

ESS In-Kind update

Christine Darve, In-Kind Senior Engineer
Mark Robinson, Head of In-Kind Management Division, ESS (via ZOOM)

10th September 2024

christine.darve@ess.eu

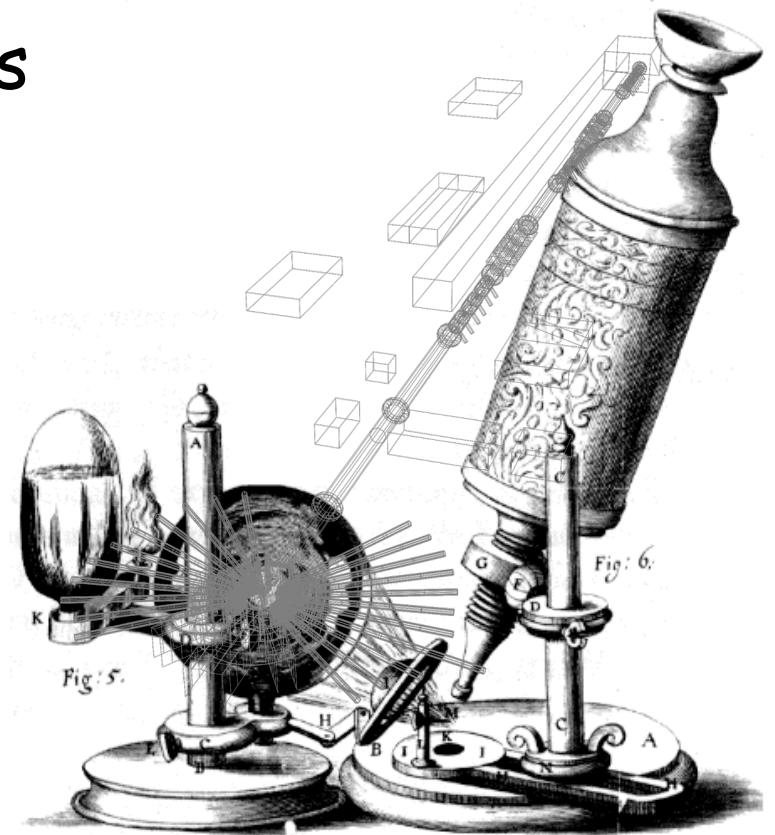
ESS In-Kind update

Reminder: In-Kind Collaborations

IK Status

Knowledge Transfer

More Perspectives ?



In Kind Management



Behind the Scenes



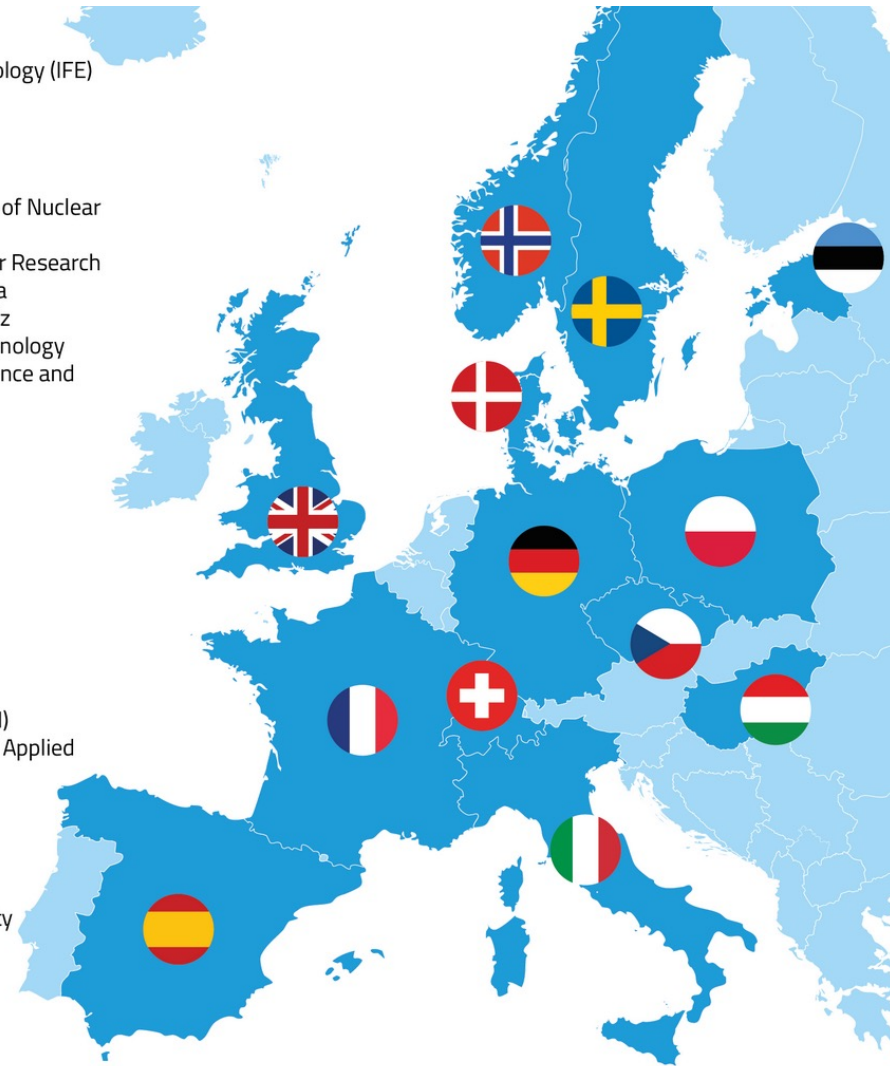
More than 550 employees from over 55 countries all over the world, and in excess of 100 collaborating institutions, are constructing and building the world's most powerful neutron source



In-Kind Management

-  **Czech Republic**
 - Nuclear Physics Institute of the CAS
-  **Denmark**
 - Aarhus University
 - Roskilde University
 - Technical University of Denmark (DTU)
 - University of Copenhagen
-  **Estonia**
 - Tallinn University of Technology
 - University of Tartu
-  **France**
 - Laboratoire Léon Brillouin (LLB)
 - National Center for Scientific Research (CNRS)
 - French Alternative Energies and Atomic Energy Commission (CEA)
-  **Germany**
 - Forschungszentrum Jülich
 - Helmholtz-Zentrum Geesthacht
 - Technical University of Munich
-  **Hungary**
 - Hungarian Academy of Sciences - Centre for Energy Research
 - Hungarian Academy of Sciences - Institute for Nuclear Research (ATOMKI)
 - Wigner Research Centre for Physics
-  **Italy**
 - National Institute for Nuclear Physics (INFN)
 - Elettra Sincrotrone Trieste
 - National Research Council of Italy (CNR)

-  **Norway**
 - Institute for Energy Technology (IFE)
 - University of Bergen
 - University of Oslo
-  **Poland**
 - Henryk Niewodni Institute of Nuclear Physics (IFJ PAN)
 - National Center for Nuclear Research
 - Polska Grupa Energetyczna
 - Technical University of Lodz
 - Warsaw University of Technology
 - Wroclaw University of Science and Technology (WUST)
-  **Spain**
 - ESS Bilbao Consortium
-  **Sweden**
 - Lund University
 - University West
 - Uppsala University
-  **Switzerland**
 - Paul Scherrer Institute (PSI)
 - ZHAW Zurich University of Applied Sciences
-  **United Kingdom**
 - Science and Technology Facilities Council (STFC)
 - UK Atomic Energy Authority (UKAEA)

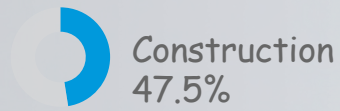


A coalition of 13 European countries



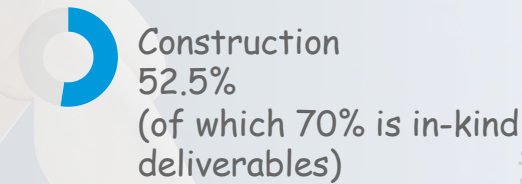
Host countries

Sweden, Denmark



Non host member countries

Czech Republic, Estonia, France, Germany, Hungary, Italy, Norway, Poland, Spain, Switzerland, United Kingdom.



The European Spallation Source *ERIC established in 2015

*ERIC legal framework was created by the European Commission in 2009

IKRC.29 – 19-20 March, 2024

Courtesy Mark Robinson

In-Kind Cost Overruns



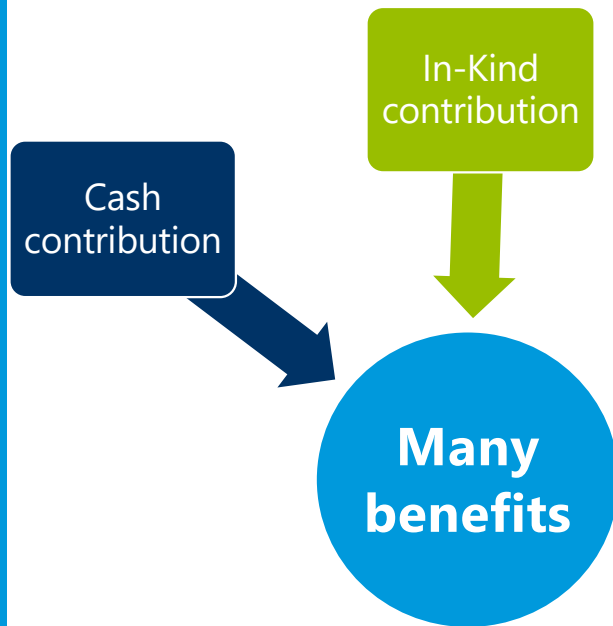
There are several issues adversely affecting In-Kind costs, generally the principles for 'dealing' with these are as follows:

- The IK Partners are responsible to absorb all the costs for their IK contributions. This is in exactly the same way that ESS is responsible to absorb all the costs related to direct procurements.
- The IK Contribution Agreements for example are very clear on responsibilities for covering the recovery costs for any of their IK component defects – regardless of where in the In-Kind supply chain these occur.

ESS however continues to do all possible to help IK partners with all aspects of their contributions and associated costs, examples include:

- Assisting IK Partner management teams with the preparation of the non technical aspects of TA change requests
- Investigating any opportunities for 'economy of scale' procurements
- Further identifying, as early as possible, any items in the design that are long lead time items
- Working with the IK Partners to assist them with their funding agencies / ministries

What is an In-Kind Contribution?



Key advantages

- Develop and maintain the Member's industrial base
- Boosts the professional and social capital of the member's scientists and engineers
- Enhanced **status** for their respective national institutions that are part of the global communities
- Distribution of the work to the Members is a major driver in fostering a community of innovators

→ ESS Bilbao - SOCIO-ECONOMIC IMPACT

The Spanish contribution from ESS Bilbao to ESS European Spallation Source ERIC

Each country participating in the ERIC Council is represented in the IKRC by one delegate. The Chair and Vice-Chair are nominated by the Committee and approved by the Council.

Delegates

Chair
Fiamma García-Toriello (Chair)
 ESS Bilbao

Petr Šittner
 Academy of Sciences of the Czech Republic - Institute of Physics
 Czech Republic

Niels Bech Christensen
 Technical University of Denmark
 Denmark

Piret Pikma
 Tartu University
 Estonia

Arsene Goukassov
 Laboratoire Léon Brillouin (LLB)
 France

Tania Claudio Weber
 (Vice Chair)
 Forschungszentrum Jülich
 Germany

Viktória Sugár
 Óbuda University
 Hungary

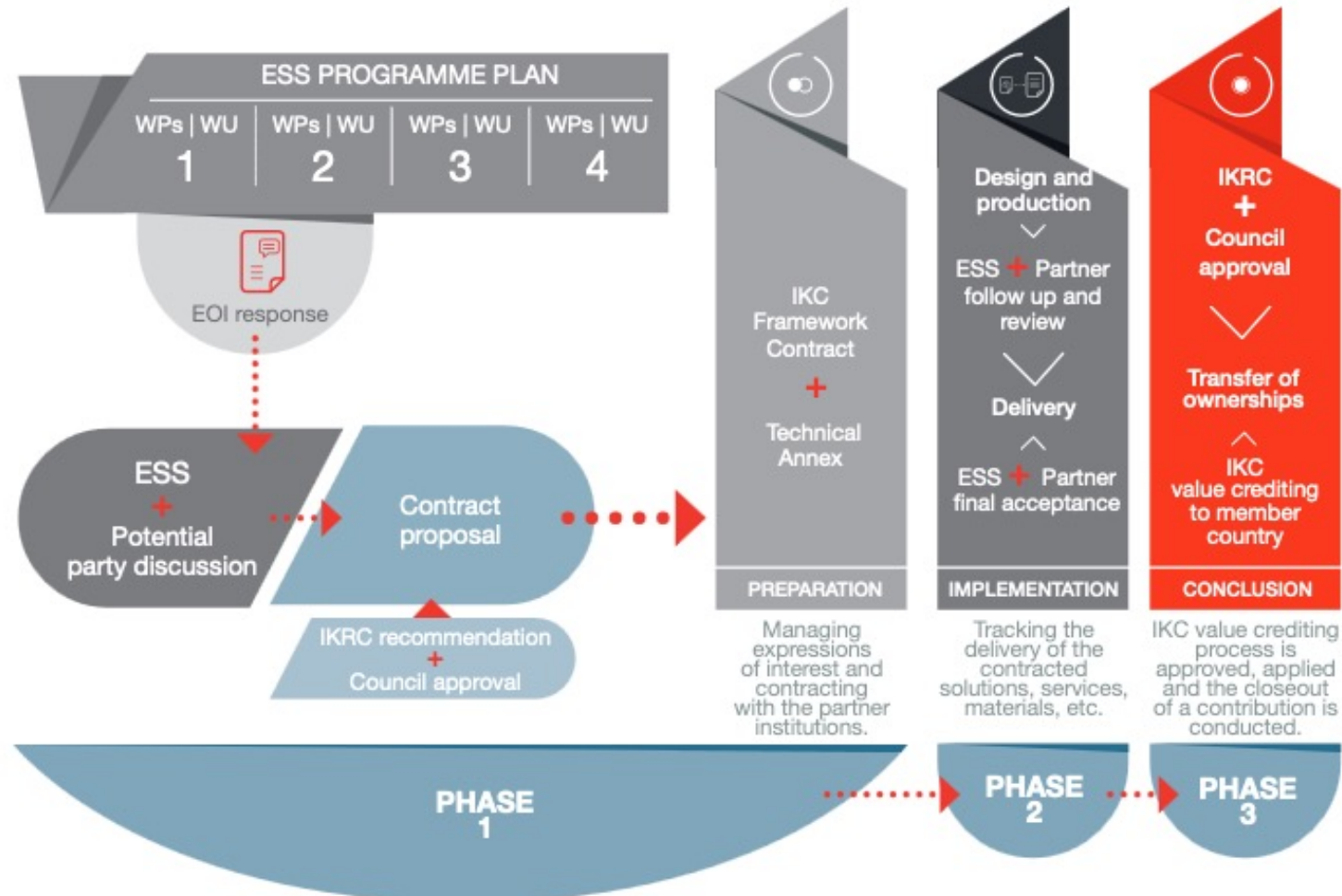
Giuseppe Gorini
 University of Milano-Bicocca
 Italy

Erik Wahlström
 Department of Physics at Norwegian University of Science and Techn
 Norway

Dariusz Bocian
 Institute of Nuclear Physics, Polish Academy of Sciences (IFJ-PAN)
 Poland

Félix Jiménez-Villacorta
 ESS Bilbao
 2024-09-11 PRESENTA
 Spain

In-Kind Contribution Process



WPs: Work Packages | WU: Work Unit | EOI: Expression of Interest | IKRC: In-Kind Review Committee

In-Kind Agreement Process

Contracts between ESS and In-Kind partners are composed of In-Kind Collaboration Agreements and Technical Annexes



- Technical requirement/scope
- Product compliance with European Directives
- National regulation and harmonized standards
- Project Quality Plan

- Methodology supported by ESS Management System and ESS handbooks
- Tools to facilitate data transfer and integration
- Continuous follow up from technical experts from In-Kind partner and ESS



IK status – March '24

2 ESS Sub-Project Status

Sub-project budgets and In-Kind Goals are based on the original Cost Book values from 2013 and do not include escalation. 'TAs approved' refers to TAs that have received approval at the ESS ERIC Council whereas 'recommended' refers to recommendation at the IKRC (but without Council approval). Accredited and Approved includes direct contracts from Czech and German IK partners.

Accelerator			
510 M€ Budget	75% (383 M€) In-Kind Goal	17 TAs accredited (71 M€) 20 TAs approved (171 M€) 4 TAs recommended (15 M€) 13 Collaborations signed (31 M€)	0 TAs in preparation (0 M€) 0 M€ of further In-Kind identified
56% (287 M€) forecasted as In-Kind			

Target			
155 M€ Budget	65% (101 M€) In-Kind Goal	9 TAs accredited (12.1 M€) 7 TAs approved (64.1 M€) 5 TAs recommended (17 M€) 1 Collaboration signed (0.2 M€)	0 TA in preparation (0 M€) 0 M€ of further In-Kind identified
60% (93 M€) forecasted In-Kind			

Neutron Scattering Systems			
350 M€ Budget	65% (228 M€) In-Kind Goal	61 TAs accredited (16.1 M€) 39 TAs approved (148 M€) 5 TAs recommended (12.1 M€) 9 Collaborations signed (7.6 M€)	0 TA in preparation (0 M€) 0 M€ of further In-Kind identified
50% (176 M€) forecasted as In-Kind			


Integrated Control Systems			
73 M€ Budget	50% (36.5 M€) In-Kind Goal	16 TAs accredited (10.3 M€) 4 TAs approved (4.6 M€) 1 TA recommended (1 M€) 1 Collaboration signed (0.4 M€)	0 TA In Preparation (0 M€) 0 M€ of further In-Kind work identified
22% (16.3 M€) forecasted In-Kind			

Table 1 - Current IK totals per Project for March 2023


PROJECT	Values kEUR										
	Mar 2024 CONSTRUCTION IN-KIND REPORTING										
	% IKC PLANNED & POTENTIAL			Planned Potential	Host States	All	In-Kind Goal	Not In-Kind**	TOTAL ***		
Accredited *	Approved & Endorsed	Total									
11 Accelerator Systems	70,682	185,870	256,552	50.3%	0	30,891	287,443	56.4%	75%	222,557	510,000
12 Target Station	12,148	81,044	93,192	60.1%	0	204	93,396	60.3%	65%	61,604	155,000
13 Neutron Scattering Systems	16,095	160,958	177,053	50.6%	0	7,560	184,613	52.7%	65%	165,387	350,000
14 Integrated Control Systems	10,309	5,555	15,864	21.7%	0	425	16,289	22.3%	50%	56,711	73,000
Total - All 4 projects	109,233	433,427	542,660	49.9%	0	39,080	581,740	53.5%		506,260	1,088,000
Total - All ESS				29.4%				31.6%	747,250	1,843,000	

*Includes completed German Direct Contracts, **Calculated compared to 2013 Budget, ***2013 Budget Totals


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	Czech Republic ERIC founder	36.86 M€ Construction Commitment	68% (25.2 M€) In-Kind Commitment	25.2 M€ Allocated IK Value	4 TAs Accredited (0.9 M€)	6 TAs Approved (24.3 M€)	0 TAs Recommend-ed (0 M€)
IKC Agreements: UIF (Signed)							


The majority of funding is supplied via EU Structural Funds. Strong contributions to Target (He Loop and ventilation/cooling) and NSS (BEER). CZ Ministry increased funding from 0,3% to 2%. Czech Republic have indicated that remaining fund allocated as IK will be contributed as cash. BEER TA has been approved by Council in June 2021 together with a dedicated IKCA. 3 Procurements carried out in Dec 2021 for Target, which count as accredited IK.

	Denmark ERIC founder Host country	225 M€ Construction Commitment	12 Signed Collaborations (10.8 M€)	0 Planned Collaborations (0 M€)			
Collaboration Agreements: Aarhus Uni (Signed), DTU/KU (Signed), Roskilde Uni (Signed)							

Collaboration agreements signed with Accelerator (Aarhus U), NSS (Roskilde & DTU) and Target (DTU). Instruments BIFROST and HEIMDAL are led by DTU/KU and Aarhus Uni, respectively. Interest from various Danish Institutes (including DTU & Aarhus University) for supplying IK during Initial Operations. Two TAs already approved for IO with DTU and Univ of Copenhagen.

	Estonia ERIC founder	4.6 M€ Construction Commitment	70% (3.2 M€) In-Kind Commitment	3.2 M€ Allocated IK Value	9 TAs Accredited (2.15 M€)	5 TAs Approved (1.1 M€)	0 TAs Recommend-ed (0 M€)
IKC Agreements: Tallinn Technical University (Signed), Tartu University (Signed)							

There are 14 approved TAs with Estonia, 7 with Tallinn University (mainly ICS and Accelerator) and 7 with University of Tartu (all NSS). Funding for IK collaborations comes from Structural Funds. All construction IK funds have been allocated. Estonia has shown interest in having further IK during Initial Operations

	France ERIC founder	147 M€ Construction Commitment	82% (121.4 M€) In-Kind Commitment	121.4 M€ Allocated IK Value	13 TAs Accredited (15.2 M€)	15 TAs Approved (105.4 M€)	0 TAs Recommend-ed (0 M€)
IKC Agreements: CEA (Signed), CNRS (Signed), LLB (CEA-CNRS) (Signed)							

IK Agreements signed and endorsed for CEA and CNRS covering scope for Accelerator and ICS. IKCA for LLB, which is jointly owned between CEA and CNRS, signed at the end of June 2019. Three amendments to be presented for the instruments at IKRC 29. Likely that spares during the Initial Operations phase will be purchased as direct contracts.

Country IKC Briefs



Spain Member	50.3 M€ Construction Commitment	89% (44.7 M€) In-Kind Commitment	45.0 M€ Allocated IK Value	0 TAs Accredited (0 M€)	0 TAs Approved (0 M€)	15 TAs Recommended (45 M€)
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IKC Agreements: ESS Bilbao (Pending resolution of expiry date of ESS Bilbao)

Total Contribution has dropped from 92 M€ to 55 M€ (inc. pre-construction). Became a member of ESS ERIC in April 2018. TAs with all four sub-projects including Vacuum Vessel and Target Wheel for Target and the instrument Miracles for NSS. A number of endorsed TAs are being revised to allow for tailor-made warranty provisions. IKCA has been agreed with ESS Bilbao but formal approval and signature is pending and agreement to extend the ESS Bilbao consortium to 31 December 2027. All TAs have been endorsed by the IKRC pending the signed IKCA.



Sweden ERIC founder Host country	645 M€ Construction Commitment	12 Collaborations Signed (28.3 M€)	0 Collaborations Planned (0 M€)
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Collaboration Agreements: Lund Uni (Signed), Uppsala Uni (Signed)

Collaboration agreements have been signed and are progressing well between Uppsala University/Lund University and Accelerator and ICS. 5 TAs agreed with Lund University for Initial Operations. 6 TAs have been approved for the IO Phase (6.2 M€).



Switzerland ERIC founder	61.1 M€ Construction Commitment	58% (35.2 M€) In-Kind Commitment	35.2 M€ Allocated IK Value	9 TAs Accredited (6.6 M€)	7 TAs Approved (28.6 M€)	0 TAs Recommended (0 M€)
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IKC Agreements: ZHAW (Signed), PSI (Signed), Individual Agreements for Instruments

Signed MoU between ESS and Swiss Research Ministry (SERI) together with approved amended TAs and main Agreements have been put in place to enable Swiss institutes to be paid by Call-Offs. Discussion taken at IKRC #15 that future Swiss TAs and IKCAs will be presented *unsigned* with a cover page. Four IKCAs have recently been agreed and approved by Council and SERI (ODIN, BIROST, MAGIC and HEIMDAL - June 2021). Cost Allocation Agreement in place with PSI for ODIN and ESTIA instruments. Three Payment Orders processed for ESTIA under the CAA and one against the Service Agreement.



United Kingdom ERIC Founder	183 M€ (165 M€) Construction Commitment	68% (125.2 M€) In-Kind Commitment	115.5 M€ Allocated IK Value	9 TAs Accredited (21.9 M€)	8 TAs Approved (93.6 M€)	0 TAs Recommended (0 M€)
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IKC Agreements: STFC (Signed)

STFC involvement in Instruments LOKI and FREIA. 15 TAs approved by Council 20.99 in Jun 2020 - 9 with NSS (LOKI, FREIA, Detector Readout), 4 with Accsys (High Beta Cavities for 25 M€, LWUs, RD Dist), 1 with ICS and 1 with Target (Active Cells for 25M€). IKCA signed on 18 Jun 2020.



Germany ERIC founder	182 M€ Construction Commitment	41% (74 M€) Contribution Commitment	74.2 M€ Allocated Cont. Value	17 TAs* Accredited / Completed (15.2 M€)	12* TAs Approved (59.0 M€)	0 TAs Recommended (0 M€)
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IKC Agreements: FZJ (signed), TUM (signed), HZG (signed)

All three German partners are contracted with a Contribution Agreement based on the standard IKCA template with some bespoke clauses due to unique tax status of the German partners. IKCs are mainly NSS (BEER, ODIN, C-SPEC, SKADI and DREAM instruments) and Target (moderator/reflector plug, cryogenics). German Contributions are funded by partners submitting invoices to ESS. FZ Jülich and Hereon have agreed to the Cost Allocation Agreement (CAA) for scope swap for the instruments where as TUM has split invoices with some funds returned to ESS to cover for the scope transferred.

*The figures for 'TAs Accredited / Completed' and 'TAs Approved' includes those early German contributions agreed as Direct Contracts.



Hungary ERIC founder	17.6 M€ Construction Commitment	70% (12.3 M€) In-Kind Commitment	12.25 M€ Allocated IK Value	12 TAs Accredited (0.9 M€)	3 TAs Approved (11.4 M€)	0 TAs Recommended (0 M€)
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IKC Agreements: Wigner (Signed), Atomki (Signed), Centre for Energy Research (Signed)

Three partner institutes; 1 TA with Atomki for a RF Local protection system approved, 9 TAs with Wigner and 5 with Centre for Energy Research for NSS. TA TIK 6.2 for the Casks Assemblies including Hoists for the Target/Hot Cells facility is funded by 7.4 M€ construction IK, 2.5 M€ from Initial Operations IK and remaining amount by ESS directly. Expected total cost of the work is 20 M€ (2021 Euros). Revised MoU to cover Call-Off mechanism for the Casks.



Italy ERIC founder	104 M€ Construction Commitment	71% (74.3 M€) In-Kind Commitment	74.3 M€ Allocated IK Value	12 TAs Accredited (35.3 M€)	6 TAs Approved (39.0 M€)	0 TAs Recommended (0 M€)
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IKC Agreements: INFN (Signed), Elettra/INFN Trilateral (Signed), CNR (signed), CNR/INFN Trilateral (Signed)

3 Institutes; INFN, Elettra and CNR. INFN and Elettra have 63 M€ of IK with Accelerator. INFN acting as representing entity and as such is VAT exempt. Trilateral Agreements between ESS, INFN and Elettra for AIK 2.1, 17.2 & 17.7 have been approved by ESS Council (INFN undertakes procurement avoiding VAT). A trilateral agreement (CNR/INFN and ESS) was approved at Council 20.99. First TA during IO (AIK 19.3) due to go to IKRC 28 for recommendation.



Norway ERIC founder	46.1 M€ Construction Commitment	28% (12.8 M€) In-Kind Commitment	9.5 M€ Allocated IK Value	13 TAs Accredited (4.4 M€)	3 TAs Approved (5.1 M€)	0 TAs Recommended (0 M€)
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IKC Agreements: Bergen (Signed), IFE (Signed), Oslo Univ (Signed)

Agreements signed with Accelerator (Oslo Uni, Bergen Univ.), NSS (Bergen Univ.) and ICS (IFE). IFE involvement in instruments HEIMDAL and BIFROST was approved at Council.17 (Dec 2019). Decrease in instrument Cost Book Value due to scope being transferred back to ESS for the common projects. Due to transfer unallocated IK by April 2024.



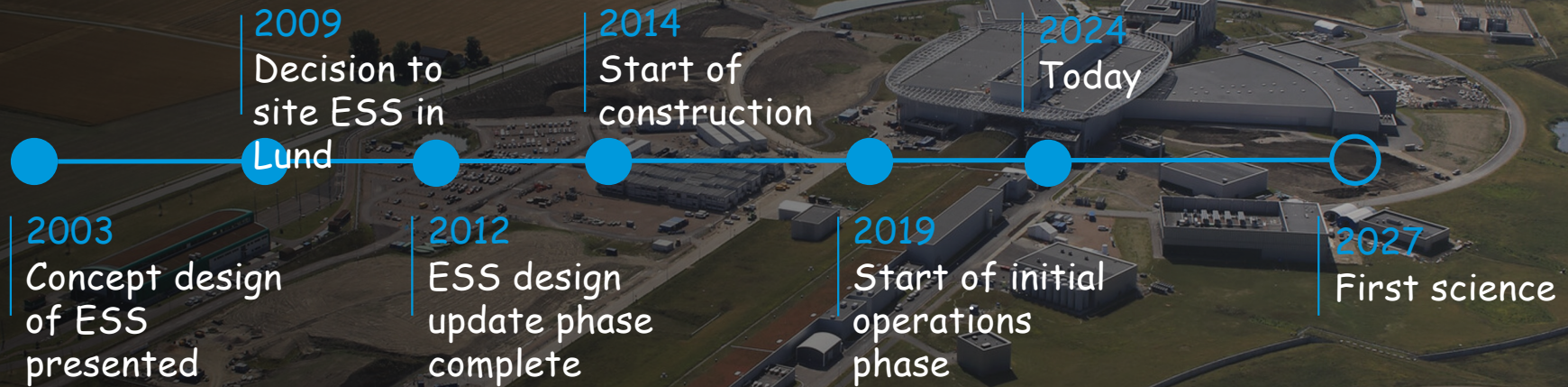
Poland ERIC founder	33.2 M€ Construction Commitment	83% (27.6 M€) In-Kind Commitment	27.6 M€ Allocated IK Value	5 TAs Accredited (6.7 M€)	5 TAs Approved (20.9 M€)	0 TAs Recommended (0 M€)
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IKC Agreements: Warsaw UT (Signed), Wroclaw UT (Signed), IFJ PAN (Signed), NCBJ (Signed), PEG (Signed), Łódź UT (Signed)

Most work packages are for Accelerator and were agreed and presented on IKRC #10 (NCBJ, IFJ PAN, PEG, Warsaw Univ.). One TA during IO already approved with two further TAs during IO to be presented at IKRC 28 for recommendation.

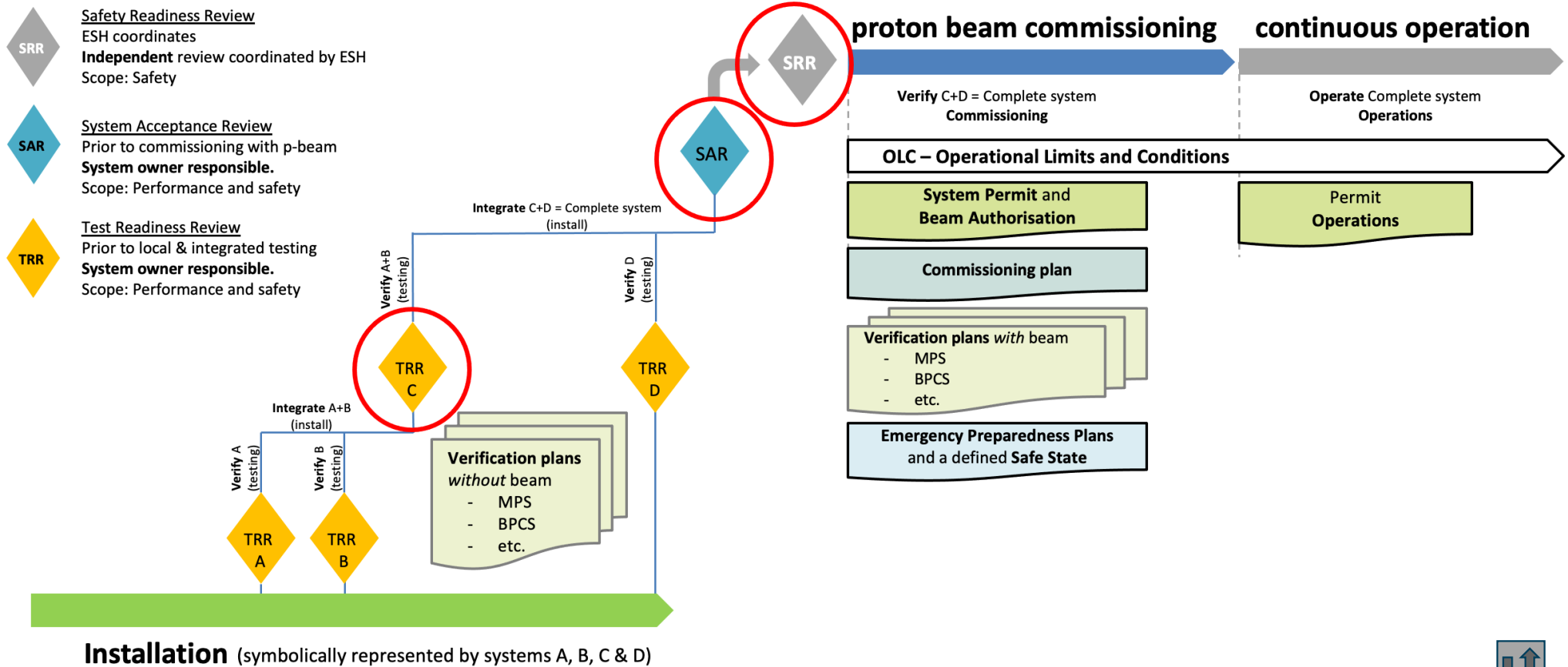
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Timeline



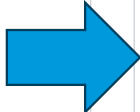
SAR4 / SRR4 preparations

SAR and SRR Scope and General principles



SRR4 / 5 preparation meetings

Courtesy Thomas Hansson



4 Plan and follow-up of TRRs, TG5, SAR5 and SRR5 (BoT)

@ Thomas Hansson showed a further developed road-map to BoT based on @ Andreas Jansson earlier version which now had been complemented with input from TD, NSS/Science and ICS.

The overview is still to be considered as a draft and feedback is more than welcome to make sure it correctly reflects our way forward. After that, we can add information about foreseen dates.

It was clarified that all(!) the reviews in the scheme are expected to cover the **readiness** with respect to the three basic pillars:

- equipment
- documentation & procedures
- personnel including their required training

Check List of Required Technical Documents

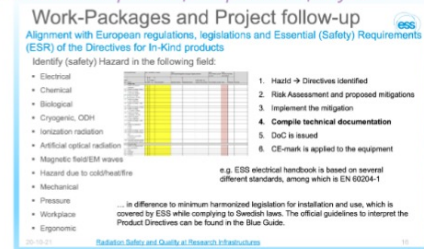
Compliance and Knowledge Transfer purpose

As Designed

Iterative process to Approve Equipment for Operation – to be enforced at each phase of the product life-cycle

1- Design document (not exhaustive list):

- System Description
- P&ID
- Functional Specification
- Mechanical dwg, diagrams
- Electrical dwg, diagrams
- 3D models
- Materials Data Sheets
- Certificate of Compliance
- Preliminary as-built documents (where applicable)



2- Risk Assessment (RA) (see ESS-1713369 Hazard Identification Checklist (Rev 2) : Hazid including Risk Assessment)

3- User Instructions (maintenance and operation manuals - based on RA and system description) (ESS-2137383 - User and Maintenance Instruction)

As Built

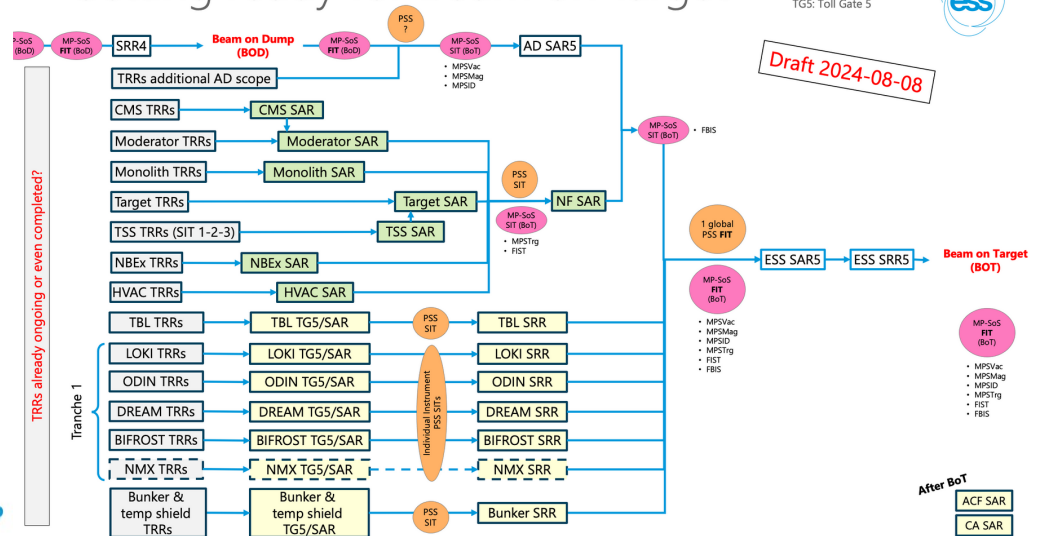
4- Verify the system integrity – SAT / FAT (approval of installation ; List of Outstanding activities; and NCRs from the Installation Phase, etc)

[Confluence Pages](#) / [In-Kind Management Home](#) / [In-Kind Management Quality Follow-up](#)



Getting ready for Beam on Target

SAR: System Acceptance Review
SRR: Safety Readiness Review
TRR: Test Readiness Review
TGS: Toll Gate 5



Knowledge Transfer continuous Tracking

Tracking of In-Kind Contribution status

IK No.	TA Formal Stats	Agreement Type	WP Description	Member State	In-Kind Partner	CB Value (2013 Euro)	Criticality	ESS Work Package Leader / Coordinator	EXTENSION WORK Package Leader / Coordinator	Description of TA KT Requirements	Description of any EXTRA KT Needs	Due Date of KT	KT required before next	KT STATUS	KT Confirmed/Completed	Notes	Feb 2nd, 2024	
																	Suggested	Comment
TK 2.1	Endorsed - TA waiting for IK Agreement	IKC Technical Annex	Target Wheel	Spain	ESS Bilbao Consortium	8 360 000	3	Ulf Odén	Fernando Sordo	Carrying out the verification activities as defined in the System Verification Plan of the facility element, which includes support for the Site Acceptance Test to be conducted at the ESS site Reporting and documenting a System Verification Report the outcomes of the verification activities Presenting the verification outcomes during the System Verification Plan of the facility element, which includes support for the Site Acceptance Test to be conducted at the ESS site Reporting and documenting a System Verification Report the outcomes of the verification activities Presenting the verification outcomes during the System	Support during installation and commissioning	RBOT	Yes	PreI documentation delivered. As built in progress	Yes	Critical component with partner support in ops (?)	3	Keep an eye on but good progress with delivery of parts on time to ESS. Check Manual (operation, maintenance and Spare part), for the He Rotary Union as Drive Unit.
TK 2.2	Approved by Council	IKC Technical Annex	Target He Cooling System	Czech Republic	Nuclear Physics Institute of the CAS	5 590 000	3	Ulf Odén	Jakub Vydval	Carrying out the verification activities as defined in the System Verification Plan of the facility element, which includes support for the Site Acceptance Test to be conducted at the ESS site Reporting and documenting a System Verification Report the outcomes of the verification activities Presenting the verification outcomes during the System	Support during installation and commissioning	RBOT	Yes	PreI documentation delivered. As built in progress	Yes	Critical system (no ops support) – prioritize Option A	2	Gas bearing replaced by Active Magnet Bearing (AMB). The IKP, CZ provider, improved its management and week meeting with ESS rttack progress. ESS, and MECOS work.
TK 3.1	Others - Completed Direct Contract	Procurement Technical Annex	Moderator & Reflector Plugs	Germany	Forschungszentrum Jülich	4 700 000	2	Mark Kickules	Yannick Beßler	Full user documentation package and quality documentation	n.a.	delivered Aug. 2022	Yes	done	Yes	Critical component with (long term) partner support in ops.	1	
TK 3.2	Others - Completed Direct Contract	Procurement Technical Annex	Cryogenic Moderator System (LH2)	Germany	Forschungszentrum Jülich	4 532 300	2	Marc Kickules	Yannick Beßler	Full user documentation package and quality documentation	n.a.	delivered Mar. 2022	Yes	done	Yes	we should consider this as a critical system for the ESS, however, knowledge transfer has happened and extended in-kind partner support	1	

Welcome to Christine Darve's Home Page

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 Partikilgan 2, 224 84 Lund, Sweden
and CERNE-BIDD

Research Infrastructures and Educations:

- European Spallation Source - and ESR via YouTube: ESS science seminars
- ESS-In-Kind Management Home - Intranet (restricted access)
- ESS - Cymru/UK Collaboration speaker - [SBC EIP@Lanc](#) - [SBC@](#)
- CFRRI and Booms Department (BE) of CERN Education, Communications and Outreach (ECO) Forum, Accelerator Directorate and Technical Division
- Lund University - I-TRIF and Dept of Physics
- Northwestern University and Argonne, Univ. of Eng., ITBM (CERN and ITC)

International Organizations:

- Forum on International Physics (FIP): PHYSICS MATTERS Online Colloquia Series: All events and Playlist
- International Union of Pure and Applied Physics (IUPAP) WU14 - Accelerator Science
- International Panel on the Information Environment (IPIE)

Europe:

- Accelerate Your Teaching MOOC - Trailer - Descriptions and Videos
- FASEM - French-Swedish Academy for Scattering Experiments and Modeling: 2024: Life Science and 2019: Materials & Environment
- ERIC-Forum (eJopied 3)
- ERIC Forum and Science in School
- HEP@Tech
- RFPI: Research Infrastructures and Technology Infrastructure for Impact
- CERIC-ACCELERATE - e-Neutron Methods and Quality and - Radiation

American Physical Society (APS)
 American Association for Advancement of Science (AAAS)

African School of Fundamental Physics and Applications (ASFP) and 1st online ASP2010
 A.S.F. African Light Source

Specific presentations:

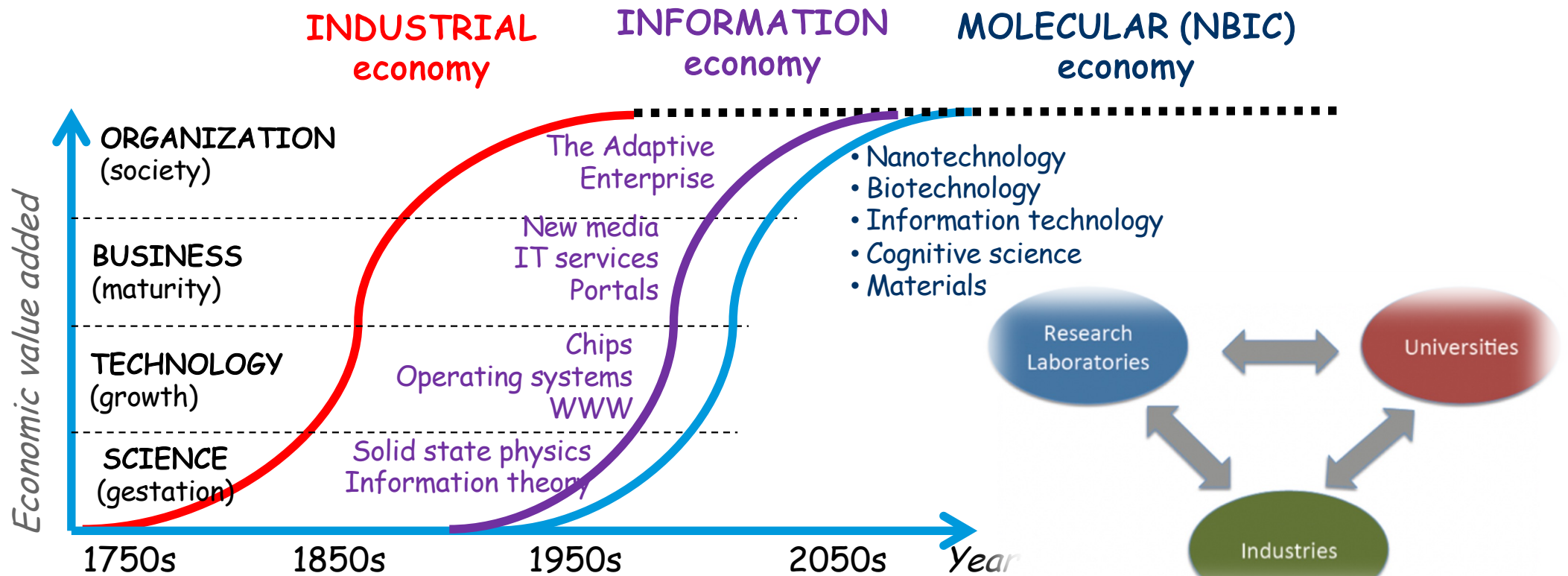
- About ESS general introduction
- Accelerating Medical Knowledge: Sharing for a Sustainable Future - I-FAST Accelerators for Healthcare, July 24
- Accelerating Global Physics Knowledge Transfer for Sustainable Societies - ESS Science Cafe, June 3
- Forum to accelerate a global digital world, Apr-24 - Recording
- The Use of 2-3 generations - APS, AIP and beyond: [astro MOOC as a catalyst](#), Apr-24
- Introduction to accelerator science, Activities and Lectures - High-School course, Apr. 15-17, '24 and [Learners program summary Report](#) - [astu:z.eu](#)
- Expanding the Frontiers, Bridging Local and Global Physics - CACPA, Mar-24
- APS FIP Bevelated and "Bridging Physics Making"
- Unsupervised Acceleration of Acceleration, Oct-23
- Introduction to a digital accelerator world only have made possible? - [RFPI@LPS](#) - [Puls-19](#)

DKRAFT version - the current version is still in work for all questions... please contact Christine Darve

Examples: Context of Paradigm Evolution

Triangle of knowledge - The Ecosystem

Materials & life science facilities are keys to new economy



It's Alive - The Coming Convergence of Information, Biology, and Business Christopher Meyer 2003

Communication channels

Knowledge and Technology Transfer

- ILO – Field Coordinators
- [IK Network and former Field Coordinators](#)
- In-Kind Committee reviews (restricted)
- EC Grants (e.g. ENRIIC)
- [ERIC-Forum](#) (WP9)
- [Big Science Forum](#)
- [HEPTech](#)
- IUPAP-WG14 & socio-economical studies
- More at <https://cdarve.web.cern.ch/>

"Create value for Swedish industry and society by transferring new knowledge, technology, and competence to diverse areas of application."

- Tracking Quality and Engineering
- In-Kind Group / Technical Documentation
- Field Coordinators - Dashboard
 - Field-Coordinator Topical miniWorkshop - Logistics
 - Latest Field-Coordinator Meetings (Oct. 1 2020 - Now...)
 - In-Kind Support Network - Dashboard
 - Build on Best Practices
 - ESS Database
 - Few selected Meetings (IKA)
 - In-Kind Group Calendar
 - Frequently Asked Questions - FAQ
- ARCHIVE PAGE - In-Kind Management Home
- Scope Transfers - The Overview

SPACE NEWS

RELATED PEOPLE

- Christine Darve
- Gareth Aspinall

In-Kind Management

Organisation | Our Workplace | People | Management | Support

Pages / In-Kind Management Home

In-Kind Support Network - Dashboard

Created by Miro Davidovic [X] last modified by Christine Darve on Feb 28, 2024

SPACE SHORTCUTS

Here you can add shortcuts links to the most important content for your team or project.

- In-Kind Management Home
 - In-Kind Management Quality Follow-up
 - Tracking Quality and Engineering
 - In-Kind Group / Technical Documentation
 - Field Coordinators - Dashboard
 - In-Kind Support Network - Dashboard
 - 2022-09-14 The In-Kind Support Network Meeting #1 - Kick-Off
 - 2022-10-08 The In-Kind Support Network Meeting #2
 - 2022-10-27 The In-Kind Support Network Meeting #3
 - 2022-11-17 The In-Kind Support Network Meeting #4
 - 2022-12-08 The In-Kind Support Network Meeting #5
 - 2023-01-12 The In-Kind Support Network Meeting #6
 - 2023-02-02 The In-Kind Support Network Meeting #7
 - 2023-02-23 The In-Kind Support Network Meeting #8
 - 2023-03-23 The In-Kind Support Network Meeting #9
 - 2023-04-06 The In-Kind Support Network Meeting #10
 - 2023-04-27 The In-Kind Support Network Meeting #11
 - 2023-05-25 The In-Kind Support Network Meeting #12
 - 2023-06-08 The In-Kind Support Network Meeting #13
 - 2023-11-23 The In-Kind Support Network Meeting #21
 - 2023-12-14 The In-Kind Support Network Meeting #22
 - 2024-01-29 The In-Kind Support Network Meeting #23
 - 2024-03-16 The In-Kind Support Network Meeting #24
 - 2024-03-11 The In-Kind Support Network Meeting #25
 - 2024-04-04 The In-Kind Support Network Meeting #26
 - 2024-04-18 The In-Kind Support Network Meeting #27
 - Images and videos
 - Build on Best Practices
 - ESS Database
 - Few selected Meetings (IKA)
 - In-Kind Group Calendar
 - Frequently Asked Questions - FAQ
 - ARCHIVE PAGE - In-Kind Management Home
 - Scope Transfers - The Overview



In-Kind Support Network Collaboration Dashboard

A brief explanation about what the In-Kind Support network is.

Below you can find some links to the BrightNESS 1 & 2 repositories. These repositories can be useful in accessing information pertinent to the formation of the In-Kind Support Network.

BrightNESS Framework

- BrightNESS and its Deliverables
- BrightNESS2
- B1 people and B2 people
- Build on Best Practices

All of the meeting notes can be found on the left hand side of the page, under the In-Kind Support Network Collaboration Dashboard link tree.

Earlier Field Coordinator activities

- MGM

Field Coordinators Collaboration Space

The In-Kind Field Coordinators of BrightNESS Work Package 2 work with maximizing the possibility for ESS and In-Kind partner organisations to deliver value during the Construction Phase through In-Kind Contributions, according to the ESS IC Process as well as to minimize and mitigate the risks associated with these contributions.

Region	Representative
North-West	Caroline Wainwright
Central	Erica Claude-Meyer (PI)
North	Caroline Axel Garcia
South	Frederic Huetten (ICM)
East	Paula Menez (ICM)
East	David Goussard (Manager)

➤ and ESS In-Kind Management Team

Ongoing Activities ==> In-Kind Support Network - Dashboard

- Earlier activities :**
- Build on Best Practices (BrightNESS Series of Workshop)
 - Topical miniWorkshop: Field-Coordinator Topical miniWorkshop - Logistics (October 15, 2020)
 - In-Kind Management Quality Follow-up
 - Instrument Monthly Risk Registers
 - Spatial Integration Section and Design and Engineering Group
 - Few selected Meetings (IKA)
 - ESS Database
 - BrightNESS Framework:
 - BrightNESS and its Deliverables
 - BrightNESS2
 - B1 people and B2 people
 - Build on Best Practices
 - Useful links
 - ESS Database
 - Few selected Meetings (IKA)
 - In-Kind Group Activities Communication list
 - List of IP Managers (see on Jira file)
 - List of IC Contributions (XRM - 12 March 2020)
 - Field Coordinator bi-weekly Meetings and Action Items:
 - Meetings preparation
 - Field Coordinator Meetings (December 12, 2019 - April 2nd, 2020)
 - Field Coordinator Meetings (April 16, 2020 - June 25, 2020)
 - Field Coordinator Meetings (July 9, 2020 - Sept. 11, 2020)
 - Field Coordinator Meetings (Oct. 1, 2020 - Feb. 11, 2021)
 - Field Coordinator Meetings (March - Dec. 2021)

HEPTech

We are **24** Members

16 Countries

Access to

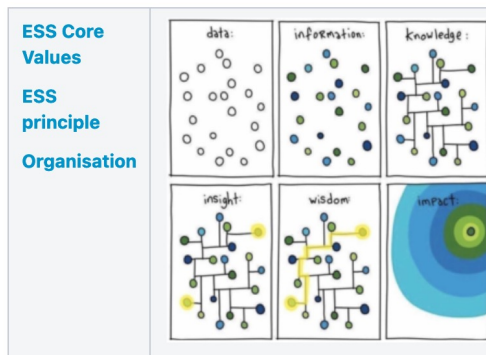
HOME

- NEWS AND EVENTS
- ABOUT US
 - VALUE PROPOSITION
 - ORGANIZATION
 - MEMBER INSTITUTIONS
 - PARTNERS
 - CONTACT US
- ACTIVITIES
 - EVENTS
 - BEST PRACTICE
 - WORKSHOPS
 - HEPTECHPANELS
- NEWS
 - NEWSLETTER
 - PRESS RELEASES
 - FROM THE MEMBERS
 - PERFORMANCE ANALYSIS
- MEMBERS AREA

Examples: [IKRC.26](#) & [IKRC27](#) and Motivation

In-Kind Management to enable / support In-Kind Collaboration

The In-Kind Management, in close collaboration w/ **Quality & Compliance**, and **Technical Directorates (incl. Tech. Office)**, is continuing and pro-actively supporting In-Kind partners to deliver the required engineering components and associated quality :



ESS 4 Core Values:

- Excellence
- Collaboration
- Openness
- Sustainability

IN-KIND DIVISION GOAL AND MISSION

Achieve In-Kind agreement and performance goals through strong, proactive engagement with IK Partners.

Support and advise the sub-projects in achieving IK schedule milestones and required quality standards.

Strengthen cooperation and intra-directory communication, to drive stronger and effective IK teamwork.

See [Announcement \(11 Jan 2021\)](#)

➔ Strengthening In-Kind 'bridges' and Sc. & Tech. communications between:

- In-Kind Partners and their suppliers (providers),
- Technical Directorate leadership and work package managers (owners) and
- ESS Central System Engineering Functions (enabler/facilitator/mediate)

Examples: In-Kind Management Home Page

SPACE SHORTCUTS
Here you can add shortcut links to the most important content for your team or project...

In-Kind Management Home
Created by Daniel Fris [X], last modified by Christine Darve on Aug 07, 2024

IN-KIND DIVISION GOAL AND MISSION
Achieve In-Kind agreement and performance goals through strong, proactive engagement with IK Partners.
Support and advise the sub-projects in achieving IK schedule milestones and required quality standards.
Strengthen cooperation and intra-directory communication, to drive stronger and effective IK teamwork.
See [Announcement \(11 Jan 2021\)](#)

In-Kind Contributions	Link to XRM+
In-Kind Management Quality Follow-up	Few ESS DataBase (incl. Status Reports)
Equipment Compliance	Build on Best Practices IK Support Network - Dashboard
How to Collaborate? and FAQ	Few selected Meetings

ESS Core Values
ESS principle
Organisation

How we work!

- > Way of Working with In-Kind Partners (incl. TA templates)
- > ESS Management System (incl. Handbooks, Eng. training, Equipment Ac
- > Learn more... and Explore

NOTES TO IK PARTNERS:

NB1: ADMIN: New Personal Tax Legislation:

- [Economic Employer Concept_Joint Briefing_5 Oct 2021.pdf](#)
- [New tax legislation.pdf](#) see HR/Karin Boerjesson for more information

NB2: TECH: ESS-2972919 - ESS Rule for Equipment Compliance

- > [In-Kind Review Committee \(IKRC\) and tech. deliveries](#)

And its practice

How we work!

- > [Way of Working with In-Kind Partners \(incl. TA templates\)](#)
 - [ESS-0011842 - ESS Procedure for In-Kind Contribution Management](#)
 - [ESS-2135593 - ESS Procedure for In-Kind Contribution Management during Initial Operations \(preliminary\)](#)
 - [ESS-0056433 - ESS Policy for In-Kind Management](#)
 - [ESS-4075720 - In-Kind Cost Book for ESS Initial Operations](#)
 - [ESS-0273044 - ESS Guideline for Amending Schedules \(TA\) to In-Kind Contribution Agreements](#)
 - **OVERALL IN-KIND PROCEDURE:**
 - o **1 - Confirmation of A) Receipt and b) Inspection of delivery**
 - A) ESS procedure for Receiving Goods and Parcels at ESS [[ESS-0042154](#)]
 - B) Reception Inspection Procedure [[ESS-0102301](#)]
 - o **2- Acceptance of delivery after successful SAT (or equivalent tests)**
 - ESS Procedure for Factory Acceptance Test (FAT) and Site Acceptance Test (SAT) [[ESS-0094204](#)]
 - Site Acceptance Test (SAT) template [[ESS-0113711](#)] (see Rev 4)
 - o **3- Approval of the Project Results - Final Report (FR)**
 - In-Kind Project Final Report [[ESS-2969952](#)]
 - **TEMPLATES for Technical Annexes (TA):**
 - o [ESS-0047398 - Technical Annex - Generic \(file.pdf - see 2. Related Documents\)](#)
 - o [ESS-0015345 - In-Kind Contribution Agreement](#)
 - o [ESS-2969952 - In-Kind Project Final Report \(fileR1.pdf\)](#)
 - **DASHBOARD: Technical Annexes Summed per Country**
 - [ESS Manage Supply - incl. IKM](#)
- > ESS Management System (incl. Handbooks, Eng. training, Equipment Acceptances, Procedures)
- > Learn more... and Explore

Examples: IKC Equipment Compliance

ESS Rule for Equipment

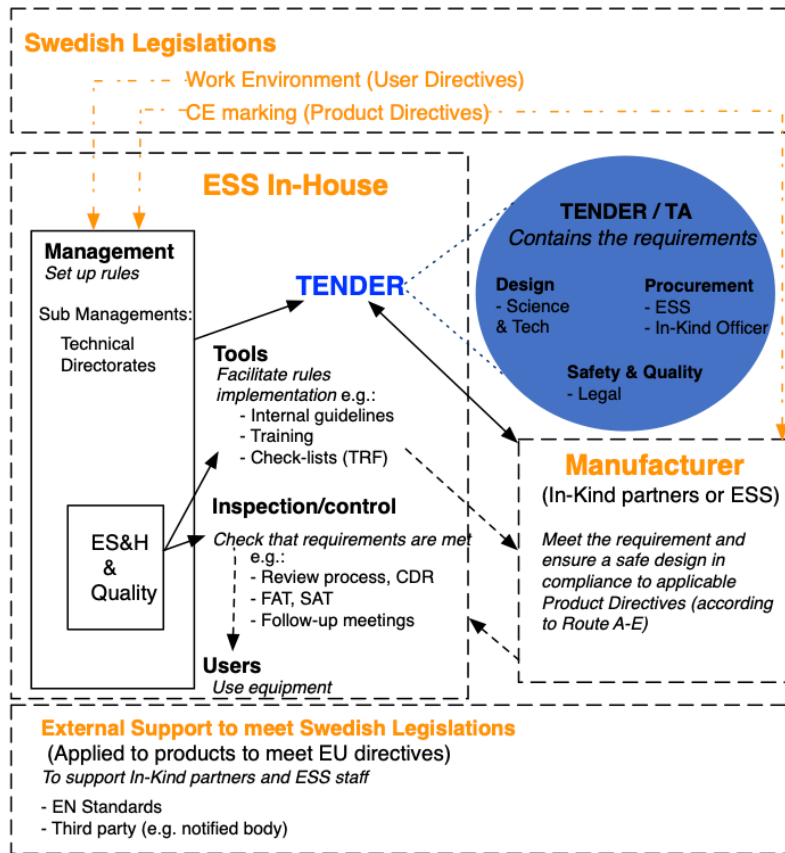
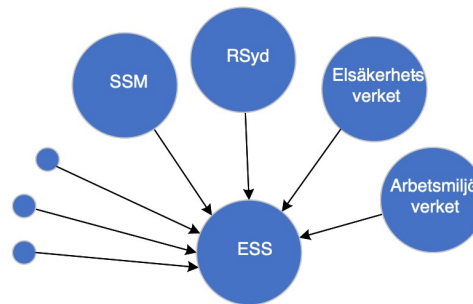


Figure 5: Flow of information between the different Stakeholders

ESS RULE FOR EQUIPMENT COMPLIANCE

	Name	Role/Title
Owner	Christine Darve	Author / In-Kind Engineering Scientific
Reviewer	Mattias Skafar	Head of Quality Division
	Mark Anthony	Project Director
	Dimitri Argyriou	Associate Director for In-Kind Management
	Carlo Bocchetta	Technical Director (acting)
	John Weisend	Accelerator Division Licensing Coordinator
	Peter Rådahl	ESS Chief Engineer
Approver	Peter Jacobsson	Head of ES&H Division
		CERN Safety Reviewer
		WoW area owner / General Director (acting)



- Rsyd → Local Rescue Service (Fire Brigade)
- Elsakerhetsverket → Swedish Electrical Safety Agency
- Arbetsmiljöverket → Swedish Work Environment Authority
- Stralsakerhetsmyndigheten (SSM) → Swedish Radiation Safety Authority

Figure 1: Some applicable Authorities at ESS

8.2 Accelerator: Modulator: ESS – Spain (ES)

The accelerator klystron modulators for the Radio-Frequency Quadrupole (RFQ) and Drift Tube Linear Accelerator (DTL), are In-Kind contributions from ESS Bilbao, Spain (see Accelerator In-Kind Technical Annex, AIK #17.6). The klystron modulators are manufactured by a Spanish company (based on ESS design), before being delivered, tested and installed at ESS.

The design is done by ESS and completed by the In-Kind Partner, ESS-Bilbao, who contracted Spanish company (JEMA added ~10% of the final product design and built it). As shown in Figure A3.1, the technical file from ESS is retrieved by ESS-Bilbao/JEMA. JEMA are manufacturing the equipment, ensure the quality of the build equipment, and be responsible for CE-marking.

In this case, the application of the Appendix 1 terminology is:

- ESS own and provide the *Technical file* (incl. build to print drawings and owner of the Intellectual Property (IP))
- JEMA is the Manufacturer (ESS-Bilbao procurement, follow-up of contract, FAT, SAT)
- ESS is the end User

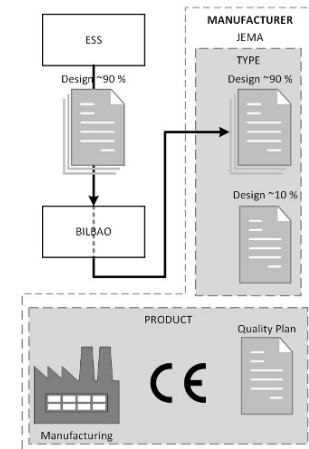


Figure A3.1: Distribution of roles and responsibilities

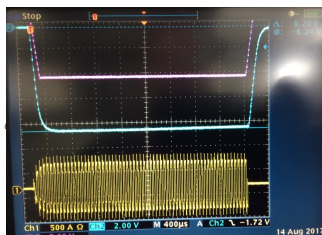
Example of innovation

Stacked Multi-Level (SML) Modulator

Part I – Low Voltage Power Conversion stage



Part II – High Voltage Oil Tank Assembly



115kV/100A; 3.5ms/14Hz
reduce flicker from the local grid

Impact:

- In-house design has permitted to reduce the budgeted costs by 70% and the space requirements by 80% !
- ESS in partnership with University, industries and In-Kind collaboration

ESS

MODULATOR DESIGN AND DEVELOPMENT

Coordinating university: Lund University, Faculty of Engineering, www.lth.se



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Project description

ESS will be the world's most powerful neutron source. This source has at its heart a linear accelerator which fires protons at a tungsten target, producing the powerful neutron beam. The linear accelerator is fed, at the first stage of the powering chain, by 33 modulators which have to deliver, each one, 11,5 megawatts peak and 600 kilowatts average power, at a rate of 14 pulses per second. While this should be possible by scaling up standard technology, it quickly became clear that there was not enough budget and space. Furthermore, the impact of such huge amount of pulse power in the local electrical power network in Lund municipality would have been seriously affected by flicker and harmonic distortions.

The research group, led by Carlos Martins, performed critical work together with the power converter team at ESS, designing, testing and commissioning critical parts for the ESS modulator following a novel topology. The final engineered solution reduced budgeted costs of modulator components by 70% and the space requirements by 80%, while factors like reliability, the quality of both the output pulse and of the power absorbed from the electrical network reached unprecedented performance.

Team

Lund University, Faculty of Engineering:

- Carlos Martins, Senior lecturer, power converters high-voltage modulator design, Industrial electrical engineering and automation
- Mats Alaküla, Professor, power converters high-voltage modulator design, industrial electrical engineering and automation
- Max Collins, Doctoral student, Industrial electrical engineering and automation
- Avo Reinap, Assistant professor, power converters high-voltage modulator design, Industrial electrical engineering and automation

Core deliverables

- High voltage power electronics
- Power converters for physics applications
- New solid state high power modulator system design
- High voltage pulse transformer design
- Complete prototype system design and construction
- Test, commissioning and verification
- Full system design specifications, build-to-print instructions, procurement documentation, follow up of series production contract

Industry involvement

AQ Elautomatik, Herman Anderssons Plåt, Plåtmekano, Carlsson & Möller

Year

2013-2018

Total budget

EUR 1.2 million

Hyperlink:

<https://europeanspallationsource.se/article/how-do-you-power-worlds-most-powerful-linacs>



Procurement codes

Electrical engineering and magnets
Electronics and radio frequency
Mechanical engineering and raw materials

Reminder: ESS Linac – A Collaborative project

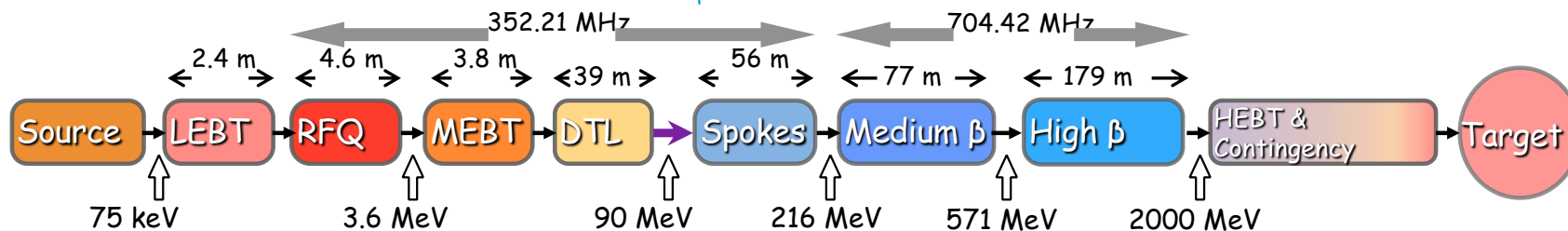
Normal Conducting Super Conducting

Key parameters:

- 5 MW average beam power
- 2 GeV
- 62.5 mA peak
- 2.86 ms long pulses
- 14 Hz
- 4 % duty cycle

A collage of logos and images representing the collaborative project. Logos include INFN, cea, Science & Technology Facilities Council, UPPSALA UNIVERSITET, LUND UNIVERSITY, and CTRs. Images show various linac components such as RFQs, DTLs, and superconducting cavities.

	Spoke	M-β	H-β
β	0.5	0.67	0.86
# CM	13	9	21
Cav. /CM	2	4	4
# Cav.	26	36	84
CM L [m]	2.9	6.6	6.6
L [m]	56	77	179



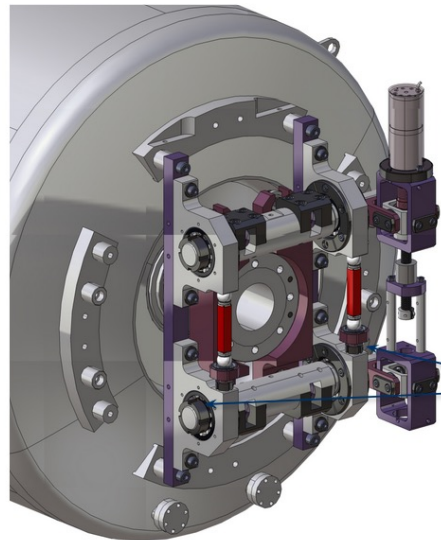
96% of acceleration will be provided by superconducting cavities supplied by dedicated high power RF sources

Examples: IK support Coll. w/ Industry

ESS / ICJ Lab and Phytron – Stepper motor

Tuning SRF cavities

Example of Cold Tuning System (CTS) for Spoke cavities



Slow tuner action

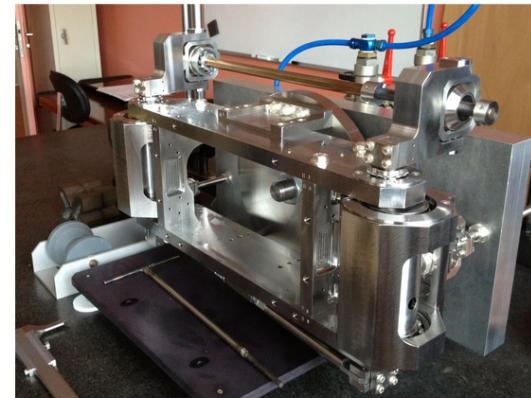
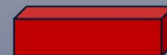
Main purpose : Compensation of **large** frequency shifts with a **low** speed

Actuator used : Stepper motor with planetary gearbox (1:256)

Fast tuner action

Main purpose : Compensation of **small** frequency shifts with a **high** speed

Actuator used : Piezoelectric actuators

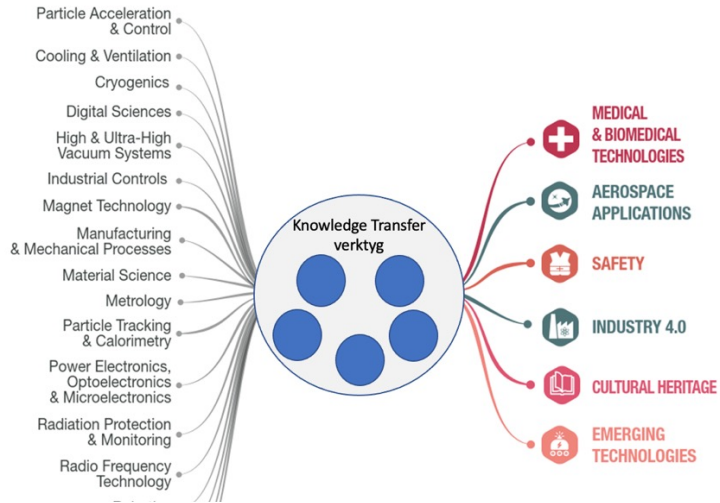


CTS for Elliptical cavities

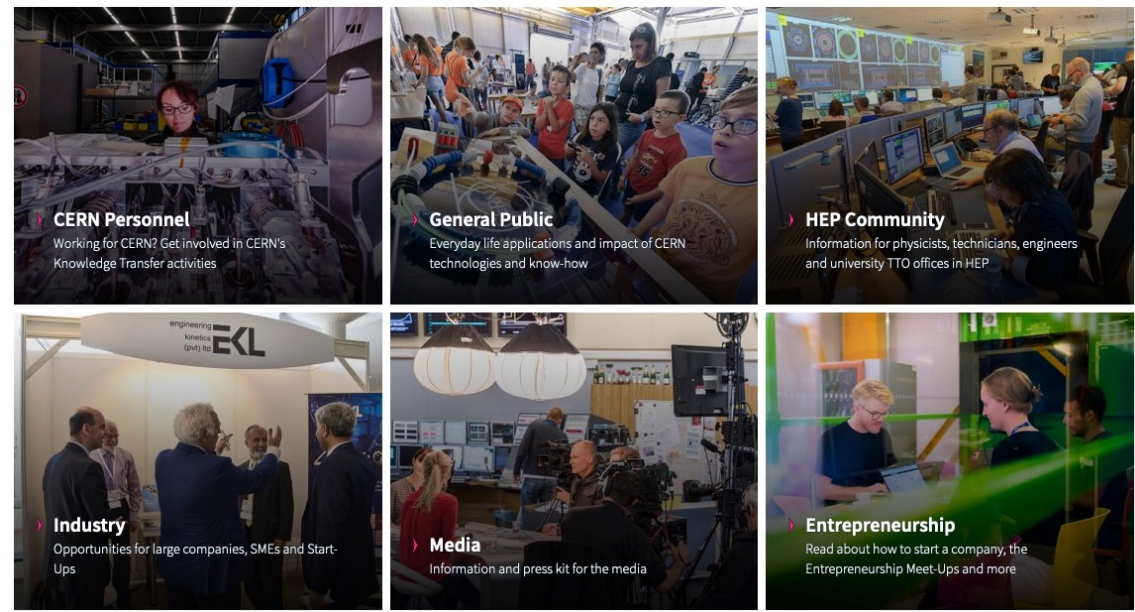
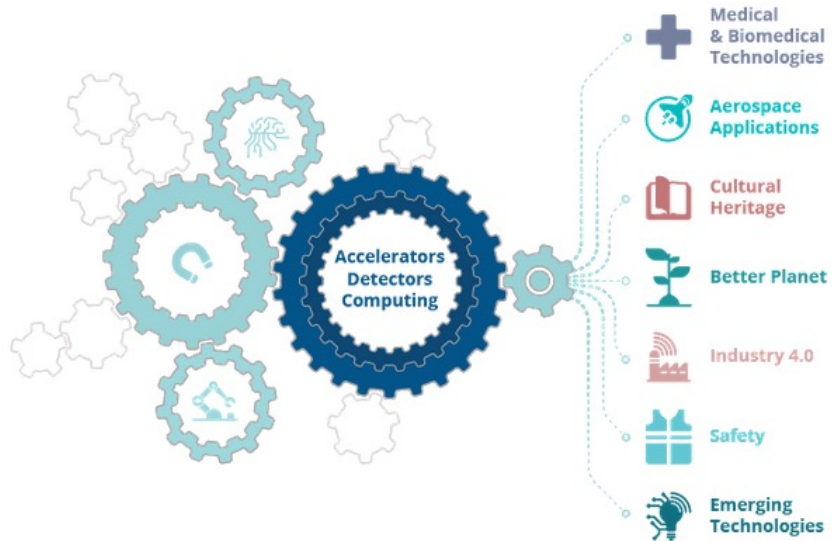
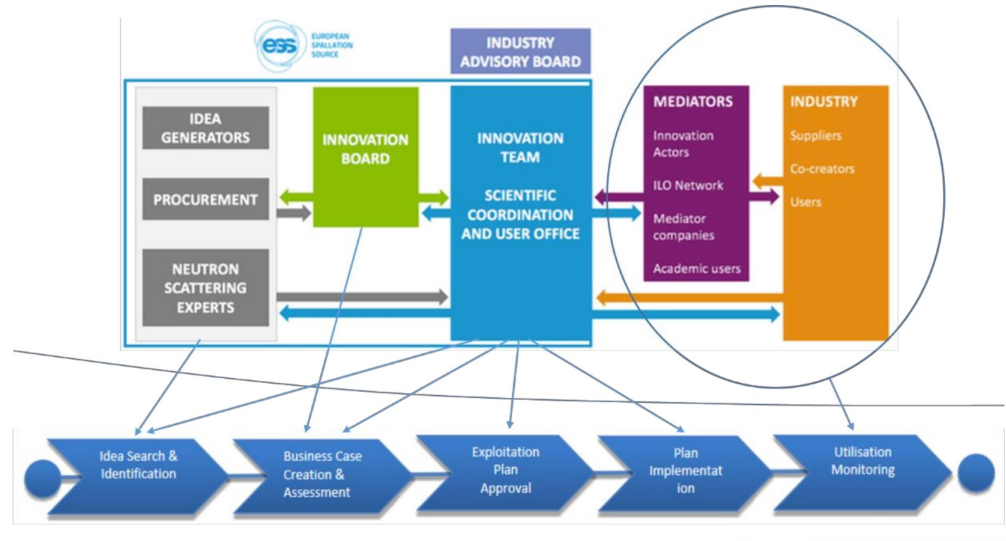
phytron
— a step ahead

Example: CERN to ESS KT

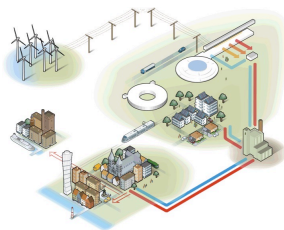
Kunskap och teknik utvecklad genom att bygga och driva forskningsanläggningen.



Identifierade applikationsområden (är relaterade till samhällsutmaning och Agenda 2030)



Reminder: Selection of Sweden and Lund as home for ESS was based on a number of factors



Competence & higher education

Synergies with research facility nearby

Accessibility

Unique energy & sustainability ambitions

Site integrated with city



**LUNDS
UNIVERSITET**



Københavns Lufthavne



RI to Enable Science for Society



Research Infrastructure (RI) and industries supported by the enlightened organizations and education, can generate a sustainable environment to serve this purpose



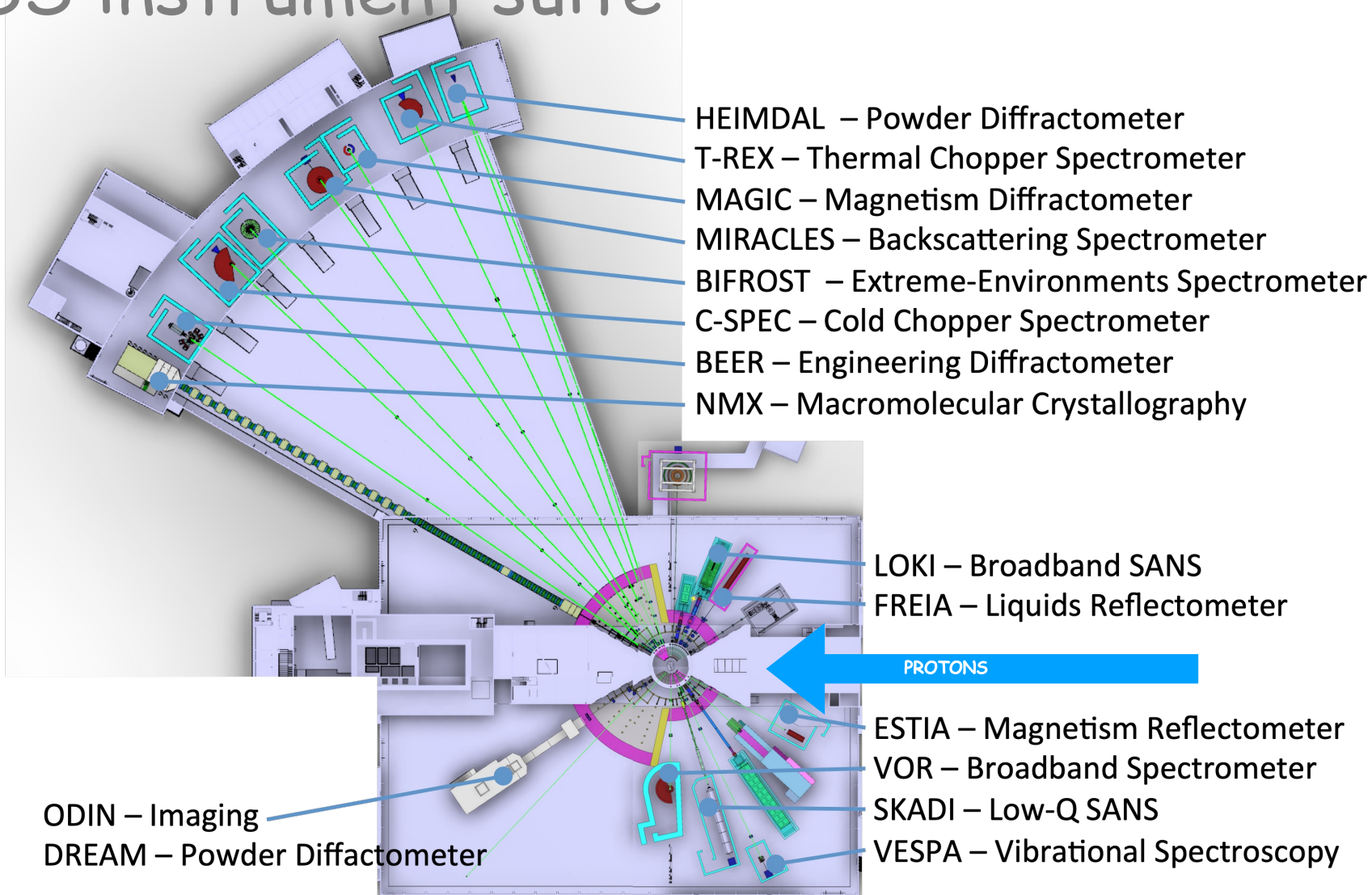
Synergies between 4 main stakeholder groups, that together empower solution driven and results focused execution of projects.

Big science and Large-scale infrastructure

- Knowledge transfer as a socio-economical impact:
 - Lessons-learned, best practices and building business cases
 - European Infrastructure consortium, ERIC
 - In-Kind model: only viable model for such ambitious goal
 - Education: engaging younger population and University network
 - Governance and Collaboration: Boards, Forums, Workshops, Associations (LENS, ESFRI, C-ERIC, BrightnESS², EOSC, SciLab, etc)
- Technology transfer:
 - Innovation catalogue : See BrightnESS² --> [“Industry and innovation at ESS”](#)
 - Products: RF station, modulator, remote handling, SRF Cavity (ADS), Data: DMSC, AI/ML, Toolbox to enhance the control system functionality

Additional Information

ESS instrument suite



e.g. France contributions to ESS

USER COMMUNITY

National neutron source: LLB,
CRG @ ILL

Principal investigators: 524

OVERALL CONTRIBUTION

Construction: € 167.3 M, 8.5 %

Initial ops: € 91.3 M, 11.3 %

Image of eg DREAM or
CRYMODULE

IN KIND CONTRIBUTIONS

- Construction

Current ambition € 125.4 M,
75 %

31 Technical Annexes

- 11 ACCSYS
- 2 ICS
- 18 NSS (6 instruments)

CASH CONTRIBUTION

Construction: € 41.9M

Initial ops: € 91.3 M (Goal 106)

French IKC Partners

Minister for the Ecological and Inclusive Transition

Minister of the Armed Forces

Minister of Higher Education, Research and Innovation

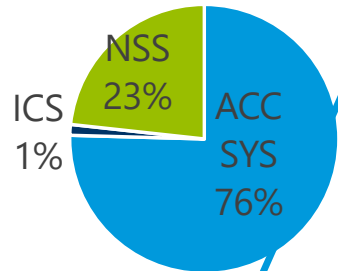
CEA (61%)
Commissariat à l'énergie atomique et aux énergies alternatives
 16 010 staff,
 4,1 billion Euro / year,
 9 research centers
 Relevant Directorate:
 → Recherche Fondamentale

CNRS (16%)
Centre national de la recherche scientifique
 31637 staff,
 €3.3 billion,
 10 national institutes:

LLB (23 %)

In-Kind ~79 % **(Cash ~21 %)**

→ 125,44 kEuro
 (as per March 12, 2020)



- 31 Technical Annexes
- 11 ACCSYS
 - 2 ICS
 - 18 NSS

CEA:
 - RFQ
 - Elliptical Cryomodules
 - Diagnostic Linac

CNRS:
 - Spoke cavities and Cryomodules
 - Cryogenic Distribution

CEA
 Controls for Proton Source, LEBT and RFQ

MAGIC (60%)
 CSPEC (50%)
 BIFROST (22%)
 DREAM (24%)
 SKADI (50%)

NMX (14%)

- Expanding European collaboration
- Transfer expertise from and to similar accelerators (RFQ, IPHI, CM assembly, SONATE)
- Cash flow to institute operation (new test zone, new amplifier, etc..)
- Labor cost
- Investment in national companies (Procurement at proximity even if open call for tender)
- Patterns

- Magnetism, chemistry of materials, Electronics phenomena
- Engineering materials, geoscience
- Life science and soft condensed matter