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Strategy for Spin-Polarised Helium-3 Services at ESS

Executive Summary

The ESS launched the Neutron Optics and Shielding Group (NOSG) project with the provision of polarised ^{3}He gas in the project scope. The goal is to supply ^{3}He to the instrument suite, and provide the associated technical support equipment and personnel. However, during the priortisiation activites and budget allocations during 2012-2013, it quickly emerged that there were higher priorities for the management to consider in the allocation of funding. ^{3}He activities were consequently allocated to "scope contingency" category in the NOSG project. This means that the activities would be postponed until the prioritisation needs to be changed, and funding may be reallocated at a later stage, but the budget would be set to zero for the ^{3}He activities in the first instance.

This report very briefly describes how the strategy for provision of polarised ^{3}He will be handled during the ramp up to operations at ESS, in light of this budget situation.

1 The Current Strategy

The plan is still that NOSG will provide ^{3}He polarisation services and support to the operational instruments. The outstanding questions are *when* and *on what scale*. It is not yet clear how many instruments, how many devices, and what volume of gas is required, and at what stage during hot commissioning the demand for ^{3}He will emerge. Until the situation is clarified during the next few years, the following process should be followed:

1. Assume that each instrument desiring ^{3}He will achieve its needs with a modular SEOP system. Individual SEOP systems are generally cheaper than a large, central MEOP station[1]

2. Assume that NOSG technical support personnel will be in place during operations to look after the installation and maintenance of the systems.

3. Assume that NOSG laboratory space for the ^{3}He service will be present, except:

4. If you want an *in-situ* system, that is continuously polarising a small volume of gas in the beam, the SEOP units are obviously located at the instrument, and the local infrastructure needs to accomodate such a system. For *in-situ* systems you should still assume that they will be maintained via NOSG.

Around 2017, it should be possible for NOSG to begin estimating the total ^{3}He needs for the suite of instruments, and to make recommendations to ESS management on how to address them in more detail. At this stage, it may well be preferable that many SEOP modules may be merged together into one or two scalable systems. It is also possible that MEOP may emerge as the more advantageous path to take. This is a decision that we will make as the instrument suite is clarified, along with the commissioning schedule. In this case, the cost to individual instrument projects should be expected to come down.

2 Planning and Budgeting

Instrument projects should absolutely continue to plan on having ^{3}He if it is important for their science case. It is imperative that *instrument activities maintain close communication with NOSG*. By all means, if the instrument projects wish to engage with potential suppliers directly they should do so, but they should make sure that NOSG are copied into the dialogue. This is to make sure that NOSG can anticipate our operational needs, and reduce the total suite cost via the right amount of centralisation.

3 External Funding

During the course of establishing ^{3}He activities, NOSG will be mindful of potential sources of external grants. If ESS deploys ^{3}He systems it should become a technology leader rather than simply a consumer.

[1] SEOP is around 200 kEuro for a small unit for one instrument, a large MEOP station is a factor of 4 in cost higher, but it can potentially serve multiple instruments.

4 Related Activity: Polarising Supermirrors

Slightly related to ^{3}He is the provision of polarising supermirrors. NOSG will be providing small quantities of individual, custom supermirror optical devices itself, by the time the ESS is measuring neutrons to a level that polarisation is important ($yr > 2020$). During instrument construction projects, before operational budgets are available, NOSG will provide supermirrors via procurement / in-kind contracts with existing commercial partners for large quantities. For small items during this period, PSI is foreseen to be the key partner, with other foreseen partners being the ILL and Berlin depending on the scale, the device, and the partner's manufacturing lead time when the supply is to be made. As for ^{3}He, NOSG must be kept in the loop if the instrument projects have direct engagement with vendors and partners, so that a good overview of the scale, supply and instrument needs can be maintained in NOSG.