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Date: January 24, 1992

From: P. H. Rutherford

Subject: FEAC Panel 1 Report

I attach various suggested modifications of Secs. I-III of the FEAC Panel 1 report, some minor, others major. I hope that you also received my Jan. 22 fax on the list of "findings".

Reading the report as it seems to be presently emerging, I think that I will probably choose not to sign it myself. In this case, I will draft a brief "statement of dissent", which I would ask you to append to the report, making clear also that I have not joined the "majority" report. My reasons are partly technical, in that I really do disagree with the general thrust of the report, and partly "political" in that, as Chairman-Designate of the ITER Technical Advisory Committee, I really can't have my name associated with a report that will certainly reach the foreigners and could be viewed as damaging to the U.S.'s commitment to support of the full ITER mission.

The problem with the report is that it displays an only-slightly-concealed and pervasive bias in favor of the two-machine strategy, with which I profoundly disagree. I do not view the second machine as technically credible, as we have described it, and I think that our report will be viewed by the fusion community as slightly ridiculous, because of our attachment to a machine which lacks any real embodiment, even at the conceptual design level. If DT operation in TFTR and JET goes according to plan, these two machines will make about 15 MW and 25 MW of fusion power, respectively, for pulse lengths in the few-second range and with average neutron wall loads of about 0.15 MW/m^2 and 0.10 MW/m^2, respectively. How do we expect to increase the fusion power two-fold and the neutron wall load up to ten-fold, steady state, unless the new machine

is *very* considerably more expensive than either TFTR or JET? If we go for a relatively large, moderate-field device, such as that described in the Conn/Jassby report, we require almost 200 MW of auxiliary power, and necessarily produce about 200 MW of fusion power. If we go for a compact, higher-field device, we will have to extract about 50 MW steady-state from a device smaller than JET, which experiences a severe heat-load limit at about 20 MW, pulsed.

If the nuclear testing device is to achieve a fluence of 3 MWyr/m^2 in the 10 years of operation shown in Fig. II.1, then it must achieve an average availability over its lifetime of 30%, even if a neutron wall load of 1 MW/m^2 can be achieved. (My own view is that about 0.5 MW/m^2 is the maximum wall load that one could credibly get from a compact driven Q~1 machine.) Has there been any study to indicate that 30% average availability is credible, including the initial "shakedown" years of operation? If the machine is designed for remote installation and replacement of full blanket sectors, rather than test modules, has there been any study of the impact of this on availability? Even if the fluence goal were reduced to 1 MWyr/m^2 and the availability goal to 10%, this would still seem extraordinarily ambitious since it must be accomplished averaged over the entire 10-year lifetime. Although the ITER availability goals were (at least in the CDA) also in the 10-30% range, we should remember that these were ultimate availabilities, which applied to a relatively late stage of fully-mature operation.

Even if the nuclear testing machine were credible technically, I can't see that a > $2B machine is credible politically, in addition to a $6B ITER. Especially since its mission in blanket-concept testing is something that ITER has always said it will do, even if it does not do it to the complete satisfaction of the most demanding among us. Thus, in favoring the two-machine strategy, I think that the Panel is adopting a position that is not only slightly ridiculous from the technical viewpoint, but is also highly ridiculous in the context of the present (worldwide) political/funding climate for fusion. How can the U.S. base its ITER strategy on the funding of a second machine in the > $2B class, when our previous strategy (i.e., including BPX), which was in many ways more logical technically and was certainly more cost-effective in the long run, was "shot down" because of our inability to fund a $1B machine? In the upcoming negotiations on the

technical objectives of ITER (e.g., SWG-1), how can the U.S. present a position that depends so critically on a second, > $2B machine, which it cannot afford to build nationally and which has not even entered into the thinking of our ITER partners, all of whom still see ITER as fulfilling this mission, at least at some minimum level? Has not FEAC Panel 1, in focusing so much of its attention on the two-machine scenario, failed to provide the advice that was requested of it, namely on how the U.S. should position itself in the "continuum" of realistic options for ITER itself, extending from the (most aggressive) CDA/HARD option to the (least aggressive) EC option?