Lawrence Livermore National Laboratory

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94-026

Dr. Thomas Dillon
Group Senior Vice President
Science Applications International Corporation
10260 Campus Point Drive, M/S C-2
San Diego, CA 92121

Dear Dr. Dillon:

Dr. Robert Conn, Dean of Engineering at UCLA, has informed us of your plans to organize a team of Russian scientists, using Nunn-Lugar DoD support, for the design and construction of a Volume Neutron Source (VNS) based on either a small beam-driven, steady-state Tokamak or Gas-Dynamic Trap device. As stewards of Inertial Fusion Energy (IFE) applications at LLNL, we would like to express our support for such an initiative, since IFE as well as MFE would benefit from data such a facility could produce. At the risk of oversimplification, we see the many past conceptual designs of IFE power plants as dividing into two basic classes differentiated with respect to materials development needs: (1) fully protected-wall IFE fusion chamber concepts such as HYLIFE, HYLIFE-II, or CASCADE, where neutronically-thick liquid or granular-fluid flows reduce structural wall material doses sufficiently that there would be no need for high-fluence materials development; and (2) solid dry wall or partially-protected-wall IFE fusion chamber designs such as PROMETHEUS, SOMBRERO, and OSIRIS, which generally utilize porous silicon carbide or carbon-based composites as structural materials used to support renewable-liquid film front surfaces on woven-fibre or rigid first wall tubes or panels. Each class of approaches to IFE poses very different sets of uncertainties and development needs. The foremost materials issue most often associated with the latter set is the useful lifetime due to effects of helium generation from neutron reactions degrading the structural properties of such carbon-containing materials, which might be measurable with modest neutron fluences equivalent to 5 to 10 dpa. Such low activation materials are important to potential direct-drive IFE concepts, yet their service life due to helium generation i sunknown.

Your proposed VNS facility could provide an important screening test for generic structural sub-scale modules fabricated from such materials., which would have an important influence on the subsequent development of a whole class of such IFE concepts employing such materials. We understand from conversations with Dave Crandall at DOE/OFE that the MFE community also has an interest in moderate fluence testing of such materials for low-activation reasons. If so, this area of materials/structure testing needs would have common utility to both IFE and MFE. Accordingly, we strongly endorse this proposed Russian VNS facility, and hope that any information gained on the C/SiC composites as a result of this Russian project be made available to the U.S. materials research community for IFE as well as MFE future use.

Very Truly Yours,

Grant Logan

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William J. Hogan

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