БАТЛАВ
ЦДҮС-ТЕХНИКИЙН ЕРӨНХИЙ
ИНЖЕНЕР Б.ЭРХЭМЗАЯА

Хяналт удирдлагын мэдээллийн системд Улаанбаатар салбарын шинээр орсон дэд станцуудыг нэмж холбон, технологийн сүлжээнд оруулах ажлын техникийн тодорхойлолт
Ерөнхий шаардлага

1.Нийлүүлэгч нь санал болгож буй төхөөрөмжийн үйлдвэрлэгчийн албан ёсны тусгай зөвшөөрөлтэй эрх бүхий компани байх;

2. Олон улсад хүлээн зөвшөөрөгдсөн сертификаттай 3 болон түүнээс дээш тооны мэргэшсэн хүний нөөцтэй байх /сертификатын нэр NSE4, NSE5, NSE 7, CCNA, CCIE/. Эдгээр ажилтан нь тухайн компанид 1 жилээс дээш хугацаанд үндсэн ажилтнаар ажилласан байх;

3. 2023, 2024, 2025 он тус бүр санал болгож буй бараатай ижил төстэй бараа нийлүүлж, суурилуулалт тохиргоог гүйцэтгэсэн туршлагатай байх. Үүнийг нотлох гэрээ, акт ирүүлэх.

1. Мэдээлэл цуглуулах төхөөрөмжийн техникийн тодорхойлолт

Мэдээлэл цуглуулах төхөөрөмж /RTAC SEL-3530-4 дүйцэхүйц/	
Operating System	SEL Linux® Yellowstone running Linux kernel 3.x with real-time preemption patches
Operating Temperature Range	–40° to +85°C (–40° to +185°F)
Processing and Memory	Processor Speed: 533 MHz Memory: 1024 MB DDR2 ECC RAM Storage: 2 GB
Security Features	Account Management: User Accounts User Roles LDAP Central Authentication RADIUS Central Authentication Strong Passwords Inactive Account Logouts Intrusion Detection: Access/Audit Logs Alarm LED Light Sensor 3-Axis Accelerometer Encrypted SSL/TLS, S Communication: HTTPS
Automation Features	Protocols : Client: DNP3 Serial, DNP3 LAN/WAN, Modbus RTU, Modbus TCP, SEL ASCII, SEL Fast Messaging, LG 8979, IEEE C37.118, CP2179, SNMP, SES-92, CDC Type II, Courier, IEC 60870-5-103, EtherNet/IP Explicit Message Client Server:

	DNP3 Serial, DNP3 LAN/WAN, Modbus RTU, Modbus TCP, SEL Fast Messaging, LG 8979, SES 92, IEC 61850 MMS, IEC 60870-5-101/104, IEEE C37.118, FTP, SFTP, CDC Type II, EtherNet/IP Implicit Message Adapter Peer-to-Peer: IEEE-61850 GOOSE, SEL MIRRORED BITS Communications, Network Global Variables (NGVL), Parallel Redundancy Protocol Engineering Access Modes. SEL Interleaved, Direct Port Server. Map Serial Ports to IP Ports Secure Web Server: Diagnostic and Communications Data
Communications Ports	Ethernet Ports: 2 rear Data Rate: 10 or 100 Mbps Rear Connectors: RJ45 Female or LC Fiber (single-mode or multimode, 100 Mbps only) SEL-3530-4 Serial Ports Ports: 4 Type: EIA-232/EIA-485 Data Rate: 300 to 115200 bps Connector: DB-9 Female Time Synchronization: IRIG-B USB Ports Ports: 1 Device Port: Type B
Electromechanical Outputs	DC Output Ratings : Voltage: 250 Vdc Rated Voltage Range: 19.2–275 Vdc Rated Insulation Voltage: 300 Vdc, Make: 30 A @ 250 Vdc per IEEE C37.90 , Continuous Carry: 6 A @ 70°C; 4 A @ 85°C Contact Protection: 360 Vdc, 40 J MOV protection across open contacts AC Output Ratings: Rated Operational Voltage: 240 Vac Rated Insulation Voltage: 300 Vac Utilization Category: AC-15 (control of electromechanic loads > 72 VA) Contact Rating Designation: B300 (B = 5 A, 300 = rated insulation voltage) Contact Protection: 270 Vac, 40 J Continuous Carry: 3 A @ 120 Vac 1.5 A @ 240 Vac Rated Frequency: 50/60 ± 5 Hz
Product Standards	Communications Equipment in Utility Substations: IEC 61850-3:2013 IEEE 1613-2009 Severity Level: Class 1 (excluding dial-up modem) Measuring Relays and Protection Equipment: IEC 60255-26:2013* IEC 60255-27:2013

2. Мэдээлэл цуглуулах төхөөрөмжийн техникийн тодорхойлолт

Мэдээлэл цуглуулах төхөөрөмж /RTAC SEL-2241 дүйцэхүйц/	
Operating System	SEL Linux® Yellowstone running Linux kernel 3.x with real-time preemption patches
Operating Temperature Range	–40° to +85°C (–40° to +185°F)
Processing and Memory	Processor Speed: 533 MHz Memory: 1024 MB DDR2 ECC RAM Storage: 4 GB (2 GB reserved)
Security Features	Account Management: User Accounts User Roles LDAP Central Authentication RADIUS Central

	Authentication Strong Passwords Inactive Account Logouts Intrusion Detection: Access/Audit Logs Alarm LED Light Sensor 3-Axis Accelerometer Encrypted SSL/TLS, S Communication: HTTPS
Automation Features	Protocols : Client: DNP3 Serial, DNP3 LAN/WAN, Modbus RTU, Modbus TCP, SEL ASCII, SEL,Fast Messaging, LG 8979, IEEE C37.118, IEC 61850 MMS, CP2179, IEC 60870-5-101/104, SNP, SES-92, CDC Type II, Courier, IEC 60870-5-103, EtherNet/IP, Explicit Message Client Server: DNP3 Serial, DNP3 LAN/WAN, Modbus RTU, Modbus TCP, SEL Fast Messaging, LG 8979, SES-92, IEEE C37.118, IEC 61850 MMS, IEC 60870-5-101/104, FTP, SFTP, CDC Type II, EtherNet/IP Peer-to-Peer: SEL MIRRORED BITS Communications: IEC 61850 GOOSE, Network Global Variables (NGVL), Parallel Redundancy Protocol Fieldbus: EtherCAT Client (in RTAC), EtherCAT Server (I/O modules)
Communications Ports	Ethernet Ports (To Backplane): Ports: 1 Data Rate: Automatic Protocols: Dedicated EtherCAT port Ethernet Ports (Terminal Side) Ports: 2 Data Rate: 10 or 100 Mbps Connector: RJ45 Female or LC Fiber Single-Mode or Multimode (100 Mbps only) Serial Ports: Ports: 4 Types: EIA-232/EIA-485 (software selectable) Data Rate: 300 to 115200 bps Connector: DB-9 Female Time Synchronization: IRIG-B Power: +5 Vdc power on Pin 1 (500 mA maximum per SEL-2241) USB Ports Device Ports: 1 Type B
Electromechanical Outputs	DC Output Ratings : Voltage: 250 Vdc Rated Voltage Range: 19.2–275 Vdc Rated Insulation Voltage: 300 Vdc, Make: 30 A @ 250 Vdc per IEEE C37.90 , Continuous Carry: 6 A @ 70°C; 4 A @ 85°C Contact Protection: 360 Vdc, 40 J MOV protection across open contacts AC Output Ratings: Rated Operational Voltage: 240 Vac

	Rated Insulation Voltage: 300 Vac Utilization Category: AC-15 (control of electromechanic loads > 72 VA) Contact Rating Designation: B300 (B = 5 A, 300 = rated insulation voltage) Contact Protection: 270 Vac, 40 J Continuous Carry: 3 A @ 120 Vac 1.5 A @ 240 Vac Rated Frequency: 50/60 ± 5 Hz
Product Standards	Communications Equipment in Utility Substations: IEC 61850-3:2013 IEEE 1613-2009 Severity Level: Class 1 (excluding dial-up modem) Measuring Relays and Protection Equipment: IEC 60255-26:2013* IEC 60255-27:2013

3. Сүлжээний свитчний техникийн тодорхойлолт

Сүлжээний свитч / Planet GS-4210-24T2S дүйцэхүйц /	
Hardware Specifications	Hardware Version 2 Copper Ports 24 x 10/100/1000BASE-T RJ45 auto-MDI/MDI-X ports SFP/mini-GBIC Slots 2 100/1000BASE-X SFP interfaces, supporting 100/1000Mbps dual mode Console 1 x RS232-to-RJ45 serial port (115200, 8, N, 1)
Switching	Switch Architecture: Store-and-Forward Switch Fabric: 52Gbps/non-blocking Switch Throughput:64 bytes,38.6Mpps 64 bytes MAC Address Table:8K entries Shared Data Buffer: 4.1 megabits Flow Control: IEEE 802.3x pause frame for full duplex Back pressure for half duplex Jumbo Frame: 9216 bytes
Standards Conformance	Regulatory Compliance FCC Part 15 Class A, CE Standards Compliance IEEE 802.3 10BASE-T IEEE 802.3u 100BASE-TX/100BASE-FX IEEE 802.3z Gigabit SX/LX IEEE 802.3ab Gigabit 1000BASE-T IEEE 802.3x flow control and back pressure IEEE 802.3ad port trunk with LACP IEEE 802.1D Spanning Tree Protocol IEEE 802.1w Rapid Spanning Tree protocol IEEE 802.1s Multiple Spanning Tree protocol IEEE 802.1p Class of Service IEEE 802.1Q VLAN Tagging IEEE 802.1x Port Authentication Network Control IEEE 802.1ab LLDP RFC 768 UDP RFC 793 TFTP RFC 791 IP RFC 792 ICMP RFC 2068 HTTP RFC 1112 IGMP version 1 RFC 2236 IGMP version 2 RFC 3376 IGMP version 3

	RFC 2710 MLD version 1 RFC 3810 MLD version 2 ITU G.8032 ERPS Ring
Environment	Operating Temperature: 0 ~ 50 degrees C Relative Humidity: 5 ~ 95% (non-condensing) Storage Temperature: -10 ~ 70 degrees C Relative Humidity: 5 ~ 95% (non-condensing)
Management Functions	Basic Management Interfaces: RS232 to RJ45 Console Web browser Telnet SNMP v1, v2c Secure Management Interfaces: SSHv2, TLSv1.2, SNMPv3 System Management: Firmware upgrade by HTTP/TFTP protocol through Ethernet network LLDP protocol SNTP PLANET Smart Discovery Utility PLANET NMS System/CloudViewer Event Management Remote/Local Syslog System log: SNMP MIBs RFC 1213 MIB-II RFC 1215 Generic Traps RFC 1493 Bridge MIB RFC 2674 Bridge MIB Extensions RFC 2737 Entity MIB (Version 2) RFC 2819 RMON (1, 2, 3, 9) RFC 2863 Interface Group MIB RFC 3635 Ethernet-like MIB
Security Functions	Access Control List IPv4/IPv6 IP-based ACL/MAC-based ACL,Port Security IEEE 802.1X – Port-based authentication,Built-in RADIUS client to co-operate with RADIUS server,RADIUS/TACACS+ user access authentication,MAC Security IP-MAC port binding ,MAC filter,Static MAC address Enhanced Security DHCP Snooping and DHCP Option82 STP BPDU guard, BPDU filtering and BPDU forwarding DoS attack prevention ARP inspection IP source guard

4. Порт сервер /SEL-3620 дүйцэхүйц/

Порт сервер /SEL-3610 дүйцэхүйц/	
Operating Temperature Range	–40° to +85°C (–40° to +185°F)
Networking	Web Management: Protection Protocols: HTTPS, TLSv1.2, TLSv1.3 Authentication: X.509 and Username/Password Encryption Key Strength: 128-bit, 256-bit Ethernet Protocols: Address Resolution Protocol (ARP) Dynamic Host Configuration Protocol (DHCP) Client Dynamic Host Configuration Protocol (DHCP) Server (USB-B Only)

	Hypertext Transfer Protocol Secure (HTTPS) Internet Control Message Protocol (ICMP) Lightweight Directory Access Protocol (LDAP) Client Modbus TCP/IP Network Time Protocol (NTP) Client/Server Remote Authentication Dial-In User Service (RADIUS) Secure Shell version 2 (SSHv2) Client/Server Simple Network Management Protocol (SNMP) Spanning Tree Protocol (STP) Syslog Telnet Transmission Control Protocol (TCP) Transport Layer Security (TLS) User Datagram Protocol (UDP) VLAN Maximum number of VLANs per physical interface: 1
Communications Ports	Ethernet Ports: Ports: 2 rear, 1 front Data Rate: 10 or 100 Mbps Front Connector: RJ45 Female Rear Connectors: RJ45 Female or LC Fiber (single-mode or multimode, 100 Mbps only) Standard: IEEE 802.3 Serial Ports Type: EIA-232/EIA-422/EIA-485 (software selectable) Data Rate: 1200 to 115200 bps Connectors: DB-9 Female (Ports 1–16), Isolated 8 pin (Port 17) Power: +5 Vdc power on Pin 1 (500 mA maximum cumulative for 16 ports) USB Ports 1 Host Port: Type A (nonfunctional, for future use) 1 Device Port: Type B Supports USB Networking with DHCP server for out-of-band management access(driver downloadable from selinc.com)
Power Supply	Input Voltage: Rated Supply Voltage: 125–250 Vdc; 110–240 Vac, 50/60 Hz; 48–125 Vdc; 120 Vac, 50/60 Hz 24–48 Vdc Input Voltage Range: 85–300 Vdc or 85–264 Vac 38.4–137.5 Vdc or 88–132 Vac, 18–60 Vdc polarity dependent Power Consumption AC: < 40 VA DC: < 30 Watts

5. Сервер компьютер техникийн тодорхойлолт

Сервер компьютер /ONLOGIC N97 fanless дүйцэхүйц/	
Processor	Intel Alder Lake-N N97, 4 cores, 4 threads, up to 3.6 GHz Turbo, 12W TDP
Graphics	Intel UHD Graphics (Gen 12), supports triple display (HDMI, USB-C DP)
Memory	1× DDR4 SO-DIMM, 3200 MHz, up to 32GB supported
Storage	1× M.2 Key M slot (PCIe Gen3 x1 & SATA3 SSD), supports 2242/2260/2280 sizes
Expansion	1× M.2 Key E (2230), supports Wi-Fi and other modules
USB Ports	2× USB 3.2 Gen2 Type-A, 2× USB 3.2 Gen2 Type-C (DP output, 5V/3A)
LAN Ports	2× 2.5 GbE Ethernet (Realtek R8125BG controller)
Display Outputs	2× HDMI 2.0b, 1× USB-C DP 1.4a, up to 4K@60Hz each
Serial	1× COM header (configurable RS-232/422/485)
Audio	Combo audio jack (Mic-in/Line-out), Realtek ALC256 codec
Digital I/O	4 DI, 4 DO, opto-isolated (optional)
Power Input	9–19 VDC (barrel port), includes 60W power adapter
Operating Temperature	-40°C to 70°C
Dimensions	142 × 61.5 × 107 mm, weight approx. 1.15 kg
Mounting Options	Wall, VESA, and DIN rail compatible
Warranty	5 years standard (optional 3 to 5 years)
Certifications	RoHS, REACH, designed for industrial environments
security	TPM 2.0
Cooling system	Fanless

6. Синхрон цаг /MGL-7/24/365 дүйцэхүйц/ техникийн тодорхойлолт

Синхрон цаг /MGL-7/24/365 дүйцэхүйц/	
Дэлгэц	Цагийн мэдээлэл харуулдаг дэлгэцтэй
Гаралт	IRIG-B стандартын гаралттай, 2 ооc доошгүй BNC гаралттай (IRIG-B, 1PPS)
Хурд	Синхран цагийн дундаж хурд 100н/с, дээд хурд 500н/с
Тэжээлийн хүчдэл	AC/DC125-250В, 47-63 Гц

7. Зөвлөх үйлчилгээ тодорхойлолт

Зөвлөх үйлчилгээ	
local topology Network LAN, WAN,	Дэд станцын дотоод сүлжээний загварчлал, Сүлжээний аюулгүй байдал
Access IP(serial, conwerter media, RJ45),	Алсаас дэд станцын дотоод сүлжээнд төхөөрөмж рүү хандах
4 end diffenential 2740M, Cyber security	Нийлмэл реле хамгаалалтын ажилдагааг сайжруулах, тохируулах

NR, SEL, VAMP, ABB,	Бусад төрлийн тоноглол, HMI скадагийн программ хангамжуудтай зохицож ажиллах, тохируулах
Protocol core respond IEC 60870-5-104 IEC61850 GOOSE MNS SV	Сүлжээний протоколуудын тохируулга, алсаас хандах, төлөв өөрчлөх тохируулах

Хянасан:

Хангамж Ил тод байдал хариуцсан менежер О.Отгонбаатар

РХАХТХ-ийн дарга Н.Батбаяр

Техникийн тодорхойлолт гаргасан:

УБС-н РХАХТА-ийн инженер Э.Одбал