

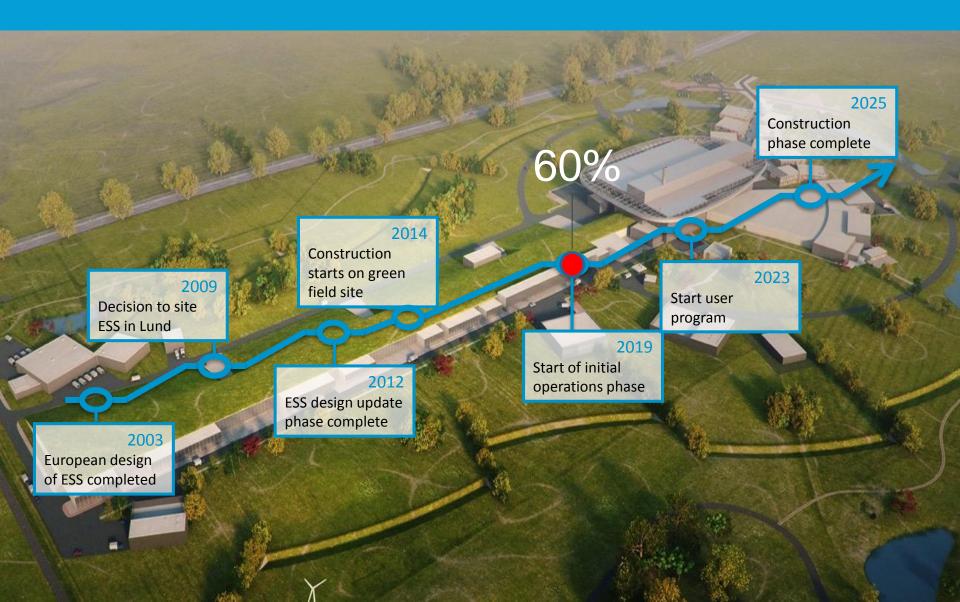
ESS Collaborations: From Defining to Delivering

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Introduction





Accelerator start-up

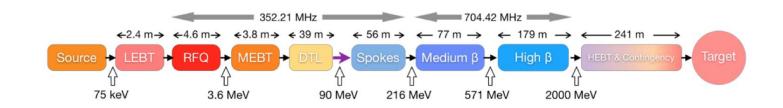


- When Lund was selected at the site of ESS in 2009, the so-called Design Update Phase started.
- ESS was the proverbial green-field site, and building up a complete organization in Lund to do design and construct the accelerator "in-house" was not an option.
- Instead, the emerging Accelerator
 Division under Mats Lindroos started by looking for collaborators in Europe that had the necessary competence, resources and willingness to become involved in the ESS project.
- Forming the collaboration went in parallel with the start of the accelerator design.



Linear Accelerator





Particle species
Energy
Current
Average power
Peak power
Pulse length
Repetition rate
Operating time
Reliability (all facility)

2.0 GeV 62.5 mA 5 MW 125 MW 2.86 ms 14 Hz 5200 h/year

95%

0 100 200 m

Partner Institutions

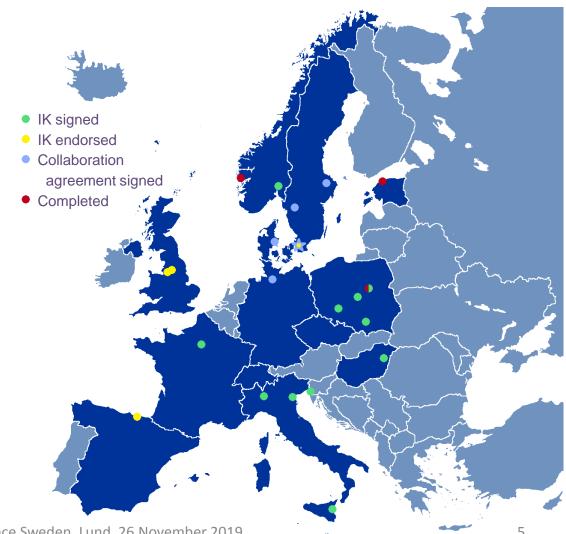


In-kind (main contributions)

ATOMKI (RF-LPS) CEA (RFQ, SRF, Diagn) CNRS (SRF, Cryogenics) Cockcroft Inst (Diagn) Daresbury Lab (SRF, Vacuum) Elettra (RF, Magnets, PS, Diagn) ESS-Bilbao (MEBT, RF) Huddersfield Univ (RF distrib) IFJ PAN (Installations, test stand) INFN Catania (Source, LEBT) INFN Legnaro (DTL) INFN Milan (SRF) Lodz UT (LLRF) NCBJ (LLRF, gamma blockers) Tallinn UT (RF) Univ Bergen (Seconded staff) Univ Oslo (Diagn) Warsaw UT (LLRF) Wroclaw UT (Cryogenics)

Collaboration agreements

Aarhus Univ (Beam delivery, diagn) DESY (Diagn) Lund Univ (LLRF, RF) Uppsala Univ (Test stand) University West (Diagn)



Accelerator Components ~50 Technical Annexes





Example: Cryomodules from CEA, France



Protons are accelerated by strong electric fields in resonant cavities. The
cavities are made from superconducting niobium, cooled to 2 K in order
to reduce dissipation from currents induced in the cavity walls.

The cavities are enclosed in cryomodules that are vacuum vessels and

provide the thermal shielding.

 The cavities are delivered in-kind from STFC (UK) and INFN (Italy), that are in turn subcontracting services to DESY (Germany), and IPNO (France) has provided design support.

 Development started 2009, and ESS will get 30 cryomodules from CEA at a total value of more than 100 M euro.



Status of Deliveries to the Accelerator



- Ion-source & Low Energy beam transport commissioned and Medium Energy beam transport & Radio Frequency Quadrupole (RFQ) installation are under way (INFN-LNS, ESS, CEA)
- ESS cryoplants operating and delivering liquid Helium to clients (ESS)
- Drift Tube Linac tank (DTL) assembly started on ESS site (INFN)
- 5 ESS-designed modulators and 27 klystrons delivered to ESS (ESS-Bilbao, ESS)
- 22 out of 30 valve boxes with interconnections for elliptical linac installed (Wroclaw University)
- Installation of RF distribution well under way (Huddersfield Univ., IFJ-PAN)









Procurements in Near and Long Term



- 5 high-beta modulators (ESS design)
- Spare parts for beam diagnostics, vacuum, cryogenics, RF sources, modulators and power supplies
- Installation material such as cables, cable trays etc
- Services such as specialised welding
- Consumables such as oil for modulator transformers and industrial gases
- General spare parts, consumables and services
- Superconducting RF Maintenance and Repair Facility
- ESS Neutrino Super Beam
- Participation in external projects (e.g. DONES)
- ...

