EUROPEAN SPALLATION SOURCE

Big Science Projects

What is it that makes some a success and others fail?

IPAC 2014

Dresden, 18 June 2014

James H. Yeck
ESS CEO & Director General

www.europeanspallationsource.se

Personal experience with large science projects

- Compact Ignition Tokamak at Princeton Plasma Physics Laboratory (~0.5B) – Cancelled
- Relativistic Heavy Ion Collider at Brookhaven National Lab (~0.75B) – Successful…
- US Large Hadron Collider at CERN: US “In-Kind” Project (~0.75B) – Successful
- IceCube Neutrino Observatory at the South Pole Antarctica (~0.3B) - Successful
- National Synchrotron Light Source II at Brookhaven National Lab (~1B) – Commissioning
- European Spallation Source at a new site in Lund Sweden (~2B) – To be determined
- Plus some experience with DUSEL/LBNE, LIGO, FRIB, and others

Experience from other projects: A few ingredients to success

EUROPEAN SPALLATION SOURCE

Facility must be a priority of the science community!

Funding agency commitments and strong host role

Collaboration leadership enables success of others

Establish realistic goals – “Experience over hope”

Credibility through openness with transparency

Collective ownership of problems & solutions

Populate the organization with experience

IceCube SOUTH POLE NEUTRINO OBSERVATORY

US/LHC

BROOKHAVEN NATIONAL LABORATORY NSLS II

RHIC

Compact Ignition Tokamak at PPPL (~20% contingency)

- Lack of priority within the US plasma science community
- Declining US fusion funding required redirection of existing funding – winners and losers
- Slow decision-making on technology choices – better enemy of good enough
- Host priority conflict between existing operating facility and new project
- Expectation that a better facility/experiment (BPX) @ 1B would be supported
- CIT cancelled, team redirected to BPX, BPX also cancelled

Relativistic Heavy Ion Collider @ BNL (~15%)

- Priority established within US nuclear physics community - long range plan
- Priority of the US funding agency, within annual funding limits
- Highest priority of host lab with generous external resources and support
- Hired key individuals and engaged NP community leadership
- Initial cost and schedule goals unrealistic, but morphed into achievable goals
- Limited scrutiny allowing work on problems in the shadow of the focus on SSC
- Completed when ground rules were changing – to deliver on initial promises!

US LHC (ATLAS, CMS, Machine) @ Labs & Universities (20% & 40%)

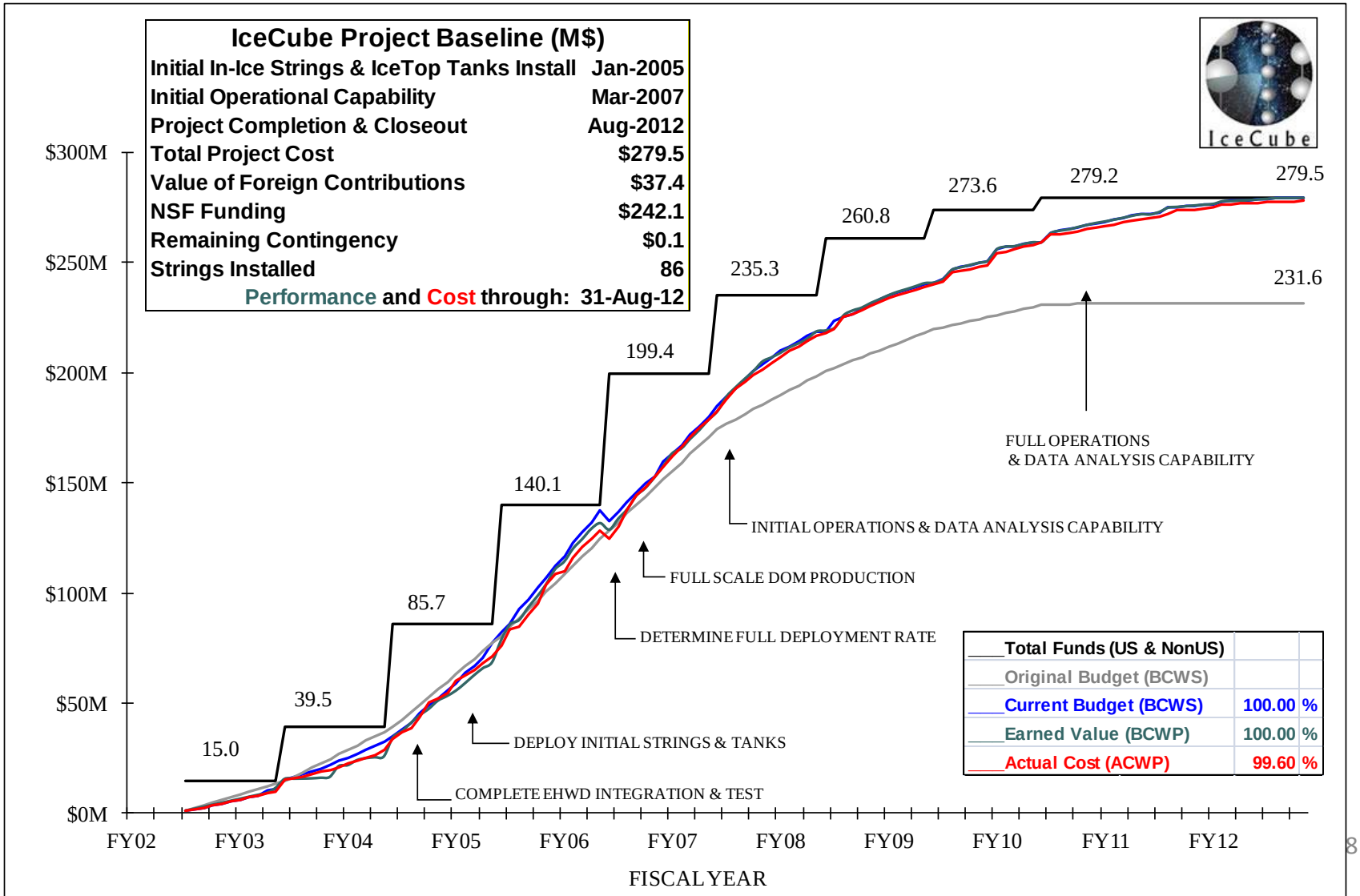
EUROPEAN SPALLATION SOURCE

- Unquestioned priority within the US high energy physics community – post SSC
- Explicit internationally agreed upon annual funding profile
- Priority of host laboratory and universities – people and management support
- Highly experienced and motivated collaborations and leadership
- Maximized US deliverables within a fixed total budget
- Realistic goals including high initial contingency resulting in more deliverables
- Collective ownership in challenges and success

IceCube @ South Pole (~22% contingency)

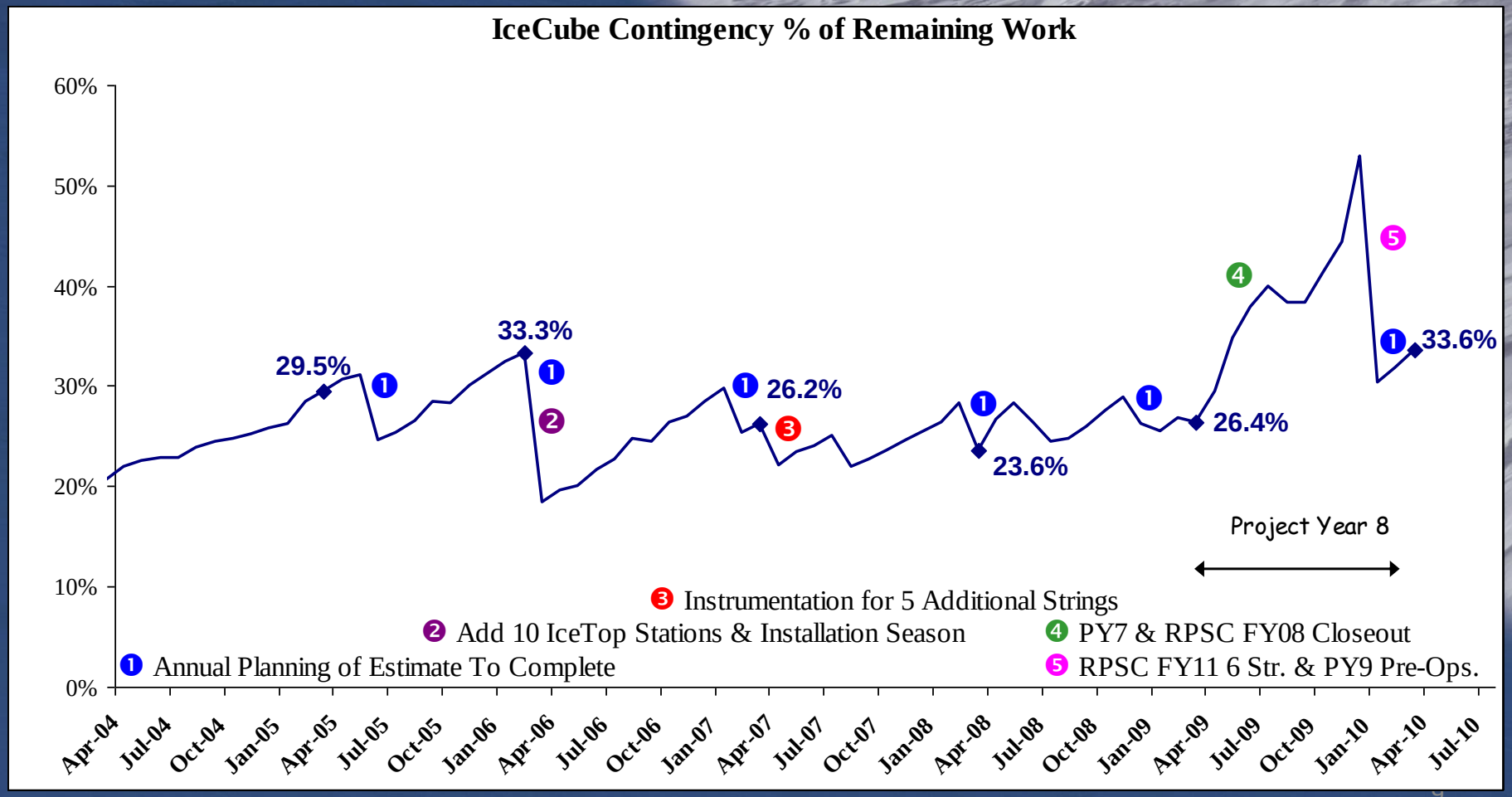
- Academy studies confirmed priority based on new funding (NSF MREFC)
- US National Science Foundation Major Research Equipment and Facility Construction (MREFC) funding – stable annual profile based on requirements
- Priority for NSF South Pole Station (support) and University of Wisconsin-Madison (project and collaboration host) – resources and management
- Unique challenges due to seasonal installation - austral summer ~ 3 months
- Realistic goals - contingency resulted in more 20% more deliverables
- Collective ownership in challenges and success

IceCube Performance (Funding, Plan, Actual)



Contingency Experience

Contingency % of Remaining Work



Dimensions of ESS

A Next Generation Materials Research Infrastructure

EUROPEAN SPALLATION SOURCE

PROJECT/FACILITY

A partnership of 17 European nations committed to the goal of collectively building and operating the world's leading facility for research using neutrons by the second quarter of the 21st century.

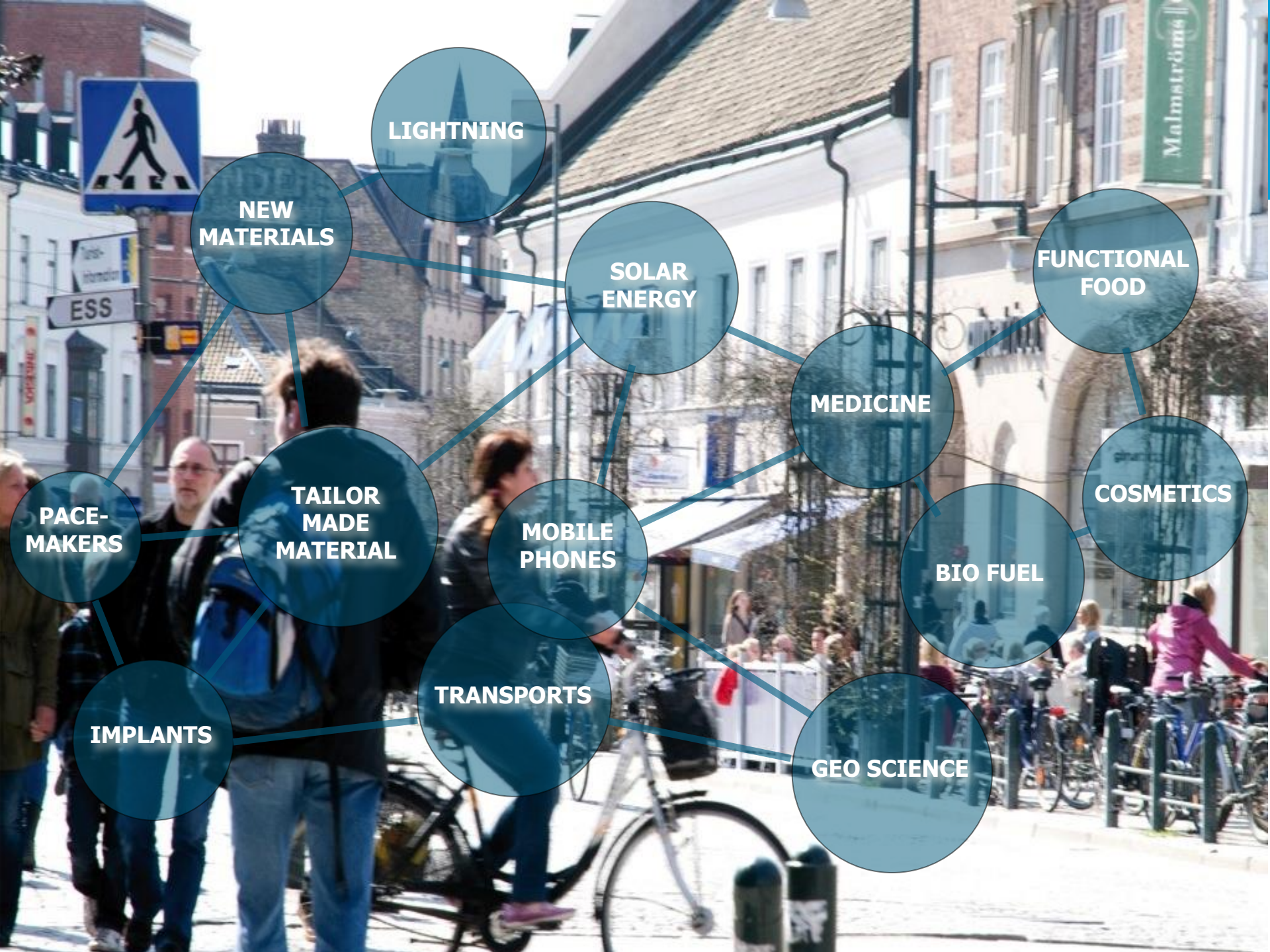
SCIENCE

The most powerful spallation source with the highest flux and realtime data acquisition

- Life science
- Soft condensed matter
- Chemistry of materials
- Energy research
- Magnetism and superconductivity
- Engineering materials and geosciences
- Archaeology and heritage conservation
- Fundamental and particle physics

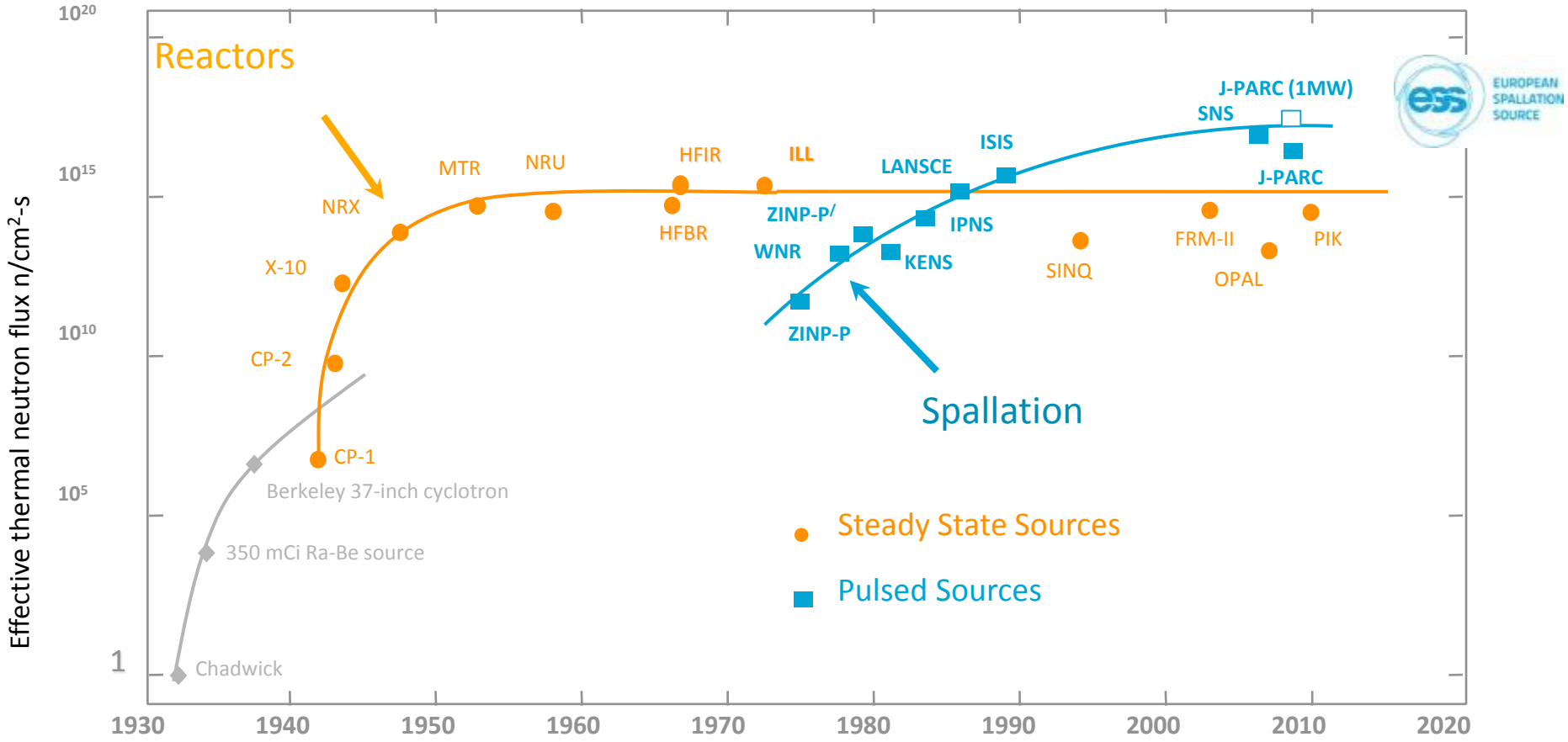
SOCIETY

Research directly related to societal values
Opportunity to benefit from the innovation capacity of industry.
Driver for job creation

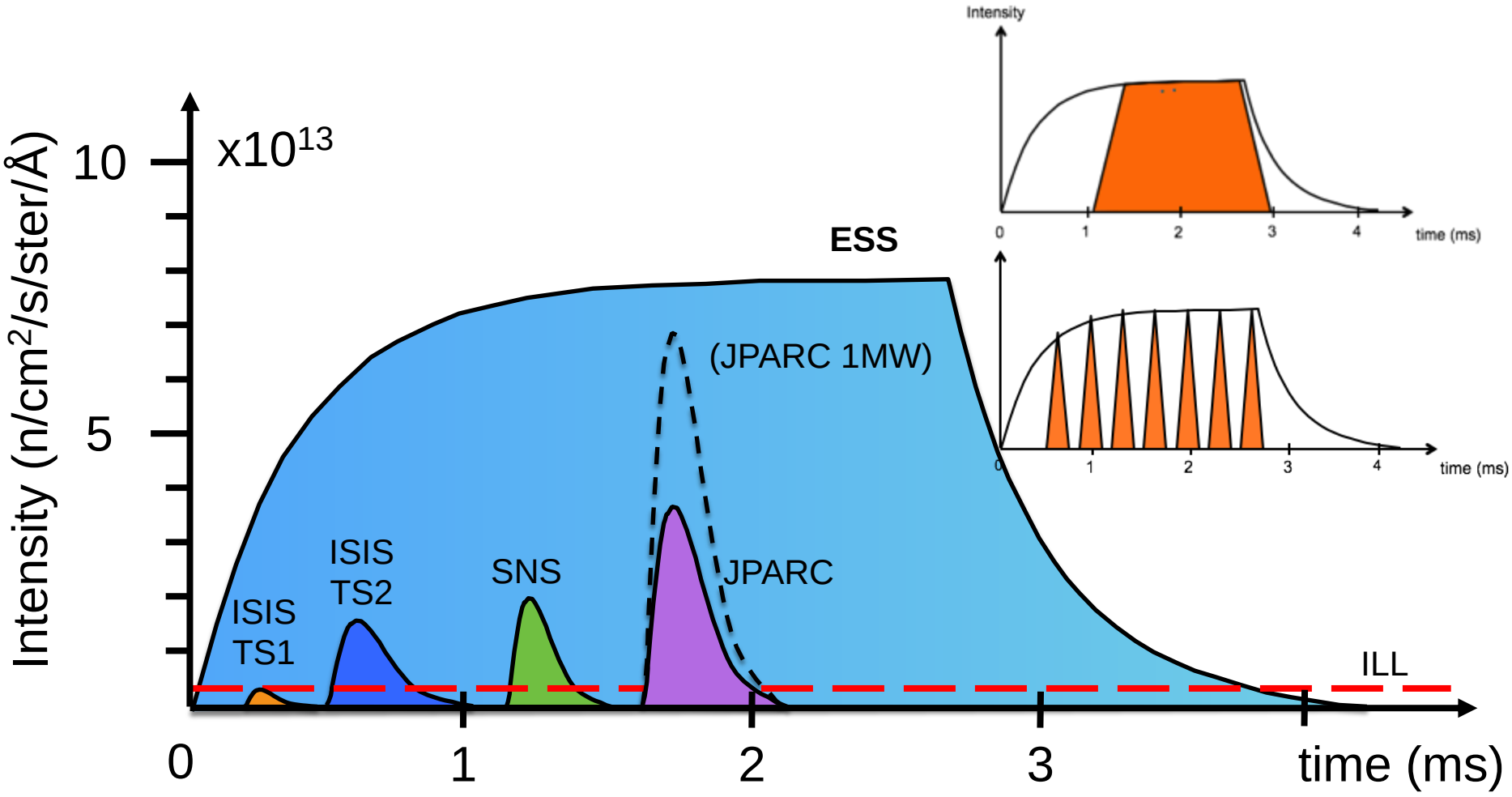

LIGHTNING
NEW MATERIALS
SOLAR ENERGY
FUNCTIONAL FOOD
MEDICINE
COSMETICS
PACE-MAKERS
TAILOR MADE MATERIAL
MOBILE PHONES
BIO FUEL
TRANSPORTS
IMPLANTS
GEO SCIENCE
ESS
Malmstrøms

ESS - Bridging the Neutron Gap

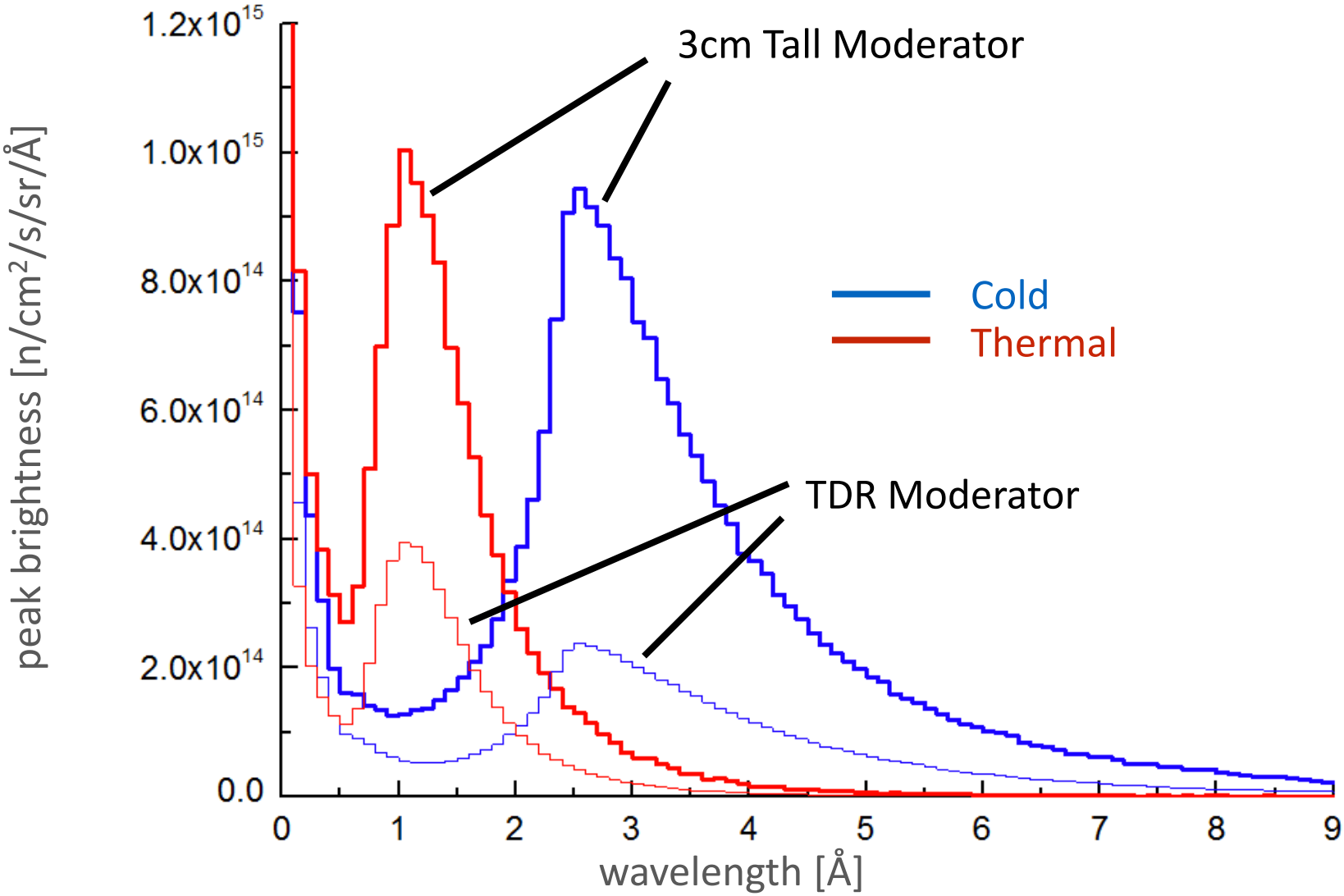
- ESS long pulse is more powerful and 30 - 100 times brighter than existing facilities
- Compliments existing short pulse neutron scattering facilities



ESS long pulse potential



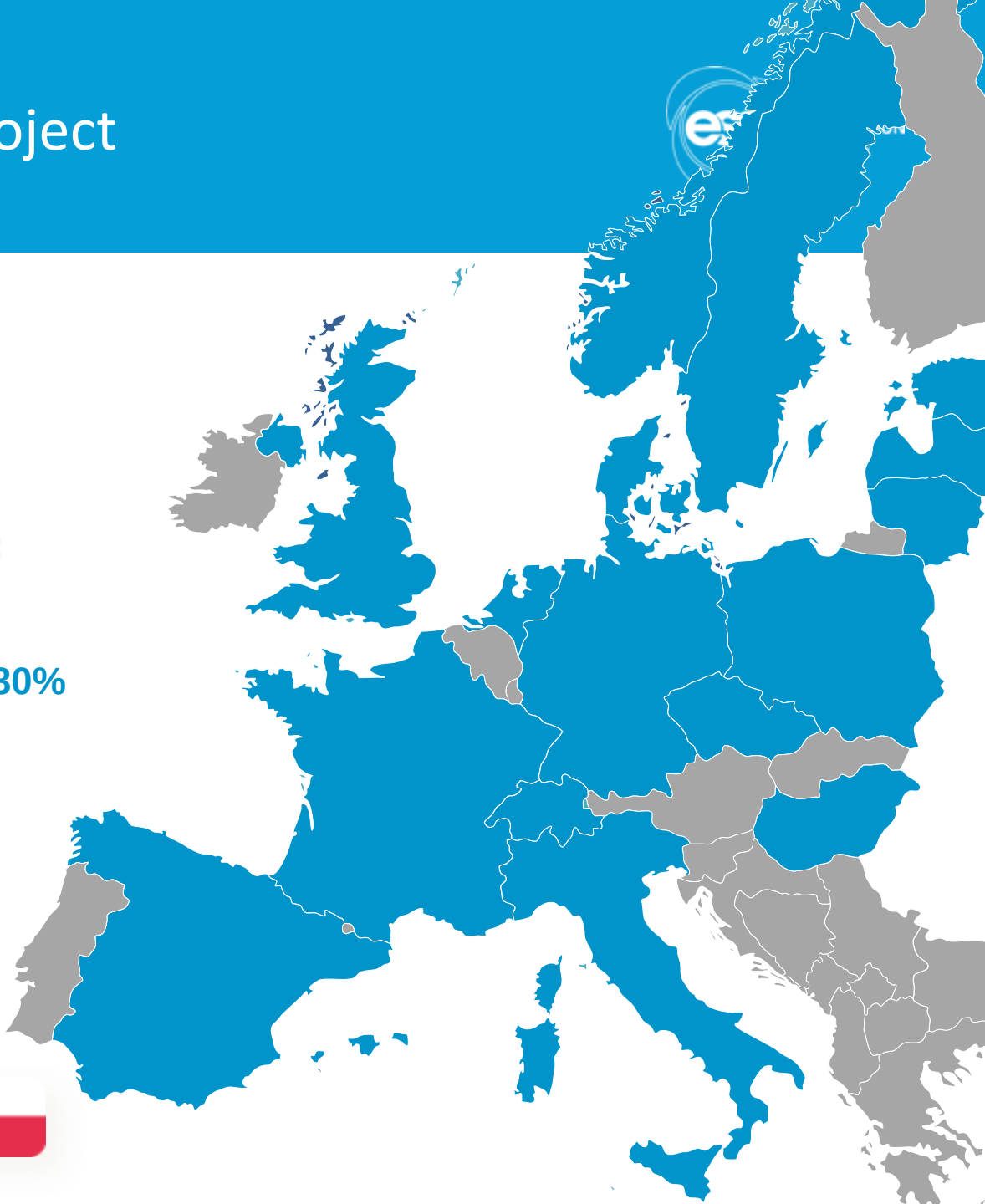
Recent improvement in ESS performance



European science project

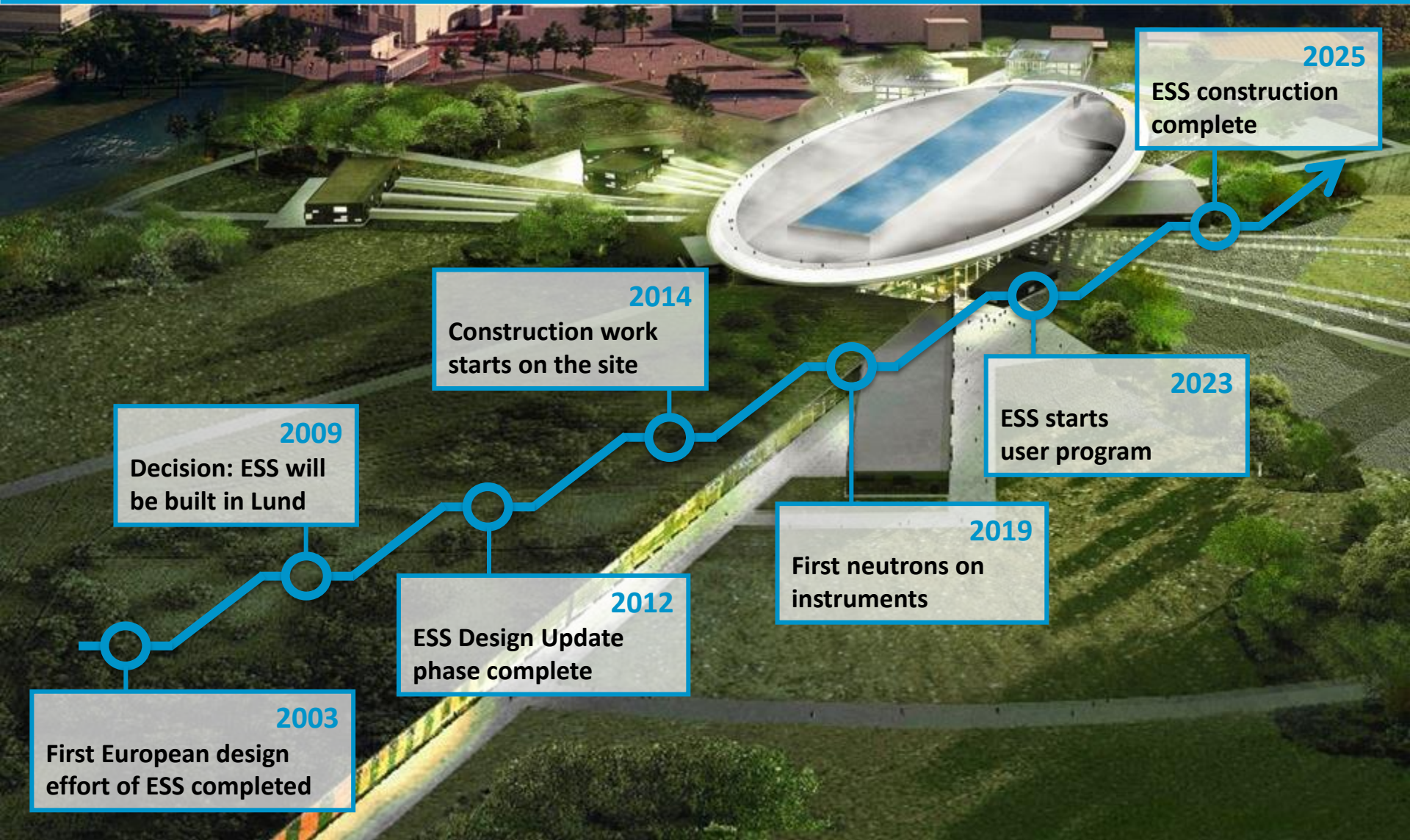
Sweden and Denmark:
47,5% Construction
15% Operations
100% Cash

Partner Countries:
52,5% Construction
85% Operations
IKC/Cash ~ 70% / 30%

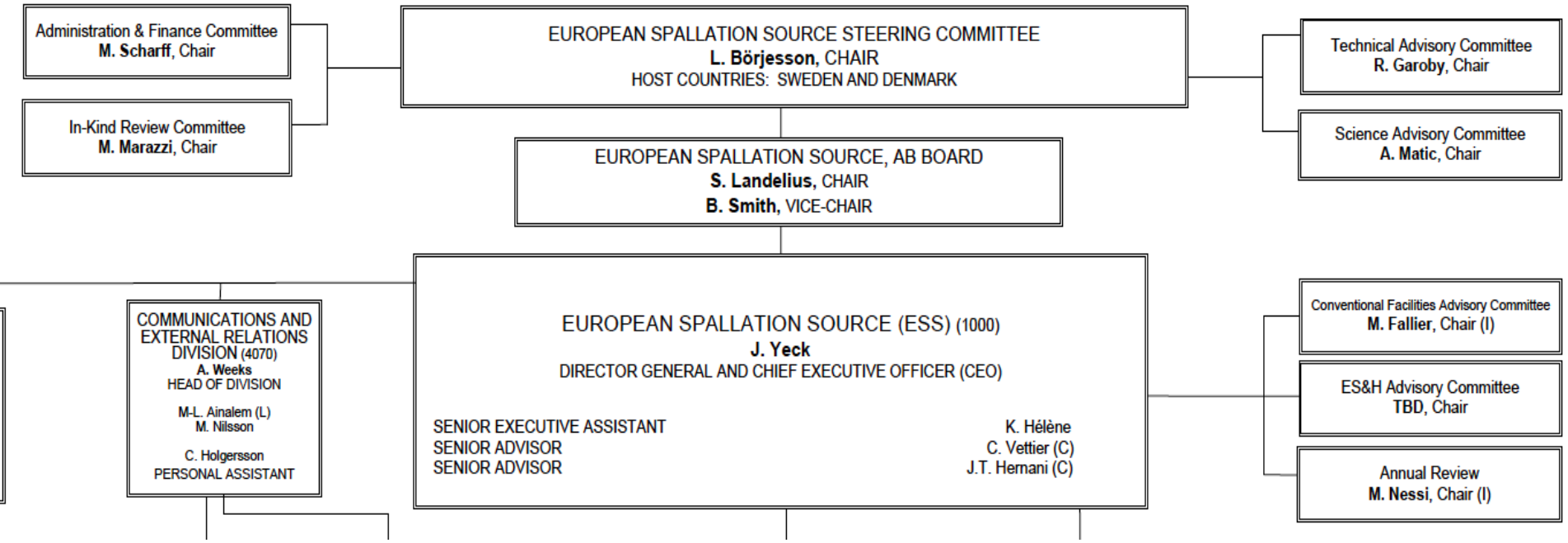


Road to realizing the world's leading facility for research using neutrons

EUROPEAN SPALLATION SOURCE

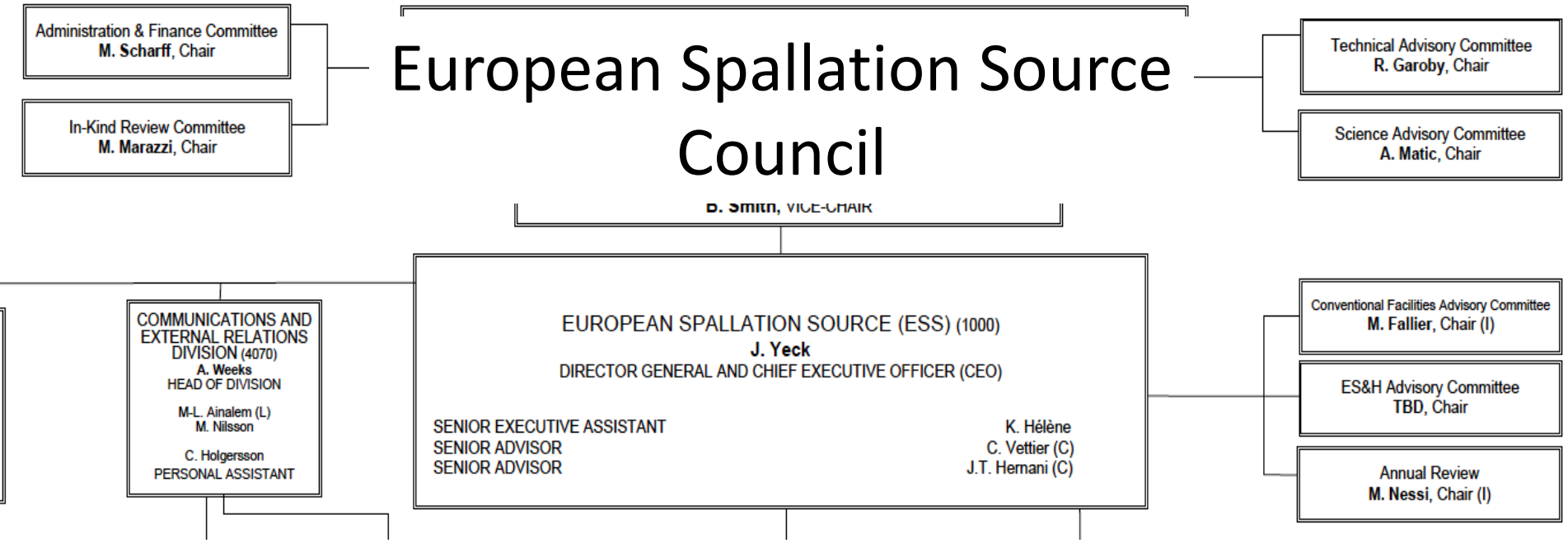


ESS transition from ESS AB to an ERIC



- ESS member countries will submit application this summer to establish a European Research Infrastructure Consortium (ERIC) for ESS. ERIC will be in place in early 2015.

ESS transition from ESS AB to an ERIC

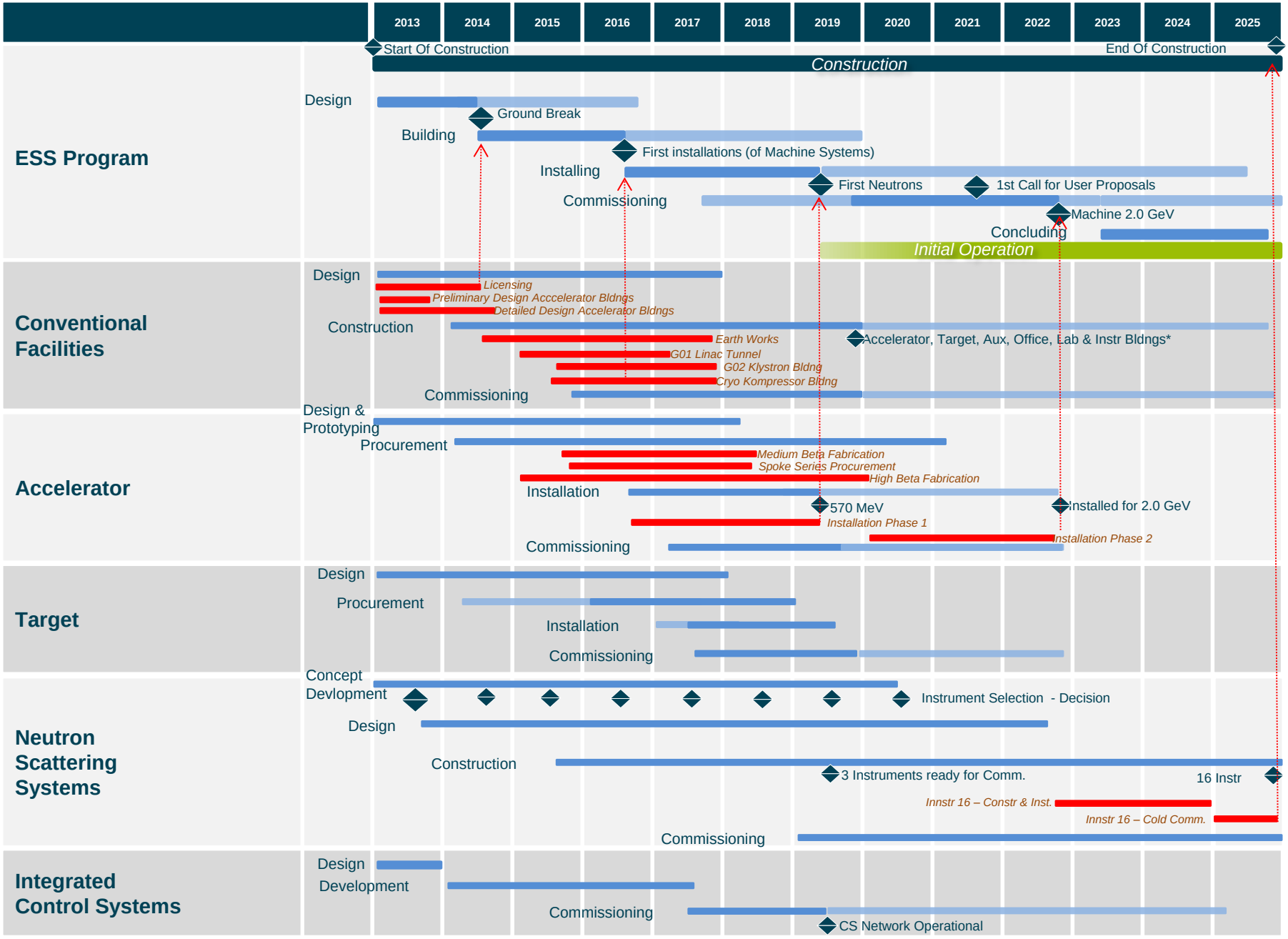


- ESS member countries will submit application this summer to establish a European Research Infrastructure Consortium (ERIC) for ESS. ERIC will be in place in early 2015.

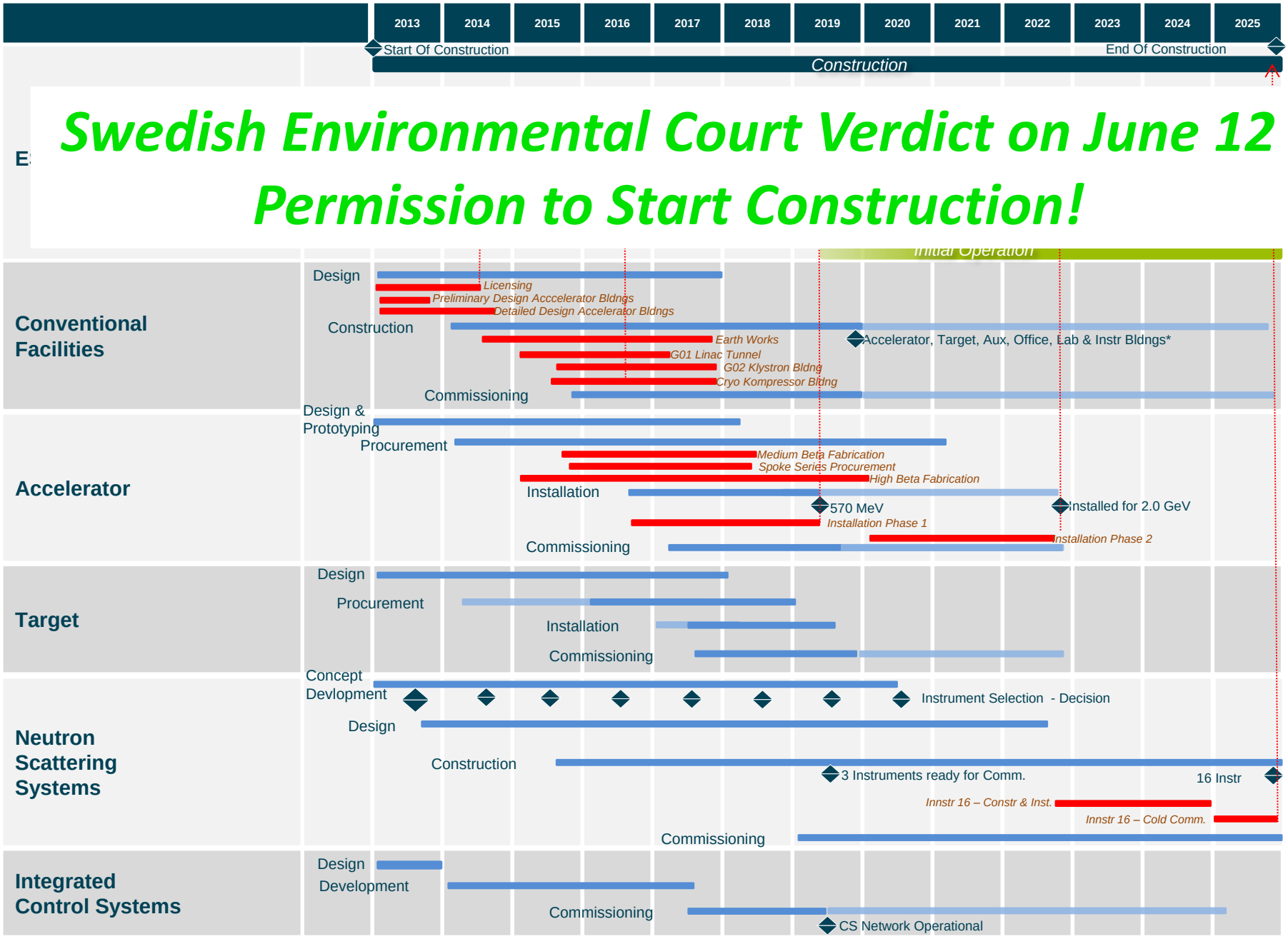
Preparing the project

- Deliver on the Technical Design Report performance and Steering Committee commitments
  - **5 MW accelerator capability**
  - **Construction cost of 1,843 B€**
  - **Operations cost target of 140 M€**
  - **22 “public” instruments**
- Start w/ unconstrained resources (technically limited schedule) and develop credible project execution plans
- Comprehensive review of project baseline and execution plans
- Secure funding and resources and align schedules with the available resources

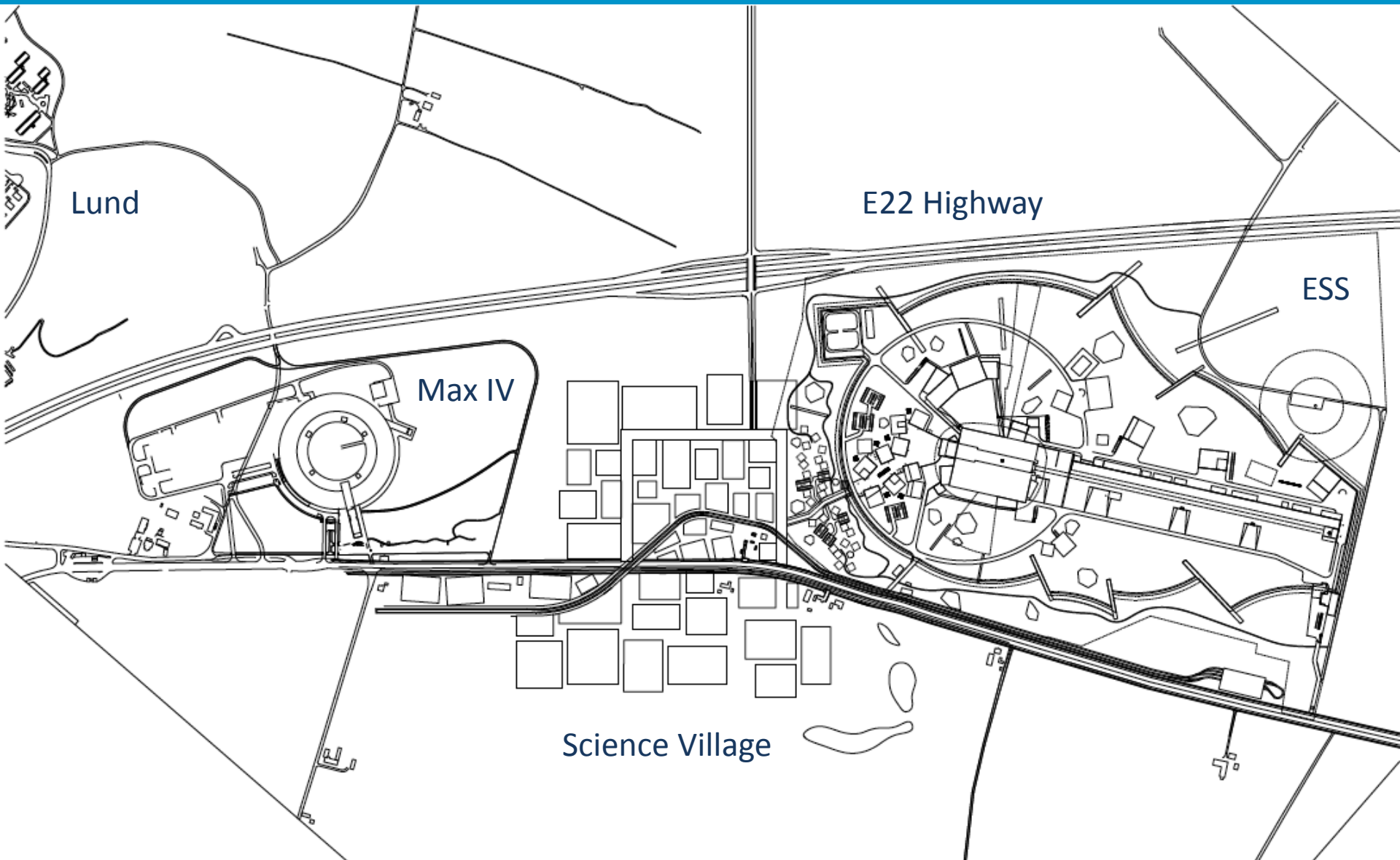
Top-Level ESS Project Schedule



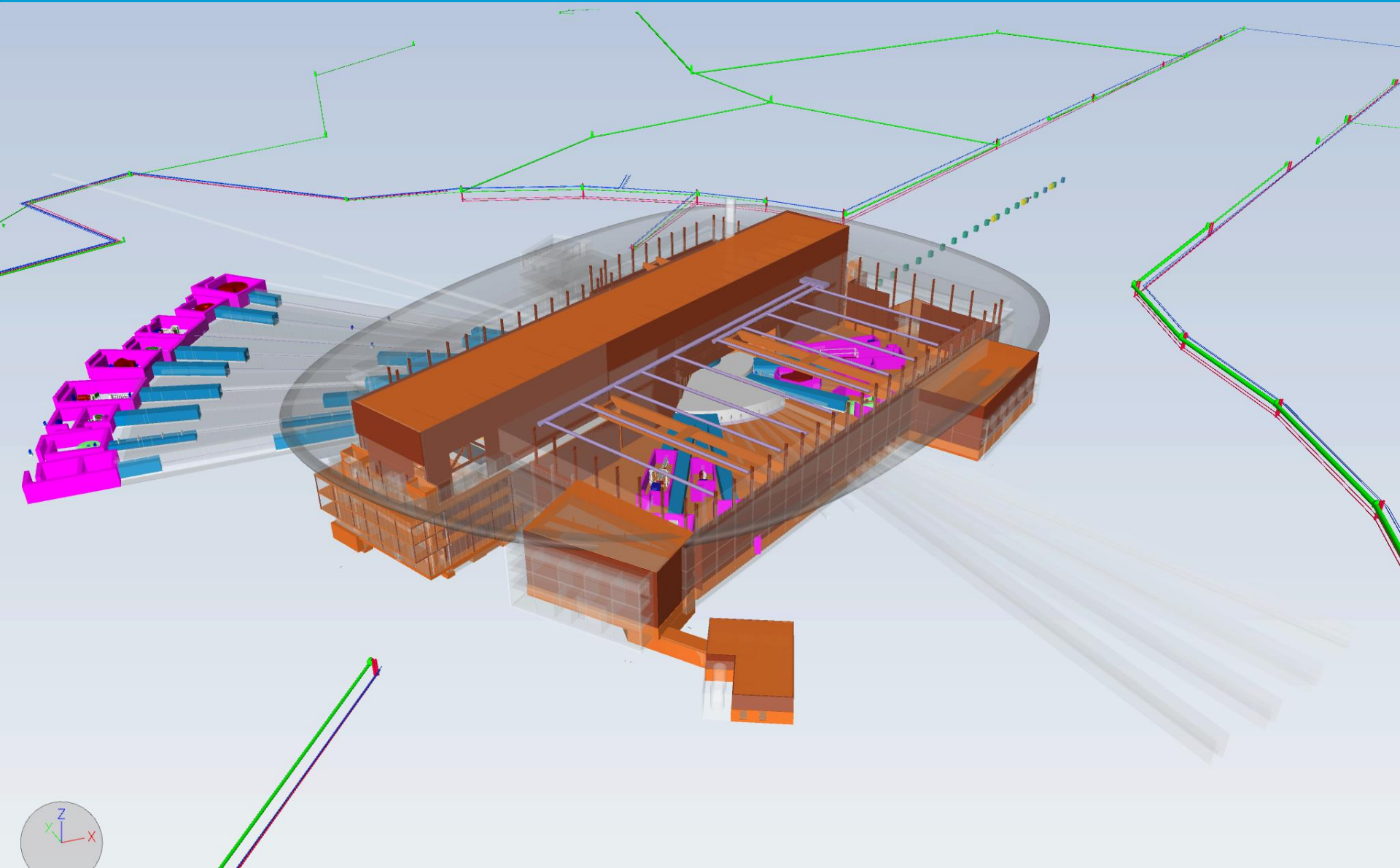
Top-Level ESS Project Schedule



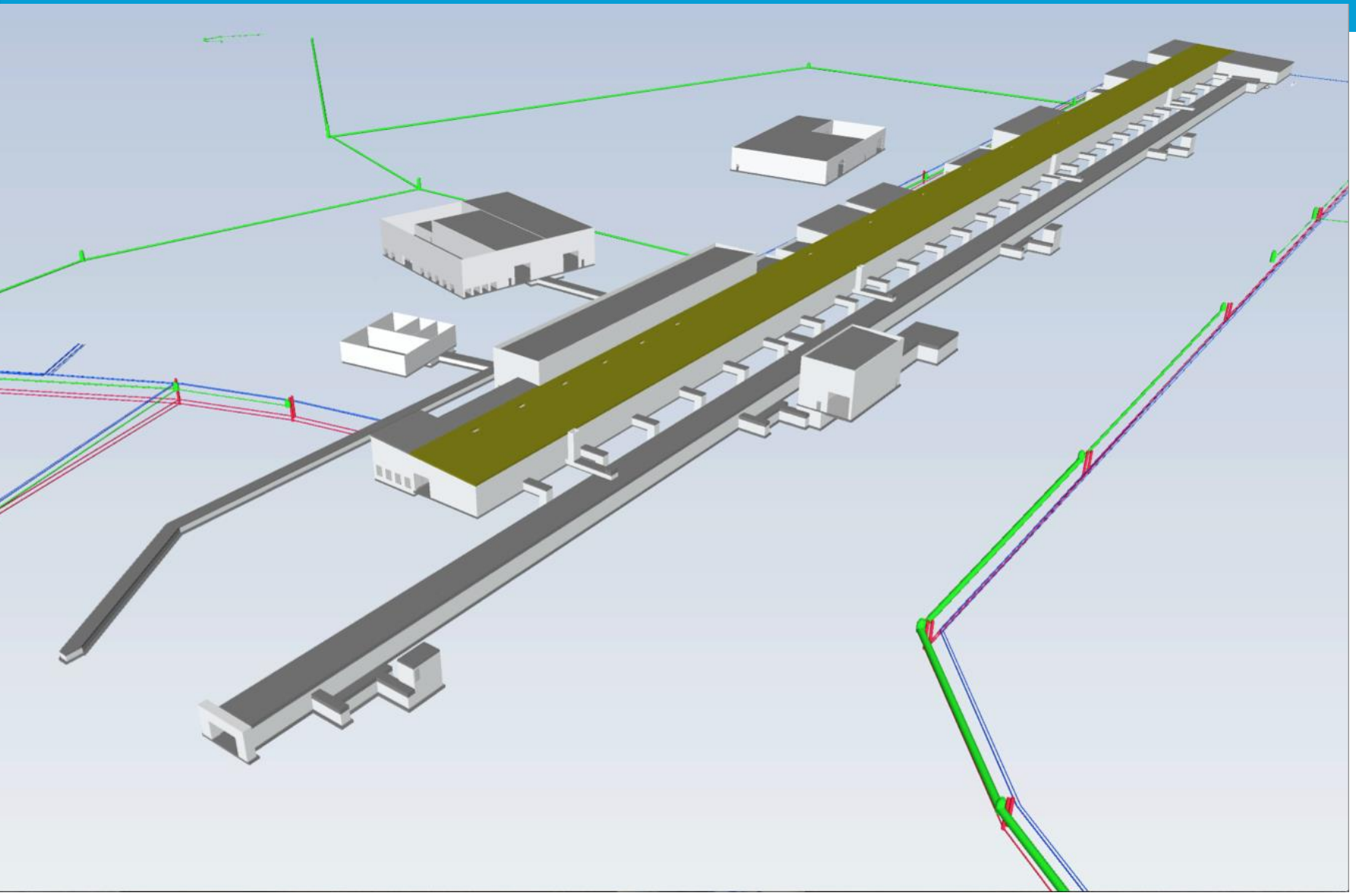
ESS, Max IV and Science Village near Lund



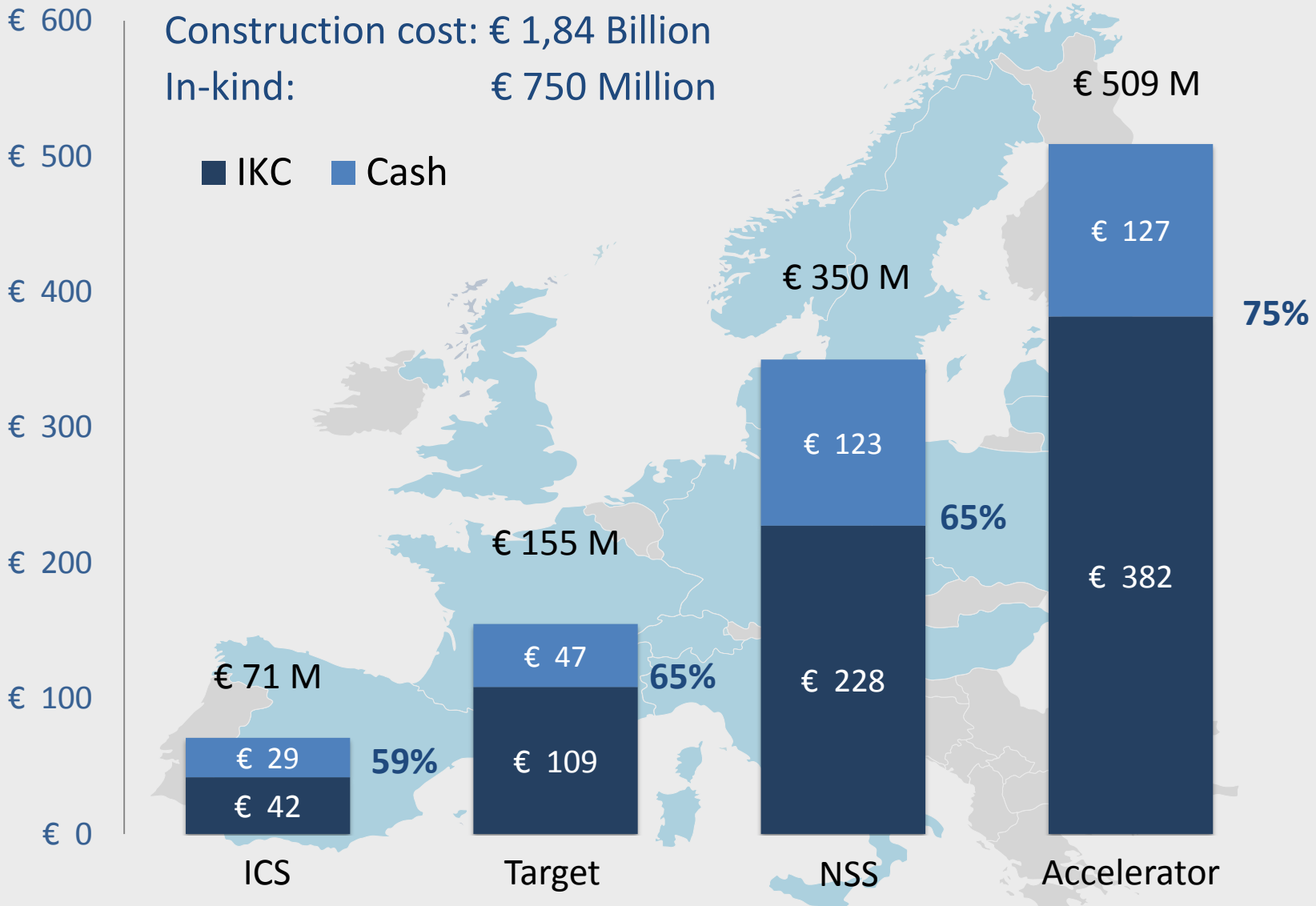
Target station and experimental halls



Accelerator



ESS In-kind Goals



Ingredients to Success

- Facility is a priority of the science community!
- Funding agency commitment and clarity of roles and responsibilities
- Strong host role as an equal partner with the funding agencies
- Populate the organization with high quality people – recruit experience
- Project & Collaboration Leadership
  - Makes timely decisions, seeking consensus whenever possible
  - Serves as an umbrella for the team so they can focus on their jobs
  - Manages expectations and communicate plans and results
- Understand the project – determine characteristics that are common to other large projects and those that are unique
- Establish realistic project goals (experience over hope)
- Maintain credibility with stakeholders through openness and transparency
- Seek collective ownership of problems and solutions

EUROPEAN SPALLATION SOURCE

Thank you for your attention!