Project Progress Report

Q1 Report 2017

His Excellency David Johnston, Governor General for Canada, ESS Director General John Womersley and His Majesty the King of Sweden, Carl XVI Gustaf visiting the ESS Construction Site.

Report due date:
April 2017

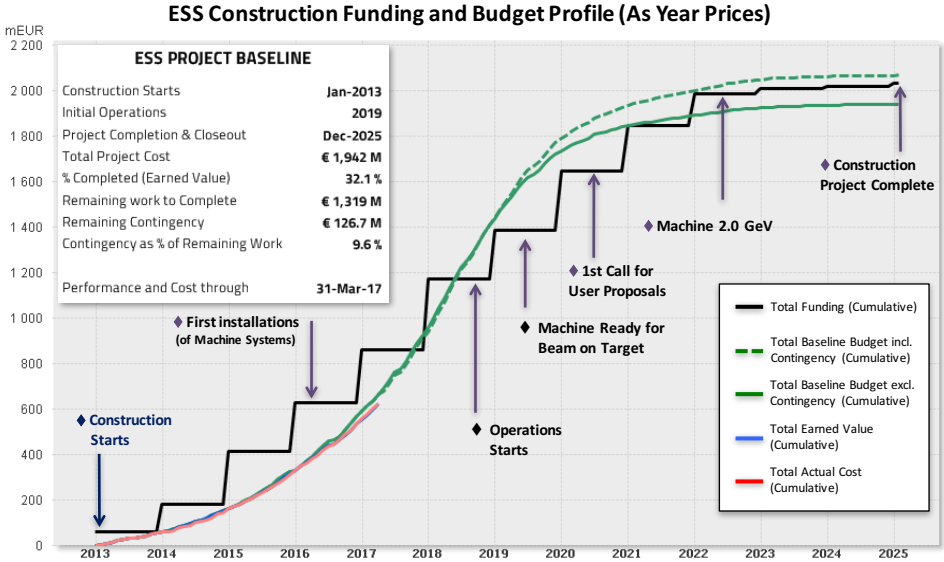
John Womersley
Director General European Spallation Source ERIC

Director General Overview

ESS continued to make excellent progress in the first quarter of 2017. Highlights of this period include:

- Conventional Facilities construction continues at a rapid pace, working in close collaboration with Skanska. We are actively managing the scope of work to ensure that we remain within the cost envelope agreed with the host states. The target monolith and instrument halls are now the main focus of construction work.
- Installation work of the first cryogenic and electrical systems has begun and ESS will shortly be taking over occupancy from Skanska of the first buildings at the site. The first 75 ESS staff will be relocating out to the construction site in May.
- Cost and Schedule performance continues to be monitored closely. We are progressing with our value engineering exercise and have now identified a significant number of cost savings and items that will need to be deferred in order to generate additional contingency.
- We are continuing work on an integrated schedule for the commissioning phase of accelerator, target and instruments with the goal of delivering science with neutrons as rapidly as possible.
- The next set of documentation for our operations permitting process has been successfully delivered to SSM.
- In kind agreements of various kinds are now in place for packages covering 303M€ of value. We have now signed the overall in-kind agreement with Switzerland. We are still working to address VAT issues with some of our other partners but this is not delaying work.
- Following last autumn's successful review of our bottom-up estimate of operations requirements and costs in the "steady state" operations phase, we have undertaken a similar assessment of the operations requirements and costs for the initial operations phase 2019-25. In this period ESS installation will be completed, the facility will be commissioned and first operated for science, and many of the deferred scope items that have been delayed from the construction phase will be added. An international review committee will examine these estimates in May so we can report to council in June.
- ESS continues to work closely with our host states, our member states and with potential new communities. A new MOU between ESS and MAX-IV is being finalised. We have hosted a number of VIP visitors including HM the King of Sweden, HE the Governor-General of Canada, the science ministers of Canada and Sweden, and the Swiss and German ambassadors.

ESS Construction Funding and Budget Profile (As Year Prices)



The chart above provides March 2017 status against the construction baseline.

Technical Director Overview

Achievements

- Good progress with prototyping and construction work both at Lund and at in-kind partners, although some items suffer from administrative blockages. A new version of the integrated schedule will be issued in Q2-2017, once these issues will have been solved and the corresponding manufacturing contracts signed with industry.
- Conclusions were drawn from the Value Engineering exercise leading to a potential reduction of more than 32 M€ of the cost of construction of the Machine, mostly by reducing proton beam energy to 1.3 GeV and beam power to 3 MW.
- Plans have been established for the Installation phase including the coordination of its support. Implementation has started while installation is ramping up.
- The additional information requested by SSM has been provided at the beginning of March, which is compatible with getting SSM permission on-time for respecting the ESS schedule.
- Plans and resources for Initial Operations are being prepared for review by external experts at the beginning of May and submission to the ESS Council in June.
- The focus and agenda of TAC have been prepared for its 15th meeting planned on 5-7 April.

Main issues

- Delays at in-kind partners cannot be mitigated anymore and put at risk the milestone of 570 MeV beam in 2019.

Accelerator Systems

Achievements

- Design reviews held this quarter included: Preliminary Design Reviews for the Phase Reference Line, the Gamma Blockers, the Quadrupole Power Supplies, and the Non-Invasive Profile Monitors as well as Critical Design Reviews for the MEBT Mechanical Design & Assembly, the Test Stand Cryogenic Distribution System and the Beam delivery System. The first of the Installation Readiness Reviews (IRR) was held for the Accelerator Cryoplant.
- Responses to the request for tenders for the Medium Beta Cavity klystrons have been received and are under evaluation.
- Wroclaw University of Science and Technology has chosen a vendor for the production of the majority of the cryogenic distribution system.
- Machining of the RFQ copper structure has begun.
- The Accelerator Cryoplant (ACCP) Cold Box is near completion and the final piping inspection has taken place (see Fig. 1).

Figure 1: View of ACCP Under Final Assembly at Vendor.

- The Prototype Spoke Cavity and Coupler Assembly has been installed in the HNOSS Facility (see Fig. 2) in the FREIA Lab at Uppsala University and has started to be cooled down.
- The pace of site installation activities is increasing. All Area Managers are now in place and Work Package Managers are filling out Work Safety Coordination Plans to properly plan for safe onsite work. Installation of piping by the current vendor (PowerHeat) continues.
- Series production of Beam Position Monitors is well underway at the DESY Laboratory.

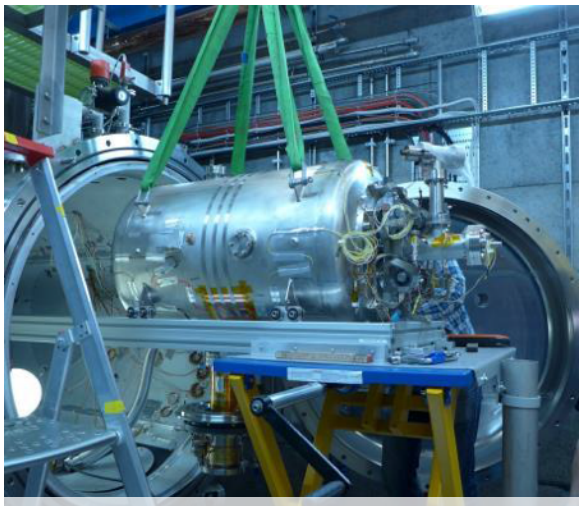


Figure 2: Installation of the Romea Prototype Cavity and coupler in the HNOSS Facility.

- The second prototype Linac Warm Unit along with final Beam Tubes has been delivered to ESS by STFC.
- All three klystron prototypes have been delivered to ESS and testing of the first one will finish in the summer.
- For IK partners the main focus is on progress of the technical work and preparation of remaining Technical annexes. The total value of Technical annexes signed, endorsed and planned represents 52% of the total accelerator budget.
- The Accelerator IK contract work during Q1 has progressed as expected. Today the remaining work is focusing on the finalization of all open Technical Annexes. Out of the

49 work packages defined today, 31 are agreed with IK partners and presented to the IKRC for endorsement. Work continues on the 7 TAs planed for submission at the IKRC 12 meeting on May 10. For the remaining 10 open work packages the work continues with procurement, according to the project schedule.

- Schedule and progress are major considerations and it is clear that ESS will have to self-perform some work packages due to the lack of an in-kind partner. These remaining work packages mainly consist of large commercial items such as RF sources and power supplies with a total value of 65 M€.
- With most IK partners the focus has changed from engineering efforts to prototyping, constructions of components, manufacturing verifications and installation planning. Any delay arising from the IK partners risk having consequences on the project schedule. It is very important to receive early warnings of potential slippage and delays in order to implement mitigation for minimizing impact on the overall schedule.

Recent and upcoming milestones

Name	Current Forecast	Delay (W.Days)	Comment
Start RFQ machining	1-Jan-17	-	Complete
Thales Klystron Prototype Delivered	2-Feb-17	-	Complete
DTL production starts	28-Feb-17		Complete
Spoke cryomodule prototype available for Uppsala test stand (FREIA)	1-Mar-17	-120	35 d further delay since the Q4 report.
Spoke & MB CM production launched.	1-Mar-17	-45	Obsolete milestone, separate milestones will be established for the spoke and MB cryomodule production start. The current plan maintains the delivery dates for the spoke and MB CM deliveries on site. No change since the Q4 report.
CPI/Thales and L3 IOT prototypes delivery	19-Apr-17	-80	No change since the Q4 report.
Ready For Installation (RFI) SPK High Power Amplifier - 1st unit	15-Jun-17	-92	No change since the Q4 report.
LEBT assembly complete	14-Aug-17	-170	The installation schedule is being modified and the testing time at IK partner reduced to maintain agreed schedule. No change since the Q4 report.
Ready For Installation (RFI) HV Power Converter for SPK - 1st unit	7-Mar-18	-204	36 d further delay since the Q4 report.

Main issues

- Confirmed delay or in some cases complete stoppage of procurements at In-kind partners will adversely affect the Project Schedule. More mitigation measures keep on being searched. In-kind partners are urged to strive and solve/minimize them with the support of ESS whenever relevant. Examples include:
    - Halt of procurements for ESS at IPN Orsay,
    - Halt of procurement for ESS of some components at ESS Bilbao,
    - Remaining VAT related issues between INFN and Elettra have halted procurement on Spoke RF power supplies and magnet power supplies at Elettra,

- Some more delays are expected to come out of various placed manufacturing contracts when the contractors detailed planning is produced. Such changes will be incorporated into the updated P6 Plan.

Target Station

Achievements

- The Preliminary Design of the systems comprising the Target Station is now essentially complete, with a few minor exceptions. The Final Design is well underway for most systems and even completed for some. At the end of March 2017, earned value for the Target sub-project stood at 22%.
- All 22 bounding accident analyses for operations were finalised and submitted as part of the license application to the Swedish Radiation Safety Authority. The work included implementation of a new dose-to-worker method and analysis of uncertainties and conservatisms.
- An order has been placed by IK partner UJF's subcontractor CVR for the helium circulators that are part of the target cooling system.
- Additional steel shielding surrounding the ECHIR (Ess CHip IRradiation) beam pipe was delivered and installed (see Fig. 3). The ECHIR embedments accommodate the future installation of a chip irradiation station at ESS, should funding for such a capability materialize.

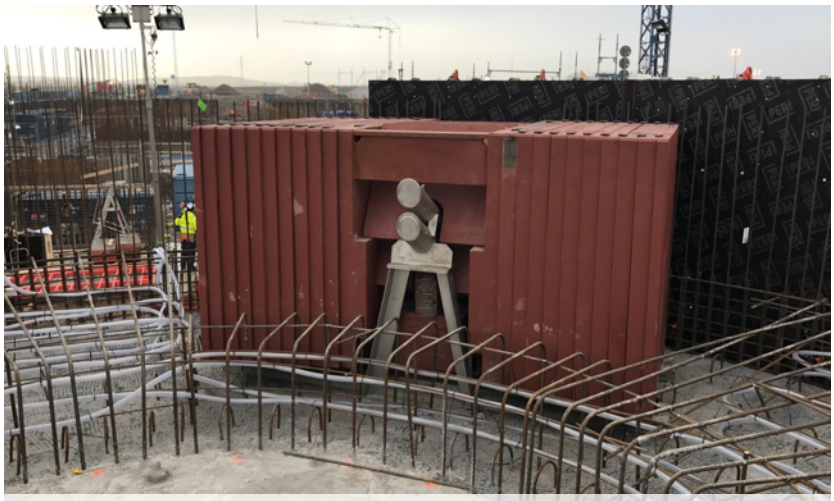


Figure 3: ECHIR beam pipe and the surrounding shielding installed.

- The experimental studies of irradiated tungsten bricks, for measuring the release rate of iodine and tritium as a function of temperature has been finalized by collaborator DTU. The results, presented in a final report expected by end of April, support the safety case that iodine releases are not significant for tungsten temperatures below 700°C.
- Installation of anchor plates and conduits for electrical cabling has started in parallel with civil construction works for the Active Cells (see Fig. 4).

Figure 4: High electrical conduits installed for embedment into Active Cells floors and walls.

- Preliminary Design Review was conducted for the Monolith Shielding System.
- Critical Design Reviews were conducted for the Lower and Mid Sections of the Monolith Vessel as well as for the Cryogenic Moderator System, and preparations for procurement and fabrication is ongoing.
- The Target sub-project participated in the ESS-wide effort to define plan and resources the Initial Operations phase 2019-2025, in preparation for review early in May.

Recent and upcoming milestones

Relative to last quarter, the milestone list is updated with the L1 milestones approved this quarter by the Change Control Board. The delays for "Contract Signed – Target Spallation Material" and "Delivery on Site – Monolith Vessel" have increased but they should be recoverable due to a shorter manufacturing time than originally estimated. The date for the milestone "Installation Complete – Target Cryoplant" was re-baselined to reflect the conclusion that delayed award and signing of the contract is expected to be recovered with compressed installation schedule.

"Delivery – Complete Target Wheel to ESS Site" is further delayed 28 days as compared to previous quarterly report, due to the decision to manufacture a prototype for justification of fabrication and inspection methods. This was deemed necessary in order to decrease the project risk.

"Tuning Beam Dump Ready for Proton Beam" now shows a delay of 68 days. Further analysis of the installation plan is ongoing to try and recover.

Name	Current Forecast	Delay (W.Days)	Comment (+ text below)
Contract Signed – Target Spallation Material	18-Apr-17	-93	In-kind partner has chosen to delay procurement due to feedback from suppliers that delivery time will be shorter than originally estimated. But, now no float remains in the schedule for assembly.
CDR Target Helium Cooling System	30-Jun-17	0	No change since the Q4 report.

Name	Current Forecast	Delay (W.Days)	Comment (+ text below)
Delivery on Site – Monolith Vessel	29-Mar-18	-36	Delayed procurement but shortened production time.
Delivery On Site – Cold Moderator Assembly incl. Vacuum Jacket	29-Mar-18	0	No change since the Q4 report.
Installation Complete – Target Cryoplant (Helium)	21-May-18	0	Rebaselined after initial delay due to slow contract signing process. Schedule is being compressed but end date still unchanged.
Delivery – Complete Target Wheel to ESS Site	13-Aug-18	-44	End date moved due to delays in vessel prototype work (originally not included in scope but deemed necessary). RBOT date not affected.
Tuning Beam Dump Ready for Proton Beam	03-Jul-19	-68	The installation part of the schedule needs review. It is highly probable that the forecast date can be pulled back.
Installation - 1st Survey of TCS	20-Mar-19	-1	
D02 Bunker Area D03 side released for NSS work	01-Oct-19	0	
D02 Bunker Area D01 side released for NSS work	08-Oct-19	0	
WP3 System Test complete - Cryogenic Cooling Systems (Helium + LH2)	03-Feb-20	0	
Target Ready for BOT / ESS Readiness review	31-03-20	0	

Main issues

- Tracking earned value of some IK partners in our project plan is still not functioning properly, which generates artificially low Schedule Performance Index for the Target sub-project. We are working with all partners to resolve the issues and get it to work properly.
- The Target sub-project is putting in place a plan and organizational structure to support the major installation activities which begin in the fall of 2017. A deputy Target's Installation Coordinator has been recruited and will start by end of April 2017.
- Accident analysis works and support for license application continue to draw significantly more resources than originally anticipated and budgeted for, which causes delays in the execution of other planned work as for example the design of the Target Safety System. Additional resources for upcoming safety analysis work need to be considered.
- Failure to secure in-kind partner(s) for a few but large work elements has necessitated the decision to self-perform a larger scope of work including design and procurement. This will require additional recruitments and put pressure on the already heavily loaded procurement function.

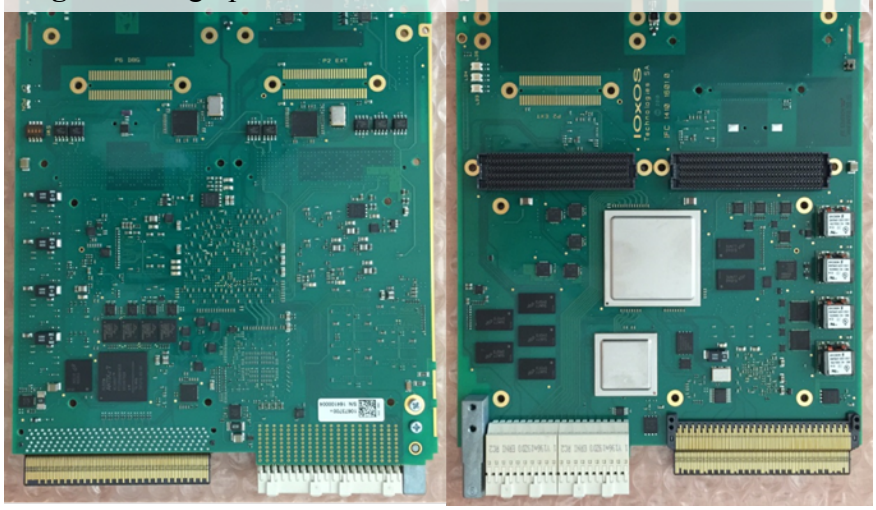
Integrated Control System

Achievements

- A first version of an installation plan for ICS has been created based on the project plan that was completed in Q3 2016. The installation plan covers the previously unplanned ICS installation activities that were discovered during the re-planning in 2016.

- In-kind projects are executing better than expected or according to plan with only one exception. The ICS in-kind manager is effectively driving in-kind partner projects and facilitating alignment and coordination across ESS stakeholders and in-kind partners. A moderate number of new in-kind contracts have been pursued in the period, mainly extending/expanding already existing ones, increasing in-kind scope with existing partners or adding scope to complement an in-kind collaboration with an ESS stakeholder. The contractual problems with Switzerland that blocked progress on important in-kind projects have now been solved and tasks are being realigned to minimize the impact of the encured delay.
- Recruitments have progressed well albeit a bit slower than anticipated. Five new employment contracts have been signed in the period and one employee has resigned. Several new consultants have joined the ICS team to increase capacity primarily in the hardware and integration group.
- A new group in charge of Infrastructure (work package 7) was created in February 2017. The recruitment of the group leader is ongoing.
- The commercial framework agreement for the ICS infrastructure services has progressed as planned in the period and the completion of contracts is expected in 2017-04. This will give ICS access to a range of services from trusted suppliers.
- The first series of the ICS digital platform (see Fig. 5) have been delivered as part of the in-kind collaboration with PSI, Switzerland. The first applications have already been integrated on this Micro TCA capable platform and some problems have been identified that will be corrected in future batches.
- ICS scope and timelines have been revisited as part of the overall ESS Value Engineering exercise and several scope deferrals and savings were identified.

Figure 5: High performance MicroTCA card.



Recent and upcoming milestones

Milestone	Forecast	Delta	Comment
Controls for proton source and LEBT ready offsite	2017-03-03	-180	Completed.
ICS controls HW for Linac CDS installed before Cryogenic Distribution for Lund Test Stand 2	2017-06-15	0	Risk of delay due to change of procurement process.
ICS controls for Accelerator Cryoplant ready for commissioning	2017-07-01	-80	Delayed due to procurement issues but still compatible with Cryogenics installation schedule.
ICS controls for TICP (Test and Instruments Cryo	2017-07-15	-65	Delayed due to

Milestone	Forecast	Delta	Comment
Plant) ready for commissioning			procurement but still compatible with Test stand schedule.
ICS controls HW for Linac CDS installed before Cryogenic Distribution for Spoke Linac	2017-10-02	0	
ICS controls HW for Linac CDS installed before Cryogenic Distribution for Elliptical Linac	2017-11-03	0	
Accelerator PSS-1 complete	2018-04-02	0	Rebaselining compatible with overall schedule.
Accelerator PSS-2 complete	2018-12-21	0	No change since the Q4 report.

Main issues

- The ICS installation plan contains early installation activities, for some of which there is not yet any clear solution how to staff the activities.
- Several ICS work packages continue flagging too low resource capacity to keep plan. Recruitments and consultant procurements are continuously needed.
- Although the on-going initiatives for increasing the amount of in-kind are being pursued, it is clear that the 50% in-kind goal will not be met.

Engineering and Integration Support

Achievements

- The bridging function “Installation Support Coordination” with representatives from the sub-projects and central functions has been successfully implemented. A clear mission and responsibility has been endorced by management and the first weekly meeting was initiated in beginning of January.
- A new group “Installation Support Group“ is under establishment in the EIS division. The main purpose of the group is to build up and lead the team of ESS-wide installation resources (personnel and equipment) and to prepare the transition from installation to operation of the technical infrastructure systems.
- Establishment of ESS-wide cable coordination is on-going whith a small central core team providing coordination, softwares, methods and planning.
- The Survey, Alignment and Metrology team has successfully implemented all reference points in the accelerator tunnel and is fully prepared to support the installation in the tunnel.
- Value engineering items related to equipment, resources and softwares have been identified and implementation is underway.

Main issues

- Implementation of needed framework agreements for manufacturing and installation support is late due to the lack of resources and the late decisions to establish the new Installation Support Group.
- The intensive work of implementing new functions in the division and the detailed budget work for 2018 and initial operation have put a lot of pressure on the core team of the division.
- The departure of the group leader for Integration, an essential position during the installation phase, may have a major impact if an adequate solution is not found quickly.
- Central support and service organizations are not yet fully prepared for supporting the installation activities.
- Requests for installation services must be communicated early enough for the central teams to prepare.

- Issues with the new software version of the PLM platform are delaying several PIM projects by 5-6 weeks. Mitigation and re-prioritization are done to ensure that new functionalities will be aligned to the agreed road-map during Q2.
- Lack of an ESS-wide coordinated approach to integration with insufficient communication of changes to the central integration team increases the risks during installation.

System Engineering

Achievements

- The System Engineering team has successfully coordinated the preparation of the additional information requested by SSM and submitted it at the beginning of March.
- The preparation of plans and resources for Initial Operations is being coordinated. It includes the organization of a review by external experts on May 3-5 and the submission to the ESS Council in June.

Main issues

- Schedule is very tight for preparing plans and resources for Initial Operations. All teams have to contribute and this work interferes with other high priority tasks (e.g. contributions for the SSM permit, installation work, equipment design and follow-up of construction…).

Science Director Overview

Director's Summary

After successfully setting the initial scope of the first 15 instrument projects last year, Q1 of 2017 was dominated by Tollgate 2 (Tg2) reviews for instrument projects. The teams have shown great dedication in the process from scope-setting to Tg2, and we are pleased to see instruments entering Phase 2. The ESS-wide value engineering exercise has affected the Science Directorate mainly through proposed scope reductions in CF, which would affect the labs, workshops and offices supporting the instruments and the user program. Extensive efforts have been made to make consequence analyses and to identify savings potentials with limited effect on the scientific output of the facility.

Instrument projects

MAGIC, BEER, ODIN, CSPEC, T-Rex, SKADI and BIFROST all conducted Tg2 reviews, the prerequisite for entering Phase 2. All Science Directorate divisions were involved in the extensive work of reviewing the design documents, and external review panels were convened. 11 of the 15 instruments have now been through Tg2, and four of these have so far been approved to pass into phase 2. The remaining seven are earmarked to pass into phase 2, conditional on additional work identified at the TG2 review.

The 12th IKON meeting was held in February, kindly hosted by PSI in Switzerland. Nearly 200 participants attended the meeting, which has developed into an effective working meeting for delivering the ESS neutron scattering systems.

Figure 6: The NSS team of staff and partners gathered for IKON12 at PSI in February, setting a new record for IKON participation.

Instrument Technologies

Following last year's favourable results of the 10B multi-grid detector installed on the cold-chopper spectrometer CNCS at SNS, the detector group received positive indications to expand the collaboration to the thermal spectrometer SEQUIOA at SNS. J-PARC has also indicated interest to collaborate using the thermal spectrometer 4-SEASONS. Meetings with the colleagues at SNS and J-PARC to assess the feasibility and timeline for such tests are planned.

The Neutron Beam Optical Assembly (NBOA), a sub-system of the Target's Neutron Beam Extraction (NBEX) system, will be among the first instrument components installed at ESS in early 2019, in preparation for being ready for Beam on Target and Beam on Instruments. Specific NBOA designs are being developed using information

from the instrument teams. This aims to create a conceptual engineering design for all of the in-monolith optics at the ESS facility with the objective of ensuring high performance and reliability as well as effective integration into the in-monolith systems, which are the responsibility of Target. Close collaboration between NSS and Target is required for this work. A workshop dedicated to the design and technical challenges and solutions is planned to take place at PSI in early April, involving experts from PSI, FRM-II, and LLB.

Integration of different instrument systems such as detectors, choppers and motion-control systems into the ESS-wide controls system is ongoing in the context of the ESS Instrument Integration Platform (ESSIIP), together with the Integrated Control System (ICS) group.

The Common Shielding Bunker

The bunker design continues to move rapidly forward. A decision was taken to construct the shielding for the bunker roof out of iron and high density polyethylene in a laminar structure. This has the advantages of lower weight, greater clearance for the D02 cranes and lower cost. The Critical Design Review of the bunker project is scheduled for September 2017. Meanwhile, the detailed design is underway, and we are actively engaging with potential partners for manufacturing and construction.

Science Support Systems

By the end of 2016 Council approved the scope of science support systems (SSS). The sample environment reference suite is now defined to cover the needs of the first 8 instruments. During Q1 2017 the team provided input to the initial operations planning on how to cater for instruments 9-15 and defining the milestones for entering operation.

Progress on the Utgård sample environment labs continues: The 1-tonne gantry crane started successful operation, a test cave and z mock-up for instrument sample are built. Testing the kinematic mounting will start soon. Electrical installation in the large lab area to prepare it for use by the platforms for fluids, mechatronics as well as ICS, and accreditation is ensured for safety on electrical installations and first aid.

A comprehensive report on particle physics at ESS resulting from a workshop at TUM has been delivered, covering NNBAR/HIBEAM, ANNI and more.

A major milestone within the in-kind agreement with Norway (University of Bergen) was reached with the delivery of the first major piece of equipment, a robot for protein crystallization work.

DMSC

Q1 has seen a large number of meetings and workshops at DMSC, the most important of which is the start of a series of instrument software workshops. The objective of these workshops is to couple the DMSC project activities directly to deliverables for ESS instruments, and they have the remit of collecting requirements for experiment control, data reduction, data analysis and data management. The workshops are attended by representatives from DMSC, individual instrument projects and STAP members. They are held annually, on a per-class basis.

An ESS policy for scientific data has been drafted, and was approved by EMT prior to presentation at AFC, SAC and Council (scheduled for Q2 2017). Having a well-defined policy for scientific data aids the facility users in dissemination of research and assists them with their scientific workflow, as well as clarifying organizational responsibilities with respect to data. The draft policy is in line with similar polices at other European neutron and photon large-scale facilities.
In collaboration with IT and ICS, we have been discussing ESS-wide harmonization of specific IT-related functions concentrating on information and cyber security capability. Also, an ESS-wide owncloud solution for storage and sharing is underway.

Collaboration with MAX IV

ESS and MAX IV are deepening our collaboration, with joint management meetings and an intensified engagement in the planning of Science Village Scandinavia. Synergies are being pursued, such as enabling MAX IV to connect to the ESS cryo-plant and the possibility of co-developing user office software. ESS were invited to contribute to the organization of UM17, the first MAX-lab user meeting held since the inauguration of MAX IV, and ESS Science were actively engaged with talks, chairs and posters.

Conventional Facilities Overview

For the first quarter this year progress is still strong. The seismic retrofit design of the target building and instrument halls is still a challenge. This design is still on critical path, but it becomes more and more stable. The major issues have been addressed and solutions have been agreed. The main design achievements during this period is that almost all baseline agreements have been either approved or released for review by stakeholders. The last agreement for Experimental halls and laboratories is still to come.

Progress on site is still excellent. In the monolith area at the target building we are working on our first vault, meaning that we have reached ground level in this area. MEP works in Accelerator buildings are progressing well and access milestones will be achieved.

The coming period we will need to solve all consequences of the revised design. The delays in design deliveries for D and E buildings together with the massive rebar quantities increases, means that mitigations in production will not only be a challenge in time, but can also end up in a problem with production resources, since a lot of work will have to be performed at the same time and in a limited area. We are currently looking at this.

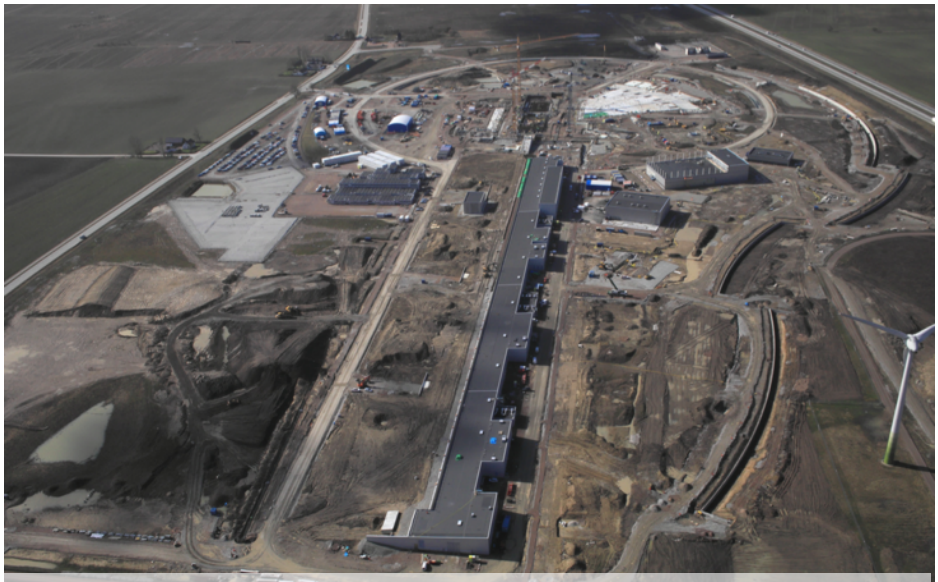


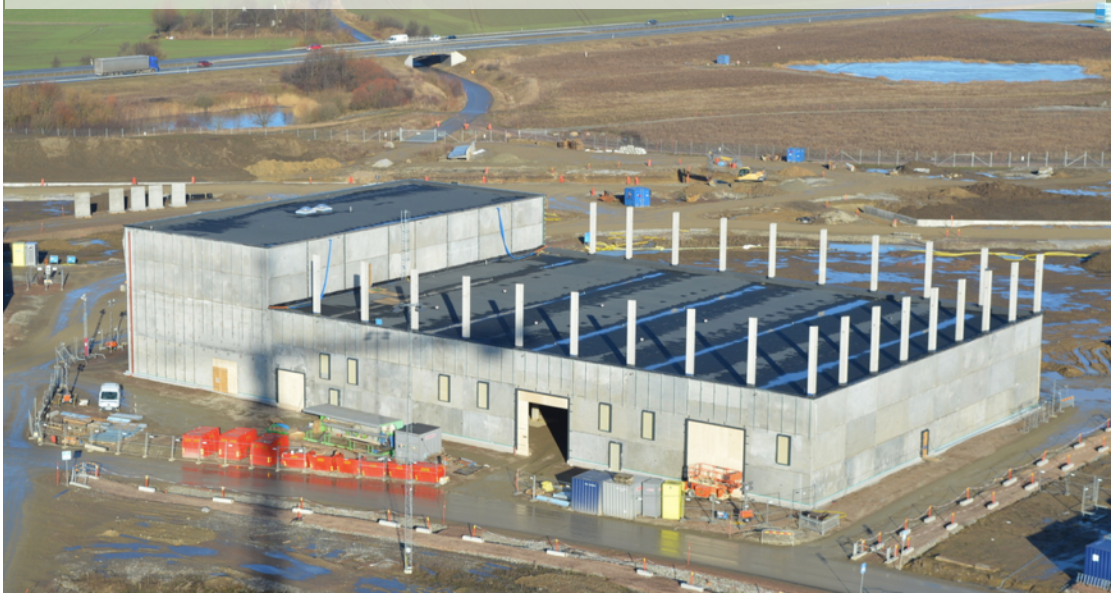
Figure 7: Aereal view of the Construction Site March 2017.

The procurement of the outsourcing of the Central Utility Building (H01) is proceeding according to plan and we will hopefully have a contractor ready in May. See picture of the building below.

The requested Campus revision adding 2000 m2 to the office in an optimal fashion has been concluded with the Architecht. If lease agreement and land agreement falls in place we can start tender prequalification end of next quarter.

We are also working with setting up a group called Infrastucture pre-ops. Here we collect services needed for ESS between buildings handover until we go into Initial operations.

Figure 8: The Central Utility Building, H01, in January 2017



Project Support and Administration Director Overview

The establishment of additional temporary offices for installation workers on site was completed in March. The facilities are being equipped and furnished and will be operational as planned from the beginning of Q2. To support incoming contractors and in-kind staff performing installation work the Administration has taken the lead to develop an on-boarding process focusing on addressing practical matters arising pre-arrival aiming at ensuring a smooth arrival at the Lund construction site.

In February, the 3rd meeting of the Committee on Employment Conditions (CEC) was held with a focus on taxation and social security as well as staff planning. The following day, the Council convened for a Strategy Meeting and three workshops were held on operations, membership, and schedule and value engineering. The 8th meeting of Council addressed requests by two of the Founding Observers concerning the deadline for accession.

The work of the Supply, Procurement and Logistics Division is proceeding according to plan, managing a high number of procurement and logistics requests. Work continues to optimize procurement processes, including improving functionality in the ERP system (Agresso) and rolling out an e-procurement tool, which should be launched in Q2 2017. A cross-orgainsational Procurement Coordination Forum, composed of representatives from central functions and sub-projects, is being established in order to support near-term planning and coordination of technical procurements. This will complement the Strategic Procurement Board, which is composed of the DG, Directors and Head of Procurement and meets on a quarterly basis. Work is on going to define the procurement strategies to support installation work.

The logistics function has been visiting a number of in-kind partners, prioritized based on complexity and value of the in-kind delivery (to date, STFC, ESS Bilbao, INFN (several locations), CEA and IPNO) and presented to field coordinators at BrightnESS forum in Q1. The purpose of these meetings is to establish communication, share information, plan and provide advice to in-kind partners in order to mitigate risks and costs related to transportation of highly sensitive goods throughout Europe and between in-kind partners, regardless of delivery terms.

For Human Resources the high recruitment pace has continued throughout Q1 2017. 17 recruitments were finalized and 32 are on-going.

The 30th of January we held a Managers' meeting with focus on interaction between managers in the organisation and the ESS Management Team. The managers also did a work-shop on leadership dilemmas.

The work with creating a staff plan for ESS is moving ahead. The initial data collection has been concluded and we are now starting the qualitiative part that will complete the analysis.

IT implemented a new version of service management tool, SNOW, to allow tracking of internal service levels which will support efficiency increases.
The first administration In-kind agreement with Norway to fund network equipment (ICS in the lead) has been partially delivered.
Deployed the new collaboration platform and ESS internal webpage; ESS Inside.

Integration with HR is ongoing to provide automatic user registration, with self service points for external users.

For the legal function, efforts are continued to support the in-kind contracting process and the development of the technical annexes to the in-kind agreements, where e.g. a trilateral agreement between ESS, Elettra and INFN (Italy) for accelerator work package magnets, and Swiss MoU and Swiss in-kind agreement (with PSA and Zhaw) have been brought to completion.

Work on revising the Scientific Data Policy has been completed. The Policy will be presented to the SAC and to the Council later this year. The second revision of the ESS ERIC Procurement Rules has now beed implemented, taking into account the experience gained during the first year of the rules being in use.

A lot of effort has been made in the organisation regarding the uncertainty if the VAT exemption as outlined in Article 143 and Article 151 of Council Directive 2006/112/EC would in addition to be applicable for the ERIC, also apply to purchases made by Members of the ERIC. We have now received confirmation from the Swedish authorities that the VAT exemption is also applicable for Members of the Eric (assuming the purchases are made for the sole purpose of the ERIC). For the sake of clarity, it should be mentioned that since currently only States are Members of the ERIC the exemption is applicable for purchases made by the Member States.

Procurement
A table providing an overview of contract awards >200.000 EUR that were completed during Q1 2017 is provided in Annex 5. These contract awards correspond to procurement processes published on the ESS website, following procedures defined in the ESS ERIC Procurement Rules. In order to support the principle of transparency, ESS has been publishing these contract award notices on the ESS website since 1 October 2015. They are published on a quarterly basis, based on the month of final contract signature.

A list of open and forthcoming procurements is available on the website: https://europeanspallationsource.se/procurement.

External Grants summary
The number of grant applications submitted by ESS has increased significantly in the past years. With only 3 submissions recorded in 2012 and 2013 respectively, ESS grants participation increased to 14 submissions in 2014, 22 in 2015, 42 in 2016 and 6 in the first quarter of 2017. Among the 6 projects submitted in 2017, 5 were European grants, and 1 national grant, for a total volume of more than 2MEUR.

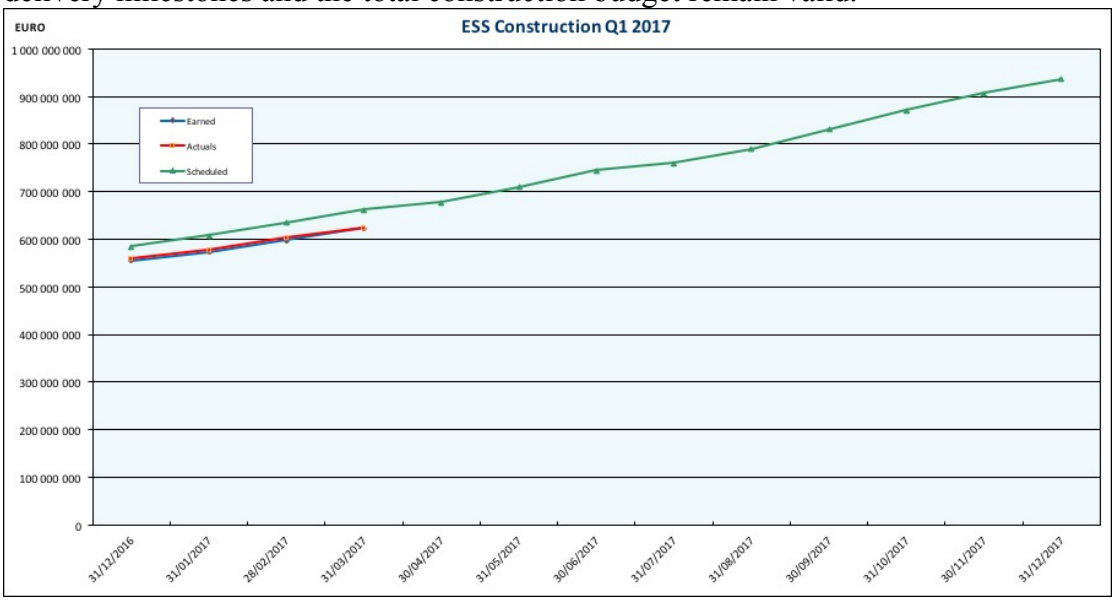
ESS is currently involved in 16 international or national grants (11 European grants, 1 regional grant and 4 national grants) with a total volume of approx. 14,7MEUR, including ESS co-funding of 415kEUR. Please see below a detailed overview of all international and national grants ESS is currently involved in.

The funding schemes include the EU Framework Programmes for Research and Innovation 7th Framework Programme (FP7) and Horizon 2020, Interreg activities as well as support from the Swedish funding agency VR. Most FP7 grants with ESS involvement started in 2011 and have been finalised and closed in the course of 2016.

Currently only one FP7 project remains open (EuCARD2, which termination is planned 30th April 2017).
Three out of the four projects with ESS involvement that were awarded through Horizon 2020 funding in 2016 have started in 2017: the CERIC ACCELERATE (ACCEleration of Leading ReseArch infrasTructurEs) project, the STFC led EOSCpilot (European Open Science Cloud for Research) project, and the Université Grenoble led Marie Curie ITN RAMP (Rationalising Membrane Protein chrystallalisation). The fourth one, the CERN led ARIES (Accelerator Research and Innovtion for European Science and Society) project will start 1st May 2017.

Cost/Performance Overview
Current trends in earned value measurement (EVM) indicate that ESS is slightly behind schedule but with costs somewhat lower than planned. There is no question that some work is behind schedule, and the priority is to avoid delays in critical path activities that might jeopardise the overall ESS delivery schedule.

The EVM performance is reviewed in the sub-projects, and for all the sub-projects combined every month after the close of the previous month's accounting. Activities to mitigate potential delays and seek cost savings are being pursued. The external delivery milestones and the total construction budget remain valid.



Annex 1 provides more detailed information on Cost Performance Status, Risk and Contingency Status, Cost Baseline Change Log, Level 2 Baseline Budget Status and Contingency as % of Remaining Work.

Upcoming Events April 2017 – September 2017

Technical Advisory Committee	5-7 April
Administration and Finance Committee	26 April
Initial Operations review, Lund	3-5 May
In-Kind Review Committee (IKRC) 12, Lund	10 May
Instrument Collaboration Board, Lund	11 May
IPAC, Copenhagen	14-19 May
GSO meeting, Naples	15-17 May
SAC, Lund	18-19 May
Science Workshop, Riga	23 May
Council meeting	1-2 June
IKC Best Practice Workshop, Catania	13-14 May
Target Collaboration Board, Lund	21 June
ACCSYS Technical Board, Lund	29 June
ICNS, South Korea	9-13 July
GRC Neutron Scattering, Hong Kong	6-11 August
ACCSYS Technical Board, Lund	7 September
ILO meeting, Lund	13 September
France@ESS (French Industry Workshop)	25-26 September
IKON, Lund	26-29 September

Annex 1: Cost/Performance Status

The construction budget is 1 843 M€ in 2013 prices. The indexed budget is 2 069 M€ and all cost and schedule performance data using earned value management (EVM) is based on indexed values (n.b. In-kind not indexed).

The project is 32.1% complete versus the plan of 34.1% complete, measured using earned value techniques. The contingency budget is 127 M€, 9.6% of the remaining work planned for the overall construction project. There were no changes to the original construction contingency budget during the initial construction years; 2013, 2014, and 2015. Changes were proposed as part of the 2016 and 2017 budget process, (reduction of 15.4 M€ in 2016 and 25.0 M€ in 2017). A project management objective is to keep the contingency budget above 10% of the remaing work budget, in support of the overall goal of completing the ESS construction project within the approved cost baseline.

The Cost-Schedule Status Report (CSSR) for the ESS Construction Project through March 2017 is shown below. The report includes updated Estimate-at-Completion (EAC) forecasts prepared by the subprojects. These estimates capture the project leaders' best understanding of the likely final cost for their subproject. The method used for the EAC figures varies, e.g., the estimate for Accelerator Systems is mainly based on a high-level risk assessment and the Conventional Facilities estimate is based on the final target price negotiations with Skanska. ESS will continue to improve the overall quality of EAC forecasts.

ESS PROJECT PERFORMANCE REPORT

WORK BREAKDOWN STRUCTURE

PROJECT			FROM	2017-01-01		TO	2017-03-31						
PERFORMANCE DATA													
Total Project.EPS	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION			
	BUDGETED COST		ACTUAL	VARIANCE		BUDGETED COST		ACTUAL	VARIANCE		APPROVED BUDGET	ESTIMATED	FORECAST	EAC
ITEM	WORK SCHEDULED (Planned Value)	WORK PERFORMED (Earn Value)	COST WORK PERFORMED (Actual Cost)	SCHEDULE (=EV-PV)	COST (=EV-AC)	WORK SCHEDULED Planned Value)	WORK PERFORMED (Earned Value)	COST WORK PERFORMED (Actual Cost)	SCHEDULE (=EV-PV)	COST (=EV-AC)		Actual + Remaining		Estimated At Completion
Project Support & Administration	8 209 097	8 026 701	5 623 909	-182 396	2 402 792	85 977 522	85 866 896	85 272 648	-110 626	594 249	128 364 542	127 625 607	7 868 329	135 493 937
Conventional Facilities	27 068 641	35 008 323	31 159 315	7 939 682	3 849 008	273 581 023	275 477 149	275 472 101	1 896 126	5 048	640 960 505	640 328 599	35 941 407	676 270 006
Accelerator Systems	21 607 860	11 967 799	12 906 757	-9 640 060	-938 958	145 684 765	124 222 551	126 362 924	-21 462 214	-2 140 373	521 018 325	520 856 942	33 050 000	553 906 942
Target Station	8 929 879	4 364 800	4 797 092	-4 565 078	-432 291	47 396 624	37 792 514	39 050 595	-9 604 110	-1 258 081	172 755 481	174 029 996	6 881 839	180 911 835
Integrated Control System	4 020 795	2 717 754	2 786 383	-1 303 041	-68 629	25 916 118	20 561 490	20 442 896	-5 354 628	118 594	78 156 991	77 943 865	5 551 877	83 495 742
Technical Management & Services	2 320 201	1 783 759	1 722 336	-536 442	61 423	24 609 038	23 893 102	23 333 533	-715 936	559 569	36 125 834	36 019 268	0	36 019 268
Neutron Scattering Systems	5 348 921	4 393 391	4 622 846	-955 530	-229 455	59 553 109	55 535 738	53 609 081	-4 017 370	1 926 657	361 007 241	358 540 106	0	358 540 106
TOTAL	**77 505 393**	**68 262 528**	**63 618 637**	**-9 242 865**	**4 643 891**	**662 718 198**	**623 349 439**	**623 543 777**	**-39 368 758**	**-194 338**	**1 938 388 919**	**1 935 344 383**	**89 293 452**	**2 024 637 835**

Schedule Variance (BCWS-BCWP): The cumulative schedule variance is increasing and the total schedule variance at the end of March 2017 is -39 369 k€ compared to -32 729 k€ at the end of December 2016. The majority of the schedule variance is within the Accelerator, Target, ICS and NSS and mainly due to delay in Power Converters, NCFE, RF Systems, Vacuum and Cryogenics and delays in the He Cryoplant but current schedule is being compressed to compensate. There are also delays in Target monolith system where particularly the shielding systems is critical and the ICS hardware and IO controllers (in.kind). The overall trend suggests less work is being performed than planned and could lead to a schedule delay unless corrective actions are taken.

The variances at the sub-project level include Accelerator Systems (-21 462 k€), Target Station (-9 604 k€), Integrated Control System (-5 355 k€), Neutron Scattering Systems (-4 017 k€), Technical Management & Services (-716 k€) and Project Support & Administration (-111 k€).

There is a schedule variance for Accelerator and Target Station that could correspond to a potential delay of several months. There is a joint effort by all areas to recover and hold the external milestone for machine ready for beam on target in December 2019.

Cost Variance (BCWP-ACWP): The accumulated cost variance at the end of March 2017 is -194 k€ which is lower than the accumulated cost variance in December 2016 of -4 838 k€, i.e. the current trend for the accumulated cost variance showing that the cost for performed work is decreasing. The majority of the negative cost variance is within the Accelerator and Target and mainly due to higher cost in Power converters, Beam Diagnostics, Beam Delivery and Cooling Support and higher cost for design in the Target sub-project due to more design work performed than planned as well as using more consultants than staff for work performed. However, the overall trend suggests that the work performed costs slightly less than planned.

The negative cost variance is related to Accelerators (- 2 140 k€) and Target (-1 258 k€). There is also a positive cost variance for Neutron Scattering Systems (+1 927 k€), Technical Management & Services (+600 k€), Project Support & Administration (+594 k€) and Integrated Control System (+119 k€).

If the positive trend in the cumulative cost variance continues there could be potential savings.
Cost savings are being be sought in all areas, either through value engineering efforts or through cost scrubbing to hold the baseline budget.

Risk and Contingency Status
The graph below shows the calculated risk exposure for identified and analysed risks, together with the contingency as a percentage of remaining work budgeted. Remaining work is excluding the Conventional Facilities (CF) and Neutron Scattering Systems (NSS) projects (CF cost risk within limits is assumed to be a contribution of the Host Countries and the NSS budget is ring-fenced with risk and contingency managed within the fixed budget). The current contingency budget, excluding CF & NSS, is 22.0% of the remaining work budgeted. The current risk exposure is calculated at 11.9%.

The cost risk exposure is dominated by a small number of risks while the schedule risks come from a broader range of areas.

The total potential impact of all registered risks on the project's estimate at completion is 150M€. Risk workshop frequency has been intensified to improve our understanding especially of the largest risks and to focus attention on development, implementation, execution, and tracking of our most important mitigation actions. The funding for transition into operation is becoming an urgent issue. The risk remains for a gap of at least 23 M€ in 2019.

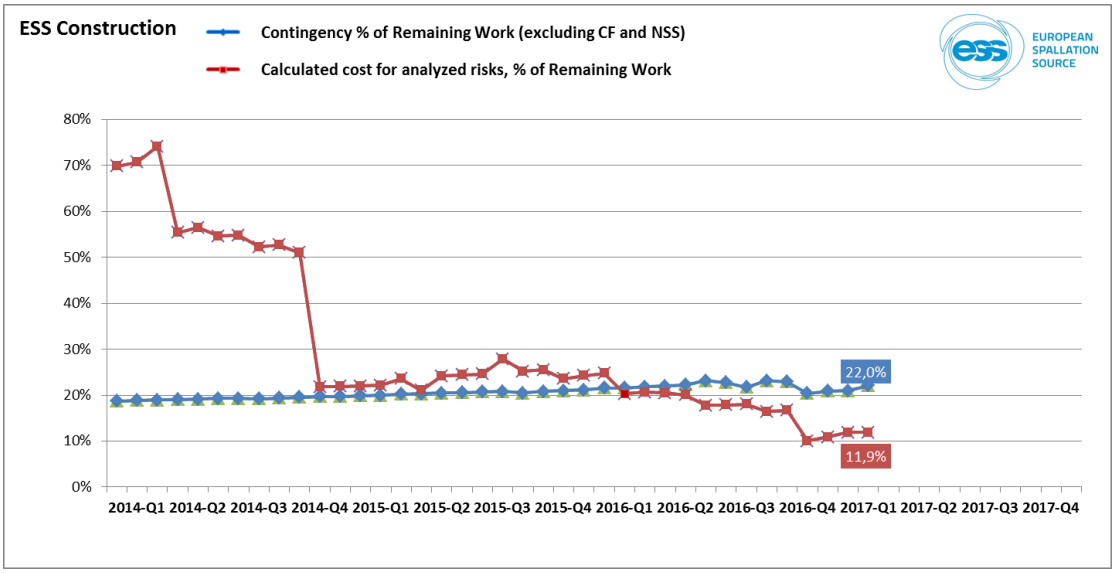
Managing the complexity of installation, integration, and verification activities will be critical for a successful delivery of ESS. For the same reasons, well established tools, processes and procedures will be important for reaching expected quality in a cost-efficient way.
Overall ESS has made progress during the last quarter in many of the cost risks where e.g. the liquidity gap risk could be retired due to the signing of the cash facility in November 2016.

One main cost risk that is still active and significant is VAT where uncertainties in VAT reimbursement possibilities not only impact costs directly but also in-directly. Significant progress has been made last quarter but, at the same time, new issues have been identified which affects and delays the signing of contracts with in-kind partners which is still a major concern.

Last quarter, progress has been made to deliver documents needed for permits and licenses. Therefore, this risk is now limited to a smaller part of the ESS Organisation. The associated delay risk is still substantial which means that further mitigation has been initiated involving cross functional efforts within ESS.

Costs associated with delays in construction would most probably not be covered by the ESS contingency, even if all possible remedial actions towards such delays were taken to limit the cost impact. Looking at the current risk exposure compared with remaining contingency, see graph below, and the forcast or unforeseen costs cost there is a low probablility that the remaining contingency will be sufficient to cover any delay.
Work with installation planning is identified as a success factor for all sub-projects. The structure of the installation organisation is being formed.

Intensified mitigation has been accomplished to ensure an efficient design reviews in order to reduce risks for rework and late discovery of poor quality. The design review process has been improved and efforts are continued to be put in obtaining timely decisions for procurement and manufacturing activities on the critical path.



Change Log – ESS Total Project Budget Baseline (k€) – 30th March 2017
The table below lists the already approved allocations of contingency in ***Grey*** (part of the 2016 and 2017 budget approval) and the new proposed allocations of contingency in ***Blue***.

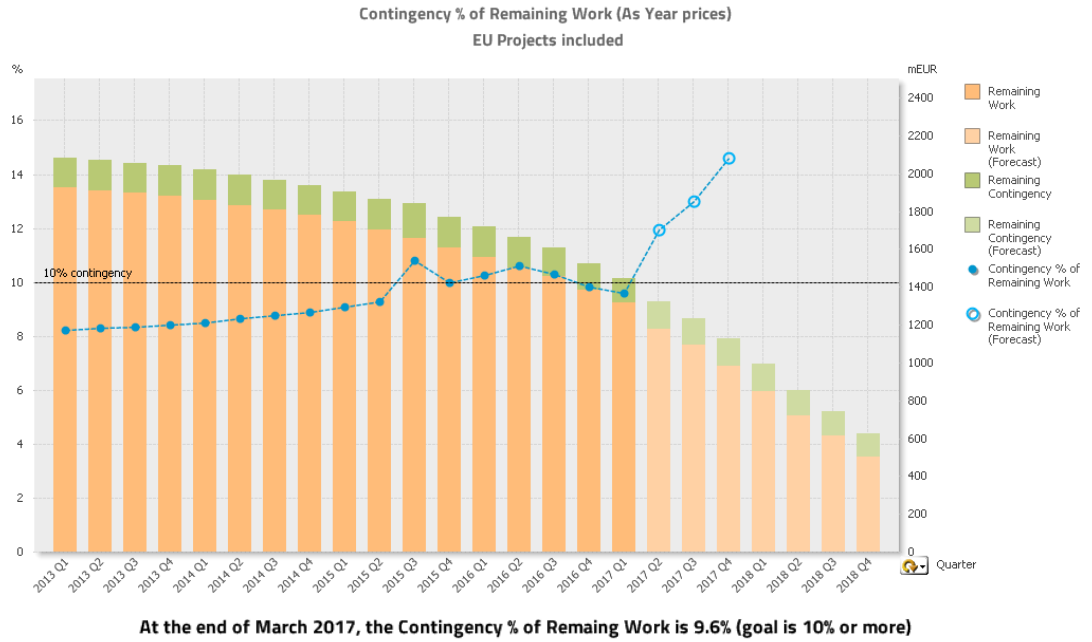
CR No.	Project	Description	Total Amount (kEuro)
CR0001	ESS Project (ES&H)	Increased fees to be paid to Swedish radiation regulatory authorities.	-840
CR0018	Target	Change to improved design of the moderator/reflectors in the Target.	-4 040
CR0019	ICS	Oxygen depletion and radiation monitoring for personnel safety system.	-2 000
CR0026	Target	Addition of an ESS chip irradiation (ECHIR) beam line.	-125
CR0029	Accelerator	Cryomodule to Cryogenic Distribution System Connections.	-750
CR0030	Accelerator	Lund Cryomdule Test Stand Activities (WP10).	-1 310
CR0031	ICS	Budget transfer from Accelerator to ICS for IPNO work.	-2 500
CR0032	Accelerator	Accelerator Cryoplant cost savings based on actual contract award.	+8 350
CR0033	Accelerator	Radio Frequency (RF) integration laboratory work.	-500
CR0041	Design & Engineering	Increased scope for development, integration and implementation of Product Lifecycle Management (PLM) system.	-4 000
CR0044	ESS Project (Insurance)	Insurance costs covering risks associated with installation of equipment.	-1 600

CR No.	Project	Description	Total Amount (kEuro)
CR0040	ESS Project (ES&H)	Additional cost for rad waste licensing (200 k€). Scope originally planned for Initial Operations in 2017-2018 (1000 k€).	-1 200
CR0042	ESS Project Support (Communication)	Increased scope and level-of-effort for supporting partners and coordinating in-kind.	-594
CR0045	ESS Project (Administration)	Orphan scope - Rent for DMSC office in Copenhagen during construction phase.	-1 332
CR0043	ESS Project (Technical/Admi)	Increased scope and level-of-effort to cover establishment of and Internal Auditor, Operations Coordinator, and Technical Coordinators. Functions recommended by the annual reviews.	-2 304
CR0046	ESS Project (Administration)	Increased scope for Project Support & Administration due to ERIC VAT-administration and Legal support for in-kind agreements and IPR-issues.	-692
CR0057	Accelerator	Cryogenics savings on TICP procurement	1 244
CR0026	CF	CF part of Target ECHIR beam line	-125
CR0058	Accelerator	Power converters	-686
CR0059	Accelerator	Power converters elettra in-kind contribution contract	-150
CR0060	Accelerator	Halogen free cables	-555
CR0052	Accelerator	Elliptical cavities and cryomodules	-1 097
CR0064	Target	Target Cryoplant cost savings	2 700
CR0067	Accelerator	Vacuum	-6 000
CR0004	CF	Dogleg & Beam dump	-1 000
CR0006	CF	Grounding System Accelerator buildings	-210
CR0007	CF	15.6 600V Transformers	-100
CR0008	CF	Stubs (6) between Tunnel and Test Facility	-300
CR0009	CF	Relocation of Technical Labs	5 000
CR0010	CF	Ventilation of CRYO Compressor Building	-120
CR0012	CF	Changed layout of HEBT Loading Bay	-1 044
CR0013	CF	Enlargement of the CUB	-1 000
CR0014	CF	Temporary Shaft Front End Building	-330
CR0015	CF	Active cells layout and waste package logistics	170
CR0016	CF	Chamfers in Stubs	-50
CR0017	CF	Status monitoring for low voltage switchgear	-140
CR0020	CF	Doors in cold box hall	-38

CR No.	Project	Description	Total Amount (kEuro)
CR0021	CF	CUB, fibers	-923
CR0028	CF	Sprinklers in G01	-305
CR0036 *	CF	Cooling in klystron gallery	-2 460
CR0037	CF	Increased power and cooling to G04, moderator configuration	-1 300
CR0038	CF	EMC grid	-49
CR0048	CF	House vacuum for D&E building	-386
CR0049	CF	Changes in sample environment	-224
CR0051	CF	Nonmagnetic floor in D03	-238
CR0065	Accelerator	AD cryo warm piping	-1 800
CR0070	Target	Beam drift room	-2 280
CR0070	CF	Beam drift room	-1 003
CR0071	CF	Rad Waste Handling Equipment (RWHE) and complementary infrastructure	-1 500
CR0072	ESS Project (Administration)	Budget 2016-2019 for the Logistics function	-2 090
CR0073	Accelerator	Commissioning Dump from CERN	-92
CR0074	CF	A2T shielding concrete	-2 330
CR0075	CF	Update of heat loads for racks in the G02 RF gallery	-180
CR0076	ESS Project (Administration)	Staffing of Quality Division(QD)	-500
CR0077	Target	Coverage for wrongly coded staff/contracted staff in P6 Target Project Plan	-2 000
CR0026	Target	NNbar	-250
CR0079	ESS Project (Administration)	Contract with SKB for final disposal of Radioactive Waste/Material	-1 270
CR0082	CF	Structural Shielding	-4 310
CR0083	CF	Increased Campus design cost due to single offices	-168
CR0088	Target	Target Div New Milestones and cost due to new access dates	-8 886
CR0093	ICS	ICS Div New Milestones and cost due to new access dates	1 379
CR0095	ESS Project (Administration)	Change PS&A project End Of Construction date to 2018-12-31	16 238
CR0096	ESS Project (Administration)	Change Project 61 project End Of Construction date to 181231	2 265
CR0097	ESS Project (Administration)	Extended Amount of Staff for ES&H Division	-880
CR0098	Accelerator	Change phase reference line design and cost	-260
CR0099	ESS Project (Administration)	Cash Facility - the loan to bridge the liquidity gap 2016-2017	-3 236

CR No.	Project	Description	Total Amount (kEuro)
CR0092	Technical Mgmt & Services	Change TMS project End of Construction date to 181231	3 270
CR0063	CF	Requirement regarding cable splicing and verification/testing method.	-265
CR0105	CF	Change to previous decision regarding CF funding from ESS Contingency	1 500
CR0106	CF	Insufficient contingency distribution to CF for changes up until May 2016	-1 500
CR0111	CF	Increased CF Design Costs for Late Interpretation of SSM reqs	-13 000
CR0114	Target	Deferral of the procurement of the Target Station Hotshop	50 000

After the proposed allocation of 14 765 k€ and a proposed return of 4 820 k€ to the contingency, the total remaining contingency is 126 699 k€ ("As Year" budget) which is approximately 9.6% of remaining work.

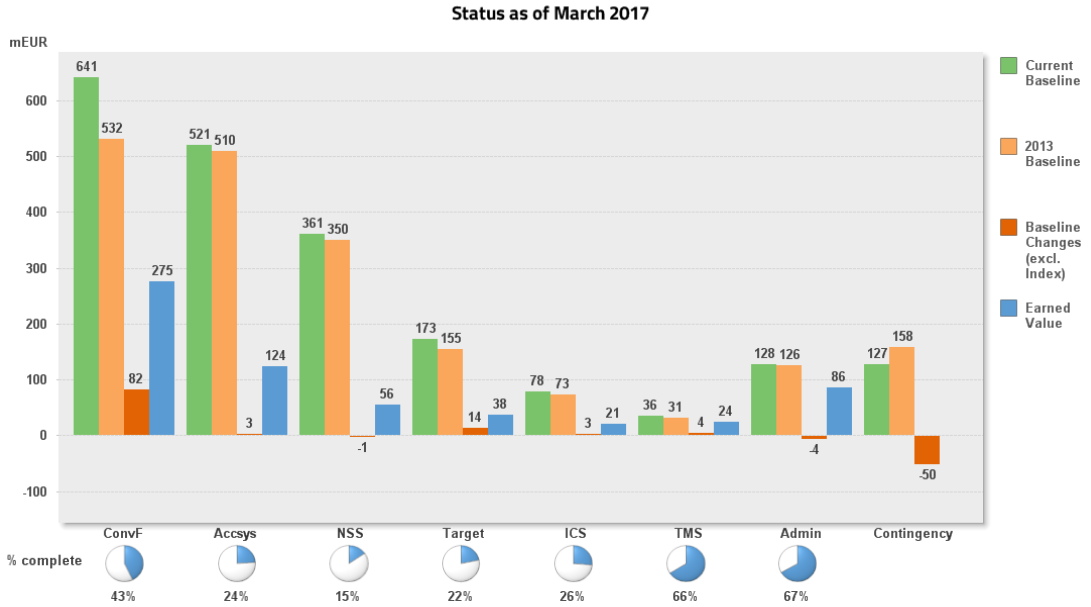


The graph above compares contingency with the cost of the remaining work. The goal is to reach a contingency above 10% and currently the level is 9.6%. It should be noted that changes amounting to -2 078k€ has been approved by CCB and ESS DG and are awaiting implementation. This will, once implemented, decrease the remaining contingency to 124 621 k€ which is approximately 9.4% of remaining work.

A value engineering exercise on-going in order to increase the level of contingency.

Level 2 Budget Status

The chart below provides the current Level-2 budgets, including changes and indexation. Also shown is the percentage complete per project based on the Earned Value Measurement data.



Annex 2: In-kind Status

The In-Kind Review Committee (IKRC) was not held in the first quarter however the Council did meet in February and approved 5 TAs, collectively worth 15 M€, raising the total amount of approved TAs to 56 with a combined value of 182 M€. This leaves the total value of In-Kind under agreement (Heads of Agreement, Collaboration Agreements with host countries, and endorsed and approved TAs) at a little over 303 M€.

The next IKRC will be held in May 2017 where 12 TAs are planned to be presented for endorsement. Additionnally several Final Reports will be presented for crediting from the NSS sub-project.

The IKRC recently approved three TAs from Switzerland in an offline procedure. That enabled funding to come available at Swiss institutes allowing major procurements to be made. There are currently on-going discussions regarding the handling of VAT between the German Ministry of Science (Das Bundesministerium für Bildung und Forschung - BMBF) and the German institutes. Work is also being done in Italy to finalise IKC agreements. There are on-going talks with the UK as well to finalise the terms of the main IKC Agreement. Funding questions for the Spanish contribution have delayed key tenders and agreement on future TAs.

The BrightnESS project held a productive Quality, Health and Safety training for the BrightnESS Field Coordinators in February. An Installation workshop is also planned for 13-14 June in Catania, Sciliy to share experience of installation and commissioning of large scale scientific projects. A web based In-Kind Management software tool, XRM+, also funded by BrightnESS, has been launched and is proving to be a strong asset in coordinating and overseeing the individual IKCs.

Table 1 below shows the current status of IK across the 4 projects. Table 2 shows the difference in the figures from the last quarter (Qtr. 4 2016). The increase in Agreed to 182 M€ following the February Council meeting can be seen. The potential IK total has reduced by 30% as work is being self-performed rather than executed as In-Kind to protect the schedule. This affects the overall In-Kind total with a reduction of 14.8 M€ from the previous quarter (mainly from the Accelerator project).

Table 1 - Current IK totals per Project for Qtr 1 2017

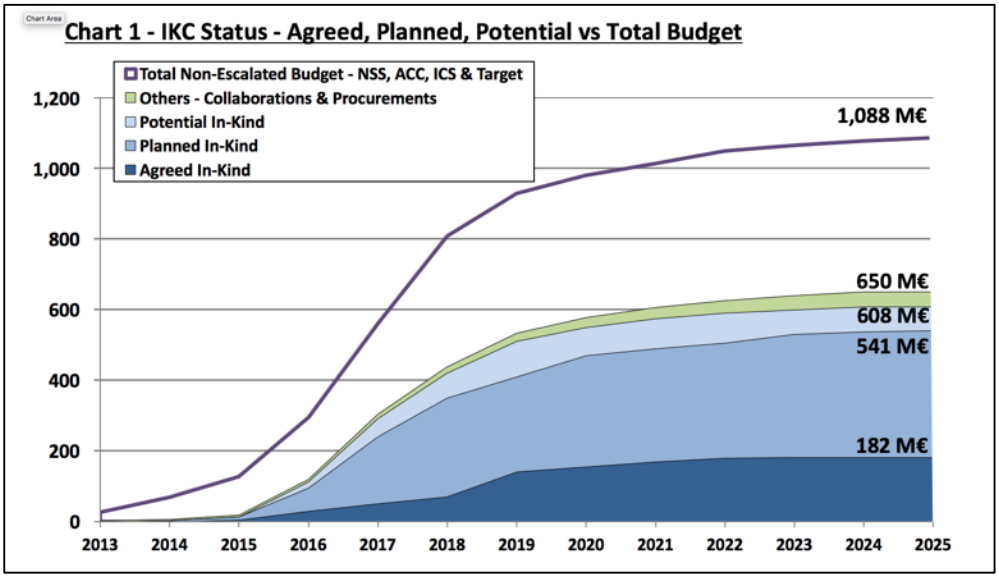
Values kEUR	Qtr 1 2017 IN-KIND REPORTING										
	% IKC POTENTIAL										
	% AGREED & PLANNED										
PROJECT	Agreed	Planned	Planned & Agreed		Potential	Others*	Agreed, Planned, Potential & Others		In-Kind Goal	Not In-Kind**	TOTAL***
11 Accelerator Systems	156,535	114,742	**271,277**	**53.2%**	27,797	15,451	**314,525**	**61.7%**	**75%**	**195,475**	**510,000**
12 Target Station	18,278	37,951	**56,229**	**36.3%**	21,942	16,960	**95,130**	**61.4%**	**65%**	**59,870**	**155,000**
13 Neutron Scattering Systems	2,535	194,736	**197,271**	**56.4%**	15,762	8,802	**221,835**	**63.4%**	**65%**	**128,165**	**350,000**
14 Integrated Control Systems	4,861	11,207	**16,068**	**22.0%**	1,685	825	**18,578**	**25.4%**	**50%**	**54,422**	**73,000**
Total - All 4 projects	**182,209**	**358,636**	**540,845**	**49.7%**	**67,185**	**42,038**	**650,068**	**59.7%**		**437,932**	**1,088,000**
Total - All ESS				**29.3%**				**35.3%**	**747,250**		**1,843,000**

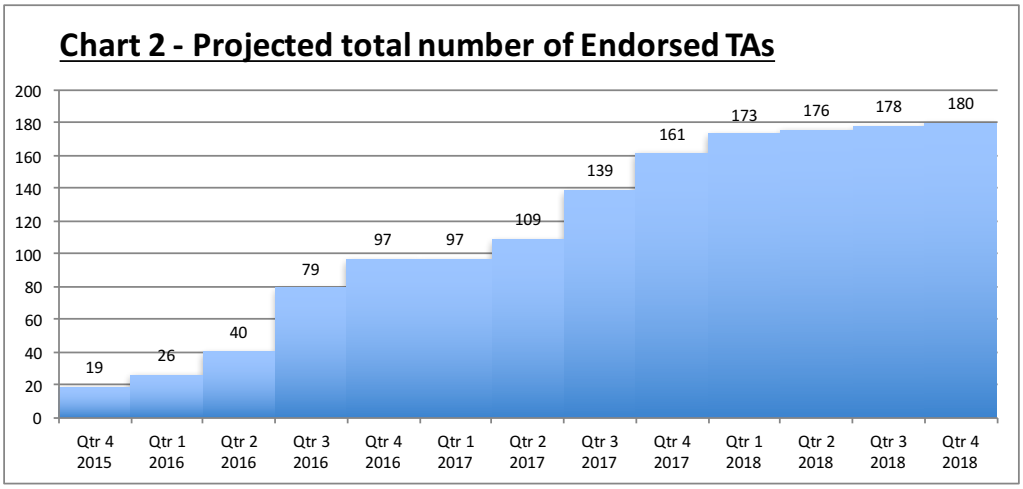
*Collaborations & Procurements/Cash as In-Kind, **Calculated compared to 2013 Budget, ***2013 Budget Totals

Table 2- Difference in IK totals per Project between Qtr 4 2016 & Qtr 1 2017

Values kEUR	CHANGE - % IKC POTENTIAL									
	CHANGE - % AGREED & PLANNED									
PROJECT	Agreed	Planned	Planned & Agreed		Potential	Others*	Agreed, Planned, Potential & Others		In-Kind Goal	Not In-Kind
11 Accelerator Systems	14,779	-14,777	**2**	**0.0%**	-15,558	-410	**-15,965**	**-3.1%**	**0%**	**15,965**
12 Target Station	0	0	**0**	**0.0%**	124	-20	**103**	**0.1%**	**0%**	**-103**
13 Neutron Scattering Systems	247	6,906	**7,153**	**2.0%**	-14,129	6,354	**-622**	**-0.2%**	**0%**	**622**
14 Integrated Control Systems	0	850	**850**	**1.2%**	428	375	**1,653**	**2.3%**	**0%**	**-1,653**
Total Change - All 4 projects	**15,026**	**-7,021**	**8,005**	**0.7%**	**-29,135**	**6,299**	**-14,831**	**-1.3%**		**14,831**

Chart 1 shows the agreed, planned and potential IK budget profile during ESS construction years. Chart 2 shows the current predicted dates for TAs being endorsed.





ESS Project Status

Project budgets and In-Kind Goals are based on the original Cost Book values from 2013 and do not include escalation. 'TAs approved' refers to TAs receiving approval at the ESS ERIC Council whereas 'endorsed' refers to endorsement at the IKRC (but without Council approval yet).

Accelerator				
510 M€ Budget	**75%** (**383** M€) In-Kind Goal **62%** (**315** M€) forecasted as In-Kind	**25** TAs approved (**156** M€) **6** TAs endorsed (**51.7** M€) **2** HoAs signed (**15.1** M€) **10** Collaborations signed (**16.8** M€) **1** Procurement (**26.1** M€)	**5** TAs in Preparation (**37.5** M€) **11.8** M€ of further In-Kind work identified	**33.2** M€ EV (*includes work on unapproved TAs and HoAs*) **45.6** M€ PV (*includes work on unapproved TAs and HoAs*)

Accelerator: For IK partners the main focus is on progress of the technical work and preparation of remaining Technical annexes. The total value of Technical annexes signed, endorsed and planned represents 52% of the total accelerator budget.

The Accelerator IK contract work during Q1 has progressed as expected. Today the remaining work is focusing on the finalization of all open TAs. As of today 49 work packages have been defined, out of which 31 are agreed with our IK partners and have been presented to the IKRC for endorsement. Work continues on the 7 TAs planned as IK contributions for presentation at IKRC #12 in May. For the remaining 10 open work packages the work continues as procurement to protect the Accelerator project schedule.

Schedule and progress are major considerations and it is clear that ESS will have to execute some work packages as procurements due to the lack of an in-kind partner. The remaining work packages in need of partner mainly consist of large commercial items such as RF sources and power supplies with a total value of 65 M€.

With most IK partners the focus has changed from engineering efforts to prototyping, constructions of components, manufacturing verifications and installation planning. The Accelerator is vulnerable to delays arising from the IK partners. It is important to receive early warnings of potential slippage and delays in order to implement mitigation and take necessary measures to be able to meet the overall project schedule.

A major concern is that delays, or in some cases complete stoppage of procurements at In-kind partners, will adversely affect the Project Schedule. This includes postponed of procurements at IPN Orsay, ESS Bilbao, procurement issues at Elettra and changes of sub-contractors where original schedule plans can no longer be maintained.

Target				
155 M€ Budget	**65%** (**101** M€) In-Kind Goal **61%** (**95** M€) forecasted In-Kind	**4** TAs approved (**18.3** M€) **5** TAs endorsed (**16.6** M€) **2** HoAs signed (**1.1** M€) **1** Collaboration signed (**0.2** M€) **3** Procurements (**16.8** M€)	**3** TAs in preparation (**20.2** M€) **21.8** M€ of further In-Kind work identified	**6.41** M€ EV (*includes work on unapproved TAs and HoAs*) **9.96** M€ PV (*includes work on unapproved TAs and HoAs*)

Target: No technical annexes from the Target Sub-Project were brought to the IKRC for endorsement this quarter. Target now has ten signed technical annexes (including one collaboration agreement) totaling 35.1 M€ in value. In Target, there are still issues related to tracking earned value of some IK partners in our project plan. We continue to work with the partners to resolve this issue.

Decision to self-perform two work elements, previously released for in-kind partnering, has been taken due to lack of interest and formal offers from the partner countries.

Integrated Control Systems				
73 M€	**50%** (**36.5**	**9** TAs approved (**4.9** M€)	**6** TAs In	**1.39** M€ EV

Budget	M€) In-Kind Goal **25%** (**18.6** M€) forecasted In-Kind	**3** TAs endorsed (**7.6** M€) **1** Collaboration signed (**0.43** M€)	Preparation (**4.8** M€) **0.87** M€ of further In-Kind work identified	(*includes work on unapproved TAs and HoAs*) **2.72** M€ PV (*includes work on unapproved TAs and HoAs*)

Integrated Control Systems: Work with existing in-kind contracts has progressed favorably in the period with only a few exceptions. The previously difficult contractual situation with Switzerland - a key partner country for ICS - has cleared and contracts are now fully running. The new ICS in-kind manager has started and is fully operational, providing good support to the division's in-kind partners and activities. Six new in-kind agreements are planned and pursued. A few other agreements are being explored with established or new in-kind partners. The ICS management team continues to improve the systematic initiation of new in-kind activities, specifically in the area of software development.

Neutron Scattering Systems				
350 M€ Budget	**65%** (**228** M€) In-Kind Goal **63%** (**222** M€) forecasted as In-Kind	**18** TAs approved (**2.5** M€) **27** TAs endorsed (**12** M€) **5** Collaborations signed (**0.67** M€) **8** Procurements (**1.8** M€)	**32** TAs in preparation (**173.1** M€) **32** M€ of further In-Kind work identified	**5.4** M€ EV (*includes work on unapproved TAs and HoAs*) **7.4** M€ PV (*includes work on unapproved TAs and HoAs*)

Neutron Scattering Systems: Since November 2016, nine Tollgate 2 meetings took place and four more are expected before the end of the year 2017. The first two of the nine (ESTIA and DREAM) have officially passed the Tollgate, and the rest are working towards that goal with modifications to the documentation.
A Template for the Technical Annexes for the Instrument Construction Projects, Phases 2-4 (i.e. covering until the end of cold commissioning) has been distributed to the instrument teams.
The Annexes for the Instruments that were first to pass Tollgate 2 will hopefully be ready before the summer break, while the last Phase 1 Technical Annexes will be presented to the In-Kind Review Committee at the May 10th meeting.

Annex 3: Major Milestones

The following table presents the status of Project Major Milestones as of March 2017.

Milestone	Baseline	Actual/ *Forecast*
SSM 2nd licence & first Commissioning stage, application submitted (ADMIN)	02-May-2016	**4 May 2016**
Thales and Toshiba and CPI Klystron Prototypes Delivered (ACCSYS)	01-Jun-2016	**18 Nov 2016**
Timing System components for Accelerator ready for production (ICS)	30-Sep-2016	**30 Sep 2016**
All Scope & Cost setting meetings for the construction phase instruments performed (NSS)	31-Oct-2016	**31 Oct 2016**
Decision proposal for construction phase instruments presented to ERIC council (NSS)	16-Dec-2016	**16 Dec 2016**
LEVEL1.1G.ACCSYS.WP04.WP05.Spoke & MB CM production launched	23-Dec-2016	***3 Apr 2017***
SSM 2nd license & first Commissioning stage approved (ADMIN)	01-Mar-2017	***1 Jun 2017***
Temporary Control room operational (ICS)	31-Mar-2017	***31 May 2017***
Full Access to Cryo-Compressor Building G04 (CONVFC)	01-May-2017	
~~Full access CUB H01 PRELIMINARY (CONVF)~~	~~02-May-2017~~	~~***25 Oct 2019***~~
Full Access to Test Stand, Coldbox G02 (Sectional) (CONVF)	02-May-2017	
Full Access to Linac Tunnel & Front End Bldg G01 level 90 (CONVF)	02-May-2017	
Ready for installation 1st DTL (DTL4) (ACCSYS)	26-Oct-2017	***29 Oct 2018***
Controls ready for Integrated testing ISrc - LEBT (ICS)	30-Nov-2017	***5 May 2017***
~~Ready for Installation - Bulk Shielding Below Base Plate (TARGET)~~	~~07-Dec-2017~~	
Ready for ESS Readiness Review (1) for Ion Source and LEBT (ADMIN)	01-Jan-2018	***15 Feb 2018***
Delivery on Site - Monolith Vessel (TARGET)	08-Feb-2018	***29 May 2018***
SSM 3rd License & Second Commissioning Stage, application submitted (ADMIN)	01-Mar-2018	
Ready to start assembly of Bunker (NSS)	29-Mar-2018	***21 Jan 2019***
Controls ready for Integrated testing ISrc - LEBT - RFQ - MEBT (ICS)	03-Apr-2018	
Full Access to D04 Lab 2 (CONVF)	31-May-2018	***7 Feb 2020***
Full Access to E04 Lab 3B (CONVF)	31-May-2018	***26 Apr 2019***
Ready for ESS Readiness Review (2) for RFQ and LEBT(ADMIN)	02-Jul-2018	
Start RFQ commissioning (ACCSYS)	16-Jul-2018	***7 Dec 2018***
Ready for ESS Readiness Review (3) for DTL 1 (ADMIN)	01-Oct-2018	
Full Access to Experimental Hall D01 (CONVFC)	24-Oct-2018	***17 Dec 2020***
~~Installation Complete - LH2 System (TARGET)~~	~~14-Jan-2019~~	
SSM 3rd License & Second Commissioning Stage, application approved (ADMIN)	01-Feb-2019	
Ready for ESS Readiness Review (4) for DTL 2-4 (ADMIN)	11-Feb-2019	
Ready for ESS Readiness Review (5) for DTL 5 (ADMIN)	18-Mar-2019	
Main Control room operational (ICS)	03-Jun-2019	
Ready for ESS Readiness Review (6) for A2T, Target and Instrument Bunker (ADMIN)	17-Jun-2019	
WP3 System Test complete - Cryogenic Cooling Systems (Helium + LH2)	3 Feb 2020	***3 Feb 2020***
Bunker ready for beam (and Readiness Review 6) (NSS)	15 Oct 2020	
1-11 High Beta Cryo Modules installed (ACCSYS)	02-Jun-2021	
12-21 High Beta Cryo Modules installed (ACCSYS)	04-Jul-2022	
First call for experiments in full user programme (NSS)	13-Jan-2023	

Annex 4: External Grants Overview

Funding Programme	Project		Total Budget	ESS Budget (in EUR)	Funding rate	Total ESS Cash Income
FP7	*NMI3 CLOSED 31/03/2017*		*€ 13 349 994,30*	€ 140 115,36	*75%*	€ 105 086,52
	EuCARD-2		€ 7 979 700,00	€ 198 046,40	46%	€ 90 646,00
Erasmus+	NPAP		€ 397 345,00	€ 25 840,00	100%	€ 25 840,00
Interreg ÖKS	ESS and MAX IV	WP1: Research and Education	€ 18 976 308,00	€ 649 270,00	50%	€ 324 635,00
		WP5: International Attractiveness		€ 11 500,00	0%	€ 0,00
		WP3: Coming to the Öresund		€ 18 975,00	0%	€ 0,00
Vetenskapsrådet (paid in SEK / conversion rate 1 SEK to 0,10 EUR)	Statistical Methods for Energy Determination in Neutron Detector Systems		SEK 833 333,00	€ 71 500,00	100%	€ 71 500,00
	Computational methods for analyzing self-assembly with time resolved SANS/SAXS		€ 1 000 000,00	€ 315 000,00	100%	€ 315 000,00
	A New Method to Model the Dynamic Structure Factor by Molecular Dybanics Simulations		€80 000,00	€ 53 000,00	100%	€ 53 000,00
Vetenskapsrådet / Röntgen Ångström Cluster	TT-SAS		€ 1 200 000,00	€ 117 500,00	100%	€ 117 500,00
Horizon 2020/ Research Infrastructures	RAMP		€ 3 392 000,00	€ 263 659,00	100%	€ 263 659,00
	ARIES		€ 10 000 000,00	€ 82 800,00	78 %	€ 64 800,00
	ACCELERATE		€ 3 325 755,00	€ 486 900,00	100%	€ 486 900,00
	EOSCpilot		€ 9 953 067,50	€ 77 625,00	100%	€ 77 625,00
	iNext		€ 9 999 534,25	€ 47 000,00	100%	€ 47 000,00
	CREMLIN		€ 1 696 250,00	€ 50 625,00	100%	€ 50 625,00
	SINE 2020		€ 12 080 867,00	€ 1 595 625,00	100%	€ 1 595 625,00
	BrightnESS		€ 19 941 964,00	€ 10 264 672,75	100%	€10 264672,75
	SoNDe		€ 3 800 932,00	€ 201 250,00	100%	€ 201 250,00
TOTAL BUDGET				**€14 670 903,51**		**€14 155 364,27**

Annex 5: Contract awards

The following table provides an overview of contract awards >200.000 EUR completed in Q1 2017. These contract awards correspond to procurement processes published on the ESS website, following procedures defined in the ESS ERIC Procurement Rules. In order to support the principle of transparency, ESS has been publishing these contract award notices on the ESS website since 1 October 2015. They are published on a quarterly basis, based on the month of final contract signature.

Month	ESS Tender Reference	Description	Name of Company	Award Value	Duration
March	OCT-2017-111100001-001	Nitrogen supply and liquid nitrogen tanks for ESS cryogenic systems	Air Liquide Gas AB (Sweden)	Framework Agreement	3 years
	OCT-2016-600800002-001	Service Agreement concerning provision of ESS Financial Audit 2016-2019 and related advisory services	Öhrlings PricewaterhouseCoopers AB (Sweden)	475.700 SEK/year	4 years

Annex 6: European Spallation Source Construction Project

European Spallation Source ERIC
The world's most powerful neutron source for life sciences, energy, environmental technology, cultural heritage and fundamental physics
TYPE: Single site
MEMBER COUNTRIES

Czech Republic	Denmark
Estonia	France
Germany	Hungary
Italy	Norway
Poland	Sweden
Switzerland	United Kingdom

OBSERVER COUNTRIES

Belgium	The Netherlands
Spain	

TIMELINE

- ESFRI Roadmap entry: 2006
- Preparation phase: 2008-2010
- Pre-construction phase: 2010-2012
- Construction phase: 2013-2025
- Operation phase: 2019 -
- Legal entity establishment: ERIC, 2015

ESTIMATED COSTS

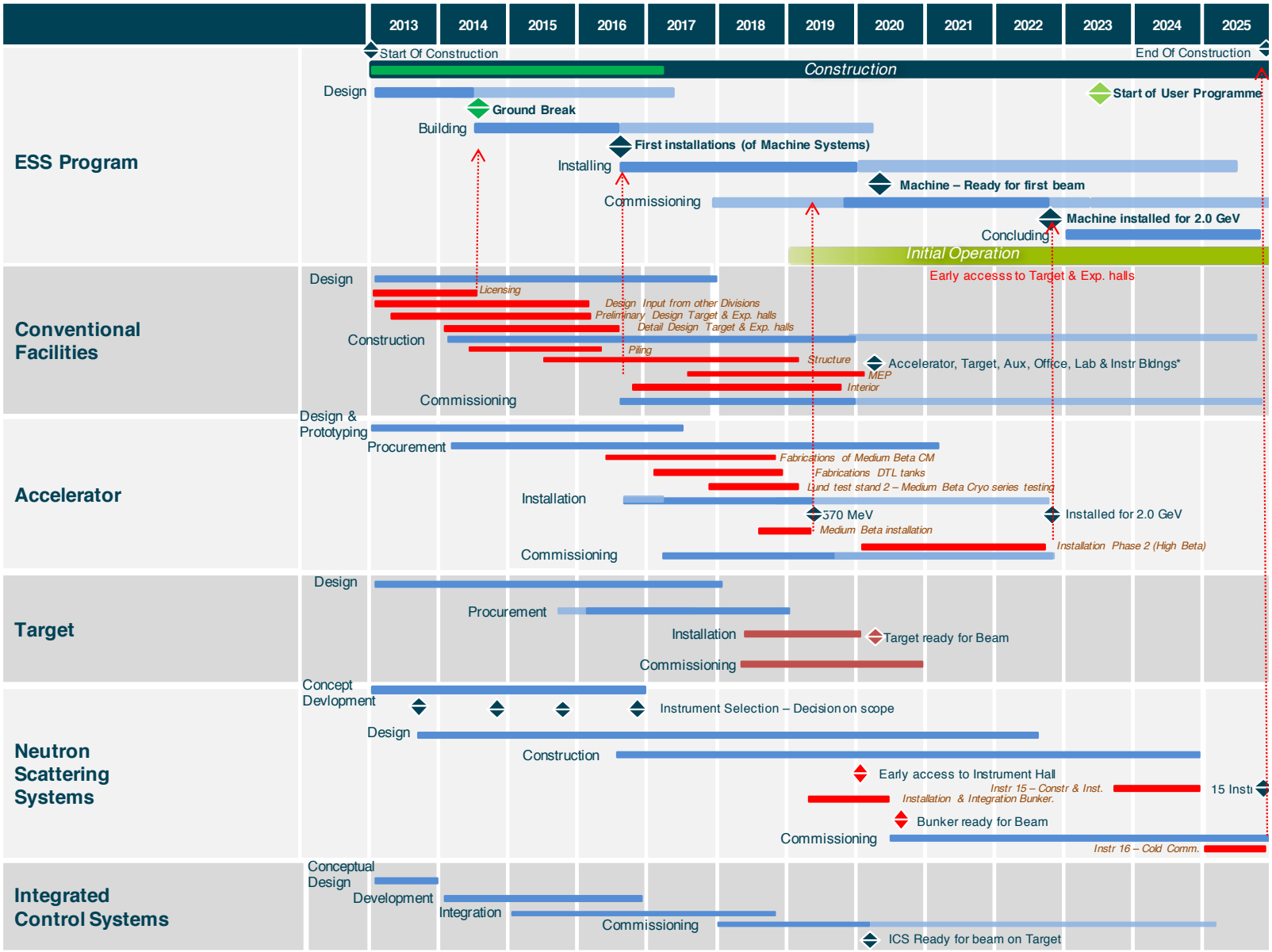
- Capital value: 1.843 M€
- Operation: 140 M€/year

HEADQUARTERS
European Spallation Source ESS ERIC
P.O Box 176,
SE-221 00 Lund

WEB SITE
http://www.europeanspallationsource.se

DESCRIPTION
The European Spallation Source is a research infrastructure committed to the goal of building and operating the world's leading facility for research using neutrons. The ESS will deliver a neutron peak brightness at least 30 times greater than the current state-of-the-art source, thus providing the much-desired transformative capabilities for interdisciplinary research in the physical and life sciences.
ESS officially became a European Research Infrastructure Consortium (ERIC) in October 2015. The facility is under construction in Lund (Sweden), while the ESS Data Management and Software Centre (DMSC) will be located in Copenhagen (Denmark). The foreseen milestones include the beginning of the first on-site Accelerator installations (Sep 2016), facility ready for Accelerator beam on the Target (Dec 2019), the first call for user proposals (2022), the Machine installed for 2.0 GeV performance (Dec 2022), start user programme (2023), and the completion of the 16 construction phase instruments (Dec 2025).
ACTIVITY
A total of 16 instruments will be built during the construction phase to serve the neutron user community, with more instruments built during operations. The suite of ESS instruments will gain 10-100 times over current performance, enabling neutron methods to study real-world samples under real-world conditions. The Neutron Scattering Systems (NSS) Project at ESS is responsible for the development and coordination of state-of-the-art instrument concepts for ESS, in collaboration with international partners. Around 40 concepts were developed by ESS scientists and partners. Of those, 16 concepts have now been selected and approved by the ESS Steering Committee for construction within the NSS project. Our partners from the member countries will lead the construction of most of the instruments, and many will benefit from contributions from two or more participating organisations. The NSS project is coordinating the construction and installation of these instruments, and the associated support systems (such as sample environments and data processing and analysis capabilities) to ensure the highest quality outcomes for the European Community. Selection of the additional six instruments will occur once construction of the initial suite of eight instruments, of the total sixteen instruments included in construction, is approaching completion.
IMPACT
ESS will be an attractive and environmentally sustainable large compound, including industrial and laboratory buildings, office space, and guest accommodation facilities, all housed within a significant architectural design that will make an impact on the world's stage. Even before the expected world-scale scientific impact can be realised with the operation phase, the construction of ESS will have a direct economic impact, by generating growth and jobs, advance development and fuel innovation potential in the Öresund region and across the EU. With ESS being built as a collaborative project, the growth effect will be shared between the Host Countries (Sweden and Denmark) and the ESS-ERIC partners. The realisation of ESS enables access to frontier technology, experienced technical and scientific staff, as well as unique production facilities and technologies, which would otherwise be unattainable. In addition, ESS will be a key instrument for addressing the Grand Challenges, through novel insights on matter at the molecular and atomic level, and applications to energy, carbon sequestration methods, and health issues at a biological level, as well as drug development and delivery strategies, plant water-uptake processes of relevance for agriculture, novel data storage materials, and more.

Project Milestone Schedule



Annex 7: Conventional Facilities building numbers