Report from the Science Directorate

Overview

The past seven months have been a time of transformation for NSS, moving the project firmly from design towards implementation. After the 16-instrument suite was ratified by the ESS ERIC Council in October, work has commenced in identifying more partners, moving the instrument projects forward into Phase 1, and aligning the supporting ESS-based activities with the envisaged initial suite. A baseline for beam-port allocation has been established, and the work with the joint shielding bunker has progressed significantly. This period also saw a change of top management, with Professor Andreas Schreyer assuming the role as Director for Science, taking charge as the directorate moves into realizing the instrument suite.

The Suite of 16 Instruments

In October 2015 the European Spallation Source ERIC Council endorsed the initial 16-instrument suite proposed by ESS, based on SAC recommendations. The suite has been developed through years of joint efforts from the European neutron community, with the SAC playing a pivotal part and putting in a lot of work in evaluating proposals and advising ESS. This has resulted in a balanced, thoroughly vetted suite with strong community support. The general plan for sequencing the instrument projects discussed at the September SAC meeting was also endorsed by Council.

Partnering Up

The work of identifying in-kind partners and establishing technical annexes for NSS continues. The NSS in-kind target is 65% of the 350 M€ budget, and we're making good progress with partners to match competence to work packages while aligning with each country's agreed contribution. Assigned and discussed in-kind agreements currently add up to 93% of that target, and we plan to keep the remaining 7% as contingency, to reassess later. The instrument projects are dominated by in-kind contributions, and most of these will have lead labs outside ESS headquarters. An urgent matter is identifying a partner for delivering the bunker, which is early in the installation plan.

Several in-kind projects kicked off in the beginning of this year, including a Danish sample-environment project and a data-streaming work package with ISIS. Furthermore, ESS is taking a leading role in the MANTID data reduction software project, which is a collaboration involving ISIS, SNS and ILL. This work has generated an order of magnitude increase in performance for ESS-specific detector geometries such as that proposed for the LOKI instrument.

Initial work on UK in-kind contributions for outfitting the user labs has started, and an agreement with the HZB sample environment team about second-hand equipment has been reached.

The Detector group successfully agreed on an in-kind contribution with STFC to design the common detector back-end electronics systems for instruments. This activity goes across instruments, detector systems and the DMSC and is a major step forward towards having a standardised system available in accordance with the overall NSS schedule.

Beamport Allocation and Bunker Design

With the suite defined, the NSS project team, our instrument build partners and other ESS staff worked together to establish a baseline for the instrument lay-out with the main priority to provide the best outcome in terms of performance and operability for instruments 1-15, and the two options for instrument 16. (See separate document for details.) The benefits of the proposed lay-out are brought by having fewer mechanical interference areas, which reduce both complexity and cost during construction phase, and associated costs in the operational phase during maintenance. At the same time, the number of useable beamports for future instruments is maximised in balance with the performance of the suite. The beam-port allocation baseline enables us to move forward into more detailed planning of the experimental halls and the bunker design. We have received change requests from some instrument teams, and these are under consideration.

The common instrument bunker will provide joint instrument shielding closest to the target monolith, and most instruments will have choppers inside the bunker. Therefore it needs to meet strict regulations whilst allowing for effective maintenance during down periods. After an intense collaborative effort with NSS, Target and Conventional Facilities, a concept for the bunker design, including materials choices, is now being finalized. (See The Quarterly Report 2016 Q1 for an illustration of the design.)

Radiological Licensing

ESS has recently submitted an application to the Swedish Radiation Safety Authority, applying for licenses to install and commission the first components. This is one of several comprehensive applications in a step-wise process towards a full operational license for the facility. This work has been a top priority for ESS during the past months, and all of NSS have been involved in preparing documentation. The licensing work has direct consequences for facility operations and the user program.

In-House Interfaces

In-house collaboration is intensifying through our work with the regulatory licenses, the bunker development and the interface to Conventional Facilities as the NSS buildings go into construction. The ESS Integration Project was established by DMSC with the Integrated Control Systems (ICS), SSS, the Motion Control and Automation and Chopper groups. The project is setting up a test laboratory in Lund for software integration between ICS (the ESS timing and EPICS networks), the EPICS Input-Output Controller software developed by the technical groups and their in-kind partners, and the software developed by DMSC and their in-kind partners.

Meetings

Since the last SAC meeting, the ESS ERIC Council has met twice: in October and in February. Apart from the instrument suite (see above), topics included operations funding models, VAT rules and liquidity solutions. Council is chaired by Professor Lars Börjesson of Chalmers University of Technology.

The Instrument Collaboration Board has also met twice, in December and March. Chaired by the ESS Director for Science and peopled by NSS partner institution representatives, this board handles NSS in-kind resource issues.

In alignment with SAC advice, a STAP for Science Support Systems has been installed, divided into one group with focus on sample environment and one on lab facilities. The Sample Environment STAP, chaired by Dr. Elizabeth Blackburn of Birmingham University, met for the first time in April of this year. Also the DMSC STAP, chaired by Adrian Rennie of Uppsala University, met in December. See the STAP reports for details.

The 10th IKON meeting was held February 16-18 in Düsseldorf. Jointly hosted by Forschungszentrum Jülich and ESS, the meeting brought together over 150 NSS collaborators. The main meeting was preceded by satellite meetings on BEER, MIRACLES and sample environment.

The ESS Annual Project Review was held at headquarters in Lund in April. The rewiew was chaired by Prof. Marzio Nessi of CERN, the NSS subcommittee by Dr. Dan Neumann from the NIST Center for Neutron Research. The review recognized all the progress made since last time, and helped us identify and prioritize challenges. It was a constructive review and the work leading up to it is deemed very valuable for the NSS team.

Matching Scope to Budget and Aligning Support Functions

In order to align the instrument suite scope with the budget, all remaining instrument projects have agreed to begin Phase 1 (preliminary design) this year, including a scope-setting meeting for each instrument. At this meeting, an initial scope that is harmonized with available resources will be agreed upon. The instrument class STAPs will convene prior to the scope-setting meetings.

In parallel, we are looking over the scope and budget of all in-house efforts. With the preliminary sequencing of instruments supported by the SAC and Council, we have moved forward in aligning support systems to match the expected early instruments. Instrument technologies, sample environment, labs and DMSC planning are being adjusted and optimized to deliver early science with the early instruments. For example, an internal review of the Detector Systems work package was carried out, aligning it to the now known suite of instruments. This resulted in the relocation of 1.05M**€** budgeted value into the NSS-wide contingency. Science Support Systems is prioritising the development of reliable and useful sample environment for the first instruments. At the same time these teams are gearing up to support all the instrument projects going through Phase 1. A comprehensive coordinating effort has been conducted involving the Instrument Technologies, Science Support Systems and DMSC teams, who are liaising actively with the instrument teams. A key result is the set of reference handbooks presented at IKON10.

By October 2016 15 instrument projects will have had their scope-setting meetings and the internal processes will be concluded. (Final decisions on the 16th slot will be made later, following SAC advice.) Based on the findings of these processes, a comprehensive plan will be developed, specifying which parts of the envisaged NSS scope can be implemented inside the construction budget. This plan will be presented to the SAC, the ICB and to ESS Council for discussion and approval by the end of the year.