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OAK RIDGE EPR AND TNS STUDIES*

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This ORNL Study has resulted in an evaluated Reference Design that does satisfy the technical objectives set out for a tokamak Experimental Power Reactor. Because of the large size and cost and poor extrapolation of this design to a demonstration reactor, a reconsideration of the basic physics and range of technical objectives has been undertaken. This has led to an intermediate step and new design, TNS-The Next Step after TFTR, having a higher benefit/cost than EPR. The TNS experiment, now in the early design phases, is based on a smaller size and considerably higher power output than the EPR design, and extrapolates to an economically viable fusion reactor.

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1. Summary of EPR Study

1.1 INTRODUCTION

In terms of the overall fusion design process, the FY1975-76 EPR study represents the most extensive effort to date in advanced studies of early power reactors though it is still only the present point on the evolutionary scale of design for the first fusion 'reactor'. The results of this study, discussed herein, have been twofold. On the detailed technical level many issues have been investigated and more clearly appreciated; work is now underway to address the problems identified. On the broader programmatic level, the need for an achievable, high power density fusion plasma device, extrapolatable to an economically viable reactor has been keenly made clear. The present EPR design does not satisfy the economic viability criterion although it does satisfy the technical requirements. The recognition of the being pursued as an ignition device whose characteristics do extrapolate to an economically viable fusion reactor.

1.2 Principal Considerations at the Outset of the EPR study

1. EPR is a major step in the U. S. fusion program.

As such, it is necessary for rational fusion program planning that a clear picture of the EPR's nature, magnitude, requirements, and options be generated as input to the overall plan.

2. This study is a forcing function for science and technology.

In the iterative process of defining objectives, projecting current scientific and technological understanding to reactor application, undertaking engineering design, and then comparing costs and schedules with objectives, two critical benefits emerge: