Scope of Work and Project Description:

Strengthening inclusive Local Governance (iLG)

الحوكمة المحلية الشاملة في العراق برنامج تعزيز

Estimated timeframe for implementation: 3-4 months

Destination place in Iraq: Diwanyah Governorate – Almalab Pumping Station

General Information

Brief information on the project

The Strengthening Inclusive Local Governance Project (iLG) support partners at a provincial level on improving administrative processes and enhancing citizen-centricity in service provision (for example within of the fields of water supply management, and municipal services delivery). This is firstly done by improving the efficiency of selected administrative processes. By adapting administrative procedures, optimizing core processes and internal coordination, public services delivery will be more efficient, can therefore be provided more quickly, and information is more transparent. Besides of that, the continuous dialogue with the central government level assures the exchange of experiences and support for the decentralization process.

Background

The scope of this intervention is to upgrade the communication management of the portable water pumping station at **Diwanyah Governorate – Almalab Pumping Station** applying the SCADA system. This facility discharges water through the water distribution system to various locations inside the city. The SCADA system monitors and controls the pumping station through a dedicated Programmable Logic Controller (PLC) setup and I/O modules that communicate with field devices and equipment.

The awarded company is responsible for implementing this intervention, which includes the supply, testing, on-the-job training and commissioning of the newly installed SCADA system (as per Annex 1). GIZ is looking for a company-based technology and integrated solutions provider that delivers all required products listed at the specifications.

Through this intervention, the efficiency of Water supply services (Communication, control, Data and Monitoring) to be improved, by applying the digital solution SCADA (Supervisory Control And Data Acquisition), that enable the Directorate to:

- Ensure optimal use of the water distribution and pumping systems and monitors key parameters such as water pressure, flow rate, levels, and energy consumption.

- Implementing a SCADA system helps to alleviate significant problems related to water management and operations. This helps in the detection of any sub-system inconsistency problem-solving capabilities through real-time data acquisition and reduces the response time necessary in decision-making.

- Reduce reliance on manual labor, minimize human errors and improve efficiency

Pumping station

Target Infrastructure: Al-Malaab pumping station has 7 pumps with 1000 m3/h with head 55 metersand250 kw motor power) including VFD-ABB starters with two outputs: 1.Aloroba line 800 mm line. 2.Alsakan line 800 mm line. That supplies portable water to 700,000 People in the centre of Diwanyah. (please the ABB diagram and details as an Annex)

The above mentioned pump station consists of Seven fixed speed pumps, which are assigned duties based upon their respective start and stop pressure setpoints. The water reservoir receives raw water from the main pipeline. Water is pumped from this reservoir out into the distribution system.

The discharge flow rate and pressure are used manually in the operation of the pumps.

Objective

The main objective is to strengthen communication and digitalization capabilities through effective monitoring, decision-making, and forecasting tools. Therefore, GIZ is looking for adequate companies to supply and install SCADA at the Water Pumping Station in Diwanyah Governorate, aiming for real-time control tasks, controlling individual devices or small-scale processes, while SCADA systems provide a higher level of supervision and data acquisition.

By applying this SCADA's cost-effective solution, the Directorate will be able to provide a system that is easy to develop and engineer at a much more efficient level than in the previous system. With considerably lower operating and maintenance costs, this total solution enables engineers to access all of the system's pumps from the Directorate's central control room.

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Photos are taken inside the pumping station that shows the existing pumps and VFD starters.

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General instructions should be takend into consideration:

1 To provide RTU, and PLC systems, including sensors, flow meters, water level meters, analysers, actuators ,other requirments, at the Water pumping station (Almalab), including Inlets/outlets of the Clear Water Pumping Stations.

2 Each of the Units mentioned above will be programmed using appropriate technology like RTU/PLC as mentioned above, monitored and controlled at an individualand local level within the unit. The hardware and software required for the above-mentioned system are to be provided by SCADA system supplier/vendor.

3 Similarly with above, all the individual units should also be connected together and monitored/controlled at a central location, preferably in the Diwanyah Water Directorate office. This point will be defined during implementation.

4 Finally, the SCADA will have the flexibility to be extended/integrated with the command-and-control centre to be developed under the Water Directorate workplan.

General technical requirements:

Design Requirements for Instrumentation, Control, Automation and SCADA Systems

The instrumentation, control, and automation of SCADA installations shall fully comply with design standards, regulations and the material and workmanship requirements of the Specification. The electrical plant installations associated with instrumentation control and automation systems shall also comply and be tested in accordance with the latest edition of BS 7671 or equivalent European standards. All equipment and materials incorporated in the system shall be selected, designed and rated to operate under the defined performance duties and specified site conditions and to maintain a high level of operational reliability. The instrumentation control and monitoring system equipment and materials shall have an operational life of not less than 15 years unless otherwise approved by the Directorate's Engineer.

Design criteria for Instrumentation, Control, Automation and SCADA Systems

1. Instrumentation System: Electronic instruments shall utilize solid-state electronic components, integrated circuits, microprocessors, other electrical requirements, and shall be of developed design .
2. All instruments shall be suitable for continuous operation.
3. All digital outputs shall be volt free.

4. All instrumentation systems to be used outdoor shall be protected to IP 65 for sensors and transmitters, while enclosures under submersible conditions shall be protected to IP68.
5. All analogue displays shall be of the digital type with no moving parts utilizing backlit liquid crystal diode technology.
6. For transmitting instruments, the output signal shall be 4-20 mA DC linear, having a wires system.
7. The overall accuracy of all measurement systems shall be ±0.5% of the measured value, and repeatability shall be±0.5%.
8. After a power failure, when the power supply resumes, the instruments and associated equipment shall start working automatically.
9. The instruments shall be designed to permit maximum interchangeability of parts and ease access during inspection and maintenance.
10. The instruments shall be designed to work at extremes ambient conditions in relation to temperature, humidity, and chlorine contamination that may prevail. The instruments shall be given enough protection against corrosion.
11. A lockable enclosure shall be provided for the field-mounted instruments wherever required.
12. All field instruments and cabinets and panel-mounted instruments shall have tag plates (name plates) permanently attached to them.
13. The performance of all instruments shall be unaffected by the ±10% variation in power supply voltage and ±5% variation in frequency simultaneously.
14. All wetted parts of sensors shall be made out of non-corrosive material capable of working with chlorine content of 5ppm.
15. For all instruments (transmitting analogue signals) installed in the field, surge protection devices (SPDs) shall be provided at both ends of the connecting cable for protection against static discharges/lightning and electromagnetic interference.
16. Pressure transmitters shall be provided with two valve manifolds and a test port so that in situ calibration can be carried out.
17. Two-wire transmitters shall be provided with online test terminals.
18. The ranges of all instruments shall be suitable for the application in the process.
19. Instruments of a similar type shall be of same made for an appropriate inventory of spares, ease of maintenance and training.

PLC System

PLC shall be provided as a Hot-Standby configuration to perform combinational and sequential logic functions, status monitoring and reporting functions with counter and timer facilities. PLC panel interrogation power supply should be fully redundant. PLC shall comprise of necessary processors, input/output (I/O) modules, communication interface modules and man-machine interface (MMI) required to perform the desired functions. Each PLC shall have memory protected built in historical archiving/data logging of system alarms and events and process variables. Data logger shall be able to log data based on time or an event.

PLC shall have enough memory allocated to allow 200,000 time and data stamped discrete and /or analog values to be archived. The historical archive shall allow the oldest data from SCADA to roll off the system as memory is used keeping the 200,000 most current data points available. Process point time stamping frequency shall be selectable within the configuration software. It shall be possible for the archived data to be exported in CSV format allowing use with standard spreadsheet and data software applications PLC shall have the following attributes as a Hot-Standby configuration.

1. Carry out sequential logic implementation for operations of plant.

2. Carry out computation and interfacing for data acquisition, data storage and retrieval.

3. It shall accept downloaded program from a programmer.

4. It shall have different functional modules to perform the desired functions.

5. It shall scan the inputs in time cycles and update the status of its outputs.

SCADA System

The SCADA shall be a fully dual redundant server integrated microprocessor-based control and data acquisition system which will monitor, control, display, record and trend all assigned plant and water supply network inputs and outputs. The main process monitoring and control shall be by means of Visual Display Unit (min. 60 inch. LED monitor) based process operator workstations that shall be located in the central control room. SCADA/HMI system shall be designed and implemented such that the failure of a central processor or HMI console does not inhibit continuous automatic control of the plant. In the event of such a failure, historical data shall be recoverable to a condition where a worst-case maximum of 15 minutes of historical data is lost. Failure of a single outstation or communications to that outstation shall not affect control or operation of any other outstation, unless the failed outstation provides essential data to another outstation, in which case the non-failed outstations shall revert to a fail-safe mode.

SCADA Software:

1. Software:
a. Detail the communication protocols that will be used to connect all system components, ensuring compatibility and seamless data exchange.
b. Data Logging the SCADA software should support data logging and historical data storage for all the monitored parameters.
c. Alarming System: Implement an alarm system that can trigger alerts (e.g., email or SMS notifications) when parameters go out of predefined ranges. For VFDs, all electrical data (power, voltage current, thermal sensors, etc..) should be transferred to SCADA.
d. Trending and Visualization: The software should provide trending and visualization

tools to help operators analyse historical data and make informed decisions.
e. Security: Ensure robust security measures to protect the SCADA system from unauthorised access, including user authentication, role-based access control, and encryption.
f. Remote Access: Consider remote access capabilities for system monitoring and control from off-site locations but ensure strict security measures are in place.

2. Reporting: Implement a reporting system to generate and store regular reports on system performance and parameter trends.
3. Integration and Protocols:
a. Ensure that all sensors and devices support industry-standard communication protocols such as Modbus, OPC, or Ethernet/IP for seamless integration with the SCADA system .
4. Training and Documentation:
a. Provide training to operators and maintenance personnel on how to use the SCADA system effectively.
b. Create detailed documentation for system configuration, troubleshooting procedures, and maintenance schedules.
5. Backup and Disaster Recovery:
a. Establish a robust backup and disaster recovery plan to ensure minimal downtime and data loss in case of system failures.
6. Regulatory Compliance:
a. Ensure that the SCADA system complies with relevant industry standards and regulations for water treatment and distribution.
7. Scalability:
a. Consider future scalability requirements

Specifications for online water quality monitoring systems

This section covers the specifications required for online water quality sensors to be provided under the contract. The system should be user-friendly and operates and analyze at a minimum interval according to standards without any need for reagents, chemicals, or consumables with low maintenance and calibration requirement. It should be capable of integration with the SCADA system. Online multi-parametric pH, free Chlorine at various points of water distribution and reservoirs. The system proposed should have adequate channels to accommodate the above measurements and should have the capacity to display up to a total of 10 parameters to future-proof the system as it is not envisaged to upgrade the controller for the next few years. The system should have the capability to accommodate any additional sensors viz. ORP, Dissolved Oxygen, and Nitrite may be required by the stakeholder (Directorate of Water) from time to time. Parameters will be monitored at different locations as mentioned below. The water

quality monitoring station will contain the sensors and equipment to measure the below mentioned parameters.

1. pH
2. Residual Chlorine
3. Flow
4. Pressure
5. Multi-parameter Controller System Specifications:

The overall proposal shall:

Include any supporting documents, diagrams, or technical specifications that enhance the proposal's comprehensiveness.

Ensure that your tender proposal is well-organized, comprehensive, and addresses all project requirements. Be prepared to answer questions and provide clarifications to potential clients or evaluators during the tender process.

Provide a high-level overview of the proposed SCADA system architecture. Mention the key components, such as PLCs, sensors, HMI, and the SCADA server.

Explain how data will flow within the system, including communication protocols and data paths.

Scope of Work and Project Description:

Annex 1: Existing VFD details:

Comprehensive connectivity

The ACQ580 drives offer a wide range of standard interfaces. In addition, the drive has two option slots that can be used for extensions including fieldbus adapter modules and input/output extension modules.

Default control connections to the CCU-23 control unit