Hydroelectric Power Generation

Hydroelectric power is one of the oldest methods of power generation and remains a critical contributor to the world’s electricity supply. Yet, the ability to reliably, quickly and consistently generate power in the face of unpredictable variations in demand is an ongoing – and potentially costly – challenge.

Outdated, proprietary control solutions in place at many plants can prevent you from reaching your production targets. These solutions often lack the service and reliability necessary to meet power production requirements, and failure to produce the contracted amount of power in a timely manner can lead to steep penalties.

Fortunately, a reliable control system capable of alerting operators to potential problems before they occur can help you avoid those financial consequences.

Rockwell Automation offers a full range of nonproprietary power and control solutions that meet or exceed industry requirements, and our broad services and support offerings will help keep your operations running smoothly. You can trust our extensive hydropower industry experience to help you to produce the right amount of power at the right time.

Capabilities

Programmable Automation Controllers (PACs):
- CompactLogix (Bulletin 1769)
- ControlLogix (1756)

Distributed I/O:
- Flex I/O modules (1794)

Power Management:
- Powermonitors (1403/1404)
- Combination generator control modules (1407-CGCM)

Data Management:
- Sequence of event modules (1756-SOE)
- HiProm GPS module (1756HP-GPS)
- FactoryTalk Historian ME module (1756-HIST)
- FactoryTalk View SE (9701)

Condition Monitoring:
- Turbine supervisory instrumentation
- Vibration monitoring solutions

Networks and Communication:
- CIP Sync technology
- Stratix Ethernet Switches (1783)

Services and Support:
- NERC CIP compliance consulting services
- On-site and remote training and support
- Rockwell Automation distributor network
- Network Services
- Engineering Services
**Hydroelectric Power Generation Process**

1. **Flex I/O** modules are mounted near the sluice gates to gather data for the control system. In some cases, a small **CompactLogix** PAC might be used to control these gates independent of the main control system.

2. Water flow through the turbine is controlled by wicket gates, which are operated with large hydraulic servomotors. The position of the gates is controlled by a **ControlLogix** PAC that uses turbine speed as the feedback, with a requirement to control unit speed to IEEE 125 standards.

3. As part of the control system, a **Powermonitor** and **Combination Generator Control** module control the excitation of the generator and provide data to synchronize the turbine generator to the utility grid. **Dynamix Turbine Surveillance** equipment provides vibration diagnostics and protection to ensure that the operation of the turbine/generator is within expected parameters.

4. Located in the powerhouse is either a **ControlLogix CompactLogix** PAC, and other associated control products including a **PanelView Plus** operator interface, power supplies, terminal blocks, relays, etc.

5. As a part of the control package, **ControlLogix Sequence of Events** modules are used to track alarm and shutdown events to the millisecond, and the **HiProm GPS** module provides precise time information to the control system, which is coordinated by **CIPSync** technology. **FactoryTalk Historian ME** modules located in the control system chassis provide a database of event and alarm information useful to the utility engineer.

In the control room, a series of **FactoryTalk View SE** stations allow visibility to all the turbine/generators in the plant from a central location. **FactoryTalk Historian** collects the data from the control system.

To address network security, Rockwell Automation **Network Services** include network architecture review and design using **Stratix** switches, and **NERC CIP consulting** services to ensure the system meets the relevant power generation standards.

For some very complex systems previously controlled by mechanical fail-safe devices, **GuardLogix** systems provide the control for turbine shutoff valves, and other critical systems.

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**www.rockwellautomation.com**

**Power, Control and Information Solutions Headquarters**

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

Europe/Middle East/Africa: Rockwell Automation NV, Pegasus Park, Drl Kielstraan 12a, 1831 Diegem, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0649

Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

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