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Cryogenic cooling of the cold neutron source at ESS

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The European Spallation Source (ESS) neutron spallation project currently being designed will be built outside of Lund, Sweden. The ESS design includes three helium cryogenic plants, providing cryogenic cooling for the proton accelerator superconducting cavities, for the target cold neutron source, and for the ESS instrument suite. Supercritical hydrogen circulates through and cools the target cold neutron source, and is in turn cooled from the target helium cryogenic plant. This report describes the unique cooling requirements for the cold source supercritical hydrogen cooling system, defines the operating parameters for the target helium cryogenic plant based on expected heat loads, and explores design options for the target cryogenic plant to optimize its performance.

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