The Real Polywell

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The US Navy is understandably reluctant to release information about the current status of Polywell research, so it is difficult to get the latest developments. We do know that the EMC2 San Diego research team is more than half-way through its present $8 million Navy Contract. The Navy "call for proposals" for the present contract asked the contractor to do the following:

*The **Contractor shall construct and test a** small-scale Magnetic Grid (MG) Insulated **Wiffleball Polyhedral Device WB8. WB8 shall be built based on results of WB7** and shall utilize design and performance knowledge gained from test of prior WB machines. The design shall use circular coils around each main face cusp axis. The device shall use emitter electron gun arrays and an ion beam drive. The machine will be operated in magnetic fields with pulsed currents. **WB8 shall be operated at a magnetic field strength of approximately 0.8 Tesla, which represents an increase of 8 times the magnetic field strength of previous WB machines**. Improvements over previous WB machines in WB confinement, ion energy and fusion reactivity are expected as a result of these changes to the earlier WB machine design.*

***Within 20 days of completion of testing of the WB8, the contractor shall deliver a report** detailing results of the experimental testing. The report shall provide sufficient information to guide programmatic and design decisions about further, refined design efforts for similar devices. **The report shall address** the plasma dynamics of WB devices, and shall address **the scaling laws that apply to polywell fusion**. Within 30 days of build and test of WB8, the contractor shall provide a predictive model of WB behavior including data points for detailed 2D/3D profile measurements of plasma density, ion energy and WB magnetic field structure during follow-on tests **to validate the scientific basis for a Polywell fusion power reactor**, and guide further research. The contractor shall coordinate with the Government for a program review meeting at the contractor's facilities to be held no later than 40 days after the testing of the WB8 and shall provide the detailed predictive model and data points at this program review meeting. The contractor shall deliver a periodic progress report specifying status information of the experimental testing of the WB8.*

The contractor shall deliver a conceptual design for a follow-on fusion demonstration device WB-9. Conceptual studies will focus on the feasibility of extending the WB-8 results to this device and determining the suitability of this concept as a fusion reactor. This design will be delivered at the end of the contract.

*Option for further development and testing WB8.1: Enhanced Ion Drive with PB11 (proton/boron 11): **Based on the results of WB8 testing**, and the availability of government funds **the contractor shall develop a WB8.1** which incorporates the knowledge and improvements gained in WB8. **It is expected that higher ion drive capabilities will be added, and that a "PB11" reaction will be demonstrated.** The contractor shall investigate and validate the plasma scaling laws with respect to B-field, voltage and reactor size.*

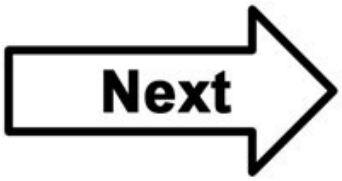
*The contractor shall **investigate the feasibility of a neutron-free fusion power reaction** using a polywell WB machine. It is anticipated that improvements in WB confinement, ion energy, and fusion reactivity will be demonstrated in WB8.1. Improvements over the WB8 predictive, computational model are expected, which should yield a better understanding of the WB fusion reaction thus allowing optimization of the WB machine.*

*The contractor shall deliver a report detailing the results of the experimental testing of WB8.1. The report shall provide sufficient information to guide programmatic and design decisions about further, refined design efforts for similar devices. The report shall address the plasma dynamics of WB devices, and shall address the scaling laws that apply to polywell fusion, and the feasibility of the PB11 reaction. **The report shall address the conceptual requirements for a polywell fusion reactor capable of generating approximately 100 Megawatts.** Within 30 days of testing, the contractor shall update the predictive computer model of WB behavior created earlier using the PB11 reaction and shall deliver the model within 30 days of completion of initial tests specified in paragraphs above. The contractor shall refine the experimental database including detailed 2D/3D profile measurements of plasma density, ion energy and WB magnetic field structure to validate the scientific basis for a Polywell fusion power reactor and to guide further research.*

*The contractor shall coordinate with the Government for a program review meeting at the contractor's facilities to be held no later than 40 days after the testing of the PB11 and shall demonstrate the database at this program review meeting. The contractor shall deliver a periodic progress report specifying status information of the experimental testing of WB8.1. for enhanced ion drive development and testing. **The contractor shall develop an enhanced ion drive system that is compatible with Wiffleball 8.1 and projected future wiffleballs.** The ion drive system shall be **capable of injecting protons (ionized Hydrogen), and ionized Boron 11**. The ion drive system shall be capable of generating ions **in sufficient quantity to fully fuel the wiffleball fusion machines.***

The Polywell team will be using their new WB-8 Polywell to explore the physics of Polywell devices, to validate the R^7 power scaling, and other scaling laws beginning in February of 2011. If all goes as planned, a review panel meeting in Sept or October of 2011, will give the go-ahead for p-B11 testing.

Money for doing this seems assured in the short term, but it is in our national interest to make sure that the funding continues!



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