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Integration of service pipes into the lower port for the DEMO Double Null Concept Design Study

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A study into the viability of a double null concept for DEMO has been undertaken as part of the work to address Key Design Integration Issues (KDIIs) within the DEMO powerplant. The objective of this study was to evaluate the feasibility of a double null architecture, featuring split blanket segments to enable a wider range of maintenance options.

One of the main challenges found was the integration of the service pipes to provide connections to the cooling and tritium breeding systems for the divertor and breeding blanket. By understanding how these pipes might be integrated, the constraints on key details such as the length of the lower port could be understood. Consequently, this allowed for progression of other areas of the design and investigations into the remote handling of these pipes during maintenance periods.

The key requirements identified for the service pipe routing included the removal sequence for the blanket and divertor segments during maintenance; access for the cutting and welding tool at the pipe/blanket interface; pipes grouped as modules per component; and maximisation of port space for the vacuum pumps.

Two proposals were considered due to their impact on the insertion location for the cutting and welding tool: pipes with large radii, and pipes with smaller radii. The former was found to be most preferable due to the remote maintenance advantages, versus the insignificant space gains offered by the latter. This paper will describe the development of these requirements, both proposals, and discuss the challenges uncovered during the study in more detail.

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