EUROPEAN SPALLATION SOURCE

European Spallation Source Update

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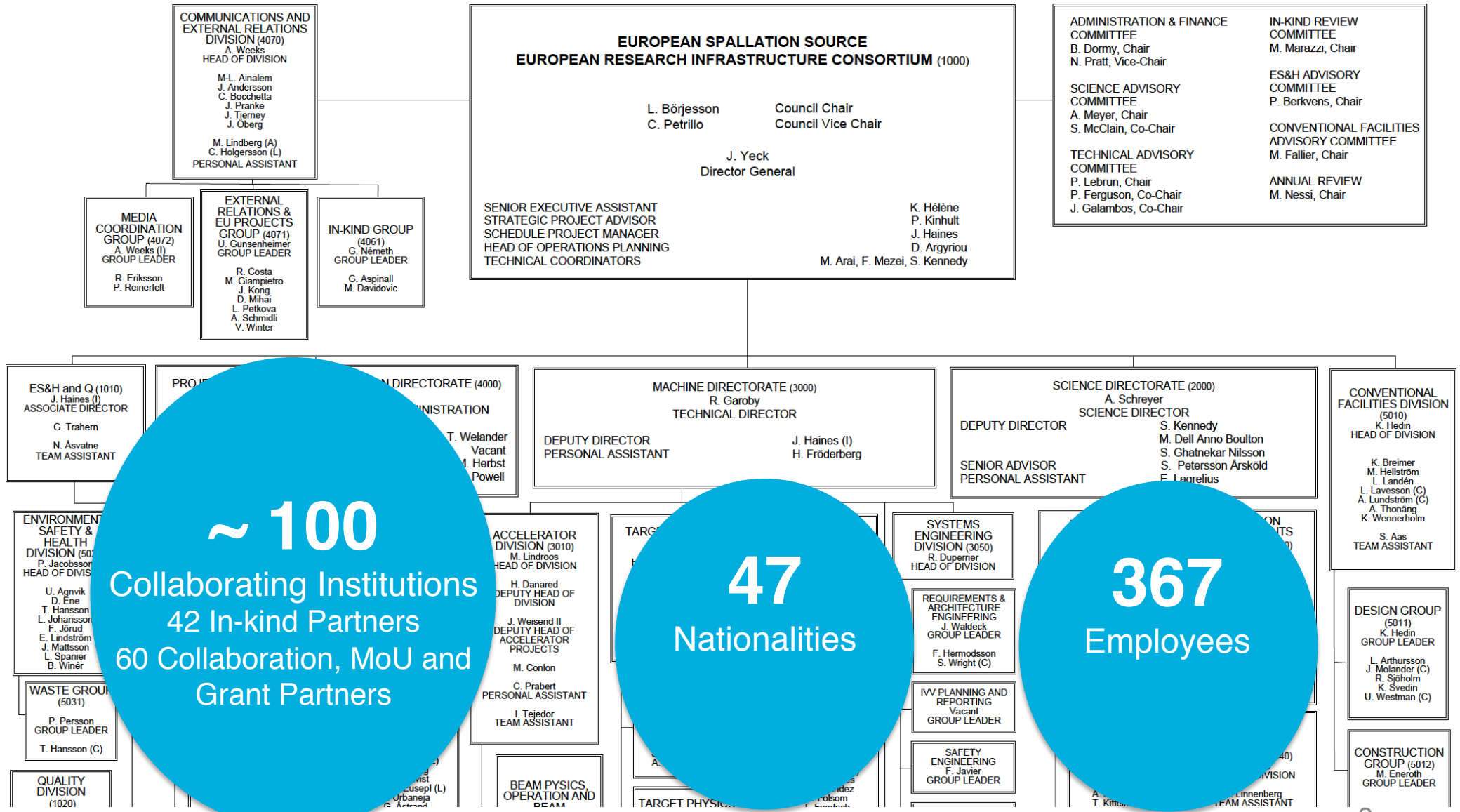
9 May 2016

Scientific Advisory Council

www.europeanspallationsource.se

Organisation



~ 100
Collaborating Institutions
42 In-kind Partners
60 Collaboration, MoU and Grant Partners

47
Nationalities

367
Employees

Partner institutions delivering the design & construction of ESS

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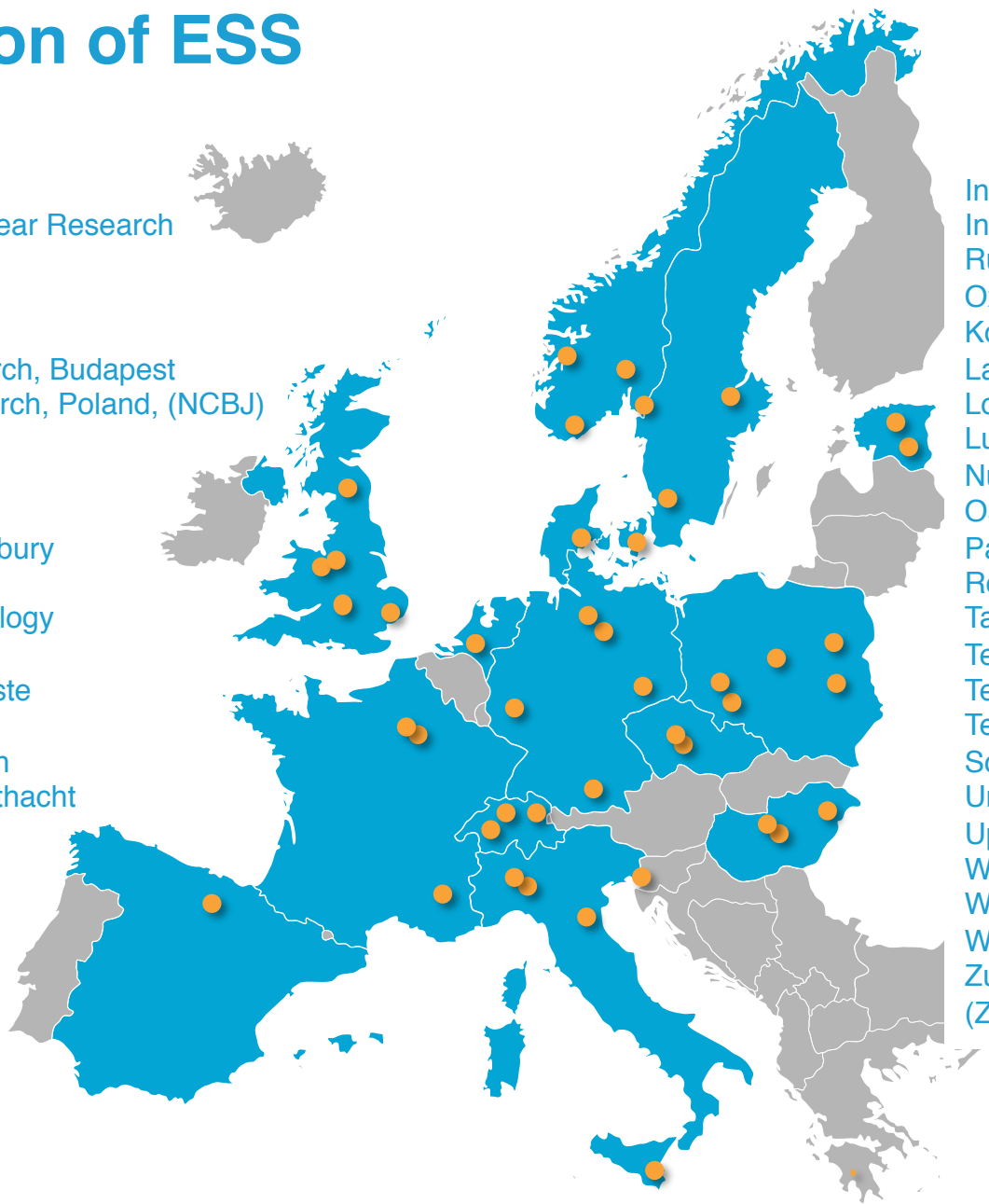
Aarhus University
Atomki - Institute for Nuclear Research
Agder University
Bergen University
CEA Saclay, Paris
Centre for Energy Research, Budapest
Centre for Nuclear Research, Poland, (NCBJ)
CERN, Geneva
CNR, Rome
CNRS Orsay, Paris
Cockcroft Institute, Daresbury
DESY, Hamburg
Delft University of Technology
Edinburgh University
Elettra – Sincrotrone Trieste
ESS Bilbao
Forschungszentrum Jülich
Helmholtz-Zentrum Geesthacht
Huddersfield Univesrity
IFJ PAN, Krakow
INFN, Catania
INFN, Legnaro
INFN, Milan



Institute for Energy Research (IFE)
Institut Laue-Langevin (ILL)
Rutherford-Appleton Laboratory, Oxford(ISIS)
Kopenhagen University
Laboratoire Léon Brilouin (LLB)
Lodz University of Technology
Lund University
Nuclear Physics Institute of the ASCR
Oslo University
Paul Sherrer Institute
Roskilde University
Tallinn Technical Univesrsity
Technical University of Chemnitz
Technical University of Denmark
Technical University Munich
Science and Technology Facilities Council
University of Tartu
Uppsala University
WIGNER Research Centre for Physics
Wroclaw Univesrity of technology
Warsaw University of Technology
Zurich University of Applied Sciences (ZHAW)

Cost baseline – 1 843 M€ (2013 pricing)

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(M€) Project	Original baseline (2013 prices)	Original baseline (incl. indexation)	Current baseline (incl. indexation and changes)
Conventional Facilities	438.9	458.1	458.0
Accelerator Systems	510.2	518.0	513.1
Target Systems	155.3	158.7	162.0
Integrated Control Systems	73.0	75.1	79.6
Technical Management Services	31.0	32.4	39.5
Neutron Scattering Systems	350.0	361.9	361.9
Project Support & Administration	126.5	132	138.9
Contingency	158.5	176.5	159.6
Total	**1 843.3**	**1 912.6**	**1 912.6**
Host Countries' CF Scope	93.0	100.5	115.9
Total including Host CF	**1 936.3**	**2 013.1**	**2 028.5**

ESS Schedule Objectives

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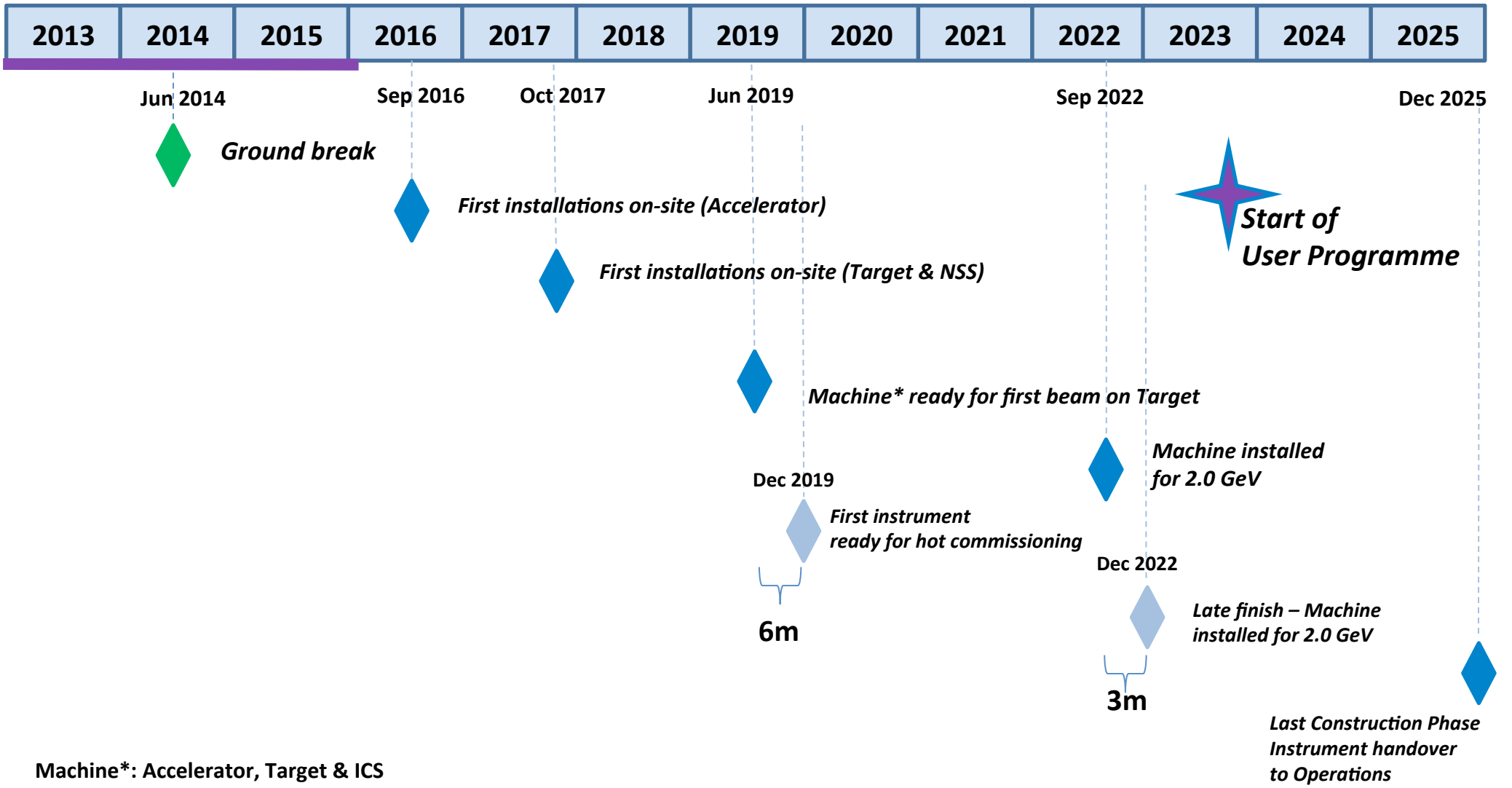

Machine*: Accelerator, Target & ICS

Construction and operations budget profiles

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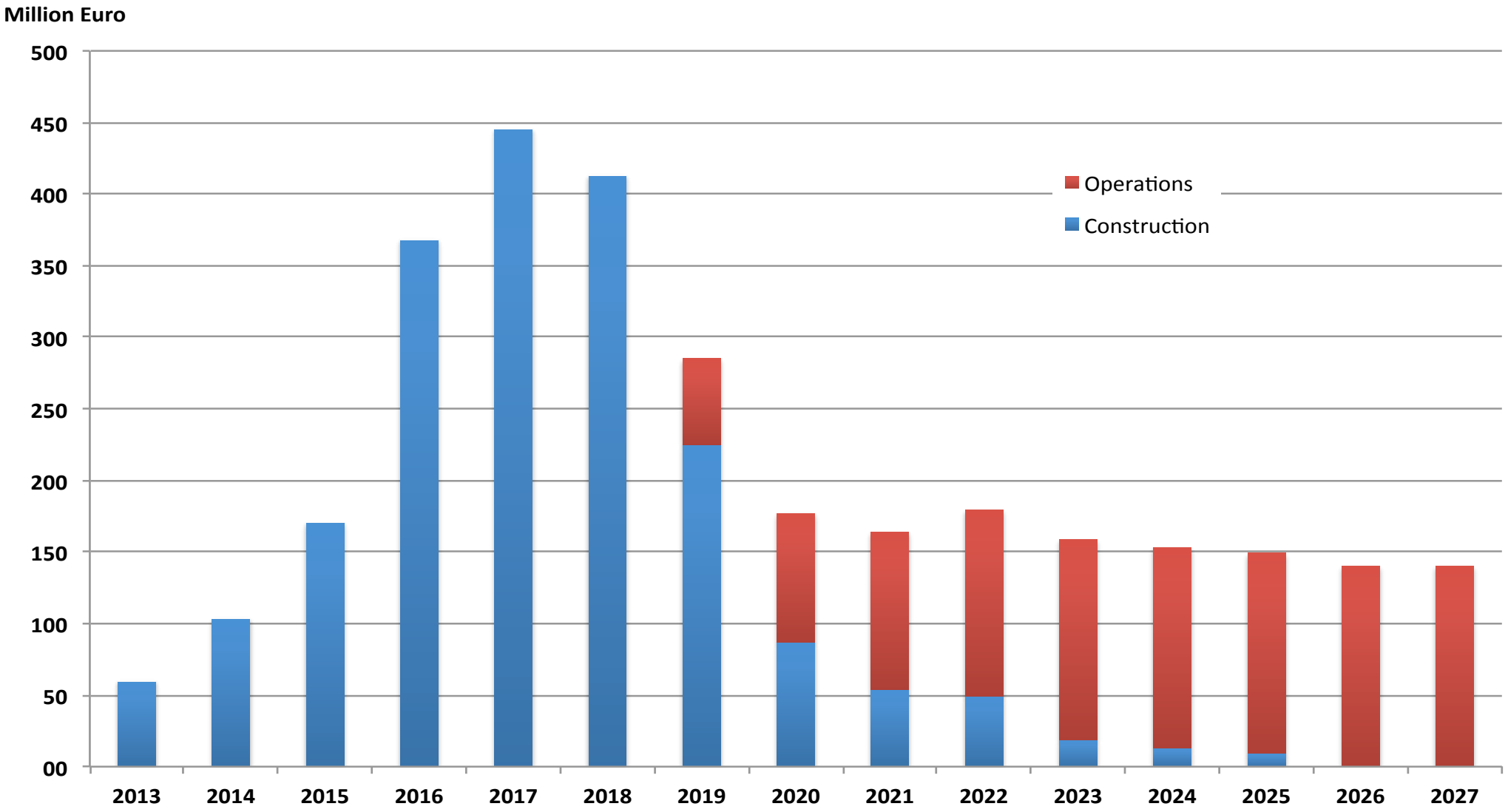
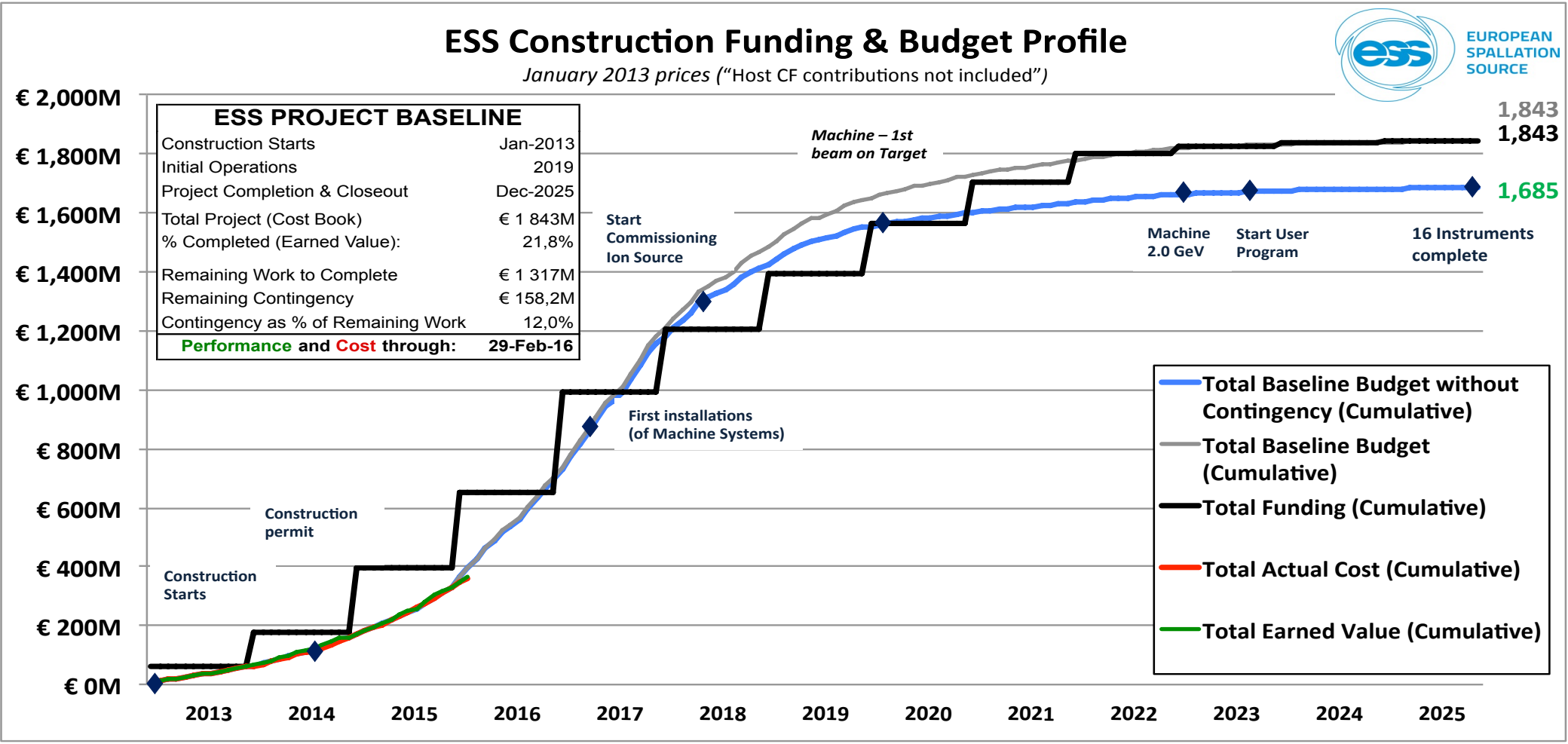
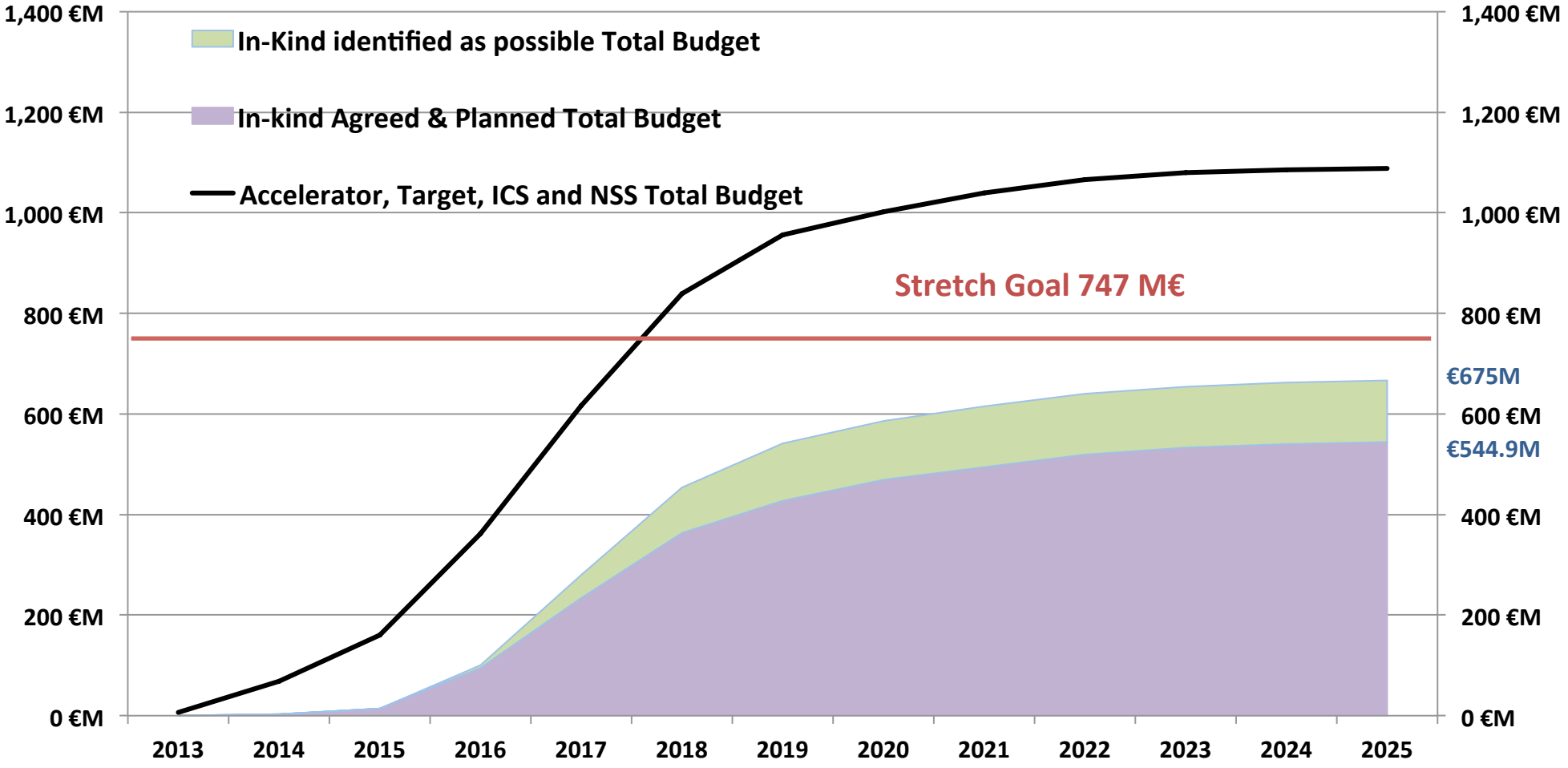


Current S-curve based on February data



In-kind status and plans



2015 priorities (*slide from April 2015 review*)

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- Establish In-kind agreements ☑☐☐ **IKC, HoA, TA's…**
- Complete transition from ESS AB to the ERIC organisation ☑…
- Recruit directors for neutron scattering systems and administration ☑
- Demonstrate that schedule drives decision-making (project culture) ☑…
- Complete 2nd Annual Project Review and implement action plans ☑…
- Implement technical coordination and resolve open design issues ☑…
- Secure solution for liquidity needs during peak construction years ☐ **June**
- Submit application for regulatory license required for installation ☐ **May**
- Ensure appropriate employment conditions for staff and secondees ☐ **?**

2016 priorities

- Continue emphasis on schedule performance – key to success
- Transition In-kind partners into execution phase (instruments!)
- 3rd Annual Project Review and Response – now
- Submit application to regulatory authority for license to commission first stages of accelerator systems – May
- Establish a “cash facility” for liquidity gap/hold schedule – June
- ESS start installation machine (accelerator) equipment – Sep
- Establish operations plans consistent with requirements – Dec
- Engage new members – ongoing

Summary

- Construction project ~ 21% complete and ~ 35% by end of 2016
- Emphasis on securing in-kind deliverables in a collaborative framework
- Priority on schedule performance – key to success
- Additional work to ensure European Spallation Source ERIC provides the institutional framework needed for long term success
- Working to establishing operations plans consistent facility requirements and supportable by the ESS Council

Core Values are Excellence, Openness, Collaboration, and Sustainability

Mission – design, build, and operate the world's leading research facility using neutrons

General impression
Annual Review 2016

- Once more a very intense and positive year, impressive progress since spring 2015.
- The ESS project is now accelerating its path, the Civil Engineering work is in full swing, the accelerator begins to deliver its first hardware.
- Every subproject is making detailed plans for the installation, which should start this Autumn for the accelerator.
- About 21% of the entire project cost figure has been already spent. In-kind projects have started.
- The 2019 milestone to deliver a first beam on target remains a challenge.
- The ESS has now emerged out of the green field, it has become a real host laboratory within the ERIC framework.
- Operation resources and planning are now the next step in the project definition.

Top 10 actions

1) Level 1 Technical Coordination, Comunication, Integration: The ESS technical coordination scheme is helping facilitate technical integration risks, however the committee finds there is still a need for technical ownership of the entire ESS facility. Reconsider the need for a TC or DDG at Level 1.

2) Installation schedule (steering, organization,…): Related to #1, there remains a need for an overall technical coordination of ESS to manage the installation activities, as well as coordination of space and logistics.

3) ESS liquidity : ESS will run out of cash by the end of 2016, even if all approved contributions are received as planned. It is absolutely essential to place now a final decision at the June Council meeting. Solutions exist.

4) VAT, taxation and employment conditions for in-kind partners @ ESS: The ESS ERIC Agreement provides VAT tax exemption for its in-kind partners, however the specific implementation plan for VAT exemption in each country are not in place. This uncertainty is a high risk for schedule delay (upcoming in-kind contracts). ESS should work closely with the ERIC in-kind partner representatives to resolve this as soon as possible.

Top 10 actions

5) In-kind organization : Although some 50% of expected TAS (235) are agreed or under preparation, the Committee remains concerned about the local follow up and progress made wrt to set schedules and milestones. The Committee is pleased to see the EC-funded Brightness project offering tracking and assistance for its regional hub partners, but does not consider it as sufficient. The Committee thus recommends a stronger presence of ESS staff on IK partner production location, in particular in the early phases of the agreement execution.

6) 7-12 months projected delay: As this reported delay has a fundamental impact on other projects, the Committee recommends that under the leadership of ESS management, a thorough analysis is made resulting in a resources loaded schedule, where the necessary interfaces are identified. The updated baseline plan needs to reflect the phasing of the work, realistic staffing and the funding profile. The advice is to re-baseline the overall schedule, focusing on delivering science in 2023.

Top 10 actions

7) NSS construction agreements and schedule : There are serious doubts that the budget plan for 16 instruments is feasible within the 350 M€. The Committee recommends NSS to review the order and priority in which the instruments could be installed. Urgency should be given to establish all pending agreements.

8) Regulatory permits : ESS management is encouraged to increase its current interactions with SSM to avoid absence of required permits causing delays in the construction, installation schedules and start of operation.

9) Bunker story : bunker design, requirements and construction are on the critical path. Much more interaction is needed between the various parties in the different projects. Waiting for an in-kind parter for this item looks unrealistic and a possible source of problems and delays.

Top 10 actions

10) Risks analysis and financial implications : The risk register appears to contain items which are entered inconsistently across the different projects. The software-calculated value is not well understood. It is recommended that once the baseline cost and forecast variances are, consistent guidelines are followed across the projects to update the registry to correctly signal risks that established contingency allocation mechanisms are unable to address.

Review themes

- Evaluating results from the annual project review completed two weeks ago, a hard-nosed and constructive review
- Recognized intense efforts and impressive progress over the last year and provided excellent advice on issues and future challenges. We will consider the results as we strengthen plans and develop actions to address specific recommendations. 200 pages can be reduced to a few key themes:
- **Schedule Management** - Continue to improve integrated schedule and resolve known schedule conflicts and delays. Identify lessons from current experience, e.g., delays starting machine in-kind work, target building construction, etc. and consider these lessons-learned in future plans. Ensure that interim milestones are relevant to delivery of early science success at start of user program in 2023.

Review themes continued…

- **Liquidity Gap –** Encouragement to finalize work with lending institutions and the Council so that a “cash facility” for managing the liquidity gap is in place by the last half of the year.
- **Technical Integration, Installation, and Project Management -** Strengthen central technical integration and project management to achieve better ESS-wide communication and optimization. Organize for integrated coordination of installation.
- **Instrument Program –** Take the necessary steps to establish schedules for construction of instruments and increase the probability that the first suite of instruments will be ready at the start of the user program in 2023.

Review themes continued…

- **Operations Transition -** Ramp-up planning for operations. Integrate the schedules and plans for construction and initial operations and establish a management approach that can optimize over the total effort.
- **Safety and Health –** Ramp-up efforts on safety and health to be ready for delivery of buildings and the start of installation work on the site later this year.

The report included over sixty recommendations and many positive findings. Congratulations to the entire organization for receiving this recognition! The committee sees an organization with the competency and capacity to benefit from a thorough critique.

"Project reviews are the most important management tool to ensure that the project is staying on track. If you are not required to have them, you should inflict them on yourself."

Update on DG3.0 recruitment

- Council meeting on April 29th will consider results of search committee's activities.
- If all goes well, announcement in mid-May
- Transition after the summer, exact date/details tbd

- Momentum will be maintained

Civil construction groundbreaking

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September 2014


Progress in 18 months…
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March 2016

Accelerator Tunnel

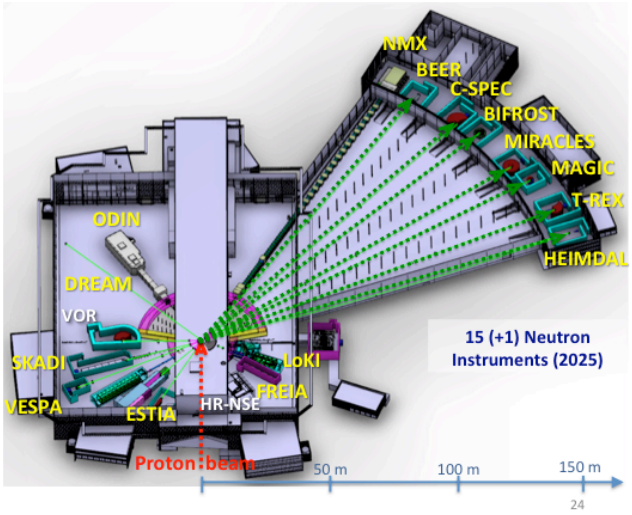
Length: 560 m

Accelerator => Target

Target Building

Fukishima: Target building has to survive 7,5 magnitude earthquake (probability 1/1.000.000)

Target => 150 m long instruments



6000 piles rammed into the ground more than 10 m deep