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The Evolution of the Cryogenic System of the European Spallation Source

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The European Spallation Source (ESS) is an intergovernmental project building a multidisciplinary research laboratory based upon the world's most powerful neutron source to be built in Lund, Sweden. The ESS will use a linear accelerator which will deliver protons with 5 MW of power to the target at 2.0 GeV with a nominal current of 62.5 mA. A cryomodule test stand will be supplied with helium for the site acceptance tests. The target will have two moderators using supercritical hydrogen to cool down the neutrons. The neutron instruments and the experiments' sample environment will use liquid helium and liquid nitrogen to cool detectors and samples. The ESS cryogenic system is designed to deliver cryogenic cooling capacity to all four client system.

A first concept of the ESS cryogenic system was developed in 2010 and 2011 with a limited amount of input from the clients as well as from site infrastructure (i.e. buildings and utilities). The design had to be flexible enough to accommodate future changes in scope, schedule and available infrastructure. Over the following years the design has evolved together with these parameters to achieve a maturity today which allowed us to order the accelerator cryoplant and to start procurement of many of the other parts of the ESS cryogenic system. This paper presents the evolution of the design throughout the years and the factors influencing certain design choices, focusing on external design aspects, such as requirements for buildings and utilities.

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