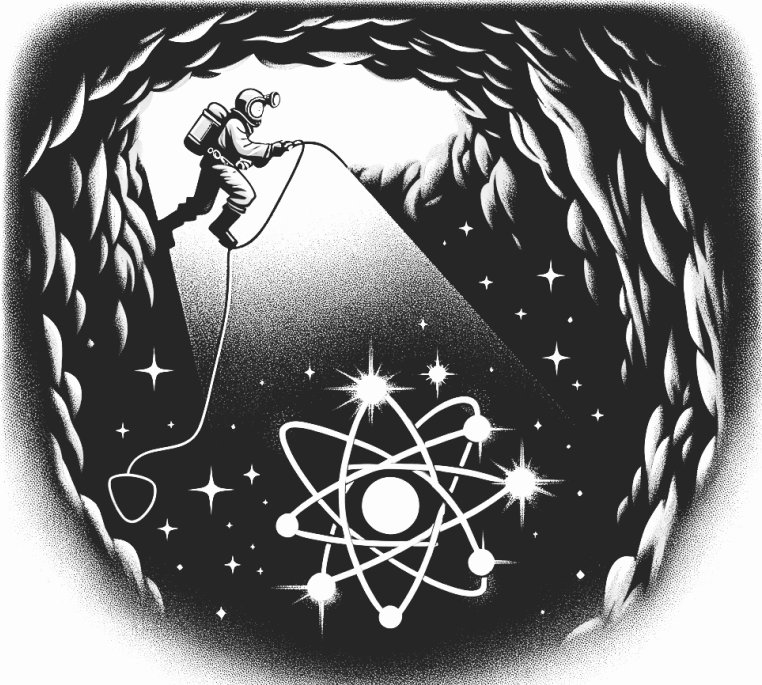


Spelunking for Spallation



(DALLE 2)

A 10 minute glimpse of the
European Spallation Source

Presented by Corey Lehmann

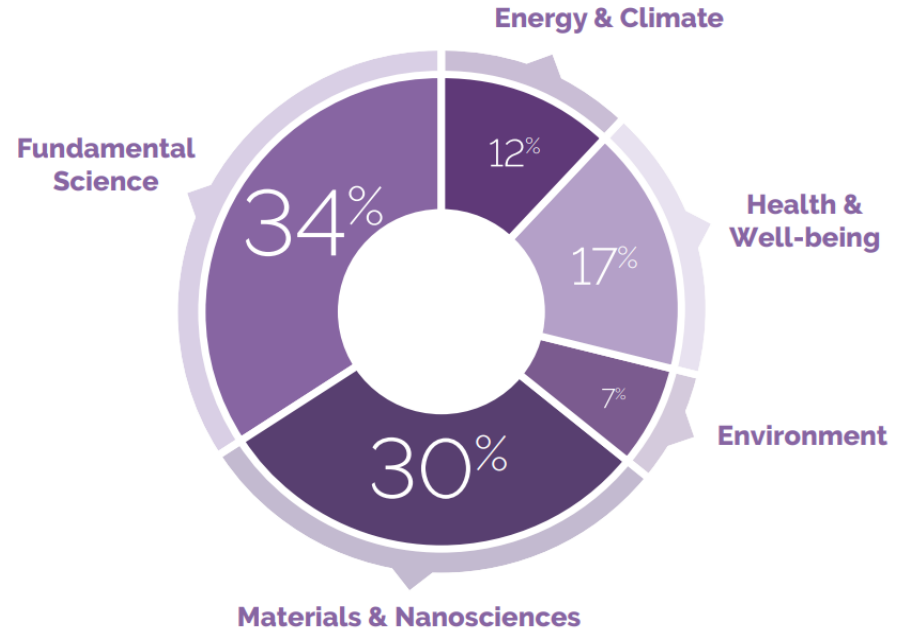


(Not Affiliated)

Neutrons for Science

Neutrons are very useful for many kinds of science!

1. No electrical charge -
Interact with atomic nuclei
2. Interactions with lighter elements -
Hydrogen and hydrocarbons
3. Non-destructive penetration -
Imaging and testing samples



Purposes of beamtime requests averaged over ILL, ISIS & LLB as of 2013.

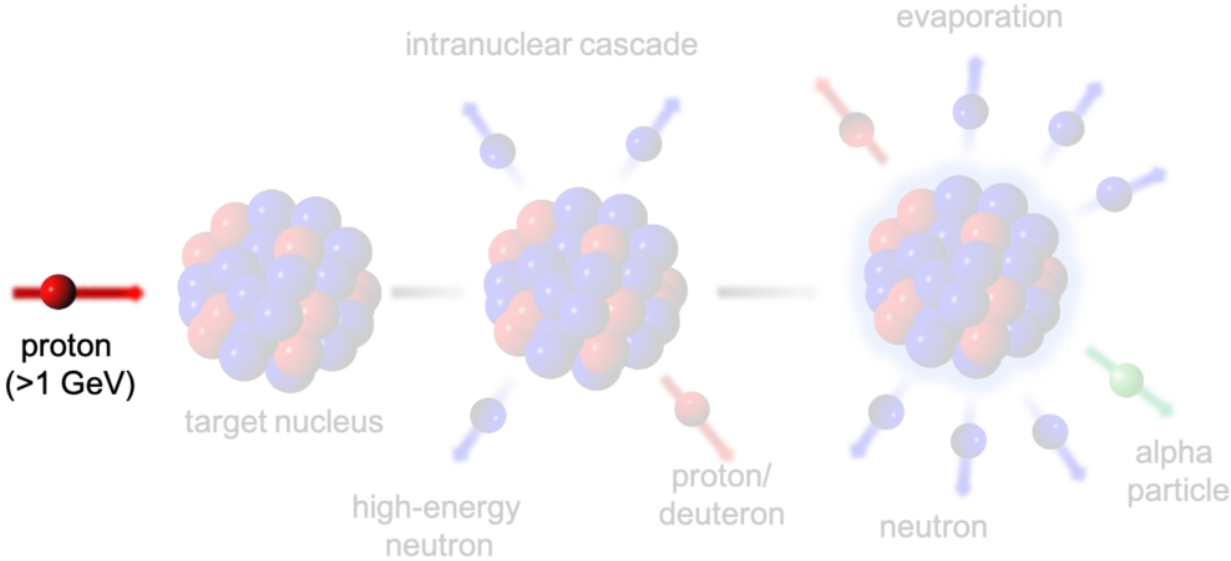
[\(ESFRI, Neutron scattering facilities in Europe\)](#)

Science Drivers for Neutron Sources

- Polymers
- Self-assembled colloids
- Thin film devices
- Nanostructures
- Composite materials
- Drug delivery systems
- Food science
- Neutron decay
- Neutron electric dipole moment
- Photovoltaics
- Biomolecular dynamics
- Macromolecular structures
- Biological membranes
- Novel states of matter
- Waste management
- Battery materials
- Earth and environmental sciences
- Archaeology and conservation

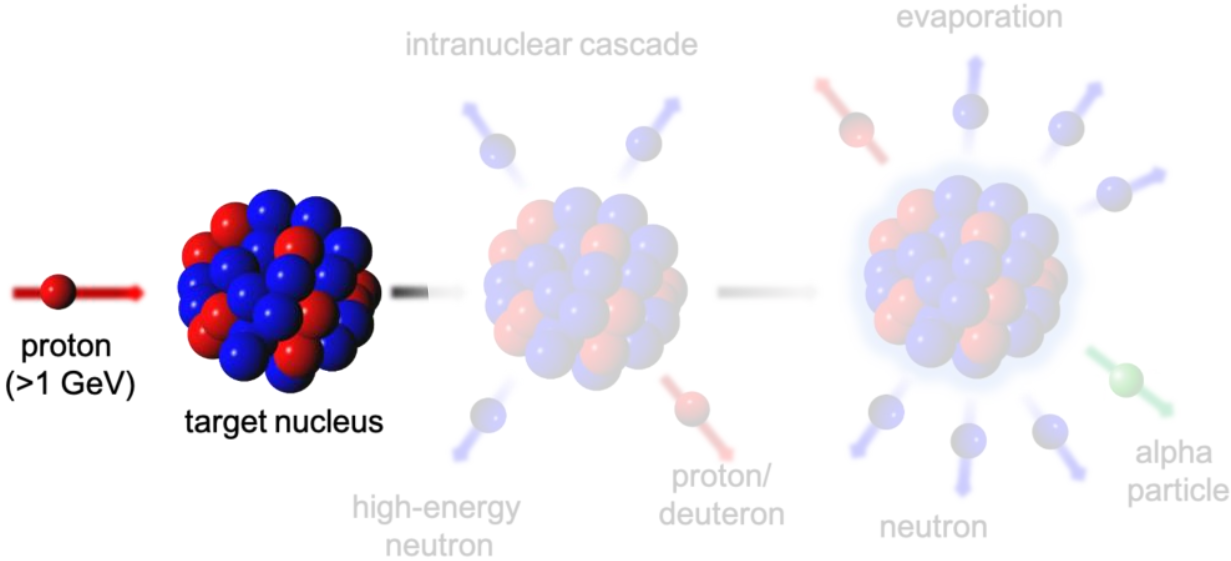
[\(ESS Technical Design Report\)](#)

Physics of Spallation

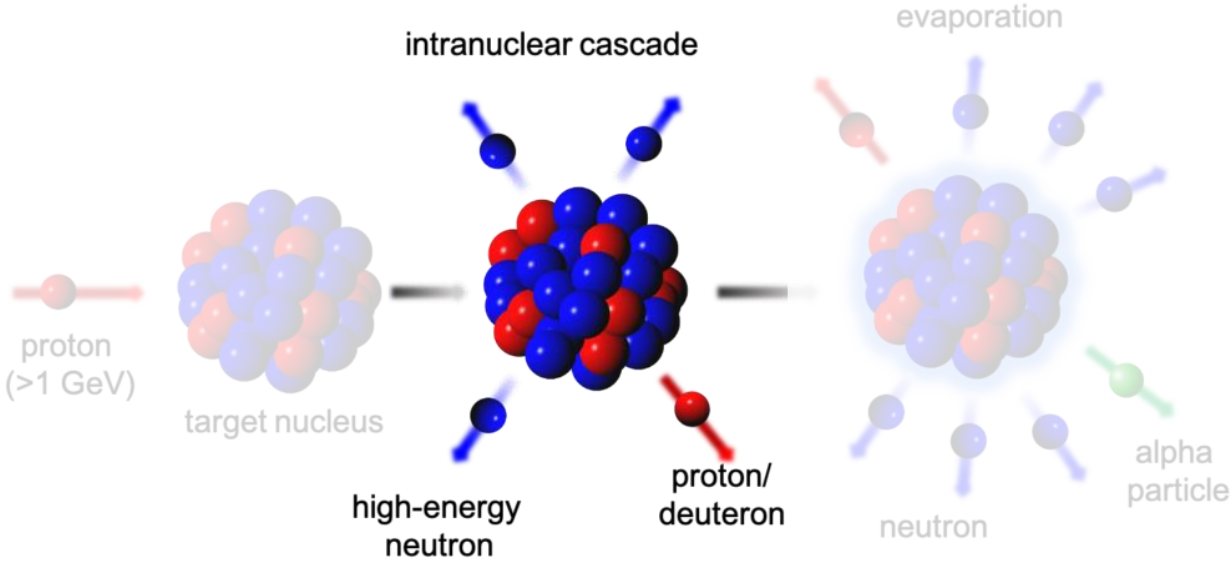


[\(ELENA Webpages\)](#)

Physics of Spallation

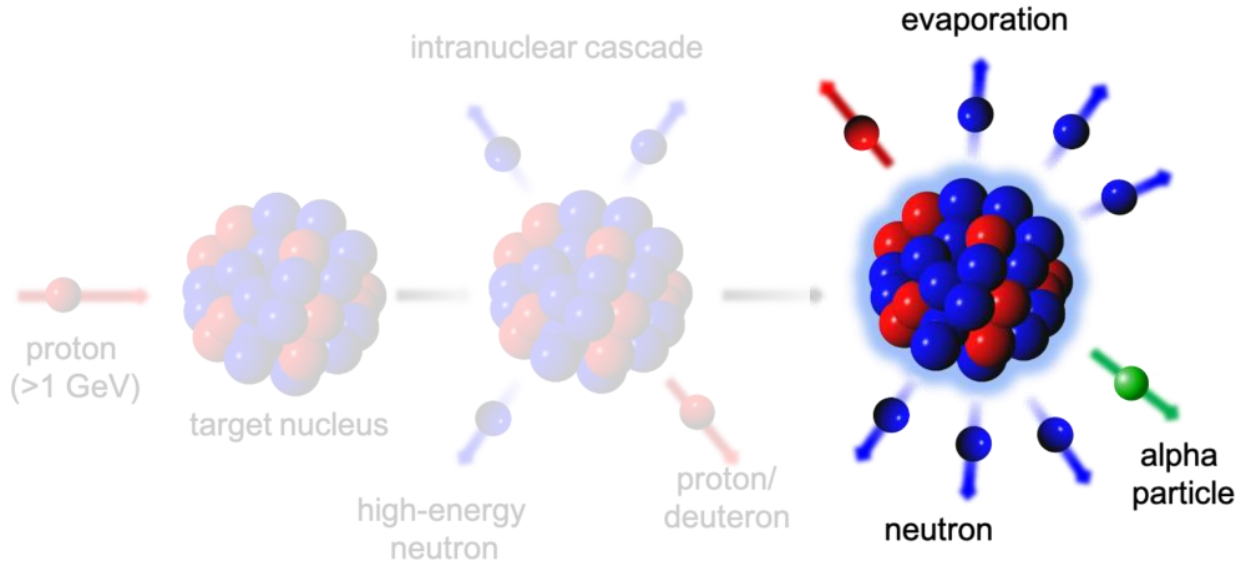


Physics of Spallation



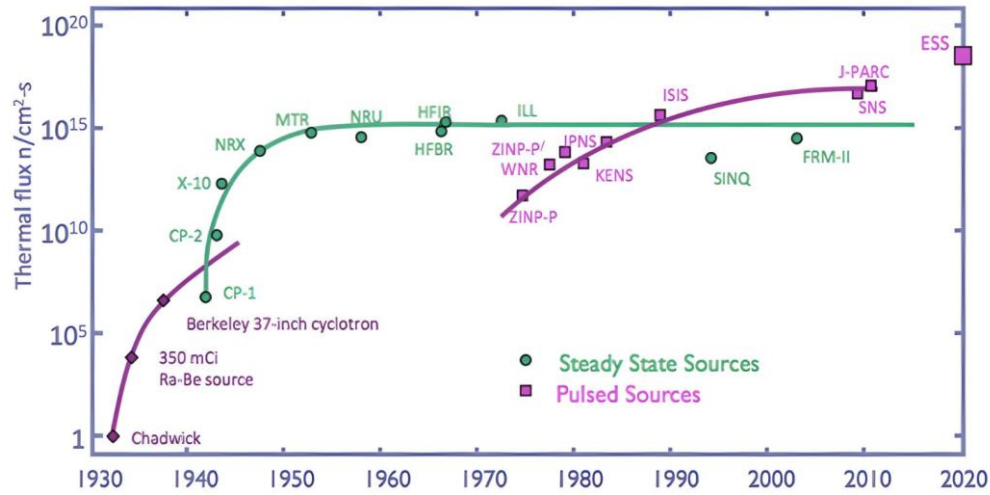
[\(ELENA Webpages\)](#)

Physics of Spallation

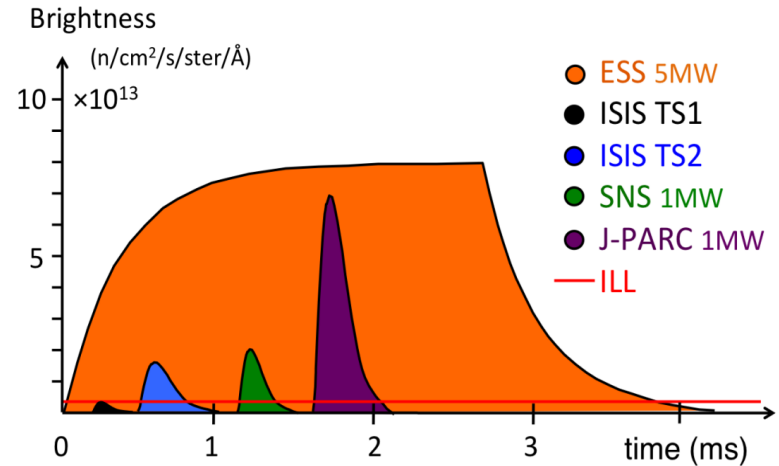


The Next Step in Spallation

- Higher neutron flux
- Better timing flexibility

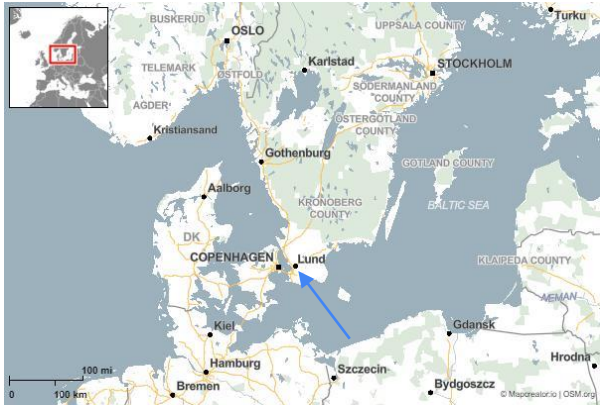


[\(Opportunities and Challenges in Neutron Crystallography\)](#)



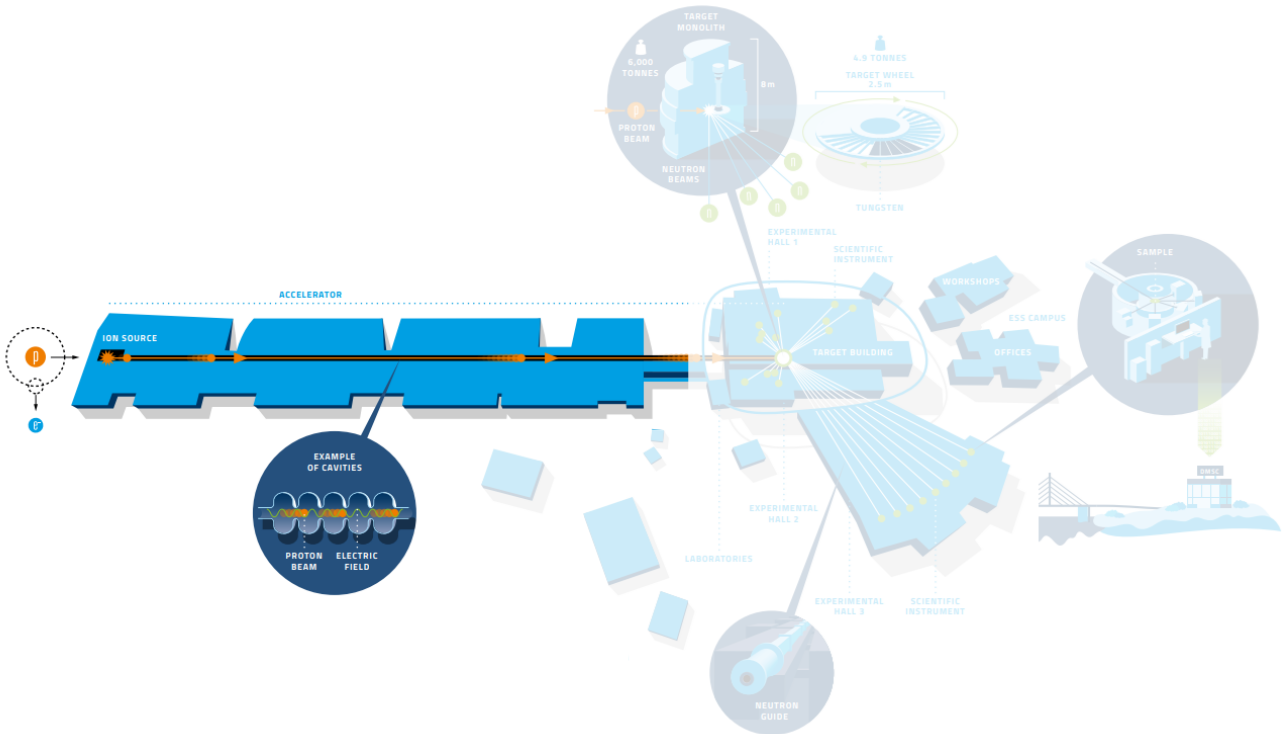
[\(ESS Technical Design Report\)](#)

European Spallation Source (ESS)

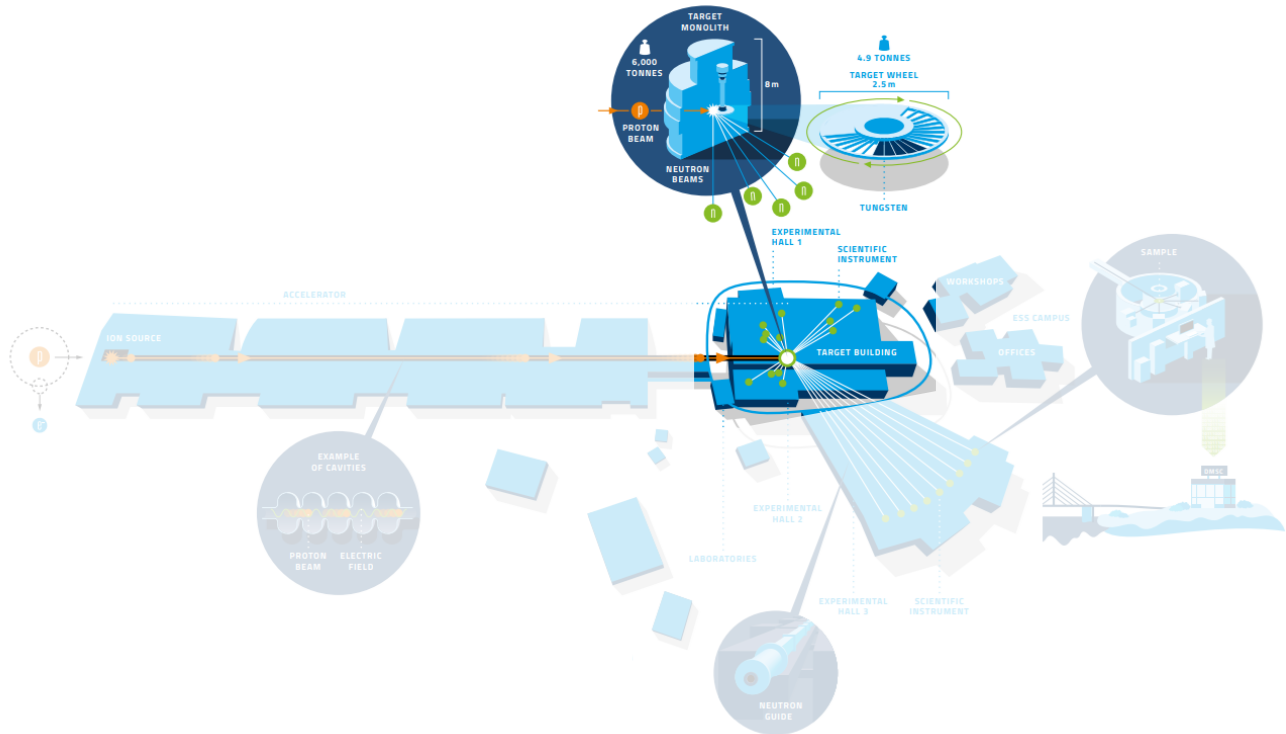


[\(ESS Website\)](#)

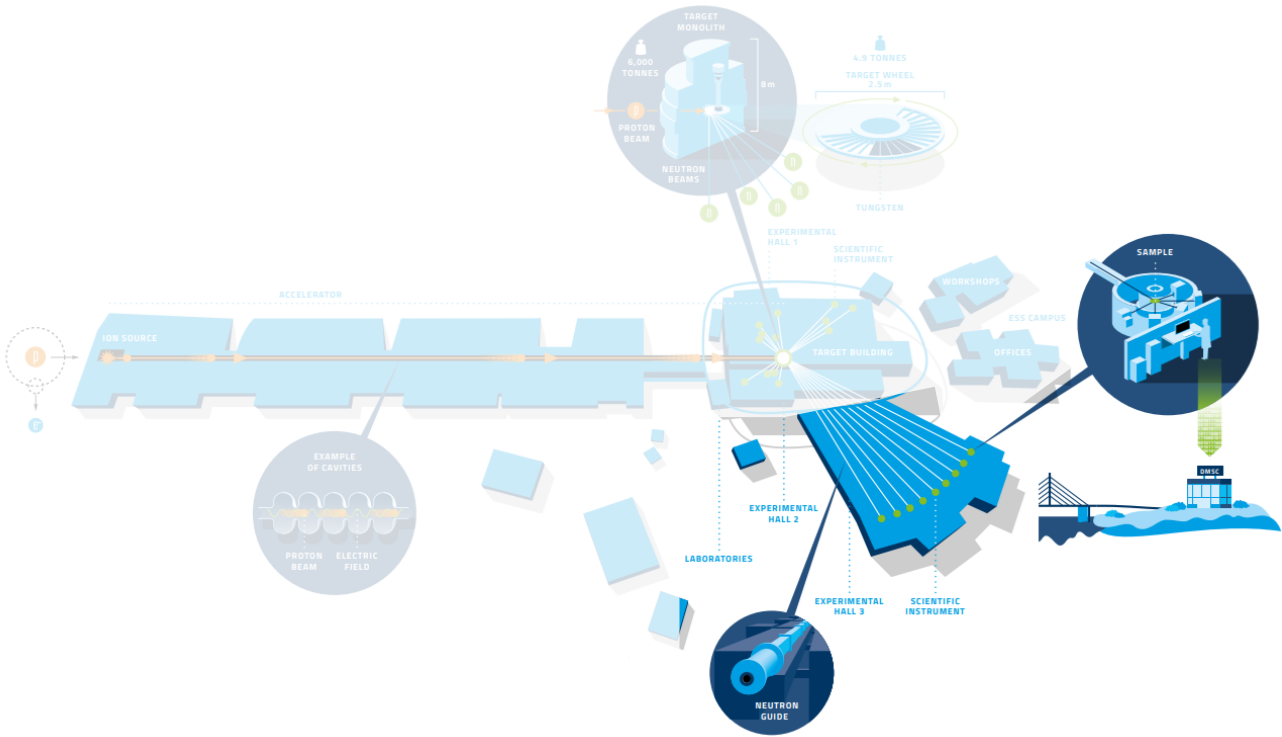
ESS Structure



ESS Structure



ESS Structure

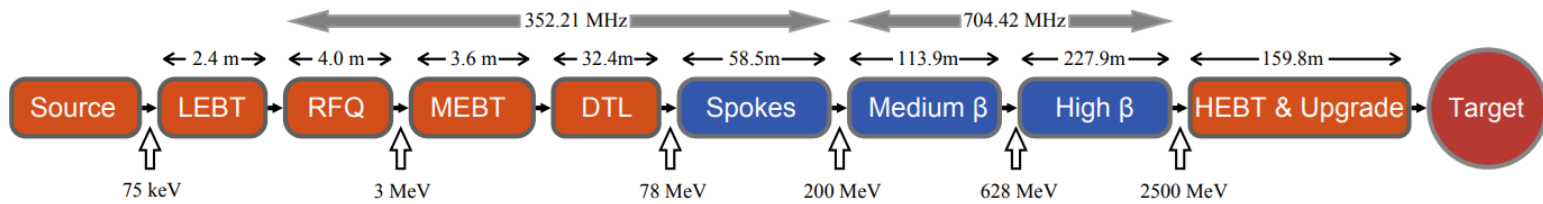


ESS Accelerator Design

- 2.5 GeV Proton Accelerator, pulsing at 12 Hz
- Average pulse current of 50mA, giving power of 5 MW
- Linear design to minimise losses and give better timing control



[\(ESS Website\)](#)



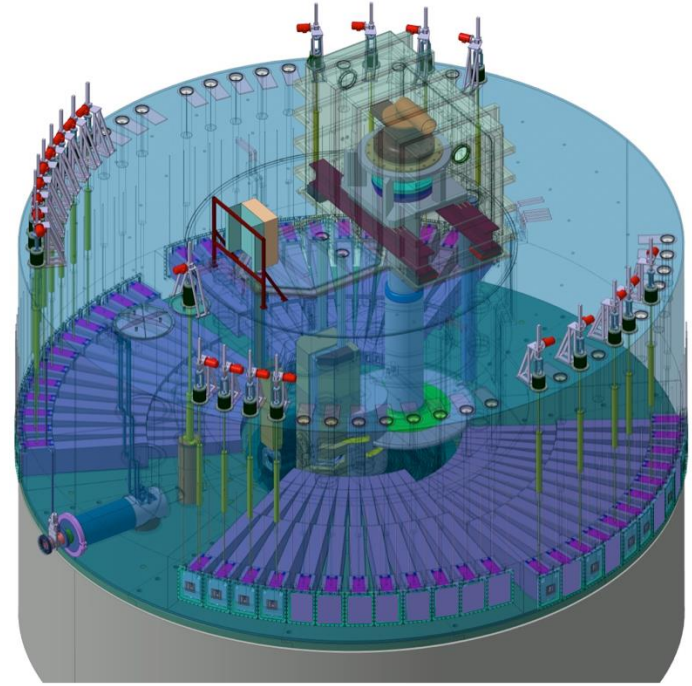
[\(ESS Technical Design Report\)](#)

ESS Target Design

- Tungsten target built from 33 sectors
- Constantly rotating to avoid melting
- Embedded in 6,000 ton steel “Monolith”



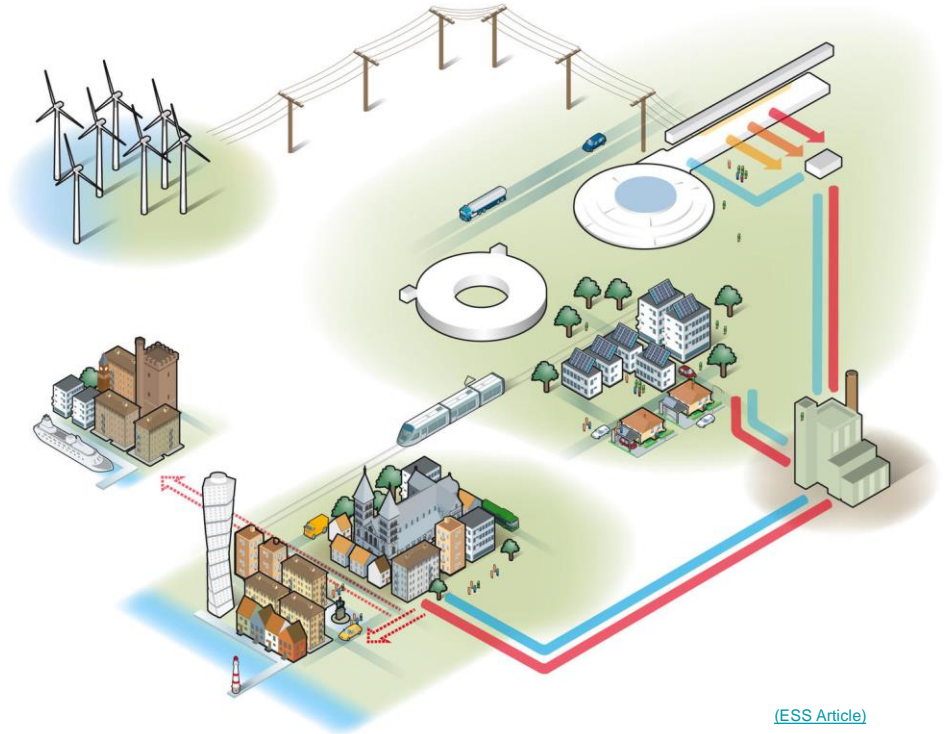
[\(ESS Website\)](#)



[\(ESS Website\)](#)

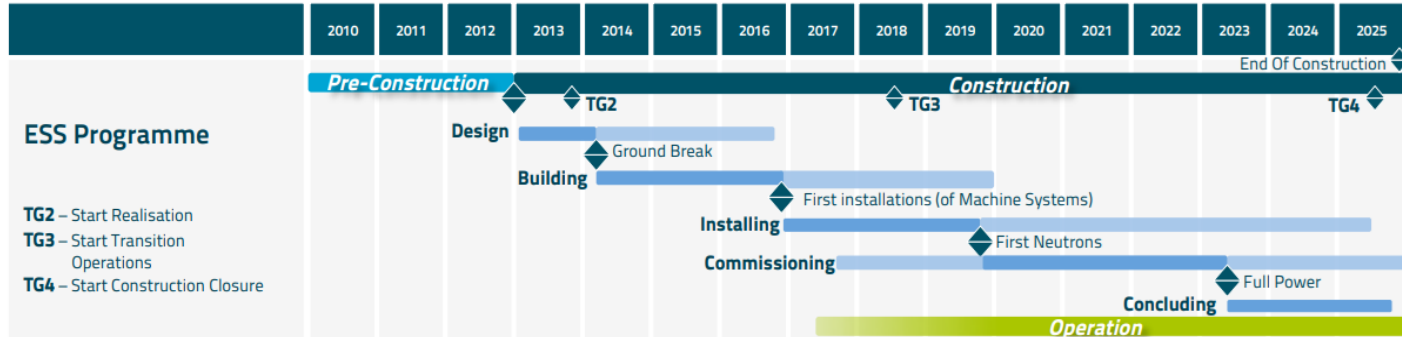
Environmental Innovations

- Aim to become world's first completely sustainable large-scale research centre
- Powered by renewable energy
- Excess heat will be used to heat water for the towns of Malmo and Lund
- Excellent example of accelerator design innovation



[\(ESS Article\)](#)

ESS Timeline



- Facility is a bit behind schedule compared to technical design report timeline
- Expected to commence full operation in 2028.

Thank You

