

EAM Project at ESS

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Program Manager

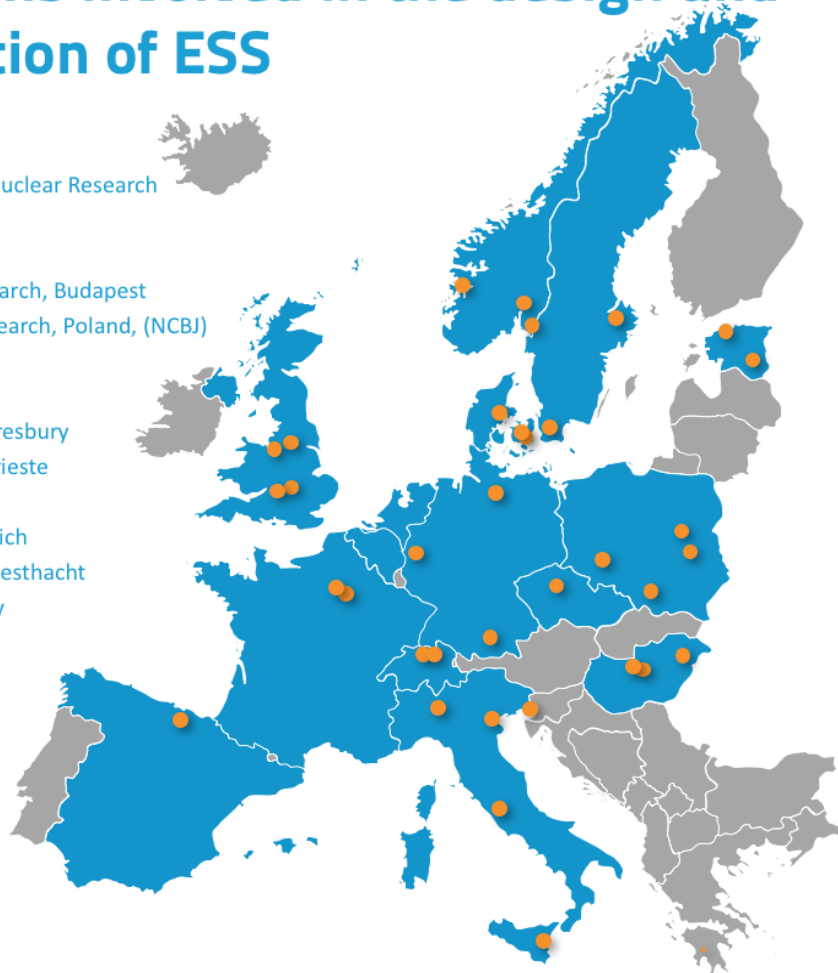
www.europeanspallationsource.se

23 March, 2018

The ESS Collaboration

40+ In-Kind Partners and more than 100 institutions involved in the design and construction of ESS

- Aarhus University
- Atomki - Institute for Nuclear Research
- Bergen University
- CEA Saclay, Paris
- Centre for Energy Research, Budapest
- Centre for Nuclear Research, Poland, (NCBJ)
- CNR, Rome
- CNRS Orsay, Paris
- Cockcroft Institute, Daresbury
- Elettra – Sincrotrone Trieste
- ESS Bilbao
- Forschungszentrum Jülich
- Helmholtz-Zentrum Geesthacht
- Huddersfield University
- IFJ PAN, Krakow
- INFN, Catania
- INFN, Legnaro
- INFN, Milan
- Institute for Energy Research (IFE)



- Rutherford-Appleton Laboratory, Oxford (ISIS)
- Copenhagen University
- Laboratoire Léon Brillouin (LLB)
- Lund University
- Nuclear Physics Institute of the ASCR
- Oslo University
- Paul Scherrer Institute (PSI)
- Polish Electronic Group (PEG)
- Roskilde University
- Tallinn Technical University
- Technical University of Denmark
- Technical University Munich
- Science and Technology Facilities Council, UK
- University of Tartu
- Uppsala University
- WIGNER Research Centre for Physics
- Wroclaw University of Technology
- Warsaw University of Technology
- Zurich University of Applied Sciences (ZHAW)

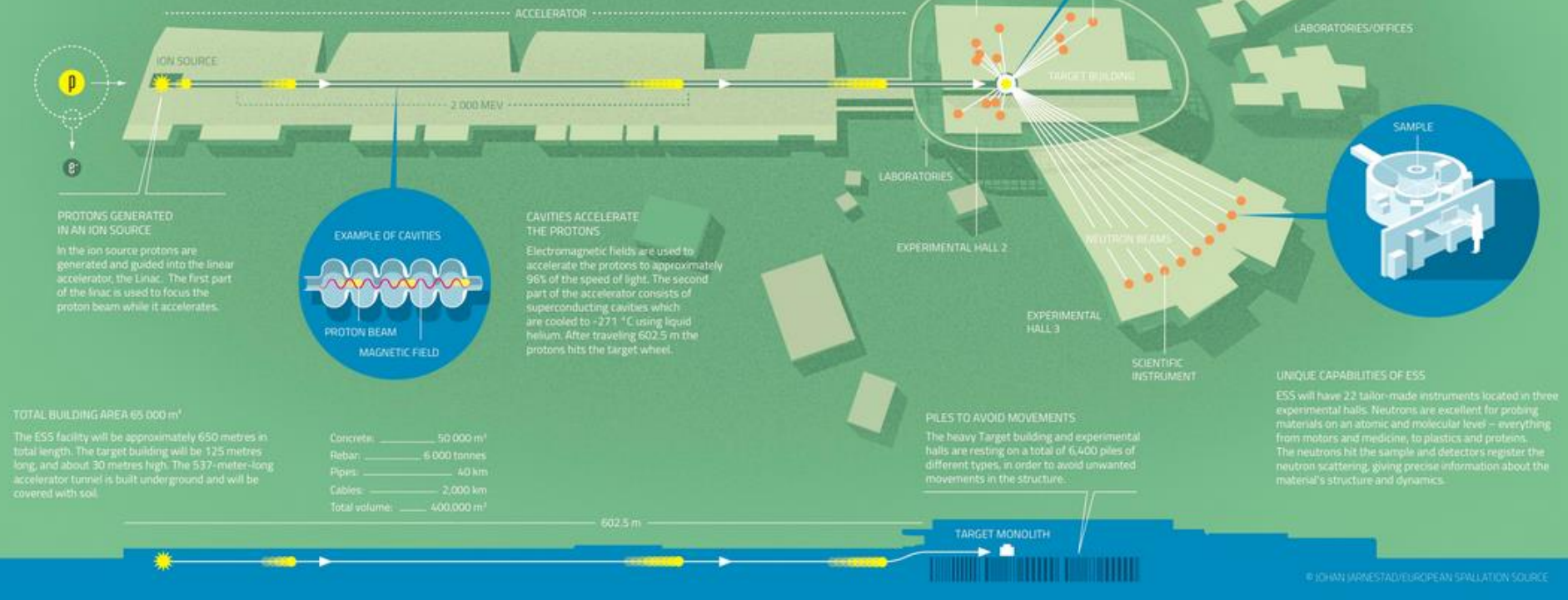
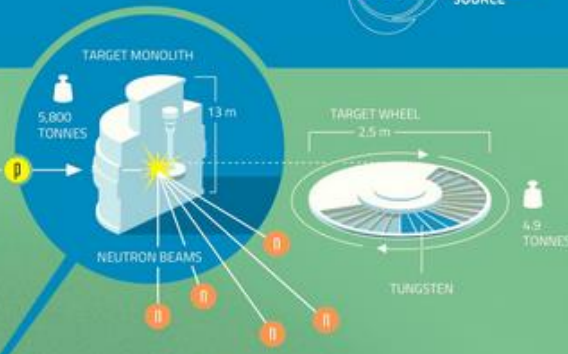
European Spallation Source

The European Spallation Source (ESS) is a multi-disciplinary research centre based on the world's most powerful neutron source. ESS will give scientists new possibilities in a broad range of research, from life science to engineering materials, from heritage conservation to magnetism. ESS is a pan-European project, with Sweden and Denmark serving as host countries. The main research facility is being built in Lund, Sweden, and the Data Management and Software Centre (DMSC) is located in Copenhagen, Denmark.



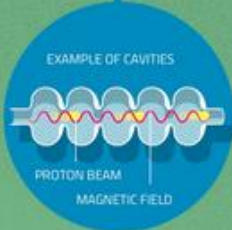
THE TARGET IS THE NEUTRON SOURCE

When the accelerated protons hit the rotating tungsten target wheel, spallation occurs and neutrons are scattered from the tungsten nucleus. The more neutrons produced and collected in the target, the "brighter" the neutron source. The neutrons are directed through moderators and neutron guides to the scientific instruments where they are used for experiments. The Target monolith consists of the Target wheel, moderators, cooling systems and shielding and weighs approximately 5,800 tonnes.



PROTONS GENERATED IN AN ION SOURCE

In the ion source protons are generated and guided into the linear accelerator, the Linac. The first part of the linac is used to focus the proton beam while it accelerates.



CAVITIES ACCELERATE THE PROTONS

Electromagnetic fields are used to accelerate the protons to approximately 96% of the speed of light. The second part of the accelerator consists of superconducting cavities which are cooled to -271 °C using liquid helium. After traveling 602.5 m the protons hit the target wheel.

TOTAL BUILDING AREA 65 000 m²

The ESS facility will be approximately 650 metres in total length. The target building will be 125 metres long, and about 30 metres high. The 537-metre-long accelerator tunnel is built underground and will be covered with soil.

- Concrete: 50 000 m³
- Rebar: 6 000 tonnes
- Pipes: 40 km
- Cables: 2 000 km
- Total volume: 400 000 m³

PILES TO AVOID MOVEMENTS

The heavy Target building and experimental halls are resting on a total of 6,400 piles of different types, in order to avoid unwanted movements in the structure.

UNIQUE CAPABILITIES OF ESS

ESS will have 22 tailor-made instruments located in three experimental halls. Neutrons are excellent for probing materials on an atomic and molecular level – everything from motors and medicine, to plastics and proteins. The neutrons hit the sample and detectors register the neutron scattering, giving precise information about the material's structure and dynamics.

ESS Timeline

GROUND BREAKING 2014	INITIAL OPERATIONS 2019	INSTRUMENT COMMISSIONING BEGINS 2021	USER PROGRAM BEGINS 2023	PROJECT COMPLETION STATUS 43%
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Construction Financing

BUDGET 1843 M€	HOST COUNTRIES SWEDEN & DENMARK 47.5%	NON-HOST MEMBERS 52.5%	IN-KIND CONTRIBUTIONS 550 M€
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ESS Mission and vision

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

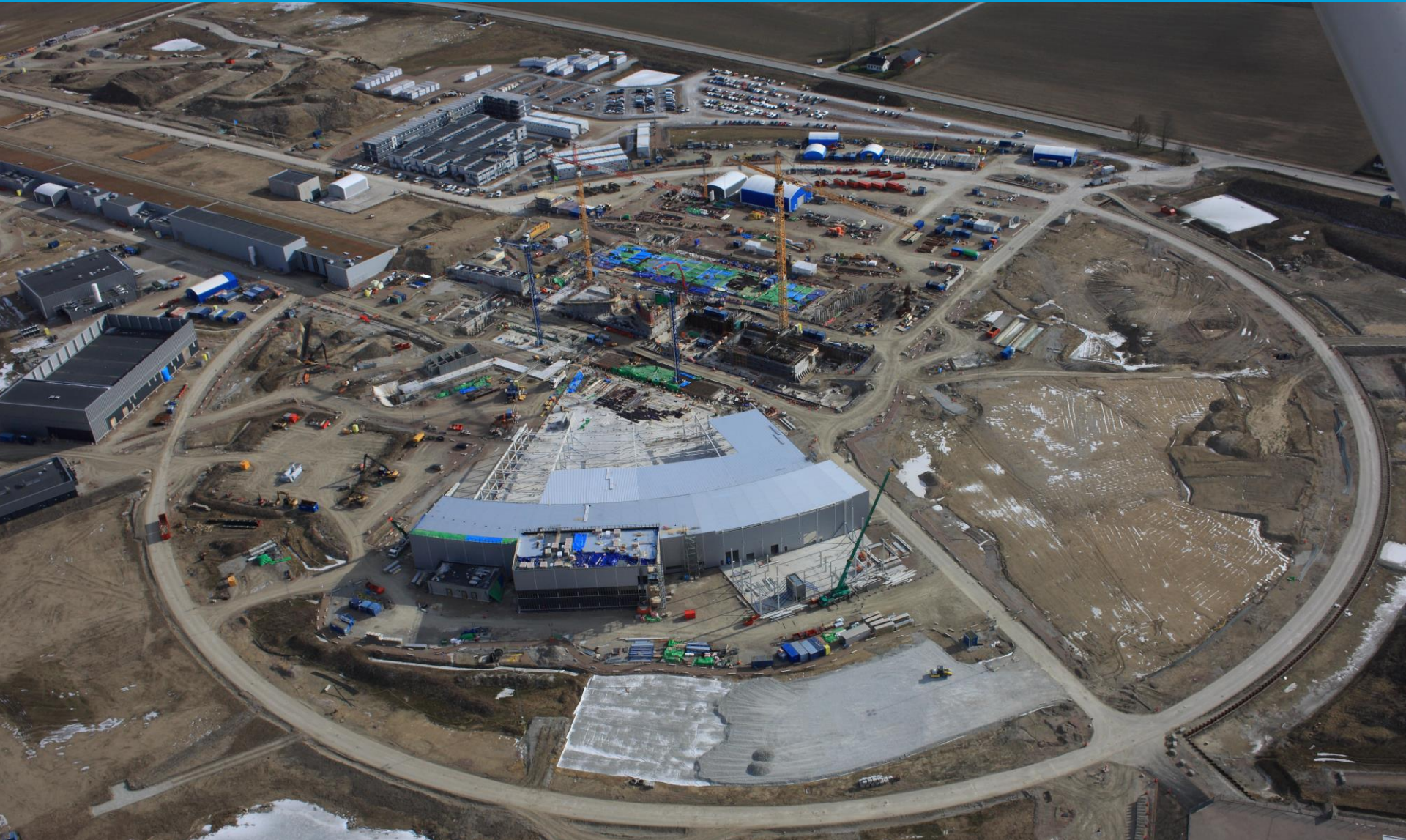
To do this, we commit to deliver ESS as a facility that:

- 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

European Spallation Source, Lund



European Spallation Source, Lund



- Started mid 2017 and was completed in December 2017
- Perform a pilot study on Infor EAM by implementing a EAM system that is operational by
 - Establish a limited agreement with Infor
 - Investigate SNS strategies related to their data-exchange between Infor and EPICS
 - Define required roles
 - Identify requirements for the site maintenance organization and operate EAM; both during ramp-up and steady state
 - Identify and map integrations to ensure that data in ESS existing software's (PIM, ERP, controls) can be transferred and maintained in the EAM solution
 - Implement and operational version of EAM to be used for building G04
 - Perform a recommendation whether to continue with a full-scale implementation project across ESS or another approach to support the organization with EAM functionalities in due time
 - Define requirements for consolidation and management of data related to EAM as part of the official PIM software and the data-exchange between various databases and its structured content

Contributors

ESS Internal

- Conventional Facilities (7)
- Engineering, Integration and Support (6)
- Information Technology (7)
- Neutron Scattering Systems (1)
- Environment, Safety and Health (1)
- Finance (2)
- Procurement (2)
- Logistics (1)
- Target Project (1)
- Quality (3)
- Integrated Control Systems (2)

External

- CERN
- SNS
- Gothenburg Energy
- Perstorp Chemistry
- Maitc

- Which ESS database/structure should hold what information
- Create and manage assets from G04 (around 50 components + some spare parts)
- Inventory and maintenance of machinery and tools
- Work planning and Scheduling
- Work orders
- Fault reporting
- Preventive maintenance
- Goods marking
- Role definitions

Test Scope (cont)

- 20 high level use cases where written
- Tested hands on in a cloud environment set up in accordance to our use cases
- All use cases where performed hands on together with Infor over two days
 - Focus areas where identified so that for instance logistics could drop in for their parts
 - CF performed the full hands on evaluation

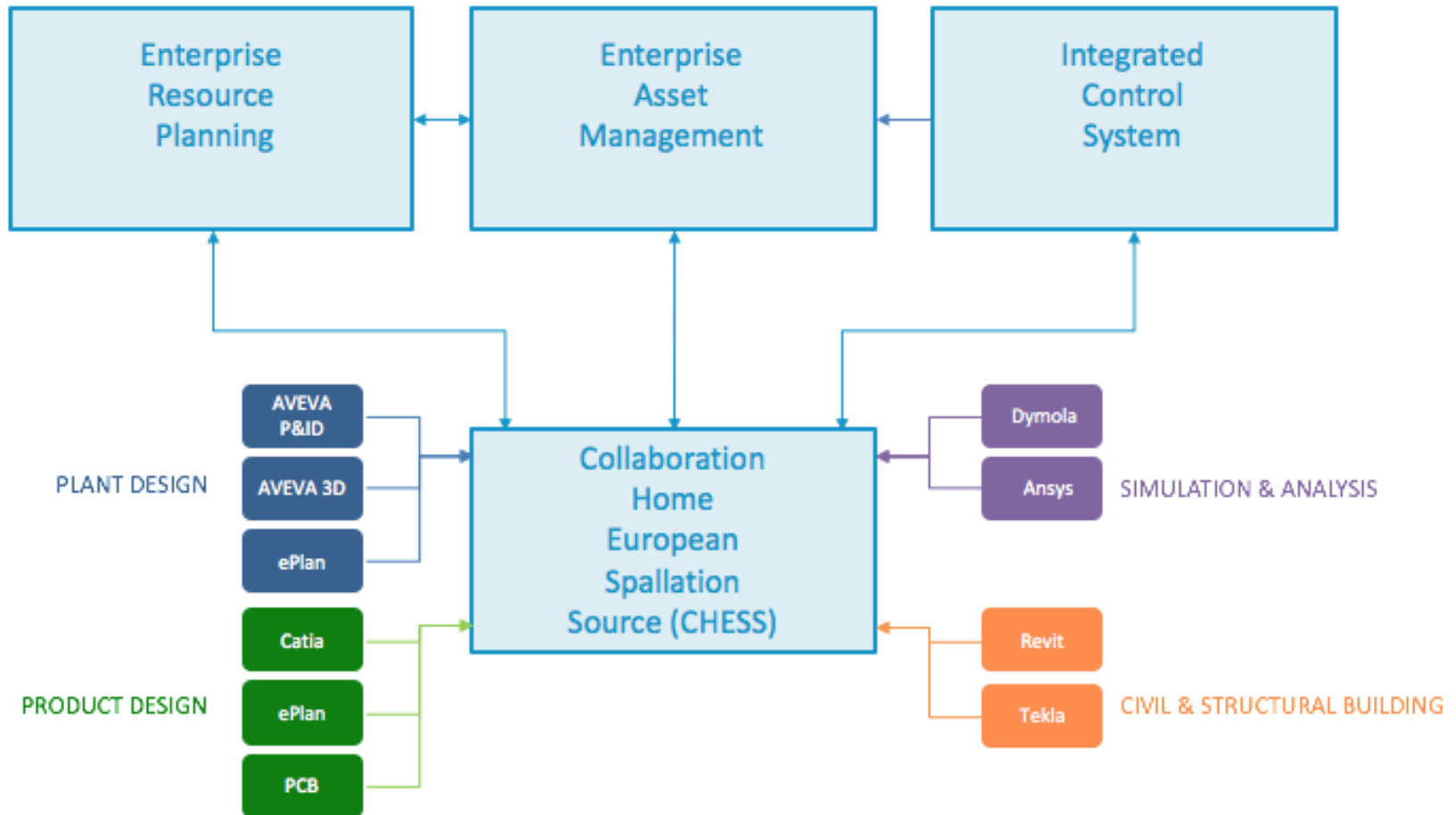
Evaluation Scope

- Data import & integration to/from ESS systems
 - Special advice in the integration with Agresso
- Predictive maintenance (SCADA connection)
- Financial depreciation
- Warehouse/spare part management
- EAM Support/Maintenance/Licenses
 - License cost
 - IT infrastructure and maintenance cost
 - Support organization needed

Evaluation Scope (cont)

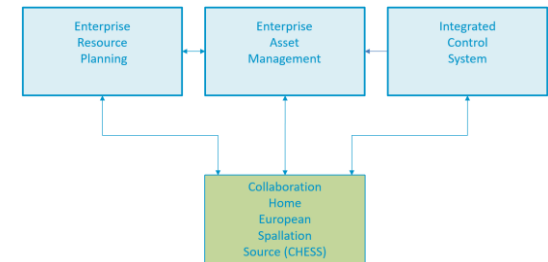
- Workshops
 - ICS & SNS
 - Gothenburg Energy for ERP – EAM integration
 - Maitc

System overview and integrations



Responsibility - CHESS

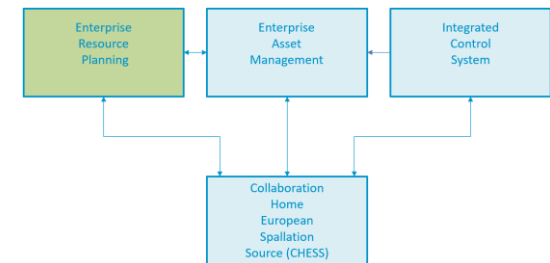
- Product Lifecycle management
- Facility Lifecycle management
- Consolidation of all technical documents and data needed to design and operate the facility.



Responsibility - ERP

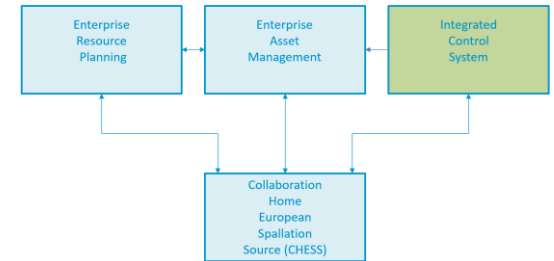
Commercial & transactional information

- Suppliers
- Manufacturers
- Price information
- Purchase Orders
- Contracts



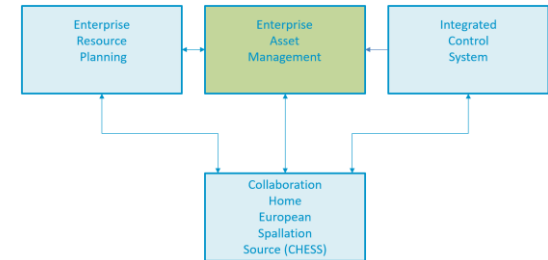
Responsibility - ICS

- Responsible for controlling, operating and monitoring the machine through the Integrated Control System (EPICS)
- Responsible for receiving and monitoring information from other conventional SCADA systems in use at ESS



Responsibility - EAM

- Managing operations of physical assets in the ESS Facility
- Define and execute preventive maintenance schedules
- Work Order management
- Enable predictive maintenance through analysis of operational data from EPICS (including industrial SCADA systems through EPICS)
- Installation Coordination - Schedule, document and monitor
 - Permits to work
 - Workforce balance
 - Materials assignment and use
 - Work requests and work orders



Information flow - EAM

CHESS to EAM

- Released FBS and LBS structure including meta data, documentation and associated parts

EAM to CHESS

- Information regarding installed assets, their corresponding tag and location

ICS to EAM

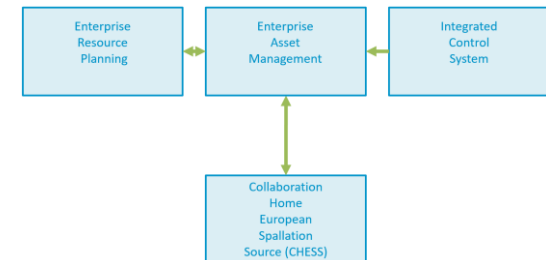
- Operational data logged on installed assets including “non machine assets” fed through EPICS

ERP to EAM

- Information regarding purchase orders, delivery dates, manufacturers, prices

EAM to ERP

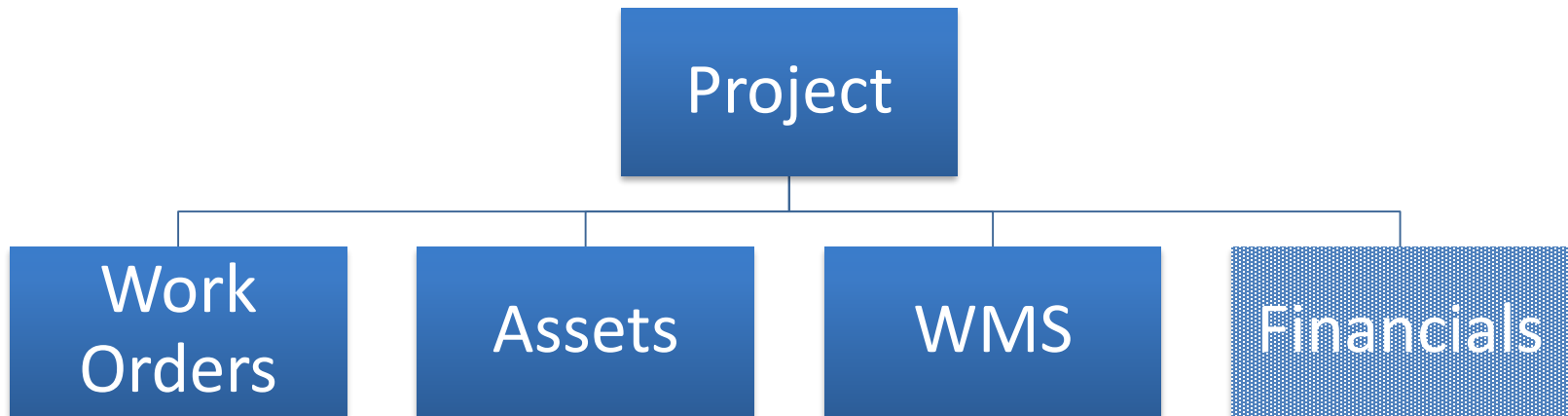
- Information regarding assets taken into operation or taken out of operation



Division Specific Results

Division	Supports EAM	Comments
Conventional Facilities	Yes	EAM System is needed urgently and the piloted should fulfill requirements
EIS – PIM Content	Yes	EAM System is needed and there is no available in house solution at ESS
EIS – Installation Coordination	Yes	Not feasible to perform installation and commissioning without a system support
ES&H	Yes	Without system support for work orders and assets, ESS might not fulfill SSM requirements, do a proper decommissioning of the facility as well as reduce chance of accidents.
Finance	Yes	Inventory control is vital for accurate financial reporting and correct tax returns
IT - Operations	Yes	Piloted EAM system can be supported by IT operations
IT – Information Systems	Yes	No real impact on the Information Systems Group resources and scope
ICS	Yes	A system to harvest and consolidate data from EPICS is required in order to trace trends and do predictive maintenance
Logistics	Yes	Logistics needs a WMS. EAM has proven capable to fill ESS needs for this and asset tracking
NSS	Yes	NSS will have a need of asset management after installation is been completed
Procurement	Yes	Material master management and location based warehouse management is needed
Target	Yes	Target needs support for work orders and asset management
Quality	Yes	Work orders, task lists, asset tracking and possibilities to archive this information

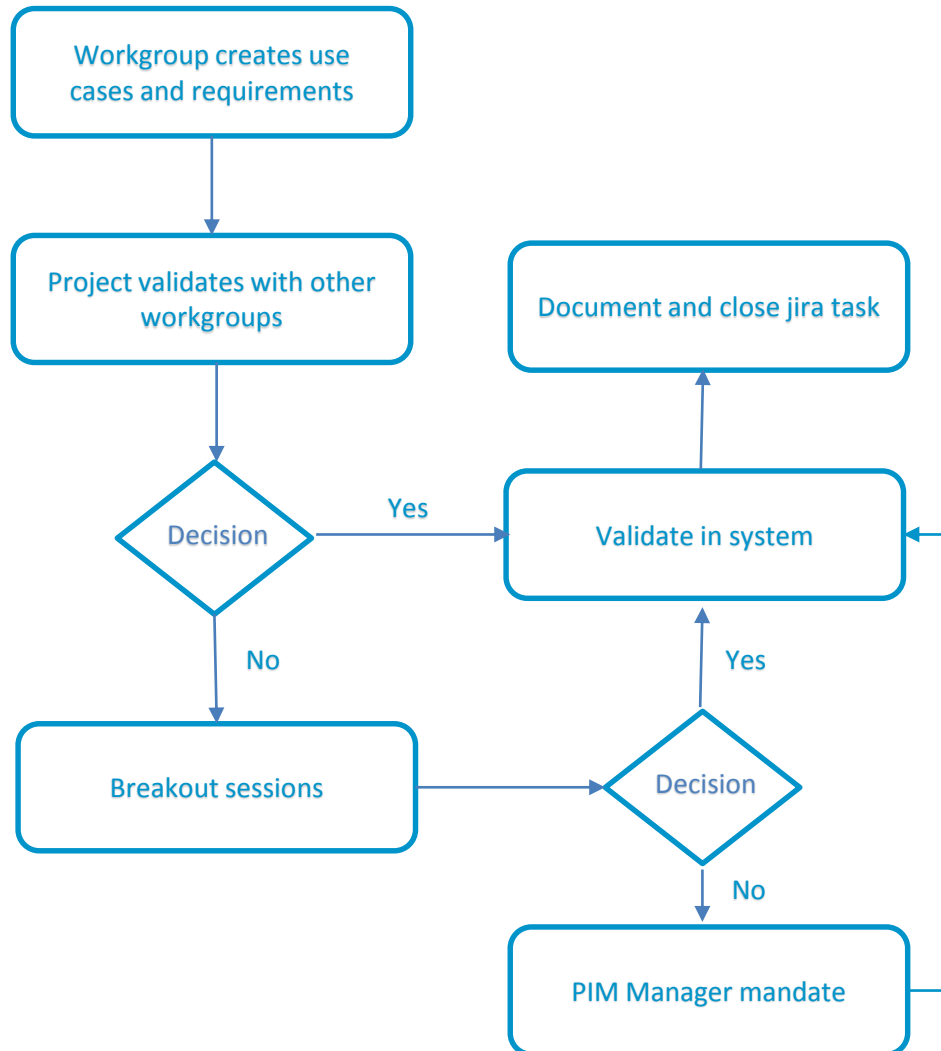
Overall structure, Implementation



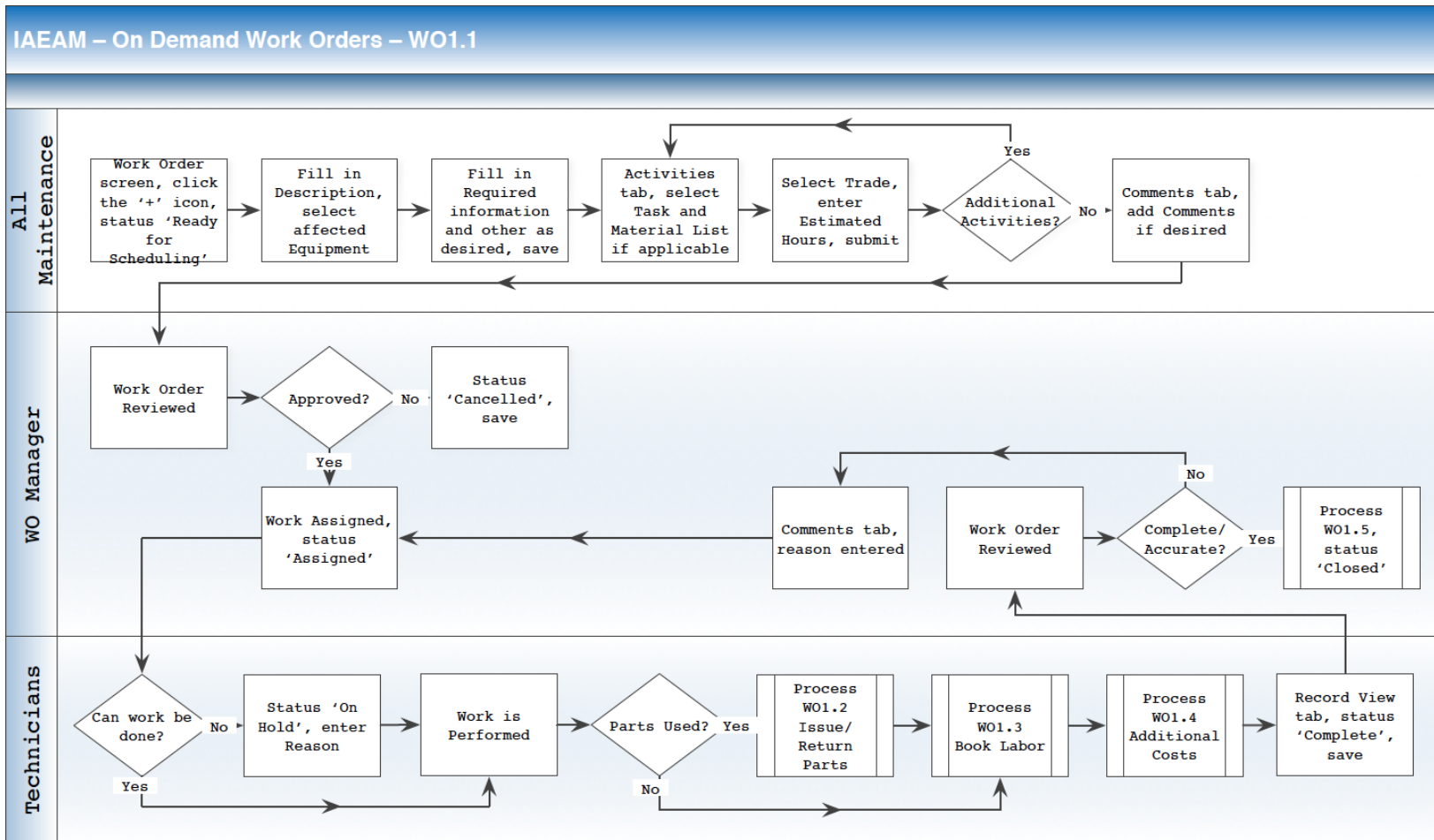
Responsibilities

- Each work group is responsible of delivering validated use cases and requirements to the main project
- The project manager is moderating the work in the groups but it's the groups responsibility to deliver a working solution to the main project
- The project manager will be responsible to have the overview and ensure that issues where one working groups decision influences another group are resolved
- Any issues that cannot be solved within the project will be escalated to the PIM manager whom has the mandate to take the decisions

Process



Implementation Accelerators



Current Status

- Waiting for Infor to come back with
 - Installation plan
 - Suggestion for training
 - Admins / Super users
 - Users at go live
 - External/Internal users through e-learning

What's next

- Start implementing our use cases in test environment and validate together with Infor
- Key success factor is to have Infor functional consultants to assist so that we don't do something stupid.

Thank You