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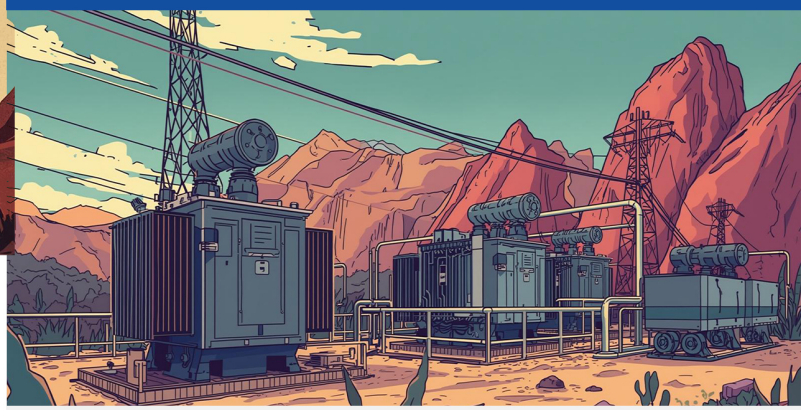
WESTCO Electrical & Equipment Corp. Case Study

Protecting Asia's Geothermal Giants: A Retrofit Case Study for Generating Transformer Modernization

Engineered for a Secure Future



How a Seamless Protection Scheme Retrofit Secured Enhanced Reliability Through Systematic Infrastructure Integration

This case study addresses a Power System Scheme Development project for the modernization of the protection system of a generating transformer at one of the biggest geothermal power plants in Asia, which is in the Generation industry. The project was a retrofit, meaning it involved replacing an old system while incorporating the new system with existing infrastructure.

The Challenge: Obsolete Protection and Integration

The need to modernize the system arose because the existing **protection system** was outdated, utilizing **static generation protective relays**. The client's requirement was to upgrade this system.

- **Technological Obsolescence:** The requirement was to replace the aged static relay by a modern **numerical protective device**.
- **Seamless Integration:** Making the new numerical relay compatible with the current infrastructure, including the installed **Current Transformer (CT)** wiring and control circuits, without deep, expensive physical revamps.
- **Protection Recalibration:** Recalculating the set value for the different **protective elements** such as **Differential protection**, Overcurrent protection (for backup), **Ground fault**, **Phase and ground protection**, and **Under/over voltage protection.** The new settings had to be **re-calibrated** to be reliable and effective on the new device while remaining compatible with the overall operational needs of the generating system.
- **Documentation and Approval:** The need to initially carry out a thorough **as-built** survey of the installed scheme, create a full new design (**single-line diagram**, **schematic diagram**, and **protection and control** drawings), and submit all aspects—design and **Setting Calculation**—open to strict client approval with documented technical rationale, as arbitrary settings are not allowed.

The Solution: Adaptive Design and Precision Calibration

The solution involved a systematic **Power System Scheme Development** process.

- **As-Built Analysis:** An entire analysis of the installed protection system, including an **as-built survey of the wiring (e.g., CT wiring),** was conducted to realize the current configuration and address the **Technical Issue.**
- **New Scheme Design**: A new Protection Scheme was created with an improved **Single-Line Diagram (SLD)** and **schematics.** This included modifying the existing CT wiring to the new numerical relay's connector and establishing the new **protection and control logic.** The design also specified the **breakers** that need to be tripped and where indications (like trips from **protective devices**) will go, such as to **SCADA** or **annunciator devices.**
- **Setting Calculation and Recalibration:** The engineer conducted a **Setting Calculation** to determine the exact **set value** for the new **numerical protective device.**The new setting had to be **re-calibrated** and **adapted** from the existing setting to fit the new device. The engineer provides **bases** for all the recommended settings.
- **Documentation and Approval:** The entire design package (SLD, schematics, logic, and **Setting Calculations**) was documented and submitted to the client. Both the initial design and the **final setting** were subject to client **approval.**

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Schedule a consultation now with WESTCO to find out how our proficiency in Power System Analysis and **Protection Scheme Development** can provide your facility with dependable, well-coordinated protection and uninterrupted operation.

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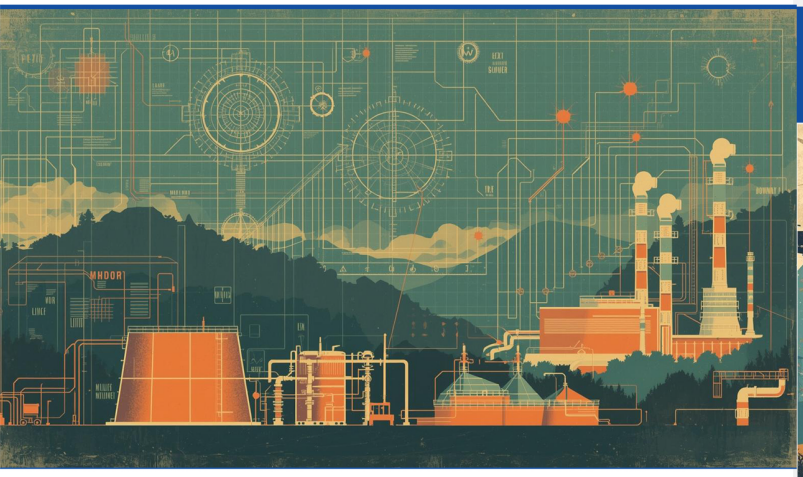

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The Impact

Business Result:

- **Asset Longevity and Value:** Through the successful retrofit of the key generating **transformer,** the customer prolonged the life of a significant asset.

- **Compliance and Risk Mitigation:** The upgrade ensured the **protection system** is up-to-date with regard to current safety and regulatory requirements, diminishing the risk of extensive failure or extended outages as a result of protection system failure substantially.

- **Reduced Operational Cost (Long-Term): Numerical Protective Devices** have sophisticated diagnostics and self-monitoring functions, which normally result in reduced maintenance expenses and faster fault detection than with traditional **static generation protective relays.**

Technical Result:

- **Enhanced Protection Reliability and Selectivity:** The digital relay offers greater precision and speed in detection and isolation of faults. With its sophisticated algorithms, protection selectivity is increased, i.e., it trips only those **breakers** that are required, thus limiting the area of the outage.

- **Advanced Diagnostics and Data:** The new system enables detailed fault analysis and event recording with vital data made available to operators, often via **SCADA.**

- **Seamless Integration:** The effort was able to seamlessly integrate the new **numerical protective device** within the legacy system, adapting the existing **CT** infrastructure.

- **Accurate Documentation:** Providing current **as-built** drawings enables the client with a correct foundation for future planning, troubleshooting, and maintenance.

Conclusion:

This project underscores that **Power System Scheme Development** is a multifaceted engineering discipline that extends beyond simply selecting a device. The successful retrofit for the geothermal power plant was a testament to the essential role of specialized expertise in system analysis, integration design, and precision engineering.

The deployment of the new **scheme** ensures the generating transformer, a critical asset in the power plant's operations, is protected by a reliable, state-of-the-art system, safeguarding the continuous and safe generation of power.

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