ANNEX II + III: **TECHNICAL SPECIFICATIONS + TECHNICAL OFFER**

Contract title: SCADA Platform for DSO

Publication reference: NEAR/BEG/2022/EA-OP/0129

Columns 1-2 should be completed by the Contracting Authority
Columns 3-4 should be completed by the tenderer
Column 5 is reserved for the evaluation committee

Annex III - the Contractor's technical offer

The tenderers are requested to complete the template on the next pages:

- Column 2 is completed by the Contracting Authority shows the required Specifications (not to be modified by the tenderer),
- Column 3 is to be filled in by the tenderer and must detail what is offered (the words “compliant” or “yes” are not sufficient)
- Column 4 allows the tenderer to make comments on its proposed supply and to make eventual references to the documentation

The eventual documentation supplied should clearly indicate (highlight, mark) the models offered and the options included, if any, so that the evaluators can see the exact configuration. Offers that do not permit to identify precisely the models and the Specifications may be rejected by the evaluation committee.

The offer must be clear enough to allow the evaluators to make an easy comparison between the requested Specifications and the offered Specifications.

Unless otherwise stated, the following requirements shall also apply:

Compliance to safety rules and regulations
When submitting a tender, the tenderer must state expressly that all of the proposed equipment meets the safety requirements of the applicable rules and regulations in force in the Republic of Serbia. Upon delivery, the tendered equipment shall include proof of compliance.

Warranty
The Contractor shall provide a warranty for the equipment supplied in line with the Special Conditions. This warranty shall remain valid for one year after provisional acceptance.

Remark

Unless otherwise specified, the requirements in these Technical Specifications and Appendix to Technical Specifications are presented as a minimum standard which the offered goods must meet.

GLOSSARY

1-in-20 Peak Day Demand	Is the highest demand that would occur as a result of extreme temperatures during a 7-day peak period occurring with a statistical probability of once in 20 years
1-in-20 Severe Duration Demand	Is any period of at least 30 days of exceptionally high gas demand, occurring with a statistical probability of once in 20 years
Annual Demand	Is the aggregate demand for gas on all Days in that year
Average Winter Duration Demand	Is the demand that would occur over a period of at least 30 days in case of the disruption of the single largest gas infrastructure under average winter conditions
Balancing Actions	Actions taken by the DSO pursuant to the Code for the purposes of Operational Balancing
Balancing User (Entry)	Is the specified single User who is allocated the remainder of the Entry Point Daily Quantity Delivered not allocated to other Users (if any) at the Exit Point, whilst each of these other specified Users is allocated a fixed UDQI
Balancing User (Exit)	Is a single Registered User at an Exit Point who is allocated the remainder of the Exit Point Daily Quantity Offtake not allocated to other Registered Users (if any) at the Exit Point pursuant to Exit Allocation Method 1
Business Day	Means a Day other than a Saturday or a Sunday, or a Day which begins at 06:00 hours on a bank holiday in the Republic of Serbia
Capacity Charge	A Firm Capacity Charge or an Interruptible Capacity Charge
Capacity Period	The duration of System Capacity pursuant to the annual, monthly and daily invitation, allocation and registration processes
Capacity Requirements	A User's requirement for Firm System Capacity to meet its contractual requirements to supply gas
Code Operations Platform	The physical system constituting the result of the Code Operations Platform Project. It consists of multiple hardware and software components

Code Operations Platform Project	A project, resorting under the Programme, the object of which being the realisation of the Code Operations Platform under a contract negotiated with a Contractor as a result of the subject Tendering Process.
Connected Delivery Facility	Is a single facility or system (comprising pipeline(s), plant and/or other installations), operated by one person (or jointly operated by several persons), and connected to the System at an Entry Point
Connected Offtake Facility	Is a single system or facility (comprising pipeline(s), plant and/or other installations) operated by one person (or jointly operated by several persons) and connected to the System at the Exit Point
Curtailment Effective Time	The time from which an Interruptible Curtailment Notice takes effect which is on the hour and shall not be earlier than 06:00 hours nor later than 02:00 hours on the Gas Flow Day and not less than 4 hours after such notice is given
Day	Means the period from 06:00 hours on one day until 06:00 hours on the following day
Demand or Demand for Gas	Is the quantity of gas, offtake or to be off taken from the System or that part of the System or at that point on that Day or in that period
DM	Daily Metered
Emergency	Is a reference to a Gas Supply Emergency
Emergency Plans	Means such documents as are prepared by the DSO [in accordance with the Regulations.]
Entry Capacity	Firm Entry Capacity and/or Interruptible Entry Capacity as the context requires
Entry Constraint	In relation to that Entry Point where, at any time after hours on the Preceding Day, the DSO determines that it will not or may not be feasible to accept gas in the amounts or rates at which the expects gas to be delivered by Users (within their Available Entry Capacity entitlements)
Entry Facility	Is the facility comprising plant and equipment owned and operated by the DSO/TSO at an Entry Point

Entry Measurement Equipment	Is the metering, sampling, analysis and other equipment required by the Entry Measurement Provisions to be installed (whether at the Connected Delivery Facility or on the System) and is designed, installed, maintained and operated to meet the relevant requirements of Annex 6-1 and Annex 6-2 of the Code.
Entry Point	A System Point at which gas can flow into the System
Entry Tolerance	In respect of a User on any Day is calculated by multiplying the User's FDQI by 0.1%
Exit Capacity	Firm Exit Capacity and/or Interruptible Exit Capacity as the context requires
Exit Facility	Is the plant and equipment owned and operated by the DSO/TSO at an Exit Point
Exit Point	A System Point at which gas can flow out of the System
Exit Tolerance	In respect of a User on any Day is calculated by multiplying the User's FDQO by: (a) in the Summer Months a figure of 4%, and (b) in the Winter Months a figure of 2%
Firm Capacity	Firm Entry Capacity and/ or Firm Exit Capacity as the context requires
Gas Flow Day	Means, in relation to the application of any provision of the Code, the Day in relation to deliveries, offtakes or flows of gas or other operations on which such provision is to apply
Gas Year	A period of 12 months commencing at 0600 hours on 1 January in a calendar year and ending at 0600 hours on 1 January in the following calendar year
Grid Code	Natural DSO System Code
Interruptible Capacity	Interruptible Entry Capacity and/ or Interruptible Exit Capacity as the context requires
Interruptible Curtailment Factor	A factor which the DSO/TSO determines is necessary to relieve an Entry Constraint or an Exit Constraint
Interruptible Curtailment Notice	A DSO/TSO notice to all Users in circumstances of an Entry Constraint and/or an Exit Constraint which cancan be avoided or remedied by the

	curtailment of Interruptible Capacity held by Users at one or more System Points
Interruptible Entry Capacity	Capacity in the System which a User is treated as utilising in delivering gas to the System at an Entry Point where such delivery is subject to interruption by the DSO/TSO
Interruptible Exit Capacity	Capacity in the System which a User is treated as utilising in off taking gas from the System at an Exit Point where such offtake is subject to interruption by the DSO/TSO
Linepack	Is at any time, the amount of gas within the System
Local Operating Information	Is information provided to the DSO/TSO by the Delivery Facility Operators to the rates at and quantities in which gas is expected to be delivered to the System at the Entry Point in respect of any time
Local Operating Procedures	In respect of an Entry Point or Entry Points are procedures for co-ordination between the DSO/TSO and the Delivery Facility Operator in connection with the operation of the Connected Delivery Facility and the part of the System at which it is connected, including the exchange of information between the DSO/TSO and the Delivery Facility Operator
Locational Balancing Action	A Balancing Action where the DSO/TSO agrees with the User at which Entry Point or Exit Point a Balancing Action is performed
Locational System Buy	A Balancing Action performed by the User decreasing its offtake of gas at a specified Exit Point or increasing the delivery of gas at a specified Entry Point
Locational System Sell	A Balancing Action performed by the User increasing its offtake of gas at a specified Exit Point or decreasing the delivery of gas at a specified Entry Point
Maintenance Affected Point	Is a System Point where on any Day it is not feasible for the DSO/TSO to make available gas for offtake from the System by a User at an Exit Point, or to accept into the System gas tendered for delivery by a User at an Entry Point, or (in either case) its ability to do so is restricted, by reason of it is carrying out any maintenance in a Planned Maintenance Period

Maintenance Programme	A programme (or an updated programme) of planned maintenance of the System containing the information specified in paragraph 1.9 and such other information as the DSO/TSO shall decide to include
Maintenance Relevant Facility	A Connected Delivery Facility or Connected Offtake Facility or any pipework owned by the DSO/TSO downstream of the System
Maintenance Relevant Party	Any User, a Delivery Facility DSO/TSO or Offtake Facility DSO/TSO
Maximum Delivery Rate	In respect of an Entry Point is an amount (in MJ/hour) determined as the Physical Firm Capacity for the Entry Point divided by 24
Maximum Offtake Rate	(in MJ/hour) in respect of an Exit Point is an amount determined as 1.5 times the Physical Firm Capacity for the Exit Point divided by 24
Maximum Permissible Hourly Rate	Shall mean the limitation on the rate (in MJ/hour) at which the User is entitled to deliver gas in accordance with Section 4 paragraph 1.39 (in the case of an Entry Point) and the limitation on the rate (in MJ/hour) at which the User is entitled to offtake gas in accordance with Section 4 paragraph 2.35 (in the case of an Exit Point)
Metering Platform	The physical system constituting the result of the Metering Platform Project. It consists of multiple hardware and software components.
Metering Platform Project	A project, resorting under the Programme, the object of which being the realization of the Metering Platform under a contract negotiated with a Contractor as a result of the subject Tendering Process.
NDM	Non-Daily Metered
NDM Demand Categories or NDCs	Are distinct categories to which NDM Exit Points will be allocated in accordance with the NDM Demand Methodology
NDM Demand Methodology	Is the methodology the DSO/TSO will in establish and update in the manner provided for in Annex 2-1, which will be used to determine the Exit Point Daily Quantity Offtake for any NDM Exit Point
Nomination	A nomination by a User in respect of a quantity of gas to be delivered to or off taken from the System on a Day
Nomination Time	Means 11:00 hours on the Preceding Day, in relation to the Gas Flow Day

Offtake Facility Operator	Is the operator of a Connected Offtake Facility (who may without limitation be the operator of another transmission system, the operator of a storage facility, the operator of a gas consuming plant or the operator of a distribution network)
Offtake Measurement Equipment	Is the metering, sampling, analysis and other equipment used to determine the quantity of gas offtake at the Exit Point
Offtake Profile Notice	A notification provided to the DSO/TSO, not later than the time on the Preceding Day specified in the Network Exit Agreement, setting out average rates of offtake (not exceeding the Maximum Offtake Rate) for each Whole Hour throughout the Gas Flow Day.
Operational Balance	Means the balance between the quantities of gas respectively delivered to and off taken from the System
Operational Balancing Requirement	Is any requirement for a Balancing Action to be taken
Party	Means the DSO/TSO or any User
Peak Day Demand	Is the highest demand for gas on any Day in that year
Planned Maintenance Period	The months of April to October inclusive in any year
Preceding Day	Means the Day before the Gas Flow Day
Programme	A wider EU funded programme managed by the European Union Delegation to the Republic of Serbia “Technical Assistance to Srbijagas; Contract no. 07SER01 35 42”
Regulator	Means the Serbian Energy Regulator, AERS (Energy Agency of the Republic of Serbia)
Remaining Capacity	Shall mean Remaining Firm Capacity or Remaining Interruptible Capacity
Renomination	A nomination which revises an earlier Nomination (including a Renomination)
Seasonal Normal Annual Demand	Is a reference to Annual Demand under seasonal normal conditions

Serbian Balancing Point or SBP	A virtual point on the System where title to a quantity of gas may be transferred from one User to another User by the submission of Trade Nominations
System	Throughout the Technical Specifications the term "SYSTEM" refers to the SCADA Platform for DSO.
System Point	
System Operations Platform	Is a point or a composite group of points on the System which is designed to permit gas to flow through one or more pipes into or out of the System
System Operations Platform Project	The physical system constituting the result of the System Operations Platform Project, the aggregate of deliverables of the Contract resulting from the Tendering Procedure. It is characterized as the composite of all material components and services, organized in systems and sub-systems, and performing the functions as identified and specified in these Technical Specifications.
Technical Specification Document	A project, resorting under the Programme, the object of which being the realization of the Systems Operations Platform under a contract negotiated with a Contractor as a result of the subject Tendering Process.
User Daily Quantity Input ("UDQI")	The document containing the Technical Specifications.
User Daily Quantity Output ("UDQO")	Is the quantity of gas treated as delivered by a User to the System on that Day at an Entry Point

ABBREVIATIONS

A&E	Alarm and Events
ACC	Auxiliary Control Centre
ACE	Area Control Error
ADC	Analog to Digital Converter
AGC	Automatic Generation Control
AI	Automatic Inadvertent Correction
AMP	Automated Mitigation Process
ANI	Actual Net Interchange
ANSI	American National Standards Institute
AOC	Award of Contract
AOR	Area Of Responsibility
API	Application Program Interface
ARO	After Receipt of Order
ASC	Automatic Supervisory Control
ATC	Available Transfer Capability
ATE	Automatic Time Error Correction
AVR	Automatic Voltage Regulator
BAS	Billing and Accounting System
BCC	Backup Control Centre
BCS	Backup Control System
BDS	Backup Dispatch System
BG	Balancing Operator

BMS	Business Management System
BOM	Bus-Oriented Model
BTU	British Thermal Unit
CA	Control Area or Contingency Analysis
CAI	Computer-aided Instruction
CB	Circuit Breaker
CBT	Computer-based Training
CC	Control Centre
CCAPI	Control Centre Application Program Interface
CD	Current Day
CD-ROM	Compact Disk – Read Only Memory
CF	Constant Frequency
CIC	Communications Interface Controller
CIM	Common Information Model
CNI	Constant Net Interchange
CNP	Communication Network Processor
COP	Current Operating Plan
CP	Communication Processor; see also CNP
CPS	Control Performance System
CSU/DSU	Channel Service Unit/Data Service Unit
CSV	Comma Separated Variables
CT	Combustion Turbine
DA	Data Acquisition

DAIS	Distributed Applications and Interoperable Systems
DAM	Day-Ahead Market
DB	Database
DCS	Disturbance Control Standard
DDE	Dynamic Data Exchange
DEX	Data Exchange
DFAX	Distribution Factor
DLT	Digital Linear Tape
DMD	Digital Micro-mirror Device
DMS	Distribution Management System
DNI	Desired Net Interchange
DNP	Distributed Network Protocol
DNS	Domain Name Server
DS	Data Set
DSO	Distribution System Operator
DST	Daylight Saving Time
DSU/CSU	Data Service Unit/Channel Service Unit
DTE	Data Terminal Equipment
DTS	Dispatcher Training Simulator (see OTS)
DVD	Digital Video Disk
EAI	Enterprise Application Interface or Integration
EAI/BPA	Enterprise Application Integration/Business Process Automation
ECO	Equipment Change Order

ECS	Energy Control System
ED	Economic Dispatch
EIA	Electronic Industries Association
EMI	Electro-Magnetic Interference
EMS	Energy Management System
EOS	Equipment Outage Scheduling
EPRI	Electric Power Research Institute
EST	Eastern Standard Time
EVC	Electronic Volume Corrector
FAC	Final Acceptance Certificate
FACTS	Flexible AC Transmission System
FAT	Factory Acceptance Tests
FCO	Field Change Order
FEP	Front End Processor
FERC	Federal Energy Regulatory Commission
FOB	Freight on Board
FTP	File Transfer Protocol
GNS	Gas Network Simulation
GPS	Global Positioning System
GT	Gas Turbine
GUI	Graphical User Interface
HA	High Availability
HAM	Hour-Ahead Market

HASSIS	Highly Available and Secure Server Infrastructure system
HMI	Human Machine Interface
HTML	Hyper Text Markup Language
HTTP	Hyper Text Transfer Protocol
HVDC	High Voltage Direct Current
I/O	Input/Output
ICAP	Installed Capacity
ICCP	Inter Control Centre Communications Protocol – TASE.2
ICHP	IDEC Communications Host Protocol
ID	Identification
IDC	Interregional Distribution Calculator – NERC
IDEC	Inter-Utility Data Exchange Consortium
IDS	Intrusion Detection Systems
IEC	International Electro-technical Commission
IED	Intelligent Electronic Device
IEEE	Institute of Electrical and Electronic Engineers
IoT	Internet of Things
IP	Internet Protocol
IPS	Intrusion Prevention Systems
IS	Interchange Scheduler
IS&R	Information Storage and Retrieval
ISN	Interregional Security Network – NERC

ISO	International Organization for Standardization
ISP	Internet Service Provider
IT	Information Technology
ITS	Interchange Transaction Scheduling
ITTIS	Internal Tactical Threat Intelligence system
ITU	International Telegraph and Telephone Consultative Committee
JOU	Jointly Owned Unit
LAN	Local Area Network
LBMP	Location-Based Marginal Cost Pricing or Price
LCD	Liquid Crystal Display
LDAP	Lightweight Directory Access Protocol
LF	Load Forecast
LP	Linear Programming
LSE	Load Serving Entity
LTC	Load Tap Changing
MCD	Momentary Change Detection
MIS	Market Information System
MMU	Market Monitoring Unit
MP	Market Participant
MVA	Mega-Volt-Ampere
MVAr	Mega-Volt-Ampere-reactive – reactive power
MW	Mega-Watt
NAT	Network Address Translation

NEC	National Electric Code
NEMA	National Electrical Manufacturer Association
NERC	The North American Electric Reliability Council
NGFW	Next-Generation Firewalls
NIC	Network Interface Card
NOM	Node-Oriented Model
NSI	Net Scheduled Interchange
NSP	Network Status Processor
NTSC	National Television Standards Committee
OAG	Open Access Gateway
OASIS	Open Access Same-time Information System
ODBC	Object Database Connectivity
OEM	Original Equipment Manufacturer
OOM	Out-of-Merit
OPF	Optimal Power Flow
OS	Outage Scheduler or Operating System
OSF	Open Software Foundation
OSI	Open Systems Interconnection – 7-layer network architecture
OTS	Operator Training Simulator
PA	Parameter Adaptation
PAC	Provisional Acceptance Certificate
PAL	Phase Alternating Line
PAR	Phase Angle Regulator

PC	Production Cost
PCC	Primary Control Centre
PCS	Primary Control System
PDS	Program Development System
PDU	Protocol Data Unit
PFS	Power Flow Study
PGE	Portland General Electric
PGE	Wholesale Power Market
PI	Plant Information – System designed by OSI Software, Inc. to archive and display data.
PLATFORMS	The aggregate of the System Operations, Code Operations and Metering Platforms.
POD	Point of Delivery
POE	Power over Ethernet
POR	Point of Receipt
POSIX	IEEE Portable Operating System Interface
Pre-FAT	Preliminary Factory Acceptance Tests
PSAS-T	Power Scheduling and Accounting System
PSE	Purchasing–Selling Entity
PSM	Power System Model
PSNA	Power System Network Analysis
PSS/E	PTI's power flow data exchange format
PTI	Power Technologies Incorporated
PX	Power Exchange

QA	Quality Assurance
QAS	Quality Assurance System
RDBMS	Relational Database Management System
RFB	Request For Bid
RM	Reserve Monitor
RMON	Resource Monitor
RPC	Remote Process Calls
RSTP	Rapid Spanning Tree Protocol
RTDB	Real-Time Database
RTM	Real-Time Market
RTNMB	Real-Time Network Model Builder
RTO	Regional Transmission Organization
RTSA	Real-Time Security Analysis
RTU	Remote Terminal Unit
S&CP	Standards and Communication Protocols
SAS	Statistical Analysis System
SAT	Site Acceptance Tests
SC	Supervisory Control
SCADA	Supervisory Control and Data Acquisition
SCC	System Control Centre
SCD	Security Constrained Dispatch
SCUC	Security Constrained Unit Commitment
SDB	Source Database

SDX	Security Data Exchange – NERC
SE	State Estimator
SFP	The small form-factor pluggable
SMTP	Simple Mail Transfer Protocol
SNMB	Study Network Model Builder
SNMP	Simple Network Management Protocol
SOE	Sequence of Events
SOW	Statement of Work
SQL	Structured Query Language
SSL	Secure Sockets Layer
SSO	Single Sign-On
STLF	Short-Term Load Forecast
SVC	Static Var Compensator
SYSTEM	Synonym for the "System Operations Platform"
TCP/IP	Transmission Control Protocol/Internet Protocol
TIS	Transaction Information System
TLB	Tie-Line Bias
TLR	Transmission Loading Relief
TO	Transmission Owner
TP	Transmission Provider
TSA	Transient Stability Analysis
TSD	Technical Specification Document
TSIP	Transmission Services Information Provider

TSO	Transport System Operator
TTC	Total Transfer Capability
TV	Television
UC	Unit Commitment
UCA	Utility Communications Architecture
UDP	User Datagram Protocol
UI	User Interface
UPFC	Unified Power Flow Controller
UPS	Uninterruptible Power Supply or Source
UTC	Universal Coordinated Time
UTP	Unshielded Twisted Pair
VCC	Virtual Control Centre
VCR	Video Cassette Recorder
VLAN	Virtual Local Area Network
VPN	Virtual Private Network
WAN	Wide Area Network
WTC	World Trade Centre Building - Portland
WYSIWYG	What You See Is What You Get
XML	Extensible Markup Language

1. Item Number	2. Specifications Required	3. Specifications Offered	4. Notes, remarks, ref to documentation	5. Evaluation Committee's notes
1. Scope of Supply: Hardware and Software **Notice:** Functional requirements of the hardware are described in further detail under item 2.5.6.				
1.1. Highly Available and Secure Server Infrastructure system (HASSIS), fully redundant with no single point of failure.				
1.1.1.	**Rack** QUANTITY: 1			
	Manufacturer's name:			
	Product model:			
	● Height suitable for mounting all elements of the HASSIS consisting of at least 3 computing nodes, specified in this Technical Specification, and at least 4U spare space after mounting all elements. ● all elements necessary for mounting HASSIS components; ● PDU ensuring connection of all HASSIS components; ● electrical installation for all installed system components; ● grounding wires; ● removable front door with lock;			
1.1.2.	**HA system with computing nodes, Computing nodes** QUANTITY: 3			

	Manufacturer's name:			
	Product model:			
	● Rack mount – to be mounted in the rack specified under position 1.1.1 ● Computing system: at least 3 nodes, maximum 4U hight in total ● Redundant supply for server nodes ● Solution enables creating distributed fail system on cluster nodes ● Software enables implementation of redundancy and high availability mechanism in case of failure of two nodes, resilience to simultaneous double node failure ● Support for virtualization and hypervisors from other manufacturers ● Number of processors: 2 ● Cores per processor: minimum 12 ● RAM: at least 256GB expandable up to at least 3TB ● 10TB of useful capacity out of which 20% (+/- 5%) must be with SSD 3DWPD Enterprise Flash drives in RAID1 and 80% (+/- 5%) with SAS 10K HDDs in RAID5 configuration with one spare HDD ● Network interfaces: o 6 x 10Gb/s SFP+ o 2 x 1Gb/s			

	○ 1 Ethernet interface for hardware management ● Redundant power supply ● Rack mount – to be mounted in the rack specified under 1.1.1, maximum 2U hight in total ● Operating system fully licensed according to complete technical solution			
1.1.3.	**HA storage services software** QUANTITY: for all offered computing nodes			
	Manufacturer's name:			
	Product model:			
	● All required OS and System Software licenses included, with support to optimize at least 30TBs of storage capacity depending on licensing model ● Software provides possibility of creating high-available system on cluster nodes using local disks in nodes, and providing full tolerance to simultaneous failure of 2 system components ● Software enables implementation of redundancy and high availability mechanism in case of failure of two nodes ● Support for QoS, workloads prioritization and SLAs fulfilment ● Support for VMs and hypervisors from different vendors ● Support for disk data auto-tiering			

	● Support for iSCSI, Fibre Channel and Fibre Channel over Ethernet protocols ● Support for non-stop operations and application transparent failover ● Support for continuous data protection ● Support for automatic data migration and non-disruptive hardware storage upgrades ● Support for automated restart of VMs in the case of hardware or OS failure ● Support for live migration of VMs with no user interruption or service loss ● Support for synchronous mirroring and remote data protection using asynchronous replication for disaster recovery services			
1.1.4.	**Uninterruptible Power Supply (UPS)** QUANTITY: 2 pieces			
	Manufacturer's name:			
	Product model:			
	● Type: On-Line Server grade UPS ● Output power capacity: Minimum power 5KVA/4.5KW ● Connectivity: Serial RS-232 or RS-485, Ethernet Interface port ● Mounted in the delivered rack specified under position 1.1.1. or freestanding ● Input voltage: 200-240V, 50/60Hz ● Support for online double conversion			

	• Support for additional external or internal battery modules for hold-up time extension • Support for one additional slot. • Support for integrated WEB/SNMP interface for UPS monitoring and shutdown management. • Support for integrated Serial RS232 or RS 485 interface and MODBUS RTU protocol • Support for parallel redundant operation for busines continuity • Support for manual bypass without interruption • Support for 10 battery extension modules • Support for dry contact module. • LCD Panel for management and diagnostic • Hold-up time: minimum 50 min for the entire delivered HASSIS. The Tenderer is required to include in the offer detailed calculation of the hold-up time for the offered solution; • Input voltage: 200-240V, 50/60Hz • Rack-mountable or freestanding, must be compatible with the server racks described under item 1.3.1. – Server rack, specified			
1.1.5.	**Top Of the Rack Ethernet switch** QUANTITY: 2			
	Manufacturer's name:			

	Product model:			
	• Rack mount – to be mounted in the rack specified under position a) • Ports: minimum 24x Gigabit Ethernet RJ-45, 4x SFP+ ports for speeds up to 10Gbps and 2x QSFP+ ports for speeds up to 40Gbps with support that each of them be split to 4x 10Gbps for potential total of 12x 10Gbps ports • Supported Maximum PPS (Packets Per Second) at least 425Mpps • Support for Jumbo Frames • Support for switching capacity of at least 275Gbps • Network latency maximum 2µs • Support for up to 8000 MAC address • Support for configuration up to 4095 (min. 512 active VLAN) • Support for the following L2 standards and protocols: IEEE 802.1D Spanning Tree Protocol (STP), IEEE 802.1s Multiple STP (MSTP) • IEEE 802.1w Rapid STP (RSTP) • IEEE 802.1p Class of Service (CoS) prioritization • IEEE 802.1Q Tagged VLAN (frame tagging on all ports when VLANs are enabled) • IEEE 802.1x port-based authentication			

	• Support for managing the switch from NGFW (item 1.1.6) management console, thus switch ports become extension ports of NGFW device			
1.1.6.	**Segmentation Next Generation Firewall** QUANTITY: 2			
	Manufacturer's name:			
	Product model:			
	• Ports: minimum 16 x Gigabit Ethernet RJ-45, minimum 4 x SFP+ for speeds up to 10Gbps, minimum 8 x Gigabit Ethernet RJ-45 SFP based, • Minimum 480GB internal SSD storage • Firewall throughput minimum 25Gbps (for 512-bit UDP packets) • Threat protection throughput 3Gbps • SSL inspection throughput 4Gbps • Firewall Latency (64 byte UDP packets) maximum 5 μs • IPSec VPN throughput 13Gbps • IPS throughput 5Gbps • Support for Industrial security, Endpoint protection, Antispam Services, Botnet IP/Domain, IDS/IPS, Web Filtering and Application Control, • Recognition and filtering traffic by type of application			

	● Recognition and filtering of traffic by username based on information from Active Directory ● Support for static and dynamic (RIP, OSPF, BGP) traffic routing ● Rack mount with Included Support for Redundant Power Supply Threat intelligence solution, provided by NGFW specified above or by virtual appliance licenses that will use and consume not more than 10% of resources specified in Items 1.1.2. and 1.1.3. 1. Real time cyber security alerts monitoring system ● The system has enabled monitoring full set of network and user devices in this network including at least routers, core switches, firewalls, servers, IoTs, ICSs… ● System dimensioned to support real time acquisition and processing (parsing, correlation, statistical analyses) and storing of at least 20,000 events per second, with capability of upscaling to 200,000 events per second. 2. Events Data Collection and processing ● Collecting, storing and analysing real-time events sent from IT systems ● Enabled fast searching through large amounts of data for the purpose of analyses and digital forensic of cyber			

	incidents. Search through 100 million events not lasting longer than 10 seconds.
	● The system support the storing and analysis of an unlimited amount of data, limited only by the hardware capacity
	● Event data storing performed in following forms:
	  ● Original text format (native, unaltered data form that will be automatically archived and used primarily for legal purposes)
	  ● Raw events data (original, raw data form with additional metadata related to the reception model). This format must support fast search
	  ● Parsed data (analysed, context-based and/or syntax-based data for fast search and correlation of events)
	  ● Enhanced events (native parsed events with additional critical information based on correlation in real time)
	  ● Synthetic events: data generated by the correlation of the original data
	● Correlation capacity, with following features:
	  ● Real-time correlation (<100ms) for purpose of recognizing known attack vectors, as well as identify behavioural anomalies based on statistical models
	  ● the possibility of "enrichment" of the original data based on the correlation or statistical data gathered before			

	• Creation of "union" events that include all variations of mutually correlated events in one single event, excluding the need to keep all relevant events • Capability of automated remediation (also called “orchestration”) for the purpose of prevention or minimization of consequences. The time of correlation and reaction should not be longer than 500ms • Capability to implement any business logic in correlation rules, add any external function • Historical correlation applied against historical data, for the detection of slow, low-profile attacks, as well as retroactive correlation of newly discovered vector attacks against old data. • Integration with at least 50 different antivirus modules for the purpose of multi checks of potentially malicious / infected processes, as well as retroactive analysis of all ever-started processes • Correlation engine should support automatic detection of noise events (highly repeated events with same or very similar content), and automatically degrade events priority or remove events, for purpose of analyses being able to track important alarms even during DoS attacks or data source misconfiguration issues			

	3. Threat Intelligence ● System has automated tracking of external, publicly available Threat Intelligence sources and collection of their threats indicators at 24h bases ● Solution integrates at least 20 Threat Intelligence sources. ● Integration and tracking of Commercial Threat Intelligence data sources at 1h base ● Solution has local storage of threat indicators for purpose of fast search and analyses ● Real time correlation of at least 1,000,000 stored threat indicators with real time events sent from existing IT systems 4. Cyber traps ● Cyber traps will be deployed for the purpose of proactive detection of any "intruders" inside organizations. Traps should support every phase of attack, including traps at web application level, operating system level, network level, fake services, host memory, marked documents ● Cyber traps are capable of simulating real systems for the purpose of deception of attacker and capability of disclosing attackers IP and geolocation, an attack vector as well as tools attacker tries to upload to target systems (malware, CnC services, exploits etc)			

	● Traps support external deployment (at public IPs) or internal deployment (internal LAN) ● Solution provides traps integration with central monitoring and correlation system, for the purpose of interactive analyses, visual reconstruction, forensics and correlation with other events 5. Internal Tactical Threat Intelligence system ● Internal Tactical threat intelligence system should collects, in real time, data from all cyber traps and perform different type of data processing, as described below ● ITTIS provides live map of ongoing attack attempts against internal cyber traps across internal network ● ITTIS show every attack attempt details, including ● Full, clear text attack payload ● Full, clear text credentials logon attempt information ● Full text request attacker has made against trap ● ITTIS should be capable of analysing and detecting in real time following: ● Automated detection of a new, never seen before, attack requests (never seen in general and never seen for each specific location)			

	●Collection of all credentials ever exposed to attack attempt (in general, per location and per sensor) ●Collection of all attack request for the purpose of later ●Correlation with information from external threat sources, for purpose of detecting similar attacks and/or attacker information ● ITTIS should allow security analyst following: ●Performing statistical analyses of all attacks, per each separate data field, searching using wildcards against any data ●Performing detailed analysis of any specific attack, showing low level details related to attack ●Showing live dashboards with information updated every 1-60 minutes for easy attack exposure tracking. Live dashboard should support custom creation of each separate graph as well as custom combination of graphs ●Creating custom reports related to ITTIS data stored and deliver them by email. Report creation should support both report generation on demand and scheduled, automated report creation.			
1.1.7.	**Next Generation Firewall for ICS** QUANTITY: 2			

	Manufacturer's name:			
	Product model:			
	• Ports: minimum 4x Gigabit Ethernet RJ-45 ports, 2x SFP ports, 1x Bypass GE RJ45 Port, Integrated 3G4G/LTE Modem, 1x USB (client/server) and 1x console RJ45 Port • Firewall throughput 6Gbps (for 512-bit UDP packets) and 8Mpps • Application Control Throughput 1.25Gbps • SSL inspection throughput 450Mbps • IPS throughput 950Mbps • Threat protection throughput 500Mbps • Next Gen FW throughput 500Mbps • IPSec VPN throughput 3.5Gbps • SSL VPN throughput 400Mbps • Firewall Latency (64 byte UDP packets) maximum 4 μs • Support for extended operating temperature range from -40C to +75C • Support for Industrial OT/ICS/SCADA & IoT security, Endpoint protection, Antispam Services, Botnet IP/Domain, IDS/IPS, Web Filtering and Application Control, • Recognition and filtering traffic by type of application			

	● Recognition and filtering of traffic by username based on information from Active Directory ● Support for static and dynamic (RIP, OSPF, BGP) traffic routing ● Supported ICS protocols: ADDP, BACnet, CC-Link, CIP, CN/IP (EIA/CEA-852), CoAP, DICOM, DNP3, ECHONET Lite, ELCOM 90, Ether-S-Bus, EtherCAT Automation Protocol (EAP), Ethernet Global Data (EGD), EtherNet/IP, FL-net, HART-IP, HL7, IEC 60870-5-104, IEC 60870-6 (TASE.2/ICCP), IEC 61850 MMS, IEC 61850 R-GOOSE, IEC 61850 R-SV, IEC 62056 (DLMS/COSEM), IEEE 1278.2 Distributed Interactive Simulation, IEEE C37.118 Synchrophasor, KNXnet/IP (EIBnet/IP), LonTalk/EIA-709.1, Modbus TCP, MQTT, MTConnect, Niagara Fox, OPC Classic (DA, HDA, AE), OPC UA, OpenADR, PROFINET, RTPS, SafetyNet p, S7, S7Plus, LOGO, STANAG 4406, STANAG 5066, TriStation, Vedeer-Root			
1.1.8.	**Threat intelligence appliance, SCADA protection and security** QUANTITY: 2			
	Manufacturer's name:			
	Product model:			
	● Industrial strength Centralized, fully automated and integrated OT and IoT security management platform, with tight			

	integration with components under item 1.1.9 ● Support for protecting at least 1000 nodes ● Support for performance throughput of at least 250Mbps ● Support for at least 64GB of internal storage ● Support for at least 5 (five) 1000Base-T monitoring ports ● Support for at least 1 (one) expansion slot with potential to add 4 (four) SFP based ports ● Support for at least 20 (twenty) remote devices for collecting asset and threat intelligence data from remote locations ● Support for Advanced Anomaly and Threat Detection that identifies cybersecurity and process reliability threats, detects early stage and late-stage advanced threats and cyber risks ● Support for automated blocking of attacks when integrated with compatible firewalls and endpoint security products ● Support for asset intelligence and anomaly detection for OT and IoT that filters out alerts for benign behaviour, accelerating incident response delivering ongoing OT and IoT asset profile and behaviour data ● Support for accelerated incident response that improves response time and productivity with precise alerts that are easy to prioritize			

	● Support for security services that correlates Threat Intelligence information with broader environmental behaviour to deliver maximum security and operational insight. ● Support for wide recognition of OT, IoT and IT protocols			
1.1.9.	**Management platform, hardware or virtual appliance** QUANTITY: 1			
	Manufacturer's name:			
	Product model:			
	● Fully automated and integrated IT security management platform, with support for single pane of glass management of components under f), g) and h) ● Support for at least 200GB of storage expandable to 16TB, and min. 2GB per day capacity of logs expandable to 25GB per day. ● Support for High availability ● Support for Security automation and reduces complexity by leveraging automated REST API, scripts, connectors, and automation stitches ● Support for Centralized policy and device management with potential to manage up to 100,000+ devices and policies such as firewalls, switches, and access points			

	● Support for Zero-touch provisioning, workflows automation and configurations for firewalls, switches and wireless infrastructure ● Support for Secure SD-WAN provisioning and monitoring ● Support for provision and monitoring of Secure SD-WAN from one console across the network ● Support for multi-tenancy and minimum 10 mutually isolated administrative domains (ADOMs) ● Support for separate customer data and manage domains leveraging ADOMs to be compliant and operationally effective ● Enterprise-grade high availability and integration ● Support for automated backups to up to 5 nodes (1 Primary, and 4 secondary) with streamlined software and security updates for all managed devices			
1.1.10.	**Enterprise Data protection solution** QUANTITY: 1			
	Manufacturer's name:			
	Product model:			
	● Mechanical form factor, compact 2U chassis for up to 4 nodes, Rack mount – to be mounted in the rack specified under position 1.1.1			

	• Hardware and software from the same manufacturer • Solution support modern Software Defined Storage architecture, embedded ability to classify and migrate worm and cold production data to optimal storage tier • Minimum 4 nodes included, with total support for data capacity at least 32TB on primary location. • System contains all required software licenses in order to optimize, compress and deduplicate at least 10TB of optimize backup data. • System configured with minimum 3 nodes to ensure full data fault tolerance with erasure coding (EC) • Single node specification: minimum 2x – 2.1 GHZ – 12 Core (or equivalent), 1x 240 Gb boot SSD, 12TB HDD capacity, 1,6TB flash capacity, 64GB RAM, Connections: 4x 10GbE, 1x IPMI • System supports multiprotocol access to the same data in order to provide support for enterprise operating systems and application NFS, CIFS, SMB or equvalent. Object Storage support for S3 compatible REST API for easy integration with existing services. • All system updates and upgrades must not disturb normal operations and backup jobs and activities during update.			

	• System is highly scalable, it scales at least to 5PB of production, cold archive, and private cloud data. • System support global deduplication (primary location – DR – Private Cloud), with strict data consistency. When primary data changes, it is required that secondary data has also been automatically change, either on DR or private Cloud location. • System support unlimited number of "fully-hydrated" snapshots and writable snapshot clones in order to provide conditions for quick data restore. • Minimum provided data compression is 2X. • RTO (restore time) 100 VMs (virtual machines) must be extremely quick, at worst below 5minutes for full restore of 100VMs. • System has embedded granular and secure replication services for geo redundancy. • Support for Object Metadata indexing provided in order to allow search of all objects within the cluster system. • Support for QoS policy provided in order to optimize performance of various types of production workloads. Support for priority restore provided. • Data encryption at rest as well as online production data, based 256bit AES standard. Platform is compliant with FIPS-2 standard.			

	● Support for long period data retention provided as well as WORM functionality. ● System support backup data monitoring in order to protect against various data malware attacks. ● System locates and reports personal identifiable information data, at least passwords, personal Ids and, credit card numbers. ● Private Cloud integration, in order to archive data for long retention period. ● Rack-mountable, compatible with the server racks described under item 1.3.1. – Server rack.			
1.2. Workstations				
1.2.1.	**Dispatch WorkStation** QUANTITY: 4			
	Manufacturer's name:			
	Product model:			
	(Desktop Clients and Monitors have to be from the same manufacturer) ● Processor: Minimum Intel Core i9-9900 (8C / 16T, 3.1 / 5.0GHz, 16MB) or equivalent ● Graphic: DirectX 12, 6GB GDDR5, PCIe 3.0 x16, 120 watts, 1x DVI-D (up to 2560x1600@60Hz), 1x HDMI (up to 4096x2160@60Hz), 3x DP (up to			

	5120x3200@60Hz), occupies two slots, support for minimum 4 monitors ● RAM Memory: minimum 2 x 16 GB UDIMM DDR4-2666 ● Storage: minimum 1x 1TB SSD M.2 2280 PCIe 3.0x4 NVMe Opal + 1x 1TB HDD 7200rpm 3.5" ● Optical: minimum DVD±RW ● Mouse, Keyboard ● Card reader at items must at least support the following standards: SD, SDHC, SDXC ● Ethernet: Integrated 100/1000 M ● Noise Certificates: TUV Low Noise or equivalent ● Workstation Operating System with transferable license(s) matching the SYSTEM needs and the hardware configuration, Enterprise version (if available in case of offered OS). MONITORS (4 pieces per one station, 16 in total): (Desktop Clients and Monitors from the same manufacturer) ● Display Size: Minimum 34" ● Resolution: minimum 3440x1440 pixels ● Aspect Ratio: 21:9 ● View Angle (H / V): minimum 178 / 178 ● Pixel Response Time: 4 ms (Extreme mode) / 6 ms (Typical mode) / 17 ms (off mode)			

	● Multiple Input: HDMI, DP, USB Type-C Gen1(DP1.2 Alt Mode) ● USM Port: 4 x USB 3.1 Gen1 (1 BC) ● Dot / Pixel Per Inch: 109 dpi ● Contrast Ratio: 3000:1 ● Color Gamut: 99% sRGB ● Power Consumption (Typical / Maximum): up to 46W / 140W			
1.2.2.	**Engineering Station** QUANTITY: 5			
	Manufacturer's name:			
	Product model:			
	(Desktop Clients and Monitors have to be from the same manufacturer) ● processor: Minimum Intel Core i9-9900 (8C / 16T, 3.1 / 5.0GHz, 16MB) or equivalent ● Graphic: DirectX 12, 6GB GDDR5, PCIe 3.0 x16, 120 watts, 1x DVI-D (up to 2560x1600@60Hz), 1x HDMI (up to 4096x2160@60Hz), 3x DP (up to 5120x3200@60Hz), occupies two slots, support minimum 4 monitors ● RAM Memory: minimum 2 x 16 GB UDIMM DDR4-2666 ● Storage: minimum 1x 1TB SSD M.2 2280 PCIe 3.0x4 NVMe Opal + 1x 1TB HDD 7200rpm 3.5"			

	• Optical: minimum DVD±RW • Mouse, Keyboard • Card reader at items must at least support the following standards: SD, SDHC, SDXC • Ethernet: Integrated 100/1000 M • Additional Certificates: TUV Low Noise • Workstation Operating System with transferable license(s) matching the SYSTEM needs and the hardware configuration, OS is Enterprise version, if applicable. MONITORS (Quantity: 2 pieces per one station, 10 in total): (Desktop Clients and Monitors have to be from the same manufacturer) • Display Size: Minimum 34" • Resolution: minimum 3440x1440 pixels • Aspect Ratio: 21:9 • View Angle (H / V): minimum 178 / 178 • Pixel Response Time: 4 ms (Extreme mode) / 6 ms (Typical mode) / 17 ms (off mode) • Multiple Input: HDMI, DP, USB Type-C Gen1(DP1.2 Alt Mode) • USM Port: 4 x USB 3.1 Gen1 (1 BC) • Dot / Pixel Per Inch: minimum 109 dpi • Contrast Ratio: 3000:1 • Color Gamut: 99% sRGB			

	● Power Consumption (Typical / Maximum): up to 46W / 140W			
1.3. Common items				
1.3.1.	**Colour Laser Printer with Scan&Copy function** QUANTITY: 2			
	Manufacturer's name:			
	Product model:			
	● Resolution: Minimum 600 dpi ● Printing speed: black and white – minimum of 15 pages per minute, colour – minimum 15 pages per minute. ● Paper size: minimum support for A4 (210 by 297 mm) ● Connection: USB, LAN port			
1.3.2.	**VideoWall (2 x LCD Display, 1 x DeskTop PC)** QUANTITY: 1			
	Manufacturer's name:			
	Product model:			

	Full HD Video Wall, Large Format LCD Display (pieces 2): ● Minimum 55" Diagonal Size ● With extreme narrow bezel and 4-side even Panel (1.8 mm) ● Landscape and portrait orientations enable in-store installation flexibility ● Supports 1920 x 1080 Full HD ● Supports 500 nits high brightness and 1400:1 contrast ratio ● 24x7 operation ● Embedded cooling system ● Aspect Ratio: 16 : 9 ● Input: Video HDMI x 2, DVI x 1, Display Port x 1, VGA x 1, minimum ● Input: Audio Mini Jack x 1 ● Input: Control RS-232C x 1, RJ-45 x 1, LAN x 1, IR x 1, minimum ● Input: Other slot/ports USB x 1 ● Output: Video Display Port x 1, DVI-I x 1 ● Output: Audio Mini Jack x 1 ● Output: Control RS-232C x 1, IR x 1 ● Internal Speaker 10W+10W, minimum Desktop Clients for VideoWall control (pieces 1): ● processor: Minimum Intel Core i9-9900 (8C / 16T, 3.1 / 5.0GHz, 16MB) or equivalent			

	● Graphic: DirectX 12, 6GB GDDR5, PCIe 3.0 x16, 120 watts, 1x DVI-D (up to 2560x1600@60Hz), 1x HDMI (up to 4096x2160@60Hz), 3x DP (up to 5120x3200@60Hz), occupies two slots, support not less than 4 monitors ● RAM Memory: minimum 2 x 16 GB UDIMM DDR4-2666 ● Storage: minimum 1x 1TB SSD M.2 2280 PCIe 3.0x4 NVMe Opal + 1x 1TB HDD 7200rpm 3.5" ● Optical: minimum DVD±RW ● Mouse, Keyboard ● Card reader at items must at least support the following standards: SD, SDHC, SDXC ● Ethernet: Integrated 100/1000 M ● Additional Certificates: TUV Low Noise ● Workstation Operating System with transferable license(s) matching the SYSTEM needs and the hardware configuration, OS is Enterprise version (if applicable).			
1.3.3.	**LAN network equipment** QUANTITY: 2			
	Manufacturer's name:			
	Product model:			
	-			

	• Minimum L2 LAN switch managed by item #1.1.9. (Management platform) • Minimum 24x 10/100/1000 BaseT ports • Rackmount compatible with item #1.1.1.			
1.3.4.	**WAN communication equipment** QUANTITY: 2			
	Manufacturer's name:			
	Product model:			
	● ● - Next Generation Firewall, minimum 6x GigabitEthernet RJ45/POE+ ports managed by item #1.1.9. (Management platform) ● - Minimum 2x SFP ports ● - Minimum dual redundant PowerSupply ● - Minimum support for IPS/IDS, Application control, Web filtering, Industrial security DNS filtering, Real-Time SSL inspection			
1.4. Hot Swaps (Redundant components)				
1.4.1.	**WAN communication equipment** QUANTITY: 1			
	Manufacturer's name:			
	Product model:			
	●			

	- Next Generation Firewall, minimum 6x GigabitEthernet RJ45/POE+ ports managed by item #1.1.9. (Management platform) - Minimum 2x SFP ports - Minimum dual redundant PowerSupply - Minimum support for IPS/IDS, Application control, Web filtering, Industrial security DNS filtering, Real-Time SSL inspection			
1.4.2.	**LAN network equipment** QUANTITY: 1			
	Manufacturer's name:			
	Product model:			
	● - Minimum L2 LAN switch managed by item #1.1.9. (Management platform) - Minimum 24x 10/100/1000 BaseT ports - Rackmount compatible with item #1.1.1.			
1.5. Software, Notice: Detailed functional requirements are further described under items: 4.1.1, 4.1.2, 4.1.3, 4.2 of Section 4, Appendix to Technical Specification Section 4				
1.5.1.	**Real-Time Network Operations** Quantity: 1 (1 for CC Belgrade)			
1.5.2.	**Planning Applications** Quantity: 1 (1 for CC Belgrade)			
1.5.3.	**Network Analysis Applications** Quantity: 1 (1 for CC Belgrade)			

1.5.4.	**Data Acquisition and Data Processing - SCADA** Quantity: 1 (1 for CC Belgrade)			
1.5.5.	**IS&R (Data acquisition)** Quantity: 1 (1 for CC Belgrade)			
1.5.6.	**Interface to Metering/Code Operations Platform** Quantity: 1 (1 for CC Belgrade)			
1.5.7.	**Interfaces to Legacy Systems** Quantity: 1 (1 for CC Belgrade)			
1.5.8.	**Utility software** Quantity: 1 (1 for CC Belgrade) ● Utility software is Enterprise version (applicable only if Enterprise version for software is available on the market).			
1.5.9.	**Development software** Quantity: 1 (1 for CC Belgrade) Development software is Enterprise version (applicable only if Enterprise version for offered software is available on the market).			
1.5.10.	**Interface to GIS Software, SCADA Integration** Quantity: 1 (1 for CC Belgrade)			
2. System Operations Platform				
2.1. Functional Requirements				

2.1.1. Functional Requirements > Real-Time Network Operations (applications supporting the System Operator's day-to-day network monitoring, dispatch and restoration activities)				
2.1.1.1. Dynamic Network Visualization **Notice:** The primary User Interface for the SYSTEM shall support technologies so as to permit automatic centralized monitoring, dispatch and restoration of the gas network. This functionality is accessible from any secure location on DSO Distribucijagas Serbia's secure SYSTEM communication network. Users external to DSO Distribucijagas Srbija's secure SYSTEM communication network shall use a similar interface through a specially configured secure environment that includes the capability for DSO Distribucijagas Srbija to define specific functional restrictions.				
	a. Audible alarm annunciation.			
	b. Dynamic and real-time information on the displays must refresh at a rate configurable by an authorized programmer/engineer.			
	c. Users must be provided with positive, visual feedback when they make a selection, which remains visible until the request is completed, cancelled by the user, or until the user makes a new selection.			
	d. Navigation aids to enable users to easily determine which display is being viewed and to facilitate movement around the current display and to other displays.			
	e. Displays have a consistent look and style. Use of colours and fonts applied consistently. Control buttons, navigation aids, message windows and any other window functions have a consistent appearance, function and location.			
	f. Pages load quickly, as defined in display response requirements.			

	g. Situation Awareness Techniques (Visualization) implemented as per requirements described in the points 4.1.1.1.3.1 through 4.1.1.1.3.6 of the Functional requirements (Appendix to Technical SpecificationS, Section 4).			
2.2. Functional Requirements > Network Operations Planning (exposes the Planning Applications)				
2.2.1.	**Demand Forecast** **Notice:** Demand Forecast (DF) function shall ensure preparation of the roll-over demand forecasts calculated for user-specified future time periods (from one hour-ahead to one year-ahead) on the basis of historical and weather data and weather forecasts. DF function is implemented by the Contractor either as a single function, or as a set of functions.			
	a. DF User Interface has at minimum the following user displays: [1] Demand Forecast Data; [2] Weather Forecast Data; [3] Historical Demand Data (actual system demand plus the estimated or actual demand shed); [4] Historical Weather Data; [5] Demand Model Parameters; [6] Graph showing the forecast and actual demand; [7] Error Analysis Displays; [8] Consumption control command (or action) Execution Displays; [9] Execution Message and Alarm Summary;			

	[10] Save Case and Study Control Displays.			
	b. The user capabilities to generate One-year demand forecasts, monthly demand forecasts, Short-Term Demand Forecast and Hours-ahead Consumption Forecasts as described in the points 4.1.2.1.2 through 4.1.2.1.5 of the Functional requirements (Appendix to Technical SpecificationS, Section 4).			
	c. In addition to the user capabilities described in the point 4.1.2.1.6 of the Functional Requirements (Appendix to Technical SpecificationS Section 4), the following user capabilities must be provided for the DF Users: [1] Manual or automatic retrieval of data for input to DF system; [2] Automatic storage of new data as it becomes available (IS&R); [3] Interactive access to historical DF data profiles for tabular and graphical display; [4] Interactive editing to support revision of DF data profiles.			
	d. The DF function with the following variables: [1] Temperatures (ambient, dry bulb, heating degree days, and dew point); [2] Temperature change trend [3] Rainfall; [4] Cloud coverage;			

	[5] Wind speed; [6] Wind direction. The relative humidity calculated from the ambient and dew point temperatures. The user selectable weather variables to be used in the search for the best demand pattern match.			
	e. The DF function utilizes one or more of the following algorithms as described in the point 4.1.2.1.8 of the Functional Requirements (Appendix to Technical Specifications Section 4): [1] Pattern Matching Forecast; [2] Weather Adaptive Forecast [3] Neural Network Forecast.			
2.2.2.	**Maintenance Program Service Notice:** The SYSTEM shall provide the Maintenance Program Service (MPS). The subject of the MPS is the provision of application support for DSO Distribucijagas Srbija to comply with the Grid Code, the generation of the Maintenance Program in particular.			
	a. Maintenance information are as described in the point 4.1.2.2.1.1 of the Functional Requirements (Appendix to Technical Specifications Section 4).			
	b. Features of the Maintenance Planning Application are as described in the point 4.1.2.2.1.2 of the Functional Requirements (Appendix to Technical Specifications Section 4).			
	c. Synchronization of the MRdb with the Real-Time Gas Distribution Network Model are as described in the point 4.1.2.2.1.3 of the Functional Requirements			

	(Appendix to Technical Specifications Section 4).			
	d. Maintenance Program Application provides a yearly Maintenance Program and Interim Maintenance Programs as described in points 4.1.2.2.2.1 and 4.1.2.2.2.2 of the Functional Requirements (Appendix to Technical Specifications Section 4).			
2.2.3.	**Code Operations Capacity and (Re-)Nomination Verification** **Notice:** The output of the Demand Forecast and Maintenance Programs applications is applied to identify constraints for capacity and nominations information imported from the Code Operations Platform. Using the Maintenance Programs Application the DSO will, prepare a new Interim Maintenance Program, and will subsequently compare calculated System Point capacity constraints against On-a-Day Available and Registered Capacities declared by the CodeOperations Platform operator. Comparison results are recorded, and any identified anomalies are notified to the Code Operations Platform operator using messaging facilities integrated with the Maintenance Programs Application.			
	a. Using the Demand Forecast Application, the DSO may verify Nominations and Renominations imported from the Code Operations Platform against the results of an interim Short-Term Demand Forecast or Hours-Ahead Consumption Forecast report specifically tailored for such comparison.			
	b. Using functions supplied with the DF Application, the DSO is able to compare Weekly Estimates declared by the Code Operations Platform Operator with the Short-Term Demand Forecast generated by the DF Application for the week that is the subject of the Weekly Estimates data. The User Interface enable sending notifications to the Code Operations Platform operator with regard to any			

	anomalies concerning Weekly Estimates identified using DF Short-Term Demand Forecast functions.			
	c. The DSO is able to compare Nominations and Renominations declared by the Code Operations Platform Operator with an Interim Hours-Ahead Consumption Forecast using the DF Application, using functions supplied with the DF Application. The User Interface enables sending notifications to the Code Operations Platform operator with regard to any anomalies concerning (Re-) Nominations identified using DF Hours-Ahead Consumption Forecast functions.			
2.2.4.	**Dispatch Schedule Generation** **Notice:** Dispatch Schedule Generator, is an application which shall produce Dispatch Schedules. A Dispatch Schedule will be the primary document used by Control Centre Dispatchers to monitor and coordinate the state of DSO Distribucijagas Serbia' gas network at any time. The Dispatch Schedule Generator will use a custom data model specifically designed by the Contractor, and apply a custom designed algorithm also designed by the Contractor, to process information resulting in a Dispatch Schedule. Both the data model and algorithm have to be approved by DSO Distribucijagas Serbia prior to building the SYSTEM.			
	a. The Dispatch Schedule presents information for 24 hours, starting at 06:00h, for every Day. The granularity for the 24-hour time scale must be 15 (normally 60 minutes, tuned by DSO Distribucijagas Serbia) minutes.			
	b. For every 15 (normally 60 minutes, tuned by DSO Distribucijagas Srbija) minute time interval the Dispatch Schedule provides:			

	[1] A list of actions that are scheduled to be undertaken by the DSO Control Centre. Information consist of: [1.1] Commands to position network control equipment in order to establish scheduled gas distribution regimes. [1.2] Commands to control the control equipment itself. [2] For all System Points and network nodes: target status information. Such information will be utilized for Network Condition Monitoring. [3] For all System Points and network nodes: scheduled event information. Such information will be utilized for Network Condition Monitoring.			
	c. The algorithm to generate Dispatch Schedules is complex. It is in accordance with the provisions of the points 4.1.2.4.3 and 4.1.2.4.4 of the functional requirements (Appendix to Technical Specifications, Section 4).			
	d. The SYSTEM is designed to integrate information generated by the Demand Forecast, Maintenance Programmes, LinePack Calculations and Real-Time Network Operations applications in a manner that facilitates optimized (with respect to algorithm processing time) converging solutions for generating Dispatch Schedules. In addition, The Dispatch Schedule Generator imports data from the Code Operations Platform.			

2.2.4.1.	**Dispatch Schedule application user Interface**			
	a. All functions required to generate Dispatch Schedules are presented on a single application control display.			
	b. If functions must be executed sequentially, the sequence in which functions must be invoked is logically represented in the screen layout.			
	c. Users receives notification when a Dispatch Schedule Generator function starts and completes its processes.			
	d. The Dispatch Schedule available in screen display version as well as in paper document version.			
	e. Lists of control actions to be undertaken at the Control Centre is compiled for an entire Day. Control action schedules is displayed as a timeline sequence in tabular form, or as a graphic timeline. Grouping events for designated geographical areas is possible.			
	f. The application integrates functionality to convert schedules to MS Excel or MS Project.			
	g. Information concerning all System Points and gas network nodes available on-line to Dispatch Schedule users. The information is presented [1] in a tabular form,			

	[2] in graphic form			
	h. Grouping System Points and gas network nodes in pre-defined geographical zones and to print tabular and graphic information displayed on screen.			
	i. The Dispatch Schedule User Interface provides the capability to outputs any information presented on displays to editable paper versions.			
2.2.4.2.	**Reissuance of the Dispatch Schedule**			
	a. Reissuance of the Dispatch Schedule may be required as a consequence of changes in the conditions that infer the regime calculated by the Dispatch Schedule Generator for a particular Dispatch Schedule time slot. Special methods are applied when the need for a Dispatch Schedule reissuance arises. Contractor will propose a methodology for Dispatch Schedule reissuance, which is agreed upon by Distribucijagas Srbija during a Functional Design stage. Such methodology considers: all the provisions of the section 4.1.2.4.6.2 of the Functional Requirements (Appendix to Technical Specifications, Section 4).			
2.2.5.	**Geographic Information System (GIS) integration** **Notice:** Contractor shall supply a Geographic Information System integrated with SCADA System, multi-application integration The purpose of a Geographic Information System (GIS) is to collect, store, manage, analyse and present geoinformation. Geoinformation refers to data that can be reflected spatially in the real world. Typically, this spatial data is combined with attribute data, which is additional information about the spatial features. Other types of geoinformation systems include Remote Sensing (RS) and Global Navigation Satellite Systems (GNSS). RS refers to gathering data about areas or objects from a distance			

	and usually involves the use of satellites or aircraft. This data is useful for studying and monitoring changes in the environment. GNSS, the most well-known system of which is the Global Positioning System (GPS), is useful for quick, precise monitoring and positioning of object and human movements. DSO Distribucijagas Srbija will provide detailed map, general map, metering stations asset maps and overview maps with different scales. The numeric data and the communication with the graphical display is fixed in the data model. Beside the management of pipe maps with various details, contents and scales the net relevant data of the GIS supports the information, statistics, analyses and business processes via freely configurable interfaces. GIS software will incorporate the communication ability of all used software programs included in this Project. Supplied GIS software is based on open architecture to cope with the requirements of modern IT environments, by supporting current and future GIS applications. The dynamic data model shall allow the supplementation and extension of the existing object structures. GIS software shall assure data consistency between graphical elements and numeric data. Point 4.1.6 of Functional Requirements (Appendix to Technical Specifications, Section 4). Geographic information system (GIS) with spatial analysis, map publishing, and search capabilities includes:			
	a. Location platform for additional location-based services for gas stations (MRS) locations			
	b. Detailed vector-street mapping function with a resolution of: 1 : 10.000 or higher.			
	c. Routing function for routing of gas service technicians in field and include driving time duration			
	d. Geocoding marker tool for gas station (MRS) location and enhanced address matching capabilities			
	e. Editing of tables and reports			
	f. The application is compatimble with 64bit desktop OS (Appendix to Technical Specifications, Section 7).			
	g. An enterprise version for at least 9 desktop licenses plus 2 servers			

	h. The application is vendor certified for: o Spatial Ware on SQL Server 2016 or higher			
	i. The application supports export into following formats: o Shapefile o CSV o GeoTIFF o ECW o JPEG o PNG o JPG o GIF o WMF o BMP o MRR o PostGIS o SQL Server			
	j. Integrated GIS and SCADA System including following funcionalities: o Showing dynamic process data in static geoinformation o Monitoring status information, including geographically correct location o The attribute data includes details about each metering station, such as its			

	name, type and function and the equipment it contains. o The spatial data would be the locations of the metering stations.			
	k. Gas facilities information need to be documented in a system according to their location.			
	l. Combining SCADA and GIS enabling: o Location of assets (assets associated with their geographically locations) o The process data acquired from the SCADA system shown in real time to indicate the state of the assets on a GIS map layer o Visualization of system status o Fault location o Remote system control o Data entry processes much more efficient			
	m. Screen size, position and visibility are configurable			
	n. Objects which illustrate network and process equipment are already organized in custom layers, which are successively overlaid in the graphical GIS view			
	o. Every layer contains a custom arrangement of lines, areas and markers.			
	p. Geo-coordinates can be precisely adjusted.			

	q. For each object, a context menu can be configured to contain all sorts of functions from the SCADA application (Alarms, measured values, switch to detailed process screens or generate and display equipment related reports)			
2.2.6.	**Linepack Planning** **Notice:** Linepack Planning specifies functions used for planning purposes. Functions used for gas system analysis are specified in point 4.1.3 – Network Analysis of the Functional requirements (Section 4); the latter functions apply the same modelling and parameterization features as specified for Linepack Planning functions. The network analysis functions is sized as defined in point 5.1, Capacity and Performance of the Non-Functional Requirements (Appendix to Technical Specifications, Section 5).			
2.2.6.1.	**Application Modelling and Execution**			
	a. Gas System Modelling - Gas system modelling feature is completely in accordance with the provisions of the point 4.1.2.5.1.1 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	b. Common Execution and Solution Requirements is completely in accordance with the provisions of the point 4.1.2.5.1.2 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	c. Each network planning and analysis function includes displays to manage the execution of the function, "tune" the function, and to diagnose errors. The Execution and Diagnostic Displays is in accordance with the provisions of the point 4.1.2.5.1.3.1 of Functional Requirements			

	(Appendix to Technical Specifications, Section 4).			
	d. Input and result displays is completely in accordance with the provisions of the point 4.1.2.5.1.3.2 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	e. Real time Network Planning Analysis. Real-time network planning analyses functions monitors the current state of the gas system and analyse the effect of contingencies. Its features sre in accordance with the provisions of the point 4.1.2.5.1.4 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	f. The real-time network planning analysis functions us executed in sequence. Real Time Network Analysis Execution is in accordance with the provisions of the point 4.1.2.5.1.4.1 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	g. The real-time sequence input preparation (RTSIP) task builds the input case for the real-time sequence. RTSIP maps real-time data and data from the parameter adaptation function into the gas system model to prepare the input case. The RTSIP maps all available data into the input case.			
	h. Real Time Sequence User Interface is in accordance with the provisions of the point			

	4.1.2.5.1.4.3 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	i. Study network analysis functions is executed on user demand to analyse current, past, and future gas system conditions. It is in accordance with the provisions of the point 4.1.2.5.1.5 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	j. Study Input Preparation features are in accordance with the provisions of the point 4.1.2.5.1.5.1 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	k. Study Network Analysis Execution features are in accordance with the provisions of the point 4.1.2.5.1.5.2 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
2.2.6.2.	**State Estimation** **Notice:** The State Estimator (SE) produces a complete energy and flow balance solution for the gas network model, including System Point information, balancing gas estimations, for the observable and unobservable areas of the gas system model.			
	a. State Estimator Input uses real-time data and computed data from real-time executions. It is in accordance with the provisions of the point 4.1.2.5.2.1 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	b. Prior to solving the network model, State Estimator checks the input data for			

	consistency and determine the observable and unobservable areas of the gas network model.			
	c. The consistency check verifies that equipment states and measurements are consistent. This feature shall be in accordance with the provisions of the point 4.1.2.5.2.2.1 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	d. The SE examines the availability of good telemetry and identify observable areas of the network prior to solving the network. The SE accommodates multiple observable areas and multiple observable areas within multiple gas network islands. There is no mismatch at the boundaries of observable and unobservable islands and any error in the unobservable islands does not impact the accuracy of the observable islands.			
	e. The SE produces a full solution for both the observable and unobservable areas of the gas network model. This solution is in accordance with the provisions of the point 4.1.2.5.2.2.3 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	f. State Estimator User Interface is in accordance with the provisions of the point 4.1.2.5.2.3 of Functional Requirements (Appendix to Technical Specifications, Section 4).			

2.2.6.3.	**Gas Flow Calculations** **Notice:** The Gas Flow (GF) is used to perform gas flow studies that include loss of gas system equipment, changes in gas injections, changes in gas off-take, and any other changes in system or area quantities (demand). The GF shall apply gas flow equations, applying the energy balance equation, to describe flow in pipes expressed explicitly as functions of both pressure and temperature. The formulated equations in which pressure and temperature are considered as primary variables, form a system of equations which are nonlinear. An iteration procedure is provided by the Contractor to solve such equations.			
	a. The iteration method must solve for pressure and temperature simultaneously.			
	b. Using this model, pressure and temperature profiles for gas flow along a pipeline system is predicted. Phase behaviour model and correlations are coupled to determine the gas fluid properties of the system.			
	c. GF produces a complete solution for the gas system model, including the effects of elevation changes, temperature variation, and pipe geometry and pipe orientation, for the entire gas system model.			
	d. The SYSTEM includes multiple GF solution algorithms such as the full the Newton-Raphson method, the "fast-decoupled" Newton-Raphson method, the Weymouth or the Panhandle model. This is in accordance with the provisions of the point 4.1.2.5.3.2 of Functional Requirements (Appendix to Technical Specification Section 4).			
	e. The GF user interface shall provide for the display of non-converged GF studies, including presentation on diagrams and tabular displays. Summaries shall present information on the nature of the			

	convergence problem including a list of stations with the most severe convergence problems and solution statistics such as the number of iterations, the number of control actions, and identification of constraints for gas system equipment.			
2.2.6.4.	**Balancing Gas Requirements** **Notice:** The DSO is required to maintain and "Operational Balance" as defined in the Grid Code. Detailed description of this feature can be found in the point 4.1.2.5.4 of Functional Requirements (Appendix to technical specification Section 4). Contractor shall propose a solution, to be approved by DSO Distribucijagas Srbija during a Functional Design Stage early in the SYSTEM delivery project, and implement this solution as the Balancing Gas Requirements application.			
	a. The solution must comply with all aspects declared in the Grid Code.			
	b. Whenever an Operational Balancing Requirement is declared, the BG operator will request a save-case of the latest Dispatch Schedule Generator data model to build a Balancing Gas Requirements model. The save-case data set will be manually modified to reflect the conditions that have caused the declaration of the Operational Balancing Requirement.			
	c. Balancing Gas Execution and User interface shall be in accordance with the provisions of the points 4.1.2.5.4.2 and 4.1.2.5.4.3 of Functional Requirements (Appendix to Technical Specification Section 4).			
2.3.	**Network Analysis Services**			
2.3.1.	**Post-Operation System Analysis**			

	a. Disturbance Analysis - The SYSTEM shall provide functions for DSO Distribucijagas Srbija engineers to make the analyses of the conditions leading to and being consequent of disturbances (including Emergencies). Requirements for Disturbance recording and associated user interaction in specified in Section 4.2.2.2.3 of the Functional Requirements (Appendix to Technical Specifications, Section 4) entitled Disturbance Recording.			
	b. Network Capacity Analysis - The SYSTEM shall provide the capability for users to perform Network Capacity Analyses. Requirements for This application are described in point 4.1.3.1.2 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
2.3.2.	**Linepack Calculations** **Notice:** Contractor shall supply a Linepack Calculation module, being a set of integrated industry-strength applications with the same user interface look-and-feel as the core SYSTEM application software, capable of analysing the dynamic linepack properties of the entire gas network or a segment thereof. The purpose of the Linepack Calculations application is to provide distribution information per area or location and over time about gas properties including density, pressure, temperature, flow path, velocities and chemical constituent properties.			
	a. The functional characteristics of the Linepack calculation module shall be as described in the point 4.1.3.1.3.1 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	b. Linepack calculation Data, processing and output shall be as described in the points 4.1.3.1.3.2, 4.1.3.1.3.3, and 4.1.3.1.3.4 of			

	Functional Requirements (Appendix to Technical Specifications, Section 4).			
	c. The calculation result matrices shall be available on user screens: [1] In tabular format; [2] graphically, on a time scale; [3] geographically, on a map displaying the results for a particular moment in time.			
2.3.3.	**Information Storage and Retrieval Services (IS&R)** **Notice:** IS&R collects data from the real-time database, presents the information on displays and reports, and transfers data to archive storage where it may be used internally by the SYSTEM or externally by other users, notably the System Operator and DSO Distribucijagas Srbija business departments that require data available in the SYSTEM to perform their respective business tasks.			
	a. Any data value in the SYSTEM database shall be available for collection, calculation, retention, and archiving by IS&R.			
	b. A solution that includes the capability to capture (for future analysis and/or replay) all changes of real-time data (similar to a flight data recorder) shall be provided). IS&R data and functionality shall be available in primary and redundant system configurations.			
	c. The IS&R functions shall execute on servers dedicated to that functionality.			
	d. IS&R shall be scalable to support other business applications in addition to those required of the SYSTEM.			

	e. IS & R shall service SYSTEM users and a number of non-SYSTEM users while ensuring that the security and performance of other component systems of the SYSTEM are minimally affected.			
2.3.4.	**Gas Network Simulation Services** **Notice:** The GNS shall reproduce the actions of the gas network and SYSTEM.			
	a. The characteristics of Gas Network Simulations Services shall be as described in point 4.1.5 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	b. The gas network shall be simulated in the GNS, with the definition of the gas network derived from the Gas Distribution Network Model. The Gas Network Simulator shall be in accordance with the provisions of the point 4.1.5.1 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	c. Gas offtake shall be modelled using predefined daily area offtake curves or by a single offtake curve covering multiple days. The Gas Offtake Modelling Application shall be in accordance with the point 4.1.5.1.1 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	d. Gas Supply Modelling - The gas supply dynamic simulator shall realistically model the intake of gas at distribution system entry nodes. The Gas supply			

	Modelling Application shall be in accordance with the point 4.1.5.1.2 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	e. Control Equipment and Field Logic Modelling - The logic that GNS shall simulate must be in accordance with the point 4.1.5.1.4 of Functional Requirements (Appendix to Technical Specifications Section 4).			
2.3.4.1.	**Control System Simulator** **Notice:** The control system simulator shall be a replica of the SYSTEM with some exceptions.			
	a. The features of Control System Simulator shall be in accordance with the point 4.1.5.2 of Functional Requirements (Appendix to Technical Specifications Section 4).			
2.3.4.2.	**Scenario Builder** **Notice:** A GNS scenario shall be the gas network transformation to be simulated over the course of an analysis/training session.			
	a. The features of Scenario Builder shall be in accordance with the point 4.1.5.3 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
2.3.4.3.	**GNS Execution Management** **Notice:** GNS features shall facilitate execution and management of scenarios and interaction with the GNS User by the Scenario Builder.			
	a. The features of GNS Execution Management shall be in accordance with the point 4.1.5.4 of Functional			

	Requirements (Appendix to Technical Specifications, Section 4).			
2.4. SYSTEM Design > Infrastructure (This SYSTEM Design Section contains the specifications for functional components to be delivered by the Contractor, and their respective characteristics.)				
2.4.1.	**SYSTEM Configuration** **Notice:** The system configuration is shown and describe in point 4.2.1.1.1 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	a. The design, construction, and performance of all equipment and software supplied by the Contractor conforms to the latest applicable standards: SRPS, EN, IEC, ISO, ITU, ANSI, IEEE, DIN, DVGW and EIA or equivalent. Some of these standard are listed in the Grid code of the DSO system.			
	b. New server systems are provided in the existing control centre in Belgrade. The server system has a redundant failover system, thereby creating dedicated emergency backup facilities. Logically, the installed server system will be a redundant system with the redundant components.			
	c. Organized from an operational perspective, the SYSTEM includes: [1] The Primary Control System (PCS) located at the main Distribution System Operations Control Centre in Belgrade, Serbia.			

	[2] The Backup Control System (BCS) also located at the Belgrade, Backup Control Centre (BCC).			
	d. The PCS collects, processes, and stores the real-time data from the following data sources: [1] Remote terminal units (RTUs) or other data collection devices located at stations, intake sites, and other facilities throughout DSO Distribucijagas Srbija's gas network. The PCS should collect data from up to 5000 MRS Metering and Regulating Stations. [2] Station SCADA or other data acquisition systems located throughout the gas network, such as TSO Srbijagas SCADA System and TSO Srbijagas Metering Platform [3] Generation control systems located at production sites [4] Computer systems connected to a computer network linking the SYSTEM with neighbouring utilities, and associated market participants by direct links or communication clouds (the CC WAN) [5] Computer systems connected to DSO Distribucijagas Srbija's Information Systems WAN (the IS WAN)			
	e. The SYSTEM transmits data to the following external systems: [1] Station SCADA systems located throughout the gas transport/distribution network (TSO Systems and DSO Systems)			

	[2] Control systems located at production sites. [3] Computer systems connected to a computer network linking the SYSTEM with the neighbouring utilities, Security Coordination Centres, and power pools (the CC WAN) [4] Computer systems connected to DSO Distribucijagas Srbija' Information Systems WAN (the IS WAN) [5] RTU and other field devices such as EVCs, Flow Computers, RTU.			
	f. The BCS hardware and software are the same as the PCS. The functionality of the BCS is identical to that of the PCS, unless specifically stated otherwise. Performance and capacity of the BCS is identical to that for the PCS as specified in Appendix to Technical Specifications, Section 3 and elsewhere, unless specifically stated otherwise.			
	g. External users are defined as users connecting to the SYSTEM over DSO Distribucijagas Srbija's Information Systems Wide Area Network (IS WAN). The SYSTEM includes resources dedicated to supporting these users with the specific goals of: [1] Deterministic PCS and BCS resource utilization from these users.			

	[2] Protecting the SYSTEM from unauthorized access from users with access to the IS WAN.			
	h. The External User Support System (EUS) includes user interface and IS&R servers supporting access to authorized data and displays by external users. [1] The UI servers manage all interaction with external users with effectively zero incremental utilization on the PCS or BCS for each additional external user. [2] The UI servers enforce access control security commensurate with the requirements of the point 4.2.1.1.2.6. Functional Requirements (Appendix to Technical Specifications, Section 4) [3] The EUS is updated in real-time. All data on the EUS is current to within the parameters include in User Interface Response.			
	i. Separate firewalls are required when the EUS is connected to the SYSTEM network or the IS LAN. [1] The EUS servers and the firewalls secure the SYSTEM from unintended and malicious access by users on the IS WAN. [2] It is not possible for any user on the IS WAN to directly access the SYSTEM via the EUS servers.			

	j. The PDS is initially delivered with basic database and display development and maintenance capabilities. The initial PDS includes the Contractor's standard software and support tools sufficient to perform database conversions from the existing SYSTEM. The initial PDS includes software development tools, such as compilers, source control, and development kits necessary to support porting of DSO Distribucijagas Srbija' existing or newly develop applications to the Contractor's platform.			
	k. The Contractor is responsible for the supply and implementation of all communications facilities not marked as Supplied by others in this Specification.			
	l. Local and Wide Area Networks is defined as in point 4.2.1.1.2.5.1 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	m. The SYSTEM communicates with DSO Distribucijagas Srbija' new or/and existing RTUs or/and EVCs over DSO Distribucijagas Srbija provided communication network. The SYSTEM includes RTU Front-End Processors that support the connection between RTUs and the SYSTEM. The FEP is considered as a server. The existing DSO Distribucijagas Srbija RTUs are describe in the point 4.2.1.1.2.5.2 of Functional Requirements			

	(Appendix to Technical Specifications, Section 4).			
	n. The SYSTEM includes capabilities for users outside the SYSTEM LAN to access the SYSTEM for the purposes of monitoring, analysing, and maintaining the SYSTEM. The Contractor, prior to commissioning of the SYSTEM, may use this access to support the PDS. Access over this facility is tightly controlled and shall include strong access restrictions and encryption. Virtual Private Network technology is required. The remote maintenance access and user authentication (login) procedure includes characteristic from the point 4.2.1.1.2.5.3 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	o. The SYSTEM includes a feature where a user can, with a single action, isolate the SYSTEM from the IS WAN, from the PDS and OTS, and from all external systems, it satisfies the criteria from point 4.2.1.1.2.5.4 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	p. Each of the component systems supplied (PCS, BCS, PDS) includes a clearly defined electronic security perimeter described in the point 4.2.1.1.2.6 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
2.4.2.	**Data Acquisition Subsystem**			

	The Supervisory Control and Data Acquisition (SCADA), data exchange, and data processing requirements of the SYSTEM are presented in the point 4.2.1.2 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	a. Telemetered data is collected from the data sources described in the point 4.2.1.2.1 (from [1] to [8]) of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	b. The SYSTEM supports all features of all specified protocols unless specifically stated otherwise. The SYSTEM support the following protocols: [1] IEC 61850 protocol. [2] OPC (OLE for Process Control). [3] Modbus, Modbus RTU, Modbus ASCII and Modbus TCP/IP protocols. [4] IEC 870-6-503, TASE.2 protocol.			
	c. Scan Groups [1] The SYSTEM supports all data addressing capabilities of each data source and specifically is not limited (protocol permitting) to retrieving only all data or all data of a specific type (status, analog, or accumulator) in a single scan. [2] A scan group, as used in this Specification, is defined as an addressable unit of data to be retrieved from a data source. A scan group may include one or more items of data, as defined by the			

	protocol used by the data source and its configuration. [2.1] No scan group will be defined to span more than one data source. [2.2] Each data source may include any number of scan groups and each scan group may contain any number of points, up to the limits of the protocol. [2.3] Each item of data available from each data source is assigned by DSO Distribucijagas Srbija to one or more scan groups, in accord with the capabilities of the source and the protocol used by the source.			
	d. The SYSTEM acquires data by periodic polling (master/slave relationship between the SYSTEM and the data source), by spontaneous reporting (peer-to-peer), and on demand. The SYSTEM accepts and process data transmitted as a full report and by exception.			
	e. Data Acquisition Characteristics are explained in points 4.2.1.2.1.2.1 to 4.2.1.2.1.2.8 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	f. The SYSTEM suspends acquisition of (remove from scan) any individual point, scan group, or entire data source when directed by a user.			

	[1] Suspended points, scan groups, and data sources reporting spontaneously are not processed nor stored in the database. [2] Suspended data sources acquired by polling are not polled. [3] Suspended points acquired by polling may continue to be polled from the data source, but are not processed nor stored in the database.			
	g. The SYSTEM enables acquisition of a point, scan group, or data source when directed by a user. [1] Points marked as manually substituted when acquisition is enabled are not processed or stored in the database, until the user removes the manual substitution. [2] The acquisition suspended quality code shall be removed from the affected points, and the affected points are removed from the off-scan summary. [3] Enabled points are acquired, processed, and stored in the database.			
	h. 'Telemetry failure' is defined as any of the following conditions: [1] Failure of the SYSTEM to complete a scan group data collection due to errors in the communications with the data source. [2] Failure of the SYSTEM to complete a scan group data collection prior to the next scan request addressed to the same scan group.			

	[3] Failure of the SYSTEM to complete a scan group data collection within a timeout defined for the scan group. The user is able to inhibit this failure restoration procedure (for all sources, not individually).			
	i. An RTU / EVC (EVC-Electronic Volume Corrector) Failure alarm is generated anytime all of the scan groups of an RTU / EVC fail to scan successfully for each of the corresponding scan groups configured number of retries. [1] This alarm is also generated if the RTU / EVC or all of the scan groups are removed from service. [2] This alarm is generated even when an RTU / EVC fails on a primary path and successfully connects on a secondary path if it exists.			
	j. The SYSTEM maintains a retry count for each scan group. [1] The retry count is reset whenever a successful acquisition is completed. [2] The count is incremented for each erroneous transmission from a spontaneously reporting scan group. [3] The count is incremented for each failed scan of a polled scan group. Scans of failed, polled scan groups is immediately retried (without waiting for the next periodic scan time).			

	k. The telemetry failure is declared according to point 4.2.1.2.1.4 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	l. The SYSTEM supports one of the following methods from the point 4.2.1.2.1.5 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	m. Sequence-of-events (SOE) data, time-stamped reports of status changes, are collected from appropriately configured data sources, as described in the point 4.2.1.2.1.6 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	n. Data Acquisition Eavesdropping is as described in the point 4.2.1.2.1.7 of Functional Requirements (Appendix to Technical Specifications Section 4). Selected data acquisition communications errors are reported to DSO Distribucijagas Srbija' central security logging system. These errors include but are not limited to: [1] Communication errors, such as invalid checksum or protocol violations. [2] Replies of incorrect length. The SYSTEM rejects over-length replies. This feature is specifically demonstrated during factory testing. [3] Detection of control commands, scan requests, or other central-system-initiated			

	commands not initiated from authorized systems (the PCS or BCS). [4] Unexpected replies, including incorrect replies to commands from the SYSTEM, spontaneous reports from sources not configured as spontaneously reporting, and spontaneous reports from spontaneously reporting sources that have been inhibited.			
	o. Data Acquisition Security is as described in the point 4.2.1.2.1.8 of Functional Requirements (Appendix to Technical Specifications Section 4). The data acquisition front-end processors protect the SYSTEM local network from unauthorized and inappropriate communication attempts from the field devices. [1] All IP-enabled data acquisition and control communications must be capable of authentication (host and end device) and encryption. [2] This protection is implemented for both traditional serial protocols as well as routable protocol transports. All suspicious events are reported to DSO Distribucijagas Srbija' central security logging system.			
	p. Provision is given to record all communication traffic, selectable on a communication channel basis, for the purpose of detecting unauthorized activity, unusual activity, and attempts to defeat the			

	security capabilities of the SYSTEM or its electronic security perimeter.			
2.4.3.	**TASE.2 Data Exchange** **Notice:** The Telecontrol Application Service Element (TASE.2) protocol is used for data acquisition and for the transmission of data to the computer systems of neighbouring utilities, gas network users, and gas markets connected to the Control Centre WAN. TASE.2 may be referred to as Inter-Control Centre Communications Protocol (ICCP).			
	a. The TASE.2 implementation is compliant with the IEC 870-6-503, TASE.2 Services and Protocol, and IEC 870-6-802, TASE.2 Object Models, Version 1996-08, Conformance Blocks 1, 2, 4, 5, 7 and 8, except whene noted in this section.			
	b. TASE.2 operates over the Internet Protocol (IP).			
	c. The TASE.2 implementation supports the developing 'Secure ICCP' standard, using SSL/TLS authentication with or without SSL/TLS encryption, authentication, and encryption to be based on X.509 certificates.			
	d. As a data server, the SYSTEM must send data only with associated correct quality codes (e.g., no default or stale data values or states are sent without the associated quality code indicating the data is not valid).			
	e. Conformance Blocks 1 and 2 are employed for the acquisition of telemetered data and for the transmission of telemetered data. Those blocks must be in accordance with the provisions of the			

	point 4.2.1.2.1.9.1 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	f. Block 4 is also provided. Block 4 must support the functions described in the point 4.2.1.2.1.9.2 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	g. Supervisory control between control computer systems is supported by conformance Block 5. Conformance Block 7 is used for confirmation of supervisory control actions. This block must be in accordance with the provisions of the point 4.2.1.2.1.9.3 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	h. Block 8 is provided for the bi-directional transfer of data messages between the SYSTEM and other computer systems. Block 8 must support the functions described in the point 4.2.1.2.1.9.4 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	i. TASE.2 Specification provide a detailed description of Bilateral Tables and access control. For this procurement, the Contractor provides the full access control functionality described in the TASE.2 Specification. A Bilateral Table structure (or the functional equivalent) with the required access controls is provided.			

	j. Bilateral Tables, the contents and functionality thereof is as stated in points 4.2.1.2.1.9.5, 4.2.1.2.1.9.5.1 and 4.2.1.2.1.9.5.2 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	k. The user interface includes operational tools to: [1] Monitor connection status, availability, and performance. [2] View and maintain the TASE.2 parameters. [3] Control connections and associations. [4] Create and edit data sets. [5] Create and edit bilateral tables.			
	l. Bilateral Table Creation and editing and Data Set Creation and Editing is as described in points 4.2.1.2.1.9.6.1 and 4.2.1.2.1.9.6.2 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	m. Connection and Association Control - Users shall manage TASE.2 data exchange through a graphic user interface with the features as stated in is as described in point 4.2.1.2.1.9.6.3 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	n. The TASE.2 system provides tools to allow the user to view and maintain the TASE.2 system and database.			

	Maintenance tools must have characteristics as described in point 4.2.1.2.1.9.6.4 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	o. Performance Monitoring - The TASE.2 Quality of Service (QOS) attribute provides the user with performance statistics on a connection and association basis. Performance Monitoring must have characteristics as described in point 4.2.1.2.1.9.6.5 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
2.4.4.	**Generic Data Exchange** **Notice:** The SYSTEM shall store in the real-time database the most recently acquired and processed value of: Sequence-of-events (SOE), Accumulator data, Status data, and Analog data. This data may be acquired from telemetry (refer to section 6.2) or may be generated by other means (refer to section 6.3) of Functional Requirements (Appendix to Technical Specifications Section 4).			
	a. Generic Data Exchange must be as described in point 4.2.1.2.1.10 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	b. Bulk Data Transfers - Some of the remote data sources (and their associated protocols) have the ability to receive, store and transfer certain bulk data. This data may include: Digital Fault Records, Automated station Logs, station Device Condition, Monitoring Data, station Device Configuration Data (e.g., data conversion formulas, limits, etc.), Automatic Control Equations. Bulk Data transfers must be as described in the point			

	4.2.1.2.1.10.1 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	c. Changes in the status of TASE.2 connections is reported as alarms. [1] The alarm message identifies the reasons for a loss of connection.			
2.4.5.	**Data Acquisition Features**			
	a. Non-Telemetered Data - Non-telemetered data is generated by the following means: [1] Imported from external files or applications. [2] Calculated by applications. [3] Calculated by the data processing function. [4] User entry. Unless explicitly stated otherwise, all requirements pertaining to telemetered data, such as enabling and suspending data acquisition, manual substitution, limit monitoring, state change detection, enabling and inhibiting alarms, and quality codes, also applies to non-telemetered data.			
	b. Data Processing must be in accordance with the point 4.2.1.2.2.2 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	c. Data Quality - Quality codes are attributes of database points that identify conditions			

	affecting a database point. Data Quality are in accordance with the point 4.2.1.2.2.2.1 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	d. Network Status Processor - The active/inactive state and in-service/out-of-service status of each gas network device defined in the gas network model is determined and stored in the database so that the status can be shown on displays and the mapboard. Network Status Processor are in accordance with the point 4.2.1.2.2.2.2 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	e. Determination of Energization Status and Determination of In-Service Status Processor is in accordance with the points 4.2.1.2.2.2.2.1 and 4.2.1.2.2.2.2.2 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	f. Processing of data acquired subsequent to a restart of the data acquisition and processing functions may require different processing, depending on the database used for restart and the data acquisition method used to collect the data. The Initial Scan Processing are in accordance with the point 4.2.1.2.2.2.3 of Functional Requirements (Appendix to Technical Specifications, Section 4).			

	g. Analog Data - the point 4.2.1.2.2.2.4 of Functional Requirements (Appendix to Technical Specifications, Section 4).			
	h. ADC Accuracy Monitoring - the point 4.2.1.2.2.2.4.1 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	i. Conversion to Engineering units - the point 4.2.1.2.2.2.4.2 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	j. Reasonability Checking - the point 4.2.1.2.2.2.4.3 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	k. Operating Limit Checking - the point 4.2.1.2.2.2.4.4 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	l. Rate of change checking - the point 4.2.1.2.2.2.4.5 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	m. Operating Limit Sets Operating limit sets are collections of operating limits that upon user direction, replace the operating limits currently in use. Operating Limits Sets are in accordance with the point 4.2.1.2.2.2.4.6 of Functional			

	Requirements (Appendix to Technical Specifications Section 4).			
	n. Dynamic limits - In addition to the base operating limits and other static limit sets, the user is able to select limits based on dynamic device (e.g., pipeline and control divide) ratings. Dynamic Limits Sets are in accordance with the point 4.2.1.2.2.2.4.7 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	o. Timer Based Alarm Limits - The SYSTEM includes Timer-Based Alarm processing that provides operators with automated notification when a point value violates alarm limits over a period of time. Timer Based Alarm Limits are in accordance with the point 4.2.1.2.2.2.4.8 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	p. Status Data Prior to storage in the SYSTEM database, status data is processed as follows: [1] State change detection. [2] Normal state processing. [3] State conversion.			
	q. State Conversion - Each status point telemetered from a data source is converted to a meaningful state as follows (where supported by the data source and the protocol used to communicate with the data source). State Conversion are in accordance with the point 4.2.1.2.2.2.5.1			

	of Functional Requirements (Appendix to Technical Specifications Section 4).			
	r. Normal State Processing - One of the states of each status point is designated as its 'normal' state. Normal State Processing are in accordance with the accordance with the point 4.2.1.2.2.2.5.2 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	s. State Change Detection - Each time a status value is acquired, its state is compared to the state currently resident in the database and any change of state shall be reported. State Change Detection are in accordance with the accordance with the point 4.2.1.2.2.2.5.3 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	t. Accumulator Data - Prior to storage in the SYSTEM database, accumulator data is processed as follows: [1] Accumulator substitution. [2] Limit checking. [3] Reasonability checking. [4] Conversion to engineering units.			
	u. Conversion to Engineering Units - Data sources will report accumulator points in two forms, as a continuous count value and as a resetting count value. Conversion to Engineering Units are in accordance with the accordance with the point 4.2.1.2.2.2.6.1 of Functional			

	Requirements (Appendix to Technical Specifications Section 4).			
	v. Reasonability Checking – is in accordance with the point 4.2.1.2.2.2.6.2 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	w. Operating Limit Checking - All accumulator points are compared against operating limits that define various operating ranges for the point. Operating Limits Checking - are in accordance with the point 4.2.1.2.2.2.6.3 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	x. Long Value Accumulator Quality Code - If the value of a telemetered accumulator point is not acquired because of a telemetry failure, the point are marked with a 'telemetry failure' quality code (refer to point 4.2.1.2.2.2 - Data Processing). Long Value Accumulator Quality Code are in accordance with the point 4.2.1.2.2.2.6.4 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	y. Accumulator Substitution - When an accumulator value cannot be determined, a substitute value is stored in the database. Accumulator Substitution are in accordance with the point 4.2.1.2.2.2.6.5 of Functional Requirements (Appendix to Technical Specifications Section 4).			

	z. Sequence of Events Data SOE data are in accordance with the point 4.2.1.2.2.2.7 (Appendix to Technical Specifications Section 4).			
	å. Non-Telemetered Data - Certain data in the database will not be updated from data sources or SYSTEM functions but will be manually entered by users. [1] These data points include analogue, accumulator, and status points. An event message is generated for each change made to a non-telemetered value. Non-telemetered points are marked with a 'non-telemetered' quality code, but not with a 'telemetry failure' quality code or a 'manual entry' quality code. [2] non-telemetered points are otherwise indistinguishable from telemetered or calculated points.			
	ä. Calculated Data is in accordance with the point 4.2.1.2.2.2.9 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	ö. Calculation Suspension and Quality Codes - Data is in accordance with the point 4.2.1.2.2.2.9.1 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	aa. Generalized Calculations - is in accordance with the point 4.2.1.2.2.2.9.2 of Functional Requirements (Appendix to Technical Specifications Section 4).			

	bb. Processing of Calculated Data - is in accordance with the point 4.2.1.2.2.2.9.3 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	cc. Not-Commissioned Data - are in accordance with the point 4.2.1.2.2.2.10 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	dd. Redundant Data Processing - is in accordance with the point 4.2.1.2.2.2.11 of Functional Requirements (Appendix to Technical Specification Section 4).			
	ee. Alarms may be generated by any SYSTEM function, including the processor and device failure detection functions described in section Configuration Control, Redundancy, and Failure Management. [1] Users may indicate that they have taken action on the alarm by acknowledging the alarm. [2] Alarms, when initially detected, are marked as 'unacknowledged'.			
	ff. Events are conditions that may be recorded by the SYSTEM, but that do not require annunciation or action, including acknowledgement, by users. [1] For that purpose, events are considered as a special case of alarms, where the event is intended only to record information. Events may be generated by the same functions as alarms. Alarms are subjected			

	to a series of alarm processing actions and user interactions. [2] Those actions to be executed are determined by the AOR assigned to that database item that is exhibiting the alarm condition and by the alarm class also assigned to the database item. Each database item may be associated with several alarms.			
	gg. Each alarm is assigned to a single alarm class that determines how the following alarm presentation and management characteristics are to be employed according to point 4.2.1.2.2.3.1 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	hh. Alarm messages is a single line of text describing the alarm that has occurred. Each alarm message includes: [1] The ability to define 'hypertext' or URL addressable links. [2] The value, state, or condition of the item changed before and after the alarm. [3] A clear (non-coded) description of the alarm. [4] A complete identification of the database point. [5] The time and date of the alarm. (Alarms from previous days are clearly identified).			

	Distribucijagas Srbija is able to modify alarm message formats and define new formats.			
	ii. The alarm window provides a visual indication of alarm conditions in every AOR assigned to the user. [1] Cursor selection of the indicator for a data source or application calls to the screen an alarm list filtered for that data source or application. [2] Acknowledgement of all the alarms of the data source or function modifies the attributes of the indicator to indicate the presence of only acknowledged alarms. [3] When an unacknowledged alarm is present in any data source or function, the indicator is displayed and flashing, colour, or other highlighting is used to draw the user's attention to the indicator. [4] Indicators for data sources and functions with no alarm conditions present is not visible.			
	jj. Alarms for any database item or application function condition are acknowledged by user action on any display presenting the alarm and programmatically. Alarms are acknowledged both individually and by groups of multiple alarms. Page acknowledgement is supported only on the alarm summary display and affects only those alarms visible within the window at the time the acknowledge action is commanded. Requirements are described			

	in the point 4.2.1.2.2.3.4 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	kk. Alarms for any database item or application function condition are deleted by user action on any display presenting the alarm and programmatically. Alarms are deleted both individually and by groups of multiple alarms.			
	ll. Page deletion is supported only on the alarm summary display and shall affect only those alarms visible within the window at the time the deletion action is commanded. All these requirements are described in the point 4.2.1.2.2.3.5 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	mm. Inhibiting and enabling of alarm annunciation for any point is possible only by user command. Alarm inhibit and enable operations are reported as events. When inhibited, alarms for the point are detected and processed and the database attributes for the alarm condition is set. [1] Alarms detected subsequent to an inhibit action is not enunciated when alarming is enabled. [2] Alarm conditions and messages existing at the time of an inhibit action remain as before the action. [3] Alarms detected while the point is in alarm inhibit are not enunciated nor presented on the alarm summary.			

	nn. Silencing, suppressing and enabling of audible alarm annunciation is possible only by user command.			
	oo. A configurable timer limiting the duration that audible annunciations may be suppressed is provided.			
	pp. Additional features for alarm management is provided. The enhanced alarm management function includes items of point 4.2.1.2.2.3.8 of Functional Requirements (Appendix to Technical Specifications Section 4).			
2.4.6.	**Supervisory Control** **Notice:** The SYSTEM issues supervisory control commands to field devices when directed by a user or an application program. The Supervisory Control is presented in more detail in the point 4.2.1.3 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	a. The SYSTEM supports the supervisory control of devices that can only be commanded to one state. It is not possible to select a command into the second state for these devices.			
	b. The SYSTEM supports the supervisory control of devices, such as valves, that can be commanded to either of two states. Three-state points may also be commanded into one of two states.			

	[1] It is not possible to select a command to a third or fourth state for three-state points.			
	c. Selected two- and three-state switching devices or valves are designated as 'delayed close' points. The procedure for controlling these devices is the same as that of a switching device or valve except that subsequent supervisory control actions for the same device is inhibited for a specified interval after the switch or valve has been opened. [1] The initial value of the delay is determined by DSO Distribucijagas Srbija individually for every device subject to delayed close and is stored in the database with the definition of the control command. [2] If a user attempts to operate the device prior to expiration of the time interval, the error is managed as a permissive check failure. [3] Commands subsequent to a close command is allowed immediately (without waiting for the delay).			
	d. The SYSTEM supports the supervisory control of devices, where the supervisory control command specifies the desired operating point as a continuous (not discrete) value. The user command sequence allows the user to enter the desired operating point, typically in engineering units.			

	Control actions that would result in movement of the device beyond its defined operating range are rejected. [1] A message indicating that the requested control action exceeds the operating range is issued. [2] The operating range is defined by DSO Distribucijagas Srbija individually for each device and is stored with the definition of the device. As part of the setpoint definition, the programmer/engineer is able to define a periodic refresh automatically on a timed or triggered basis. [1] A means to individually define a deadband value and a delay between successive controls is provided for each setpoint. An analogue feedback for each setpoint is able to be defined. An alarm is issued if the feedback point does not match the setpoint output within a certain period of time after the control is set and periodically thereafter. The timeout for the alarm is configurable per setpoint.			
	e. The Automatic Supervisory Control (ASC) function enables multiple supervisory control commands to be programmed for automatic execution in a predefined sequence. The following manipulation of ASC sequences is possible and ASC commands to be supported include items of point 4.2.1.3.5 of Functional Requirements			

	(Appendix to Technical Specifications Section 4). The initiation of an ASC sequence is recorded as an event is also described in the same section.			
	f. Control Completion Check is in detail presented in the point 4.2.1.3.6 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	g. Execution of selected supervisory control commands is dependent on passing a control permissive check. The presence of any, all, or none of the following conditions for the selected device is deemed as a failure of the check, only selected devices that will be specified with the permissive status value, and permissive check fails are described in the point 4.2.1.3.7 of Functional Requirements (Appendix to Technical Specifications Section 4). Where a supervisory control action is initiated by a Contractor or DSO Distribucijagas Srbija-supplied application, the interface includes features to report the presence of a control inhibit tag and to accept override commands from the application.			

2.5. Functional Requirements > Software

Notice: The SYSTEM shall run on a standard third-party operating system capable of being locked down from a security perspective. Operating system software is a standard product and shall not be modified by the Contractor. The distributed computing environment is able to use both local area networks and wide area networks transparently, such that there will be no restrictions on the geographic dispersal of applications and data among the servers of the SYSTEM.

	a. System Services - System services provide facilities to the application systems that run in the computing network.			
	b. Global Naming Service - Objects of interest in the computing network are assigned names in a global directory. Such objects are servers, peripheral devices, and users. The global naming service allow users to reference computing network objects in the directory both by name and by type of service.			
	c. Network file service, scheduling services, time services, print services, distributed backup and archiving, email are to be implemented as described in points 4.2.1.4.1.2 through 4.2.1.4.1.7 of the Functional requirements (Appendix to Technical Specifications Section 4).			
2.5.1.	**Application and System Development** **Notice:** An application, as used in this section, shall mean a module of functionality such as data acquisition. An application shall consist of various components such as executable application images, user interface definitions (displays and display interactions), data sets, messages, and reports, all working together to deliver a particular functionality.			
	a. Programming interfaces and software configuration management are to be implemented as described in points 4.2.1.4.2.1 thru 4.2.1.4.2.2 of the Functional requirements (Appendix to Technical Specifications Section 4).			
	b. Compilers - Compilers with code optimization features are provided for all programming languages used in the System. Compilers conform to the latest			

	applicable standards (ANSI, DVGW and IEEE standards). Program source code utilize symbolic interfaces for all application system services. The compiler provides extensive error checking facilities, explicit error messages, and complete output listings.			
	c. Interactive Debugger - An interactive debugger product is supplied that, as a minimum, includes full or selective (interpretative) trace, memory alter and dump, snapshot with or without memory dump, and search capabilities. The interactive debugger sutilize symbolic references to statements and variables. The interactive debugger provides simultaneous presentation of the source code with an indication of program flow (that is, an indicator showing the currently executing statement).			
2.5.2.	**Diagnostics** **Notice:** The SYSTEM shall include all diagnostic software provided by the manufacturers of all hardware, including servers and peripheral devices, supplied with the SYSTEM. The SYSTEM shall also support error detection and diagnostic tools sufficient to support the requirements of this section.			
	a. Diagnostics for communications data sources and computer systems external to the SYSTEM provides at least the following capabilities: [1] Select any communications channel for test. [2] Select a request message for transmission to data sources and computer systems.			

	[3] Select single or cyclic message transmissions to data sources and computer systems for test purposes. [4] Monitor and display information sent to and received from data sources and computer systems. [5] Monitor and display data communication device status. [6] Provide communication statistics including the number of errors, retries, bytes transferred, etc.			
	b. The communications diagnostics include a "trace" facility for messages as they are sent and received. [1] The trace facility traces a selected set of or all logical channels, and provides explicit trace information at each level of the protocol stack. [2] It is possible to trigger the trace facility manually as well as by program status flags and inter-program messages. [3] The level of detail included in the trace is triggered by incoming or outgoing message contents on one or more logical channels, or by any of the methods described.			
2.5.3.	**Critical Infrastructure Protection** **Notice:** All security functions required by this specification must be implemented in a non-interfering manner, such that authorized and legitimate use of the SYSTEM is not hampered, nor is the ability to perform required functions impeded by the security features.			
	a. Appropriate use banner - Users accessing the SYSTEM through interactive or			

	maintenance access is presented with an 'Appropriate Use Banner', prior to logon, the banner contents as provided by DSO Distribucijagas Srbija.			
	b. Secure maintenance access to the operating environment is provided for both remote and local users. [1] The access provides authentication of valid users without transmitting plain-text passwords on the network. [2] An encrypted access mechanism such as SSH is used for 'command line' access to POSIX nodes. [3] Secure file copy features included in SSH is used to manually transmit files between nodes when using the network.			
	c. Authorization process - The Contractor maintains lists of all authorized personnel with access to the SYSTEM while on site at the Contractor's development site, including their specific electronic and physical rights to the systems, servers, or databases, and a date for which access will be terminated. DSO Distribucijagas Srbija is informed of all changes to the list.			
	d. Authentication methods and password construction, disable unused services, software updates and virus scan, free of "electronic self-help" enabled software, detection of unauthorized modifications to software, anti-virus and malware detection software, security access monitoring, generic and default accounts and user			

	authentication are tpoints sections 4.2.1.4.4.4 thru 4.2.1.4.4.12 of the Functional requirements (Appendix to Technical Specifications Section 4).			
2.5.4.	**Data Architecture** **Notice:** The data architecture of the SYSTEM shall include facilities for storage of data defining the state of the gas network and parameters that determine the operation of the SYSTEM.			
	a. Real-Time data access is to be implemented as described in point 4.2.1.4.5.1 of the Functional requirements (Appendix to Technical Specifications Section 4).			
	b. The Gas Distribution Network Model data is stored in a real-time database supporting relational data concepts, providing fast data access in order to meet the SYSTEM performance requirements. The Gas Distribution Network Model complies with gas industry asset modelling standards. The Contractor must provide reference to standards applied for the SYSTEM. The SYSTEM provides an abstract object/data model for DSO Distribucijagas Srbija' observable Gas Distribution Network Model, including network assets, respective status information, calculated data, application result data, and incidental data required for the SYSTEM to perform its specified functionality. The Gas Distribution Network Model is capable of modelling relevant portions of systems to which the SYSTEM is interfaced. The SYSTEM Services provides the generic interfaces			

	required to access and use said model and the data contained within the model.			
	c. Gas Distribution Network Model Database Features - The SYSTEM implementation provides support for network model databases of different size and level of modelling details. The structure of tables, views, data relations of the Gas Distribution Network Model in the SDB is generated from an industry standard model database generation utility, which will apply a documented approach for data structures, database access, data editing, data area population, database maintenance, data validation, and error reporting. The SCADA, planning, network analysis, and user interface and information exchange applications are intended to strictly use the real-time database or direct derivatives thereof. The database supports all real time and study network-oriented application functions specified in these Technical Specifications. Information and data that is common among SYSTEM functions is entered only once.			
	d. Data Naming - Data items in the SYSTEM databases is identified using a consistent naming scheme for all the applications. Data items representing gas network device attributes, including telemetered data and supervisory control outputs, accommodates DSO Distribucijagas Srbija's existing naming convention. The			

	existing naming convention includes the following components: [1] Station or line name: 16 alphanumeric characters, upper and lowercase. [2] Pressure: 4 numeric characters, plus an optional decimal point. [3] Device name: 16 alphanumeric characters, upper and lowercase. [4] Device attribute: 6 alphanumeric characters, upper and lowercase (such as 'MW', or 'HITemp').			
	e. Database development and maintenance, save cases and working areas, adjustable parameters and data conversion are to be implemented as described in points 4.2.1.4.5.4 thru 4.2.1.4.5.7 of the Functional requirements (Appendix to Technical Specifications Section 4).			
2.5.5.	**Configuration Control, Redundancy, and Failure Management** **Notice:** The ability of the SYSTEM to perform its specified tasks under normal conditions and under conditions of hardware and software failure is of paramount importance to DSO Distribucijagas Srbija. This section presents requirements for monitoring and managing the SYSTEM hardware and software.			
	a. SYSTEM Management - is to be implemented as described in point 4.2.1.4.6.1 of the Functional requirements (Appendix to Technical Specifications Section 4).			
	b. Server and device states identifies the operating condition of each server and peripheral device of the SYSTEM and is used to determine the system's reaction			

	when restart and failover operations take place. The definition of states will depend on the Contractor's SYSTEM design. The following states, or their equivalent, are supported: [1] Primary: A primary server or device performs any or all of the SYSTEM functions [2] Backup: A backup server or device replaces a primary server or device in the event of primary failure or upon user command [3] Down: A down server or device is not communicating with other elements of the SYSTEM and is not capable of participating in any SYSTEM activity			
	c. Server and device interconnections and backup databases are to be implemented as described in point 4.2.1.4.6.3 through 4.2.1.4.6.4 of the Functional requirements (Appendix to Technical Specifications Section 4).			
	d. Error Detection and Failure Determination - All servers, devices, and functions are monitored for fatal and recoverable errors. All detected errors and failures are recorded centrally for maintenance purposes. These records include the dates and times of the failures, the reason for the failure, and of the subsequent automatic or manual return to service.			
	e. Server and Device Errors - All fatal and recoverable errors of all servers operating			

	in the primary and backup states sre detected. [1] Each type of recoverable error is assigned a threshold. [2] When the count of recoverable errors exceeds this threshold, a fatal error is declared. [3] Where multiple devices share a common communication channel, such as party-lined RTUs, the quantity of failed devices that constitute failure of the communication channel are individually specified for each channel.			
	f. Software Errors - Execution errors in functions that are not resolved by program logic internal to the function are considered fatal software errors. The errors that may be resolved by internal program logic include failure of a function to achieve a solution due to violation of an iteration limit or arithmetic errors (such as division by zero). These errors produce an alarm informing the user of the error but are not considered fatal software errors. Fatal software errors result in either termination of the function or are handled as a fatal server error. [1] The action to be performed are defined for each function. [2] If the function is to be terminated, future executions of the function are inhibited until the function is again initiated.			

	g. Reasonability of data - All data checked for reasonability. [1] All input data and parameters, whether collected automatically or entered by a user, is checked for reasonability and rejected if they are unreasonable. [2] All intermediate and final results are checked to prevent unreasonable data from being propagated or displayed to the user. When unreasonable input data or results are detected, diagnostic messages, clearly describing the problem, is generated. All programs and the system continues to operate in the presence of unreasonable data. All calculations using the unreasonable data is temporarily suspended or continue to use the last reasonable data. A flag indicating this status is presented.			
	h. Server redundancy and failure management, function restart, server failover, server start-up and system power-on start-up are implemented as described in points 4.2.1.4.6.6 through 4.2.1.4.6.6.4 of the Functional requirements (Appendix to Technical Specifications Section 4).			
	i. Device redundancy and failure management, device failover, device reinstatement are implemented as described in points 4.2.1.4.6.7 thru 4.2.1.4.6.7.2 of the Functional requirements (Appendix to Technical Specifications Section 4).			

	j. Inter-Site Switchover is implemented as described in point 4.2.1.4.6.8 of the Functional requirements (Appendix to Technical Specifications Section 4).			
2.5.6.	**Hardware** Definitions: [1] Communications processors [1.1] Requirements applied to servers also apply to communications processors. [1.2] Communications processors may also be referred to as front-end processors (FEPs) or CNPs (communications network processors). [1.3] Servers dedicated largely to communications with other computer systems or with data sources. [2] Workstation [2.1] Requirements applied to servers also apply to workstations only if the workstation executes applications other than the user interface. [2.2] A peripheral hosting graphical user interface functionality: the GUI. [3] Servers [3.1] Requirements applied to servers are deemed to apply to the server resources collectively, not individually (individually to each processor). [3.2] A server may include multiple processors. [3.3] Servers are general-purpose computing devices dedicated largely to the execution of SYSTEM applications.			

	a. Archive storage devices is used for backup of the SYSTEM data and software and archival storage for the Information Storage and Retrieval functions. LTO (Linear Tape-Open) media storage are provided for general back-up purposes and short-term archiving. [1] The LTO drive has sufficient capacity for a complete backup of the SYSTEM data and software (including all source code) without requiring user action to replace filled recording media. A media changer that accepts industry-standard media handling commands is preferred. The SYSTEM includes rewritable single-platter DVD (digital versatile disk) drives for long-term archive storage. The DVD drives also read CD-ROM media.			
	b. Time facility is to be implemented as described in point 4.2.1.5.2 of the Functional requirements (Appendix to Technical Specifications Section 4).			
	c. User Interface Equipment - The user interface includes all hardware necessary to facilitate optimum user communication with the SYSTEM and to efficient operational control and monitoring of the gas network.			
	d. Workstations, monitors, keyboard and cursor control and audible alarm are implemented as described in points			

	4.2.1.5.3.1 through 4.2.1.5.3.1.4 of the Functional requirements (Appendix to Technical Specifications Section 4).			
	e. Printers and video hardcopy - All printers have the following characteristics and features: [1] TrueType or OpenType character set support. [2] Paper input and output trays of at least 500-sheet capacity. The printer accommodates letter (8.5 by 11 inches), legal (8.5 by 14 inches), and A4 (210 by 297 mm) paper. [3] A minimum black and white print engine speed of at least 20 pages per minute. [4] A minimum resolution of 600 dots-per-inch. [5] Adobe' PostScript' language support. [6] Desktop mounting enclosure. Colour printers are provided for video hardcopy and have the following additional characteristics: [1] A minimum colour print engine speed of at least 10 pages per minute. [2] Colour calibration facilities. Printers are interfaced with the SYSTEM LAN. Parallel or serial USB port connections to a processor are not acceptable.			

	f. Other Peripheral Devices - The Contractor supplies any other peripheral devices or equipment normally provided for operation, software support, and maintenance of the SYSTEM.			
	g. Operating and Construction Requirements - The servers include facilities for orderly shutdown and resumption of server operation upon detection and subsequent resumption of power. Each server include: [1] Includes a single, at least 17-inch, colour server terminal. [2] Be one of multiple servers switched via a KVM (keyboard, video, and mouse) switch or remote server control utility into a single (preferably rack-mounted) colour server terminal. The terminal will be used for access to the operating system and other server and network management tools. All SYSTEM equipment operate and be constructed in accordance with the following requirements.			
	h. Power distribution and protection, environment, equipment noise, enclosures, assembly and component identification, enclosure grounding, interconnections and finish colours are to be implemented as described in points 4.2.1.5.5.1 thru 4.2.1.5.5.8 of the Functional requirements (Appendix to Technical Specifications Section 4).			

2.5.7.	**Servers**			
	The SYSTEM servers apply the latest IT technology to enable perpetually redundant main server site <> standby server site architectures. Failover does not result in perceivable user operation suspension. Server computers assert the latest "virtualization" techniques. The virtualization methods is used to configure the server systems as computing clusters with broad flexibility as far as geographical location,			
2.5.8.	**Communications**			
	a. Communications processors satisfies the general requirements for servers. Communications processors is software-compatible with other servers in the SYSTEM. Contractor provides communications processors that use commercially available hardware for communication channel interfaces.			
	b. The Contractor is responsible for implementing the SYSTEM LAN and the connections to the IS WAN and the Control Centre Network (CCN).			
	c. The SYSTEM LAN is based on Ethernet (IEEE 802.3). The Contractor provides all SYSTEM LAN cabling. Category 6/6a/7 UTP cabling is used. Where redundant LANs are required, each LAN is implemented with a separate hardware (switches, firewall, routers, etc.), including chassis and power supply.			

	[1] UTP cable colouring differentiates the redundant LANs. Where modular network hardware is supplied, the circuit boards is hot swappable, such that it is not necessary to power down the entire chassis in order to replace a single card. [1] The network design provides dedicated bandwidth for each LAN segment (switched technology) and facilitate the addition of future LAN segments. On-line reconfiguration and enhancement of network hardware and software is supported via password-protected administrative interface. The network hardware supports the configuration management tools describes in point 4.2.1.4.6.1 entitled SYSTEM Management of Functional Requirements (Appendix to Technical Specifications Section 4).			
	d. Communications with RTUs and other data sources will be carried over the Data Acquisition (DA) networks. [1] The DA networks can be divided into a DA WAN.			
	e. Communications Network Processors is supplied to support communications among control computer systems over the CCN using the IEC 870-6 (TASE.2) protocol. The Contractor is responsible for the connections from the SYSTEM to the CCN.			

	[1] The SYSTEM connects to the CCN via a 1000BASE-T Ethernet interface or higher (10GBASE-T).			
	f. IS WAN must be as described as in the point 4.2.1.6.2.4 of Functional Requirements (Appendix to Technical Specifications Section 4).			
	g. The SYSTEM communicates with data sources (RTUs and other sources) over network channels.			
	h. These DSO Distribucijagas Srbija-provided circuits will be carried over combinations of leased Digital Links (64kbps) (Released over copper or fiber optic cable) and of leased Private APN in GPRS/3G/UMTS/LTE mobile network by on other Telecommunications Service Provider. The following configuration is assumed for communications with RTUs over the DA WAN: [1] The DA WAN is dedicated to data acquisition traffic. [2] The DA WAN is connected to communications processors (CPs, also referred to as CNPs or front-end processors). This connection is separate from the CP connection to the SYSTEM LAN. [3] The CPs connects to the DA WAN via a 100BASE-T / 1000BASE-T Ethernet interface.			

2.6. Functional Requirements > Service Features				
2.6.1.	**User Interface Features** **Notice:** The principal interface between users and the SYSTEM are the workstations. Printing devices and a video projection system is also part of the interface between the users and the SYSTEM. The following definitions applies:			
	a. Cursor Targets: A pushbutton-like area on displays that the user 'operates' (typically, by pushing a mouse button) to interact with the SYSTEM. Other requirements are described in the point 4.2.2.1 of the Functional requirements (Appendix to Technical Specifications Section 4).			
	b. World Coordinate Space: A world coordinate space is a device independent Cartesian coordinate system -used for specifying graphical input and output.			
	c. Display: A display is the image selected by the user for view on a screen or within a window. A display may be part of a world coordinate space.			
	d. Window: A window is that area of a screen where a display is presented.			
	e. Screen: A screen is the full physical display area of a monitor.			
	f. Workstation: A workstation is an operating position consisting of one or			

	more monitors and user interaction devices.			
2.6.2.	**User Interface** **Notice:** User workstations are presented as part of a component system. The arrangement must be flexible to support varying staff and locational requirements associated with off-prime shifts, storm support, or emergency operations due to the loss of a control centre. Also, the design of the proposed system is flexible to allow DSO Distribucijagas Srbija to add, delete, or move user interface devices, peripheral equipment or control centres as determined by business needs. The support of these control room fundamentals leads to an underlying requirement for 'locational independence'. For the user, this means:			
	a. [1] A UI client should be able to logically connect to any component of the SYSTEM [2] A user's Role (permitted areas of responsibility and associated functional permissions) must be based on the user's login user id, not on the user's physical connection or location (it is noted however that certain functions, e.g., control actions may need to be limited to secure facilities). [3] Workstations operates as common facilities shared among all component systems. [4] Any workstation is allowed to be assigned (logically connected) to any SYSTEM component assuming that a suitable communications path exists between the workstation and the component system.			
	b. The graphics system supplied with the SYSTEM executes on all workstations provided by the Contractor and on DSO Distribucijagas Srbija-supplied personal computers running the latest operating systemusing commercially available Graphical User Interface (GUI) software			

	products. DSO Distribucijagas Srbija build a display only once, after which it operates on any workstation. DSO Distribucijagas Srbija is not have to develop multiple versions of displays for each type of workstation or for different GUI products included with the SYSTEM. Other parts of the UI are implemented as requirements described in the point 4.2.2.1.2.1 through 4.2.2.1.2.3 of the Functional requirements (Appendix to Technical Specifications Section 4).			
	c. A mechanism for defining and controlling user access to the SYSTEM is provided. This security scheme is provided in addition to that included with the operating system. That is, even though a user has logged onto the SYSTEM network or a processor, access to the SYSTEM functionality is subject to additional security checks. The user login, remote operation access and access security management is implemented as described in the point 4.2.2.1.2.4.1 through 4.2.2.1.2.4.3 of the Functional requirements (Appendix to Technical Specifications Section 4).			
	d. Windows, display selection, list displays, scaling and translation, supervisory control initiation, data entry, user action recording, interlocks, memos, inactivity timeout and user guidance are to be implemented as described in points 4.2.2.1.2.5 through 4.2.2.1.2.16 of the			

	Functional requirements (Appendix to Technical Specifications Section 4).			
2.6.3.	**Display Generation** **Notice:** The prevalent interface for using the SYSTEM is operating workstations displaying gas network or related business information. While additional requirements are included elsewhere in this Technical Specification Document (most prominently in sections pertaining to User Interface), subject displays is generated by the SYSTEM in accordance with specifications set out in this section.			
	a. Network Operational Displays (DSO Distribucijagas Srbija built) - Applying graphic design facilities provided by the Contractor DSO Distribucijagas Srbija will provide the displays and they are as described in points 4.2.2.1.3.1.1 through 4.2.2.1.3.1.4 of the Functional Requirements (Appendix to Technical Specifications Section 4). The SYSTEM shall support the development and integration of these displays. The display features presented below are supported by the SYSTEM. DSO Distribucijagas Srbija only has to draw these displays once.			
	b. System/Application Displays (built by Contractor) - The Contractor provides the displays and they must be as described in points 4.2.2.1.3.2.1 through 4.2.2.1.3.2.4 of the Functional Requirements (Appendix to Technical Specifications Section 4). All Contractor-provided displays presents data using data names defined by DSO Distribucijagas Srbija.			
	c. Summary displays are list displays presenting gas network and SYSTEM conditions to the users. Unless indicated otherwise in the following specific			

	requirements for individual summary displays, user interaction with the displays is limited to filtering and sorting of the data presented in the displays. The SYSTEM supports filtering by: [1] Point type [2] Date and time [3] Alarm class [4] Point name [5] Location (e.g., station or site) [6] AOR The SYSTEM supports 'wildcard' filters. All other functionalities must be as described in points 4.2.2.1.3.2.5.1 through 4.2.2.1.3.2.5.9 of the Functional Requirements (Appendix to Technical Specifications Section 4).			
	d. Station tabular, communication maintenance displays, application program display and other displays are to be implemented as described in points 4.2.2.1.3.2.6 through 4.2.2.1.3.2.9 of the Functional Requirements (Appendix to Technical Specifications Section 4).			
2.6.4.	**Interactive Operational Information Generation**			
	a. Trending - the SYSTEM includes tools and applications to enable the creation of common graphical representation of database values for real-time, historical or both timeframes. The graphical			

	representation tools and applications basic capabilities includes: [1] User definition of new variables or fields and corresponding observations or records based on mathematical and/or logical combinations of existing SYSTEM database variables or fields and corresponding observations or records. [2] User selection of existing SYSTEM database variables or fields and corresponding observations or records for each variable or field. [3] Capturing and presenting entire populations of SYSTEM data or user defined samples of SYSTEM data. The graphical representation tools and applications are capable of handling the following data types described in point 4.2.2.1.5.1 of the Functional Requirements (Appendix to Technical Specifications Section 4).			
	b. Historical Data Playback - the SYSTEM includes the ability to perform historical playback of alarms and point updates (status, values, tags, quality codes, etc.). [1] User playback controls (pause, rewind, fast forward, etc.) provided. [2] The user is able to move forward and backward through the disturbance file or other historical data and the corresponding alarms and data updates is shown on the display as they occurred in time. [3] The user is able to select start and end dates and times from continuous data			

	recording, the historical alarm and event file, or other selected data from the Information Storage and Retrieval functions (Reference Section Historical Information Services) and have the data shown visually on a graphical representation of the system.			
	c. Tagging - Tags are conditions applied to database values in order to call the users' attention to exception conditions for field devices and to inhibit supervisory control actions and is to be implemented as described in points 4.2.2.1.5.4.1 through 4.2.2.1.5.4.2 of the Functional Requirements (Appendix to Technical Specifications Section 4).			
	d. Display Hardcopy - The SYSTEM prints a copy of a window on any workstation when commanded by a user. [1] Colour displays translated to grey scale for black and white printers using a mapping table (or other, similar technique) that can be changed by the user. [2] The output is directed to a printer of the user's choice. The display hardcopy function does not inhibit the workstation from normal operation after a copy is requested, even when multiple users issue simultaneous hardcopy requests. The hardcopy devices correctly prints all fonts supplied with the User Interface. A facility to copy screens and/or a selected window and save in a proper format.			

2.6.5.	**Information Storage and Retrieval**			
	a. IS&R Data Collection - IS&R collection and storage is divided into methods. [1] An IS&R retrieval request make use of all collected data available in the IS&R regardless of what collection methods are used. [2] The SYSTEM allows DSO Distribucijagas Srbija to define multiple collection methods for an IS&R data item, the IS&R values of an analog point can be defined to be collected periodically and continuously. [3] The SYSTEM supports these IS&R collection methods: [3.1] Continuous. [3.2] Event. [3.3] Demand. [3.4] Periodic. [4] A method is defined by the type of data collected and stored and the periodicity of collection.			
	b. IS&R Data definition, data buffering and latency, periodic data collection are to be implemented as described in points 4.2.2.2.1.1 through 4.2.2.2.1.3 of the Functional Requirements (Appendix to Technical Specifications Section 4).			
	c. Demand Data Collection The demand data collection method is similar to the periodic			

	method with the exception that each collection is initiated through a programmatic interface. [1] The interface returns a success/failure indication to the calling program. [2] The interface facilitates initiation of single (demand) execution of the collection of a collection set specified in the calling parameters. A demand data collection set is defined by a list of the data items to be collected and the minimum number of collections (snapshots) to be retained in the IS&R data store. [1] There is no limit on the number of data items to be included in any set nor on the number of sets defined in the SYSTEM. The data to be collected includes status, analogue, and accumulator data, including calculated data. [1] The data collected includes the quality codes of the point. [2] The data collected is sufficient to identify the data point and its value at the time it was collected, the time of the collection, and whether the resultant state was the normal state for the point (status points only).			
	d. Even data collection, continuous data collection, data compression are to be implemented as described in points 4.2.2.2.1.5 through 4.2.2.2.1.7 of the			

	Functional Requirements (Appendix to Technical Specifications Section 4).			
2.6.6.	**IS&R Data Storage** **Notice:** The time stamps of data stored in IS&R shall include sufficient information to convert the time to local time, including consideration of daylight savings time changes and leap years. For the purposes of this IS&R function, 'on-line' data is defined as data available within IS&R without requiring mounting of archive (storage) media.			
	a. [1] Data older than the retention period is transferred to archival storage. [2] The retention period given in the dimensioning table in the point 5.1.3 – Appendix to Technical Specifications, Section 5, is the minimum length of time the data is kept on-line. [3] Data stored on such media is considered archive or off-line data. IS&R data remains in the IS&R data store until deleted by specific user action. [1] Removal of data item from the source database or the real-time database is not result in removal of the data from the IS&R store. The addition of attributes to the data previously stored does not affects access to the data. [1] Attribute addition are: [1.1] An attribute that will be local to the IS&R only and might be used by applications running off of the IS&R data. [1.2] An attribute, such as a new quality code, which is to be transferred to IS&R along with the previously defined values			

	and attributes. Data stored in IS&R is identified as fixed or editable. The user is able to define whether a value is fixed or editable. [1] A quality code is attached to any data that has been altered subsequent to its initial entry in IS&R. This code shall be separate from the manual substitution quality code. [1.1] All changes are logged with the initial and modified value, user, and time the value was changed. [2] Fixed data is not editable via any functions supplied with the SYSTEM. [2.1] Editable data may be modified by SYSTEM functions. [2.2] Fixed data includes an attribute such that an application accessing the data can determine its fixed nature. [2.3] Fixed data written to the IS&R data store remains unaltered until deleted from the data store.			
2.6.7.	**Disturbance Recording**			
	a. Disturbance Data Set - The SYSTEM provides a facility for DSO Distribucijagas Srbija to define a set of data points to be grouped under a Disturbance Data Set. Any data point within a Disturbance Data Set can be defined as a disturbance detection point. [1] Multiple disturbance detection points within a Disturbance Data Set are allowed.			

	A data point can be included in any number of Disturbance Data Sets. The number of Disturbance Data Sets and the maximum number of data points within a Disturbance Data Set are presented in the point 5.1.3 – Appendix to Technical Specifications, Section 5.			
	b. Disturbance Detection - DSO Distribucijagas Srbija is able to define a disturbance trigger condition for each Disturbance Data Set. [1] Initial registration of a disturbance is discarded if the trigger condition has been reverted within a time period defined by DSO Distribucijagas Srbija. [2] Disturbance trigger conditions includes the following: [2.1] Violation of an analogue limit which can be set by DSO Distribucijagas Srbija. [2.1.1] The analogue limit can be different from the alarm limits of an analog point. [2.2] The change of state or analogue value into alarm for a selected alarm point. [2.3] Unauthorized change of state of selected switching devices. [3] The disturbance trigger condition shall consist of a logical combination of state change and/or analog value change of the disturbance detection points. The time associated with the detection of a disturbance is automatically recorded upon detection of the trigger condition.			

	The SYSTEM notifies the operator when a disturbance has been detected.			
	c. Disturbance Data Period - Disturbance Data Period consists of contiguous pre-disturbance and post-disturbance periods. For each Disturbance Data Set, DSO Distribucijagas Srbija is able to define the duration for the predisturbance period, and possibly a different duration for the post-disturbance period.			
	d. Disturbance Data - Disturbance Data is the data that has already been captured with the Continuous Data Collection method during the Disturbance Data Period. If the IS&R employs a data compression scheme, data compression is disabled for the Disturbance Data Period to ensure no loss of accuracy. Users are able to view disturbance data on displays and printed reports for after-the-fact disturbance analysis.			
	e. Disturbance directory, disturbance data retrieval and presentation are to be implemented as described in points 4.2.2.2.3.5 through 4.2.2.2.3.6 of the Functional Requirements (Appendix to Technical Specifications Section 4).			
2.6.8.	**IS&R Data Calculation**			
	a. IS&R performs predefined calculations on IS&R data: [1] At the completion of a periodic data collection.			

	[2] When triggered by an application program. [3] When initiated by a user. [4] At specified periodicities. The calculations are defined by SYSTEM users and stored in the IS&R. IS&R accepts all IS&R data as inputs to the calculations, including the results of previously calculated data. IS&R preclude the writing of calculated data into the data stores of fixed data. Other parts of IS&R Data Calculation are described in point 4.2.2.2.4 of the Functional Requirements (Appendix to Technical Specifications Section 4).			
2.6.9.	**IS&R Data Presentation** **Notice:** Requirements for IS&R user interface are presented as requirements for retrieval of data from the database, general requirements for presentation on displays and reports, and specific displays to be provided by the Contractor.			
	a. Data Retrieval - IS&R complies with the latest Structured Query Language (SQL) standard for retrieval of data into applications. IS&R supports ODBC (Open Database Connectivity), with proven compatibility with the common productivity software.			
	b. General IS&R UI Requirements – must be implemented as its described in point 4.2.2.2.5.2 of the Functional Requirements (Appendix to Technical Specifications Section 4).			

	c. Reports - The Contractor provides report building tools that support ad hoc data retrieval reports as well as periodic and on demand reports. The tools are graphics oriented and web-based, allowing the user to see representative output during the building procedures. The tools support grouping, algebraic, logical and arithmetic functions to allow for creation of reports. Users are able to schedule the printing of IS&R reports by time and date and on demand. [1] Users are able to designate the printer on which reports are generated.			
	d. Contractor-Provided Displays are: alarm and event display, tabular displays, IS&R data playback, IS&R data treading and sequence of events display are to be implemented as described in points 4.2.2.2.5.4.1 through 4.2.2.2.5.4.5 of the Functional Requirements (Appendix to Technical Specifications Section 4).			
2.6.10.	**Audit Trail** **Notice:** An audit trail of all changes made to the IS&R database is maintained and made available for display and printout.			
	a. The audit trail identifies every change made to the IS&R database structure and content, the time and date of the change, and the user ID of the party making the change. [1] The audit trail includes both before and after values of all content changes.			

	Printouts and displays of the audit trail are available in formats sorted by: [1] Text string: text strings within the messages. [2] Device. [3] Device type. [4] Station: one, several, or all. [5] Time period. [6] Date and time (the default sort).			
2.6.11.	**Data Archive Management** **Notice:** IS&R shall notify the user when storage is near capacity so that data can be transferred to archive media. IS&R shall include a directory listing all information that has been stored on archive media.			
	a. The capability to reload any IS&R archival media and access the archived data without disturbing the collection, storage, and retrieval of IS&R data in real-time and without requiring that any current on-line archives be removed from the system is provided. [1] The minimum capacity of the working area is also specified in the dimensioning tables in the point 5.1.3 (Appendix to Technical Specifications, Section 5). [2] This Specification assumes that archived data will be reloaded into a working area in order to satisfy this requirement.			
2.6.12.	**Database Products and Licensing**			

	Notice: The Contractor shall provide database server and client software and any additional Contractor developed client software needed for the IS&R capabilities.			
	a. All licenses for IS&R software allows for full use of the software. That is, the licenses provides for use by DSO Distribucijagas Srbija of all databases and applications delivered with the SYSTEM as well as permit DSO Distribucijagas Srbija to develop additional applications and databases for their own purposes. IS&R supports requirements defined in the dimensioning tables in Appendix to Technical Specifications, Section 5 (Application Capacity for the number of simultaneous users, maximum accounts, and development users): [1] The number of development users specifies that quantity of the maximum number of users who may be developing or maintaining functionality and databases provided by the Contractor or developed by DSO Distribucijagas Srbija. [2] The maximum number of accounts specifies the total quantity of human users that will use IS&R resources (including databases and functionality not included in this Specification but developed by DSO Distribucijagas Srbija over any period of time. [3] This number of simultaneous users specifically does not include users or accounts to support non-human users, such as SYSTEM applications. [4] The number of simultaneous users specifies the maximum quantity of human			

	users that may be using IS&R resources (including databases and functionality not included in this Specifications but developed by DSO Distribucijagas Srbija) at any one time.			
2.7. Non Functional Requirements				
2.7.1.	**Non-Functional Requirements > Capacity and Performance** **Notice:** The SYSTEM is designed to meet the capacity and performance requirements defined in this section. The following definitions shall apply:			
	a. Storage unit (auxiliary memory): A storage unit is defined as physically (enclosure, standalone device) or logically (SDS - Software Defined Storage) external to a server or workstation, which is largely dedicated to auxiliary memory. Auxiliary memory: Also referred to as disk memory or hard drives Main memory: Also referred to as RAM (random access memory). Workstation: A peripheral device hosting graphical user interface functionality - the GUI. A workstation may consist of a processor with display generation electronics, main and auxiliary memory, one or more monitors and user interaction devices. Server: A server is a general-purpose computer. Servers are generally packaged in a manner suitable for desktop or rack mounting. A server may contain multiple processors. Servers are also typically characterized by the sharing (by the processors) of common main and auxiliary memory packaged within the enclosure. The requirements defined in this section applies equally, but			

	independently, to each of the individual environments , PCS, BCS, GNS and PDS.			
2.7.2.	**System Capacity** **Notice:** All capacity requirements are to be satisfied including: The server, workstation and auxiliary memory capacity requirements. Functional and database capacity requirements. The equipment listed in Section SYSTEM Architecture. While meeting: The availability requirements of Section System Availability. The performance requirements of Section System Performance. All SYSTEM capacity and performance will be verified (tested) with all supplied security features (such as, virus scanning, malware detection, SYSTEM file integrity checking, and final firewall rule sets) enabled.			
	a. Function and Database Capacity – The SYSTEM functions and their associated databases are dimensioned for the following data when delivered (interpreted as the 'delivered' capacity): The parameters in Table - Application Capacity. The data quantities listed in Table – Telemetered Data and Control Outputs, Table -Non-Telemetered Data, Table - Data Exchange, Table - IS&R Data, and Table - Gas System Data. The SYSTEM functions and associated databases are capable of accommodating at least a 100% increase in the delivered capacity without requiring regeneration, recompilation, or any other processing other than definition of the data by DSO Distribucijagas Srbija (the 'ultimate' capacity).			
	b. Main Memory - The main memory of each server and workstation is expandable to twice the delivered capacity within the delivered enclosures by the DSO Distribucijagas Srbija' maintenance personnel using OEM approved methods and tools.			

	c. Auxiliary memory and system performance are to be implemented as described in point 5.1.1.3 of the Non-Functional requirements (Appendix to Technical Specifications Section 5).			
2.7.3.	**System Performance** **Notice:** Satisfaction of the performance requirements will be verified during both the factory test and the site test as specified in this Section. It is the DSO Distribucijagas Srbija' intent that the SYSTEM exhibits consistent performance even when operating in a degraded configuration. To this end, the SYSTEM shall satisfy the performance and capacity requirement of this specification under the following configurations: A degraded configuration where one server of each redundant server group is assigned to the down state.			
	a. System Activity Scenarios - The SYSTEM performance is tested under the following activity scenarios: The high activity scenario represents field conditions during a Gas System disturbance. The steady state scenario represents field conditions during normal Gas System operation. The base conditions define SYSTEM activities and conditions upon which the steady state and high activity scenarios are layered. A catastrophic state representing highly abnormal, worst-case operating conditions. There are no resource utilization requirements for this state, however the SYSTEM must continue to provide critical system functionality and user response under these extreme conditions.			
	b. Base Conditions are to be implemented as described in point 5.1.2.1.1 of the Non-Functional Requirements (Appendix to Technical Specifications Section 5).			

	c. Resource Utilization - Utilization is defined as the average utilization over the time of the test scenario and is calculated as the used capacity of the resource divided by the total available capacity of the resource. Processor average utilization may be calculated as busy time divided by total time. LAN average utilization may be calculated as the quantity of data transferred (Mbytes) divided by the LAN data rate (Mbytes/second) multiplied by total time (seconds). The Contractor supplies software to determine resource utilization.			
	d. Steady state utilization and high activity state utilization are to be implemented as described in points 5.1.2.2.1 through 5.1.2.2.2 of the Non-Functional requirements (Appendix to Technical Specifications Section 5).			
	e. User interface response - The SYSTEM shall provide rapid and consistent response to Gas System events and user inputs. Responsiveness to events and inputs shall be within the following requirements under both the steady state and high activity scenarios.			
	f. Display request, alarm and event annunciation, user requests are to be implemented as described in points 5.1.2.3.1 through 5.1.2.3.3 of the Non-Functional requirements (Appendix to Technical Specifications Section 5).			

	g. Degraded Operation - DSO Distribucijagas Srbija expects that the SYSTEM will infrequently experience operating conditions beyond those embodied in the high activity scenario defined as the 'extreme' scenario (Table – System Activity Scenarios within point 5.1.3. System Dimensions of the of the Non-Functional requirements, Appendix to Technical Specifications Section 5). The SYSTEM includes features to minimize the degradation and the ensuing effects on Gas System operations. These features may include: Reassigning functions to resources that are less utilized. Inhibiting the execution of periodic functions until the completion of the previous execution of the function or observing a minimum delay between executions Assignment of priorities to SYSTEM functions and delaying or inhibiting the execution of lower priority functions The SYSTEM is configured to give priority to the following when operating in a degraded state: Maintaining coherency of the database, specifically including data used as inputs to functions and the outputs produced by the functions. Presenting data to the users through the workstations: priority is given to users at Operations Workstations Detecting and annunciating exception conditions (alarms) in the Gas System. Any actions taken by the SYSTEM to mitigate degraded operating conditions is alarmed to the users.			

	h. Resource Monitoring - Resource utilization is measured, calculated and displayed for the SYSTEM servers, devices, and networks. The minimum set of parameters to be presented include: Performance of LANs, bridges, routers, switches, firewalls and other network devices. All active network elements respond to RMON (groups 1-5 and 9 as a minimum) and SNMP level 1 data requests Disk data transfers per disk Time utilization (percent disk utilization) of each function per disk Time utilization (percent processor utilization) of each function per server and workstation Statistical sampling and accumulation techniques are used to collect these parameters over a user' selected time period. Tools used by the Contractor to measure and report these parameters are defined in the Test Plan and approved by DSO Distribucijagas Srbija Typical study periods shall be ten seconds to sixty minutes, and typical sampling frequencies is once per two milliseconds to once per fifty milliseconds. The user' is able to specify the study period over which samples are collected and the sampling frequency.			
2.7.4.	**Scope and dimensions of the SYSTEM** **Notice:** The following tables present the scope and dimensions of the SYSTEM, in the context of capacity and performance.			
	a. Tables are to be implemented as described in section point 5.1.3 of the Non-			

	Functional requirements (Appendix to Technical Specifications Section 5).			
2.8.	**Non Functional Requirements – SYSTEM Testing** **Notice:** Both structured and unstructured tests is performed to ensure that the Contractor produces a well-engineered and contractually compliant SYSTEM.			
	a. The DSO Distribucijagas Srbija' hall be allowed access to the Contractor's facilities during system design, manufacturing and testing and to any facility where hardware or software is being produced. Inspection is as defined in the point 5.2.1 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	b. The Contractor is responsible for all factory tests. This responsibility includes the conduct of the tests and all record keeping and document production. DSO Distribucijagas Srbija will support the factory testing by supplying staff to execute the test procedures under the Contractor's supervision. All the Test Responsibilities are described in the point 5.2.2 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	c. Test Documents, Plans and procedures are to be as described in the points 5.2.3, 5.2.3.1 and 5.2.3.2 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	d. Test Records - Complete records of all tests result are maintained. The records are keyed to the test procedures. Test records			

	are to be as described in the point 5.2.3.3 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	e. Variance Recording and Resolution - The Contractor establishes a process to record and track variances. This process is initiated at a time to be determined by the Contractor. Variance Recording and Resolution is as described in the sections 5.2.4 and 5.2.4.1 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	f. Schedule for Variance Correction - The Contractor and the DSO Distribucijagas Srbija' meets as necessary to review the variance list. Each new variance opened since the previous meeting is scheduled for correction at the meeting. Variance recording Schedule is as described in the point 5.2.4.2 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	g. Variance Resolution - A variance is deemed resolved only upon written acceptance of the correction by DSO Distribucijagas Srbija. The variance resolution must be in accordance with the point 5.2.4.3 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	h. Test Schedule, Initiation and Completion is as described in the points 5.2.5, 5.2.5.1 and 5.2.5.2 of the Non Functional			

	Requirements (Appendix to Technical Specifications Section 5).			
	i. Test Suspension. If DSO Distribucijagas Srbija considers, at any time, that the quantity or severity of variances warrants suspension of any or all testing, the test is halted, remedial work is performed, and the test is repeated. The repeat of the test shall be scheduled for a date and time agreed upon by both the Contractor and Supervision Contractor, as proposed by DSO Distribucijagas Srbija.			
2.8.1.	**Modifications to the SYSTEM during Testing (in line with technical offer)**			
	a. No changes is made to the SYSTEM after factory testing has started without the express authorization of DSO Distribucijagas Srbija. (This requirement does not apply to preliminary Factory Test.)			
	b. The Contractor carefully controls the test environment so that all changes can be readily identified and that any changes installed for any purpose can be removed and the previous test environment restored.			
	c. DSO Distribucijagas Srbija has the right to suspend testing, to revert to a previous version of any software or hardware, and to restart any testing previously performed if, in its opinion, changes have been made to the system under test without authorization.			

	d. Preliminary Factory Testing and Factory Testing is in accordance with the points 5.2.7 and 5.2.8 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	e. Equipment Test is in accordance with the point 5.2.8.1 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	f. Functional Test is in accordance with the point 5.2.8.2 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	g. Stability and performance tests are in accordance with the points 5.2.8.3 and 5.2.8.4 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	h. Unstructured Test - is be in accordance with the point 5.2.8.5 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	i. Cyber Security Audit - is in accordance with the point 5.2.8.6 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	j. Site Test is in accordance with the point 5.2.9 of the Non Functional Requirements (Appendix to Technical Specification Section 5).			

	k. Installation Test - is in accordance with the point 5.2.9.1 of the Non Functional Requirements (Appendix to Technical Specification Section 5).			
	l. Site Functional and performance test – is in accordance with the point 5.2.9.2 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	m. Site Cyber Security Audit - The site cyber security audit repeats the audit performed during factory testing.			
	n. Availability Test - The Availability Tests is conducted to demonstrate the SYSTEM and device availability in accordance with the criteria specified in Section - System Availability. The Availability Tests is conducted after the SYSTEM has been put into on-line production and shall be in accordance with the point 5.2.10 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	o. Test Activity and Test Definitions - is in accordance with the point 5.2.10.1 and 5.2.10.2 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	p. Duration and criteria for passing - The minimum duration of the availability test shall be 1000 consecutive hours of test time. The other requirements are to be in accordance with the point 5.2.10.3 of the			

	Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	q. Testing of phased deliveries. The SYSTEM will be delivered in at least two phases. The requirements for Phased deliveries testing are to be as described in the point 5.2.11 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
2.9.	**Non Functional Requirements – Training** **Notice:** The Contractor shall prepare and deliver a comprehensive training program on the operation and maintenance of the SYSTEM for 6 personnel.			
	a. Database, display and report maintenance training teaches DSO Distribucijagas Srbija the skills needed for initial database and display construction and verification and operational system maintenance and expansion.			
	b. Software training teaches DSO Distribucijagas Srbija the skills required for the SYSTEM maintenance and expansion and for the preparation and integration of new functions.			
	c. Hardware training teaches DSO Distribucijagas Srbija the skills required to perform routine preventive maintenance and perform diagnostic tests on the processors and their peripheral equipment, LANs, and display and communications equipment.			
	d. The Scope of training, Self-Study Courses and recording of courses requirements is			

	as described in the points 5.3.1, 5.3.1.1 and 5.3.1.2 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	e. Training Documents - The Contractor prepares a training plan in cooperation with DSO Distribucijagas Srbija. The Contractor is also responsible for the preparation and production of all course material. Training documents for custom features are subject to the review and approval process of point 5.3.2 (Appendix to Technical Specifications Section 5) - Documentation Review and Approval.			
	f. Training Plan is in accordance with the point 5.3.2.1 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	g. Course description is in accordance with the plan 5.3.2.2 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	h. Course Material is in accordance with the plan 5.3.2.3 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	i. Instructor Qualifications - Course instructors have demonstrated technical competence in the subject and previous instructing experience.			
	j. Training Curriculum the training curriculum presented in point 5.3.4. is			

	intended to describe the contents of the training when viewed as a whole. The subjects covered by individual courses may differ as long as the overall objectives are satisfied. (Appendix to Technical Specifications Section 5).			
	k. System overview course is in accordance with the point 5.3.4.1 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	l. Database and Display Building course – is in accordance with the point 5.3.4.2 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	m. Data Engineering Workshops are in accordance with the point 5.3.4.3 of the Non Functional Requirements (Appendix to Technical Specification Section 5).			
	n. Information Management course - Shall be in accordance with the point 5.3.4.4 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	o. Operating System Administration course – is in accordance with the point 5.3.4.5 of the Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	p. System Programming languages course - Shall be in accordance with the point 5.3.4.6 of the Non Functional			

	Requirements (Appendix to Technical Specifications Section 5).			
2.9.1.	**Programming in the System Environment** This course shall instruct the student on the skills needed to program in the SYSTEM software environment and shall be designed for the software engineers responsible for maintaining, expanding, or adding new functions. **Notice:** At the end of this course, the participant is able to meet the requirements of point 5.3.4.7 (Appendix to Technical Specification Section 5).			
	a. The Contractor provides training on the communications among data sources, communications network software used for the SYSTEM local and wide area networks, and on the interfaces or communications links with the external subsystems and networks. Training is provided for supplied software and communications products. Notice: At the end of this course, the participant is able to meet the requirements of point 5.3.4.8 of Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	b. The system administration course familiarizes participants with the procedures necessary to operate the system as an integrated entity, to recognize and respond to malfunctions, and to perform maintenance functions. The only prerequisite for this course is familiarity with the overall functionality and architecture of the SYSTEM. Notice: At the end of this course, the participant is able to meet the requirements of point 5.3.4.9 of Non Functional			

	Requirements (Appendix to Technical Specifications Section 5).			
	c. The Contractor provides training on application software. These cover all applications other than those already covered in the database, display, and Information Management courses. Each application course is organized to be responsive to the DSO Distribucijagas Srbija' specific requirements and is regarded as an extension to the standard courses that are provided. Notice: Each course covers the topics from the point 5.3.4.10 of Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	d. This course covers the operation of the simulator, scenario building, and maintenance. Notice: At the end of this course, the students is able to meet the requirements of point 5.3.4.11 of Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	e. The course teach participants the essential knowledge and skills required to successfully progress through the hardware maintenance curriculum and stress lab exercises. The course includes entry-level training in the use of operating system skills, an introduction to the critical directories and files that drive the operating system, and a discussion of diagnostic tools, system boot process,			

	networking concepts, and terminology for computer hardware.			
	f. This training shall qualifies the students to maintain and troubleshoot to the level of field replaceable modules for all SYSTEM equipment. The level of training is commensurate with the maintenance responsibilities for each equipment item as described in Section - Hardware Maintenance. Notice: This training meets the requirements of point 5.3.4.13 of Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	g. The objective of this course is to train DSO Distribucijagas Srbija staff in preparation for development of training courses for Operators and external users by DSO Distribucijagas Srbija. Notice: This training course includes requirements of point 5.3.4.14 of Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	h. To supplement formal training and to assist the Contractor in developing customized application software, DSO Distribucijagas Srbija will locate staff at the Contractor's site. One database specialist and two applications specialists will be so assigned. This resident staff will attend training courses scheduled to promote early involvement in the implementation work. These individuals will spend at least 75% of their time at the			

	Contractor's facility during system implementation and will participate in the design, coding, testing, and integration of SYSTEM programs as their primary responsibility.			
2.9.2.	**Location and Number of Students** for 6 personnel The number of the students that shall attend each training course and the desired location for the course are listed in Table in point 5.3.5 of Non Functional Requirements (Appendix to Technical Specifications Section 5).			
2.9.3.	**Training** DSO Distribucijagas Srbija expects that the courses to be taken and the number of students attending each course will change over the course of this Contract. Therefore, the total cost of all training included in this Contract shall be considered as an allocation, and DSO Distribucijagas Srbija, in consultation with the Contractor, will revise the training curriculum and the attendants at each course as long as the training allocation is not exceeded.			
2.10.	**Documentation** **Notice:** Documentation is provided for all equipment and functions provided by the Contractor as part of this procurement. All documentation is in English. The documentation shall describe the SYSTEM, including all of its hardware, software, and interfaces and shall cover functionality, testing, configuration, installation, system startup, operations and maintenance.			
	a. For the purposes of this project, the definitions from the point 5.4.1 of Non Functional Requirements (Appendix to Technical Specifications Section 5) is used.			
	b. Documents shall be delivered in two phases described in the point 5.4.2 of Non Functional Requirements (Appendix to Technical Specifications Section 5).			
2.10.1.	**Deliverable Documentation** Deliverable Documentation is presented in tabular form in point 5.4.4 of Non Functional			

	Requirements (Appendix to Technical Specifications Section 5).			
	a. The Contractor provides a document defining the standards used to create and maintain all documentation supplied by the Contractor. Notice: The standards defines the requirements of point 5.4.5 of Non Functional Requirements (Appendix to Technical Specifications Section 5).			
	b. The following documentation is provided for all hardware provided pursuant to this contract: Site installation drawings and procedures, Interconnection list, Network configuration diagram, Equipment configuration diagram, List of deliverable hardware. Notice: The other hardware documentation to be supplied is commensurate with the hardware maintenance philosophy to be employed by DSO Distribucijagas Srbija (refer to Section Hardware Maintenance). Equipment manuals is provided for all hardware to be maintained by the Contractor or a third-party maintenance contractor. This documentation is that normally supplied by the OEM. Equipment manuals and hardware maintenance manuals is provided for all hardware to be maintained by DSO Distribucijagas Srbija.			

	c. The Contractor provides a hardware list of deliverables. Notice: The list also includes network names and addresses (or these is included in the network configuration diagram) and includes a space for DSO Distribucijagas Srbija to enter equipment identification for their own purpose.			
	d. The Contractor provides equipment configuration diagrams. Notice: The configuration diagram use the same terminology as the list of deliverable hardware so that the correspondence between the two can be readily determined.			
	e. The Contractor provides a network configuration document.			
	f. The Contractor provides an interconnection list.			
	g. The Contractor provides site installation drawings and procedures.			
	h. The Contractor provides equipment manuals. OEM equipment manuals provided are acceptable for OEM equipment. Notice: Equipment Manuals contain the requirements of point 5.4.6.6 of Non Functional Requirements (Appendix to Technical Specifications Section 5).			

	i. The Contractor provides a hardware maintenance manual. The information in the manuals shall include requirements of point 5.4.6.7 of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
	j. The documents that is provided for all software are described in the point 5.4.7 of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
	k. The Contractor provides a list of deliverable software for its software and all third party software used in the SYSTEM. Notice: The software functional description includes the minimum content described in point 5.4.7.1 of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
	l. The Contractor documents the development standards used to develop the SYSTEM software and provide the software development standards to DSO Distribucijagas Srbija. Notice: The standards define requirements of point 5.4.7.2 of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
	m. The Contractor provides a database definition document. The database definition identifies the characteristics of all SYSTEM databases. It includes, but is			

	not limited to requirements of point 5.4.7.3 of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
	n. The Contractor provides an Interface Requirements Document. The Interface Requirements Document shall describe in detail the interfaces between the SYSTEM and DSO Distribucijagas Srbija-provided systems and networks. Notice:The Interface Requirements Document has full compiliance with point 5.4.7.4 of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
	o. The Contractor provides software functional description documents. The functional operation of the SYSTEM is clearly described so that it can be understood without understanding the detailed operation of each software module. Notice: The software functional description includes the minimum content described in point 5.4.7.5 of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
2.10.2.	**Installation Images and Source Code** Installation images and source code requirements is in accordance with the point 5.4.7.6 (Appendix to Technical Specifications, Section 5).			
2.10.3.	**Software Requirements Matrix**			

	The Contractor shall provide a list of all software requirements, cross-referenced to show where each requirement is discussed in the relevant software document for each custom requirement. The Software Requirements Matrix shall list each of the custom requirements for the SYSTEM stated in this specification, in numerical order, referenced by chapter, section, and requirement number.			
	a. The Contractor provides detailed design documents. The detailed design documents are intended as a second level of detail to the software functional descriptions. Notice: The detailed software design documentation includes, but is not limited to the requirements of point 5.4.7.8 of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
2.10.4.	**System Maintenance Manual** The Contractor provides a System Maintenance Manual. Notice: The System Maintenance Manual includes requirements of spoint 5.4.8 of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
2.10.5.	**Cyber Security Documentation** The Contractor provides cyber security documentation. The Contractor shall produce documentation of all network configurations, including network access control rules implemented in 'firewalls' used to secure the electronic perimeter(s) surrounding the component systems of the SYSTEM.			

	Notice: The documentation includes requirements of point 5.4.9 of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
2.10.6.	**Display Style Guide** The Contractor furnishes a Display Style Guide that describes the discretionary aspects of display design and implementation. The objective of the display conventions and standards is to promote a consistent look and feel across all SYSTEM displays.			
2.10.7.	**Operating Manuals** The Contractor submits, for review and approval, operating manuals for all SYSTEM functions.			
	a. The Contractor provides an Operator's Manual. The Operator's Manual is custom documentation written specifically for Distribucijagas Srbija' SYSTEM. All snapshots used as illustrations is of genuine displays on Distribucijagas Srbija' actual SYSTEM. Notice: The Operator's Manual includes requirements of point 5.4.11.1 of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
	b. The Contractor provides a Database Editor's Manual. Notice: The Database Editor's Manual shall include requirements of point 5.4.11.2 of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			

	c. The Contractor provides a Display Editor's Manual. Notice: The Display Editor's Manual includes requirements of point 5.4.11.3 of Non Functional Requirements (Appendix to Technical Specification, Section 5).			
2.10.8.	**Simulator Instructor user's Guide** The Contractor provides a Simulator Instructor user's guide. This document shall describe the instructor-oriented capabilities of the Simulator and how to use them. **Notice:** The Simulator instructor user guide includes requirements of section 5.4.12 of Non Functional Requirements (Appendix to technical specification Section 5).			
2.10.9.	**System Overview** The Contractor shall provide a System Overview Document for the SYSTEM and its components, PDS, GNS. The System Overview Document shall provide a basic description of the systems, the relationship between the systems, the functions supported by the systems, and the local and wide area communications network used by the system.			
2.11.	**System Availability** The following component systems are essential to maintaining control of the gas network: Primary Control System, Backup Control System. Other component systems are not critical to gas network operations, including: Program Development System, Gas Network Simulator, and Quality Assurance System (QAS).			
2.11.1.	**Availability Requirements - PCS and BCS** The requirements defined in this section for the PCS shall apply equally, but independently, to the BCS. The PCS shall exhibit a measured availability of 99.95% during the availability test. (Section Test Definitions defines availability measurement terms.)			
	a. The PCS software is considered available when all of the functions described in this Specification are operating as specified, at their scheduled periodicity, and within the execution time parameters, with the exception of the following functions:			

	Database generation and modification, Display generation and modification, Report creation and modification, Software development support.			
	b. The PCS hardware is considered available when sufficient servers, peripheral devices, and interfaces to data sources and computer systems external to the SYSTEM are operating, and the PCS is satisfying its performance requirements. Notice: The term sufficient, as used in this paragraph, is interpreted as requiring the following minimum hardware complement to be operating, as described in point 5.5.1.2 of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
2.11.2.	**Availability Requirements - Other SYSTEM Component Systems** Each component system of the SYSTEM other than the PCS and the BCS individually satisfy the availability requirements of point 5.5.2 of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
2.11.3.	Tables - User Interface Equipment, Phased Delivery, Communication Channel Interface, and SYSTEM Redundancy are presented in point 5.5.3 of Non Functional Requirements (Appendix to Technical Specifications, Section 5). List of SCADA software and equipment owned by Distribucijagas Srbija is presented in Section 7: Appendix to Technicals Specification.			

2.12.	**Hardware and Software Maintenance > Definitions** Responsibility for the maintenance of the System hardware and software will vary over the term of this Contract. Commissioning of any item is interpreted as receipt of the item at the Distribucijagas Srbija' facility, installation on-site, successful completion of the site tests, and correction of all variances from the tests.			
2.12.1.	**Deliverable Version** The responsibility for maintenance of hardware and software will vary depending on the time during the Contract. Delivered hardware and software, enables seamless integration of the hardware and software depicted in the List of hardware and software owned by DSO (Appendix to Technical Specifications, Section 7). The delivered hardware is the latest version being delivered by the manufacturer of the hardware that is compatible with the software release at the time of delivery to the Contractor s facility. The delivered software is the latest version certified to execute on the Contractor s platform. In no event shall any third party software be more than one version beyond the current version. DSO Distribucijagas Srbija and the Contractor may, by mutual agreement, elect to upgrade hardware or software during the execution of the project. The terms and schedule for such upgrades is determined at the time the upgrade is elected. No price increase whatsoever is possible after the contract signature. All hardware and software are of compatible versions. If it is necessary to revert to a previous version of any hardware or software to overcome			

	incompatibilities among the hardware or software, the Contractor bears the cost and time of the "downgrade" and presents a plan to correct the problems with the newer release. Such corrections are also be at the Contractor's sole expense. If it becomes necessary to upgrade some hardware or software to meet this requirement, the cost and time is borne by the Contractor. The Contractor is responsible to ensure that all delivered hardware and software versions will inter-operate successfully. The Contractor investigates and informs DSO Distribucijagas Srbija of any and all hardware and software patches or available upgrades with security or stability implications prior to start of Factory Tests and again prior to the start of Site Tests. The cost and schedule for such upgrades is determined at the time the upgrade is elected. DSO Distribucijagas Srbija and the Contractor may, by mutual agreement, elect to perform these hardware or software upgrades prior to the start of the FAT and/or SAT test. The cost and schedule for such upgrades is determined at the time the upgrade is elected. DSO Distribucijagas Srbija and the Contractor may, by mutual agreement, elect to perform these hardware or software upgrades prior to the start of the FAT and/or SAT test.			
2.12.2.	**Maintenance Support Program Components** The Contractor has basic maintenance support program componentsas is defined in the point 5.6.3			

	of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
2.12.3.	**Problem Reporting** The DSO Distribucijagas Srbija' shall state the severity level for any problem that it submits for correction.			
	a. Problem Severity Levels is tabular presented in the point 5.6.4.1 of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
	b. The Contractor's Maintenance and Support Program shall include a problem escalation that can be triggered automatically (e.g., 'X' amount of time has elapsed for a high severity problem, etc.) as well as manually by DSO Distribucijagas Srbija.			
	c. DSO Distribucijagas Srbija may elect to escalate a support request for the following reasons: [1] Contractor has not provided a response within the stated response time. [2] The reported severity of a problem has changed. [3] Contractor's proposed action plan or solution to a problem is unsatisfactory.			
	d. A severity of Critical or High is considered an emergency. If the problem is not resolved within the time identified in Table - Response Time, the Contractor immediately begins to make arrangement for on-site assistance. On-site support is maintained until the problem is resolved.			

	The Contractor continues to work on the problem remotely while the on-site support person(s) are in transit.			
	e. The Contractor will work with DSO Distribucijagas Srbija to understand, isolate, and resolve the reported problem. During the problem evaluation, the Contractor will work with the DSO Distribucijagas Srbija' support staff to identify any additional support that may be required to resolve the problem.			
2.12.4.	**Response Times**			
	a. Response times are to be in accordance with the tabular presentation in the point 5.6.4.4 of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
	b. The Contractor provides software maintenance releases to DSO Distribucijagas Srbija for installation. These incremental software maintenance releases include the fixes for the software problems reported by DSO Distribucijagas Srbija and correct all other known software problems at the time of the release.			
2.12.5.	**Maintenance Responsibilities > Hardware Maintenance** The Contractor is responsible for providing maintenance for all hardware provided under the contract through the end of the Warranty period. The Contractor may provide the hardware maintenance services or decide to contract with the equipment OEM or a third party to provide the required maintenance.			

	a. Once the System is installed at the DSO Distribucijagas Srbija facilities, and prior to cutover, the Contractor corrects any equipment failure within 24 hours of being notified by DSO Distribucijagas Srbija of a failure. Beginning with the start of the Availability Test through the end of the Warranty period the Contractor provides a hardware maintenance with 4 hour response time.			
	b. The Contractor recommends and supply on-site hot swap parts. Hot swap modules for field-replaceable and -repairable modules as part of the list of deliverable hardware (refer to Section – System Hardware). The hot swap parts to be supplied are adjusted by the Contractor during the project so that the delivered set is consistent with the delivered System configuration. The recommended hot swap parts include any special tools and test equipment that the Contractor and the OEM use and which are applicable for the DSO Distribucijagas Srbija' maintenance.			
	c. The Contractor supplies all expendable supplies required for use during the project while the equipment is at the Contractor's facility. The Contractor provides a list of recommended expendable supplies one month prior to any delivery of hardware to the DSO Distribucijagas Srbija' site. Expendable supplies include but are not limited to: Optical and magnetic media,			

	Cleaning materials, Printer toner and ink cartridges, Printer paper			
	d. The Contractor provides hardware maintenance as a part of Contractor's warranty for 1 year after the PAC			
2.12.6.	**Software Maintenance** The term 'software' shall include all firmware and software delivered under this Contract, as well as the associated configuration files, installation kits, release media, documentation, and support media such as on-line help facilities and maintenance tools. The Contractor will not be granted any relief for project delays caused by maintenance problems prior to the availability test.			
	a. DSO Distribucijagas Srbija has the right to alter, modify, edit, and add to all software provided with the SYSTEM. DSO Distribucijagas Srbija agrees to discuss any changes to be made to software no less than 48 hours in advance of the implementation of the change.			
	b. The Contractor is responsibile for maintenance of all software prior to delivery. This maintenance may be affected by a maintenance contract with OEMs or other parties or by Contractor staff.			
2.12.7.	**Maintenance during Commissioning** The Contractor shall have the responsibility for maintenance of all software after delivery and prior to commencement of the availability test. This maintenance may be performed by a maintenance contract with OEMs or other parties or by Contractor staff. During the Commissioning period, DSO Distribucijagas Srbija may make changes to databases, displays, and reports as necessary to meet the DSO Distribucijagas Srbija' operational needs. Both parties shall work towards a mutually agreeable implementation of the desired changes. If the Supplier considers that the changes may adversely affect the operation of software for which the Contractor is responsible, the DSO Distribucijagas Srbija' shall be notified of the potential problem and the changes shall be reviewed. DSO Distribucijagas Srbija will inform Contractor of any significant changes (e.g. addition of an RTU, new calculations, etc.) at least 24 hours prior to installation of the changes.			

	a. The responsibilities for maintenance of the software during the availability test is as for Section - Maintenance under Warranty.			
	b. Maintenance during the warranty is in conformance with the terms of the warranty sections of this Contract. (Point 5.6.5.3.2) of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
	c. The Contractor provides software maintenance as a part of Contractor's warranty for 1 year after the PAC. This warranty SCADA maintenance support should contain the following services: [1] Provision of all commercially available updates of the supplied SCADA software included in the price of annual maintenance; the Contractor is obliged to make these updates available to DSO Distribucijagas Srbija, while DSO Distribucijagas Srbija is not obliged to implement them.			
	d. At the end of the Warranty period, System software is updated to the latest SW maintenance release. The Contractor remains responsible for the successful completion of the update. The DSO Distribucijagas Srbija' staff will be available to work with the Contractor to affect this update. This shall remain valid until the end of Warranty.			

2.12.8.	**System Security for Maintenance** **Notice: The proposed security solution must be complaint with the relevant NERC CIP standards.**			
	a. All access from Contractor's facilities or Contractor's staff to DSO Srbijagas' SYSTEM for the purpose of maintenance is permitted only to the Program Development System (PDS), if not directly connected to the SYSTEM LAN and not to any component of the on-line SYSTEM. All actions performed remotely are subject to audit trail reporting and adhere to DSO Srbijagas software version and configuration control procedures. Such access are subject to the security requirements for remote maintenance access as described in the point 5.6.6.1 of Non Functional Requirements (Appendix to Technical Specifications, Section 5).			
	b. Whenever software change concerning the SYSTEM is realeased ('upgrade', 'update', 'modification', 'release', or 'patch') to correct a security-related error in the code or to close a vulnerability, the Contractor takes immediate steps to test, confirm, and install the software change on the SYSTEM. The Contractor notifies DSO Srbijagas as soon as practical that a security software change is forthcoming, in order to allow Srbijagas to allocate resources to implement the software change when it is released.			

	The security patch is tested and installed on the SYSTEM within seven calendar days of its release by the software Contractor. The implementation and testing of all security patches follows the established configuration management and change control processes. This includes the execution of test procedures where the change is deemed significant.			
	c. The Contractor immediately informs DSO Srbijagas upon the discovery of any error in or a property of any software resident on the SYSTEM that makes the SYSTEM vulnerable to cyber-intrusion. The Contractor diligently works to correct the error or modify the property to close the vulnerability, and shall make the correction available to DSO Srbijagas at no cost. This obligation for notification and the closure of security-related vulnerabilities shall not expire upon the completion of warranty or other contractual obligations but shall remain in effect for the lifetime of the SYSTEM or until DSO Srbijagas informs the Contractor in writing that the obligation for notification has been waived.			
	d. Any hardware, documentation, or other material replaced during maintenance are disposed in such a manner as to protect sensitive information. This includes maintenance actions performed on the SYSTEM as well as the Contractor's remote diagnostic system.			

3. Contractor's warranty **Notice:** The Contractor shall provide following services in his offer:				
3.1.	Help desk support in duration of 1 (one) year after the issuance of the Provisional Acceptance, as described in point 5.6.3 Maintenance Support Program Components (Appendix to Technical Specifications, Section 5) Quantity: 1 year			
3.2.	Corrective maintenance for software in duration of 1 (one) year after the issuance of the Provisional Acceptance Certificate as described in point 5.6.4 Problem Reporting (Appendix to Technical Specifications, Section 5) Quantity: 1 year			
3.3.	Restoration to normal operation within the defined Solution to restore times in case of disruptions in duration of 1 (one) year after the issuance of Provisional Acceptance Certificate as described in point 5.6 Hardware and Software Maintenance.) (Appendix to Technical Specifications Section 5) Quantity: 1 year			
4.	**Contractor Statement** Tenderer acknowledged and accepts without any reservation project implementation requirements specified in Appendix to Technical Specifications, Section 6: Project Implementation Requirements.			

5.	**Support services** Manufacturer support, ancillary services and software updates for 1 year must be included together with asset discovery and treath Intelligence services Prevention threats, malware and botnet of traffic based on information from manufacturer for minimum 1 year Traffic prevention based on URL category based on information from manufacturer for minimum 1 year Threat prevention/protection services for 1 year must be included			