BrightnESS

Building a research infrastructure and synergies for highest scientific impact on ESS

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Deliverable Report: D2.4 “1st Annual IKC Progress Assessment”

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3 List of Abbreviations

ERIC	European Research Infrastructure Consortium
ESS	European Spallation Source
HoA	Heads of Agreement
IKA	In Kind Agreement
IKC	In Kind Contribution
IKRC	In Kind Review Committee
TA	Technical Annex
WP	Work Package

Contents

4 Executive Summary

This document is Deliverable 2.4. It is a comparative overview of the In Kind Contributions (IKC) being developed by (combinations of) institutes from the ESS Partner Countries[1] between September 2015 (start of BrightnESS) and December 2016. Specifically, the deliverable highlights the important supporting role of the Work Package 2 'Field Coordinators' from the BrightnESS IKC-Hubs in aligning activities across institutes and across borders and identifying potential technical risks that would prevent ESS from maintaining synchronicity between construction activities in Lund and the delivery schedule of the technical IKC Work Packages.

This deliverable was originally due in September 2016. After discussions with the European Commission, the new due date was set for the end of 2016. To maintain consistency in the BrightnESS deliverables (the annual re-iterations of this report beginning with the start-date of the BrightnESS project), the report before you provides detailed data on the In Kind Contributions between the start of Q4 2015 and the end of Q4 2016. The total value of ESS Council approved Technical Annexes by the end of Q4 2016 is €167 Million (if all IKRC endorsed TAs are included, the total IKC value is €172 Million). This value, however, does not show the full achievement over 2016, as a lot of preparatory work culminated in the endorsements of Technical Annexes (TAs) at the ESS In Kind Review Committee (IKRC) meeting in December 2016. These endorsements have resulted in 46 new agreements (totalling €103 Million) that are put before the ESS

[1] The term 'ESS Partner Countries' as used throughout this report, includes every country with a formal participation in the ESS project, either as: (1) full ESS Member State (e.g. Czech Republic, Denmark, Estonia, France, Germany, Hungary, Italy, Norway, Poland, Sweden, Switzerland, United Kingdom), (2) Observer State (countries with the intention of becoming full members, like: Belgium, the Netherlands, Spain) and (3) countries with research institutes that have In Kind Contribution Agreements with ESS (example: Lithuania).

Council in early 2017, constituting in an additional 15 percent of ESS In Kind contributions.

The report shows a table with increase/decrease of IKC per Member country in terms of total Contribution to ESS (as approved by ESS Council), the %-share of that contribution provided as In Kind, the number of collaboration agreements signed and in preparation. Overall there is an increase in commitments by the ESS Member countries. This means a steady decrease of risk to the timely completion of the ESS facility in Lund. To show the overall delta change for 2016, each table has a separate line representing the additional Technical Annex endorsement increases as a result of the In Kind Review Committee meeting in December 2016. These will re-appear as ESS Council approvals in the next iteration of this report.

For each Partner Country, the report also shows how BrightnESS Work Package 2 has thus far facilitated and supported the transition toward claiming or implementing In Kind technical packages that make up the different TAs. Much of that work has been done by the BrightnESS network of Field Coordinators in 7 so-called ESS hubs across Europe. Their – largely qualitative – contributions have been described underneath each Partner Country's IKC.

The ESS IKRC and the partner institutes within the IK Partner Countries have confirmed that the role taken by BrightnESS in maintaining good communication and assistance to the coordination roles on the design, manufacture and delivery of IK, is very important. Although not part of this year's D2.4 description (details will be in the 2nd annual IKC overview next year), one recent example where this was expressed was during the recent workshop[2] in Bilbao on "*Engineering aspects of large-scale In Kind projects*". This workshop (14-15 November 2016; over 80 participants) was dedicated to sharing experiences and proposing improvements on engineering requirements and constraints of In Kind contributions to large-scale research infrastructure projects, such as ESS.

[2] https://brightness.esss.se/ In Kind-best-practices/workshop-ikc-best-practice-bilbao.

5 Report on Implementation Process and Status of Deliverable

This document is a comparative overview of the In Kind Contributions (IKC) being developed by (combinations of) institutes from the ESS Partner Countries[3] between September 2015 and December 2016. Specifically, the report highlights the important supporting role of the Work Package 2 'Field Coordinators' from the BrightnESS IKC-Hubs in supporting activities across institutes and across borders and identifying potential technical risks to ensure that ESS can maintain synchronicity between construction activities in Lund and the delivery schedule of the various IKC Work Packages.

5.1 Introduction

The basic philosophy behind the construction of the European Spallation Source (ESS) is to source the technical knowledge from Europe's leading experts and institutions through In Kind Contributions[4] (IKC) by partner institutes within the ESS Member countries.

The reason for this approach is that building and operating the world's most powerful neutron research infrastructure is neither economically feasible nor politically achievable at a national level. Other ERICs across Europe manage large consortia of partners and stakeholders as well, but they do not nearly have the centralised hardware technology requirements of ESS. The only way to allow ESS to move from initiation to construction has been to carry out the majority of work at national level, using national funding and working on the premise that the benefits should lie primarily at national level before the ESS starts its operations.

The In Kind Contributions (IKC) to ESS have several important purposes. They allow Partner Countries to politically justify their investments in an international project outside their borders by ensuring that some of the value of their contributions remains with their respective institutions and industry. They enable technology transfer through the participation of those organisations in the construction of a large-scale European research infrastructure. They also allow ESS to leverage the collective knowledge, experience and resources of Europe's leading research institutions and industry.

[3] The term 'ESS Partner Countries' as used throughout this report, includes every country with a formal participation in the ESS project, either as: (1) full ESS Member State (e.g. Czech Republic, Denmark, Estonia, France, Germany, Hungary, Italy, Norway, Poland, Sweden, Switzerland, United Kingdom), (2) Observer State (countries with the intention of becoming full members, like: Belgium, the Netherlands, Spain) and (3) countries with research institutes that have In Kind Contribution Agreements with ESS (example: Lithuania).

[4] In Kind Contributions are non-cash contributions in labour or material to ESS. An IKC may cover technical components as well as personnel needed to perform testing, installation, and integration. IKC may also include R&D work needed during the Construction Phase. Other products or services relevant for the completion of the ESS facility may be included as well, as long as it is a planned part of the construction project and agreed between ESS, the Partner institution and the Partner Country.

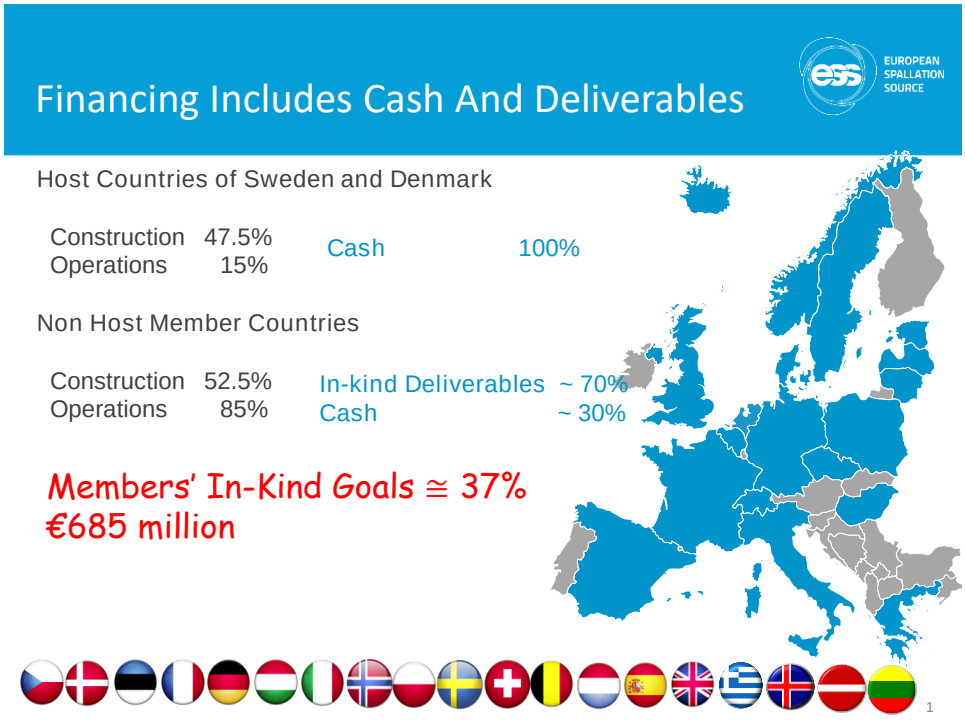


Figure 1: division of targeted Cash versus In Kind Contributions from ESS Partner Countries.

Work and activities relative to establishing IKC have been ongoing since 2011 and are making good progress. These contributions are expected to finance more than 645 million euro, or 35% of the total €1,843 Billion (2013) construction costs. Overall, ESS has identified a project scope with a potential value of 664 million euro, equal to 61% of the ESS technical work scope. The total current value of IKC work packages with Partners is €312 million, nearly half the estimated potential value. That value will continue to rise.

Suitable IKCs and their value are identified and specified by the ESS with reference to the ESS project descriptions included in the Project Construction Management Plan (also called: the Technical Design Report), and are made accessible to all Members in the ESS Cost Book. Much work has been done defining a robust and politically acceptable IKC process, but a crucial difference with some of the above name projects is the green-field nature of the ESS project.

Figure 2 below shows the different forms of collaboration in the spirit of IKC between the ESS Partner country (depending on their status as Member State, Observer State or other) and the ESS. Formal decisions are taken by the ESS Council, after endorsement of by the ESS In Kind Review Committee (IKRC). The IKRC convenes at least twice per year (usually October and December); The ESS Council meets 4 times per year (usually in February, May, October and December.

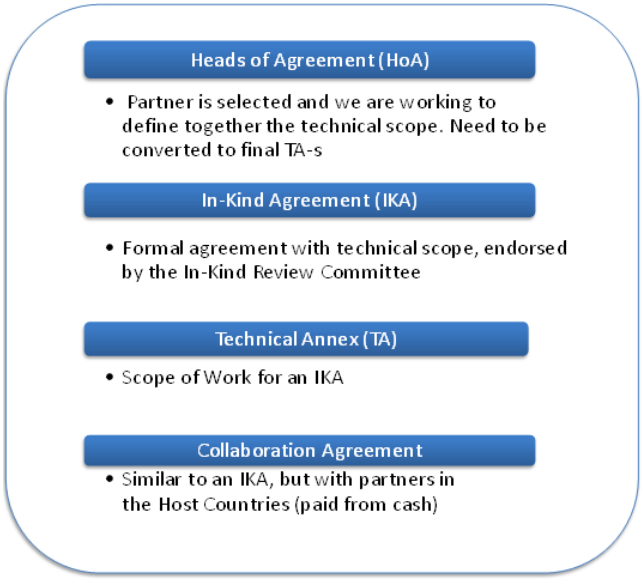


Figure 2: the different forms of collaboration in the spirit of IKC between *the ESS Partner country (depending on their status) and the ESS.*

Figure 3 below shows the division of IKC according to the four main ESS project. The red line within each column shows the end of Q3 2016 IKC committed by the ESS Member countries to each project. With the exception of 'Controls', the IKC commitments are broadly in line with expectation for the development phase ESS is currently in. Only in the 'Controls' project the IKC is behind planning, but mitigation actions to avoid delays have been set in motion. The expectation is that next year's D2.4 Annual IKC Report will show that the actions have led to the IKC for this project being on schedule again.

Figure 3: ESS In Kind Contribution goals per project.

To put the growth of IKC into perspective, figure 4 below shows the agreed/planned IKC as Potential vs. Total Budget & Objective by the end of Q4 2016.

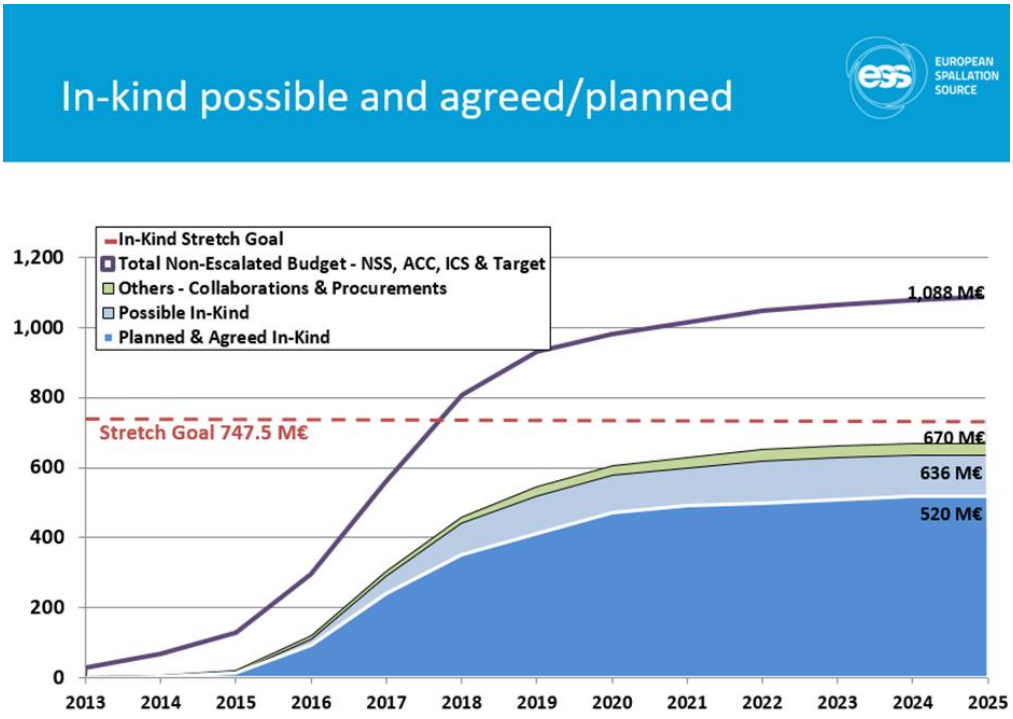


Figure 4: overview of possible and agreed/planned IKC

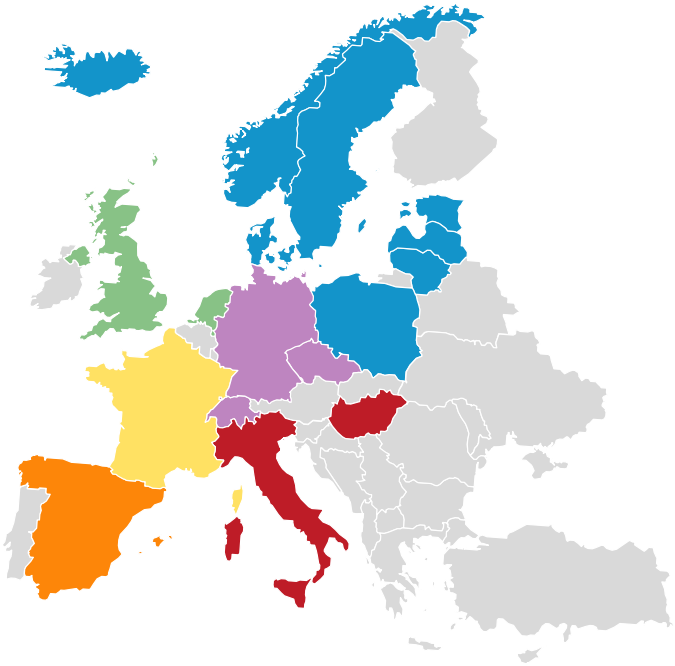
5.2 BrightnESS and ESS IKC

The BrightnESS WP2 aim is to monitor the coordination and technical progress of IKC between IKC partners and with ESS and to maximize the possibility for all to deliver value during the Construction Phase according to the ESS IKC process. This approach – which largely centers around optimizing communications at all levels – helps to minimize and mitigate the risks associated with those IK contributions. A qualitative opinion among the IKC partner institutes and technical teams at ESS shows that this BrightnESS contribution is very welcome and has filled a clear need, particularly if one keeps in mind that a single month of delay adds between €8 - €10 million to the total cost of completion of the ESS. WP2 is composed of four tasks:

1. Preparation of project implementation and training of resources needed.
2. Development and implementation of an In Kind information system for the coordination of IKC activities.
3. Development of an IKC 'Best Practice' system and standards (WEB based) with the organisation of collaboration meetings.
4. Creation of an In Kind Contribution network of regional hubs.

All these tasks have been initiated and work is in progress. With regard to task 4, the regional hubs have been placed in several IKC Partner Countries, each with a dedicated

Field Coordinator. Their role and activities are further outlined below. The choice in the allocation of the regional hubs has depended on the capacity of the different institutes, the number and complexity of their IKCs and the level of interdependent development work between institutes of different IKC countries.



Cluster / Regional hubs	Owner	Countries
North-West	STFC TU Delft	UK NL
Central	FZJ	DE, CZ, CH
Iberia	Bilbao	ES
Gallia	CEA	FR
South-East	INFN	IT, HU
Nordic / ESS HQ	ESS	DK, SE, NO, IS, LT, LV, EE, PL

Figure 5: BrightnESS regional hubs

The Field Coordinators for the regional hubs have been hired and are operative. They deliver training to staff of the local participating institutes to (1) understand the ESS, (2) understand the involvement of their home institute in the ESS and (3) familiarize them with other related technology development clusters and IKC partners related to IKC fulfillment by their home institute.

The largest part of the work of the field coordinators is to monitor and help maintain technical progress relative to schedule on IKCs. They are involved and support all three phases of the IKC process: identification, implementation and conclusion of IK contributions. Their work is to identify potential topics or issues that might lead to risks in the design, manufacture or planning of delivery of IK instruments to ESS. Their actions strengthen interfaces, reinforce quality, standards and best practices by facilitating the flow of critical information between partners. They do this mainly through optimization of the daily communication between institutes working on a particular IKC and between institutes and the main ESS project office in Lund. This has meant that significant time has been invested in getting the Field Coordinators really familiar with the procedures, processes and methods for IKC that are applied within the ESS, so that they act as ‘translators/mediators’ between the institutes and the ESS in those instances where

procedures and processes are different. The training has thus helped the Field Coordinators understand risks and identify the right people at the ESS and at the institutes that need to be involved to solve the issue.
Not all ESS Partner Countries have a Field Coordinator; in some cases, a regional hub (usually located with a main partnering institute) is responsible for two or more countries. This is done for efficiency reasons, especially in cases where institutes from two countries have to work closely together in the design, testing or manufacture of a specific (part of an) instrument.

5.3 Comparative overview of IKC progress per Partner Country

The D2.4 report is a comparative overview of IKC progress for each ESS Partner Country between the start of Q4 2015 and the end of Q4 2016, which covers the first year of BrightnESS. Table 1 below shows the overall increase/decrease of IKC per Partner Country in terms of:

- total Contribution to the ESS,
- the %-share of that contribution provided as In Kind,
- the number of TAs and collaboration agreements endorsed by the IKRC and/or approved by the ESS Council.

Table 1 shows a significant increase in the number of TAs that have been developed over the past year in close collaboration between the different research institutes and universities in the ESS Partner Countries and at the ESS in Lund. In 2016 the IKRC endorsed 46 TAs. This represents a total IKC value of €167 Million (in IKRC-endorsed and ESS Council-approved TAs, constituting in an additional 25 percent of ESS In Kind potential). This major increase in IKC commitments should be considered as an indicator for a decrease of risk to the timely completion of the ESS facility in Lund. Tables 2 and 3 show the increase from the start of Q4 2015 to the end of Q4 2016 in the number of endorsed TAs by the ESS IKRC (for approval by the ESS Council) or already approved by the ESS Council.

Table 1: Summary overview of the increase of TAs (and their corresponding value), either endorsed by the ESS IKRC (for approval by the ESS Council) or already approved by the ESS Council.

	Total national Cash & In-Kind contribution	*% of targeted IKC in national contribution*	*IK Value (in €)*
Czech Republic	37 M€ Total Contribution	82.5% (30.4 M€) In-Kind Objective	26.9 M€ Allocated IK Value
Denmark	230 M€ Total Contribution	5 Collaborations signed (3.5 M€)	
Estonia	4.6 M€ Total Contribution	70% (3.2 M€) In-Kind Objective	2 M€ Allocated IK Value
France	147 M€ Total Contribution	90% (132.7 M€) In-Kind Objective	132.7 M€ Allocated IK Value
Germany	182 M€ Total Contribution	66% (123.3 M€) In-Kind Objective	64.4 M€ Allocated IK Value
Hungary	17.6 M€ Total Contribution	70% (12.3 M€) In-Kind Objective	8.4 M€ Allocated IK Value
Italy	110 M€ Total Contribution	81% (89.4 M€) In-Kind Objective	78 M€ Allocated IK Value
Norway	46.1 M€ Total Contribution	40% (18.4 M€) In-Kind Objective	13.5 M€ Allocated IK Value
Poland	33.2 M€ Total Contribution	76% (25.4 M€) In-Kind Objective	25.4 M€ Allocated IK Value
Spain	92.2 M€ Total Contribution	80% (73.7 M€) In-Kind Objective	51 M€ Allocated IK Value
Sweden	645 M€ Total Contribution	8 Collaborations signed (13.3 M€)	
Switzerland	64.5 M€ (90.4 MCHF) Total Contribution	70% (45 M€, 63 MCHF) In-Kind Objective	31.8 M€ Allocated IK Value
United Kingdom	183 M€ (165 M£) Total Contribution	70% (128 M€, 116 M£) In-Kind Objective	96.4 M€ Allocated IK Value

Table 2: Summary overview of endorsed TAs by the ESS IKRC (for approval by the ESS Council) or already approved by the ESS Council. Status Q4 2015.

	Start Q4 2015 (Oct 2015)			
	No. TAs (cumulative) endorsed by IKRC and not yet approved by ESS Council	Value (cumulative in M€) TAs endorsed by IKRC and not yet approved by ESS Council	No. TAs (cumulative) approved by ESS Council	No. TAs (cumulative) approved by ESS Council
Czech Republic	0	0	0	0
Denmark	0	0	0	0
Estonia	1	0,2	0	0
France	0	0	0	0
Germany	0	0	0	0
Hungary	0	0	0	0
Italy	0	0	0	0
Norway	0	0	0	0
Poland	0	0	0	0
Spain	0	0	0	0
Sweden	0	0	0	0
Switzerland	0	0	0	0
United Kingdom	0	0	0	0
TOTALS	**1**	**0,2**	**0**	**0**

Table 3: Summary overview of endorsed TAs by the ESS IKRC (for approval by the ESS Council) or already approved by the ESS Council. Status Q4 2016.

	End of Q4 2016			
	No. TAs (cumulative) endorsed by IKRC and not yet approved by ESS Council	Value (cumulative in M€) of TAs endorsed by IKRC and not yet approved by ESS Council	No. TAs (cumulative) approved by ESS Council	Value (cumulative in M€) of TAs approved by ESS Council
Czech Republic	0	0	5	18,5
Denmark	0	0	0	0
Estonia	0	0	7	1,5
France	10	4,6	10	92
Germany	0	0	0	0
Hungary	2	0,25	9	3,1
Italy	12	41,8	2	21,3
Norway	0	0	10	5,2
Poland	0	0	8	25,4
Spain	8	20,7	0	0
Sweden	0	0	0	0
Switzerland	9	9,59	0	0
United Kingdom	5	26,3	0	0
TOTALS	**46**	**103,24**	**51**	**167**

This report also shows for each individual ESS Partner Country how BrightnESS Work Package 2 has thus far facilitated and supported their transition toward claiming or implementing In Kind technical packages that make up the different TAs. When reading the table, one should keep in mind that this report comprises only the first year of BrightnESS' operations, in which the first six months were largely used to put in place the regional hubs and select the candidates for the Field Coordinator positions. This has meant that for the first year of BrightnESS, the Field Coordinators were only partially active across all of the agreed and prospective IKC packages of all ESS Partner Countries. In one particular country (Hungary), it has also become clear that the local institutes are more efficiently served by having their own Field Coordinator instead of a Field coordinator from a different hub. This process has also taken some time to complete.

To prepare the Field Coordinators for their tasks, WP2 has held several joint training sessions to instruct them on procedures and processes at the ESS, as well as topical meetings at individual partner institutes. Trainings at the ESS have focused on:

- the IK processes,
- the ESS master plan,
- standards and quality control,
- systems engineering management plans,
- logistics and related topcis,
- the ESS IK cost-book work-packages both still to be assigned and assigned.

Regular biweekly meetings of Field Coordinators are held to share lessons learnt and communicate partner requirements/suggestions to ESS management.

North-West Hub (UK, NL)


The North-West hub is composed of the United Kingdom and the Netherlands. Each country has one or more representatives as Field Coordinators. Although the Netherlands is at present not a Member of the ESS, its intent is to become a Member. In fact, in December 2016 the Dutch government included the ESS in their strategic National Roadmap, thus bringing the Netherlands one step closer to full ESS membership.

The Field Coordinator has assisted in communication between the ESS and Dutch institutes for the promotion of future ESS membership. Actions also included liaison with industry for ESS involvement and innovation. The Field Coordinator is gathering information for a rapid inclusion of Dutch participation in the ESS project and supports the identification of suitable IKC.

The Field Coordinator and assistants in the UK hub have assisted in the establishment of the UK project office and the recruitment of four staff. The coordinator has held UK-ESS Board meetings with a bimonthly occurrence and has negotiated an agreed IK list of projects for the ESS. The coordinator has set in place governance arrangements and assisted UK scientists and technologists working on ESS with interfaces, such as contacts and computer systems and given assistance with the preparation of Technical Annexes. The hub team members have supported BrightnESS work package tasks such as the best practice activities which benefits communication and reduces risk.

Central Hub (DE, CZ, CH)

The Central Hub is composed of Germany, which hosts the Field Coordinator and assistant, the Czech Republic and Switzerland. After an initial recruitment phase for the Field Coordinator, work focused on partner activities related to Instruments and Target. Instrument work packages for the ESS involve many Partner Countries and institutes, requiring extensive information sharing and face-to-face meetings. Several visits to partner laboratories both within and outside Germany have helped in the sharing of sensitive project information. Risk mitigation activities by the Field Coordinator included the sharing of information on VAT-handling [5] with host partners, discussions on instruments and the shielding of instruments. The hub liaised with Gallia, Iberia and North-west hubs on common ESS work packages and initiated discussions for a common workshop on shielding of instruments.

[5] The description of IKC-related VAT issues between industry suppliers and the national institutes, as well as between institutes and the ESS is not part of this deliverable, but part of WP3 deliverables. The Field Coordinators were instrumental in providing information to ESS and to the institutes on current status on VAT and shared information about VAT-handling in the other hubs.

Iberia Hub (ES)

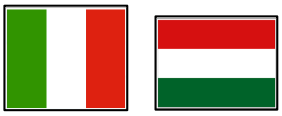
Spain has Observer Status with ESS, which means they cannot legally sign In Kind Agreements with ESS. Although they have not yet committed to full membership, Spanish institutes are, however, in charge of important technical Work Packages. Field Coordinator actions within the Iberia hub include regular meetings with ESS-Bilbao work package leaders to understand project details and share critical information from the ESS. Visits and meetings with Spanish industry have helped towards a better description of the scope of work for ESS work packages. The Field Coordinator discussions and meetings with ESS personnel from logistics helped in the preparation of transportation of first deliverables to the ESS site. Participated in the negotiations of new In Kind work (MIRACLES Instrument) and the preparation of Technical Annexes (on: Medium Energy Beam Transfer; modulator Call for Tenders; collaboration agreement with the university of Cantabria for the design and prototyping of low-level RF elements), including risk identification and the follow up on mitigation actions. The Field Coordinator assisted in the monitoring of the technical progress (schedules, milestones, interfaces and monthly reports) and reported on major issues (examples: potential delay in ESS modulator prototype that will impact Calls for Tender; target-wheel coating for diagnostics was not included in the specifications; target wheel vessel and tungsten cassettes are fabricated by different companies and therefore requires inspection by external experts). Information was shared with other BrightnESS Field Coordinators to mitigate risk in similar situations in other institutes. Support was given to standards for quality, logistics and the follow-up on tenders (examples: analysis of the required documents and procedures for first-shipment of concrete blocks for the beam-dump). Inter-hub discussions with the Gallia Hub and the South-east hub also took place on – for example - the Call for Tender on modulators.

Gallia Hub (FR)

Activities in the Gallia Hub for ESS work packages are at an advanced technological stage. Field Coordinator activities for this hub concentrated mainly on improving and strengthening liaison with industry to become potential suppliers in Calls for Tender (e.g.

procurement information and procedures; construction of French industrial network of principal actors for the instruments-part on industrial development strategy is in progress). Inter-hub activities included interactions with the Central hub for instruments (providing contact details of technical staff inside the French institutes) and the shielding of instruments and interactions with the Iberia hub for modulators. Also: collection and reaffirmation of information to ESS Lund about French companies able to provide skills and knowledge for the realization of the neutron guide bunker. Finally, the Field Coordinator also gave a seminar-presentation at the Swedish embassy in Paris on the French participation to the ESS.

South East Hub (IT, HU)



The South-East hub includes Italy and Hungary. Italy hosts the Field Coordinator at the partner institute INFN. The Field Coordinator is based at INFN Torino and assistants are based in various regional laboratories in Catania, Torino and Milano. Significant work by the Field Coordinator was done on liaising and coordinating tasks at the various INFN laboratories, at Elettra and at CNR. This involved the sharing of (additional) technical information from/to the ESS and the status of activities and solutions adopted or developed at the partner institutes and at ESS. The Field Coordinator also participated in discussions with industry on a potential delay on Calls for Tender related to the drift tube Linac tank module. The potential delay was due to a delay in the signature of the IK agreement. Support was also given to industry suppliers to update them on the progress of technical work at ESS. The Field Coordinator was also able to mitigate risks related to industry deliveries of drift tube Linac tank module technology as this would otherwise not match the ESS master plan schedule. Regular communication with other BrightnESS Field Coordinators took place to share knowledge of developments in the hub, for example, policies adopted for handling of VAT issues. Meetings with counterparts (e.g. WIGNER) in Hungary were held to understand and contribute to the optimization of ESS work package actions coming from other Hungarian partners.

Nordic-Baltic Hub (DK, SE, NO, EE, PL)

The Nordic-Baltic hub is composed of Sweden, Denmark, Norway, Iceland, Latvia, Lithuania, Estonia and Poland. The contributions from these countries are in the form of collaborations and In Kind work packages. Field Coordinator activities focused especially on Integrated Control Systems and Instruments. The Field Coordinator shared information with partner institutes and monitored the promotion of In Kind activities (examples: identifying university of Bergen as a potential accelerator partner in hub countries via the secondment of an ion source expert; assisting in discussions between ESS and Estonia on cyber security; managing contact information flow between ESS and Norway IFE concerning the design of the control room and the target bunker projects). The Field Coordinator also provided support to ESS technical personnel by organizing training sessions at the ESS about optimization of communication and risk mitigation approaches with partner institutes. The Field Coordinator also made several presentations to ESS management on areas of risk for mitigation, advising on the improvement communication and promoting meetings for the dissemination of critical information and procedures at the ESS. Finally, the Field Coordinator actively participated in meetings with government representatives on possible future membership of ESS.

IS, **LV, LT**

Iceland, Lithuania and Latvia are currently not yet active ESS Partner Countries. BrightnESS WP6.2 is holding information sessions and events to create more awareness and interest among the scientific and political communities to work with ESS in the future.

6 Conclusions on 1st year ESS IKC with BrightnESS involvement

The first year of BrightnESS WP2 involvement in the ESS IKC process saw a relatively slow start as the positions at the different institutes first needed to be filled with technical staff who also have a clear interest in communications. Maintaining continuous technical, organizational and procedural communication between industry suppliers and institutes, between institutes themselves and between institutes and the ESS is proving one of the biggest challenges when it comes to the implementation of IKC. BrightnESS Field Coordinators are established and functional, providing support to the IK processes and have come to play an important role in minimizing misunderstandings that might otherwise result in delays or misconfigurations or – just – an increase of cost. They have received training at the ESS (and continue to do so) to deepen their knowledge of ESS IK activities and share this knowledge as required with hub partners. Their activities during the year have contributed to the signing of IK agreements and Technical Annexes and towards the clarification of procedures for the final stages of IK implementation.

As to IKC itself, the increases in Council approved TAs from September 2015 to September 2016 are 12 TAs (value increase of €26 Million), with a further increase of IKRC endorsed TAs to 39 by the end of 2016. The figures are a clear indication that the model of IKC works (at least for ESS) and that technical progress toward completion of ESS construction is generally moving along as planned.