The European Spallation Source

John Womersley, Director General

August 2018

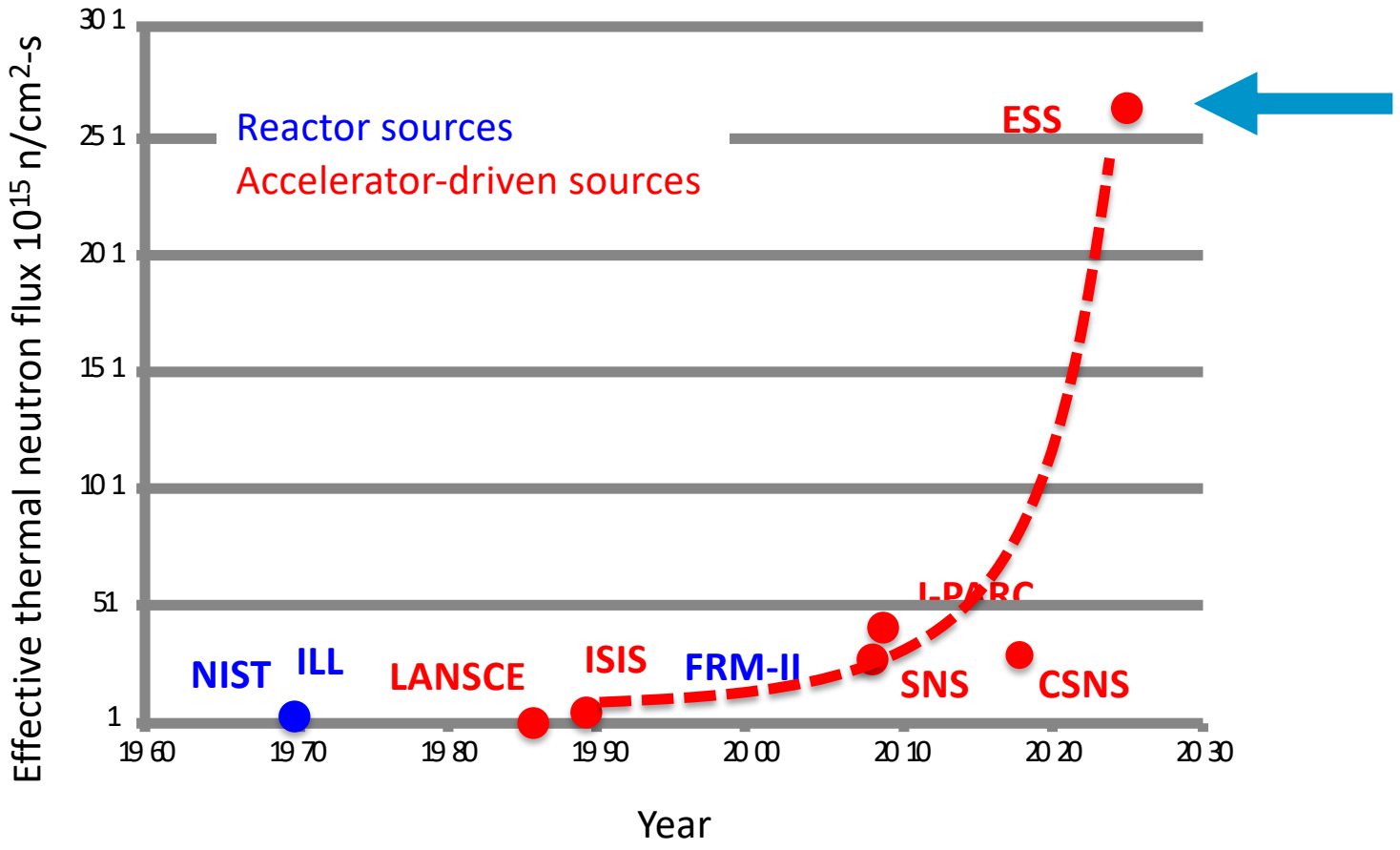
A European Flagship for Research and Innovation

- Next-generation research infrastructure for world leading research in materials science, life sciences and engineering
- intense beams of neutrons that will allow the structures of materials and molecules to be understood at the level of individual atoms
- Will offer unique capabilities 10-20 times greater than the world's current best
- Key for advances in societally and economically relevant areas from energy storage and generation, to drug design and delivery, novel materials, and environment and heritage, all central to the sustainable development of society

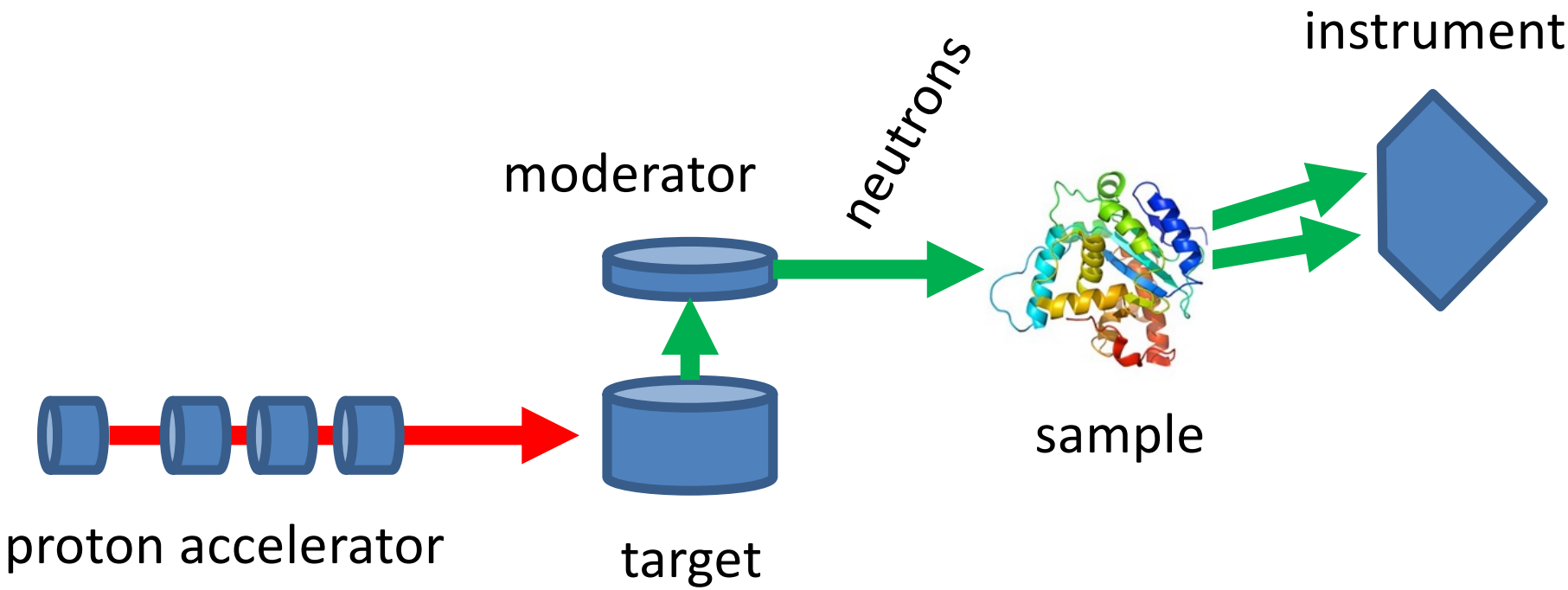
Neutron science

EUROPEAN SPALLATION SOURCE

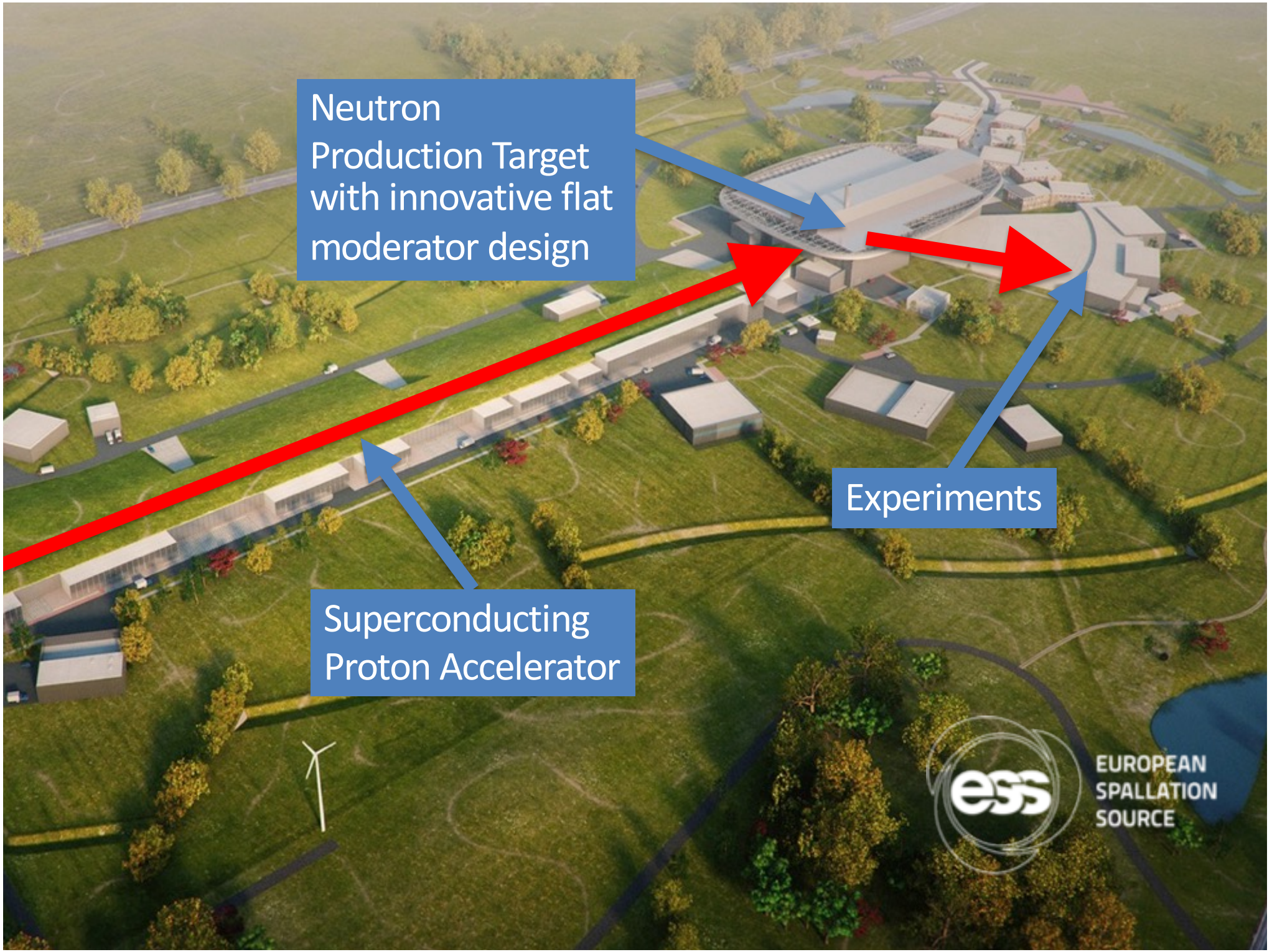
ESS Vision: Build and operate the world's most powerful neutron source



How a spallation source works



"spallation" is the process that releases neutrons from the target nuclei


Neutron
Production Target
with innovative flat
moderator design
Experiments
Superconducting
Proton Accelerator
ess
EUROPEAN
SPALLATION
SOURCE

Vision, Mission and Values

ESS Vision

Our vision is to build and operate the world's most powerful neutron source, enabling scientific breakthroughs in research related to materials, energy, health and the environment, and addressing some of the most important societal challenges of our time.

Mission

To do this, we commit to deliver ESS as a facility that:

- Is built safely, on time and on budget
- Produces research outputs that are best-in-class both in terms of scientific quality and in terms of socioeconomic impact
- Supports and develops its user community, fosters a scientific culture of excellence and acts as an international scientific hub
- Operates safely, efficiently and economically, and responds to the needs of its stakeholders, its host states and member states
- Develops innovative ways of working, new technologies, and upgrades to capabilities needed to remain at the cutting edge

Core Values

Excellence • Collaboration • Openness • Sustainability

Some numbers

1843 M€ construction cost

5 MW world's most powerful particle accelerator
2MW at start of operation

15 experimental stations

20 × more sensitive on average than today's best
at 2MW

800 experiments per year

2023 first science for users

13 ERIC member nations

Financing and In-Kind

The European Spallation Source ERIC established in 2015

Host Countries Sweden and Denmark

Construction 47.5%
Operations 15%

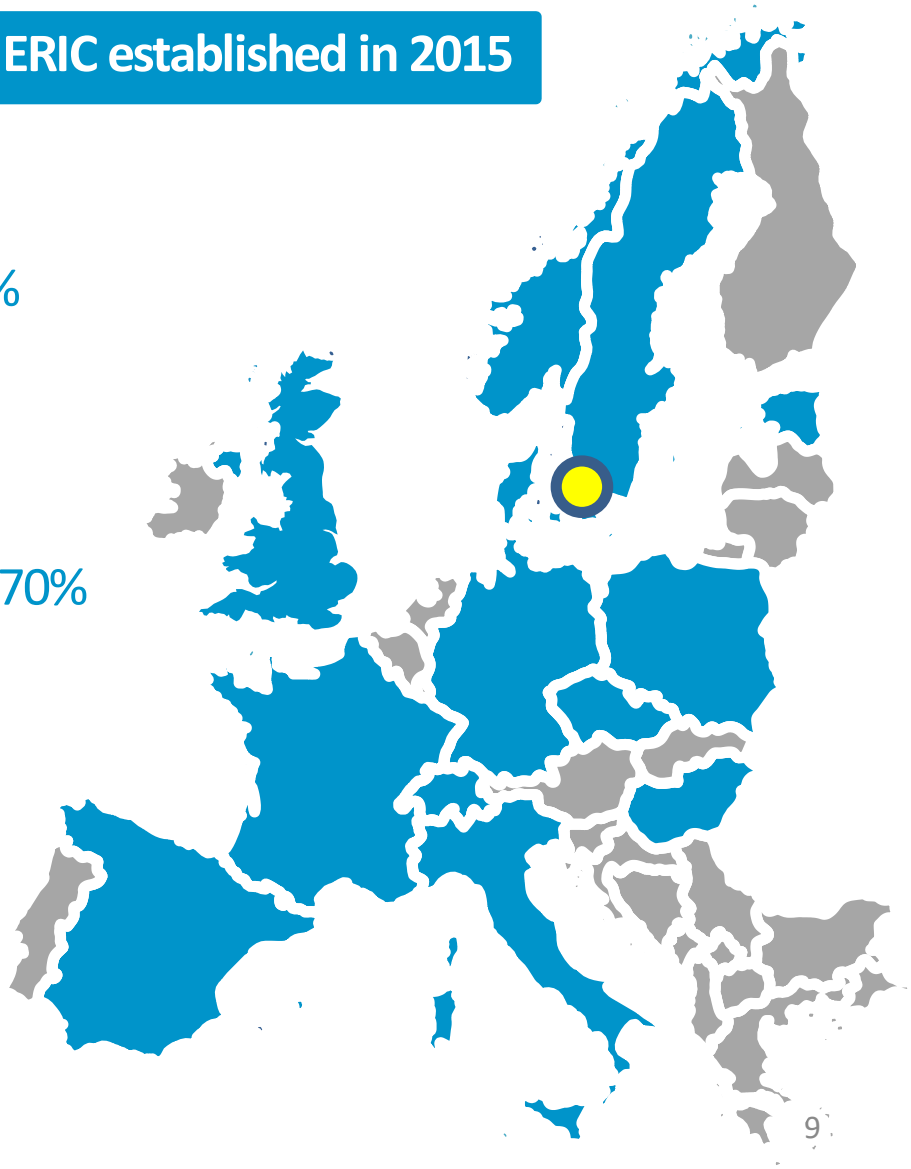
Cash Investment ~ 97%

Non Host Member Countries

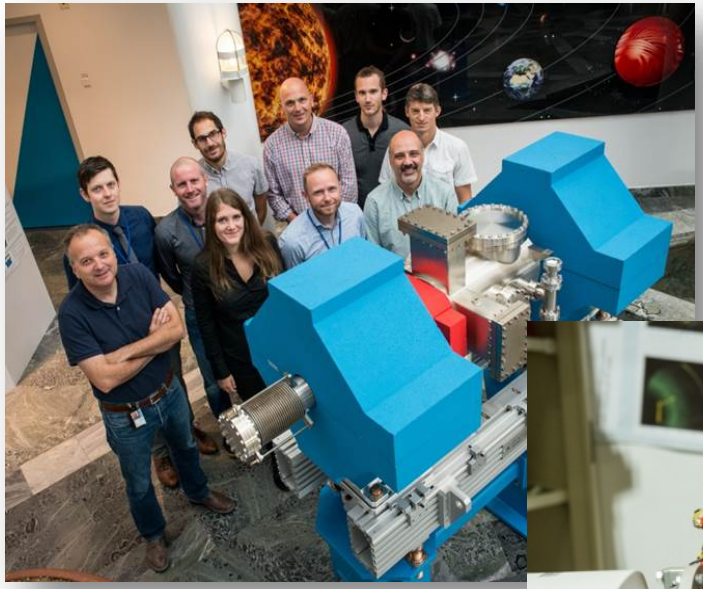
Construction 52.5%
Operations 85%

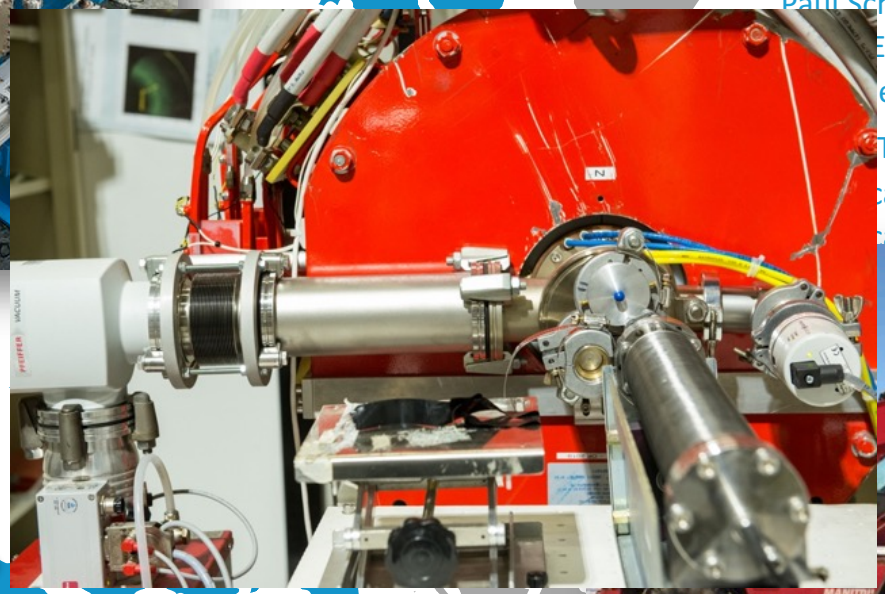
In-kind Deliverables ~ 70%

13 European Member Countries



ESS In-kind Partners





Forschungszentrum Jülich
Helmholtz-Zentrum Geesthacht
Huddersfield University

IFJ PAN, Krakow
INFN, Catania
INFN, Legnaro

INFN, Milan
Institute for Energy Research (IFE)

ISIS - Rutherford-Appleton Laboratory, Oxford
Laboratoire Léon Brilouin (LLB)

Lund University
Nuclear Physics Institute of the ASCR
Oslo University

Paul Scherrer Institute (PSI)
Electronic Group (PEG)
e University

Technical University
cal University of Denmark (DTU)
cal University Munich (TUM)

Organisation and People

EUROPEAN SPALLATION SOURCE

447

Employees

50

Nationalities

~ 100

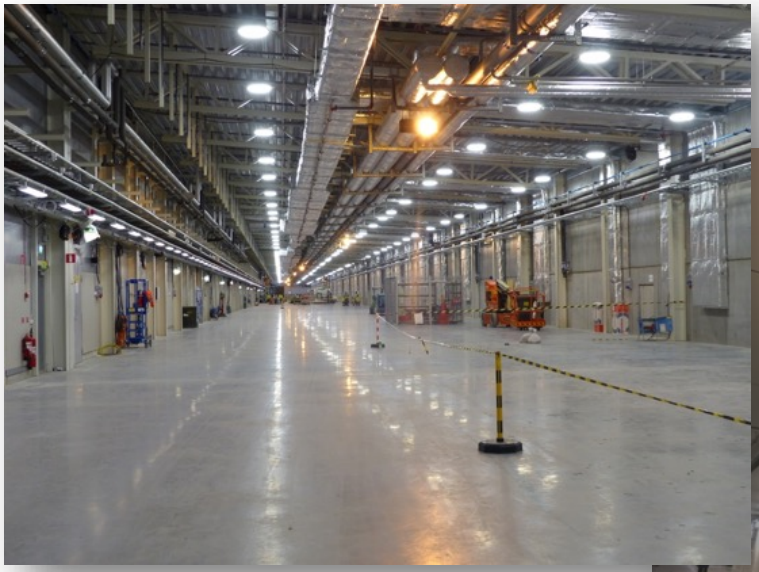
Collaborating Institutions

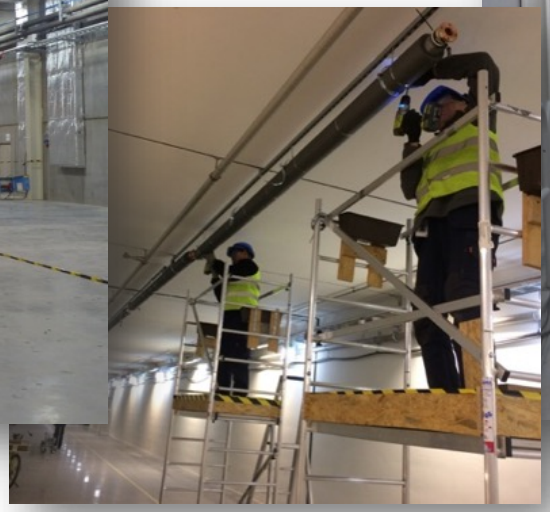
Civil Construction Groundbreaking

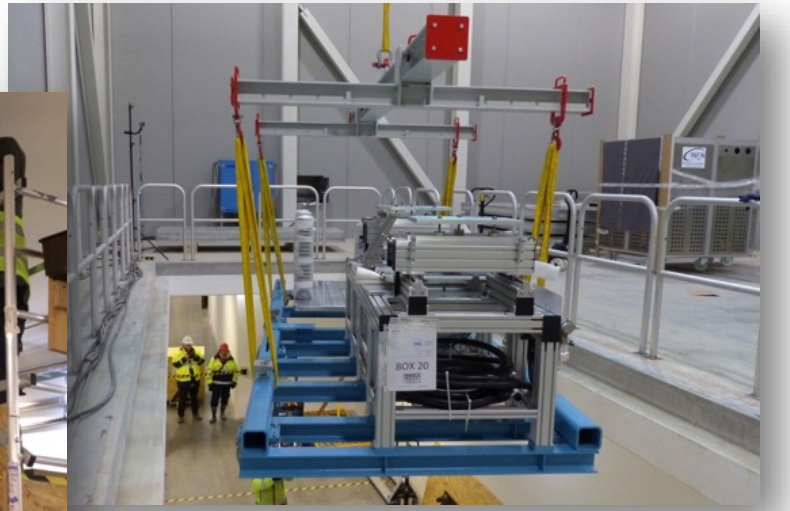
September 2014

ESS is close to 50% complete

- 2018 is the peak of construction activity
- First buildings have been handed over
- In-kind deliveries of high tech equipment arriving
- All our staff moved out to site in June this year



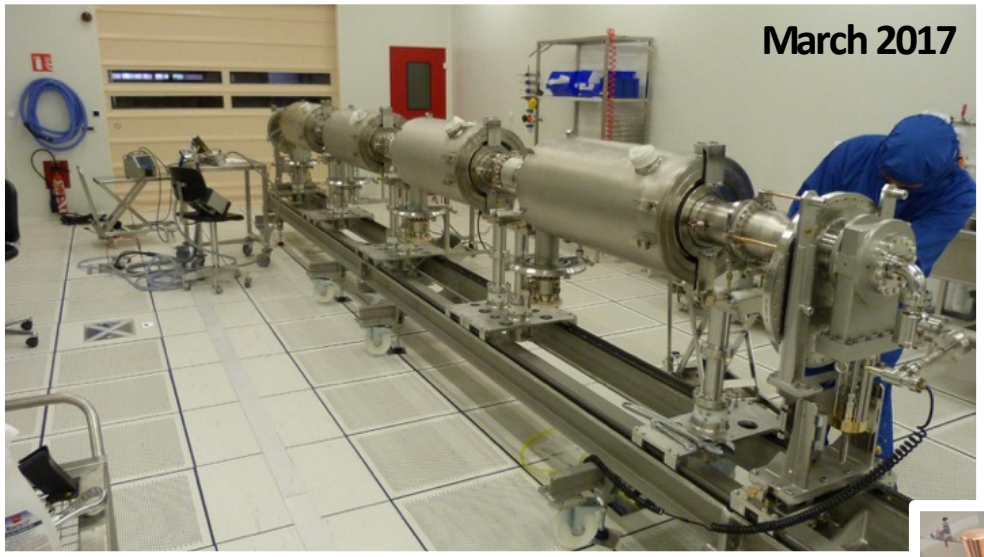


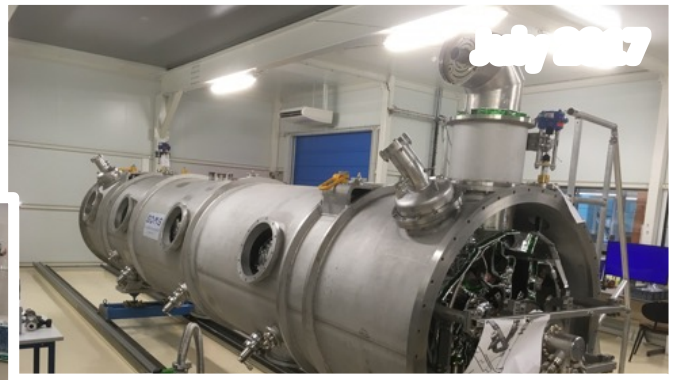


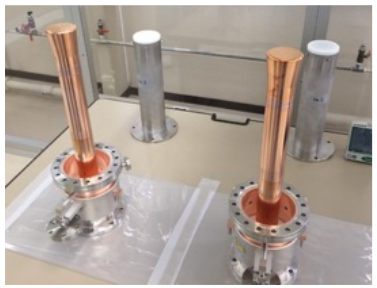
Accelerator & Klystron Gallery

Ion source & LEBT installation

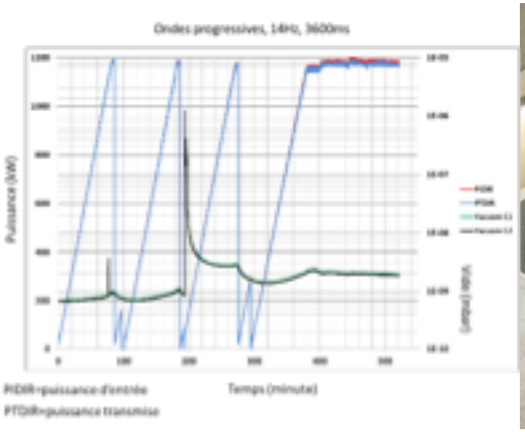
CEA – MB Prototype Cryomodule







- Assembly in ISO4 CEA CR
- 4 medium β 6 cell elliptical SRF cavities (1 LASA/3 CEA)
- Cooldown at CEA test stand in Sept 2017
  - No RF operation due to accidental rupture of coupler ceramic
- 10 couplers at nominal specs



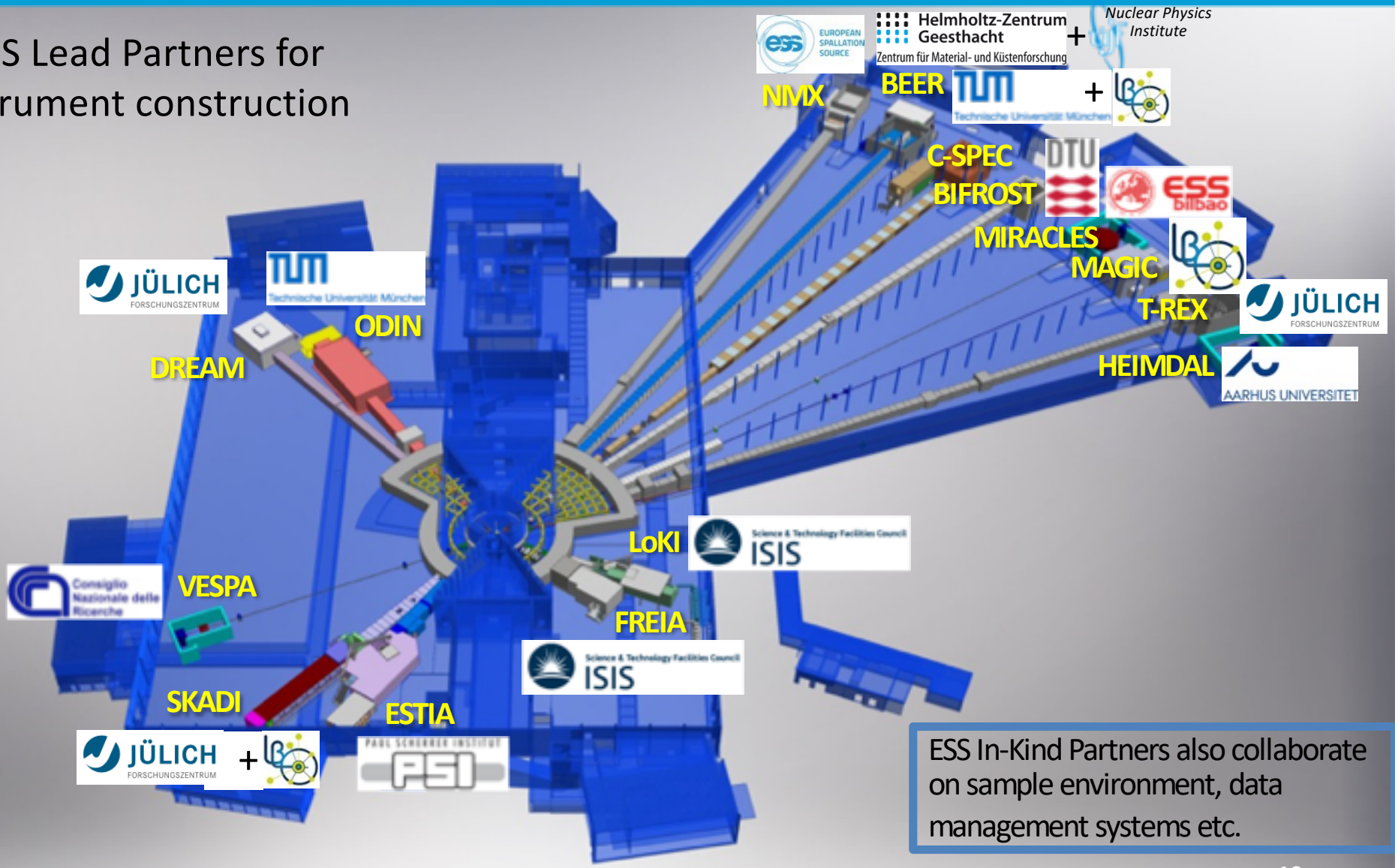
ESS is now producing liquid helium

Klystron Gallery

Coldbox

15 experimental stations (“instruments”)

ESS Lead Partners for instrument construction



ESS In-Kind Partners also collaborate on sample environment, data management systems etc.

ESS Instrument Layout (December 2016)

Data Management and Software Centre

COBIS, Copenhagen University North Campus

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Provide world leading scientific software and scientific computing support for neutron scattering at ESS

Scientific Software

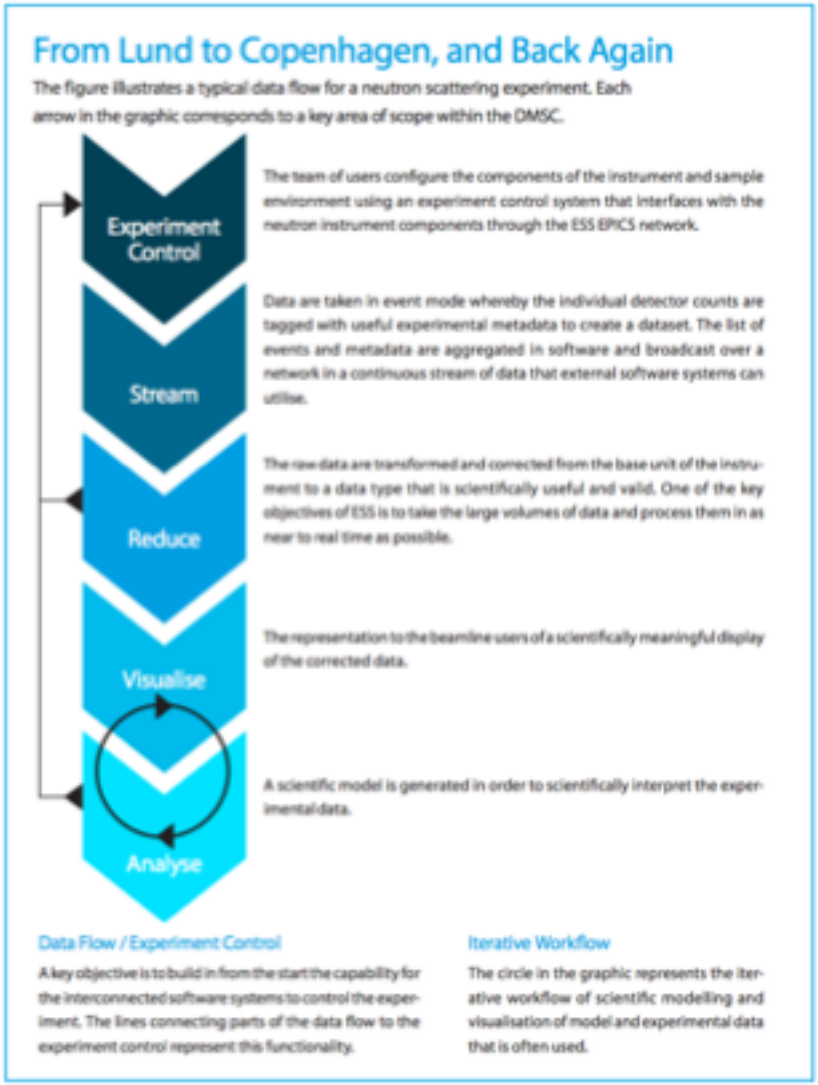
ESS experiment control system, Data acquisition, Data correction software, visualization, and software to model and analyze experimental data sets.

Data center operations

Store and catalogue ESS datasets, provide ESS users remote access to their data, computing for live data correction, and analysis software during and after experiments.

User support

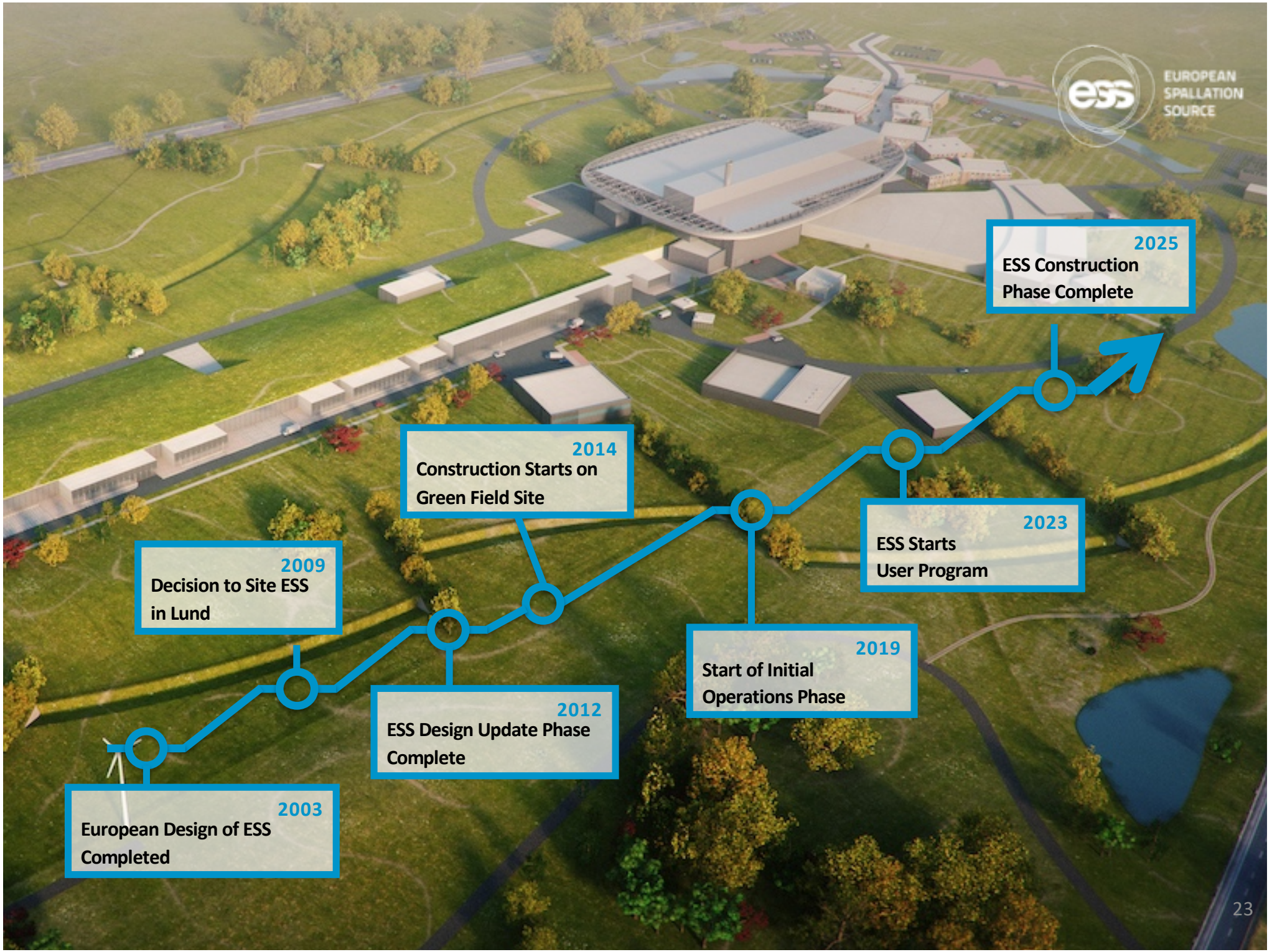
Support ESS users with data treatment and analysis.



SCIENCE VILLAGE SCANDINAVIA

SPACE Building: Reception, exhibition space, guest house for MAX IV and ESS (~100 rooms), office and meeting space, restaurant


SCIENCE
VILLAGE
SCANDINAVIA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2025
ESS Construction Phase Complete
2014
Construction Starts on Green Field Site
2023
ESS Starts User Program
2009
Decision to Site ESS in Lund
2019
Start of Initial Operations Phase
2012
ESS Design Update Phase Complete
2003
European Design of ESS Completed

ESS shows how particle accelerator technology helps to address pressing issues for the planet and society

- energy and the environment
- health
- future economic competitiveness

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Thank you!

@johnwomersley *@essneutron* *europeanspallationsource.se*