**ANNEX 3**

|  |
| --- |
| **GENERAL INFORMATION ON PROCUREMENT SUBJECT AND ON TECHNICAL SPECIFICATION (GIPS)**Negotiated Procedure “Supervisory control and data acquisition system modernisation for Inčukalns Underground Gas Storage and Gas Transmission”  |

|  |
| --- |
| Riga, 2021 |
|  |
|  |

# Introduction

Conexus Baltic Grid AS (hereinafter - Conexus) is currently using operational control system (Supervisory Control And Data Acquisition - hereinafter SCADA) for Inčukalns Underground Gas Storage (latv. *Inčukalna Pazemes Gāzes Krātuve* *or IPGK* – hereinafter Inčukalns UGS) and Gas Transmission (latv. *Gāzes Pārvade or GP* – hereinafter GT) gas pipeline equipment (shut-off devices, measuring equipment, electrochemical protection, gas quality and electrical system equipment, etc.).

The development and implementation of each part of the current SCADA systems has been performed by different developers using different technologies, and the equipment currently used in the SCADA systems (controllers, servers, etc.) is obsolete while the software (HMI (Human-Machine Interfaces), DB (Data Bases), etc.) used in the SCADA systems is diverse.

The SCADA system is one of the critical elements of the Conexus technological and business processes, with the help of which the provision of the Conexus basic services is ensured.

## Purpose of GIPS and disclaimer

Conexus “Supervisory Control And Data Acquisition modernisation for Inčukalna Underground Gas Storage and Gas Transmission” system requirements specification is made for procurement for the development and implementation of SCADA system (hereinafter - Procurement).

The purpose of this GIPS is to provide a first outline on Conexus project and its SCADA system functional, security, performance and other requirements to the market, as a first phase of the procurement process.

This GIPS issued solely for information and program planning purposes; this GIPS do not constitute a formal solicitation for proposals or abstracts.

The specification of design requirements does not go into the details of implementation but defines the approach of how the various components would be implemented and the infrastructure would be created.

## Purpose of Procurement

The purpose of this Procurement is to develop the SCADA system in Conexus, to ensure effective information technology support for Conexus Inčukalns UGS and GT operational processes. As the result of SCADA system development and implementation, Inčukalns UGS and SCADA GT will have a unified SCADA system solution for interfaces, two independent SCADA systems built on the same technology stack with integration possibility between them and they will meet the latest information security requirements at the time of development, implementation, and maintenance of SCADA systems.

## Scope of Procurement

The subject of the Procurement is the development and implementation of SCADA system in accordance with the requirements and the purpose of the Procurement, as well as the maintenance during guarantee period.

As a result of the Procurement, it is planned to conclude a Procurement Agreement for the establishment of SCADA system. The provider of the service within the scope of this procurement (Supplier) will have to ensure:

* Development of system design description (SDD);
* Project management plan;
* Software development;
* SCADA GT system (production and testing environments)
* Inčukalns UGS SCADA system (production and testing environments)
* Integration with external sources
* Integration between SCADA systems
* Documentation development;
* Software and hardware implementation
* Servers
* Licences
* PLCs and RTUs to change
* Testing and testing documentation development;
* Training;
* Maintenance agreement.

## Definitions and Acronyms

| **Abbreviation or term**  | **Description** |
| --- | --- |
| AD | Active Directory  |
| DS | Directory Service  |
| 8/5 basis | Availability every workday from 8:00-17:00 |
| ACA | Air Cooling Apparatus |
| APN | Access Point Name |
| APS | Asset Management System |
| BDC | Backup Dispatching Center |
| Conexus or Customer | Conexus Baltic Grid AS |
| CBS | Commercial Balancing System |
| COTS | Commercial off-the-shelf |
| CP | Cathodic Protection (latv. *EĶA*) |
| CPS | Cathodic Protection Station  |
| CPU | Central Processor Unit |
| CR | Compressor Room  |
| CS | Compressor Station |
| DB | Database |
| DEG | Diethylene Glycol |
| DMZ | Demilitarized Zone |
| DP | Distribution Point |
| DP | Decentralized Peripherals |
| EACS | Energy Automation Control System (latv. *EAVS*) |
| ESD | Emergency Shut Down |
| FAT | Factory Acceptance Tests |
| FGTU | Fuel Gas Treatment Unit  |
| GC | Gas Chromatography |
| GDPR | General Data Protection Regulation (EU) 2016/679 (GDPR) |
| GCP | Gas Collection Point |
| GMS | Gas Metering Station |
| GPU | Gas Pumping Unit  |
| GRS | Gas Regulating Station |
| GT | Gas Transmission |
| GTU | Gas Treatment Unit |
| GUI | Graphical User Interface |
| HDD | Hard Disk Drive |
| History logs | List of historical hourly or real time data. Usually used to retrieve one or multiple past period data from RTU.  |
| IAS | Information and Analytics system |
| IED | Intelligent Electronic Device |
| Inčukalns UGS | Inčukalns Underground Gas Storage |
| IO or I/O | Input-Output |
| IS | Information System – Hardware and Software included |
| KVM | Kernel-based Virtual Machine |
| L1 or L2 or L3 | Levels of IT Support |
| LDAP | Lightweight Directory Access Protocol |
| MCC | Motor Control Center |
| MDC | Main Dispatching Center |
| MG | Main Gas pipeline |
| MS | Metering station |
| NAS | Network Attached Storage |
| OPC | Open Platform Communication |
| OT | Operational Technology |
| PICO | Post-Installation Check Out |
| PLC | Programmable Logic Controller |
| Pre-FAT | Pre-Factory Acceptance Tests |
| Procurement | Process of finding and agreeing to terms, and acquiring goods, services, and works for Conexus “Supervisory Control And Data Acquisition modernisation for Inčukalns Underground Gas Storage and Gas Transmission” |
| RSTP | Rapid Spanning Tree Protocol |
| RTU | Remote Terminal Unit |
| SAT | Site Acceptance Test |
| SCADA  | Supervisory Control And Data Acquisition   |
| SCADA system | Supervisory Control And Data Acquisition system including software and hardware of the system |
| SIEM | Security information and event management |
| Signals | Any parameter or alarm (any data type) received from RTU configured in the system.  |
| SLA | Service Level Agreement |
| Supplier | The provider of the service within the scope of this Procurement  |
| Tags | Metadata description of data stored in the system. Usually used for data lookup using metadata label. |
| TCP | Transmission Control Protocol |
| Tenderer | Participant of the Tender |
| TP | Technological Process |
| TP | Transformator Point |
| TRC | Technological Regime Chart  |
| TS | Technical Specification (this document) |
| UPS | Uninterruptible Power Supply |
| UPS | Uninterruptible Power Supply |
| VLAN | Virtual Local Area Network |
| VM | Virtual Machine |
| VPN | Virtual Private Network |
| WFRC | Well Flow Rate Chart (In Inčukalns UGS) |

# Current SCADA system description

Currently the Conexus has multiple interconnected SCADA systems that have evolved through 20 years of gradual changes. The existing systems are adequate for current tasks, but the overall structure has become too complicated. This leads to difficulties implementing further extensions as well as makes maintenance difficult and expensive – specialists are hard to find, spare parts are sometimes unavailable and compliance with revised standards is hard to achieve. To solve this situation, complete overhaul of the system is required.

Overall SCADA system in Conexus is used for Supervisory Control and Data Acquisition of 2 main processes – Gas storage (Inčukalns UGS) and Gas transmission (GT). The system architecture consists of computers, networked data communications and graphical user interfaces to manage high-level process monitoring and uses other peripherals such as programmable logic controllers (PLCs) and discrete PID controllers to communicate with the process equipment or device.

**SCADA-GT** currently consists of following modules:

* **SCADA-MG** – module for main gas pipeline process control that is used for remote gas pipeline equipment supervision and control;
* **SCADA-GC** – module for gas chromatography system supervision and control that is used for remote gas chromatography and gas consumption accounting control at gas regulation stations (hereinafter - GRS), monitoring and control of equipment;
* **SCADA-EĶA-GT** - an cathodic protection module (hereinafter - SCADA-EĶA-GP) which is used for remote supervision and control of gas pipeline electrochemical protection equipment;
* **IAS** - Information and Analytical System Module (hereinafter - IAS) which is used for information processing, analysis and display.

**SCADA-Inčukalns UGS** currently consists of such modules:

* **SCADA-TP** - a module for supervision and control of technological processes (hereinafter - SCADA-TP) which is used for remote supervision and control of equipment;
* **SCADA-EĶA-IUGS**- an electrochemical protection module (hereinafter - SCADA-EĶA-IUGS) which is used for remote supervision and control of gas pipeline electrochemical protection equipment;
* **SCADA-EAVS** - module for power automation control system (hereinafter - SCADA-EAVS) which is used for remote supervision and control of power supply equipment, display of electrical circuit diagram, monitoring of backup power supply and guaranteed power supply.

It is important to understand that processes in Inčukalns UGS are seasonal, in the warm periods of the year the gas is injected and stored but in the cold periods the gas is withdrawn.

In the GT gas is received from several entry-exit points in the system, Gas transmission is performed throughout year, but in winter the demand for gas transmission is higher than in the summer.

## Current Gas Transmission SCADA system description

### Overall description

SCADA system is split logically into 4 systems:

* **SCADA-MG** (Main Pipelines)

Focused on real time pressure control in pipelines by manipulating valves: sites mostly have shut-off valves, controlled directly by Operator. These sites are made as similar as possible to simplify operations.

“Gas Regulation Stations” have more sophisticated valve control, gas heating control and local control HMI but are usually controlled remotely by the Dispatcher. Local HMI is used by maintenance personnel to control the system locally when repairs or maintenance is performed.

There are a few sites with analog valve control that regulate gas pressure on pipeline segment. These stations do not fit into common templates and have custom local control system and dedicated data exchange with the Gas Transmission SCADA system.

* **SCADA-GC** (Gas Chromatography)

Focused on gas volume, and quality and composition data collection.

* **SCADA-EĶA-GP** (Electrochemical Protection)

Focused on electrochemical protection equipment. There are sites that measure and apply voltage to the gas pipes.

* **SCADA-IAS** (Information and Analytics)

Processes hourly data from SCADA-GC to calculate data, not provided by field equipment, and present it in various reports. Also collects data from neighbour pipeline Operators, SCADA-MG and local control systems, that are not included in SCADA-MG.

The actual software architecture does not fully match logical split between functionalities because the system is a result of continuous evolution. Additional functions were attached to different parts of the system based on possibility of implementation with minimal expenditures. The system was constructed in various stages between 1995 and 2017.

Main technical parameters: signals ~ 15.500, PLC ~ 170.

## Inčukalns UGS SCADA system

### Overall description

Inčukalns UGS SCADA system is split into 3 systems:

* SCADA-TP (Technological Process)
* SCADA-EĶA-IUGS (Electrochemical Protection)
* SCADA-EAVS (Power System Automation)

There is no common SCADA system design and PLC coding guidelines maintained between different SCADA system platforms and PLC manufacturers. During extensions similar SCADA system pictures and symbols are used on the best effort basis. Suppliers are free to deliver new process nodes according to their own programming style – as long as they comply with technological and functional requirements.

Main technical parameters: signals ~ 27.000, PLC ~ 70.

# Main business processes

Detailed business analysis will be provided as part of technical specification to give information of what kind of activities, tasks and procedures are done in GT and Inčukalns UGS teams in relation to the SCADA system.

Since GT and Inčukans UGS have different technical process, functions and goals in the work they do and service they provide, as well as separate SCADA systems, there is a need to analyse business process separately in GT and Inčukalns UGS.

## Gas Transmission business process analysis

In Gas Transmission there are multiple process groups. Each group represents a common functionality or goal that must be achieved.

* Alarm and Event acknowledging
* Daily tasks such as:
* Dispatcher work shift change,
* work planning and responsibilities for the whole team,
* Operational data control,
* Inspection of measuring equipment measurements,
* planned works in the gas transmission,
* Control and remote control of gas transmission valves and regulators
* Daily monitoring process of GRS/GRM,
* Dispatcher gives access to GRS/GMS operator to manually control valves
* Communication and data exchange with Inčukalns UGS and partner country Dispatchers

SCADA system reads the technological data from Inčukalns UGS and partner countries, and TRC from Inčukalns UGS with the following periodicity:

- Hourly data every hour;

- Instant data - immediately after changes.

Technological data to be read must be configurable

* Report creation

Including configuring data reports and calculations and fixing faulty data in database

* Specific gas transport technological process

## Inčukalns UGS business process analysis

In Inčukalns UGS there are multiple process groups. Each group represents a common functionality or goal that must be achieved.

* Alarm and Event acknowledging
* Report creation
* Specific technological processes for gas storage
* Daily tasks such as:
* Dispatcher work shift change,
* Work planning for the whole team,
* Faulty data fix in DB
* Calculation of technological losses of natural gas
* Determination of the volume of the liquid blown out
* Inspection and calibration of measuring equipment measurements
* Dispatcher gives operator access to manually control valves
* Communication with Gas Transmission

*There are continuous data exchange from Inčukalns UGS SCADA to SCADA system in GT.*

*There are continuous data exchange from SCADA GT system to Inčukalns UGS.*

Gas Injection happens continuously throughout around 1st of May until 14th of October each year. Gas Injection Season means that gas is received from main pipeline and stored in gas wells in Inčukalns UGS. There are many steps that need to be done for gas to flow from main pipeline to storage wells.

Gas Withdrawal happens continuously throughout around 15th of October until 30th of April each year. Gas Withdrawal Season means that gas is withdrawn from gas wells in Inčukalns UGS and transferred to main pipeline. There are many steps that need to be done for gas to flow from storage wells to main pipeline, therefore the process is split in multiple processes.

# Functional requirements

The aims of the new system are to:

* Consolidate control into key SCADA systems, reducing complexity;
* Eliminate identified single points of failure, increase resiliency;
* Simplify work and training for operators and engineers;
* Make future changes and expansions simpler;
* Ensure compliance to latest security requirements.

The system belongs to critical infrastructure with 24/7 operation, which complicates upgrade procedure:

* The Operators and Dispatchers must always maintain control over most of the system;
* Each change must be announced in advance, with backup plans for possible failures;
* Hardware and software solutions must be tested before replacing existing solutions, running in parallel for a test period where possible.

Result of SCADA system development and implementation, Inčukalns UGS and SCADA GT will have a unified SCADA system solution for interfaces, two independent SCADA systems built on the same technology stack with integration possibility between them.

Due to reasons stated above, the development of SCADA system must be split into intermediate steps that are stable and easily revertible in case of issues of implementation.

## General Requirements

These requirements apply to both the Gas Transmission and Storage SCADA systems.

### Communication

The data acquisition function shall provide all the aspects needed to support data collection from the field including the requesting of data from RTU/PLC and the processing of analog and digital data received from the RTU/PLC.

### Reporting

The SCADA Systems shall support the definition, generation, scheduling, manual execution and printing of both logs and reports.

### Metering

The systems should store historized data for metering purposes.

### Data Quality

The system should allow the definition and enforcement of data quality rules.

### Alarm and event handling

Alarm and event handling shall be provided.

### Audit logging

At least 10 years of alarm long term history has to be stored for 10 years, with possibility of extension without a purchase of additional licenses. The history shall be fully available for output into reports.

### Configuration management

System shall include tools for local and remote configuration and diagnostics of communication equipment RTUs and PLCs. There shall be a possibility to configure SCADA system nodes visually. Configuration tools shall ensure displaying, editing and saving the device configuration, maintenance of the device configuration database, version control system for device firmware and application software.

All engineering software, current PLC applications, equipment configuration files have to be centrally stored to avoid version confusion

### Interfacing with other systems

Secure Data transmit/receive solution either between the two SCADAs or with 3rd party systems shall be possible by clearly defined standards and protocols with granular access controls.

### Training system

A training system shall be provided enabling to simulate real-life situations and train the operators in the usage of the SCADAs.

## Gas Transmission SCADA system

### Control locations

The GT SCADA system shall consist at least of:

* Main Dispatcher Control center (3 workplaces + display only Videowall);
* 5 additional SCADA system workplaces;
* 1 engineering station;
* 2 CP workplaces;
* 2 additional Cathode Protection workplaces;
* 1 Test and training workplace.

Each workplace can potentially access all data, available in SCADA system. Data access level and workplace configuration shall be determined by role of the user, currently logged into workplace.

#### Main Dispatching center and back-up dispatching center

Overall coordination of the Pipeline network will be done by the Dispatchers in Main Dispatching center (MDC). Dispatchers will have overview of the whole system and always know at least the general state of all subsystems.

Inčukalns UGS SCADA system Main Dispatching Center (MDC) shall serve as a Backup Dispatching Center (BDC) of Gas Transmission SCADA system. This should be required only if all workplaces of Gas Transmission SCADA system are not available for any reason. Location of BDC shall not be limited to specific geographic place.

#### Additional workplaces

There shall be 7 designated workplaces besides Transmission SCADA system MDC. 2 of those shall be dedicated to Cathode Protection system and 5 to other operation and engineering tasks. Physical locations for these workplaces will be defined by the Conexus during system implementation. Configurations shall be prepared for these workplaces to configure and monitor different aspects of the system:

* Communications engineer workplace
* Telecontrol (RTU) engineer workplace

#### Test and training workplace

A workplace should be setup to enable access to the training system as well as the non-production environments used for testing.

#### Field Engineering workplaces

There shall also be 3 laptops for work in the field, equipped with software for configuration and diagnosis of RTU and field communication equipment. The laptops shall be equipped with necessary converters to directly connect to all used field devices (serial port communication).

### Network

The system network shall be split into 3 logical levels:

* Level 1 shall be the SCADA system Plant network. It shall combine several existing subnets, separated from other levels and from each other by firewalls. Most of the traffic on this level is RTU and smart device polling. After passing through proper firewalls, it shall be connected to SCADA system Input/Output servers.
* Level 2 shall be the Client-Server network, where most of SCADA system computers shall be connected. All workplaces shall be connected to this level. Only data collection servers (I/O servers) and engineering workplaces can connect to level 1 through firewalls. All other SCADA system computers receive RTU data from I/O servers.
* Level 3 shall be the Management network. Devices shall be connected to it if they need data from level 2 and need to be accessible from Conexus Corporate network, which can be considered level 4.

All traffic between adjacent levels shall go through firewalls and be blocked unless explicitly allowed. No traffic shall be allowed between non-adjacent levels – data from RTU must go first to I/O server in level 2, then from I/O server to data integration server in level 3 and only from data integration server it can be accessed from Conexus Corporate network or other external networks.

#### SCADA system Plant network

There are several subnets that shall be used to collect the data from RTUs:

Existing copper wire infrastructure – shall be upgraded with encryption hardware where specified, while using existing line signaling devices.

Dedicated phone lines – several sites have dedicated phone lines from local telecom. New packet networking modems with VPN function shall be installed where specified.

4G cellular networks or better – field 4G modems connect to a private APN, which in turn is connected through VPN tunnel to external redundant firewalls of the system. To ensure that cellular provider cannot access the traffic, there is an individual VPN tunnel from each 4G modem to the firewalls. To add redundancy to the connections and ensure best possible coverage, 2 different cellular providers are used wherever possible. New firewalls/routers shall be installed to serve this network in control center and new 4G modems/VPN firewalls in the field. Since direct communication from station to station is not required, it shall be blocked in each installed firewall for better security.

#### Client-server network

A client-server architecture and adequate network setup shall be provided.

### SCADA system architecture

SCADA system can be provided in different architecture with compliance to security requirements.

#### Main control functions

Main SCADA system provide the following functionalities :

* Collecting RTU data and sending commands to them
* Storing SCADA system configuration and visualization data, managing alarms, licensing the system
* Storing historical data
* User management with Windows Active Directory

The system shall be operating in high availability mode.

#### Additional functions

Additional SCADA system functions shall be provided:

* Web-visualization and reporting (highly available)
* Backup
* Software update
* Access via Remote desktop terminal
* Interfaces with external systems (highly available)
* Simulation
* Support for use of videowalls

Remote desktop server shall provide remote access to the configuration of the system if needed.

### SCADA system hardware

The Tenderer has to propose an hardware setup coherent with the high availability requirement of such a system. The setup shall be redundant and failsafe.

### Communication

The data acquisition function shall provide all the aspects needed to support data collection from the field including the requesting of data from RTU and the processing of analog and digital data received from the RTU.

##  Inčukalns UGS SCADA system

* + 1. **Control locations**

The Inčukalns UGS SCADA system shall consist at least of:

* Main Dispatching center (3 workplaces + display only Videowall);
* Backup Dispatching center (3 workplaces + display only Videowall) in CS-2;
* 1 Cathode Protection system workplaces;
* 1 Test and training workplace;
* 3 Energy Automation control system workplaces;
* 9 local operator workplaces;
* 3 engineering workplaces.

Each workplace can potentially access all data, available in SCADA system. Data access level and workplace configuration shall be determined by role of the user, currently logged into workplace.

* + - 1. ***Main Dispatching center***

Overall coordination of the Inčukalns UGS shall be done by the Dispatcher in Main Dispatching center (MDC). Dispatcher shall have overview of the whole plant and always must know at least the general state of all subsystems. MDC shall have three workplaces with 3 monitors each. In addition, MDC shall be equipped with Videowall with 12 monitors that are connected to operator workplace for dynamic visualisation change, and external audible alarm system, to aid the Dispatcher in processing large amounts of data.

Based on current work mode of the plant (storing or retrieving natural gas, availability of equipment etc.), the Dispatcher can delegate control of individual units to local operators. SCADA system shall ensure that only one workplace can control each production unit at a time, with Dispatcher able to take over the control in case local operator is unavailable or cannot access the workplace.

 Inčukalns UGS MDC shall also serve as a Back-up Dispatching Center (BDC) of Gas Transmission SCADA system. This should be required only if all workplaces of Gas Transmission SCADA system are not available for any reason.

* + - 1. ***Backup Dispatching center***

Backup Dispatching Center in Compressor Station 2 (CS-2) shall serve two purposes – during normal operation, it shall be used by local operators, maintenance engineers and SCADA engineers to perform their daily work without disturbing the Dispatchers. In case the MDC is offline for any reason, the Dispatchers shall move to BDC to continue operating the plant. To facilitate this, BDC shall have the same setup of 3 workplaces, Videowall and audible alarm as the MDC, with identical hardware.

The BDC also shall have a workplace for the training/test SCADA system. The training system shall be separate from the production SCADA system and only accessed from the dedicated workplace to prevent accidental actions in production system. During training, Videowall and audible alarm systems shall be switched to the training SCADA system to allow the trainee full experience of actual work. During normal operation, audible alarm shall be either silenced or configured to a subset of production alarms, relevant to BDC users. The test workplace then shall be used for PLC and SCADA system development purposes, without changing the production system.

* + - 1. ***Additional workplaces***

There shall be dedicated workplaces configured for some of the SCADA system functions:

* 2 workplaces for Cathode (Electrochemical) Protection system, that controls pipe condition through applying and measuring electrical potentials.
* 3 workplaces for Energy Automation (Power distribution) control system, that controls power substations, power transformers, diesel generators and monitors all other signals, related to power supply.

The Dispatcher shall have general overview of these systems and most critical alarms, but detailed control is left to dedicated personnel. Physical locations for these workplaces will be defined by the Conexus during SCADA system implementation

* + - 1. ***Engineering workplaces***

There shall be 2 dedicated workplaces for PLC/SCADA/networking engineering:

* Stationary workplace with 2 monitors;
* Laptop on a docking station with 2 monitors. During normal operation all necessary devices should be configurable through network. For field work, the laptop is equipped with necessary communication adapters to directly connect to all used PLC and networking equipment (serial port communication).

Physical locations for these workplaces will be defined by the Conexus during system implementation.

* + - 1. ***Local workplaces***

Local operator workstations are equipped with 2 screens.

* + 1. **Network**

The system network shall be split into 3 logical levels:

* Level 1 shall be the SCADA system Plant (PLC) network. Only communication between PLCs, HMI panels and communication with the next level shall be allowed here.
* Level 2 shall be the Client-Server network, where most of SCADA system computers shall be connected. All operator and engineering workplaces shall be connected to this level. Only data collection servers (I/O servers) and engineering workplaces can connect to level 1 through firewalls. All other SCADA system computers shall receive PLC data from I/O servers.
* Level 3 is the Management network. Devices shall be connected to it if they need data from level 2 and need to be accessible from Conexus Corporate network, which can be considered level 4.

All traffic between adjacent levels shall go through firewalls and be blocked unless explicitly allowed. No traffic shall be allowed between non-adjacent levels – data from PLC must go first to I/O server in level 2, then from I/O server to data integration server in level 3 and only from data integration server it can be accessed from Conexus Corporate network or other external networks.

* + - 1. ***SCADA*** ***system Plant network***

The SCADA system Plant network shall provide redundant network topology– each connection point shall have two separate switches available, where each switch is connected to a different network segment with different subnet defined.

. In all cases where applicable, field switches must support both optical ring and RSTP topologies. Rack switches must support both optical ring and RSTP protocols at the same time or support at least 2 equivalent technologies. End devices shall use both networks wherever possible, less critical devices might use only one of them, where permitted by Conexus.

* + - 1. ***Client-server network***

Client-server network shall have 1Gbps electrical network connections in star topology in server racks and with nearby workstations. Between server racks an optical redundant 10Gbps backbone shall be created.

There is a significant number (at least 9) of field operator stations, that are located far enough to require separate fibre optic connections.

All networks shall be provided in the most reliable and redundant way, taking into account the possibility to use the same media for different types of communication (possibly, on a separate VLANs).

If SCADA system supports redundant networking for workstations, Client-server shall have two redundant network segments with separate switches at each endpoint. If redundancy is not supported by SCADA system, spare optical fibres shall be used with RSTP to double all connections to local switches.

* + 1. **SCADA system architecture**

#### SCADA system can be provided in different architecture with compliance to security requirements.

#### Main control functions

Main SCADA system shall enable to

* Collect PLC data and send commands to them;
* Store SCADA system configuration and visualization data, running calculations, processing the alarms, licensing the system;
* Store historical data;
* User management with Windows Active Directory.
* Manage the PLC programming software

The system shall be operating in high availability mode.

* + - 1. ***Additional functions***

Additional SCADA system functions should be provided:

* Web-visualization and reporting;
* Backup;
* Software update;
* Access through Remote desktop terminal;
* Interfaces with other systems;

Simulation.

The availability requirement can be less strict than for the main functions.

* + 1. **SCADA system hardware**

The Tenderer has to propose an hardware setup coherent with the high availability requirement of such a system. The setup shall be redundant and failsafe.

## Field Equipments – RTU and PLCs

### RTUs

Existing outdated modems shall be replaced first. All newly installed modems should rely on a reliable cellular service. The cellular connection shall be used as primary connection to reduce load on existing copper infrastructure. This will serve both for better testing of the cellular solution and provide more bandwidth to nodes where cellular connection fails for any reason.

Setup shall ensure uninterrupted monitoring of the system.

### PLCs

Among the 61 field equipments (PLC) connected to Inčukalns UGS SCADA system, 37 are to be changed within the scope of this project.

The list of specific PLCs to replace is listed in attachment, replacement model for each PLC shall be agreed with the Conexus. Existing IO modules can be reused if either the same models or fully compatible drop-in replacements for them are available from the manufacturer. All new PLCs shall be programmed in the same software package and shall use redundant Ethernet communicationPLC reprogramming shall be provided for at least following models from following manufacturers: SIEMENS – S200, S300, S1200; Allen Bradley; Unitronics; Rockwell; Schneider Electric).

# Non-functional requirements

In this part key non-functional requirements are presented. Complete requirements will be provided in the full Technical Specifications, available in the second part of the procurement

## Overall system performance requirements

*Overall system performance requirements are provided in the following table. Use software and hardware shall perform within overall system requirements.*

Performance requirements

|  |  |  |
| --- | --- | --- |
| **Functionality** | **Data characteristics** | **Maximal time to complete**  |
| Trend | 10 data over 1 day | 2s |
| Local failover |   | 2s |
| Site failover |   | 3s |
| Cold startup time |   | 5 min |
| Update screen from data arrival to SCADA |   | 500 ms |
| Switch time between SCADA screens | per 100 object displayed | 1s |
| SCADA system workplace support | 10 faceplates / 20 trends / 10 alarm lists |   |
| Report generation (standard) | 1 day period | 2s |
| Report generation (standard) | 1 year period | 30s |
| Report generation (customized) | 1 day period | 10s |
| Report generation (customized) | 1 year period | 1min |
| Web-visualization and reporting server | data update interval | 3min |
|  |  |  |
| **Historisation Requirement** | **Frequency** | **Deph** |
| Data Historisation Requirement | 1 s | 1 year |
| Data Historisation Requirement | 3s | 10 year |
| Alarm history for immediate access |   | 1 month |

## Recovery and availability requirements

RPO (Recovery point objective) must be not more than 1h;

RTO (Recovery time objective) must be not more than 2h;

MTPD (Maximum Tolerable Period of Disruption) must be not more than 3h.

## Security

The recommendations of international standards (ISO/IEC 27001 2013 – ‘Information Technology - Security techniques - information security management systems – requirements’, and Security for industrial automation and control systems – IEC 62443-2-4, Part 2-4: Security program requirements for IACS service providers) and ISA99 Industrial Automation and Control Systems Security must be complied with and implemented throughout the network segments of the SCADA system.

## Planning

Based on the developed system architecture, requirements and possible project implementation procurement scenario, the Time estimate for the total duration of project is as follows:

* Procurement procedure – 6 months;
* Project implementation (including parallel run) – 29 months;
* Warranty (per project stage) – 24 months.

Total expected project duration 59 months.

Complete set of requirements on security shall be provided in the technical specifications. The Conexus’s internal regulations on operational technology governance and security were developed and implemented in line with the policies, objectives and tasks defined by Conexus, as well as according to the laws and regulations of the Republic of Latvia, which were in force at the time of adoption of the current regulations: Law on the Security of Information Technologies, and Cabinet Regulation No. 442 “Procedures for the Ensuring Conformity of Information and Communication Technologies Systems to Minimum Security Requirements” (adopted on 28 July 2015) and must be taken into account in the SCADA system.

## Warranty

The warranty period begins the day after the issue of the Operational Acceptance Certificate of the SCADA system and its signing by the representatives of the Supplier and the Conexus.

Minimal duration of warranty period shall be 24 months.

## Infrastructure

The infrastructure of the system shall provide and ensure operation in a highly available and failsafe mode.

## Software

The Tenderer should provide up-to-date software and procedures for patch and upgrade management for entire lifecycle of all deliverables and products.

Data should be provided using cross-platform open protocol (e.g. TASE.2, OPC UA).

SCADA system shall be compatible with legacy protocols (OPC DA, OPC HDA, etc.).

The SCADA system shall employ standard protocols, software (OS, DB), interfaces (including UI), tools for data acquisition, storage, exchange and integration, standard tools for reporting etc.

## Migration and Testing

Migration shall be performed by the Tenderer or assisted by Tenderer.

Non-production environments shall be devised so that quality of the deliveries is ensured.

## Documentation

All documentation, prepared for the project, shall be in English and Latvian: Operator Manuals, Electrical Drawings Manufacturer Engineering manuals, etc.

## Training

Tenderer shall train Conexus operation engineers on internals and maintenance of the supplied system.

## Technical support and maintenance

The Tenderer must ensure a secure supply chain and support during the full lifecycle of the SCADA system.

# Additional requirements for the scope of the project

SCADA system shall ensure at least current functionality of the existing SCADA system and Tenderer shall provide equivalent or better software.

during detailed design the Tenderer has to specify the prototypes of the system in more details and have to be approved by Conexus. .

Minimum list of prototype documents:

1. Gas Transmission SCADA system:
	1. Main gas pipeline module
	2. Metering module
	3. Cathodic protection module
	4. Gas regulation station
2. Inčukalns UGS SCADA system:

Technological process module

Cathodic protection module

Energy automation control system module