Report of the Installation Readiness Review for the G02 rack aisle installation

November 15, 2017

A Sunesson, IRR Chair

**Introduction**

 The installation readiness review of the G02 rack aisles took place in Lund on November 15, 2017. The charge and committee for this review are in Attachment 1.

* The committee thanks WP 15 and the supplier for diligent work on providing the information for this review
* The committee believes the installation is under control and can commence according to schedule
* While there are some things to clarify, no showstoppers related to this review’s purpose have been identified
* A number of recommendations were defined, see later

**Decision**

ESS believes the installation is under control and can commence according to schedule

**Discussions**

The contract and the layout of the work have been arranged to allow progress while allowing flexibility for the varying requirements from ESS stakeholders. The main tool to keep track of data and requirements has been the rack spreadsheet.

The cooling solution is units that sit inside the rack rows and talk EPICS. ICS is aware of the solution.

The racks will be delivered starting mid-November, and continue every second week, until all are delivered. To allow progress, ESS will install racks as they arrive. The schedule is very tight, and to keep schedule, racks need to be installed.

It has come up as an issue that the rack aisles are too long according to applicable Swedish standards. They measure 12.2 m. The aisles have one evacuation route, and this length requires accessibility from both ends. At 10 m length, accessibility from only one end would have been satisfactory. The placement of the racks does not allow a second door to be fitted since the current available space (273 mm long) does not meet the required space of 700 mm for the implementation of a second exit. Of interest is also that the inner doors, inside the rack aisles, do not lock in open position. Since the rack aisles are already ordered and arriving, the remaining options are the following:

1. Get an exemption from the rule by submitting a derogation and preliminary risk assessment, and introduce administrative measures that mitigate the risks, to the ES&H Division
2. Take out one or more racks on the “inside” and mount a second door there
3. Move the racks out from the inner wall to give enough space for a second escape door.

Since the G02 width is limited, moving the racks out would interfere with the transport area space envelope and thus make it impossible to transport klystrons on the other side of the rack rows. This is absolutely needed to assemble the facility. Option 3 is therefore not feasible.

Option 1 is favored, and work has started in AD to prepare and submit the preliminary risk assessment and derogation. Option 2 is an alternative if Option 1 fails.

Another issue that has come up is that racks apparently have been allocated to be sent to in-kind partners for filling, testing, and then to be sent back to Lund for installation. The supplier does not know about this, and the committee was not aware of the extent of this practice. To assess if this is an issue, Håkan Danared and Anders Sunesson will try to get an overview as soon as possible. What is needed is that ESS keeps control of the installation. Therefore and end date when the racks are needed to be back at ESS to not disrupt the installation is needed in each case. A mitigation is to install “dummy” or empty racks. These could be borrowed or acquired as spares, but this needs a separate discussion.

After installation, cooling trays and cable trays need to be built on top of the rack aisles. Placeholders have been made in the CAD for this. The time needed for this is expected to be of the order of 2 months per aisle. It is also clear that no tests and no energization can take place until the water rigs are in place. This needs to be shown and designed.

There were some questions on sign-off procedures and deliverables of documentation, see recommendations.

**Answers to Charge Questions**

Will the racks meet their technical specifications? Do we know how to verify this?

*Yes: The racks will meet the technical specifications, because they have been adjusted together with the project engineers at ESS. All rack drawings (stp- and pdf-files) provided by Pentair have been approved*

Have all interfaces between this system and other systems been completely defined and agreed? Are all the connections on the ESS site in place? This applies to physical connections and physical parameters (flows, pressure, temperatures, current, voltage, UPS requirements)

*Yes: Liquid interfaces had been identified after the last visit in August 2017. The connection between the cooling system of the rack rows and the ESS infrastructure will be realized using flexible tubes. The PDUs are prepared for electrical connection realized by ESS the design of the racks and the PDUs is according to the ESS specification*

Have all safety issues been defined and dealt with? Are additional separate safety reviews or inspections required?

*Yes: The electrical safety aspect are considered in the design of the racks (Earthing point and contact protection). However the evacuation issue of the aisle containments has to be resolved as soon as possible.*

Have all QA/QC plans been defined and implemented?

*Yes: Product are designed and fabricated according to the Pentair quality and safety requirements*

Will the system fit within its allocated space and can be transported there within the given transport path (height of doors, pass by other equipment) with the available transport means?

*Yes: Product are according to the ESS dimension requirements. Racks will be delivered as a single unit. Final installation will be realized on site. There are issues within ESS with the placement, but this is not part of this readiness review*

Are the alignment requirements agreed upon and can the system components be aligned within these requirements?

*Yes. It is agreed that marks for each installation are visible on the ground*

Is the installation plan for the system adequate? Have all tools, including cranes, movement devices, stands, alignment fixtures etc. been defined. Has the staff for this work been identified? Is the installation sequence consistent with the overall installation plan?

*Yes. Delivery The installation plan has been provided to ESS. The Pentair installation team comes prepared with all needed equipment*

Has the reliability and maintainability of the system been optimized? Have all the spare parts required from the first day of operation been identified and procured?

*Yes. Pentair has identified all potential spare parts. Pentair has offered Service and Maintenance contract.*

Have all inspections and permits required prior to installation been carried out? Have the inspections and permits required between installation and the Accelerator Readiness Review been identified?

*Yes. ID06 cards are available. Safety instruction trainings are scheduled*

Have all recommendations from component design reviews been addressed?

*Yes. Pentair has provided documentation of each product with the exception of the PDU that is still in development due to the recent changes*

Are there any outstanding agreements to be made or other actions necessary to allow the work to move forward?

*See recommendations*

**Recommendations**

1. Inspection test plan for installation to be created before end 2017 (Pentair)
2. Provide FAT protocol and declaration of conformity before end 2017 for current deliveries, in future, together with delivery (Pentair)
3. Cable tray and piping design to be provided before end 2017 (Pentair and ESS)
4. Clarify who connects to utilities (ESS WP 15/WP 16)
5. Clarify what racks will be sent where and when within 2 weeks (ESS ASU/HDA)
6. Decision regarding escape routes needed within 2 weeks (ESS ESH/ASU/DPH)

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| Installation Readiness Review for Gallery RacksNovember 15, 2017Atlantic Water Conference Room ESS Site |
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| **Charge for the IRR** |
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Purpose of this IRR

 The IRR is meant to be the final technical review of the system prior to the start of installation. As such, it examines the final technical design of the integrated system with an emphasis on interfaces between components and subsystems, controls integration and a detailed look at the plans, staff and tooling required for the installation work itself.

 This IRR is for the Rack installation in the gallery. It will address interfaces between the racks and water, power and cable systems but does not review the installation of the water, power or cable systems.

**Charge to the Committee**

 The Review Committee is composed of the Chairman and members as identified in Appendix 2. This list also shows reviewers, who provide comments and review but are not on the formal committee and presenters.

 The Review Committee is asked to:

1. REVIEW: Scrutinize and assess the deliverables listed in Appendix 1, presented through the material presented and discussions, at the IRR. Note that the presentations themselves are means of communication only, and it is the documentation which must be reviewed.

2. ANSWER: Answer each question listed in Appendix 3.

3. DECIDE: The Review Committee is to elaborate and deliver at the conclusion of this IRR, a clear recommendation to ESS about the readiness of the racks to be installed in the gallery

Suggested forms for the decision are:

* Approved, without qualifying comments or further actions.
* Approved, but with recommended actions and or clarifications.
* Not approved, but with recommended actions, for further inputs and activities, and a proposal for a follow-on review.

(If the committee rules for “Approved with recommended actions” or “Not approved” of the IRR, it is of essence that the actions/comments requested are very precise in their formulation and that the fulfilment decision is transferred to INFN-LNS and ESS, all this due to time constraints in the manufacturing schedule and sequence).

4. REPORT: The Review Committee is to document in a short report to be delivered as soon as possible after the IRR, its recommendation and any specific actions and other guidance for assisting planning and future success of the Work Unit in for its scope and deliverables.

If the IRR is “Approved but with recommended actions”, there shall be a summary list of requested actions defined.

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| Appendix 1**Scope and Deliverables for Review** |
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Scope

The scope for the review includes:

* The electronics racks to be installed in the Gallery ( G02)
* Installation plans including: required permits, tooling, cranes, personnel requirements, training, schedule, alignment issues, material transport, laydown area requirements
* Readiness of supporting utilities (water, electrical power, cable trays). This will be provided by ESS staff.
* Quality Assurance and Quality Control Organisation
* Safety aspects
* Reliability

Deliverables for IRR - Information to be reviewed

The information identified below is to be described and communicated through presentation at the IRR, and the source information is to be available to reviewers for reference during the IRR.

WP15 and its vendors are requested to deliver to the IRR Chairman for distribution to the Review Committee and other reviewers, an agreed subset of the following information for pre-review and comments no later than 5 working days prior to the IRR.

1. Mechanical design at a sufficient detail to answer interface, performance, alignment and installation questions below.
2. Applicable Electrical design including: single line drawings, instrumentation lists, cable designs and connector pin outs, calibrations etc.
3. A strategy for System Verification
4. Update of all related engineering documentation
5. Detailed Installation plan including alignment strategy.
6. Hazard analysis
7. Work Safety Coordination Plan including all its Annexes (Area Hazard Analysis, Job Hazard Analysis, System Deliverables, Equipment List etc.)
8. Results of relevant component and subsystem testing
9. List of needed spares for installation
10. Installation schedule
11. Transport and delivery plan including package sizes, weights, identification and handling instructions

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| Appendix 2**Review Committee and other Reviewers, Presenters and Observers** |

The IRR Committee conducts this review of design with the authority of ACCSYS Project Leader, Mats Lindroos, and ESS Chief Executive Officer, John Womersley.

The Committee serves in an advisory capacity to:

* the ACCSYS WP 15 Leader, and
* the ACCSYS management team

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| Name | Organisation | Appointment for IRR |
| Anders Sunesson | ESS, RF Group leader | Chairman of the Review Committee  |
| Kent Wigren | ESS, ACCSYS QA Lead | Review Committee member |
| Duy Phan | ESS, ACCSYS Safety Group  | Review Committee member |
| H. Danared | ESS, Installation Manager | Review Committee member |
| Marcus Green | ESS, Area Manager, Gallery | Review Committee member |
| Frithiof Jensen | ESS, WP15 Leader | Presenter |
| Jörgen Jönsson | ESS, WP 15 engineer |  |
| Evangelia Vaena | ESS, Electrical Engineer | Presenter |
| Jan Zimmermann | Pentair, Field Application Engineer | Presenter |

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| Appendix 3**IRR Charge Questions** |

1. Will the racks meet their technical specifications? Do we know how to verify this?
2. Have all interfaces between this system and other systems been completely defined and agreed. Are all the connections on the ESS site in place? This applies to physical connections and physical parameters (flows, pressure, temperatures, current, voltage, UPS requirements)
3. Have all safety issues been defined and dealt with? Are additional separate safety reviews or inspections required?
4. Have all QA/QC plans been defined and implemented?
5. Will the system fit within its allocated space and can be transported there within the give transport path (height of doors, pass by other equipment) with the available transport means?
6. Are the alignment requirements agreed upon and can the system components be aligned within these requirements?
7. Is the installation plan for the system adequate? Have all tools, including cranes, movement devices, stands, alignment fixtures etc. been defined. Has the staff for this work been identified? Is the installation sequence consistent with the overall installation plan?
8. Has the reliability and maintainability of the system been optimized? Have all the spare parts required from the first day of operation been identified and procured?
9. Have all inspections and permits required prior to installation been carried out? Have the inspections and permits required between installation and the Accelerator Readiness Review been identified?
10. Have all recommendations from component design reviews been addressed?