Prof. David N. Ruzic
University of Illinois
druzic@illinois.edu
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Compelling International Collaboration Opportunities

I. International Facilities

The EAST and HT-7 tokamaks in Hefei China are the key facilities to target in the near term. The entrepreneurial spirit is alive and well there and they are capable of trying new ideas quickly. Collaborations should also focus on a theme. One such example is the use of lithium as a PFC. A program which links FTU in Italy, with TJ-II in Spain with T-11 in Russia – all due to their use of lithium CPS structures should be encouraged.

While ITER is the most expensive and international project being built in the next 10 years, it seems to already have structures in place for international staffing. My worry is that if a new DOE OFES program is designed with ITER in mind it will merely add a small drop to an already huge sewer-pipe-flow of money and resources being poured into ITER. Concentrating on non-ITER facilities with an eventual international-collaboration call-for-proposals would be more effective and better for the overall health of the program.

II. Key Scientific Challenges

Plasma-surface interaction will determine the lifetime and eventual cost of a fusion energy facility. In particular lithium walls allow a low-recycling solution which could revolutionize tokamak-based power-plant design since they can support an ELM-free, hot edge plasma solution which allows the entire volume of the fusion reactor to produce fusion energy. This allows for significant volume (and thus cost) reduction.

The ability to remove heat from a divertor plate with flowing molten lithium, yet maintain a low-enough surface temperature is one of the key enabling technologies which deserves closer international involvement. Lithium work across the world is fragmented and could be tied more closely together through such a program. In addition looking at other flowing molten metals, alloys, or eutectics should also be explored.

III. Modes of Collaboration

Graduate students are capable of doing an enormous amount of work at a low cost. They also become the workers and leaders of the future. In an increasingly international fusion research environment, ensuring that US graduate students who may pursue a career in fusion energy sciences are (1) knowledgeable about facilities in other nations, (2) have had direct experience

working at those facilities, and (3) have established significant networks with their peers at those facilities should be a paramount goal of a DOE International Collaboration program.

Toward that end, I suggest that a large number of graduate fellowship exchange programs be funded. This money should go to Professors at US Universities who are already funded from the DOE OFES budget. That money must be used to send some of their graduate students to a foreign lab and include funds for the Professor to travel there as well a couple times during the student's stay. A reciprocal arrangement should be sought such that the foreign students and scientists from the same lab could come to the US to visit as well.

A program as outlined above is superior to merely an ORISE fellowship that pays for a student's summer abroad. While that trip may be beneficial, it may also just turn into a vacation. By involving the Professor directly, the work is much more likely to be sustained, and the Professor could select the appropriate student at the most appropriate time.