

5th ICB Meeting

Minutes

Meeting Date
7 March 2016

Location
Hilton, Copenhagen Airport

Chairman
Andreas Schreyer

Secretary
Eva Lagrelius

1. Welcome and Opening of the meeting

Andreas Schreyer welcomed everybody to the 5th ICB meeting.

2. ESS Update

Jim Yeck gave an update on European Spallation Source ERIC project.

The Construction is funded to 99.15% by the following countries; Sweden, Denmark, Germany, United Kingdom, France, Italy, Spain, Switzerland, Norway, Poland, Czech Republic, Hungary, Lithuania and Estonia. Discussions are on going with a number of countries regarding their involvement in the project.

The construction cost is 1.84 Billion Euros whereof 747.5 Million Euros is In-kind equivalent to 40.5% of the total cost. The total budget for NSS is 350 Million Euros whereof 228 Millions of the total is In-kind.

ESS has 365 employees with 47 different nationalities and is working with around 60 Partner Institutes and that number is constantly growing.

Dimitri Argyriou has moved on to a new position as Head of Operations Planning. Last year the ERIC Council set up an Operations working group.

John Haines today has two positions; Head of ES&H and Quality with focus on the SSM Application for installation and commissioning the first stage of the Accelerator system to be sent to SSM in the beginning of May this year. John is also appointed to work with Schedule Project Management that he will be focus on after the application to SSM has been finalised.

The 1st of October ESS AB transferred into the European Research Infrastructure Consortium (ERIC) and the transaction is largely completed as the assets, obligations and personnel have been transferred.

In the construction plan there is a gap between the funding and the budget profile that will be solved hopefully shortly. Discussions are on-going with the European Investment Bank.

The construction is completed to 21% (January 2016) and NSS is around 10% completed (LOE, money spent). By end of this year the construction is planned to be completed to 35%.

Overview of the milestones

First Installation on Site (Accsys)	2016 September
First Installation on Site (Target)	2017 July
Target ready for beam	2019 July
Machine installed for 2.0 GeV	2022 December
Start of User Programme	2023 August
End of Construction	2025 December

The accelerator building will be handed over in April 2016 and installation will begin during the September 2016.

The Accelerator and Target Project Plans are well developed and are being executed. The goals and major milestones for ICS and NSS are set and the detailed plans are being developed and implemented.

The priorities for 2016 are

- Continue emphasis on schedule performance – key to success
- Transition In-kind partners into execution phase for the instruments
- 3rd Annual Project Review (32 experts, 3.5 days) – April 2016
- Submit application to Swedish regulatory authority for license to commission first stages of accelerator systems – May 2016
- Establish a “credit facility” to address liquidity gap/hold schedule
- Install 1st accelerator equipment on site – September 2016
- Establish operations plans consistent with facility requirements and supportable by the European Spallation Source Council
- Engage new members

Summary

- Construction project ~ 20% complete today and ~ 35% end of 2016
- Emphasis on securing in-kind deliverables in a collaborative framework
- Priority on schedule performance – key to success
- Additional work to ensure European Spallation Source ERIC provides the institutional and legal frame needed for long term success
- Establishing operations plans that are consistent with the needs of the facility and supportable by the European Spallation Source Council

The European Spallation Source ERIC core values are:

Excellence, Openness, Collaboration, and Sustainability

The European Spallation Source ERIC mission is to:

Design, build and operate the world's leading research facility using neutrons.

Robert McGreevy pointed out that it is important to focus on the critical issues and to focus on the schedule of these issues.

Leif Eriksson asked for clarification of the focus on this year's annual review and the previous annual reviews.

Focus on the annual reviews:

- 2013 Credible implementation plan
- 2015 Emphasis on schedule and In-kind programme
- 2016 Schedule

José Luis Martínez asked for clarification on the VAT issue. Jim Yeck responded that he assumes that ESS will be reimbursed for the VAT.

3. The challenge for 2016: Matching scope with budget

Andreas Schreyer presented the challenge for 2016: Matching scope with budget.

The NSS scope is to deliver 22 public instruments together with a technical and scientific infrastructure that enables scientific excellence and high quality scientific service.

NSS has decisions on the first 16 instruments and has the baseline where to place all of them, as well as indicative placements of the possible instruments 17-22.

The bunker design is advancing fast and ESS is working on entering several new instruments into phase 1.

The priorities for NSS during 2016 are:

- Align the instrument budgets with the NSS budget.
- Develop a realistic schedule for all instruments ensuring early science success in line with available in-kind resources and partner capabilities
- Propose to the ERIC Council in December which instruments should be operational first.

During the annual review 2015 ESS the Review Committee recommended that ESS should prioritise the choice of the first eight instruments and ensure that their scope is sufficient to deliver world-class science from the first few years of the user operations. Andreas Schreyer questioned why the Review Committee asked ESS to prioritise exactly eight instruments and proposed to make this number more flexible.

The Instrument proposals were optimized for scientific quality and with no incentive to design to a specific budget. The budget of the proposed instruments is 250 Million Euros but the NSS budget for instruments is 188.9 Million Euros so it will not be possible to cover the full scope of all 16 instruments in the day one version of the instrument. However it must be ensured that funds will be available to bring the instrument to full scope at a later stage. ESS plans to foresee funding for upgrading instrument 1-16 to their full scope in the pre-operations budget and for the instruments 17-22 in the operations budget. It is vital to ensure that the day one version of the instrument delivers early scientific success. This requires intense discussions with all partners on the budget for the day one version and to have the scope setting meetings before the end of October 2016 with the aim to make a proposal to council in Dec. 2016.

Below you find candidate instruments for early delivery to address recommendations of 2nd Annual review, presented at the ICB meeting in December 2015:

Instrument Class	Sub-class	Candidates
Large Scale Structures	Small Angle Scattering	LOKI or SKADI
	Reflectometry	ESTIA or FREIA
Diffraction	Powder Diffraction	DREAM or HEIMDAL
	Single crystal diffraction	MAGIC or NMX
Engineering	Strain scanning	BEER
	Imaging and tomography	ODIN
Spectroscopy	Direct geometry	C-SPEC or T-REX
	Indirect geometry	BIFROST, MIRACLES or VESPA

Possible criteria for selection:

- Scientific relevance, chances for early impact
- Prioritize one instrument per key partner
- Use of established technologies
- Availability of design and production resources
- Availability of funding
- Availability of skilled personnel

Ten scope-setting meetings will be scheduled to take place before November. They will be preceded by STAP meetings for each instrument class to advise on the possible impact of the science case of the scope adjustments to be decided during phase 1. At the ERIC Council meeting in December 2016 Andreas will propose an updated overall instrument budget, a proposal of sequencing of the instruments and how to ensure early science success. The Council will thereafter make a strategic decision on the instruments.

Some of the MoUs are in place. The main unassigned scope the are the 6th Spectrometer (16th instrument), 50% VESPA, 25% MIRACLES, 6% NMX and the Neutron Guide Bunker (~12-14 M€)

The ERIC council has set up an Operations working group and they had the first meeting in February. The group will propose a pre-operations and operations budget to the ERIC Council in December. The group also discusses the models how to share the costs between the partners.

The charge to ICB is:

- Discuss and agree on a schedule for 2016
- Pave the way for educated decisions on:
 - Budgeting of instruments, day one versions
 - Upgrade paths for the instruments
 - Sequence of instruments

Jim asked the ICB members, "Who is ready"?

Masatoshi Arai, Technical Coordinator at ESS, informed that on J-PARC they started with 10 instruments and today they have 21 instruments. Some of the operations budget has been used to improve different scenarios and one example is to add detectors.

Leif Eriksson pointed out that it is important to have a critical discussion on what is needed first and what can be upgraded later.

Catherine Pappas informed that the In-kind Operations budget will be discussed in the Operations Working Group. Upgrades are not done easily due to the many owners.

Alessandro Triolo asked if there is a plan for the remaining six instruments, as we need to keep budget for these instruments too. Andreas informed that we need to make sure to have budget also for these instruments in the Operations funding.

Robert McGreevy pointed out that practical things like where the instrument is placed have to be taken into consideration when planning the sequence of the instruments. Robert also reminded us that Cost book value is not the same thing as the cost.

4. NSS Project Update

Shane Kennedy informed that the cost book value is what we apply and the budget will be responsibly divided by the instruments. Shane also informed that from end of 2025 we will have a full operations budget with a ramp-up starting in 2019. We are at 84% of our in-kind target and it is not our aim to get to 100% as some contingency is needed. The cash contingency is 5.5% of cost to complete.

In-kind collaborators deliver most of the instruments, most of the bunker, large portion of sample environment, DMSC and competency development. ESS Lund coordinates the NSS Project, collaborates on instruments and delivers; neutron sources, safety systems, standards, In-Kind framework packages, buildings, services, labs, support for installation, commissioning, operations and maintenance.

Last year a NSS project team was set up to identify who is responsible for the different areas. Shane Kennedy is appointed Project Leader and the deputy Project Leader is Oliver Kirstein. An integration engineer and a construction engineer will be recruited as we are short of resources within these areas.

The NSS project phases are divided into four different phases:

- | | |
|---------|-------------------------------|
| Phase 1 | Preliminary Design |
| Phase 2 | Detailed Design |
| Phase 3 | Manufacturing and Procurement |
| Phase 4 | Installation and Integration |

Shane informed about the Neutron Beam Instrument Schedule and the Accelerator plan and the schedule is not ideal to NSS however Accelerator is open for discussion. ESS would like to start Hot Commissioning of the first Neutron Instrument by January 2020.

The Beam port allocation

The moderators will be of the butterfly design. The optimization priorities have been:

1. Performance and operability for #1-16
2. Performance and operability for #17-22
3. Maximise the possibility for further instruments by minimal blocking of un-allocated beam ports.

The optimization considered mechanical interference of physical components mostly upstream/in bunker and potential cross-talk (noisy neighbours). The final layout used computational methods and testing all possible combinations. The instrument baseline report was sent to the instrument teams in January 2016 and some challenges have been received from DREAM, ESTIA and MIRACLES, and these are now being evaluated.

Bunker

NSS is seeking In-Kind partners to collaborate on design and construction of the neutron guide bunker. The plan is to find an In-kind partner and to take a decision in mid 2016, start the manufacturing in January 2017, to have early access in the beginning of 2018 and full access in the end of the same year.

The dose levels outside the Bunker must be < 3 mSv/h -> simulate < 1.5 mSv/h.

The floor loading in the Bunker is 30 tonnes/m² and the floor loading in the experimental halls 20 tonnes/m². The engineering design is ongoing to optimize on safety, performance and the cost. The bunker end wall is 3.5 meters thick and the bunker roof is two meters thick. The materials of the bunker are Boronated-PE Concrete, Cast Iron, Lead and B4C. The cost baseline for the bunker is 14.6 M Euros and ESS needs an In-Kind partner to deliver.

Shane informed about the immediate priorities and actions for the instrument constructions teams to be taken as soon as possible:

- Formalise agreement for In-Kind delivery of Neutron Instruments with one MoU and one Technical Annex per instrument
- Recruit the instrument Lead Scientist and Lead Engineer
- Start phase 1, preliminary engineering design

Shane asked for the following information from the instrument teams:

- Advise the initial estimate for moving between project phases.
- Advise the initial estimate for readiness for STAP review, scope setting and TG2

First eight instruments

It was discussed which of the instruments should be the first eight instruments of the commencement of operation in August 2023. Shane showed his personal view, see picture below:

Order of commencement of operation of first 8 instruments (August 2023)



Matching early success in delivery of scientific outputs with the capacity of Lead In-Kind partners to deliver on schedule.

Instrument Class	Sub-class	Candidates
Large Scale Structures	Small Angle Scattering	LOKI (ISIS) or SKADI (FZJ)
	Reflectometry	ESTIA (PSI) or FREIA (ISIS)
Diffraction	Powder Diffraction	DREAM (FZJ) or HEIMDAL (ÅU)
	Single crystal diffraction	MAGIC (LLB) or NMX (ESS)
Engineering	Strain scanning	BEER (HZG/NPI)
	Imaging and tomography	ODIN (TUM/PSI)
Spectroscopy	Direct Geometry	C-SPEC (TUM) or T-REX (FZJ)
	Indirect Geometry	BIFROST (DTU), MIRACLES (Bilbao), VESPA (CNR)

Annotations:

- Select 1 of each of these pairs (pointing to LOKI/SKADI and ESTIA/FREIA)
- Should 1 of these be early? (pointing to MAGIC/NMX)
- Both of these should be early (pointing to BEER and ODIN)
- Select 2 or 3 of these (pointing to C-SPEC/T-REX and BIFROST/MIRACLES/VESPA)

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A personal view

Shane raised some questions to ICB:

- When should we start Hot Commissioning of Neutron Instruments 1-16?
The bunker needs to be completed and ESS needs to demonstrate neutron production to access operations funding and this is expected to occur in late 2019.
- The first (eight) instruments should be operational by August 2023. What should they be and who should build them?
How can NSS In-kind partners prioritise their instrument delivery for best outcome? Can ISIS, FZJ, LLB, PSI, TUM HZG/NPI each commit to prioritise delivery of one of the first six to ensure we achieve this objective? NSS will negotiate with Accelerator/Target project to optimise neutron availability based on input from our In-kind partners.
- Who will help NSS deliver the Neutron guide bunker?

Some comments from the ICB members:

Heloise Bordallo informed that it is a challenge to deliver Miracles as one of the eight first instruments.

Catherine Pappas informed that SAC has made a recommendation of which of the instruments should be first however she can't see any contradiction with Shane's proposal. We have to look at it from the scientific aspects but it is the In-kind partners who have the knowledge of when they can deliver.

Robert McGreevy would like to have fixed date in May when the decision of the bunker delivery will be done. Robert also pointed out that operations funding has to be agreed a year before the neutrons are produced.

Christiane Alba-Simionesco pointed out that ESS has to be responsible for the Personnel Safety System and it has to be in place. Shane Kennedy confirmed that ESS is responsible for the Personnel Safety System.

5. Interfacing the instrument teams with ESS and its advisory panels during construction: Instrument class coordinators and STAPS

Ken Andersen informed about the Instrument Project Structure and the main interfaces. The NSS Lead instrument Scientist and Engineer are responsible for coordination all the instruments. Each instrument class has a coordinator and each group has a STAP – Scientific and Technical Advisory Panels. ESS has the following STAPs: SANS, Reflectometry, Diffraction, Spectroscopy and Imaging & Engineering. ESS has also Horizontal STAPs; Detector, Neutron Optics, Sample Environment, DMSC and Choppers.

The Instrument Class coordinators are responsible for:

- Coordinate instrument projects and the common needs across the instrument class for example software, labs, sample environment etc. They are also responsible for identify and realise synergies like common components, scope complementarity and funding opportunities.
- Support and interface with management; provide scientific advice on project decisions, develop strategies for maximising scientific impact.
- Point of contact for communications
- Represent ESS on ICEBs of their instrument class, ensure liaison with ESS
- Manage and coordinate STAP meetings

The Scientific and Technical Advisory Panels – STAPs

- Give advice to Management; collaborative, non-adversarial, not decision-making
- Independent Experts; appropriate mix of facility, university and industry members
- Instrument STAPs; science case, functional requirements, technical choices, all aspects relevant to instrument success, TG1 and TG2 reviews
- Horizontal STAPs; technology developments, technical standards, engineering design reviews

Today the STAPs have about 80 members in total but the members will be reduced to two-three members per instrument. ESS is going through the process to select the members and the chairs. It's a three-year commitment and it is important to have good understanding of the scientific capability and technology and reasonable understanding of costs.

The following instruments [have indicated at IKON10 in February 2016 that they](#) are ready to have the scope setting meeting before November:

June: SKADI, ESTIA

September: DREAM

October: FREIA, MAGIC, BEER, ODIN, C-SPEC, BIFROST, MIRACLES

LOKI and NMX have already had their scope setting meeting.

Robert McGreevy pointed out that they would like to be informed now if they are not one of the first instruments to be able to reschedule the resources.

6. Presentation for all 15 approved instruments

BEER

The BEER project is ready to submit the concept of the instrument in June and is ready for the scope setting meeting in October 2016. The German funding is not available yet so therefore the MoU cannot be signed before the funding is in place. The project has opened a tender to find a partner do the engineering design and to do the shielding calculation.

BIFROST

The BIFROST project is in phase 0 and resources are being planned for phase 1. The instrument team and the instrument scientist are defined. The instrument engineer position will be advertised soon. The MoU is being finalised. The BIFROST project will be ready for the scope-setting meeting in October 2016. The budget proposal for BIFROST was calculated to 20 M€. A cost category of 12 M€ has been assigned, with the consequence that day one version of the instrument will not include all but will be updated later.

Thomas Brückel commented that if so much is removed the instrument will not perform as planned and it will be hard to build in at a later stage.

It was commented that this issue is not specific for this instrument.

C-SPEC

The C-SPEC project is in phase 0 but preparations are ongoing to enter phase 1. However the German project can't start before the 1st of April due to the funding situation. The budget proposal for C-SPEC was calculated to 18,5 M€. A cost category of 15 M€ has been assigned. The lead engineer has already started and Pascale Deen is appointed Lead Scientist. The MoU and the Technical Annex is in preparation. If no further delays of the German project funding C-SPEC is ready for the STAP meeting in September and the scope setting meeting in October 2016.

ODIN

The budget proposal for ODIN was calculated to 14 M€. A cost category of 8,1 M€ + 10% has been assigned. The scope setting meeting is planned in November 2016, however this has to be changed to October. The German project will not start before 1st of April 2016 due to project funding. The Lead Engineer left ESS in December 2015 and has not yet been replaced. The Lead Scientist will start 1 June 2016 and is expected to take over during August 2016. The MoU is in preparation.

The question was raised who at ESS is responsible for the Bunker project and Sara Ghatnekar informed that she is the interim Project Manager for the Bunker project.

DREAM

During April 2016 phase 1 will start for the DREAM project. Due to the funding situation in Germany the project has not yet started. The DREAM project is ready for the STAP review in June and for the scope setting meeting in September 2016. At the end of 2016 the project is ready for tollgate 2. The resources for the DREAM project have been identified and the lead scientist and the lead engineer have been appointed.

SKADI

The budget for the SKADI project has been agreed upon as well as the schedule for phase 1. The preparation work for phase 1 is in progress. The MoU negotiations are in progress and the MoU is expected to be signed soon. The personnel and resources are allocated and in place. Interfaces/synergies with other instruments are evaluated for an example common design for some components and common use of area in the neutron guide hall/bunker. The detector development is in full progress. The STAP meeting will take place in May and the

scope setting meeting will take place in June before Midsummer. The TG2 review will take place in September.

T-REX

The T-REX team is in place and the MoU between the parties is in preparation. The T-REX project is in phase 0 but is working towards phase 1. For the Preliminary Design the following aspects have a higher specific weight: Evaluation of alternative detector options, Preliminary Design of the Shielding, Conceptual design of T0 chopper, Decision/communication of moderator dimensions, inserts dimensions, beam port allocation are requested to start Neutron Optics calculations/optimization.

ESTIA

Phase 1 of the ESTIA project is running and the staff for Phase 1 is hired since last year. The instrument scientist and the instrument engineer are appointed. The MoU is expected to be signed in April 2016. The ESTIA project is planning to have the STAP meeting in April – June and the scope setting meeting in end of June 2016. The project will be ready for the Toll gate 2 in September 2016.

The ESTIA project has made an official request to ESS to change the port allocation. ESS will evaluate the request and invite the ESTIA team to ESS in Lund to discuss the issue and to take a decision.

LOKI

The Instrument team/Project Board is in place and is chaired by Robert McGreevy. The instrument engineer as well as the instrument scientist have been appointed. LOKI has already had the scope setting meeting. Robert McGreevy pointed out that it is critical that the Bunker detailed design is fixed by November 2016 to avoid further delays. The schedule for beam on Target needs to be rescheduled to avoid eight months delay to front end installation. Robert's opinion is that if it not will be possible to pre-build on site the schedule will be extended by 18 months.

FREIA and VESPA

Robert McGreevy informed that ISIS is prioritising LOKI and lessons learned from LOKI will be taken into account before rushing ahead with FREIA and VESPA. The budget/schedule required for scope setting can be done much quicker than for full Phase 1.

Alessandro Triolo informed that the Italian CNR President activated the CNR project SENTIERI whose mission is to manage the Italian In-kind budget for NSS. Earlier this year CNR decided to act as Prime Contractor in the construction of VESPA. The MoU between CNR and ESS has been signed. The proposed schedule is that the team will enter Phase 1 in July 2016. CNR are being active in defining cooperations with international partners that will join the MoU. VESPA has not yet defined the scope setting meeting but is positive to have the meeting in October 2016.

HEIMDAL

Three partners are involved in the HEIMDAL instrument and Aarhus University is leading the project. The MoU for HEIMDAL is ready to be signed and when signed the project will recruit

the Lead Scientist and the Lead Engineer. The updated proposal is planned to be finalised by June and HEIMDAL is ready to have the scope setting meeting in October 2016. The tollgate 2 review is planned to March-April 2017.

MAGIC

The lead scientist and the lead engineer are in place. The MoU is ready but not yet signed. MAGIC is ready for the scope setting meeting in October.

MIRACLES

The Lead engineer and the lead scientist are in place and a junior engineer/scientist will be recruited. ESS Bilbao will be the prime contractor for MIRACLES and is creating a consortium with other countries. MIRACLES will not be ready for the STAP in June due to baseline changes and will be ready for an informal scope setting meeting in October.

ESS Bilbao is ready for negotiation on R&D for detectors but has not received any response from ESS. Oliver Kirstein informed that on IKON the Detectors were discussed.

NMX

The MoU was signed in December 2015. During the same year the Consortium was set up and the In-kind resources were secured. Currently 64% of the In-kind is secured however the goal is to reach 70% and is under review by the NSS management. NMX is ready to start phase 2.

7. Summarizing discussion and conclusion on the schedule for 2016, next meeting

Andreas Schreyer is really happy that things are developing as presented today. ESS will come up with a detailed plan so everybody will be informed.

During the presentation Shane Kennedy asked when we should start the Hot Commissioning. Robert McGreevy commented that the Hot Commissioning should start in 2022 when the first instruments are built and to have a period of 9 months in 2021/2022 without neutrons. ESS could run the Accelerator without beam on Target.

The Neutron Guide bunker was discussed again. Several of the In-Kind partners have 10 M € unassigned NSS scope (DE, ES, FR, IT, NO). Petr Lukas informed that this was discussed last year in Czech Republic but their In-kind contribution went to Target HVAC/Helium instead.

Evaluation of possibilities with industrial sources in Czech Republic, France, Germany, Norway etc. are to be fast tracked. According to Shane there can be competent companies in Germany who could deliver the bunker. Thomas Brückel informed that he will discuss the issue in Germany and come back to Shane Kennedy.

Next meeting

The next meeting will be in late June around midsummer, and the autumn meeting will take place in the beginning of November. A doodle poll will be sent out.

On the next meeting the following items, among others, will be discussed:

- Bunker status
- DMSC
- Sample Environment
- Detectors

It was requested that the agenda should be sent out one month before the meeting. However Andreas said it might be difficult but ESS will try to send out the agenda a bit earlier next time.

It was also requested that ESS should send out some kind of news letter every month and it was agreed that ESS will send out the quarterly reports which are prepared for council.

Masa Arai pointed out that it is important to have a holistic view and to make a joint effort to investigate how the shielding around the instruments are best done and how we can save money. Phillip Bentley informed that calculations are done for LOKI and he and his team are ready to help with the calculations.

Andreas closed the meeting and thanked all the participants for a very good and fruitful meeting.

All presentations from the meeting can be found in [Indico](#).