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The road ahead for the European Spallation Source

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Abstract

With the political agreement in early summer 2009, to choose a site for the ESS, 17 European countries have joined together in a partnership to embark on a 3-year Pre-Construction Phase, including a full Design Update and Preparation to Build activities, prior to formally starting construction on the site in Lund in southern Scandinavia in 2013.

The ESS will be a 5 MW long-pulse spallation neutron source and as such it will be a unique and uniquely powerful facility offering new opportunities for materials research using slow neutrons. Compared to the user's experience today the ESS aims to offer measuring capabilities two orders of magnitude better than similar facilities today.

Our accelerator will be substantially superconducting using niobium for the cavities. Interestingly, forty years ago, in my PhD thesis work and subsequently our research group at Birmingham were investigating the diffusion of hydrogen in palladium and niobium. Such metals suck up hydrogen from the environment and it is interesting that today the absorption of hydrogen by niobium is very relevant in accelerator component technology. A large effort in understanding hydrogen in metals was made in Jülich in the 1970s and 1980s but as with much work at that time cross-fertilisation was not frequent and the solid state and materials sciences community had little interaction with the accelerator community. That is much lees the case nowadays. Recent work on niobium cavities fabricated with ingot indium carried out through a Brazil-India-Jefferson Lab collaboration has indicated major advances in performance of such cavities. After proper verification such an advance could well prove advantageous for the performance and reliability of ESS.

Planning for a new 1.5 B€ scientific facility which will be operational a decade from now requires a new approach. For example it is likely by 2020 that the way in which researchers interact with central science facilities will have changed dramatically thanks to the very rapid advance of robotics, computing and IT methods. Equally well, the energy consumption of big facilities puts a significant burden on the annual operating budget of such facilities and novel methods must be found to manage the energy inventory of the ESS. One consequence of the high demand for energy is the environmental impact, which has political overtones.

ESS will be built on a truly green field site. Green field in the psychological as well as the physical sense. This gives an opportunity to revisit the standard methods of dealing with the user community, providing facilities, which will give added value to the visiting researcher and those who remain at their home laboratories. Thanks to the construction of the high brightness synchrotron source MAX IV being built in the same location as ESS mutual advantages by bringing the user communities of the two sources together will be a gain for all. A seventeen hectare piece of land between the two facilities will be used to build INXS, the institute for neutron and x-ray science which will incorporate facilities for users such as meeting places and conference rooms but, more importantly, an assembly of separately identifiable laboratories similar in nature to the Partnership for Structural Biology which was so innovative in the ILL-ESRF site in Grenoble. Similar centres for soft condensed matter, material under extreme conditions and material for climate, energy and health will be explored. I will attempt to address these questions and give a personal view of future developments.