Financial model and in-kind contributions

Chiara Arina (UCLouvain, Belgium) on behalf of WP3

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ET-PP WP3 Financial Architecture

Objectives — Define the financial model during the design, construction and operation phases of ET

D3.1 - M36 - Handbook for design and construction phase
D3.2 - M42 - Handbook for operation phase
D3.3 - M48 - Financial Plan and Scenario Analysis

M3.1 - M33 - Constitution / first meeting of the resource board, accompanied by a workshop

- Investigate the funding architecture to ensure construction, operation and decommissioning of ET considering different legal status, designs and construction settings.
- Set a strong financial model and a common tool for all financial data
- Define guidelines with fair sharing of costs and scientific, industrial and socio-economic returns among all parties

Belgium

Chiara Arina
Universite Catholique De Louvain (UCL)

Italy

Veronica Buccheri
Istituto Nazionale Di Fisica Nucleare (INFN)

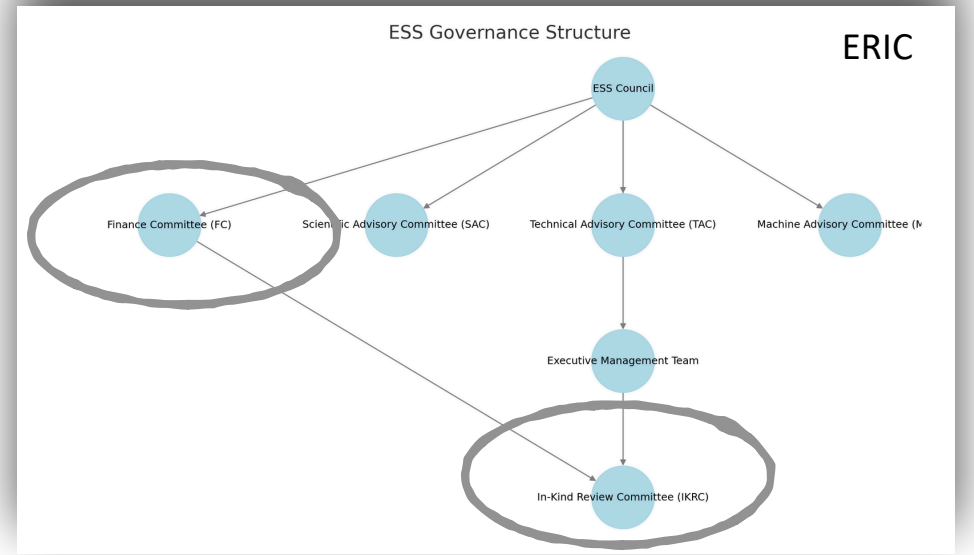
Germany

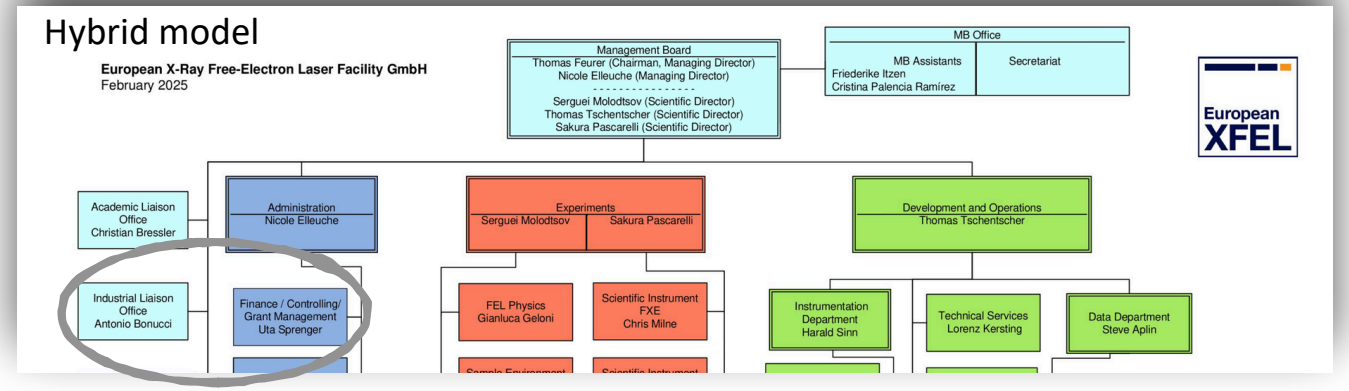
Thomas Berghoefer
Deutsches Elektronen-Synchrotron (DESY)

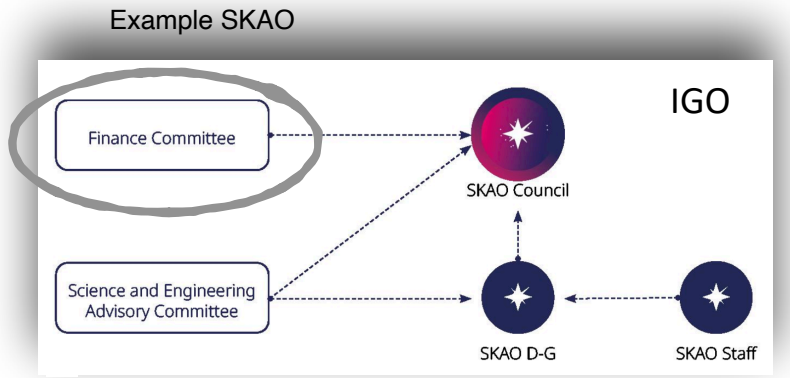
And Lisa Kamlade (DESY)

Research infrastructure governance structure

1. **Council (Top-Level Decision-Maker)**
2. **Advisory Committees (Scientific, Technical, and Financial Advice)**
3. **Executive Management (Day-to-Day Operations)**
4. **Project and Technical Groups (Implementation & Delivery)**

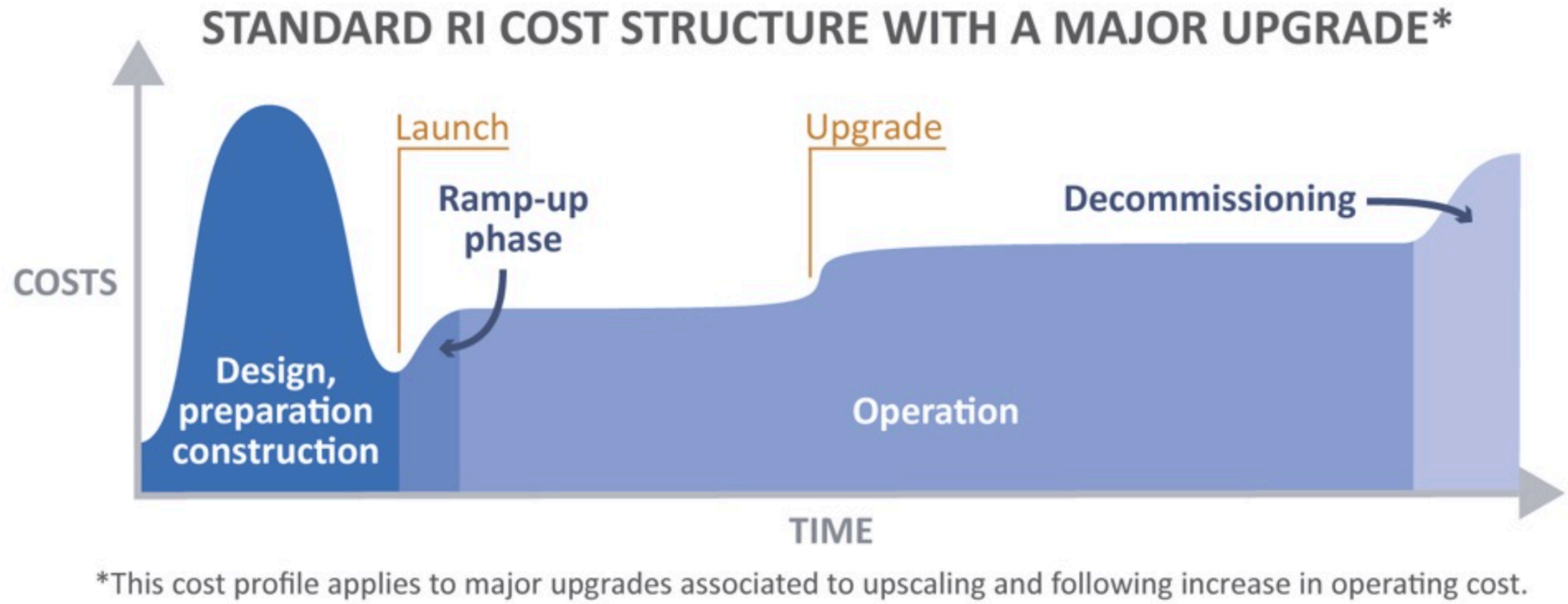






Evolution of costs for an RI like ET

From stESFRI Study: guidelines on cost estimation for RI



Upgrade not foreseen for ET at the moment —> cost during operation stays constant until decommissioning

Financial guidelines

From stESFRI Study: guidelines on cost estimation for RI

Costs: key repartitions for member state contributions

There are many viable indicators:

(I) GDP only

(II) # of scientists (belonging to the ET Collaboration)

(III) Weighted coefficient

(IV) Weighted flat rate

Allocation key

Party	GDP 2022 (B€)	R&D % of GDP	# scientists ET collab. (All)	GDP based only (%)	ET Coll. Members only (%)	Share coefficient (%)	Flat rate (%)
Country 1	492,5	32	87	**5**	**8**	**15**	**10**
Country 2	2361,2	31	128	**25**	**12**	**18**	**23.3**
Country 3	3502,2	23	169	**36**	**16**	**21**	**23.3**
Country 4	144,6	22	37	**2**	**3**	**2**	**5**
Country 5	1714,1	17	535	**18**	**50**	**34**	**23.3**
Country 6	859,8	15	96	**9**	**9**	**9**	**10**
Country 7	538,9	14	26	**6**	**2**	**1**	**5**

Costs: In-kind contributions

Definition

IKCs are **non-cash contributions** from member states, partner institutions, or funding agencies, typically in the form of equipment, technology, expertise, or services. These contributions are **agreed upon instead of financial payments** to the RI.

Key Characteristics

- **Provided by member states or partners** as part of their agreed contribution.
- **Ownership and responsibility** often remain with the contributing party until delivery and acceptance by the RI.
- **Valuation and approval**: The contribution must be assessed and valued to match financial commitments.
- **Often involves national research institutions and industries**, fostering local scientific and industrial growth.

Protocol for IKC

This chain of rules call for a strong central lab that manages the IKC from the EoI until the very end, including the quality control when delivery the IKC

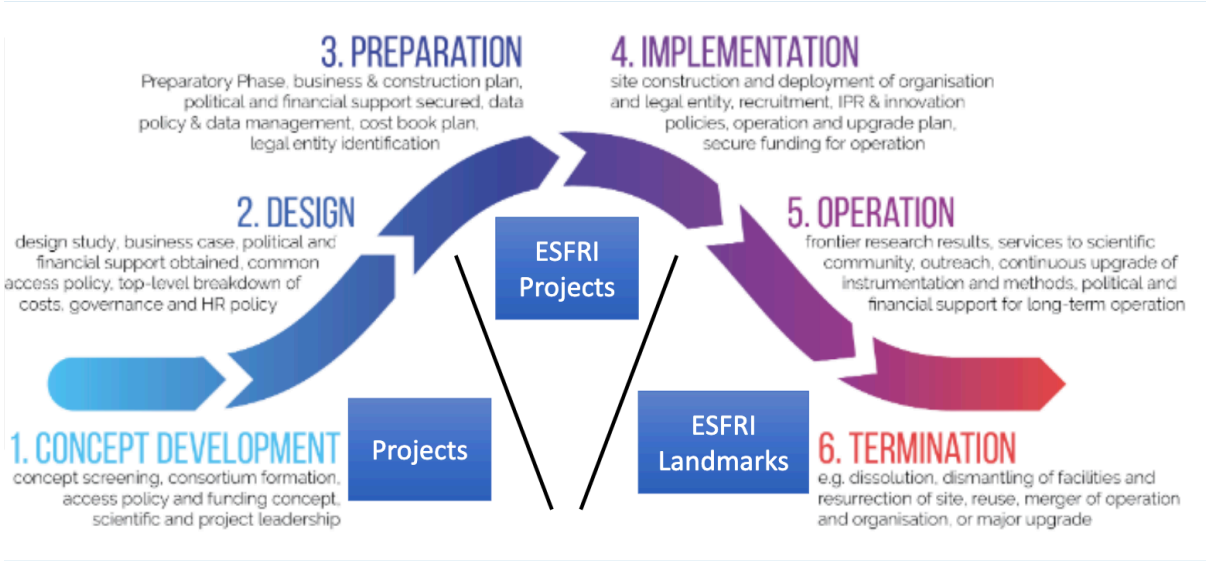
IKC are preferred for

- Custom-built, high-tech components
- Leveraging national expertise & industry
- To ensure industrial return to member states (especially for ERIC)

Stage	ESS (ERIC Model)	XFEL (National Non-Profit Model)	SKAO (IGO Model)
1. Initial Proposal	- IKC work packages are defined & valued. - Expression of interest from **IK partners**.	- Contribution proposed by **partner countries** (via institutes or companies). - XFEL Council evaluates feasibility.	- Member states commit to **specific work packages** as part of their financial obligations.
2. Agreement Drafting	- **IKC Agreements & Technical Annexes** drafted. - Reviewed by **IKC Review Committee (IKRC)**.	- **IKC Agreements include milestones, quality control, & delivery schedules**.	- SKAO signs **formal agreements** with partners, ensuring compliance with its governance rules.
3. Review & Approval	- IKRC recommends approval to the **ESS Council**. - **ESS Council** grants final approval.	- XFEL's **Administrative & Finance Committee (AFC)** makes recommendations. - XFEL Council approves.	- SKAO **Technical & Financial Boards** review submissions before Council approval.
4. Manufacturing & Delivery	- Partner manufactures/ delivers equipment. - **Factory Acceptance Test (FAT) & Site Acceptance Test (SAT)** conducted	- Partner oversees production. - Milestone-based **performance reviews** conducted	- Partner delivers hardware/software. - SKAO **monitors milestones** to ensure compliance.
5. Validation & Ownership Transfer	- Final review by ESS. - **Council credits the IKC value to the contributing member state**. - Ownership transfers to ESS.	- XFEL **verifies final acceptance criteria**. - Ownership is transferred only after **formal validation**.	- SKAO **signs off on IKC deliverables** & credits value to contributing nation.
6. Financial Recognition	- IKCs are booked as **capital contributions (assets)**. - ESS follows **auditor-approved accounting rules**	- XFEL uses a **milestone-based tracking system** to recognize IKCs in financial statements.	- SKAO credits **IKCs as financial contributions** in national balance sheets.

Typical ratio in-kind/cash in the lifetime of a RI

Phase	In-Kind Contributions (IKC) Role	In-Cash Contributions Role	Favored IKC/ Cash Ratio ✳
1. Design & Preparatory Phase	- R&D by national labs/ universities - Prototype components - Conceptual & technical studies - Expertise from partner institutions	- Administrative & legal setup - Staffing & coordination - Site selection & permitting - Travel & collaboration costs	**IKC-heavy (~70% IKC / 30% cash)**
2. Construction Phase	- Major equipment & infrastructure (accelerators, detectors, telescopes) - Software & data systems - Technical workforce from partner institutions	- Project management & governance - Contracts for non-member procurement - Contingency & risk management	**Balanced (~50% IKC / 50% cash)**
3. Early Operation Phase (Commissioning)	- Continued software/hardware upgrades - Knowledge transfer & training - Support from national institutions	- Core operational costs (salaries, utilities, computing) - Facility management & logistics	**Leaning towards cash (~40% IKC / 60% cash)**
4. Full Operation Phase (Exploitation)	- Ongoing maintenance by partners - Access to partner facilities (e.g., computing, analysis)	- Salaries, maintenance, user access programs - Energy & operational costs - Outreach & governance	**Cash-heavy (~20-30% IKC / 70-80% cash)**
5. Decommissioning Phase (if applicable)	- Dismantling expertise from partners - Technical support for repurposing	- Site remediation - Legal & safety costs	**Mostly cash (10-20% IKC / 80-90% cash)**



✳ Numbers from ESFRI report on funding of RI

In-kind contributions and legal statuses

Feature	ERICs	IGOs	National Non-Profit RIs
Legal Basis	EU Regulation	International Treaty	National law
IKC Funding Mechanism	Part of member state contributions	Strong dependence on IKCs, often tied to geo-return	Bilateral agreements with partners
VAT & Taxation	VAT-exempt in most cases	Fully tax-exempt	Subject to national tax rules
IKC Ownership	Usually transferred to ERIC	Often co-managed or transferred upon delivery	Can remain with contributors
Procurement & Fair Return	Some industrial return policies	Geo-return system (allocates work to member states)	No strict industrial return rules
Approval Process for IKCs	Technical & financial validation by governing bodies	Often involves technical review boards	Flexible, case-by-case evaluation

See next talk

Necessary strong central management and setting clear agreements

Take away

Resource/financial board is necessary

Establishing a finance resource board is essential for providing strategic oversight, ensuring financial sustainability, and facilitating transparent allocation of resources throughout the project's lifecycle.

Costs sharing and distribution

- IK Contribution PRO: relates with ecosystem of institutes. Suppliers are interested in the implementation of the results, develop and retain the know-how. Beneficial for cutting edge projects and high tech
- IK Contribution CONS: how to distribute IKC to institues, risks related to delays, ownership, importance of WBS/ technical annexes
- Valuation of IKC: Assigning fair market value to in-kind contributions to reflect their true worth in the financial plan

Questions and thoughts

Timing of Governance Structures

🟦 When is the optimal moment to establish a Finance and Resource Board for ET?

- *Should it be initiated during the preparatory phase, or only once construction funding is secured?*
- *What lessons can be drawn from existing boards in other large-scale RIs?*
- *When shall we start counting?*
- *What about the role of IK Contributions?*

Managing Major Cost Items

🟦 What might be a viable approach for the funding strategy for high-cost components such as tunnels, vacuum systems, and laser/optical infrastructure?

- *Are there best practices or innovative approaches from other RIs that could inform ET's strategy?*
- *What balance of contributions is realistic between site-hosting and non-site countries?*

Thank you!

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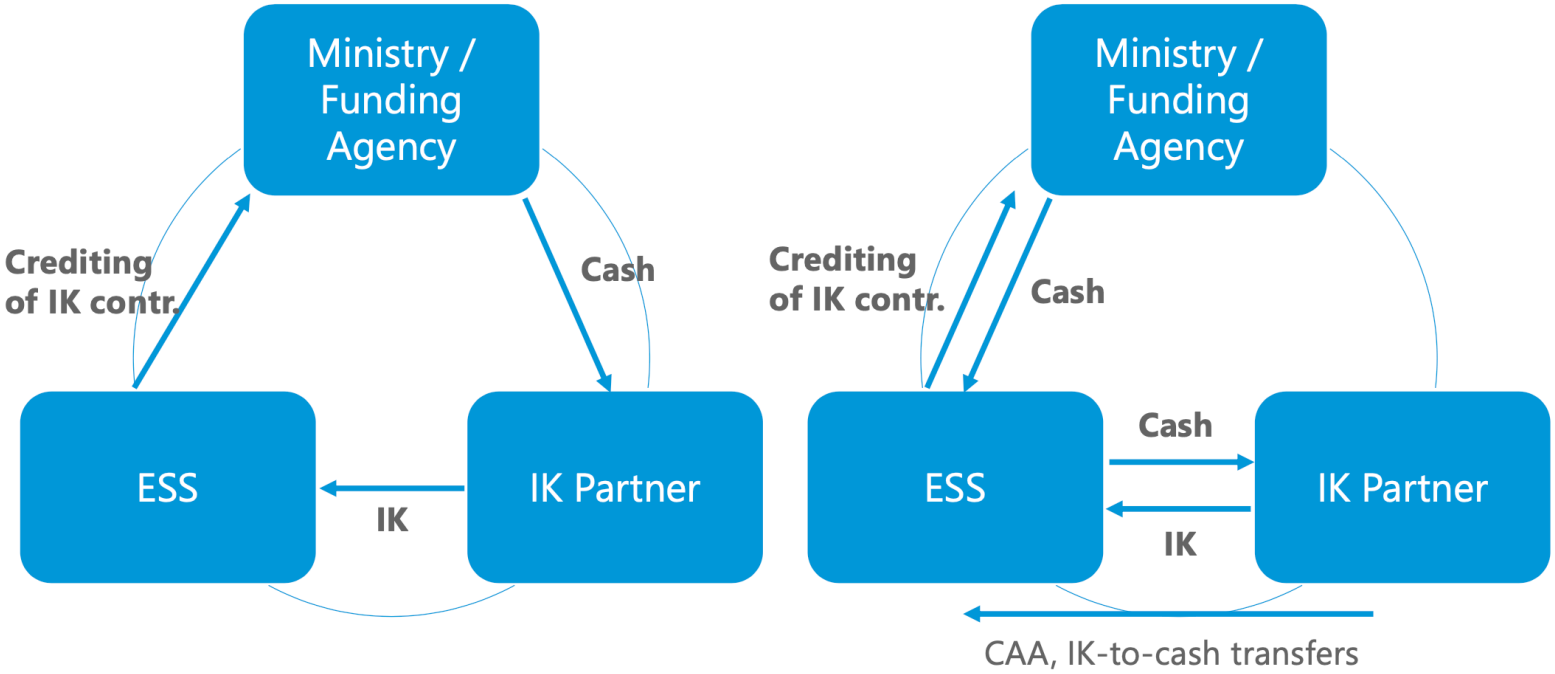
Back up slides

Details of IKC at ESS

Credit to Florian Weissbach (Head of ESS Finance)

A spectrum of IK arrangements

From "normal IK" to "cash-IK" and back



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Details of IKC at ESS

In-kind process

- Definition of IK work packages and their values
- Expression of interest from potential IK providers
- IK contribution agreements and technical annexes drafted
- IK Review Committee (IKRC) recommends agreements to Council
- Council approves agreements
- IK provider puts together IK contribution
- Factory acceptance test (FAT)
- Delivery
- Site acceptance test (SAT)
- Final report by IK provider
- IKRC recommends final report to Council for approval
- Council approves final report and credits IK contribution to the Member
- Ownership transferred to ESS

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Details of IKC at ESS

Accounting for IK contributions

Within the ERIC framework

Previously

- We regarded our Members
  - as shareholders when contributing in **cash** and
  - as governments when contributing **in kind**.
- Contributions in cash and in kind booked in different ways:
  - Cash contributions → Capital contributions
  - IK contributions → Government grants

New methodology

- We always regard our Members as shareholders both when they provide us with cash and IK.
- IK contributions become fixed assets.
- All contributions (both in cash and in kind) are booked as capital contributions.
- Applied for the first time for the financial year 2024. 2023 will have to be re-stated for comparison.

Advantages

- Enhanced transparency
- Makes financial statements more useful for ESS management and external stakeholders.

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Details of IKC at ESS

Conclusions (1/2)

Accounting:

- Align your finance function with your business.
- If you want to become an ERIC, sit down with your auditors and your host state(s) **early on** and ask them how they look at the ERIC and its Members.
- Pick a compliant accounting option for IK which is **easy to implement** and makes your financial statements transparent and useful for the readers.

In-kind in general:

- Beware of **VAT**!
  - VAT in the providing state
  - VAT on installation in the host state
- Try not to deviate from the **standard IK agreement**. If you have to, be transparent about it with all Members.
- Be very clear about **cost risks**. (Who bears cost risks? ERIC or IK partner?)
- Quality: Have staff members **at your IK partner labs** often / permanently.
- In case of issues, **escalate** them to your Council / General Assembly quickly.

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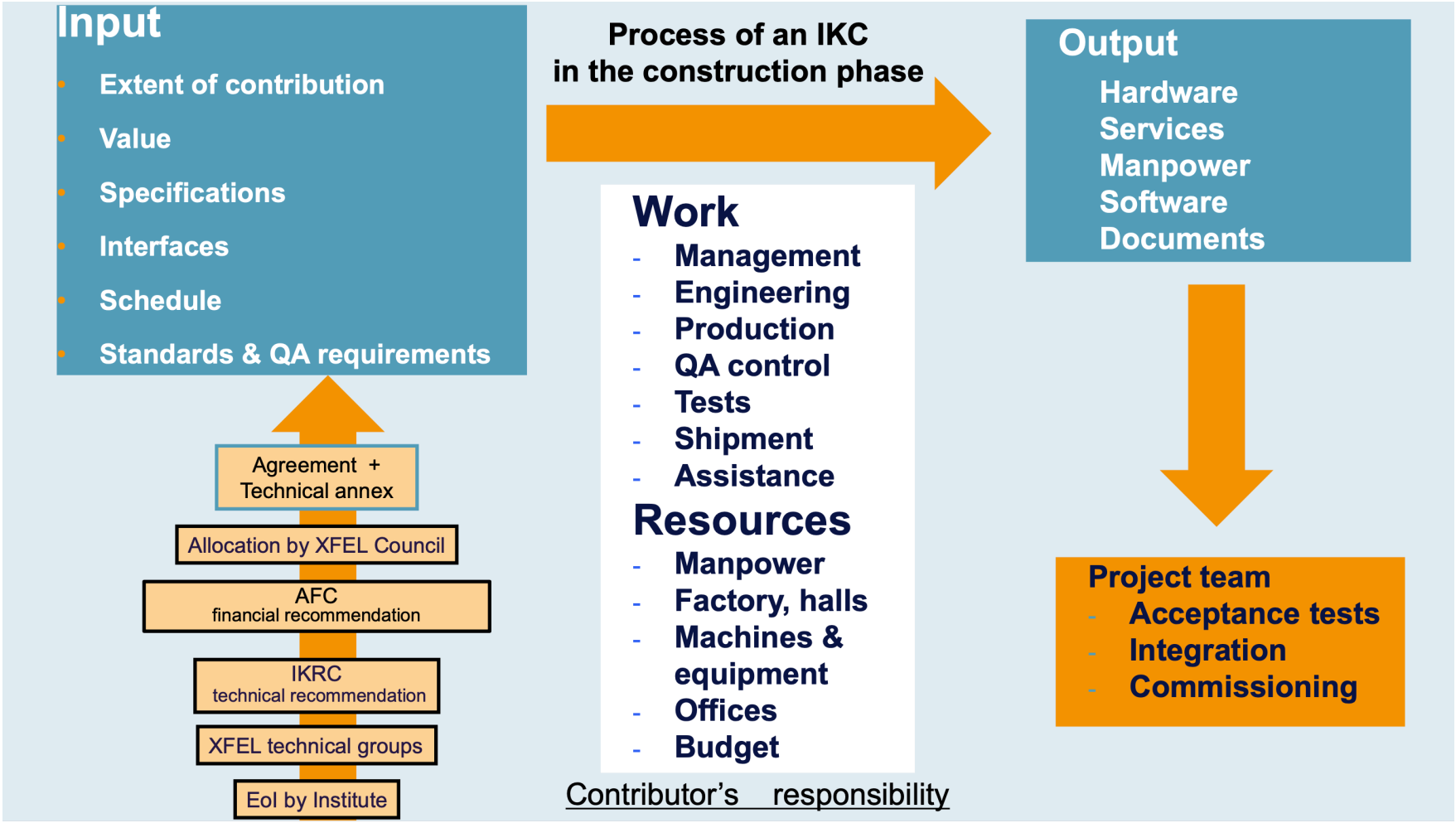
Details of IKC at XFEL

Credit to Antonio Bonucci (Head of Liaison Office IKC)



Details of IKC at XFEL

Pros and Cons of in-kind contributions for the construction phase

Reasons why IKCs are an attractive solution:

- For the contributing institute:
  - Implementing and developing its know-how
  - Local development
  - European supply chain and European technology sovereignty

- For the project:
  - Delegation of responsibilities (technical, management)
  - Delegation of risks (technical, costs)
  - Increase pool of suppliers during the operation
  - Organization of a supply chain for cutting-edge and critical components

Details of IKC at XFEL

But

- **For the Contributing Institute:**
  - **Technical Risks:** Particularly for newcomers or large-scale productions, leading to potential manufacturing and performance issues.
  - **Performance Risks**: Possibility of not achieving expected outcomes.
  - **Financial Risks:** Budget overruns or unexpected costs.
  - **Human Risks:** Loss of expertise and skills over time.
  - **Strategic Risks:** Risk of changing priorities by the funding agency.
- **For the Project:**
  - **Increased Oversight:** Technical follow-up and control may be more demanding than anticipated.
- **BUT Procurement drawbacks to be compared with increased Oversight in Kind**
  - **Limit of procurement action:** Lack of milestone verification and asset management after the procurement phase
  - **Competence Gap in procurement:** Absence of hybrid administrative-technical competence, such as that provided by an IKC officer to verify, control, mediate the technical part
  - **In case of delivery issues, Procurement works with the supplier, IKC officer with the supply chain**

Role of government bodies

Board/Committee	Function	Members
ESS Council	Supreme decision-making body; sets the strategy, budget, and policies of ESS.	Representatives from **member states** (usually government officials or national research agency representatives).
Finance Committee (FC)	Oversees the budget, financial planning, IKCs, and procurement policies.	National representatives with expertise in finance and research infrastructure.
Scientific Advisory Committee (SAC)	Advises on scientific strategy, research priorities, and technical requirements.	Experts from European research institutions and universities.
Technical Advisory Committee (TAC)	Reviews technical progress, construction, and operational challenges.	Engineering and technical specialists.
Machine Advisory Committee (MAC)	Provides advice on accelerator design, beam quality, and performance improvements.	International accelerator experts.
Executive Management Team (Directorate)	Implements the Council's decisions; manages operations, construction, and staff.	ESS Director-General and senior managers.
In-Kind Review Committee (IKRC)	Evaluates and approves in-kind contributions (IKCs) from member states.	Experts in finance, procurement, and project management.

Costs: key repartitions for member state contributions

There are many viable indicators:

(I) GDP only

(II) # of scientists (belonging to the ET Collaboration)

(III) Weighted coefficient: Share coeff = GDP x R&D fraction x # ET coll. scientists (used by MAGIC experiment)

(IV) Weighted flat rate

Allocation key

Party	GDP 2022 (B€) = A	R&D % of GDP = B	# scientists ET collab. (All) = C	GDP based only (%)	ET Coll. Members only (%)	Share coefficient = A*B*C (%)	Flat rate (%)
Country 1	492,5	32	87	5	8	15	10
Country 2	2361,2	31	128	25	12	18	23.3
Country 3	3502,2	23	169	36	16	21	23.3
Country 4	144,6	22	37	2	3	2	5
Country 5	1714,1	17	535	18	50	34	23.3
Country 6	859,8	15	96	9	9	9	10
Country 7	538,9	14	26	6	2	1	5

Costs: actual ET member state contributions

Country	No. of RU	No. of Scient	% RU	% Scientists	GDP/capita2023 (Mio. US$)	% GDP/captiva2023	GERD2023 (%)	% GERD2023	% MAGIC2007
Austria	1	10	1,1%	0,6%	56034	6,6%	3,29	7%	1%
Belgium	5	105	5,4%	5,9%	54701	6,4%	3,32	7%	11%
Brazil	1	17	1,1%	1,0%	10295	1,2%	1,15	0%	0%
Bulgaria	1	8	1,1%	0,4%	15886	1,9%	0,79	1%	0%
Croatia	1	3	1,1%	0,2%	21866	2,6%	1,39	1%	0%
France	8	148	8,7%	8,3%	44691	5,2%	2,19	4%	8%
Germany	12	258	13,0%	14,5%	54343	6,4%	3,11	7%	24%
Greece	1	9	1,1%	0,5%	23401	2,7%	1,49	1%	0%
Hungary	3	23	3,3%	1,3%	22142	2,6%	1,39	1%	0%
Israel	1	5	1,1%	0,3%	52642	6,2%	6,35	14%	1%
Italy	25	630	27,2%	35,3%	39003	4,6%	1,31	2%	18%
Mexico	1	7	1,1%	0,4%	13790	1,6%	0,27	0%	0%
Netherlands	7	134	7,6%	7,5%	64572	7,6%	2,23	6%	11%
Poland	1	33	1,1%	1,8%	22057	2,6%	1,56	1%	1%
Portugal	2	19	2,2%	1,1%	27331	3,2%	1,69	2%	0%
South Korea	1	25	1,1%	1,4%	33121	3,9%	4,96	7%	2%
Spain	9	156	9,8%	8,7%	33509	3,9%	1,49	2%	4%
Switzerland	1	23	1,1%	1,3%	99565	11,7%	3,30	13%	4%
Taiwan	1	8	1,1%	0,4%	32404	3,8%	4,00	5%	1%
UK	9	153	9,8%	8,6%	49464	5,8%	2,80	6%	12%
US	1	11	1,1%	0,6%	82769	9,7%	3,45	12%	2%
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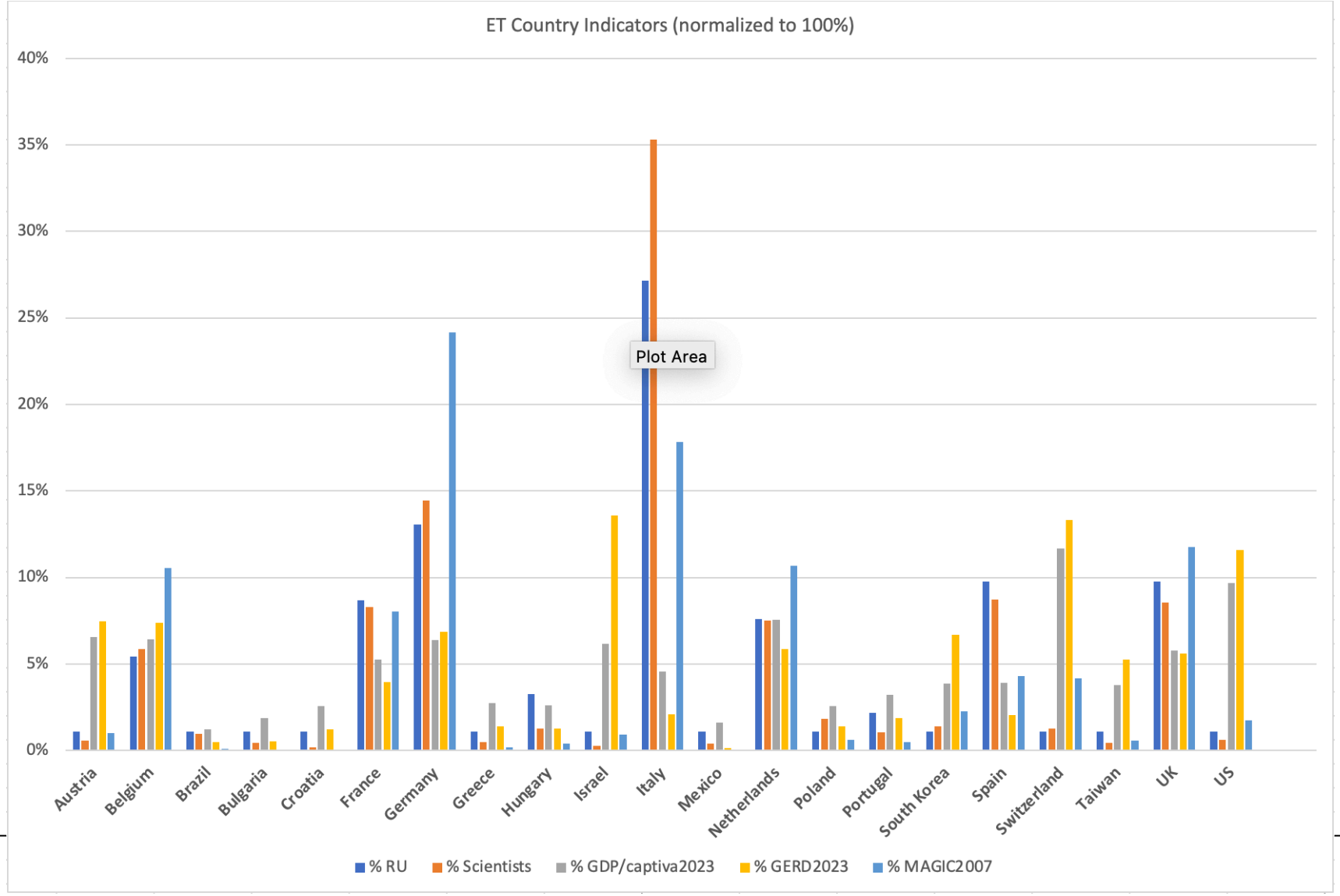
Costs: actual ET member state contributions



In-kind contributions and procurement

Key Differences Between IKC and Procurement

Feature	In-Kind Contribution (IKC)	Procurement
Who provides it?	Member states, institutions, or funding agencies	External companies or service providers via tender
Payment	No direct payment; provided as part of membership contribution	Paid by RI using allocated budget
Ownership transfer	Often remains with the contributor until delivery	Transfers upon purchase
Selection process	Negotiated between RI and contributing member state	Competitive bidding process
Purpose	Strengthens involvement of member states and their industries	Ensures cost-effectiveness and open competition

✅ **For routine infrastructure & administrative costs.**
✅ **When standardization is required (e.g., IT services, consumables).**
✅ **To prevent project delays caused by IKC contract complexities.**

Comparative of ESS/XFEL/SKAO for IKCs ✳

Phase	ESS Preference	XFEL Preference	SKAO Preference
Design & R&D	**IKC-heavy** (leverage member-state expertise).	**IKC-heavy** (utilizes research institutes).	**IKC-heavy** (global collaboration).
Construction	**Balanced (50/50)** IKCs for tech + cash for contracts.	**Balanced (50/50)** for hardware + cash for logistics.	**Balanced (50/50)** ensures industrial return & flexibility.
Operations	**Procurement-heavy** (cash ensures stable operations).	**Procurement-heavy** (cash funds annual budget).	**Procurement-heavy** (easier budget forecasting).

✳ From WP2/WP3 joint workshop in Warsaw 11/2024

In-kind contributions and procurement

Why Use Both?

Big Science projects **combine IKCs and procurement** to balance cost-sharing, expertise, and industrial return for member states.

- IKCs allow **member states to contribute strategically**, keeping local industry engaged.
- Procurement ensures **cost efficiency, transparency, and access to global suppliers** for operational needs.

Lesson learned from XFEL, ESS and SKAO

- IK Contribution: relates with ecosystem of institutes. Suppliers are interested in the implementation of the results, develop and retain the know-how. Beneficial for cutting edge projects
- Procurements: relate with supplier companies, interested in the market/commercial operation. Bound to trade secret. Beneficial for standard projects

Take away message

- Crucial role of the IK contribution manager and industrial liaison officer. From the pre-construction throughout the construction and operation phases
- Strong central management
- Risk ownership, the importance of WBS/technical annexes
- Valuation of IKC: Assigning fair market value to in-kind contributions to reflect their true worth in the financial plan.
- Be aware of VAT (see next talk by WP2) but keep the focus on the entire financing of ET

Questions and thoughts

Establishment of a Finance Resource Board for ET:

- *Given the critical role of a Finance Resource Board in the success of large-scale projects like ET, what would be the optimal timing for its establishment to ensure effective financial oversight and planning?*
- *Could experts from BGR share their experiences with similar boards in other projects or experiments, highlighting best practices and potential pitfalls?*

Insights on Legal Frameworks and Financial Structures:

- *Reflecting on the 3 legal frameworks— ERIC, IGO, and National/Hybrid model—which have been the most effective in facilitating funding and operational efficiency from past experiences?*
- *Concerning the setting up of IKC?*

Strategies for Managing Major Cost Components:

- *What approaches have proven successful in handling significant cost items like tunnel construction, vacuum systems, and laser/optical systems in large-scale research infrastructures?*
- *How should contributions be balanced between site-hosting countries and non-site countries to ensure equitable and sustainable funding?*