Conceptual Design Review of the Central Process Systems November 16, 2017

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Committee members: Mauro Nonis (CERN), Jens-Peter Jensen (DESY), John Weisend (ESS), Feri Mezei (ESS), Roland Garoby (ESS)

Committee charge: see Annex 1

Meeting agenda and presentations: https://indico.esss.lu.se/event/934/

Executive Summary

The meeting was open and constructive. The Committee appreciated the quality of the explanations and the competence of the E.ON representatives.

Although the design presented was only conceptual, the information concerning the heating and cooling systems was of good quality and the discussion was fruitful. The Committee considers therefore that the proposed Conceptual Design is capable to satisfyingly meet the ESS requirements and therefore agrees that E.ON should move forward into the Preliminary Design Phase. The ESS requirements are confirmed as a valid basis for this work, although the precise description of the needs during the progressive ramp-up of the ESS facility until 2025 remains to be refined by ESS.

The Committee takes note of the plan of E.ON to develop the “ectogrid” concept and of its interest both for E.ON and ESS if implemented in the Lund area. E.ON is therefore encouraged to pursue its ambitious plans in that respect.

A detailed analysis of E.ON proposal will only be possible when the Preliminary Design will be available. By the time of the Preliminary Design Review it is expected that E.ON will have come to a decision concerning the implementation of the “ectogrid” .

Observations

- Time did not allow discussion of the instrument air system. The design of the water quality system was executed by a specialized subcontractor which did not participate to the meeting so that discussion of this system remained superficial.

- The operation of ESS depends on the reliability of the District Heating System.

Requests to E.ON for the Preliminary Design Review

1) Present a Failure Analysis that explicitly demonstrates the redundancy of all systems including cooling, water treatment and compressed air. (No single point of failure within the CUB systems should disturb the ESS operation.)
2) Show explicitly how the quality of the water is monitored, what happens if the quality requirements aren't met and how redundancy is met.
3) The subcontracting engineers responsible for the water quality system design should attend.
4) E.ON should make a decision on the possible implementation of the "ectogrid".
5) Determine which part of the Central Process Systems needs to be attached to the backup generator. A restart strategy should also be developed.
6) Provide the characteristics of the rejected water and inform ESS of the needs for draining.
7) Describe the noise environment.
8) Provide details on the optimization of electricity consumption.
9) Describe a preliminary plan for operation, maintenance and troubleshooting.
10) Exploit the ESS replies to the questions listed in the section below ("Questions to ESS").

Recommendations to E.ON

1) E.ON should take note of the ESS PLC and EPICS standards and is encouraged to apply them.
2) ESS and E.ON should work together to optimize any interlocks. Interlocks should be minimized if possible.
3) Examine the possibly of using the 80 C heat to produce the chilled water.
4) Examine decoupling the production of temperature from the distribution of the water.
5) Consider the use of double walled heat exchangers between the ESS and the external circuits.

Questions to ESS (to be answered before the end of November 2017)

1) Confirm that there is no need for deionized water in the low temperature water system (8 degrees).
2) Check if 50 degrees water input could be used for target cooling.

Annex 1

Review charge

The main purpose of the review is to scrutinize and optimize the design of the “Central Process System” (CPS) that is proposed by the selected contractor.

The CPS design has to allow ESS to fulfil its commitments with respect to the authorities, especially in terms of heat recovery over the lifetime of the facility.

Optimization is concerning:

- Costs of construction and operation,
- Design principles in view of sustainability,
- Practical implementation in view of maximizing reliability and minimizing complexity and maintenance efforts.

DOCUMENT REVISION HISTORY

Revision	Reason for and description of change	Author	Date
1	First issue <<Keep only full number revisions when approving document>>	<<Name>>	<<YYYY-MM-DD>>