March 8, 2004

Dr. Charles Baker
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Dear Charlie,

This letter contains the report on the VLT PAC meeting held March 2 and 3, 2004 in San Diego. Your charge to the Committee was:

- Please provide feedback to Baker and Sauthoff on program and budget information on VLT and ITER project topics to be presented at the DOE OFES Budget Planning Meeting.
- Key considerations include clarity of information, relationship between VLT and ITER technology activities, and proposed priorities.

We appreciate the effort by the VLT Team in describing their program and note the progress they made during the past year. This is a period of transition for the VLT and the ITER Project. Planning is underway for supporting ITER construction assuming the successful resolution of the ongoing negotiations. We commend the excellent work by Ned Sauthoff and you in preparing for ITER negotiations and identifying a set of procurement packages, which take advantage of the previous work by the U.S. community.

ITER construction will have a major impact on all aspects of the fusion program including the VLT. The VLT Team has made a significant effort in showing how their program supports ITER. The discussions revealed that considerable design and R&D is required prior to procuring the components identified in the negotiations. As some of the speakers identified near-term R&D would be beneficial to reduce the risk in the procurement process. For example, significant issues remain in the design of the central solenoid, which must be resolved before the procurement can be made. This is just one example of many, which were identified.

The VLT Program appears to have four major components: basic research in the technology in support of fusion science, R&D in support of ITER procurements, of the burning plasma program, and of ongoing experiments. Each of these components is important and should be supported. While some tasks support more than one component, it would be helpful to articulate the elements of the program along these lines. Some of the speakers provided the committee with information that clearly explained the balance within the program and the priorities within their area. Since the speakers were not asked to show how their program had changed in response to the ITER initiative, it is perhaps

not surprising that the committee was not able to assess how the program has evolved. There are two major exceptions in the redirection of the plasma chamber program to focus on the ITER breeding blanket and the proposed elimination of the IFE technology program. In preparation for the presentation at the Budget Planning Meeting, a synthesis of the components of the program by the four major components would be helpful and would provide a context for the changes in the program.

ITER Project Overview

The committee was supportive of fabricating the entire central solenoid as a trade-off for the water system procurement. This option should be investigated with the other ITER parties.

When the procurement packages are fully defined a comprehensive review of the cost, schedule and risk mitigation plans for each package should be performed.

Magnets

The information regarding the workscope and the plans for executing the scope was very good. The team identified significant risks and the ITER funding in '05 is responsive to their request.

Plasma Facing Components

Some clarification of which activities support the procurement packages and which support the burning plasma program would be helpful.

Safety and Tritium

This talk effectively used color-coding in explaining what was in which category and the slide showed how the activities changed in various funding levels.

With the US tentatively allocated responsibility for the Tokamak Exhaust Processing System, it is important for the US to position itself to perform the required tritium processing work. In the near term, the primary activity will be working with the EU on the integrated design of the Tokamak Exhaust Processing System and the Hydrogen Isotope Separation System. The US should engage in the Tritium Working Group and work with the EU on this activity. Areas of risk should be identified and appropriate risk-management activities undertaken.

ECH Systems

Development of the electron cyclotron gyrotrons and components continues to make good progress. The ongoing development of the 1.5MW, 110 GHz tube in support of the DIII-D program will enable the DIII-D team to increase the power and pulse duration of their experiments. Review of the ITER procurements has identified the need for

modifications to the existing tube to operate at 1MW and 120 GHz. This should be pursued, as should an investigation of whether the existing 110 GHz tube is sufficient to meet the ITER requirements. The effort in developing a 2MW, 120 GHz tube is not closely linked to ITER requirements and would have to be justified in the context of future needs.

Fueling Systems

A clearer statement of mission and scope would help to clarify the different elements in the program. The relationship of the work compared with the ITER baseline was not clearly articulated. Are the options under study beyond the ITER baseline a form of risk mitigation because we are concerned about the feasibility of the proposed ITER baseline?

Plasma Chamber Systems

The primary issue here is that the funding for an ITER test blanket module is not part of the procurement scope. Nevertheless, it is an important component of the burning plasma program and the PAC recommends that the research be focused on an achievable realistic goal. The PAC recommends continued collaboration with Europe and Japan in this effort. In a future PAC meeting, a presentation on the proposed U. S. role and the relationship to the international effort should be given.

ICH Systems

The proposal has a good balance between supporting core competency in the ongoing US ICRF program and the upcoming ITER needs.

The proposal recognizes important issues and R&D needs for the ITER 20 MW ICRF system. Since the US has the lead on this, adequate funding is necessary, and in particular, some issues have to be dealt with as soon as possible, if not immediately. Of particular concern is the decision on the choice of high power tubes, namely choosing the US approach of using two EIMAC tubes connected in parallel, in groups of eight, or to adopt the European proposal of developing a high power “diacrode” tube, to be developed by the French program (which is in danger of being cancelled, if the US approach is chosen). Laboratory testing of the US approach in the near term is needed to determine its viability. Another near term R&D need is the assessment of the suitability, or replacement of the tuning capacitors by some other tuning elements, such as the proposed sliding stubs, since ceramics may not be acceptable in a neutron environment. The Committee recommends increasing the priority of the evaluation of the high power tubes.

Finally, participating in the JET ITER prototype antenna testing is valuable and should be continued due to its impact on the ITER ICH procurement packages.

FIRE

If the ITER negotiations were to falter, FIRE is an alternative to ITER. Dale Meade in his presentation identified the need for a national burning plasma program, and Ned Sauthoff strongly supported this need as well. The formation of a national burning plasma program is beyond the scope of the VLT PAC and is an appropriate topic for the Burning Plasma PAC to advise on.

Advanced Design and Socio-Economic Studies

This effort is important to the program and continues to make significant contributions. The budget constraints have resulted in focusing on the compact stellarator and stretching out the evaluation of this configuration. The committee concurs with this approach.
Materials

The materials program is at present focused on basic research and has made substantial progress. The PAC noted that while other program elements have been reoriented to near-term objectives, the materials program remains almost entirely focused on long-range goals. In light of the ITER construction, some additional near-term activities may have to be addressed within this general activity.

Despite lack of involvement by the US in the IFMIF program, some effort to maintain contact with the neutron materials testing community should be retained.

IFE

This IFE technology program has performed high quality work but has in the recent proposed budget been eliminated. This effort has supported university research and small innovative research programs. The PAC supports the request for incremental funds to enable the VLT to support both MFE and IFE technology.

As usual, the presentations to the Committee were clear and very helpful. We appreciate your preparation and leadership. If you have any questions regarding our report, please feel free to contact us.

Sincerely,

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