European Spallation Source ERIC

Project Progress Report

Q1 Report 2016

High Enery Beam Trasport Loadingbay seen from the roof of the Klystron building in February 2016

Report due date:
April 2016

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Director General Overview

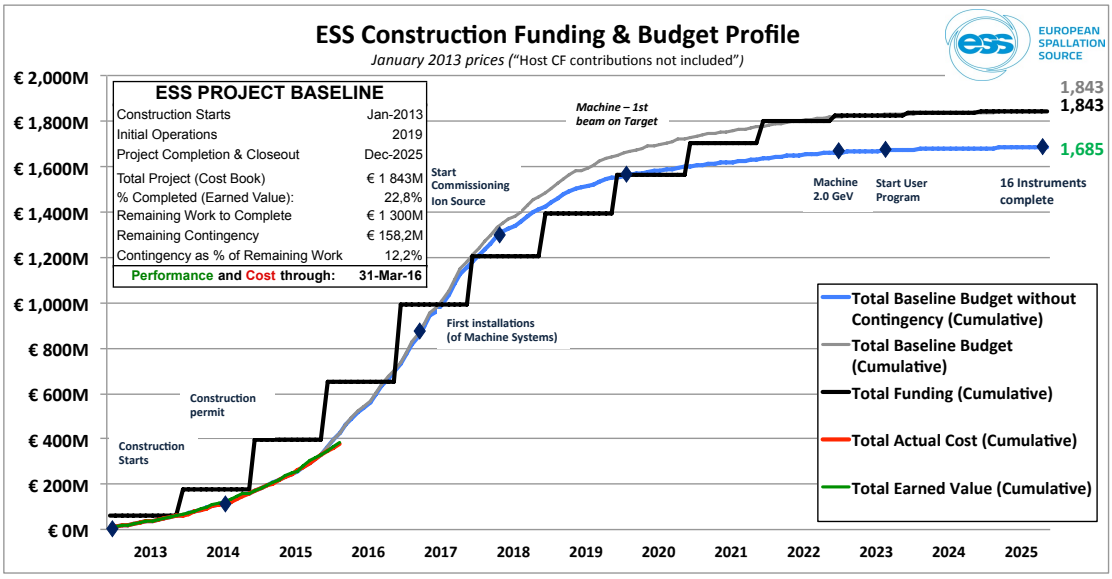
Construction progress continues to be excellent, with Conventional Facilities setting the overall pace for the project. Major activities in the first quarter of 2016 included the final preparations of the second licensing application, advancing the in-kind program on all the technical projects, developing the integrated project schedule, resolving technical interface requirements, and preparation for the annual project review. There was also an informal Council meeting in February when a number of important topics were discussed with the Council delegates such as progress on developing the integrated project schedule, liquidity requirements and issues, the path forward on instruments, and plans for new members.

The organization rallied to prepare the necessary documentation for the second licensing application to the Swedish radiation authority (SSM). The second permit covers installation of technical components and commissioning of the warm sections of the Linac. The final application will be submitted in early May and will benefit from a detailed critique in early April by the ESS Environment, Safety, and Health Advisory Committee.

The most critical factor in the execution of the construction phase is schedule performance. There are numerous threats to the schedule that must be proactively identified and mitigated as described later in this report, e.g., VAT blockages, procurement delays, etc. It is essential that ESS, collaborators, and stakeholders share the commitment to the schedule and work pragmatically to avoid delays. The in-kind program includes 42 partner institutions and continues to grow with partners responsible for the delivery of schedule critical equipment. The general approach is to work hard to solve every schedule issue creating a "project culture" where schedule performance is valued.

Experience is that the Cost Book (2013 prices) is a good reference for both the in-kind work packages and the work directly performed by ESS. Strategies for delivering the Technical Design Report scope and performance include identification of risk treatment strategies. Executions strategies include: 10% cash contingency budget; In-kind contributions defined as deliverables; Conventional Facilities (CF) cost risk, within limits, owned by the host countries; ring fenced budget for Neutron Scattering Systems; and, identification of scope contingency within the Machine. The cash contingency is still 10% of the remaining budget.

The chart below provides a status against the construction baseline. A comparison of the resource-loaded schedule to member funding plans indicates a liquidity gap, beginning in late 2016. ESS is pursuing short-term financing to cover this period.



Technical Director Overview

Achievements

- The ESS Management Team has approved the plan for "Project information Management" (PIM) at ESS to take care of support, training and update of the Engineering software tools and the ESS PLM (CHESS).
- Standardisation is progressing internally with the creation of an additional working group for standardization of electrical equipment and the edition of a central reference document. A workshop will be held before the end of April with interested external partners in view of investigating solutions for procurement.
- The decision has been taken to locate the Main Control Room (MCR) at the end of the Target station building. The requirements for "Reception, Acceptance, Tests and Storage" (RATS) have been refined and potential solutions are being studied.
- All divisions of the Machine Directorate have invested important efforts and contributed to the progress of the preparation of the application for the installation permit to SSM.
- Preparation of TAC#13 (6-8 April 2016) and Annual Review (19-22 April, 2016) are in progress.

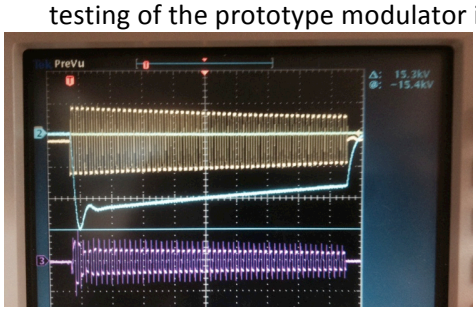
Main issues

- A number of in-kind work packages are on the critical path and have to start immediately. Approval and prompt financial support by the concerned ministries is crucial. Finalization/implementation of procedures for VAT-exemption may also cause delays. Whenever required to avoid impact on the project schedule, ad'hoc solutions using ESS cash budget will be used.
- Preparation for the "Installation Permit" which includes commissioning of the room temperature part of the linac is given a high priority and mobilizes a lot of resources.
- The updated current schedules of the different projects take into account feedback from industry and partners and they lead to a more consistent global integrated schedule. The ESS high level milestones are preserved but more activities/work packages are on the critical path and some risks are increasing.

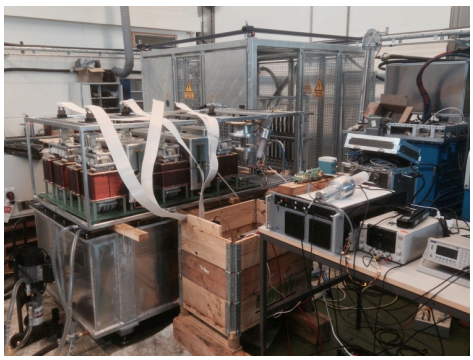
Accelerator Systems

Achievements

- The Toshiba prototype 704 MHz klystron successfully passed its Factory Acceptance Test. This prototype is now available at the Lund Integration Lab for further testing with RF system components. This completes a planned milestone 3 months ahead of schedule
- Factory testing of the L3 IOT prototype has started with the final FAT expected in late April or early May.
- The prototype SML modulator designed by ESS and Lund University has started high voltage testing at the Integration Lab. Tendering of the first ESS-designed modulators for the normal conducting linac by ESS-Bilbao will proceed immediately after successful testing of the prototype modulator in Lund.



Yellow: primary voltage of HV module #1
Magenta: primary current of HV module #1
Blue: output voltage pulse (in open loop, no regulation);



- The first piece of accelerator equipment (a vent line associated with the Cryogenic Distribution System) has been installed in the tunnel at the ESS site.

Installation of Cryogenic Distribution System Vent Line – March 2016 First ESS equipment installation on site

- The ESS RF integration test facility at the Lund University is now ready for use, pending the conclusions from the safety review which took place at the end of March.
- A Kickoff meeting was held between Air Liquide and ESS on the Test and Instruments cryoplant. This project is on track with a Preliminary Design Review scheduled for April and a Critical design review scheduled for September.
- Testing of the first Medium Beta Elliptical Cavity has started at CEA – Saclay.
- A Risk Workshop was held between CEA and ESS. Risks were reviewed and agreed upon with some risks moved to ESS. A similar workshop is planned with Huddersfield University in April and additional workshops with In Kind Partners will be held as appropriate.
- A Workshop on Oxygen Deficiency Hazards in the Accelerator was held. This workshop involving experts from CERN, Fermilab, SNS, DESY and INFN provided useful information of reasonable accident scenarios and produced recommendations for further work.
- Design reviews held this quarter included: Preliminary Design Reviews for the Low Level RF system, the Phase Reference Line, the RF interlocks system, the MEBT Buncher and Magnets and the Beam Current Monitor as well as Critical Design Reviews for the Accelerator Cryoplant and the Elliptical Cryomodule Cryogenic Distribution. The project is on track to completing the majority of reviews and moving the bulk of components into series production by the end of 2016.
- Background information and shielding studies required for the next SSM license have been completed and submitted to the ES&H Division for incorporation into the ESS License application.
- Contract negotiations are underway with 23 possible In Kind partner institutions in 12 countries. It is expected that roughly 40 technical annexes will result from this work. This effort represents an In Kind Contribution of 51.7% to the accelerator budget plus and an additional 3.1% of the budget in contracts placed with institutions in Sweden and Denmark.

- A self-consistent installation and commissioning plan has been created and entered into the P6 schedule. This plan meets the current high-level ESS goals and while ambitious, the approach is based on CERN experience. The plan will continue to be optimized over 2016.

Status of milestones planned for Q1-2016

Name	Planned date in Q4-2015 report	Status	Impact
Spoke cryomodule prototype available for Uppsala test stand (Freia)	01-Jan-16	Moved to 20-Jul-16	No impact on planned installation of the cryomodules in the tunnel but now on critical path.
LEBT assembly starts	07-Jan-16	Parts have arrived. However, this activity is now being tracked by the milestone "LEBT Assembly Complete" scheduled for 27-Oct_16.	No impact on June 2019 beam on target milestone. Some adjustment of installation plan may be required.
Cryo-Distribution System Elliptical production starts	22-Feb-16	Moved to 18-Apr-16	No impact on final delivery dates.
Thales Klystron Prototype Delivered	21-Mar-16	Moved to May 2016	No impact as the Toshiba klystron prototype delivered 3 months early will serve for tests in the Integration Lab.

Upcoming milestones

[Delays are expressed with respect to the updated current schedule which is in-line with the ESS highest level milestones (e.g. 570 MeV beam available mid-2019) but where more activities are now on the critical path.]

Name	Current Forecast	Delay (W.Days)	Comment
Cryo-Distribution System Elliptical production starts	18-Apr-16	-50	See table above.
RFQ machining starts	20-Jul-16	0	
Spoke cryomodule prototype available for Uppsala test stand (Freia)	20-Jul-16	0	See table above.
LEBT assembly complete	27-Oct-16	0	See table above.
CPI/Thales and L3 IOT prototypes delivery	31-Oct-16	-30	Forecast is for CPI/Thales device. L3 IOT will be available in May
LEVEL2. Spoke & MB CM production launched.	23-Dec-16	0	
DTL production starts	27-Jan-17	0	This milestone has significant risk as identified by TAC please see issues below
Ready For Installation (RFI) SPK High Power Amplifier - 1st unit	31-Jan-17	-64	
Ready For Installation (RFI) HV Power Converter for SPK - 1st unit	3-Apr-17	0	

Main issues

- The Technical Advisory Committee (TAC) has identified, based on experience in other projects, significant risk in the DTL production and delivery schedule. ESS is examining these risks and is working to mitigate them.

- The medium beta elliptical cavities are under design by INFN-LASA. This design will be reviewed during a Preliminary Design Review scheduled on May 19. In addition, the testing of a prototype cavity with a power coupler at the FREIA facility in Uppsala University prior to ordering the series production of these cavities is under investigation. Both these efforts will reduce technical risk for these cavities.
- It is becoming critical that In Kind Partners receive the foreseen funding in order to start procurements and production in accordance with Project Schedule. Solutions are urgently needed in Poland and Italy.
- Lack of sufficient planners and team assistants in the accelerator project is affecting documentation and reporting capabilities. A full time team assistant and a full time planner are currently missing.
- Solution for VAT-exemption is needed quickly to avoid delaying work packages on the critical path.

Target Station

Achievements

- The vendor selection process for the Target Helium Cryoplant was completed. The value was below the budgeted amount by 2.7 M€. A Change Request is being prepared to credit this savings to the ESS Program contingency.
- Test pours of concrete were performed for the placement of the Target Project's first embedments in the Target Building base mat. The pours demonstrated a promising approach for embedding stainless steel liner beams in the concrete walls of the Active Cells.
- A Kickoff Meeting was conducted in March by the United Kingdom Atomic Energy Authority, marking the formal transfer of responsibility for the Active Cells to this in-kind partner.
- Five Preliminary Design Reviews were conducted for systems in the Target Project.
- Nuclear safety assessments were conducted in support of the Preliminary Safety Analysis Report that will be submitted to the nuclear regulatory authority in May.

Recent and upcoming milestones

[Delays are expressed with respect to the updated current schedule which is in-line with the ESS highest level milestones but where more activities are now on the critical path.]

Name	Current Forecast	Delay (W.Days)
Delivery on Site - Embedments in Active Cells Floor	19-Apr-16	-35
Award Helium Cryoplant Contract	27-Apr-16	-48
Delivery on site – ECHIR pipes	16-May-16	+9
PDR - Tuning Beam Dump System	01-Sep-16	-173
Award contract for tungsten spallation material	19-Oct-16	0
CDR – Ventilation and Confinement	01-Nov-16	-73
Delivery on Site – Stainless Steel Liner Plates	01-Feb-17	0
PDR – Cask and Handling	08-Feb-17	-121

Hardware to be embedded in the concrete floor of the Active Cells located within the Target Building is scheduled for delivery by the end of April but the vendor will delay shipping because pouring of the Active Cells base mat has been delayed until August. Similarly, the ECHIR pipes, which are embedded into the monolith foundation concrete, are also not needed on site until August. The Critical Design Review for the tungsten spallation material is scheduled for early July, consistent with signing a procurement contract for this material by mid-October of this year.

Main issues

- There is a risk of schedule slippage due to the complicated interface between Target Building construction and the installation of Target System components. Mitigation efforts include integrating and refining the CF and Target schedules, and achieving earlier "early access" dates to certain rooms within the Target Building.
- There is no project responsible for the design and construction of the proton drift room just upstream of the monolith. A Change Request for this orphan scope will soon be taken to the Change Control Board (CCB) for approval by the Target Project.
- The vendor quote for internal monolith shield blocks is well above the budgeted amount. A Change Request will be submitted to the CCB to address the budget shortfall.

Integrated Control System

Achievements

- Vision, mission, operational processes, roles and responsibilities and goal setting principles have been clarified. This is now being applied hierarchically within the organization to increase internal alignment and commitment.
- Re-planning and coordination have significantly progressed. The majority of work packages have been re-planned and work package managers are now executing and tracking according to this plan. Alignment with the ESS integrated schedule has also been improved.
- Progress has been made in reaching in-kind agreements with Switzerland and Estonia. One of two technical annexes with Switzerland is now awaiting formal approval. An in-kind activity has been technically agreed with Estonia and one more is being evaluated. Technical Annexes with existing in-kind partners in France and Spain have slowly advanced.
- A number of test and prototyping facilities have been set-up in the laboratories, increasing significantly the capability for technical systems development.
- The first of four call-for-tenders for commercial supply of engineering services was launched and completed. This more competitive approach is aimed at an enlarged selection of commercial suppliers and hopefully lower cost.

Main issues

- The re-planning effort has revealed the need to clarify some software scope. This is being worked on with the support from independent experts.
- The process of reaching in-kind agreements is slow. This creates schedule pressure on ICS and its dependent stakeholders. It also increases difficulties to identify available in-kind funding opportunities in member countries.

Engineering and Integration Support

Achievements

- Design Handbooks for each discipline now include the first integrated guidelines meeting the special conditions from the Swedish radiation safety authority (SSM).
- Functionalities and support of ESS processes in the tools related to ESS Project Information Management (PIM) have progressed according to plans with important functionalities to be implemented at the beginning of Q2.
- The first draft of a common governing document for all ESS standardization will be ready by mid-April. It will be the entry point for communication and access to all ESS standardization information and given as reference in the In-Kind technical annex.
- A Laser scanning service is now being provided by the Survey, Alignment and Metrology team to support design, installation and as-built documentation.

Main issues

- Difficulty providing in a very short time span all deliverables for TAC, Annual review and the Installation Permit to Swedish radiation safety authority (SSM).
- The short timeline to fully integrate all requirements from the Swedish radiation safety authority into the technical discipline handbooks.

System Engineering

Achievements

- Major efforts continue to be invested in the preparation of the application for the "Installation Permit" in spring 2016 and beyond. The planning of the remaining radiation safety studies is further developed. Hazard analyses for prompt radiation and activated air in accelerator tunnel have been performed.
- The classification scheme for components important to radiation safety is being adapted to the recent conditions developed by the SSM. Several additional components of that nature have been identified. The SSM conditions have been deeply analyzed and communicated to the project team for supporting the consistency of the applications. Assessment of the rad waste streams in Sweden has been performed. An ESS ALARA approach has been defined and is under formal approval by EMT. Zoning principles have been redefined.
- The ESS concept of operations document has been revised to further describe the operational characteristics of the facility supporting the permit. User scenarios and especially the access modes have been aligned to the new EU charter for user access to research facilities.
- The requirements database is being upgraded and migration of data is under way. A new functionality for supporting the verification activities is under test.

Main issues

- The risk of gaps and inconsistencies in the specifications remains significant. It spans from regulatory requirements to the availability of the facility to the user, including the interface requirements covering the civil engineering and the partners. In line with a proper systems engineering approach, the concept of integration reviews is being developed and discussed with the management to treat this issue.
- The ESS management recently assigned a wider coordination role to the SE division for the radiation safety studies supporting the permits and the related activities e.g. the logistics and the security on the site.

Science Director Overview

With the suite of 16 instruments selected and in-kind partners tied to most of the instrument projects, the main challenge for the Science Directorate for 2016 is matching instrument scope to budget. We also continue our efforts to match outstanding in-kind scope to partners, and to tie our partners closer into the NSS project structure. In-house collaboration is intensifying through our work with the regulatory licenses, the bunker development, the interface to the Integrated Controls System and the interface to Conventional Facilities as the NSS buildings go into construction.

Neutron Scattering Systems

In order to align the 16-instrument suite scope with the budget, as many instrument projects as possible need to begin Phase 1 (preliminary design) this year, including a scope-setting meeting for each instrument before the end of October 2016. At this meeting, an initial scope that is harmonized with available resources is agreed upon. Scope-setting meetings have been planned for 13 of the instrument projects, and 2 have already passed Phase 1. The Scientific and Technical Advisory Panels (STAPs) will convene prior to the scope-setting meetings.

This process was the main topic when the Instruments Collaboration Board convened for the fifth time in Copenhagen on March 7th. It was also presented to the partner sphere at the 10th IKON meeting, which was held February 16-18 in Düsseldorf. Jointly hosted by Forschungszentrum Jülich and ESS, IKON10 brought together over 150 NSS collaborators. We presented reference handbooks from the instrument technologies and sample environment teams at ESS, a key ingredient in moving the instrument projects to the next level, and this was well received. The main meeting was preceded by satellite meetings on BEER, MIRACLES and sample environment.

All of NSS have been involved in preparing documentation for the Preliminary Safety Analysis Report, which is part of the ESS licensing process. The licensing work is a prerequisite for the physical installation and commissioning of components, and it has direct consequences for facility operations and the user program.

As a result of an intense collaborative effort with Target and Conventional Facilities, a concept for the common instrument bunker design, including materials choices, is being finalized (Figure 1).

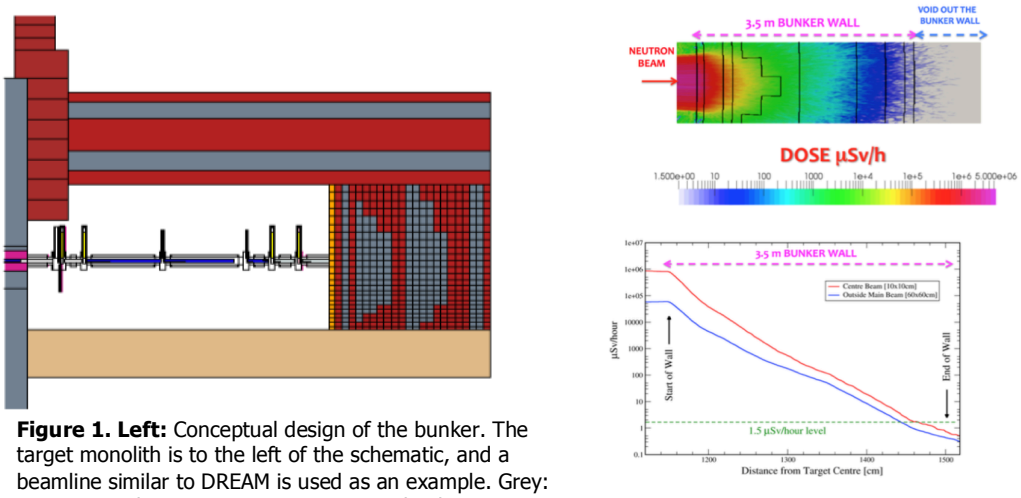


Figure 1. Left: Conceptual design of the bunker. The target monolith is to the left of the schematic, and a beamline similar to DREAM is used as an example. Grey: cast iron, red: B4C-PE concrete, orange: lead.

Right: Calculated neutron radiation dose rates through the bunker wall for a central beam at the expected guide level (red) and around the guide (blue). The simulations indicate that this solution achieves radiation levels outside the bunker well below the regulatory maximal level of 3 µSv/hr.

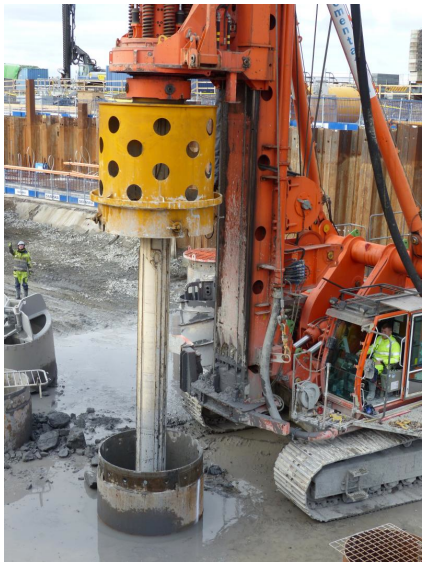
An internal review of the Detector Systems work package was carried out, aligning it to the now known suite of instruments. This resulted amongst other things in the relocation of 1.05M€ budgeted value into the NSS-wide contingency. The Detector group also successfully agreed on an in-kind contribution with STFC to design the common detector back-end electronics systems for instruments. This activity goes across instruments, detector systems and the DMSC and is a major step forward towards having a standardised system available in accordance with the overall NSS schedule.

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

Conventional Facilities Overview

Schedule and cost

An integrated schedule with Target Division was created during this quarter, but will be futher developed. Spendings during the first quarter was lower than expected, mainly due to late invoices for piling at site, but also for rescheduling of some design works due to unclear or changed requirements.



Design – Baseline Team

During Q1, 2016, the CF Baseline team (BLT) has developed internal agreements on technical requirements for all Accelerator buildings (G-buildings), which are now ready to be signed by the relevant stakeholders.

Furthermore, the design teams formed a working group to define how to work with verification plans and verifications, which shall connect the work with requirements with the established way of working with method statements and inspection and test plans within construction.

Design – Detailed Design Team

The Detailed Design has proceeded. And despite changes in requirements from Baseline Team “for construction”-documentation for the Tunnel (G01) has during Q1 been released for electrical as well as sprinkler documentation. For the Experimental Hall (E01) the drawings for the ground slabs has been released for construction as well as ramps to the Beam Line Gallery (E02). The Primary and secondary substations H05 and H06 are in place and As-built documentation is being prepared.

Cconstruction progress has been good despite new changes and tight delivery times for Construction-drawings. This demonstrates that the contract form chosen with close cooperation and a flexible construction team, is very valuable, since this amount of changes in a normal construction contract are typically very costly.

The changes and issues around piling and SSM-demands have caused delays that now seem very difficult to catch up. However mitigation of potential delays is highly prioritized in the ESS organization

Construction

This quarter the concrete works on the Linac Tunnel (G01) have completed. The super structure was completed on the Klystron Gallery (G02) and inside the Target Buildings the first floor slabs have been poured. 40 out of 42 Large Diameter Bored piles in the monolith have been completed as well as the first of 21 in the active cell. The basement of E04 is completed and preparations for the first concrete pour in E01 are done. The substations H05 and H06 are substantially completed and ready to receive permanent power. The superstructure of H01 is almost completed and G04 has the superstructure and roof completed is ready for the first floor slab pour.


Top of Linac tunnel January 2016

Campus Offices and Labs

The focus for the Campus work during the last quarter has been to create a feasible and realistic project taking functionality, architecture, workspace design, budget, financing & operational costs into a tender design and package. The work has also focused on defining a integrated schedule. The tender design will be ready in the beginning of May 2016 and will be used for internal review, as a presentation package for investors and for the tender package for the future design/construct procurement

Project Support and Administration Director Overview

The long-term financing of the project and corresponding construction plans and delivery schedules require a solution to the forecasted liquidity gap arising end of 2016 – beginning of 2017. Construction cash contributions are expected to exceed expenditures again in 2019, and the liquidity gap is expected to be eliminated by 2023. Different options for addressing the issues related to the liquidity gap are being explored, such as advancing member payments and seeking a cash facility. A proposal will be made to the Council in Q2 2016.

Establishment of an ESS Governance office is on the way and recruitment in the final stages. Preparations are ongoing for a start-up meeting of the council Committee for Employee Conditions.

Negotiations with SKB, the Swedish Nuclear Fuel and Waste Management Company, to find a sustainable solution for the handling of radioactive waste are in a final phase.

The Supply, Procurement and Logistics Division at present deals with approx. 150 new procurement requests per month for goods, services and consultants, and this is constantly ramping up. Implementation of procurement under the ERIC procurement rules started in October 2015 and is going well in the first 6 months. Awarded contracts over 50K EUR are also now published on the website. Procurement plan for 2016 has been updated and an indicative plan for 2016 is published on the website (includes >20 procurements).

Within IT collaboration with ICS was initiated in order to harmonize our ways of working.

Campus

During Q1, the second phase of the workplace design project for ESS Campus Offices and labs was concluded with the needs analysis based on use cases, a staff survey, observations and focus group interviews. To ensure the report captures the needs and characteristics of an organisation in operation, site visits were made to two other European facilities as well as more detailed interviews held with senior ESS staff previously working at SNS and J-Parc. The work of further detailing the requirements will continue during Q2 when a set of scenarios of a workplace design will be presented. A first risk workshop together with the more detailed requirements will serve as input to the preliminary design of the future buildings.

DMSC

The work of finding a long-term solution for the DMSC future offices was finalised at the end of March, when the lease agreement for a new office was signed. The lease agreement is the result of a tender process launched at the end of last year after which three proposals were investigated. After extensive negotiations the business case, showed that the offices located just next to the Copenhagen University and in the building housing the Copenhagen Bio Science Park was the most favourable choice, fulfilling the requirements as well as having the possibilities to gradually expand. The old offices do not allow any expansion and with more staff joining DMSC in Q2, the move will take place in mid-May.

External Grants summary

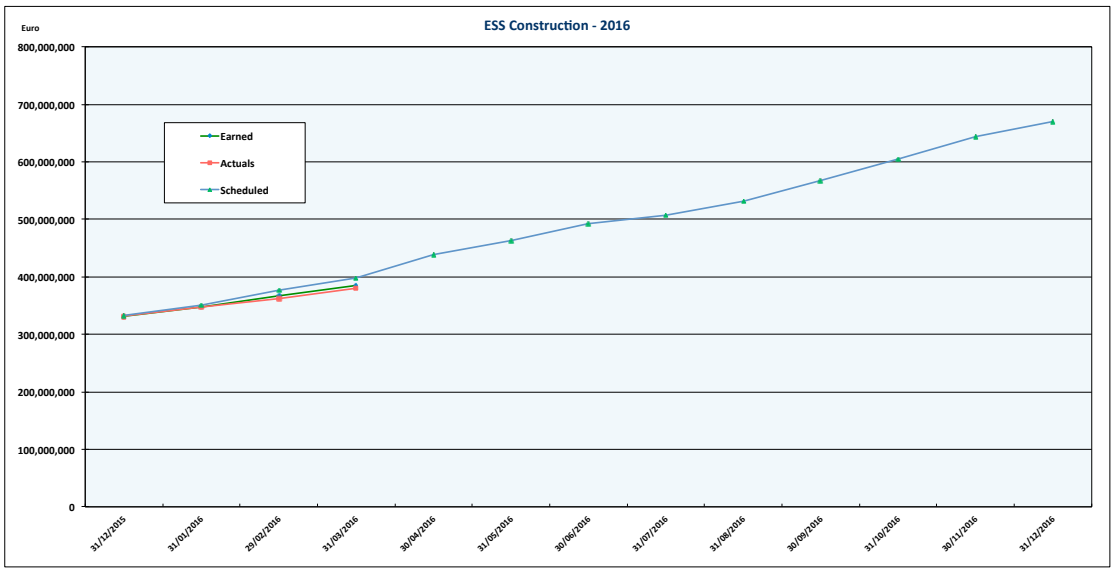
ESS is currently involved in 13 international or national grants (9 European grants, 2 regional grant and 2 national grants) with a total volume of approx. 13,5 MEUR, including ESS co-funding of 495 kEUR. Please see below a detailed overview of all international and national grants ESS is currently involved in. Two EU level projects funded through the 7th Framework Programme (oPAC and NMI3-II) have run out and will be closed in the ESS accounts after receipt of the final payments. The Vinnova funded project on capacity building in PCP and PPI was recently closed and has been taken out of this overview.

In Q1 of 2016, 13 funding application have been submitted either led by ESS staff or involving ESS staff. The funding schemes applied for include the EU Framework Programme for Research and Innovation Horizon 2020, Erasmus+, and the Swedish funding agencies VR and Vinnova.

Cost/Performance Overview

Current trends in earned value measurement (EVM) indicate that ESS is slightly behind schedule and that the activities performed overall are costing somewhat less 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. It is unlikely that the positive cost performance will result in substantial savings, as most of the measured difference between the budgeted cost and the actual cost of work performed is a consequence of delays in invoices and payments on contracts. The EVM performance is reviewed in the projects, and for all the 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 January 2016 – March 2016

Accelerator Collaboration Board meeting, Aahus	1 April
ESHAC (Lund)	4-8 April
TAC (Lund)	6-8 April
ESS Staff Meeting	15 April
Annual Review, Lund	19-22 April
BrightnESS Field Coordinators Training, Lund	27-28 April
Council Operations Working Group Meeting, Lund	29 April
Administration and Finance Committee, Copenhagen	4 May
SAC (tbc)	9-10 May
Collaboration Meeting ESS - MYRRHA, Stockholm (tbc)	20 May
In-kind Review Committee meeting #9	26-27 May

SNSS Annual Meeting	30-31 may
ESS Partner Day in Latvia, Riga Latvia	2 June
Visit of Turkish Council Members to ESS	8 June
Accelerator Technical Board Meeting	9 June
Council Meeting in Lund	9-10 June
Instrument Collaboration Board (tbc)	June

Annex 1: Cost/Performance Status

The construction budget is 1 843 M€ in 2013 prices. The indexed budget is 2 028 M€ (n.b. In-kind not indexed). All cost and schedule performance data using earned value management (EVM) is based on indexed values.

The project is 20.6% complete versus the plan of 21.7% complete, measured using earned value techniques. Remaining contingency is 159.6 M€, and the contingency as a percentage of remaining work is 10.8%. There were no changes to the original construction contingency budget during the initial construction years; 2013, 2014, and 2015. As part of the 2016 budget process, ESS proposed allocation of contingency (appoximatly 15.4 M€) and during the first quarter additional 1.4 M€ has been proposed to be allocated. The contingency at 159.6 M€ is above 10% of the cost of the remaining work – current level 10.8%. 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 2016 is shown below.

WORK BREAKDOWN STRUCTURE

PROJECT	FROM 2016-01-01	TO 2016-03-31

PERFORMANCE DATA

Total Project.EPS	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION	
	BUDGETED COST		ACTUAL	VARIANCE		BUDGETED COST		ACTUAL	VARIANCE		BUDGETED	ESTIMATED
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)	(Planned Value)	(EAC)
Project Support & Administration	5 678 469	5 164 672	5 005 581	-513 796	159 092	61 588 422	61 127 033	60 915 533	-461 389	211 500	138 886 302	142 936 429
Conventional Facilities	33 045 643	28 126 795	24 443 868	-4 918 849	3 682 927	163 599 421	159 283 142	154 997 646	-4 316 278	4 285 497	573 809 652	592 037 878
Accelerator Systems	13 371 423	10 190 361	9 734 517	-3 181 062	455 844	82 140 814	78 696 952	78 388 775	-3 443 862	308 177	513 086 326	538 424 284
Target Station	5 030 781	2 505 775	2 419 273	-2 525 007	86 502	23 049 823	19 940 063	20 313 026	-3 109 760	-372 963	161 962 286	167 528 131
Integrated Control Systems	1 971 603	1 494 562	1 338 242	-477 041	156 320	13 796 340	13 296 120	13 145 341	-500 220	150 779	79 573 885	84 377 019
Technical Management & Services	2 206 641	1 993 797	1 501 026	-212 844	492 771	16 998 959	16 817 442	16 293 345	-181 517	524 097	39 526 677	39 803 212
Neutron Scattering Systems	4 881 280	3 559 802	3 159 499	-1 321 478	400 303	37 113 784	35 322 440	35 419 595	-1 791 343	-97 155	361 907 243	361 822 248
TOTAL	**66 185 841**	**53 035 764**	**47 602 006**	**-13 150 077**	**5 433 758**	**398 287 563**	**384 483 193**	**379 473 261**	**-13 804 371**	**5 009 932**	**1 868 752 371**	**1 926 929 201**

Schedule Variance (BCWS-BCWP): The trend for the accumulated schedule variance is continuing, and the accumulated schedule variance at the end of March 2016 is -13 804 k€ compared to -11 405 k€ in December 2015. The meaning of the negative schedule variance is that the Budgeted Cost for Work Performed (BCWP) is lower than Budgeted Cost for Work Scheduled (BCWS), indicating that less work is being performed than planned. The implication of this, should this trend continue, could lead to a schedule delay

.

The variance is related to Conventional Facilities (-4 316 k€), Accelerator Systems (-3 444 k€), Target Station (-3 110 k€), Neutron Scattering Systems (-1 791 k€), Integrated Control System (-500 k€), Project Support & Administration (-461 k€) and Technical Management & Services (-181 k€).

There is a schedule variance for Conventional Facilities and Target Station that could correspond to a delay of up to seven months. However, ESS still believes that it is possible to recover these delays and replanning and optimisation of the schedule is ongoing. The current expectation is that there will be no slippage in the final Conventional Facilities delivery date, or the date when the target will be ready for beam milestones.

Cost Variance (BCWP-ACWP): The accumulated earned value cost variance at the end of March 2016 is +5 010 k€, which is slightly lower than the accumulated cost variance in December 2015 of +6 180 k€. The meaning of the positive cost variance is that Budgeted Cost for Work Performed (BCWP) is higher than the Actual Cost for Work Performed (ACWP), indicating that the work performed costs less than planned. The implication of this, should this trend continue, could lead to a lower total cost.

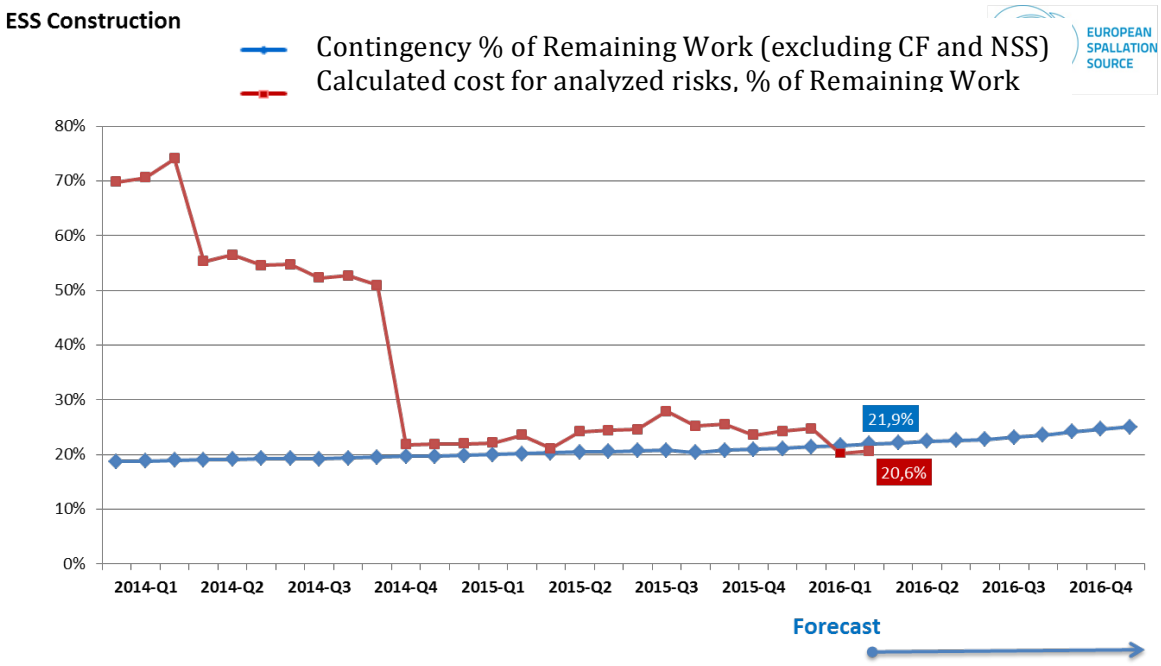
The positive cost variance is related to Conventional Facilities (+4 285 k€), Technical Management & Services (+524 k€), Accelerator Systems (+308 k€), Project Support & Administration (+211 k€) and Integrated Control System (+151k€). There is also a negative cost variance for Target Station (-373 k€) and Neutron Scattering Systems (-97 k€).

There is a positive cost variance, and if the trend continues this could lead to a lower total project cost. It should, however, be noted that the negative Cost Variance for Target is unrecoverable. Cost savings will 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, excluding the Conventional Facilities (CF) and Neutron Scattering Systems (NSS) projects (CF risk is assumed as 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 21.9% of the remaining work budgeted. The goal is to stay within the calculated risk exposure range of 20-25%. The current risk exposure is calculated at 20.6%.

The drop in calculated risk exposure in 2014 is a consequence of the successful approval of construction permits and finalized work to define interface descriptions and specifications. Calculated cost exposure does not include risk of delays in external delivery milestones and/or funding for initial operations.



Change Log – ESS Total Project Budget Baseline (k€) - 31st March 2016

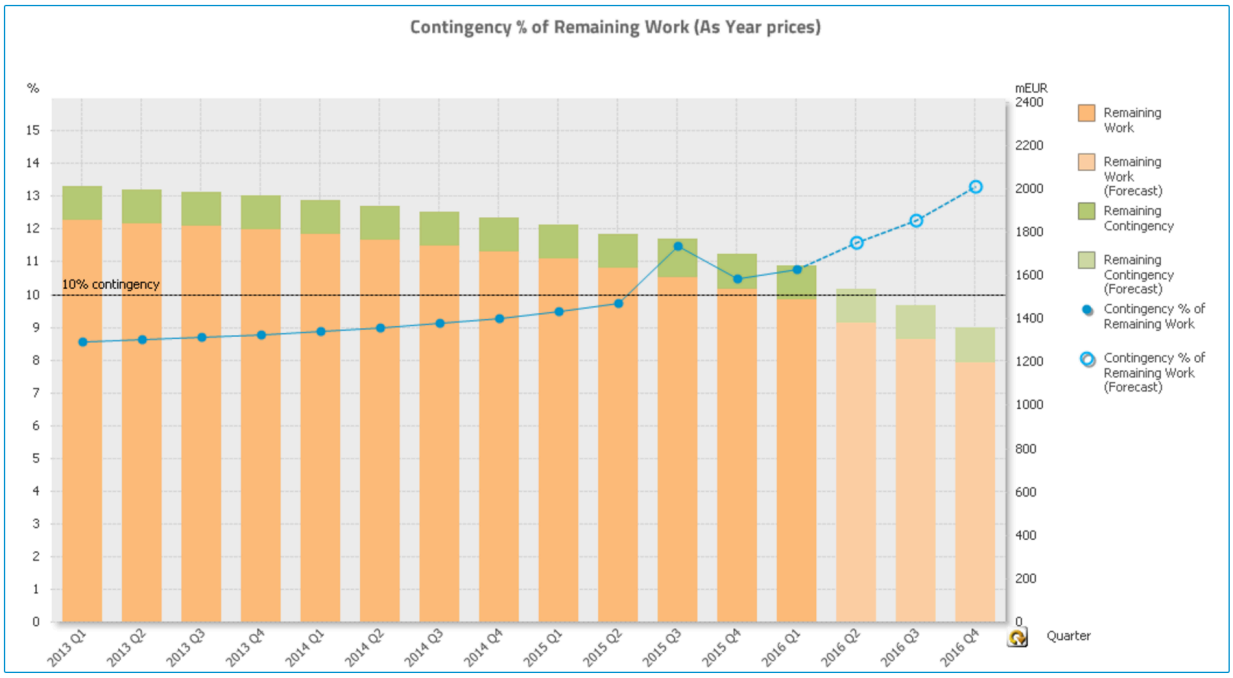
CR No.	Project	Description	Total Amount (k€)	2016 Amount (k€)
CR0001	ESS Project (ES&H)	Increased fees to be paid to Swedish radiation regulatory authorities.	-840	0
CR0018	Target	Changes to accommodate improved design of the moderator/reflectors in the Target.	-4 040	-1 300
CR0019	ICS	Oxygen depletion and radiation monitoring for personnel safety system.	-2 000	-250
CR0026	Target	Addition to accommodate a potential future ESS chip irradiation (ECHIR) beam line.	-250	0
CR0029 *	Accelerator	Cryomodule to Cryogenic Distribution System Connections.	-750	0
CR0030 *	Accelerator	Lund Cryomdule Test Stand Activities (WP10).	-1 310	0
CR0031	ICS	Budget transfer from Accelerator to ICS for IPNO work.	-2 500	0
CR0032 *	Accelerator	Accelerator Cryoplant cost savings based on actual contract award.	+8 350	0
CR0033 *	Accelerator	Radio Frequency (RF) integration laboratory work.	-500	0
CR0041	Design & Engineering	Scope for development, integration and implementation of Product Lifecycle Management (PLM) system.	-4 000	0
CR0044	ESS Project (Insurance)	Insurance costs covering risks associated with installation of equipment.	-1 600	0
CR0040	ESS Project (ES&H)	Additional cost for rad waste licensing (200 k€). Scope originally planned for Initial Operations in 2017-18 (1000 k€).	-1 200	0
CR0042	ESS Project Support (In-Kind)	Increased scope and level-of-effort for supporting partners and coordinating in-kind.	-594	-594

CR No.	Project	Description	Total Amount (k€)	2016 Amount (k€)
CR0045	ESS Project (Administration)	Orphan scope - Rent for DMSC office in Copenhagen during construction phase.	-1 332	0
CR0043	ESS Project (Technical/Admin)	Increased scope and level-of-effort to cover establishment of and Internal Auditor, Operations Coordinator, and Technical Coordinators.	-2 304	-360
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	0
CR0052	Accelerator	Elliptical cavities and cryomodules	-1 097	0
CR0057	Accelerator	Cryogenics savings on TICp procurement	1 244	0
CR0058	Accelerator	Magnet Power converters	-686	0
CR0059	Accelerator	Power converters for Elettra in-kind contribution	-150	0
CR0060	Accelrator	Halogen free cables	-555	0

** Accelerator CR's already introduced in the Accelerator budget*

After allocation of 22 597 k€ a total budget of 159 643 k€ remains. ("As Year" budget).

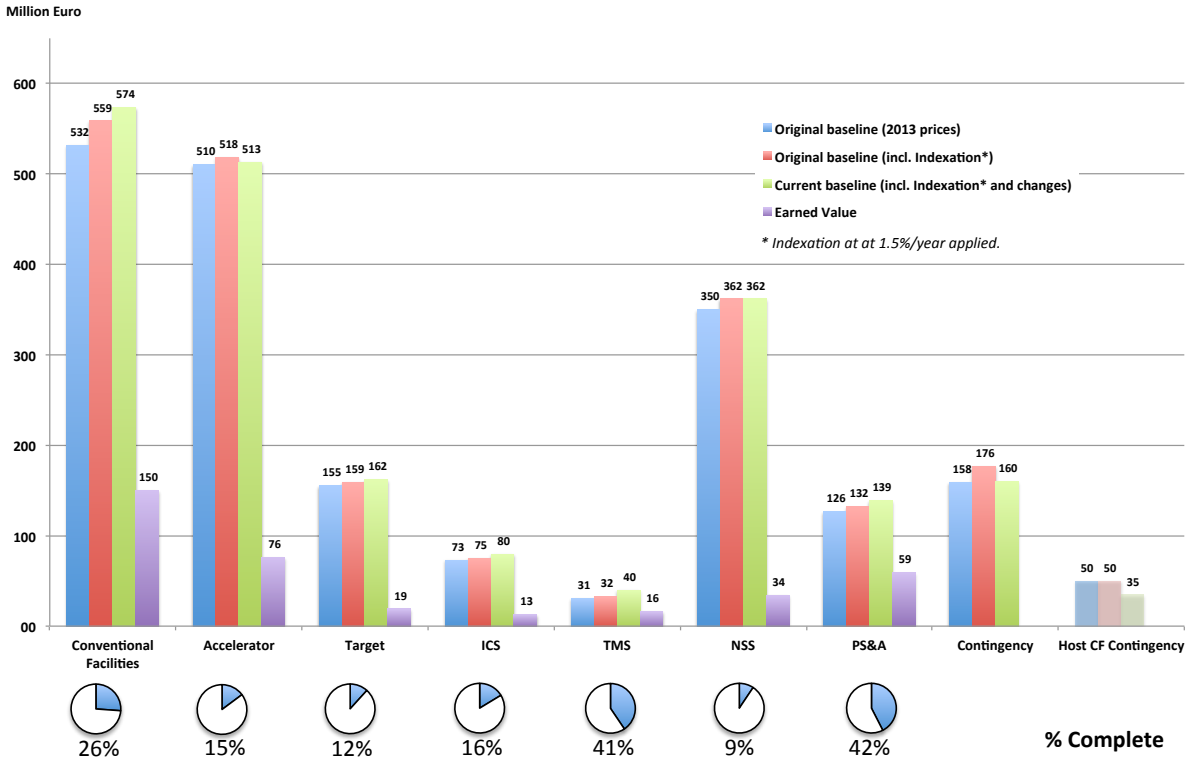
The graph below compares contingency with the cost of the remaining work. The goal is to maintain the contingency above 10%. If no further contingency is allocated in 2016 the level will be 12.1%.



At the end of March 2016, the Contingency % of Remaing Work is 10.8% (goal is 10% or more)

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 first quarter of 2016 demonstrated continued progress on In-Kind between ESS and In-Kind Partners. At the 8th In-Kind Review Committee (IKRC) held in February 7 TAs were endorsed including one signed IK Agreement, all from the NSS Project, worth collectively 4.8M€. An important milestone was reached as the first In-Kind Contributions (IKC) Final Report for completion of an IKC delivery being endorsed. This was for the Laser Neutron Pump Probe Experiment delivered by Tartu University, Estonia.

Currently 30 Technical Annexes (TA) (worth 130 M€) are under preparation. They cover a wide range of work, including the first phases of the construction for some of the instruments. Endorsed TAs that have agreed IK agreements will then subsequently be presented for approval at the June ESS Council meeting.

Member countries are working to approve and fund in-kind work, and while progress is being good, it is also a reason for the delays in presenting IKCs to the IKRC. This can be caused by delays in countries becoming full ESS members, or complications establishing the funding process for institutes, or how to account for VAT. IKCs will be at IKRCs in October and December and the overall number of TAs endorsed in 2016 will be 129. In doing so the impact of potential delays can be minimized. Still as IKC endorsements are deferred, the associated work will likely be postponed, especially as commitments for large procurements are required. That will increase the risk of significant delays to the overall ESS construction schedule.

To mitigate these delays 'Heads of Agreement' have been established with institutes that allow work to go ahead before a TA or IKC Agreement is signed. These cover 20 agreements worth over 110 M€. A number of partners have also started working on IKCs at their own risk to maintain the schedule before official agreements are in place.
Currently 145 in-kind packages have partners identified, an increase compared to 115 at the end of Q4 2015. A further 25 more IKCs are awaiting partners which, when included, raises the total value of In-kind to 630 M€ (this includes 143 M€ has been set aside for future instruments IKCs). There is a further 45 M€ of potential in-kind which is yet to be organised into individual IKCS.

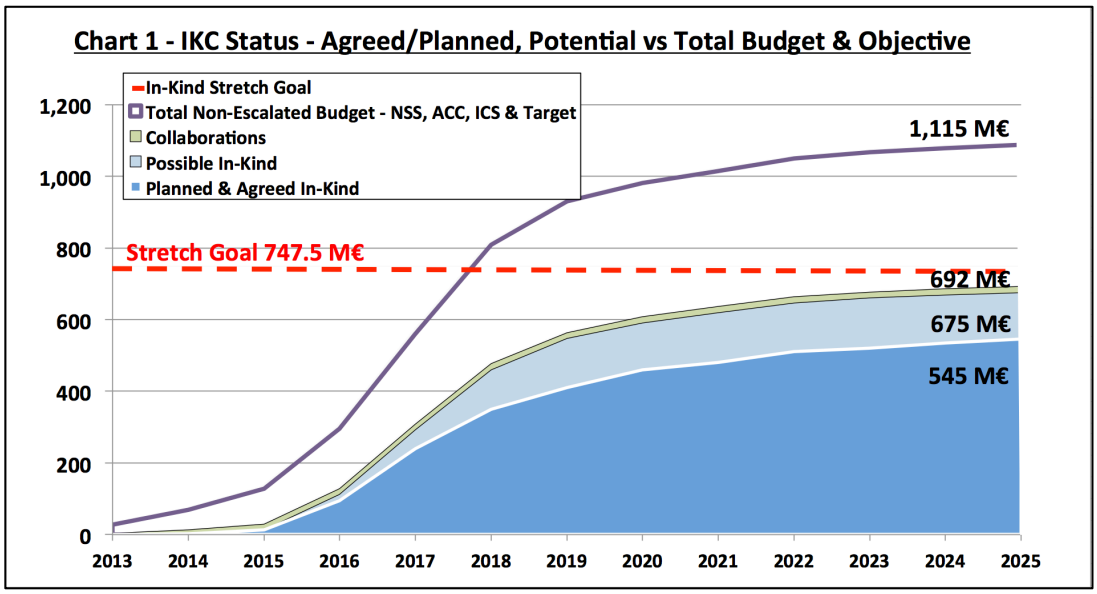
In September 2015 ESS was awarded the BrightnESS grant from the European Commission Horizon 2020 framework programme. It funds a network of 6 field coordinators working across Europe to support In-Kind. This team has now mostly been recruited with training planned for April. The grant also provides funding for software to manage the IKCs, showing progress and calculating the accreditation to member countries. The software is planned for September 2016.

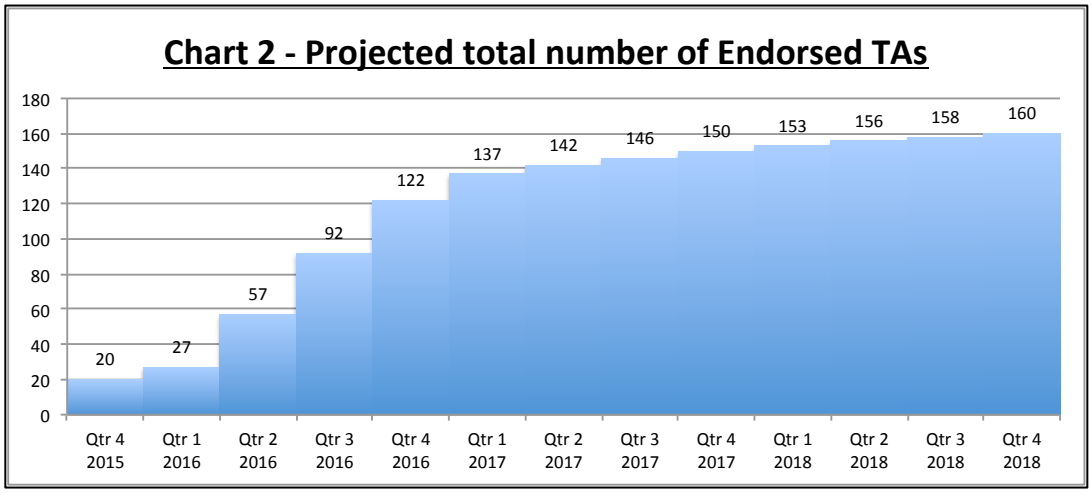
Table 1 shows the current status of IK across the 4 projects. Chart 1 shows the planned/agreed and possible IK budget profile during ESS construction years with the In-Kind Stretch Goal as a reference. Chart 2 shows the current predicted dates for TAs being endorsed.

Table 1 - Current IK totals per Project for Qtr 1 2016

Values kEUR	Qtr 1 2016 IN-KIND REPORTING									
	% IKC POTENTIAL MAR 2016									
	% AGREED & PLANNED									
PROJECT	Agreed	Planned	Planned & Agreed		Potential	Agreed, Planned & Potential		In-Kind Goal	Not In-Kind*	TOTAL**
11 Accelerator Systems	2,250	263,479	265,729	52.1%	65,045	330,774	64.9%	75%	179,226	510,000
12 Target Station	5,586	62,651	68,237	44.0%	31,827	100,064	64.6%	65%	54,936	155,000
13 Neutron Scattering Systems	266	200,641	200,907	57.4%	27,088	227,995	65.1%	65%	122,005	350,000
14 Integrated Control Systems	250	9,786	10,036	13.7%	6,095	16,131	22.1%	50%	56,869	73,000
Total - All 4 projects	8,352	536,557	544,909	50.1%	130,055	674,964	62.0%		413,036	1,088,000
Total - All ESS				29.6%			36.6%	747,250		1,843,000

*Calculated compared to 2013 Budget, **2013 Budget Totals





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 **65%** (**331** M€) forecasted as In-Kind	**2** TAs approved (**2.25** M€) **1** TA endorsed (**19** M€) **16** HoAs signed (**102** M€) **6** Collaborations signed (**15.5** M€)*	**27** TAs/HoAs in Preparation (**192** M€) **15.5** M€ of further In-Kind work identified	**11.0** M€ EV (*includes work on unapproved TAs and HoAs*) **10.9** M€ PV (*includes work on unapproved TAs and HoAs*)
Target				
155 M€ Budget	**65%** (**101** M€) In-Kind Goal **65%** (**100** M€) forecasted In-Kind	**1** TA approved (**5.6** M€) **1** TA endorsed (**8.4** M€) **4** HoAs signed (**8.5** M€) **1** Collaboration signed (**0.2** M€)*	**15** TAs/HoA in preparation (**75.4** M€) **2.1** M€ of further In-Kind work identified	**2.01** M€ EV (*includes work on unapproved TAs and HoAs*) **2.98** M€ PV (*includes work on unapproved TAs and HoAs*)
Integrated Control Systems				
73 M€ Budget	**50%** (**36.5** M€) In-Kind Goal **22%** (**16.1** M€) forecasted In-Kind	**1** TA approved (**0.25** M€) **0** TA endorsed (**0** M€) **0** HoAs signed (**0** M€) **3** Collaborations signed (**0.45** M€)*	**12** TAs In Preparation (**11.3** M€) **9.9** M€ of further In-Kind work identified	**0.22** M€ EV (*includes work on unapproved TAs and HoAs*) **0.20** M€ PV (*includes work on unapproved TAs and HoAs*)
Neutron Scattering Systems				
350 M€ Budget	**65%** (**228** M€) In-Kind Goal **66%** (**231** M€) forecasted as In-Kind	**2** TAs approved (**.27** M€) **18** TAs endorsed (**10.5** M€) **0** HoA signed (**0** M€) **1** Collaborations signed (**0.17** M€)*	**54** TAs/HoAs in preparation (**34.3** M€) **183.8** M€ of further In-Kind work identified	**0.67** M€ EV (*includes work on unapproved TAs and HoAs*) **1.69** M€ PV (*includes work on unapproved TAs and HoAs*)

** Collaborations do not contribute towards the forecasted Project In-Kind Totals*

Accelerator: Currently there are in-kind discussions with 23 potential partners. The total value of items under discussion represents 52% of the total accelerator budget, 69% of the in-kind goal. Since schedule progress is a major consideration ESS may need to self-perform certain work packages for lack of an in-kind partner. There are several key work packages in need of partners, mainly large commercial items such as RF sources and power supplies. These packages have a total value of 65 M€.

Target: In-kind partners from six countries are identified for 80 M€ of the 100 M€ of possible in-kind scope. The UKAEA held a Kickoff meeting in March, marking the formal transfer of the Active Cells design to this in-kind partner. ESS Lund and contractors for the Czech Nuclear Physics Institute have worked to refine the scope of work for the Target primary cooling system, the primary and intermediate water systems, and the Target ventilation system.

Integrated Control Systems: The first in-kind agreement was signed with Norway in October. There is also progress defining in-kind agreements with Switzerland. Two contracts, with a total value of 10% of the ICS in-kind goal, will be completed in Q2 2016. Technical Annexes with existing ESS in-kind partners in France and Spain are advancing and new opportunities were identified with Estonia and Poland for potential agreements during the first half of 2016.

Neutron Scattering Systems: NSS has now reached 78% of its overall In-Kind target and further In-Kind contributions are under discussion for a total of about 33 M€ (which corresponds to about 15% of the IK target). The In-Kind share for the instrument projects is at the moment 80%.

Another important milestone for the NSS project was reached during Q1 2016: the Bunker Radiological Design is ready. Work is now focusing on finding one or several In-Kind partners for the delivery of the Bunker project.

During the latest Instrument Collaboration Board meeting on March 7th all the instrument projects presented their planned schedule for Phase 1. Based on the information given by the partners, up to 11 instruments might have an agreed budget ready in time for the ERIC Council meeting in December 2016.

Annex 3: Major Milestones

The following table presents the status of Project Major Milestones as of March 2016.

Milestone	Baseline	Actual (A) / Forecast (F)
SSM 2nd licence & first Commissioning stage, application submitted (ADMIN)	02-May-2016	
Thales and Toshiba and CPI Klystron Prototypes Delivered (ACCSYS)	01-Jun-2016	
Timing System components for Accelerator ready for production (ICS)	30-Sep-2016	
All Scope & Cost setting meetings for the construction phase instruments performed (NSS)	31-Oct-2016	
Decision proposal for construction phase instruments presented to ERIC council (NSS)	16-Dec-2016	
LEVEL1.1G.ACCSYS.WP04.WP05.Spoke & MB CM production launched	23-Dec-2016	
SSM 2nd license & first Commissioning stage approved (ADMIN)	01-Mar-2017	
Temporary Control room operational (ICS)	31-Mar-2017	
Full Access to Cryo-Compressor Building G04 (CONVFC)	01-May-2017	
Full access CUB H01 PRELIMINARY (CONVF)	02-May-2017	
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	
Controls ready for Integrated testing ISrc - LEBT (ICS)	30-Nov-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	
Delivery on Site - Monolith Vessel (TARGET)	08-Feb-2018	
SSM 3rd License & Second Commissioning Stage, application submitted (ADMIN)	01-Mar-2018	
Ready to start assembly of Bunker (NSS)	29-Mar-2018	
Controls ready for Integrated testing ISrc - LEBT - RFQ - MEBT (ICS)	03-Apr-2018	
Full Access to D04 Lab 2 (CONVF)	31-May-2018	
Full Access to E04 Lab 3B (CONVF)	31-May-2018	
Ready for ESS Readiness Review (2) for RFQ and LEBT(ADMIN)	02-Jul-2018	
Start RFQ commissioning (ACCSYS)	16-Jul-2018	
Ready for ESS Readiness Review (3) for DTL 1 (ADMIN)	01-Oct-2018	
Full Access to Experimental Hall D01 (CONVFC)	24-Oct-2018	
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	
Integrated System Test without Proton Beam Completed - Target ready for ESS RR #6 (TARGET)	20-Aug-2019	
Bunker ready for beam (and Readiness Review 6) (NSS)	30-Sep-2019	
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	oPAC		€ 5 939 699,66	€ 472 645,78	100%	€ 472 645,78
	NMI3		€ 13 349 994,30	€ 132 160,00	75%	€ 99 120,00
	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
HEPTech	External Funding		SEK120 000,00	€ 12 000,00	100%	€ 12 000,00
Vetenskapsrådet	Statistical Methods for Energy Determination in Neutron Detector Systems		SEK833 333,00	€ 71 500,00	100%	€ 71 500,00
Vetenskapsrådet / Röntgen Ångström Cluster	TT-SAS		Tbc	€ 117 500,00	100%	€ 117 500,00
Horizon 2020/ Research Infrastructures	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	€ 9 889 485,00	100%	€ 9 889 485,00
	SoNDe		€ 3 800 932,00	€ 201 250,00	100%	€ 201 250,00
TOTAL BUDGET				**€13 493 422,18**		**€12 997 871,78**

Annex 5: 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	

OBSERVER COUNTRIES

Belgium	The Netherlands
Spain	United Kingdom

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).

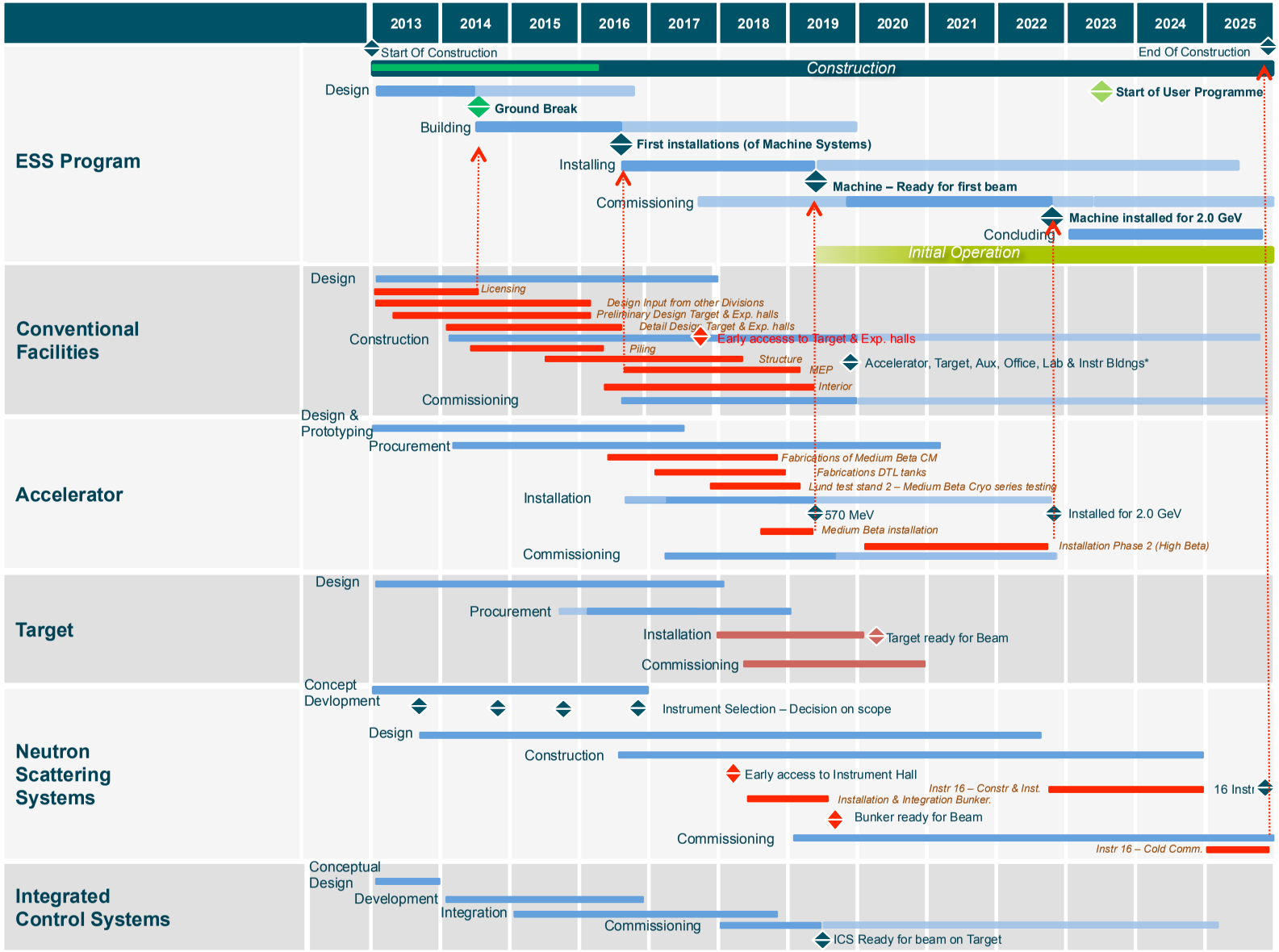
ACTIVITY

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 6: Conventional Facilities building numbers