



BrightnESS

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

H2020-INFRADEV-1-2015-1

Grant Agreement Number: 676548

brightness

Final Version

Deliverable Report:
D3.2 Determine an Innovation Strategy and Policy (TT)

Project Deliverable Information Sheet

BrightnESS Project	Project Ref. No. 676548	
	Project Title: BrightnESS - Building a research infrastructure and synergies for highest scientific impact on ESS	
	Project Website: https://brihtnness.se	
	Deliverable No.: D3.2	
	Deliverable Type: Report	
	Dissemination Level: Public	Contractual Delivery Date: 01/09/2017
		Actual Delivery Date: 02/03/2018
	EC Project Officer: Mina Koleva	

Document Control Sheet

Document	Title: Determine an innovation Strategy and Policy FINAL	
	Version: 1	
	Available at: https://brihtnness.se/about/deliverables	
	Files: -	
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List of abbreviations

EC – European Commission

ESS – European Spallation Source ERIC

EU – European Union

ILO – Industrial Liaison Office

Policy – European Spallation Source ERIC Policy for Innovation

R&D – Research and Development

SCUO – Scientific Coordination and User Office

Strategy – European Spallation Source ERIC Innovation Strategy

TT – Technology Transfer

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1 Executive Summary of Deliverable 3.2: Determine Technology Transfer Strategy and Policy

Deliverable 3.2 “Determine Technology Transfer Strategy and Policy” is the result of two documents – the European Spallation Source ERIC Policy for Innovation, and Recommendations for an European Spallation Source ERIC Innovation Strategy.

The first document, the European Spallation Source ERIC Policy for Innovation (hereinafter referred to as Policy) presents a coherent plan to guide ESS in achieving the full innovation potential generated by ESS during the entire life cycle of the facility. The Policy recognises employees as a key source of innovation, and at the same time acknowledges the importance of external partners and R&D activities. The Policy represents a commitment to exploit and disseminate innovation, and to embrace the concept of Open Innovation. The intellectual and market value of organizational innovation will be protected only if there is a clear case for doing so and if it would benefit the Organisation or its stakeholders.

The second document, Recommendations for a European Spallation Source ERIC Innovation Strategy (hereinafter referred to as Strategy) provides guidelines on how to implement the Policy. The Strategy takes into consideration conclusions from two internal brainstorming workshops and one external innovation conference organised within the framework of BrightnESS in March, August and October 2017. The purpose of the Strategy is to maximise the impact of the ESS-generated knowledge on society in terms of sustainability, technological solutions, economic growth, employment, and improved quality of life. This Strategy is a living document that will dynamically adjust to the needs presented by the different stages of building and operating ESS. The document strives to enable the Organisation to capture all innovation related to ESS, and transform novel ideas into products and other specific benefits that can have a direct impact on the society.

2 European Spallation Source ERIC Policy for Innovation

The European Spallation Source primary mission is to enable world-class research using neutrons, to contribute to the strengthening of Europe's and the Member countries position in research in the world. We aim to generate or to enable to generate knowledge that will impact society in terms of economic growth, employment, sustainability and technological contributions to the solution of the world's great challenges.

This research will lead to the emergence and creation of new ideas, devices, methods and applications of significantly better solutions that meet new requirements, unarticulated needs, or existing market needs. Innovation activities, in this context, in its broadest sense, may also include R&D that is not directly related to the development of a specific innovation.

We embrace Open Innovation and will pursue its goals with external partners, understanding that not all innovation will happen at ESS. We will encourage the exploitation and dissemination of innovations created or enabled by the use of ESS facilities and by ESS staff, for new markets and new uses.

We encourage industry to make use of our facility and the available scientific and technological knowledge to create future, marketable innovation. To this purpose, ESS will make its facilities and staff accessible also for industrial usage of the ESS. We will also encourage our academic users to cooperate closely with industry to use our facilities.

We will exploit and disseminate innovations through patenting, spin off companies, collaboration with strategic potential partners, and other forms of activities suitable for obtaining the goals of this policy. We will consider protecting the intellectual and market value of our innovations if there is a clear case for doing so, that would benefit the organisation or its stakeholders.

This Policy applies to everyone with an employment contract with ESS. It is the responsibility of staff members of ESS to document new ideas in a form or format provided by ESS, if and when there is good reason to believe that the idea is innovative and has a knowledge or monetary value to ESS or ESS stakeholders.

The responsibility for the implementation of the Innovation policy lies with the ESS Division for Communication, External Relations and In-Kind Management.

3 Recommendations for a European Spallation Source ERIC Innovation Strategy

3.1 Introduction

Being one of the largest research infrastructure projects built in Europe today, the European Spallation Source (ESS) offers a significant amount of innovation opportunities. To be able to fully leverage this potential, ESS has to build capacity within the Organisation and have a long-term vision for innovation with clearly defined goals. With this in mind, the ESS Policy for Innovation was approved by the ESS Management in September 2017. The purpose of the Recommendations for an ESS Innovation Strategy is to provide guidelines on how to implement the Policy. The Strategy is a part of BrightnESS Deliverable 3.2 entitled “Determine Technology Transfer Strategy and Policy”, and takes into consideration conclusions from two internal brainstorming workshops and one external innovation conference organised within the framework of BrightnESS in March, August and October 2017.

3.1.1 Knowledge Generated by ESS Will Have Innovation Potential

The primary mission of ESS is to enable scientific breakthroughs and world-class research using neutrons. The Organisation aims to foster a scientific culture of excellence, and contribute to the strengthening of Europe’s and ESS Member Countries’ position in the international materials research arena. Research carried out at the state-of-the-art instruments of ESS will lead to novel ideas, devices, methods and applications that will offer solutions to the latest societal and market needs.

3.1.2 Mandate to Support Innovation

The European Spallation Source is bound by its Statutes, which govern the European Research Infrastructure Consortium (ERIC). According to Article 2.2.a of the Statutes, the Organisation shall “contribute to top-level research, technological development, innovation and societal challenges.” The commitment to innovation is repeated in the ESS Vision and Mission, which has been endorsed by ESS Council in June 2017. The mission of ESS is, among other things, to “develop innovative ways of working, new technologies, and upgrades to capabilities needed to remain at the cutting edge.”

The Statutes and the ESS Vision and Mission both reflect the increasing trend in the European Union (EU) and the world to focus on turning research results into innovative services and products. The Innovation Union, one of seven flagship initiatives of the Europe 2020 Strategy, aims to make Europe a world-class science performer by removing obstacles to innovation.

The EU commitment to become a global leader in innovation has been further supported by piloting the European Innovation Council, which if successful will play a vital role in commercialisation of technologies in the EU. In addition to that, the European Strategy Forum on Research Infrastructures (ESFRI) was established to support a coherent and strategy-led approach to policy-making on research infrastructures in Europe. In 2014, ESFRI prioritised ESS as a research infrastructure project strategically relevant for Europe, thus acknowledging its role in enhancing European science and innovation competitiveness.

3.1.3 Pursuit of Innovation Manifested in ESS Policy for Innovation

In September 2017, the ESS Management approved ESS Policy for Innovation. The document presents a coherent plan to guide ESS in achieving the full innovation potential generated by ESS during the entire life cycle of the facility. The Policy recognises employees as a key source of innovation, and at the same time acknowledges the importance of external partners and R&D activities. The Policy represents a commitment to exploit and disseminate innovation, and to embrace the concept of Open Innovation.

3.1.4 Need for an ESS Innovation Strategy

The purpose of the Recommendations for an ESS Innovation Strategy is to maximise the impact of the ESS-generated knowledge on society in terms of sustainability, technological solutions, economic growth, employment, and improved quality of life. This document is a living document that will dynamically adjust to the needs presented by the different stages of building and operating ESS. The document strives to enable the Organisation to capture all innovation related to ESS, and transform novel ideas into products and other specific benefits that can have a direct impact on the society.

3.2 Objectives

This document has the following key objectives aiming to support ESS in implementing its Policy for Innovation:

- Provide guidance for the implementation of the ESS innovation framework, taking into account relevant policies;
- Ensure a common understanding of innovation across ESS, and encourage an innovation culture at ESS;
- Maximise impact of ESS throughout its entire lifecycle, considering the different project phases and priorities;
- Define owners of various innovation activities, and specify their interaction with internal and external stakeholders.

These objectives form underpinning principles for all innovation activities generated at and enabled by ESS. They guide the Organisation in making strategic decisions to ensure efficient and effective implementation of the ESS Policy for Innovation. Concrete steps to achieve these objectives are described in the chapter on Implementation.

3.3 Mapping of Industry-Related Stakeholders

Stakeholder mapping represents an important step in understanding the interests, needs and perspectives of key actors in the innovation ecosystem of ESS. The ESS Policy for Innovation recognises that a substantial proportion of innovation will be enabled rather than directly generated by ESS. As a result, industry and innovation-related stakeholders can be divided into two categories: internal and external stakeholders. Figure 1 lists specific stakeholders in each of these two groups and illustrates interaction between them. A detailed description of each stakeholder listed below is available in the Annex.

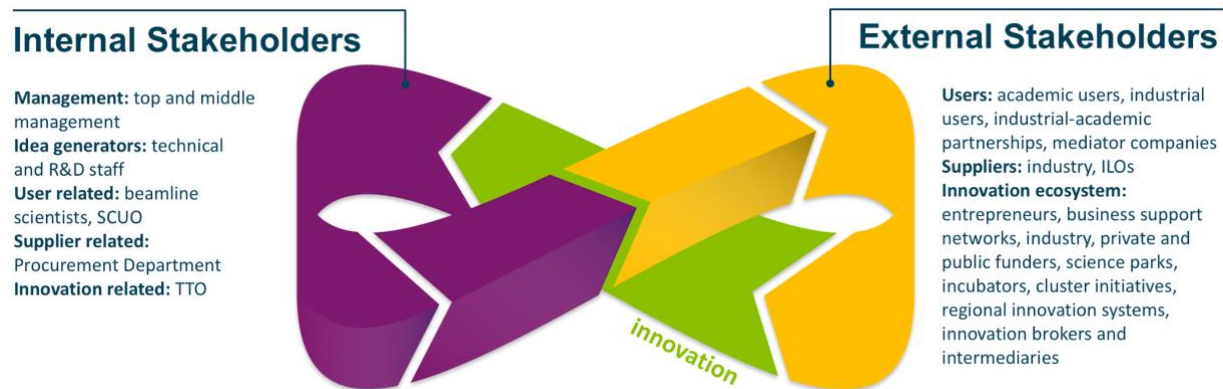


Figure 1: List of Internal and External Stakeholders and Their Interaction

Establishing and maintaining good collaboration with industry is critical to innovation. It creates value from investments in science, such as for example development of new, competitive products and creation of jobs. This increases tax revenues which can be used for the benefit of society and science.

Industry representatives often face obstacles when interacting with large-scale research infrastructures similar to ESS. This happens irrespective of whether they have the role of users, suppliers, or co-creators involved in technology transfer. Common barriers faced by industry include:

1. **Lack of awareness:** Industry is often not aware of research and development (R&D) opportunities at RIs, and has limited knowledge about what experiments and tests can be performed to the benefit of industrial users. As a supplier, industry does not always consider large-scale RIs as prospective clients.
2. **Handling of intellectual property (IP) rights:** Ownership of IP rights is crucial for industrial users, suppliers and co-creators alike. Industrial users are usually allowed to protect IP related to research carried out at RIs. However, IP problems can arise in connection to R&D contracts and when industry is asked to supply technologies that need to be developed or co-developed to meet specific needs of RIs.
3. **Difference in timescales (administrative, legal and fiscal barriers):** RIs operate on different timescales than industry. While many RIs set aside beamtime for industrial users and offer them fast access, the working speed of RIs is generally slower than that of industry. Industrial users need immediate solutions to their problems.
4. **Language barrier:** Communication between industry and RIs can be challenging because the two do not use the same terminology and thus have difficulties understanding each other's needs.

Industrial users need internal RI staff to help them interpret problems into experiments and to translate data into meaningful results. On the other hand, RIs need to rely on the technical expertise of industry to find solutions to their own needs, which often require innovative solutions and novel technology.

As a RI mandated to promote and support innovation, ESS needs to take into consideration the common barriers listed above and make concrete steps to address them.

3.4 Overall Strategic Approach

ESS is committed to Open Innovation and strives to work with industry in an effective and efficient way. In order to benefit from the experience of others, RIs similar to ESS were benchmarked and their approach to delivering innovation was assessed. This section evaluates practices observed at other RIs and suggests the best way forward for ESS.

3.4.1 Benchmarking Innovation Activities at Other RIs

The delivery of innovation was benchmarked at a number of established RIs with a similar user profile, i.e. Paul Scherrer Institute (PSI), European Synchrotron Radiation Facility (ESRF), Institut Laue Langevin (ILL), Extreme Light Infrastructure (ELI), Deutsches Elektronen-Synchrotron (DESY), and European Molecular Biology Laboratory (EMBL). All of them have a dedicated team/office in charge of innovation and technology transfer that acts as an interface for external stakeholders. The size of the office varies across the benchmarked RIs and ranges between 5-13 employees, i.e. ELI (5), PSI (9), EMBL (9), DESY (11), and ESRF (13). The functions the offices provide include facilitation of knowledge and technology transfer, brokering of collaborations with industry, patent filing and licensing, developing Non-Disclosure Agreements (NDAs), identifying funding opportunities, assisting with grant writing, supporting spin-offs and start-ups, and training and educating staff in areas relevant to innovation. The offices also help industrial users to prepare applications for beamtime and applications for the funding of beamtime access. They play a key role in communicating all opportunities to external stakeholders.

3.4.2 Internal vs External Delivery of Innovation

The responsibility for Innovation within ESS could be delivered through different routes: by outsourcing to an external contractor, by using internal resources or a combination of both. Each option has a number of pros and cons. Innovation activities at ESS have been funded through external grants until now. In order to make an informed decision about how to sustain them, and to propose the best way forward for managing innovation activities in the future, both delivery approaches have been thoroughly evaluated. The table below provides an overview of benefits and challenges of external and internal delivery of innovation.

	External Delivery of Innovation	Internal Delivery of Innovation
Control over innovation activities and their coordination	<ul style="list-style-type: none"> ESS is dependent on an external organization, whose business focus might not be in line with ESS Vision and Mission. ESS has little control over priority areas, idea development and impact. Innovation activities may not reflect the changing needs of ESS when it moves to operations. 	<ul style="list-style-type: none"> ESS has full control over innovation activities, use of ideas, and impact. ESS can fully define processes and procedures, and align them with ESS Mission and Vision, and other policies. ESS can adopt innovation actions according to its needs when moving to operations.
Process and procedures	<ul style="list-style-type: none"> External organization has established and tested processes and procedures, and can implement and trail them at ESS rather quickly. ESS has limited flexibility in adjusting processes and procedures to its own needs and internal requirements Incompatibility of processes and procedures can lead to friction between ESS and its Member Countries. To mitigate the risk, ESS needs to find external organization that is willing to accommodate its processes and procedures to ESS needs. This will be challenging and will pose a risk. 	<ul style="list-style-type: none"> ESS has to establish its own processes and procedures and test them. This can be lengthy, but ESS could benefit from the experience of other RIs, who have already done so. ESS can design innovation-related processes and procedures to best suit the Organisation's needs, ensure their compatibility with ESS Policy for Innovation, and other internal processes and procedures.
Identifying opportunities from within ESS	<ul style="list-style-type: none"> External organisation has limited ability to identify innovation opportunities at ESS due to insufficient understanding of ESS culture, limited engagement with ESS staff, and lack of trust from staff. This reduces the overall impact of ESS. External organization is active, has a broad network across many sectors, and broad market knowledge. This allows the organisation to link opportunities at ESS with market needs, and bring ideas to the market. 	<ul style="list-style-type: none"> ESS maximises its impact thanks to good engagement with staff and trustful working relations. ESS staff has good overview of activities across departments and is more likely to contribute to innovation. Limited resources for innovation lead to limited awareness of market needs. This reduces the ability of ESS to turn internal opportunities into innovation. ESS needs to implement preventive measures to address this.
Resources	<ul style="list-style-type: none"> No internal resources are required, but this does not necessarily lead to significant cost savings as the work of external organization needs to be covered. This can be done by payment for contractual work and/or giving up a share of income generated by innovation. There is some flexibility in the timing of contracted work and thus also cash flow. 	<ul style="list-style-type: none"> A number of employees dedicated to innovation is required. This represents a fixed cost that the Organisation needs to make available to carry out innovation successfully.

	External Delivery of Innovation	Internal Delivery of Innovation
Access to large external networks	<ul style="list-style-type: none"> Well-selected external organisation has a large industrial and innovation network. It has comprehensive knowledge of market needs and opportunities to take ideas successfully to market. In combination with a wide technology portfolio, this can lead to development of disruptive technology. 	<ul style="list-style-type: none"> As a young organisation, ESS currently has a small external network, but this will change over time. If internal resources are made available, ESS will be able to create a wide industrial network of its own. ESS can use its ILO Network to deliver innovation opportunities. The Network has a broad geographical reach and can thus outperform external providers.
Technology portfolio	<ul style="list-style-type: none"> External organization is more likely to have a larger technology portfolio than ESS, which can facilitate efficient interactions with industry. ESS opportunities are seen by a larger number of companies and may result in more or/and quicker technology transfer. 	<ul style="list-style-type: none"> Technology portfolio offered by internal innovation team focuses on technology developed at ESS. This could theoretically be limited and thus less attractive to industry. To overcome this challenge, ESS needs to allocate resources to carry out marketing activities and raise awareness.
Creating ESS innovation culture	<ul style="list-style-type: none"> External organization has limited access to ESS. It should have no influence on ESS policies and their implementation. Because of this, it cannot create innovation culture at ESS, which is one of the objectives of this document. 	<ul style="list-style-type: none"> Innovation culture can only be created internally through an internal framework and with the help of internal resources. The only way to achieve this objective is to have an internal innovation team.
Fair access by all ESS Member Countries	<ul style="list-style-type: none"> External organisation has its own priorities and is often linked to a particular country, especially if it receives national funding. That country would disproportionately benefit from ESS innovation opportunities. This would be in contradiction with obligations of ESS vis-à-vis all Member States. It could also limit the innovation impact of ESS as the best opportunities from a number of regions would be overlooked. 	<ul style="list-style-type: none"> Only an internal innovation team can set up processes to ensure that all ESS Member Countries get fair access to innovation opportunities and are treated equally. The team would be accountable to the Council while an external organisation would not.
Brand value	<ul style="list-style-type: none"> External organization is less likely to have the same brand value as ESS has and will have over time. A less known brand will open fewer doors. 	<ul style="list-style-type: none"> ESS enjoys a strong reputation and its brand value will increase even more in the future. This will attract more companies to work with ESS. Companies can use their cooperation with ESS as a marketing tool. It gives their products and services credibility. Its brand value makes it easy for ESS to open doors to new collaboration and carry out first vital conversations with new partners. Internal resource are needed to carry out the work.

Whilst outsourcing has some benefits, the biggest drawback for ESS in delivering innovation externally would be that the Organisation would have to give up a significant proportion of its control over innovation activities and their outcomes. This would increase the risk of deviating from the ESS Mission and Vision, core values, and ESS policies etc. In addition, this approach would be unlikely to maximise innovation outputs because the external stakeholders responsible for the delivery would have limited insight into the Organisation and limited contacts within ESS staff.

The European Spallation Source is therefore recommended to coordinate innovation internally. This approach will ensure that ESS remains in control of the implementation process and that it has the possibility to influence outcomes. In parallel, ESS can benefit from working with external innovation agencies on *ad hoc* basis. External stakeholders can contribute to the widening of the ESS network and expertise and this would not require the Organisation to invest significantly in internal resources. When establishing regional links, ESS can also benefit from its ILO Network.

3.4.3 Strategic Approach to Innovation

The strategic approach to innovation described herein builds on the recommendation that the European Spallation Source should have an in-house innovation team and the Scientific Coordination and User Office (SCUO) should be an integral part of the team. The team shall act as an interface between the Organisation and industry. Its main purpose shall be to facilitate the establishing and maintaining of effective collaboration between ESS and industry and other innovation-related external stakeholders. To maximise impact, the innovation team shall actively engage with mediators such as local innovation networks and ILOs. The establishment of the innovation function at ESS does not mean that the team would gain ownership and control of all innovation-related activities. To give an example, the team would not handle procurement. The ownership of activities of this type would remain within the responsible divisions and departments. Figure 2 illustrates the innovation function proposed by this Strategy and how the team shall interact with key internal and external stakeholders.

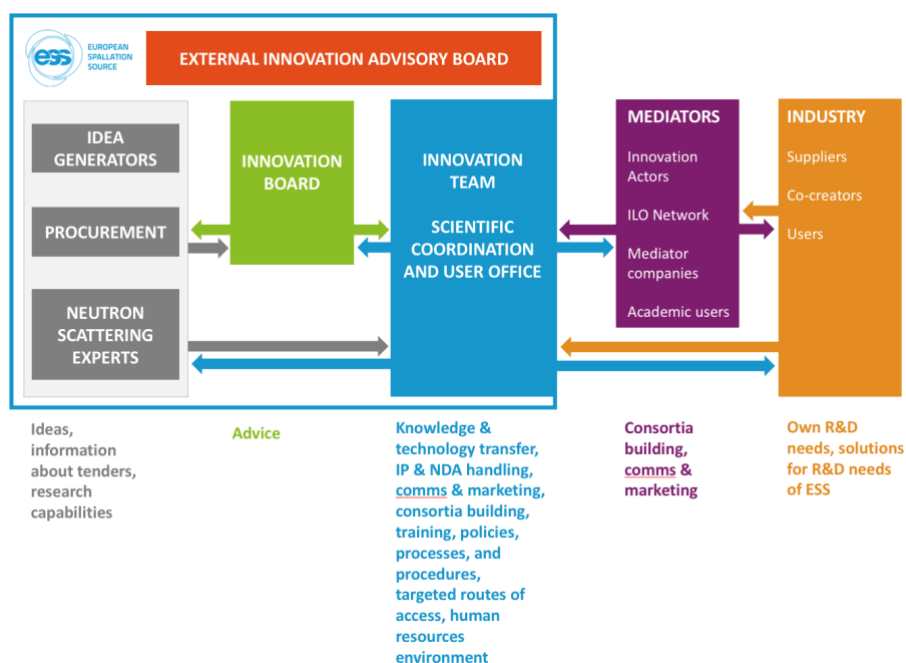


Figure 2: ESS Innovation Approach: SCUO is an integral part of the innovation team, which acts as an interface between ESS and industry

The innovation team shall support internal stakeholders in reaching out to industry by providing tailored services such as knowledge and technology transfer, handling of IP and NDAs, targeted communication and marketing, internal training for staff, consortia building, finding funding opportunities, defining relevant policies, processes and procedures, targeted routes of access, and building up human resources environment. The team shall communicate ESS requirements to industry and identify market opportunities. Representatives of the innovation team shall take part in working meetings of divisions and groups to keep regular contact with idea generators. The team shall also organize regular meetings for internal innovation stakeholders to ensure internal technological screening. The team shall act as the first point of contact for industry and establish connections between external stakeholders and relevant departments at ESS. Idea generators, the Procurement Division, neutron scattering experts, and ESS staff in general will feed into the activities of the innovation team by contributing ideas and communicating technological needs. To ensure that the innovation function remains well embedded within ESS, the innovation team will set up Innovation Board made of ESS experts representing relevant departments within the Organisation. The Board will advise the innovation team about how to optimise internal interactions, how to provide right support across the Organisation, and how to identify new opportunities at ESS. The External Innovation Advisory Board will advise the Organisation on innovation related matters.

The European Spallation Source shall use mediators, including the ILO Network, to communicate market opportunities related to tenders and technology licenses etc. The Organisation shall rely on local innovation networks to help with technology transfer and consortia building in particular. The Organisation shall also benefit from mediator companies which could facilitate access of industrial users to ESS.

3.5 Implementation

This section describes how the strategic approach to innovation will be implemented to achieve objectives defined in this document, and the ESS Policy for Innovation. The process includes the setting-up of an innovation framework at ESS, ensuring common understanding of innovation, creating innovation culture, maximising the impact throughout the lifecycle of the facility, resourcing, and ownership of innovation-related activities.

3.5.1 Setting-up an Innovation Framework

The European Spallation Source is currently in the process of establishing an innovation framework and implementing concrete steps to build internal capacity in this area. The framework relates to resources, people, tools and processes that harness the potential of ESS.

3.5.1.1.1 Management Framework

A robust management framework is essential for the successful development and implementation of processes, procedures, policies and other tasks. The framework is currently under development. So far, ESS has already designed three essential policies:

- The **ESS Policy for Innovation** was approved by ESS Management in September 2017. In parallel with the Policy, a Technology Transfer Office (TTO) was established within the framework of the EU-funded project BrightnESS to support innovation and commercialisation at ESS.
- In 2016, the Council adopted the **ESS Intellectual Property Rights and Inventions Policy** to govern the dissemination, exchange, ownership, use and protection of technical knowledge, intellectual property rights and know-how created in or arising from the ESS project.

- The Organisation has a preliminary **ESS Policy for Scientific Data**, which addresses the treatment of scientific data produced at the facility through the use of non-proprietary access to ESS neutron instruments. The Policy defines and covers raw and metadata and results coming from analysis of raw neutron data, and is in line with similar policies at other European neutron and photon large-scale facilities.

The European Spallation Source has also benefited from the **ILO Network** established in 2013. The network is a platform for direct engagement with industry. It enables companies to maximise the benefits from ESS procurement opportunities and R&D partnerships, and for ESS to integrate the companies' know-how into the construction of the facility. Each ESS Member Country is represented in the Network and provides financial support to its national ILO and all activities that aim to link national businesses with ESS.

The above demonstrates that during the last five years, ESS made important steps to establish a solid innovation framework within the Organisation. The Organisation is still rather young and it is thus natural that some areas related to innovation and technology transfer are yet to be regulated by new policy instruments and processes. Development of the following two elements will play an important role in strengthening the foundation laid in previous years:

- According to Article 17 of Statutes, ESS "shall provide effective access for European and international researchers as well as other relevant users". The Article also implies that the Organisation shall have an **Access Policy**. The Policy will be developed by the Science Directorate and will define, among other things, conditions for the access of industrial users. It will be in line with the European Charter for Access to Research Infrastructures.
- **Innovation Process and Procedure** will be developed by TTO within the framework of BrightnESS and in line with the ESS Policy for Innovation, and the Recommendations for an ESS Innovation Strategy.

3.5.2 Ensuring Common Understanding of Innovation and Creating Innovation Culture

In order to ensure common understanding of innovation across the Organization and to encourage a culture of innovation, ESS needs to implement a structural approach, which will allow for continuous improvement. The innovation team could make a significant contribution in this area. Educational trainings for staff could help raise awareness about the importance of innovation in general and specifically in the context of ESS, and build in-house capacity. Trainings targeting industry and other external stakeholders would help to create more opportunities for innovative collaboration. The innovation team will have the expertise needed to set up internal and external training programmes, which could include modules on IP, Open Innovation, innovation processes and entrepreneurship, to mention just a few examples.

The innovation team will seek the guidance of the Innovation Board, which will play a key role in streamlining innovation activities. The Organisation shall also establish a network of skilful innovation champions to promote innovation among peers. The innovation team will support them in their role and act as the first point of contact for further discussions.

The European Spallation Source needs to create a working environment that encourages staff to explore new ways of thinking and new ideas. Employees' contribution to innovation should be recognised in performance evaluation and become an integral part of career paths. The Organisation also needs to develop a system of financial and non-financial incentives to encourage innovation. This could be done by establishing an innovation fund, which would accumulate a portion of revenues generated by innovation and reinvest them in new innovation. The time that ESS staff spends on innovation needs to count against their working hours and there needs to be a dedicated budget to cover this activity.

3.5.3 Maximising the Impact of the ESS Throughout Its Lifecycle

Tangible innovation results are key for maximising the impact of the ESS project. The Organisation has to be able to leverage scientific and technological opportunities, and to turn ideas into innovation by transferring skills, knowledge and technologies. The impact of the ESS project is both direct and indirect:

- **Direct impact** includes better performance of the ESS machinery, novel opportunities in the technological area, transfer of technologies from laboratories to daily use, cost savings, money generation through IP rights, licenses, business development of industrial use, development of new skills among staff, positive public image etc.
- **Indirect impact** includes use of open data, use of innovative software, effective use of neutrons to solve grand challenges, joint activities with suppliers or new partners, new interdisciplinary projects, internal and external support of entrepreneurship etc.

In order to engage industrial users, the Organisation needs to have a good understanding of the specific needs of each industrial sector and the problems that industry wants to solve. The European Spallation Source should consider to allocate a proportion of beamtime for the development of technologies in collaboration with industry.

The European Spallation Source also needs to identify potential services that the facility could offer to external innovation stakeholders alongside its main scientific activities. Increased collaboration and contact with the research community and academia could help the Organisation to move towards this direction. This could include joint research projects and other forms of collaboration.

3.5.4 Resourcing

According to the Statutes, and the ESS Vision and Mission statement, ESS has a mandate to facilitate and support innovation. However, the construction budget of 1,843B€ does not cover activities related to innovation and technology transfer. There is clearly a mismatch between aspirations and commitments of ESS and the resources currently available. The importance of innovation and technology transfer will continue to grow in the coming years and will significantly increase when the facility moves on from the construction phase. It is essential that ESS has a dedicated team responsible for the innovation portfolio that would oversee and support day-to-day innovation activities taking place across the entire Organisation. The innovation team shall act as the first point of contact for industry and establish connections between external stakeholders and relevant departments at ESS. The Organisation also needs to decide how to finance staff creativity through a dedicated budget and how to aggregate seed money to develop innovation projects.

As mentioned earlier, RIs in the field of materials science which are similar to ESS have rather large innovation offices and employ 5-13 personnel to carry out innovation-related activities. The proposed operations budget of ESS does include a budget line for SCUO and innovation team. However, it remains to be seen whether the budget gets approved in its current form. The Organisation can benefit from the

ILO Network, which includes representatives of all Member Countries and covers a number of different industrial sectors. The activities of the Network currently focus on suppliers but the Network has a potential to be successfully transformed into an innovation platform that could help ESS meet its needs related to innovation activities.

3.5.5 Ownership of Innovation-Related Activities

The table below provides an overview of innovation-related activities and the respective owner from within the ESS.

ESS Unit	Ownership
Director General	Final decision-making (IPR protection, business case expenditures)
Innovation Team	Acting as point of contact between ESS and industry and external innovation actors, internal search for innovation, development of business cases, IP management, technology transfer (including consultation), help with private and public funding of internal innovation, training (external and internal), business development, and marketing, policies, procedures, and processes, targeted routes of access, human resources environment, management of user programme (scientific and proprietary access)
Scientific Coordination and User Office	
Procurement	Management of procurements (including procurement of innovation), supply and logistics
Legal Network	Even though IPR Policy refers to a decentralised Legal Division, legal officers should still be responsible for carrying out tasks under the Policy and provide help with licensing, and negotiating innovation agenda contracts
Human Resources	Support with innovation incentives and internal training, help with the establishment of link between innovation and personal development of ESS employees (PnD)
Grant Office	Screen funding opportunities for ideas identified by innovation team
Innovation Board	Expert internal advisory board advising the innovation team
ILOs	Communication channel to industry, related to in-kind and procurement matters. Potential future support in communication about technology transfer and proprietary access

4 Annexes

4.1 Signed European Spallation Source ERIC Policy for Innovation



Document Type Policy
Document Number ESS-0100643
Date Sep 6, 2017
Revision 1
State Released
Confidentiality Level Internal
Page 1 (1)

ESS Policy for Innovation

The European Spallation Source primary mission is to enable world-class research using neutrons, to contribute to the strengthening of Europe's and the Founding Member countries position in research in the world. We aim to generate or to enable to generate knowledge that will impact society in terms of economic growth, employment, sustainability and technological contributions to the solution of the world's great challenges.

This research will lead to the emergence and creation of new ideas, devices, methods and applications of significantly better solutions that meet new requirements, unarticulated needs, or existing market needs. Innovation activities, in this context, in its broadest sense, may also include R&D that is not directly related to the development of a specific innovation.

We embrace Open Innovation and will pursue its goals with external partners, understanding that not all innovation will happen at ESS. We will encourage the exploitation and dissemination of innovations created or enabled by the use of ESS facilities and by ESS staff, for new markets and new uses.

We encourage industry to make use of our facility and the available scientific and technological knowledge to create future, marketable innovation. To this purpose, ESS will make its facilities and staff accessible also for industrial usage of the ESS. We will also encourage our academic users to cooperate closely with industry to use our facilities.

We will exploit and disseminate innovations through patenting, spin off companies, collaboration with strategic potential partners, and other forms of activities suitable for obtaining the goals of this policy. We will consider protecting the intellectual and market value of our innovations if there is a clear case for doing so, that would benefit the organisation or its stakeholders.

This Policy applies to everyone with an employment contract with ESS. It is the responsibility of staff members of ESS to document new ideas in a form or format provided by ESS, if and when there is good reason to believe that the idea is innovative and has a knowledge or monetary value to ESS or ESS stakeholders.

The responsibility for the implementation of the Innovation policy lies with the ESS Division for Communication, External Relations and In-Kind Management.

	Name	Role/Title
Owner	Allen Weeks	Head of Division, Communications and External Relations
Approver	John Womersley	Director General

Template: Policy (ESS-0060959 Rev: 2, Active date: Jul 18, 2016)



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<https://chess.ess.eu/enovia/ESS-0100643.1/21308.5166.4566.39470>



4.2 Internal Industry-Related Stakeholders

- **Management:** Top and middle management at ESS plays an important role in stimulating innovation in both top-down and bottom-up ways. The creation of an innovation culture at ESS is highly dependent on their active support. The goals of ESS Policy for Innovation can be achieved only if the ESS Management encourages “owners” of innovation-related activities in respective working groups to generate novel ideas with the help of their teams.
- **Idea generators:** The European Spallation Source attracts leaders in science, engineering, and project management from all over the world. The Organisation hires inspired people who are excited about playing a part in the future of science in Europe. The diversity and talent of the staff are a great asset for innovation.
 - **Technical and R&D staff:** The building of ESS is truly complex with thousands of pieces of equipment to be delivered and integrated into the facility. Technical and R&D staff who designs, develops, and improves technology needed for the ESS facility and who defines specifications for equipment is key in delivering the world’s most powerful neutron source. Naturally, R&D work carries greater risks than other activities of the Organisation.
- **User related:** The European Spallation Source needs to be able to provide tailored assistance to all users, including organisational, administrative, and scientific support.
 - **Beamline scientists:** Beamline scientists have an important role in providing tailored support to users before, during, and after experiments and measurements.
 - **Scientific Coordination and User Office (SCUO):** The user programme is the heart of the ESS facility. Still in its infancy, the SCUO is developing a system that ensures transparent access modes, links users to instruments and maximises ESS scientific impact. Responsibilities of SCUO include operational management of the scientific research programme, maintaining databases, streamlining access and schedule, work environment, and community interactions.
- **Supplier related:** The European Spallation Source is a brick-and-mortar project with demand for niche and high-quality suppliers. As a green field research infrastructure project, ESS needs to maintain a robust management system for industrial supplies.
 - **Procurement Department:** The goal of the Procurement Department at ESS is to service strategic objectives of the Organisation by utilising efficiently a fully functioning procurement process in order to maximise stakeholder investment. The Department procures the required goods and services by supporting and guiding internal clients through the appropriate methodologies and approaches in synergy with contractual and internal business processes. The technical staff at ESS works in close collaboration with the Procurement Department to define tender specifications.
- **Innovation related:** The European Spallation Source has established a Technology Transfer Office to develop research findings for commercialisation, and support innovation culture within the Organisation. The office staff assists the entire Organisation in implementing the ESS Policy for Innovation. Its aim is to turn inventions into innovation by transferring skills, knowledge and technologies among research infrastructures, universities, and other institutions or organisations to industrial partners and society.

4.3 External Industry-Related Stakeholders

- **Users:**¹ Neutron user communities have a crucial role in unleashing the innovation potential of ESS. By carrying out experiments and conducting research, users will push the boundaries of science and help address societal challenges.
 - **Academic users:** Users from academia comprise the most active group of users. Academics use 85% of beamtime collectively offered by neutron sources in Europe. The sum of principal investigators from all Member and Observer Countries of ESS represents 84% of all principal investigators who lead research experiments at neutron sources in Europe in a single year. This indicates that the membership base of ESS is rather large and covers a significant proportion in Europe.
 - **Industrial users:** Around 5% of beamtime collectively offered by neutron sources in Europe is used by industry to carry out proprietary research. Industrial users need flexible access modes, fast results, and strong service support. European Spallation Source needs to be able to provide support with the interpretation of industrial problems into research projects, support industrial users during experiments carried out at the facility, and provide them with fast data analysis.
 - **Industrial-academic partnerships:** Around 10% of beamtime collectively offered by neutron sources in Europe is used for research funded by industry and carried out by academia. Collaboration with academia is beneficial for industry because of the willingness of academic partners to take over administrative burden. On the other hand, these partnerships often face challenges related to questions of intellectual property (IP) and confidentiality.
 - **Mediator companies:** Mediator companies have a significant role in building a bridge between industry and large-scale research facilities through tailored services. They act as competent intermediaries and contract research organisations with long-standing experience in sector-specific scientific fields. They provide capacity that is internally lacking within companies, and contribute to knowledge creation.
 - **Suppliers:** There are different possibilities for suppliers to provide products and services to ESS. The overall supplier base of ESS is rather diverse and international. The Organisation has created an online Business Profile tool to facilitate collaboration with industry. More than 570 companies, firms, partnerships, small and medium enterprises and service providers from 28 different countries have created a profile to express interest in collaborating with ESS.
 - **Industry:** ESS is a joint research infrastructure, which provides many opportunities for industry to contribute to the construction and future upgrades of the world's most powerful neutron source. These are the different possibilities of going into business with ESS: direct procurement, sub-supplier to in-kind partners, and sub-supplier to Skanska. Of interest for innovation are particularly companies with IP and know-how to solve challenging technical problems. Occasionally, when non-existing solution are required, industry may co-develop technology with ESS. Companies are genuinely interested in working with large infrastructure projects, however can be deterred by some significant barriers, for example: issues with specifications, customer not familiar with manufacturing technologies and unfavorable IP agreements. Not addressing those and carrying out development in-house, could increase the cost for the infrastructure project.

¹ User-related data presented herein are based on the results of BrightnESS survey of 15 European neutron sources. A comprehensive report from the survey is available as a part of BrightnESS Deliverable D6.2.

- **Industrial Liaison Officers (ILOs):** The European Spallation Source launched its ILO Network in 2013 to communicate with key industrial stakeholders in a structured way. Each Member and Observer Country of ESS has one representative in the ILO Network. Direct engagement with industry enables companies to maximise the benefit from procurement opportunities at ESS and R&D partnerships. At the same time, it enables ESS to integrate companies' know-how into the construction process. The ILOs hold first-hand knowledge on business and collaboration opportunities at ESS and are up to date on the status of each project.
- **Innovation Ecosystem:** In order to take full advantage of the innovation ecosystem surrounding ESS, the Organisation needs to establish long-term relations with its actors and collaborate with them in a systematic way. It should also seek beyond the local network to ensure that all member states can benefit from it.
- **Entrepreneurs and business support networks:** Entrepreneurs and their ability to identify opportunities could support translation of know-how and IP from ESS into products and services and increase impact beyond scientific discovery. They not only run companies which can offer products and services to ESS, but also come up with innovative ideas and pioneer products that could benefit the facility. They enjoy a variety of business support networks, which connect entrepreneurs from the same sector and provide a platform for the exchange of know-how. Invest in Skåne, Innovation at Lund University, Copenhagen Capacity, and Innovation at the Technical University of Denmark are natural points of contact for ESS to maximise outreach activities targeting entrepreneurs in the immediate vicinity of the facility. Science Village Scandinavia, a company tasked to promote ESS and MAX IV and to develop the land between the two facilities, will play an increasingly important role in the innovation ecosystem of ESS as the Brunnshög area gets more developed in the future.
- **Industry (licensing for example):** Generally speaking, the presence of one or several large industrial companies in the region where a research facility is based is of crucial importance for the development of a healthy innovation ecosystem. Companies placed on innovation campuses contribute to innovation in a positive way. Industry can also stimulate innovation by establishing research centres in the vicinity of research facilities and by developing a strong licensing relationship with research facilities. As an international partnership, ESS collaborates with industry and companies from a number of countries in Europe and beyond.
- **Private and public funders:** Financing is necessary to translate an idea into an innovation. The process can sometimes be funded directly by an organisation. Other times, the risks may be too high even though benefits are significant for organisations to follow through with innovation. In this case, access to external funding is required. There are two different types of funders: private and public. Private funders are venture capitalists, corporate venturing and angel investors. They tend to be regionally focussed but can also act globally. Public funders are the European Commission, national governments and regional governments. Public funders often support innovation in the region they are responsible for and are unlikely to fund innovation outside it. Prospective funding partners based in the Host Countries include Almi, Industrifonden, and SEED Capital. The choice of funders depends on the type of innovation and the associated risk and benefit. Funding should not be viewed and approached in a reactive way only, i.e. looking for finances when there is an idea that needs to be funded. A proactive approach to exploring prospective funding opportunities would provide a guidance on what areas ESS can strategically focus on in Open Innovation.



- **Science parks, incubators, cluster initiatives, regional innovation systems, innovation brokers and intermediaries:** These knowledge-based institutions promote the culture of innovation and competitiveness. They create an attractive environment that supports close interactions between experts in the same cluster, help to create supply chains, and stimulate the flow of knowledge between research infrastructures, universities, industry and other actors. Because these actors tend to focus on local regions, it is important for ESS to link up with such players in all its Member Countries. The Organisation will rely on the expertise of Member Countries to identify the most relevant science parks, incubators, cluster initiatives, regional innovation systems, innovation brokers and intermediaries. It will also aim to reach out to international communities of specialised innovators such as the European Innovation Network (EBN).