
IN-KIND COST BOOK FOR ESS INITIAL OPERATIONS VERSION 3



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DOCUMENT REVISION HISTORY

Revision	Reason for and description of change	Author	Date
1	First issue	Dimitri Argyriou	2 June 2022
2	Updated list of IK opportunities. Addition of contracts already placed with member's institutes	Gareth Aspinall	22 May 2023
3	Updated list of IK opportunities. Removal of Target related items	Gareth Aspinall	30 May 2023

1. SCOPE

This document provides a list of unallocated in-kind opportunities to the ESS Initial Operations phase of the project. The listed items in this cost book are all included in the P6 resource loaded project plan.

Additionally, to provide oversight, this document lists the historical allocation of in-kind opportunities to date to member's institutes.

2. ISSUING ORGANISATION

This document is prepared by the In-Kind Management team, European Spallation Source ERIC.

3. CONTEXT AND BOUNDARY CONDITIONS FOR IN-KIND CONTRIBUTIONS

The ESS additional budget request and resource loaded plan has been reviewed by the Project Advisory Committee and tuned to fit within the funding boundaries set by the ESS ERIC Council. Within this context, the first condition for any in-kind contributions is that they are an integral part of the resource loaded P6 project plan and accompanying budget [1].

The execution of the technical scope of ESS in the construction phase was undertaken by partner laboratories that have specific and often unique technical capabilities and expertise. In the initial and steady state operations of ESS, in many cases these same partners become the critical supply chain of key components that ensure the ability of ESS to maintain high levels of performance and reliability over its operational life. The strong engagement of these partners and others will support ESS during its operational life and are crucial to its long-term success. In-kind contributions as tested and evolved during the construction phase are an appropriate vehicle for the needed engagement.

Similarly, our partners hold key expertise and know-how over the equipment delivered to ESS, and engagement of their personnel during commissioning and initial operations will be a vital contribution to the project's success. Indeed, these partner experts will play a valuable role in diagnosing and solving early problems on equipment that they have designed and built as well as providing critical and timely training to ESS personnel. This cost book describes specific examples of staff in-kind opportunities as well as the level of qualifications and experience that would be needed.

The identified line items in the case of spares, replacement parts or consumables are necessary for the operation of ESS. As spares, the items must follow existing designs, specifications and manufacturing requirements established during the construction phase. Therefore, these potential in-kind packages *in most cases* include little or no technical development, but instead tend to include build-to-print, procure to specification, or in some cases, sole source procurement.

The staff line items, referred to above, identify the capabilities and skills needed for the commissioning of scientific instruments as well as scope of science support systems.

Present resolution of the P6 plan allows identification of in-kind contributions in the area of accelerator, target and instruments. The timing of these in-kind contributions may be subject to change as the plan evolves and synchronizes with the live project schedule.

4. COST BOOK VALUES AND INDEXATION

To allow tracking of contributions against commitments, all prices shown in this cost book are in 2013 Euros derived from the P6 project plan. The indexation is done according to the initial operations indexation (see Council resolution C.17.06.c¹) which is scheduled to be reviewed in mid 2023. Indexation will need to be applied to all listed prices shown in the cost book.

At present the total value of un-allocated scope in this initial operations cost book stands at approximately 11 M€₂₀₁₃. The value of scope already allocated via In-Kind contracts or by direct contracts to member's institutes is 11.2 M€₂₀₁₃.

¹ See document C.17.99 Resolutions.

5. IN-KIND CONTRIBUTIONS TO THE ESS ACCELERATOR

5.1. Allocated scope

The table below lists scope detailed in the initial IO Cost Book, related to the Accelerator sub-project, that has been allocated to member's institutes either by an In-Kind Contract or a direct contract. The total value is 2.34 M€₂₀₁₃.

It is currently envisaged that there will be no further Accelerator related In-Kind opportunities during initial operations.

ACTIVITY	PARTNER	COUNTRY	VALUE (k€ ₂₀₁₃)	CONTRACT METHOD	STATUS
RF resource	IFJ PAN	Poland	648	IK	Signed, recommended by IKRC. Feb 2023
Spare 4 Medium Beta Cavities	INFN	Italy	879	IK	Draft TA
SW for SC cavities characterisation and the ESS TS 2 cryomodule programme	Lodz	Poland	490	IK	Draft TA
Cryomodule installation support	WUST	Poland	324	IK	Draft TA

6. IN-KIND CONTRIBUTIONS FOR THE ESS TARGET

6.1. Allocated Scope

The table below lists scope detailed in the initial IO Cost Book, related to the Target sub-project, that has been allocated to member's institutes either by an In-Kind Contract or a direct contract. The total value is 6.2 M€₂₀₁₃.

Whilst there are *currently* no further envisaged Target related In-Kind opportunities during initial operations for Target, there could be opportunities listed in future versions of this document.

ACTIVITY	PARTNER	COUNTRY	VALUE (k€ ₂₀₁₃)	CONTRACT METHOD	STATUS
Casks	CER	Hungary	2,500	IK	Approved by Council Dec 21
Mark-2 Moderator/Reflector Plug	FZJ	Germany	3,183	Direct Contract	Draft Contract
Mark-2 Proton Beam Windows	ESS-Bilbao	Spain	560	Direct Contract	Draft Contract

7. IN-KIND CONTRIBUTIONS TO THE SCIENCE AND INSTRUMENT PROGRAM

7.1. Allocated Scope

The table below lists scope detailed in the initial IO Cost Book, related to Science and the Instruments sub-project, that has subsequently been allocated to member's institutes either by an In-Kind contract or a direct contract. The total value is 2.7 M€₂₀₁₃.

ACTIVITY	PARTNER	COUNTRY	VALUE (k€ ₂₀₁₃)	CONTRACT METHOD	STATUS
Polarisation (0-6 mths)	LU	Sweden	198	IK	Approved by Council, Dec 2022
Polarisation (7-36 mths)	LU	Sweden	921	IK	Approved by Council, Dec 2022
ODIN Commissioning Scientists	LU	Sweden	255.6	IK	Approved by Council, Dec 2022
NMX Commissioning Scientists	LU	Sweden	657	IK	Approved by Council, Dec 2022
DLS	LU	Sweden	158.1	IK	Approved by Council, Dec 2022
Instrument simulation & integration testing (scientist/developer)	DTU	Denmark	511	IK	Recommended by IKRC, Mar 2023

7.2. Context and boundary conditions for in-kind contributions to the Science and Instrument program during initial operations

The ESS Initial Operations budget and its corresponding scope are under frequent review in order to ensure that they fit within the funding boundaries given by the ESS Council. The first condition for any in-kind contributions is therefore that they are a part of the initial operations plan and budget [1]. With this in mind there are three main types of possible in-kind contributions:

- Seconded staff – *e.g.* a scientist or technician employed by the partner but based at ESS
- Equipment – *e.g.* design and delivery of a piece of sample environment
- Service provision – *e.g.* staff based at a partner performs neutronic calculations for ESS

In the case of seconded staff, ESS will set the requirements for each position and will make the final decision on selection of the suitable candidate. The seconded staff member will report within the ESS management structure, will adhere to ESS safety and security regulations and will be integrated within the ESS environment. The work place will be either at the ESS site in Lund, Sweden, or at the DMSC in Copenhagen, Denmark.

All in-kind opportunities are listed at the end of this section.

7.3. Instrument Commissioning Scientists

The commissioning scientists will lead or participate in the hot (with neutrons) commissioning of the neutron scattering instrument. They will record and assess the technical performance of the instrument's critical components with the aim of ensuring its successful scientific operation. Further, they will identify technical issues that prohibit successful operation of the instrument, and supervise and verify their resolution. They will also develop research activities that will be able to make effective early use of the instrument, and lead or assist scientific commissioning experiments.

Qualifications: A Ph.D. in physics, chemistry, materials science or other discipline relevant to the instrument. 5 years' experience with neutron scattering instruments, including significant experience with relevant neutron scattering techniques. A scientific background in a topic area relevant to the science case of the instrument is expected.

These are primarily full-time positions and the starting date is usually 12 months before the start of hot commissioning activities for the instrument. The duration of the position is up to three years.

Such roles would be expected to spend approximately 20% of their time on research and outreach/education activities related to the beamline in question.

7.4. Instrument Data Scientists

The role of the instrument data scientist is to provide close support for commissioning and scientific computing to each neutron instrument. In the long term, the role is expected to include direct user support and development of scientific computing tools specific for the assigned instrument. During initial operations, the focus will be on commissioning activities.

The role will require close collaboration with the instrument scientists and staff from the DMSC, primarily from the Data Reduction and Analysis group and the Experimental Control and Data curation group.

Qualifications: The candidates will have a PhD in a relevant area and both:

- Expertise and a proven track record in scientific computing for Neutron (or photon) controls and data acquisition or data processing and data analysis, with an excellent understanding of Python (essential), C++ (optional) and modern software development methods and practices (essential).
- Expertise and a proven track record in any of the following scattering methods: Small Angle Scattering, Reflectometry, Diffraction, Inelastic scattering, Imaging.

On average two instruments within the same instrument class will share one data scientist.

The Instrument Data Scientists are based at the DMSC in Copenhagen but will spend significant time at the ESS site in Lund as well.

7.5. Technicians for Sample Environment Systems

Sample Environment Systems provide the control parameters for the sample during a neutron experiment, including pressure, temperature, magnetic fields, humidity, gas mixtures, and fluid control. The Technicians for Sample Environment will integrate, calibrate, test, optimize, and maintain Sample Environment Systems and its various components, in close collaboration with scientists, engineers and other technicians during the ESS initial operations phase. They will also operate such systems during the hot commissioning phase of each neutron instrument to enable hot commissioning and first science.

Qualifications: bachelor-level qualification or a successfully completed mechanical technical training and at least 3 years of experience in a work environment requiring similar skills. Experience in machine shop work is required with a high regard for precision and quality of workmanship. Experience of scientific instrumentation would be an advantage.

7.6. User and Sample Support Staff

During the ESS initial operations phase the ESS laboratory facilities provide the chemistry/life science services required for first science on the initial instrument suite and support sample management. The laboratory technician will focus on commissioning the on-site laboratories, maintaining laboratory equipment and developing short instructions for equipment. When hot commissioning of instruments starts, scientists will begin to use the laboratories. The job will then also require giving introductions on working in the laboratories, keeping the chemistry laboratories stocked, providing assistance to users and assuring that everyone is working safely in the labs.

Qualifications: bachelor-level qualification or at least two years of education in chemistry / laboratory work. Hands-on experience from existing facilities will be an advantage.

Concerning user services, possibilities for seconded administration staff have been identified for several roles. For example, we could second a librarian or bibliographer (part time) to properly assess the work already produced at ESS and help establish efficient systems to develop and maintain that record in to the future, possibly using the existing tools at other facilities. We could also use seconded staff in the user office for academic and industrial users that provide value to our early outreach to industry where it will be critical that we are accurate and professional. As long as the work term is long enough (so that training is minimized) we could benefit by secondment for any of the user-office roles still available.

Qualifications: Typically, at least MSc is required.

7.7. Potential equipment contributions

Some equipment within the ESS scope can be delivered as in-kind contributions to Initial Operations. These projects are found within sample environment, instrument technologies and data management.

7.8. Potential Service Provision Contributions

The opportunities for service provision contributions are perhaps not as numerous as the other possibilities, but some possible examples are included in the list below. The focus of these possibilities is in linking existing facilities, infrastructures, and competence centers at universities and research institutes with ESS.

Possibilities for in-kind:

- Use of/contracting of work to university or institute workshops.
- Sharing of lab facilities (*e.g.*, Collaboration between ESS DEMAX and Lund University LP3).

7.9. Monetary Value for In-Kind Contribution to the Science and Instrument program

The following tables provides the planned timing and budgeted value for the positions and items described above. This list is subject to modifications and will be revised annually. At present, the total value of in-kind scope for science and instruments stands at approximately 11 M€₂₀₁₃.

7.9.1. Labour Costs

The table below lists in-kind values for labour contributions to the Science and Instrument program.

Start and end dates for these labour contributions are subject to change depending on the performance of the ESS construction project.

Below values include:

- costs for salary, relocation allowance and allowance for non-working partner as per the ESS Relocation Package.
- cost for social security charges, pension contributions and employer insurances.
- costs for installation allowance. For assignment of 12 months or shorter the value is based on the salary costs but no costs for additional relocation.
- one-off costs for mobile phone, laptop, screen, keyboard, mouse, access card.
- monthly costs for mobile phone subscription, healthcare/training, office space cost (low estimate) and general overhead incl consumables, salary administration, insurances, etc.
- Cost for induction and mandatory trainings.

Below values do not include:

- costs for moving of household goods or other relocation related items (except those listed above).
- travel, specific training, PPE if needed.

ACTIVITY	START	END	VALUE (k€ ₂₀₁₃)	PERSON MONTHS	COST BASIS
ESTIA commissioning scientist	2025 Jan	2027 Dec	241 279	36	level F or E scientist
MAGIC commissioning scientist	2025 Jan	2027 Dec	241 279	36	level F or E scientist
BEER commissioning scientist	2025 Jan	2027 Dec	241 279	36	level F or E scientist
BIFROST commissioning scientist	2024 Jan	2026 Dec	241 279	36	level F or E scientist
SKADI commissioning scientist	2025 Jan	2027 Dec	241 279	36	level F or E scientist
User office officer 50%	2025 Jul	2026 Dec	61 53	9	level F or G officer
User office officer 100%	2027 Jan	2027 Dec	81 69	12	level F or G officer
Lab technician 50%	2026 Jan	2026 Dec	42 36	6	level F or G technician
Lab technician 100%	2027 Jan	2027 Dec	81 69	12	level F or G technician
Sample environment technician	2027 Jan	2027 Dec	69	12	level G technician
Instrument Data Scientist for diffraction	2025 Jan	2027 Dec	322	36	Job level D
Instrument Data Scientist for spectroscopy	2026 Jul	2027 Dec	163	18	Job level D
Lead developer for imaging analysis software	2023 Oct	2027 Dec	454	51	Job level D
Scipp (data reduction) developer 1	2023 Jul	2027 Dec	416	54	Job level E
Scipp (data reduction) developer 2	2023 Jul	2027 Dec	416	54	Job level E
HPC system officer 1	2023 Jun	2027 Dec	424	55	Job level E
HPC system officer 2	2026 Jan	2027 Dec	188	24	Job level E
HPC system officer 3	2023 Aug	2027 Dec	409 472	53	Job level E or D
Full stack developer for user office and data catalogue 1	2023 Jun	2027 Dec	424	55	Job level E
Full stack developer for user office and data catalogue 2	2023 Jun	2027 Dec	424 490	55	Job level E or D

ACTIVITY	START	END	VALUE (k€ ₂₀₁₃)	PERSON MONTHS	COST BASIS
Motion control and automation	2024 Jan	2026 Dec	279 322	36	Job level E or D

7.9.2. List of Non-Labour Contributions

The table below lists in-kind values for non-labour contributions to the Science and Instrument program.

Start and end dates for these non-labour contributions are subject to change depending on the performance of the ESS construction project.

ACTIVITY	START	END	VALUE (k€ ₂₀₁₃)
Detector Spares (diffraction)	2023	2027	197
Instrument Dedicated Sample Environment	2025	2027	155
NMX sample station hardware	2023	2024	161
User office publication database & scientific KPIs	2023	2027	59
Wet cryostat IK package	2024	2026	189
Dry cryostat IK package	2023	2026	378
Spectroscopy magnet	2023	2025	1 161
Induction furnace	2023	2024	70
Dilatometer	2023	2024	386
Troughs and cells	2024	2025	160
Magnetic field device 1	2023	2026	83
Magnetic field device 2	2023	2025	90
Polarization ODIN	2023	2024	325
Polarization DREAM	2023	2024	25
Polarization HEIMDAL	2023	2025	25
Polarization SKADI	2024	2025	25
Polarization FREIA	2023	2025	37
Polarization CSPEC	2024	2025	37
Polarization TREX	2024	2025	8
Polarization MIRACLES	2024	2025	54
Polarized gas transfer stations	2023	2025	145
Spin filter assembly	2023	2025	90
Source facility for detector testing	2023	2025	1,354

8. REFERENCES

- [1] ESS Re-baselining documents C.26.06.a and Council resolutions C.26.06.c & d in document C.26.99 and resolution C.27.05.c in document C.27.99.