foundation bent on obtaining new technologies by using monetary incentives. X-prize is the more well known of the competitions, and its mission is to design and manage public competitions for the benefit of science and humanity as a whole. The Ansari X-prize, the most well known of the X-prize competitions, was a competition for the first team to launch a privately sponsored spacecraft into orbit around .On October 4, 2004, Spaceship One won the Ansari X-prize and its design team was awarded $10 million dollars in addition to a contract with Richard Branson to start a commercial spaceflight industry. Twenty seven teams competed to win the Ansari X-prize, most with sponsors prominent in aeronautical field, and other technological fields: this resulted in over $100 million invested in the technology across all teams. The X-prize foundation still has many other prizes in many diverse fields. There are currently large cash prizes available in categories of medicine, automotive, space, education, environmental, and social advancement.

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