GENERAL DYNAMICS
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Dear Dr. Weitzner:

Thank you for providing a draft of Section II for the FEAC report on the ITER. My staff and I have studied it carefully and have some observations to contribute. The most important is that the primary recommendation in the draft doesn't seem flow from the background text and the findings.

The text of the draft contains the following statements with respect to the third option, the "two machine scenario:"

- "would certainly be of lower risk,"
- "is likely to be a faster scenario and likely lead to a DEMO sooner,"
- "A third scenario with separate devices... would likely strain the understanding of the ITER terms of references, although such a scenario could accelerate the development of fusion."

The text also contains the statement:

- "any program should attempt to accelerate development even at some modest risk."

It seems that the findings point to the two machine scenario. It is our objective to accelerate the development and commercialization of fusion. Modifying the ITER Terms of Reference is a legalistic, not a scientific matter. I don't think that this really is an issue since it should be a global objective of having commercial fusion with minimum risk and cost at the earliest point in time. Legal issues are out of our charter's scope.

There also seems to be a misunderstanding of the programmatic costs of the two machine scenario. If, if fact, this scenario is shorter and of lower risk, then it should follow that it also is likely that it is less expensive. I believe that this conclusion is born out by the outcome of a program plan prepared in the 1970s by the ERDA, published as ERDA 76/110. Here, it was shown that the shorter program was less expensive since it ended sooner. The annual operating costs simply went away. This should be true as well for a global program whose annual costs are on the order of magnitude of a Billion dollars per year and growing.

It is our feeling that the two machine scenario also is likely to lead to a more attractive reactor which is, as you may know, of high concern to industry. I stated in an earlier letter to Rulon Linford:

"While I am a novice in the details of fusion, it seems to me that the ITER, as presently conceived, doesn't obviously lead to any kind of a competitive commercial power plant. Such a plant was to be the objective according to the 1990 FPAC report. The competition for fusion would appear to be nuclear fission (which has its safety and waste disposal problems) and solar (which is costly at the present time). My staff has shown me designs of the new passively safe nuclear plants and of solar electric plants, and it seems to me that these, on paper, would have far more appeal to utilities by virtue of their <u>relative</u> simplicity. I've learned that fusion plants can potentially achieve comparable capital costs per kilowatt of power, but it is not obvious to me that such complex fusion reactors can have the necessary plant availability or even can be repaired if there is some kind of large accident.

Therefore, it seems to me that the present U.S. ITER assessment is, perhaps, missing the point. Rather than trying to identify a cheaper ITER concept, maybe we ought to focus on the really central issue - does the current ITER project lead to a reactor that a utility would prefer versus the alternatives? In this connection, I've had some discussions with individuals at the Electric Power Research Institute, and I sense that this is a concern there too."

I attempted to reintroduce this commercial focus in our Dallas meeting but somehow failed to get the group to focus. As a result, the subpanel has yet to deal with this concern which I believe is essential to the success of the fusion enterprise. The two machine scenario addresses this concern in the following way:

- It permits much earlier development and testing of low activation blankets,
- it permits much earlier development and testing of high performance plasma-facing components, and
- it deals with the real (neutron) reactor problems much earlier - these are the

pacing items for commercial fusion power development!

I hasten to add that there are important plasma physics problems in addition to confinement that may require special facilities for their resolution. The following two appear to be the most important:

- Achievement of high confinement efficiency ("beta") in a tokamak or tokamak-like geometry, and
- Achievement of efficient and affordable current drive (or VERY long pulse length.)

Perhaps these can be added to the "physics" ITER as primary missions if it is deemed that they can be achieved in such a machine. If not, perhaps can be better addressed in smaller, less expensive machines.

Your draft also points out that "In any case, a 14 MEV neutron source for materials testing and low activation materials development would be necessary." It is implied that this neutron source is required in all three scenarios. However, this facility doesn't seem to appear in the ITER or any of the national plans as far as I know. Is this facility a sine qua non or can its functions be achieved in the two machine scenario?

In connection with this letter, I have attached a chart that might be a good plan for the two machine scenario. Here, we have included a 14 MeV neutron source as we feel that it is necessary. You will note that we have taken the liberty of defining the "DEMO" as an upgrade to the European CDA approach. If this is to happen, then such a machine will require close attention to the following objectives:

- Smaller/cheaper than the CDA/HARD - Perhaps like the Perkins "SMART" concept,
- Obviously reliable,
- Obviously maintainable,
- Obviously much safer and more environmentally attractive than fission (with all fission fuel cycle costs internalized), and
- Obviously economically competitive with solar and other renewables (also with all of their costs internalized).

I hope that you will agree with the conclusions of my letter. I'm looking forward to seeing you in St. Louis next week.

Sincerely

Richard P. Hora,
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and Business Area Director

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