

Cryogenics at the European Spallation Source

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Abstract – Cryogenics plays an important role at the European Spallation Source, a world class neutron science center, currently under construction in Lund, Sweden. Three principal applications of cryogenics are found at ESS. The SRF cryomodules of the ESS proton linac require cooling at 2 K, 4.5 K and 40 K; the hydrogen moderator surrounding the target that produces neutrons, requires cooling via 16.5 K helium and LHe is required for many of the scientific instruments. These needs will be met by a set of three cryogenic refrigeration/liquefaction plants and an extensive cryogenic distribution system. Significant progress has been made on the ESS cryogenic system in preparation for the expected first beam on target in 2019. This work includes: funding of industry studies for the accelerator cryoplant, preliminary design of the cryogenic distribution system, investigation of possible in-kind contributors and release of the invitation to tender for the accelerator cryoplant.

This paper describes the requirements, design solutions and current status of the ESS cryogenic system. The planned recovery of waste heat from the cryogenic plants, a unique aspect of ESS, is described. The procurement of the cryogenic system, expected to be done via a combination of purchase via competitive bids and in-kind contributions is also discussed.

Keywords – European spallation source; cryogenic refrigeration, liquefaction and distribution, hydrogen moderator