

Executive Summary

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1. Executive Summary, CCS System and Support Procurements

1.1. CCS System Procurement

This document briefly summaries the nature, scope and content of the procurement for the modernisation of Estonian Railways Ltd CCS systems. The aim of the CCS modernisation project is to fulfill the Estonian Railways Ltd's main goal to achieve optimal, reliable, safe and low-cost lifecycle railway infrastructure. Contractor-B shall supply a CCS system that shall have a long operational lifetime (minimum of 25 years). Contractor-B must be prepared to commit himself to an agreement covering the CCS system's lifecycle. Contractor-B is required to provide a well-grounded presentation of the potential lifecycle duration of the tendered system.

The current signalling systems of the infrastructure are mainly based on the Soviet Union era relay technology and they were developed between 1958 – 1992. The systems have mostly depreciated and are in the end phase of their expected service life which this modernisation procurement will respond to. This procurement will respond also to the needs to improve and develop the safety, reliability, availability, maintainability, capacity, and the life cycle cost of the existing railway network. The future needs, EU directives and standards also requires the improvement of ALSN systems.

The target is to obtain suitable technology with reasonable costs which is compatible with Class B train protection systems. Achieving the main goal includes several other new and ongoing design, construction, and expert assignments.

The Major CCS procurement will be based on a contract developed by ER's legal department. To minimize the technical and project interfaces, ER plans to procure all lines of Stage 1 and lines of Stage 2 as options from a single Contractor-B.

This procurement is executed in conditions of public procurement. Tender evaluation will be based on price and quality, which will be reviewed by project schedule, lifecycle control management plan (LCMP) and project implementation plan. Public procurement shall be announced via Public Procurement Registry.

The modernisation of CCS systems is executed in three different stages in years 2020-2027. Stages are presented on figure below.



Figure 1. Modernisation of CCS systems in 3 stages 2020-2027.



Figure 2. Geographical scope of CCS system modernization

On Stage 1 (2020-2024) the modernisation and the prerequisites for ERTMS L1 (TTCMS) are done for lines 2, 3, 4 and 6 (ALSN track coding). On stage 2 (2021-2024) the same is done to lines 1, 5 and 6 (Koidula station upgrade). And on the last stage 3 (2025-2027) the whole railway network is transferred to ERTMS/ETCS L1 system and the gradual dismantling of ALSN system is executed.

In the Major CCS Project, the train detection is designed using the audio frequency track circuits. Audio frequency track circuits are to be used to avoid the expensive parallel existence of two vacancy detection systems that using axle counters would result in. Audio frequency track circuits are used to make the further use of ALSN possible in a cost-effective way. The European Union legislation states that member states cannot further develop the existing Class B ATP systems which complicates the possible solutions for implementing the Class B ATP system to the new microprocessor interlocking. The use of ALSN results in using the chokes for traction back current system since the earthing cannot be done directly to the rail. The broken rail detection is necessary in the climate conditions of Estonia and according to Eesti Raudtee the track circuits help to find the broken rail with almost 90 % precision. According to the research done during the project there is no better available system for broken rail detection.

The Class B ATP system ALSN is to be operational during and after the major CCS procurement until the ERTMS/ETCS ATP system is built and commissioned. The frequency used in ALSN must be 25 Hz or 75 Hz because of the upcoming 25 kV 50 Hz electrification. During the implementation of the ERTMS/ETCS ATP system the ALSN must be operational as a dual equipment. In the future, ALSN and ERTMS/ETCS trackside equipment can be operational at the same time at same track sections but only one OBU (On-Board Unit) can be used at a time depending on which ATP system is being used. The specific ERTMS/ETCS level is to be decided later. There will be no limitations in the CCS procurement to the preferred level of the ERTMS/ETCS and the radio network (GSM-R or other standardized solution) implementation concerning the ERTMS/ETCS levels 2 and 3 will be specified later.

In the future while implementing the ERTMS/ETCS ATP system the dual equipment is to be designed in a way that parallel use of the Class B and Class A ATP systems is possible. The Class B ATP system is to be dismantled when the ERTMS/ETCS ATP system is commissioned. When the ERTMS/ETCS ATP system is in use there is no limitations for switching the vacancy detection principle to axle counters depending on the level of the ERTMS/ETCS chosen. When the Class B ATP system is decommissioned the earthing may be done to the rail itself and there is no further need for specific chokes. The structure of the earthing and electrification systems must be done according to the standard EVS-EN 50341-1.

The CCS Contractor-B will help ER to harmonize troubleshooting processes and with the help of Lifecycle Control and Management Plan (LCMP) create unified maintenance programs so that the maintenance personnel is able to work anywhere within the network with the CCS system in question.

Content Management Best Practices (Taxonomy of documents) have been implemented (standardized) to manage, update, and provide version information for huge document volumes in a single system.

Besides the CCS project and the projects directly connected to it, ER is running fiber optic cable project, Timetabling, Traffic Control and Management System (TTCMS) project and level crossing project. Track electrification project will be planned in conjunction with the CCS project.

At the minimum ER will provide the CCS system Tenderers the following initial data and documentation for the preparation of tenders:

- ERIR (Estonian Railways Interlocking Requirements)
- Technical Specification (TS) with annexes
 - Single- and double-line diagrams
 - Locking tables
 - o Indications and commands
 - Description of the signalling system
 - Description of ALSN
 - Project target schedule
- List of standards and applicable laws

As a part of its Tender, the Contractor-B must submit a detailed schedule, a comprehensive lifecycle control & management plan and a project implementation plan, based on the initial data and best practices from previous projects.

The Contractor's scope includes a SIL 4 level CCS System design and construction on a Line-basis, including indoor and outdoor equipment with cabinets, CTC/LOP for train dispatchers, ASLN, track vacancy proving and cabling in ready-made cable routes on stations. Also, the training for dispatchers and maintenance is required.

1.2. Introduction to Support Procurements

The major CCS modernisation project procurement is divided into smaller subsets. The subsets are presented on figure below.



Figure 3 Procurement subsets.

Support procurements include expert services, materials, and other procurements such as equipment rooms, cable routes, etc. ER is responsible for the overall project management and scheduling of the

support procurements tasks to support the CCS project(s) on different lines to achieve the target times.

All projects connected to the Major CCS Project will provide information to ER's asset management. All systems and maintenance processes should be provided with KPI parameters at a later stage, tagged in the same structure, connected to the GIS system and subsequently able to record fault history, cost history, maintenance history. ER will provide the list of required data, and the Contractors are obliged to provide the data during the project.

The schedule submitted by Contractor-B will act as the baseline for the Major CCS Project, including the already acknowledged support procurements mentioned hereafter.

1.3. Support Procurement 1: CSM ISA

Commission implementing regulation (EU) no 402/2013 on the common safety method for risk evaluation and risk assessment.

Expected publishing time of RfT: Q3/2020. Expected starting of works: Q4/2020.



Figure 4. EU regulation 402/2013 for CSM

1.4. Support Procurement 2: Owner Supervision

The Concept of Supervision comprises ER's process requirements for the major CCS project purposes of the railway infrastructure of ER. The concept relies on modern practises of the railway sector and have been used in organising relevant projects in the European Economic Area.

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The concept is adapted to the ER's infrastructure and work environment to allow all parties shown in Figure 5 to perform their tasks related to the the overall project quality management.



Figure 5. Overall project quality management elements

The overall project quality management of the Major CCS Project consists of five key elements: 1) CSM ISA, 2) Owner Supervision, 3) works of Chief Supervisor, 4) Commissioning inspection & approval, 5) EN ISA and 6) Local and national authorities. This document describes the concept and Scope of Works of Owner Supervision and Chief Supervisor. The Works of CSM ISA are described in TS Annex "Assessment Body". The Works of Commissioning inspection & approval are described in TS Annex "Commissioning Inspection & Approval". The Works of EN ISA are not directly described in the TS documentation, but indirectly via the requirements set to the CCS Contractor-B in CCS Technical Specification, and as required by the standards listed in TS Annex "A Complete List of Standards and Applicable Legislation".

From supervision point of view, only Owner Supervision and Chief Supervisor Works are directly connected. Other elements are mostly independent of each other, yet each one of them produce solid evidence and required documentation for Estonian Railways (later as "ER") to a) ensure all procurements' duties have been fulfilled, and b) apply for an operating permit from Tarbijakaitse ja Tehniline Järelevalve Amet (TTJA), the Estonian Consumer Protection and Technical Regulatory Authority.

The supervision is divided into four subsets of which 1, 2 and 3 will be performed by one, and 4 by one Owner Supervision Contractor:

- 1. Owner Supervision for trunk cabling, cable routes and civil works
- 2. Owner Supervision for equipment rooms
- 3. Owner Supervision for point machine installation
- 4. Owner Supervision for CCS System installation

Owner Supervision Contractors work under the guidance and supervision of Chief Supervisor, working in direct contractual relationship with ER. The role of the Chief Supervisor is to set unified requirements for the supervision works and provide supervision documentation platform to collect the supervision observations and data for further processing and reporting to ER.



Figure 6. Supervision model

1.5. Support Procurement 3: Cabling, Cable Routes, Signal and Cabinet Bases

The role of cabling, cable routes, signal and cabinet bases installation Contractor is to install trunk cabling on open tracks needed for the CCS system. The type and amount of cabling will be specified by the CCS Contractor in the early stages of the planning phase, planned to start in Q4/2020...Q1/2021. Also, the CCS Contractor is requested to provide the cable material.

The Contractor will install the cable routes needed for the CCS system on stations. The scope of works include cable piping, track underpasses, manholes and other needed material according to the needs of CCS Contractor and ER.

The Contractor will install concrete signal bases on stations and open tracks, as well as cabinet bases made of metal. The CCS Contractor is requested to provide the signal and cabinet bases.

All works will be performed with design & build principle, including building permits, according to the initial information and schedule provided by ER/CCS Contractor.

Expected publishing time of RfT: Q4/2020. Expected starting of works: Q2/2021.

1.6. Support Procurement 4: Equipment Rooms

The role of equipment rooms Contractor is to build equipment rooms as turnkey delivery, needed for the CCS system on stations. Currently, three different sizes of equipment rooms are needed. The scope of works include the needed electrical works and heating & cooling. The electrical works needed for the CCS system is excluded from the equipment rooms' scope of works.

All works will be performed with design & build principle, including building permits, according to the initial information and schedule provided by ER/CCS Contractor.

Expected publishing time of RfT: Q4/2020. Expected starting of works: Q1...Q2/2021.

1.7. Support Procurement 5: Point Machines

ER will replace the existing manual point machines to centralized, electrical point machines, and replace any needed existing electrical point machines. The role of the point machines Contractor is to provide a "bolt-on" point machine that fits in ER's mechanical construction without modifications.

The point machines will be delivered with DAP (Delivered At Place) to ER's central warehouse in Estonia.

Expected publishing time of RfT: Q2...Q3/2021. Expected first deliveries: Q2/2022.

1.8. Other Potential Support Procurements

Insulated rail joints

Depending on the track vacancy proving and other technical aspects, ER may procure insulated rail joints to be used for the CCS system. The insulated rail joints will be delivered with DAP (Delivered At Place) to ER's central warehouse in Estonia.

Expected publishing time of RfT: Q2...Q3/2021. Expected delivery: Q4/2021.

Expert Services of Existing Interlocking (Mipro, Siemens, relay interlockings)

Depending on the needs of the CCS Contractor, expert services of existing interlockings may be needed and provided by ER. This means both technical expertise and physical modification works, mainly related to interfaces between systems.

Expected publishing time of RfT: Q4/2020...Q1/2021. Expected starting of works: to be defined.

Notified Body

A Notified Body (NoBo) shall be used according to the regulation 2008/57/EC, "Interoperability of the rail system within the Community." A Notified Body is a European Union wide authority for assessment and certifies EU conformity. The NoBo shall be used when changes are made to class A (ERTMS/ETCS) systems or changes are made to existing systems (of class A) or a new one is built:

• ERTMS/ETCS system is connected to the CCS systems

The need for Notified Body will be assessed and defined during the project. At the moment, there are only Class B systems, and a Designated Body shall be used for the assessment.

Commissioning Inspection & Approval

Commissioning Inspection & Approval services may be used to evaluate the system conformity, safety and suitability for its purpose, based on the applicable standards, requirements and the CCS contract in question. The role of commissioning inspection & approval services include, at the minimum, analysing of CCS Contractor's design documentation, planning and carrying out FAT tests, participating in CCS Contractor's own SIT testing, planning and carrying out SAT tests and issuing a report to support ER to be able to apply for a usage permit.

Expected publishing time of RfT: Q4/2020...Q1/2021. Expected starting of works: Q2...Q3/2021.