

SY-FCC workshop

Procurement, in-kind and collaboration aspects

A. Unnervik

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High level objectives, constraints, project view of key collaboration opportunities for SY

Revised Cost estimates, once the equipment in the collider and the booster rings have been better specified (most, if not all **cost estimates should be in class 3 or better for the Feasibility Study**).

FTE requirements (CERN personnel) needs to estimated (in total FTE-years, not FTE/year), mentioning the activities covered.

Risk Register covering cost, scheduling and technical performance risks needs to be established, including mitigation measures, estimated cost for the mitigation and risk owners.

FCC Procurement Handbook, "Shopping list" to be developed, listing all requirements for FCC-ee.

Specific major additional developments for SY

RF:

The use of 2-cell cavities also for the Z machine should be evaluated.

The increase from 5-cells to 6-cells for the 800 MHz system needed for the ttbar run of FCC-ee is under evaluation.

ABT:

some 80% of the dipoles and quadrupoles in the transfer lines could possibly be made of permanent magnet technology and this possibility needs to be evaluated.

What are the different procurement/delivery models and strategies? WBS for components and systems and how are they going to be designed/prototyped/delivered (industry, in-kind, CERN)? Which quality control process is foreseen?

The Procurement Handbook will list all major systems, equipment, components, materials and activities needed for the construction of FCC-ee. It will allow an early discussion between different stakeholders to identify possible in-kind deliveries (with their respective boundary conditions) and procurement/delivery models and strategies with the objective of reducing risk and cost.

The analysis will be based on input from mainly three sources: ILOs on potential industrial partners in the MS, on proposals from the CERN technical groups and on proposals from our international collaboration partners.

Various delivery modes will probably be used (in-kind, standard off-the-shelf contracts, contracts including development, prototyping and series production, activity contracts, etc...).

Detailed Procurement Rules are not yet known (may differ from current rules).

Quality control processes have not yet been defined but it is worth mentioning that for LHC, in addition to CERN standard quality processes, a separate contract was signed for independent quality inspectors (both residential and itinerant).

Experience from other large projects (ITER, ESS, FAIR, HL-LHC)?

Some experience from other projects and organizations (ESA, ESS, ITER, F4E etc), in particular as regards in-kind:

In-kind contributions facilitate the industrial return to a given country, but they are not without difficulties. In particular:

- liability induced by late delivery or issue with the performance;
- responsibility for changing market conditions if these have not been clearly defined in the beginning;
- Difficulties to reach agreement on value of the in-kind delivery;
- engineering change requests may become necessary during production, depending on the maturity of the design, requiring lengthy and difficult negotiations with the partners. Such difficulties become even more important with an increased fraction of in-kind contributions as an issue when an in-kind contribution from one partner has an impact on one or more in-kind contributions from other partners;
- problems with interfaces between different systems delivered in-kind as well as between HW and SW systems.

SKAO

A) Allocation of the work packages up-front and thereafter only bidders in the country with the allocation are allowed to compete for the work package contracts concerned. This approach allowed a reduction of the total in-kind contributions from an estimated 70% to approximately 20% of the total cost (but the risk is reduced competition).

B) In kind contributions are covered by two agreements: a relatively short agreement with the country concerned (the Contribution Partner) and another, detailed, agreement, more like a commercial contract, with the supplier (the Delivery Partner). This latter agreement includes detailed project management and reporting requirements enabling SKAO to properly manage the Delivery Partner and to apply earned value techniques and early warning processes. This ensures that SKAO has more control over each in-kind contribution.

Experience from other large projects (ITER, ESS, FAIR, HL-LHC)?

Some Risk Management standards and frameworks that have been used as inspiration

- At CERN
 - CERN Enterprise Risk Management Framework
 - HL-LHC Risk Management Framework
 - LHC Risk Management Framework
 - North Area Consolidation Project Risk Management Plan
- Standards
 - ISO 31000 (Risk management Guidelines)
 - COSO (Committee of Sponsoring Organizations) Enterprise Risk Management Framework
- Div Org and Projects
 - Fermilab Risk Management Procedure for Projects
 - Le Grand Paris Risk management
 - F4E (Fusion for Energy) Risk and Opportunity Management Policy
 - ITER Risk Management
 - ECSS (European Cooperation for Space Standardization) Risk Management
 - Etc...

The FCC-ee Risk Management Framework will be compatible with the CERN Enterprise Risk Management Framework

Definition of the process with SY department and interfaces between FCC project and SY groups

Ad-hoc meetings with work package leaders.

In SY

Power converters

RF

Collimators, absorber, beam intercepting devices

Beam transfer

Beam diagnostics and instrumentation

Davide Aguglia

Olivier Brunner

Antonio Perillo Marcone (Anton Lechner)

Wolfgang Bartmann

Thibaut Lefevre

What is the required timeline for early decisions to be taken for the pre-TDR phase?

Revised Cost estimates, For the Feasibility Study, first iteration **Sep-Oct 2024**. To be finalized before **end-2024**.

FTE requirements For the Feasibility Study, first iteration **Sep-Oct 2024**. To be finalized before **end-2024**.

Risk Register For the Feasibility Study, first iteration **Sep-Oct 2024**. To be finalized before **end-2024**.

FCC Procurement Handbook For the Feasibility Study, first iteration **Sep-Oct 2024**. To be finalized before **end-2024**.

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Both developments: For the Feasibility Study, first iteration **Sep-Oct 2024**. To be finalized before **end-2024 (???)**.

Timeline, status and assumptions for cost exercise: What is included and what is not included (workforce, R&D, spares, ...)? Which time period is covered by the cost exercise?

Revised Cost Estimates. For the Feasibility Study, first iteration **Sep-Oct 2024**. To be finalized before **end-2024**.

The following items **are to be included in the cost estimates**:

- Construction costs, i.e., **from project approval to commissioning**;
- Tooling dedicated for production of components;
- Reception tests and pre-conditioning of components;
- Installation costs, when installed by contractor's personnel (or FSUs or similar);
- Commissioning of technical systems (without beam);
- Spares, if they have to be produced at the same time as the series production (cost of re-starting production later would be prohibitive);
- Any cost for activities carried out by non-CERN personnel;
- two (and four) detectors;
- Territorial developments such as costs related to land, roads, electricity and water connections as well as for administrative processes.

Timeline, status and assumptions for cost exercise: What is included and what is not included (workforce, R&D, spares, ...)? Which time period is covered by the cost exercise?

Revised Cost Estimates. For the Feasibility Study, first iteration **Sep-Oct 2024**. To be finalized before **end-2024**.

The following items are **not** to be included in the cost estimates:

- Costs for R&D, prototyping & pre-industrialisation **incurred prior to project approval** (despite their optimisation being a main driver in the design phase);
- Off-line computing;
- General laboratory infrastructure e.g. library, fire brigade, hostel, cafeteria;
- General laboratory services, e.g. administration, human resource management, purchasing, finance, communication & outreach;
- Commissioning **with** beam, operation, decommissioning;
- Spares (if they don't have to be produced with series-production) and maintenance (charged to operations budget);
- Taxes & customs duties;
- Costs associated with any future changes of legislation;
- Costs for local synergy developments and collective compensations that will only be known when they are designed in detail as part of the project authorisation process in the two host states.



Thank you
for your attention.