



**EUROPEAN
SPALLATION
SOURCE**



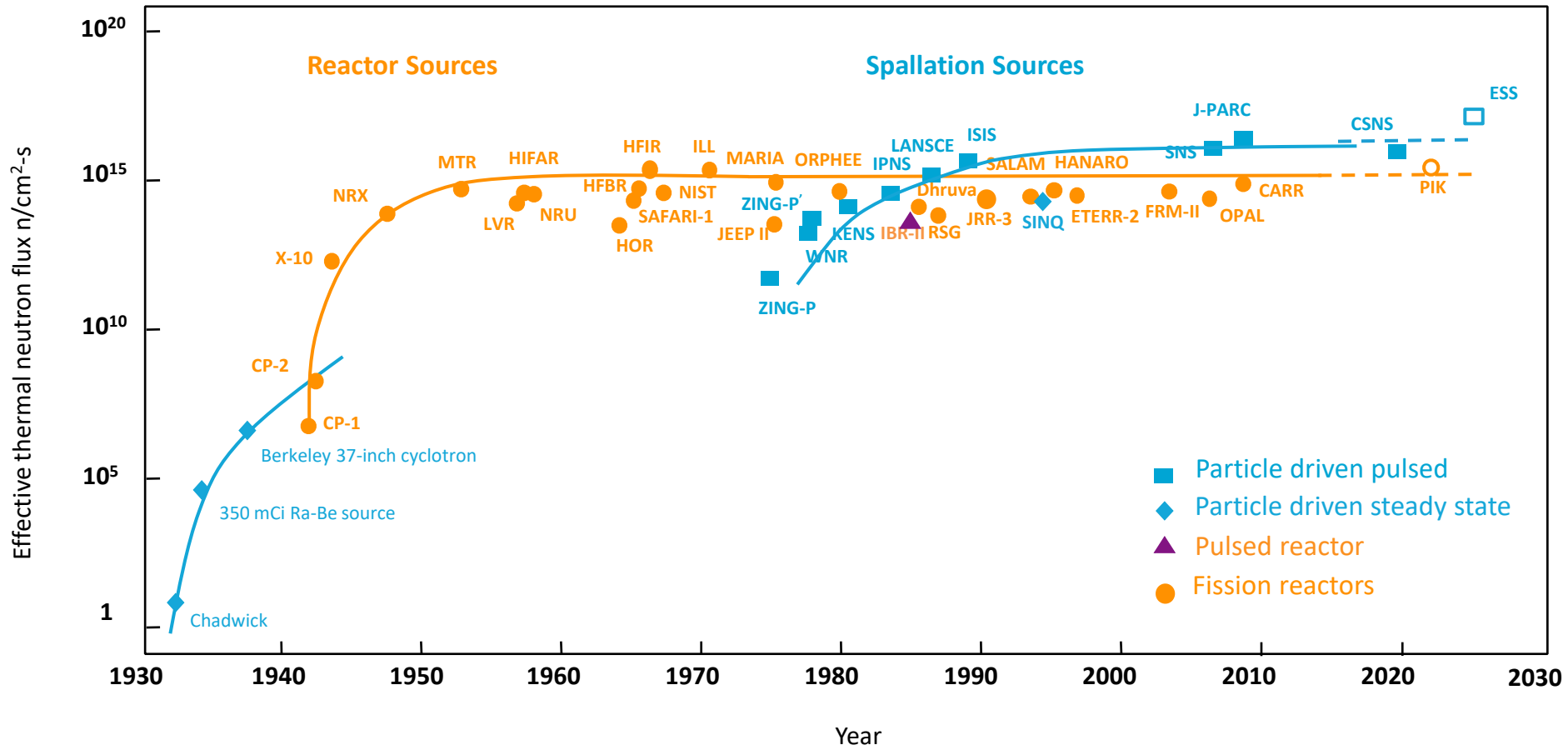
The ESS and prospects for new neutron sources in Europe

Canadian Neutron Initiative roundtable towards a National Neutron Strategy

ANDREAS SCHREYER, DIRECTOR FOR SCIENCE, ESS

16 DECEMBER 2020

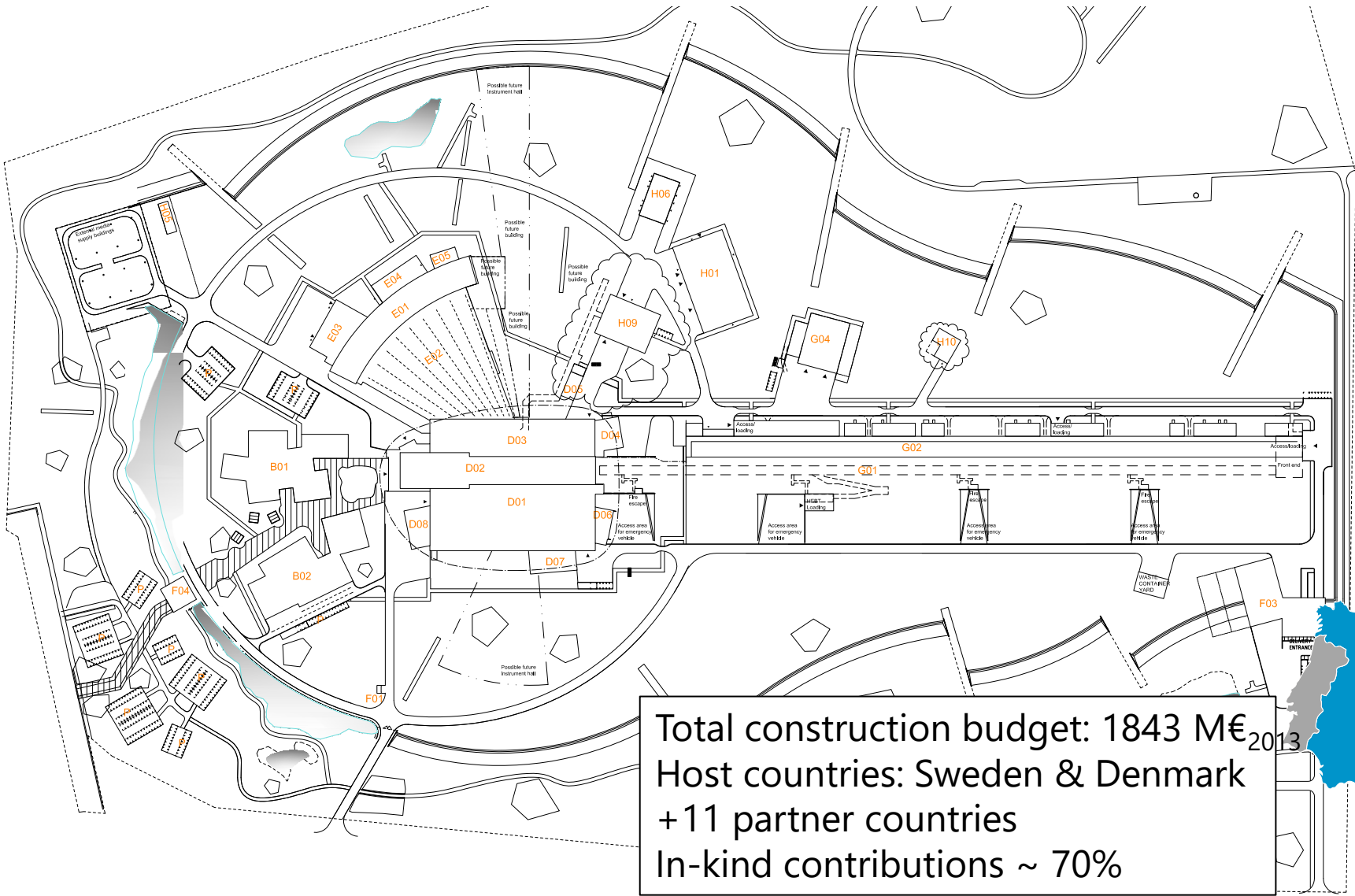
Neutron facilities – reactors and particle driven



(Updated from *Neutron Scattering*, K. Skold and D. L. Price, eds., Academic Press, 1986)



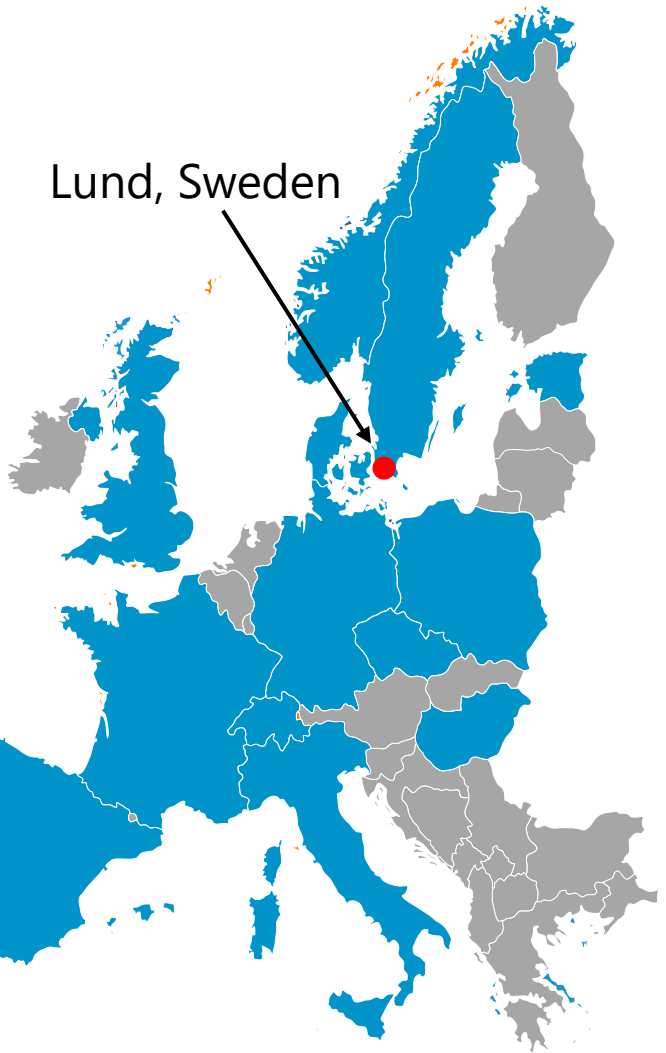
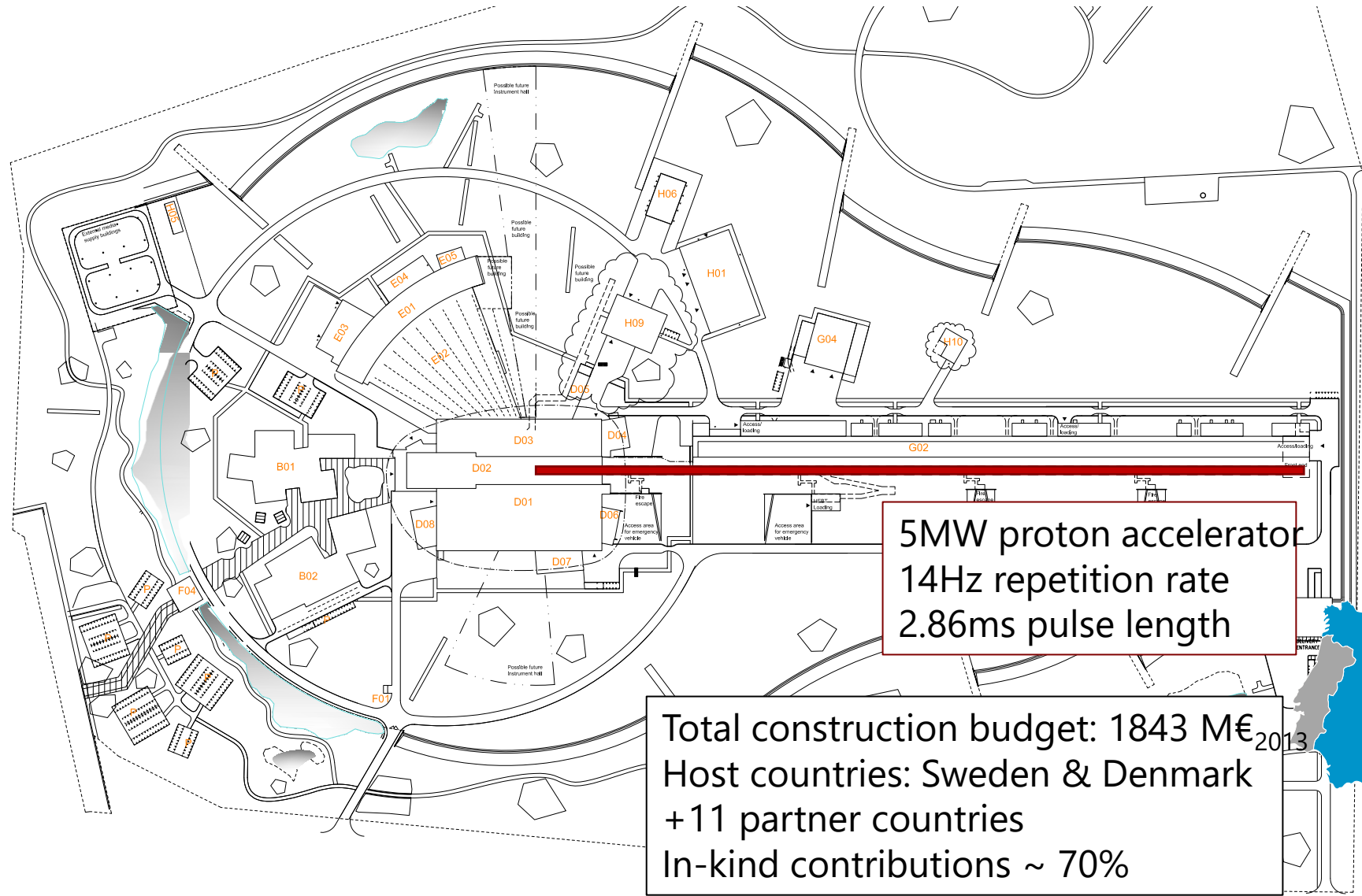
ESS: The Next-Generation Neutron Source



Total construction budget: 1843 M€
Host countries: Sweden & Denmark
+11 partner countries
In-kind contributions ~ 70%

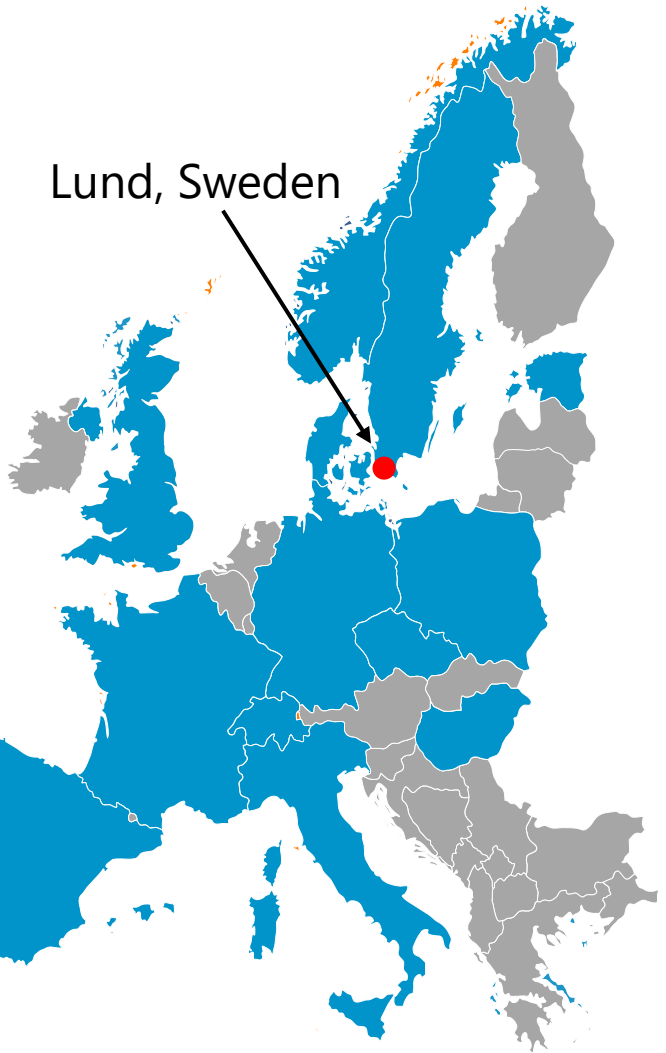
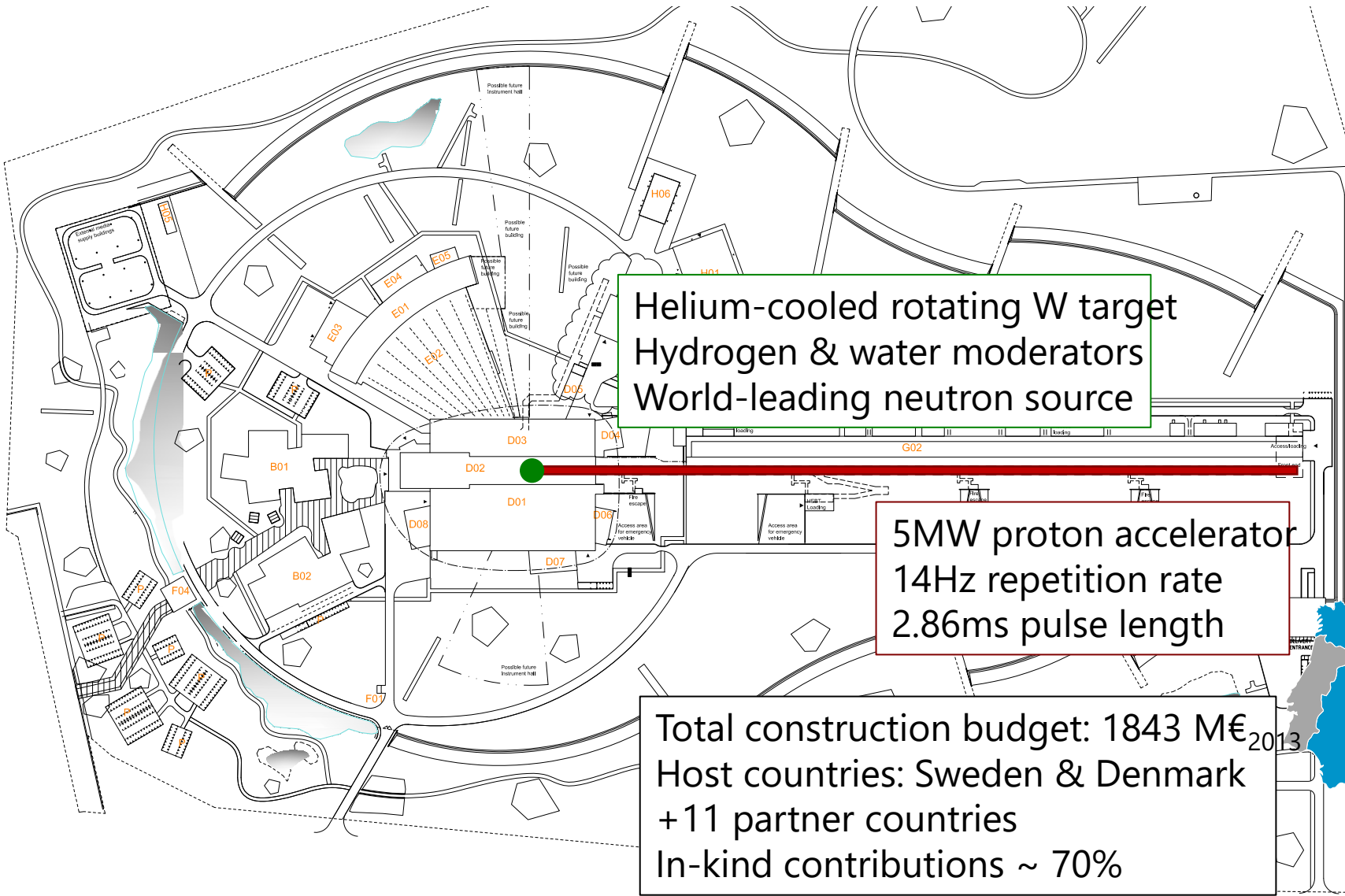


ESS: The Next-Generation Neutron Source



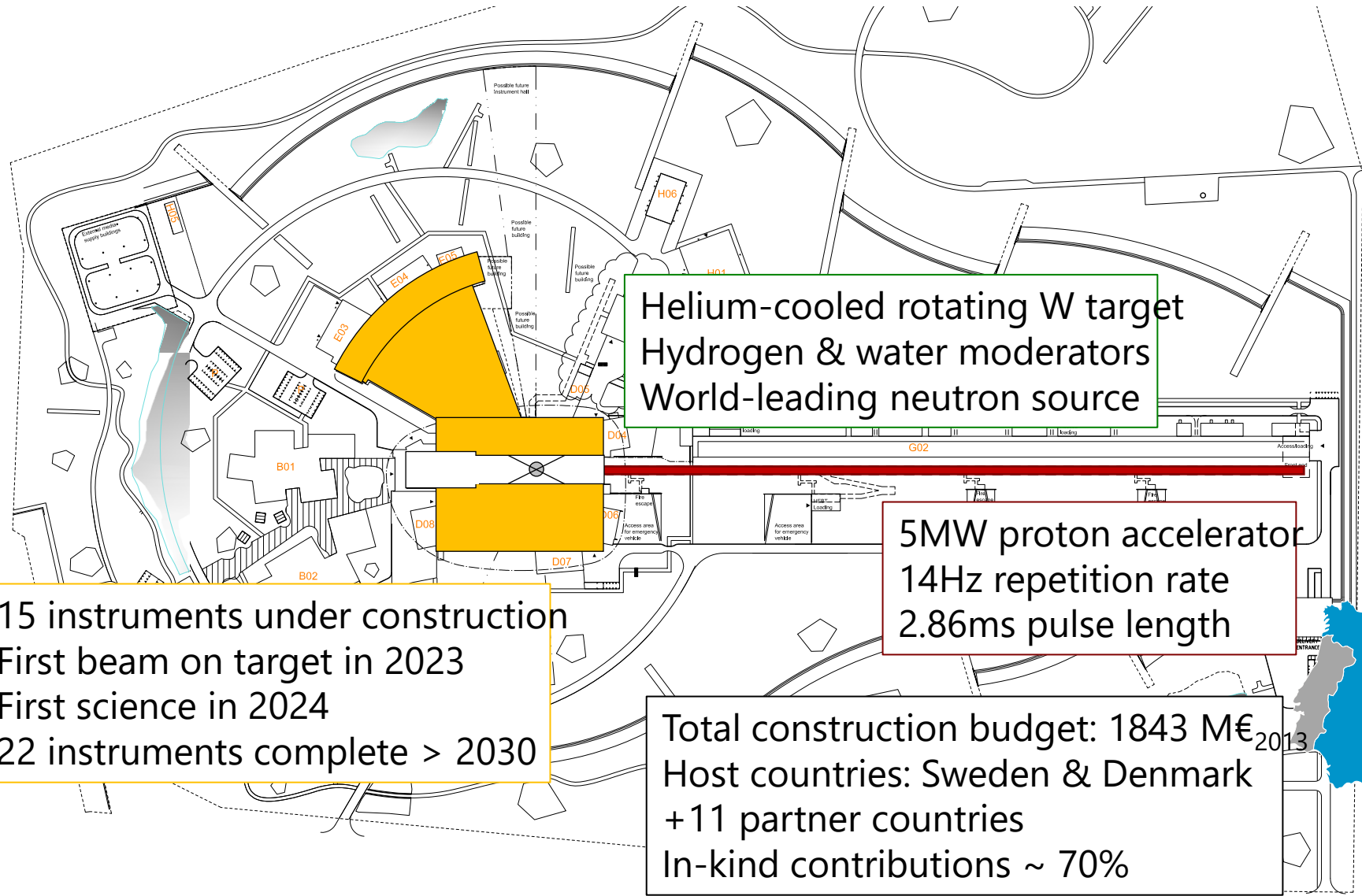


ESS: The Next-Generation Neutron Source





ESS: The Next-Generation Neutron Source



Helium-cooled rotating W target
Hydrogen & water moderators
World-leading neutron source

5MW proton accelerator
14Hz repetition rate
2.86ms pulse length

15 instruments under construction
First beam on target in 2023
First science in 2024
22 instruments complete > 2030

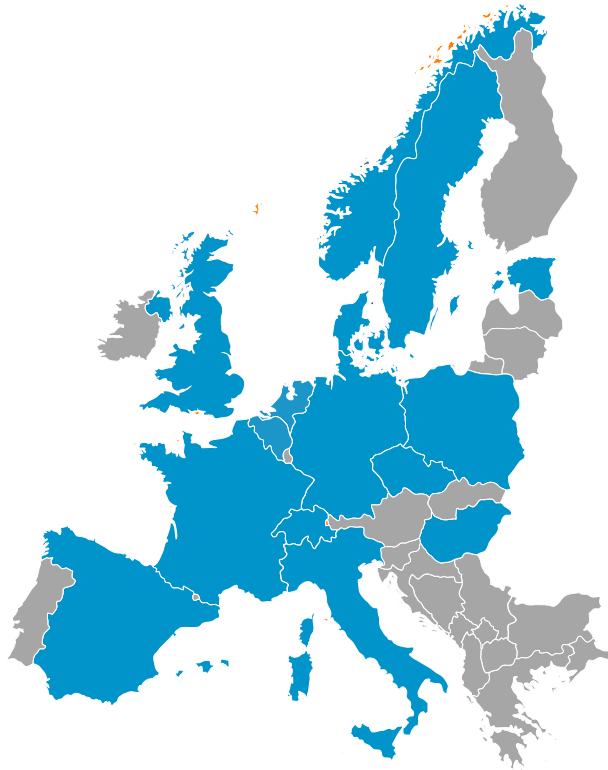
Total construction budget: 1843 M€
Host countries: Sweden & Denmark
+11 partner countries
In-kind contributions ~ 70%



Financing includes cash and deliverables

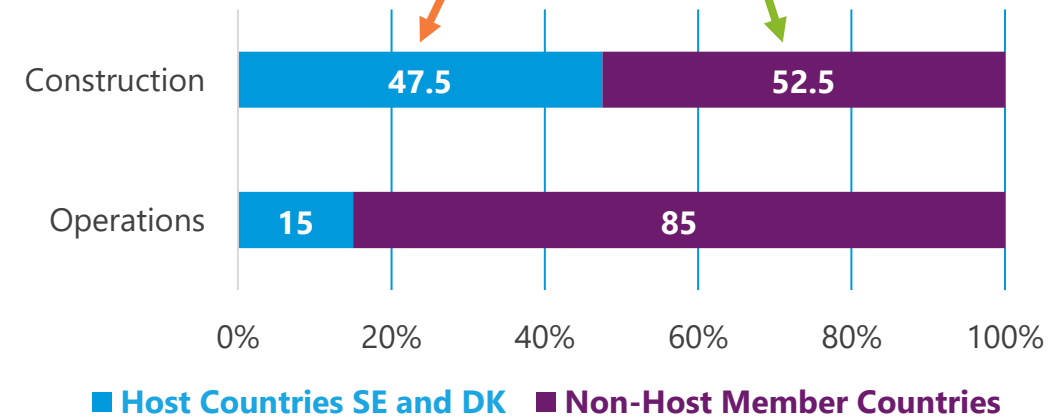
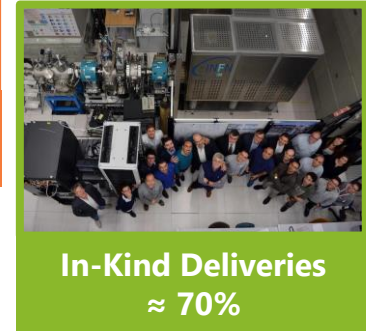


13 European Member Countries



Member country	Contribution in M EUR
Czech Republic	5,52
Denmark	230
Estonia	4,61
France	147
Germany	202,5
Hungary	17,6
Italy	110,6
Norway	46,07
Poland	33,2
Spain	55,29
Sweden	645
Switzerland	64,5
United Kingdom	184,3

1843 M EUR
construction cost (2013 prices)





**75 %
complete**

Project Highlights - Accelerator



First Spoke CM under testing at Uppsala, and the first Medium Beta CM arrived at ESS

- DTL tank #1 finished assembly, starting bead pull.
- Electrical installation in Gallery and Tunnel (cable pulling) continues now in SPK and MBL

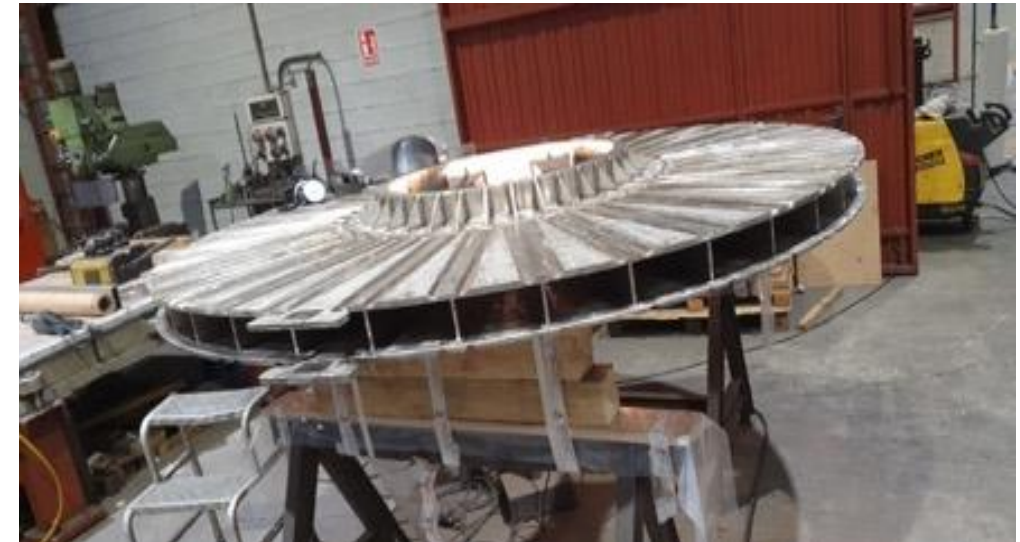
Project Highlights - Target



**Monolith Vessel,
lower & mid parts –**
Delivered Oct 26th



Neutron Beam Port Blocks –
All 39 tubes manufactured and
28 have passed pressure and
leak tests, however 3 found
outside specification.



Target wheel The critical welding
completed and impact on the
geometry is less than 1mm.
Radiography also completed sat.

Project Highlights – Instruments



Bunker Pillar system installing in D03, outer wall shielding began assembly, and electrical infrastructure installation started in E01.

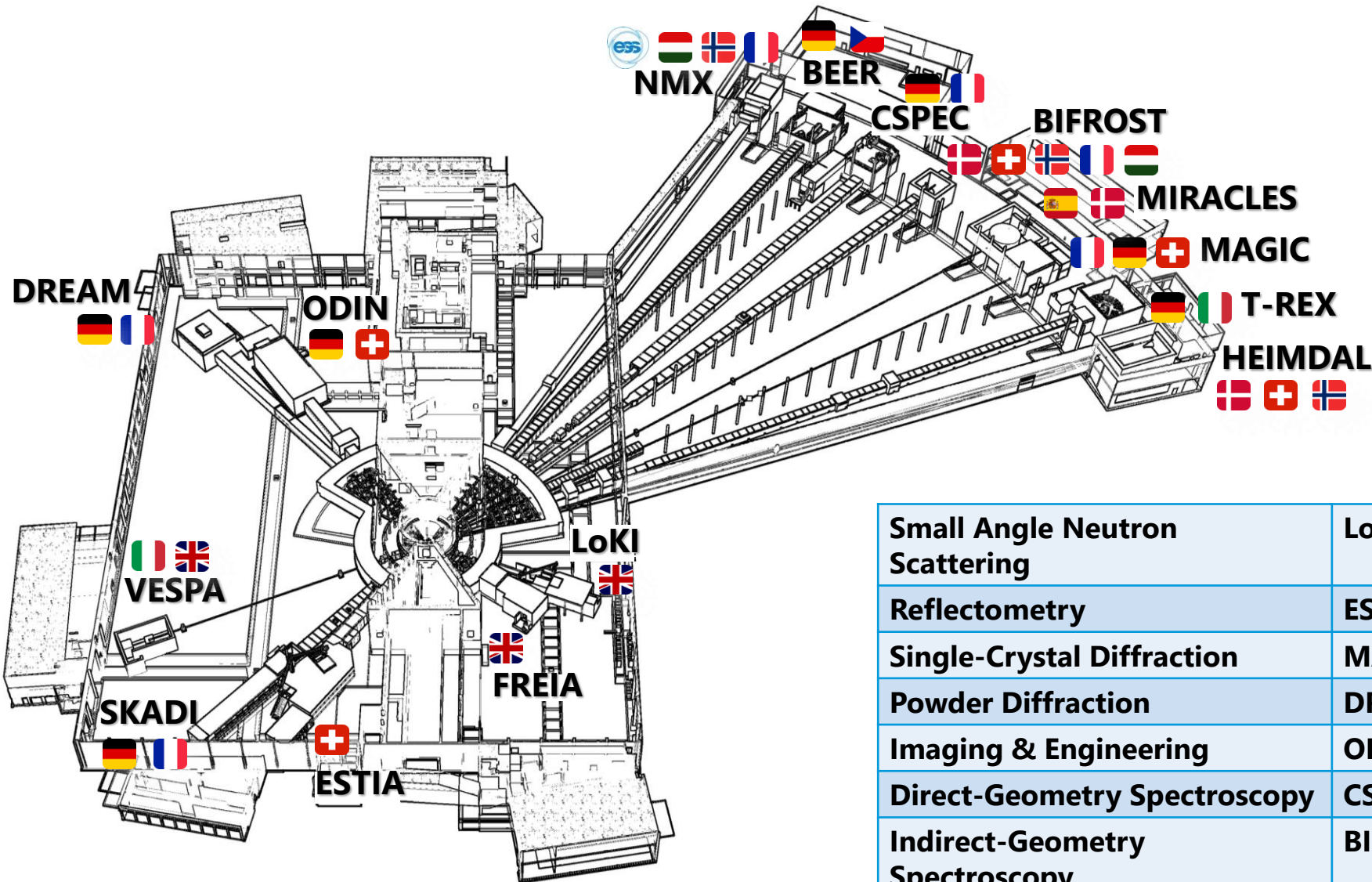


Bifrost cave completed construction



Instrument Suite

15 instruments under construction



Each instrument designed to be world leading

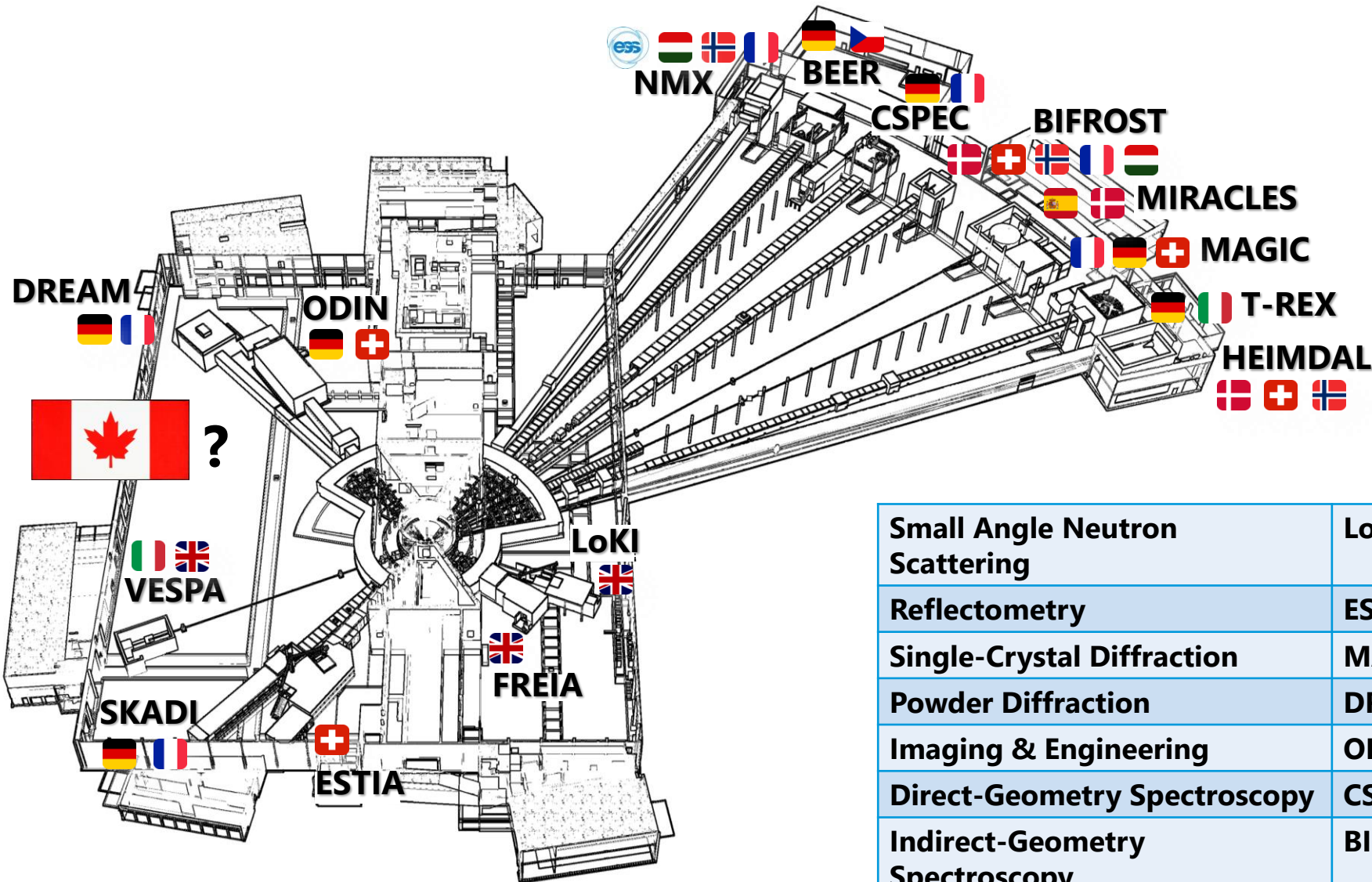
All are built by in kind partners

Small Angle Neutron Scattering	LoKI, SKADI
Reflectometry	ESTIA, FREIA
Single-Crystal Diffraction	MAGiC, NMX
Powder Diffraction	DREAM, HEIMDAL
Imaging & Engineering	ODIN, BEER
Direct-Geometry Spectroscopy	CSPEC, T-REX
Indirect-Geometry Spectroscopy	BIFROST, MIRACLES, VESPA



Instrument Suite

15 instruments under construction



Each instrument designed to be world leading

All are built by in kind partners





Small Angle Neutron Scattering	LoKI, SKADI
Reflectometry	ESTIA, FREIA
Single-Crystal Diffraction	MAGiC, NMX
Powder Diffraction	DREAM, HEIMDAL
Imaging & Engineering	ODIN, BEER
Direct-Geometry Spectroscopy	CSPEC, T-REX
Indirect-Geometry Spectroscopy	BIFROST, MIRACLES, VESPA

15 Instruments under Construction


First Science on 3 instruments, 8 instruments to be in user operation by 2024




Large-Scale Structures





ODIN Imaging Instrument     





SKADI General Purpose SANS    





LoKI Broadband SANS  

Surface Scattering    




FREIA Horizontal Reflectom.   




ESTIA Vertical Reflectometer    





HEIMDAL Powder Diffractometer    

DREAM Powder Diffractometer    

Diffractometer

Monochromatic Powder Diffractometer   





BEER Engineering Diffractometer   

Extreme Conditions Diffractometer    

MAGiC Magnetism Diffractometer  



NMX Macromolecular Diffractometer  




Spectroscopy




CSPEC Cold Chopper Spectrometer    

Broadband Spectrometer    

T-REX Thermal Chopper Spectrometer   

BIFROST Crystal Analyser Spectrometer    









VESPA Vibrational Spectroscopy   

MIRACLES Backscattering Spectrometer   

High-Resolution Spin-Echo    

Wide-Angle Spin-Echo    

Particle Physics Beamline 

	life sciences		magnetism & superconductivity
	soft condensed matter		engineering & geo-sciences
	chemistry of materials		archeology & heritage conservation
	energy research		particle physics

Scientific benefits of ESS (associate) membership



- Get the chance to build an instrument (in-kind)
- Get the chance to join existing instrument teams and contribute to instruments beyond the funded day one versions (in-kind)
- Get the chance to contribute to the neutron source (accelerator/target)
- Get Access to all ESS instruments, Ph.D. program, ...
 - Profit from the new scientific opportunities
 - Pick low hanging fruits !
They will be gone,
if you join too late...

