ABB PSPS Erich Steinmann; Generator control-2013

GENERATOR CONTROL

THE MODULAR SOLUTION FOR GENERATORS

To make sure that power is efficiently converted into electric energy, it is necessary to supervise and control complex operations within the generator.

Generator Control

Introduction – “the perfect solution”

Generator Control is an integrated solution developed to cover all the control requirements of small to large generators for hydro, industrial and utility power plants.

Highly modular and can be easily adapted to meet various customer requirements.

It’s a total compact solution, engineered and commissioned from a single source.

The solution features a standardized modular combination of the generator systems excitation (AVR), protection and synchronization, as well DCS interface and local operator interface in a single cabinet.

- **Maximizes synergies between protection, synchronization, excitation and control**

Generator Control

Introduction – “the perfect solution”

The solution is optimized to ensure that all of the devices fit into a single Cubicle.

It includes market-leading products, which offer excellent performance under all conditions.

The Generator Control contains:

- **Synchronization**
- **Automatic Voltage Regulator**
- **Protection**
- **Control and visualization package**
- **DCS interface**

Generator Control

Synchronization system for safely and quickly connect to grid

The synchronizing device for automatic generator synchronization is widely used.

In power stations , industrial installations, hydro stations where generators need to be paralleled, as well in power distribution systems.

The synchronizing equipment is suitable for :

- **Automatically synchronizing and paralleling synchronous generators with transmission lines and bus bars.**
- **Connection of de-energized circuits (dead bus) with automatic redundant dual channel system for higher uptime**
- **Seven parameter sets for multiple paralleling points that synchronize up to seven power circuit breakers**

Generator Control

Automatic Voltage Regulator (AVR)

for excellent stability and performance under all conditions

The AVR device is an optimum replacement for all types of voltage regulators.

The AVR a state-of-the-art automatic voltage regulator designed for synchronous generators and motors rated from 0.2 to 50 MW.

All excitation components are inside the enclosure, and it features the most advanced microprocessor technology and IGBT semiconductors, which make it suitable for a wide range of applications.

The maximum output current is 20 A (40 A in combination with PM40).

IGBT = integrated gate bipolar transitor; very fast switching time

Unitrol can extend to

- **PM40 power module with max 40 A output**
- **Redundant configuration**
- **PSS power stabilizer system**
- **If Ie > 40 A then static excitation with UNITROL in a separate cubicle is also available**

The fully functional single standard module includes

- **Voltage regulator , Power factor (cos. phi) regulator , Reactive power regulator**
- **Manual control (excl. current)**
- **Wide input power supply range**
- **All required software features (control modes, etc.)**
- **Standard reference applications**
- **International certifications**
- **Variety of functions – limiters for excitation current, V / Hz, reactive current, stator voltage and stator current, etc.**

Generator Control
Protection safe and reliable for your installed assets

The programmable protection relay is the first truly independent modular concept for all power system applications.

The protection relay is extremely fast. Detection capabilities make it ideal for generator differential protection applications.

The detection parameters can be adjusted to create intelligent, application-specific functions that enhance the protection system and meet very specific requirements.

The product‘s excellent performance, flexibility and scalability fulfill demanding specifications in every corner of the world. It is suitable for both new installations and retrofits.

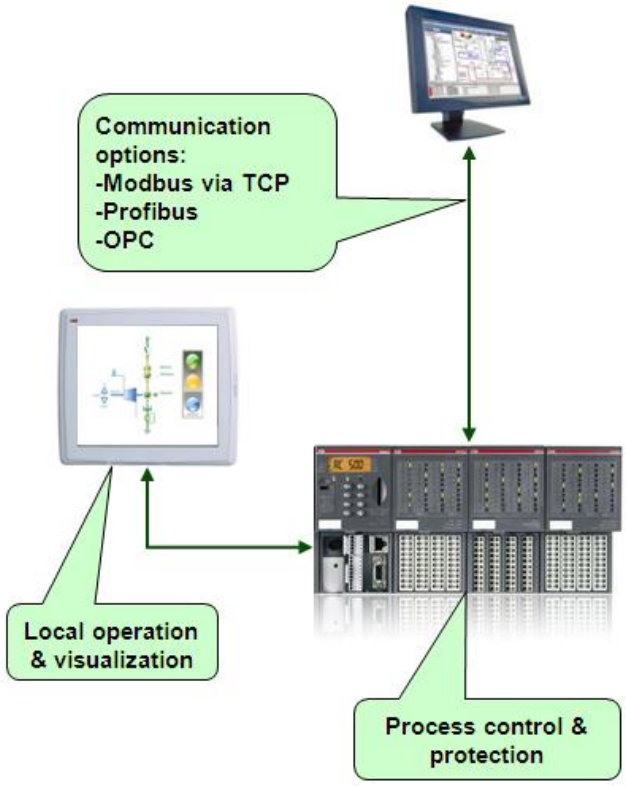
When it comes to engineering and maintenance, users will greatly value the savings by the common hardware platform.

The generator differential protection system is extremely fast, with typical operating times of 15 ms. This in no way compromises the device‘s high reliability.

Typical protection functions for:

- **Protection can be extended to cover the complete unit**
- **Generator differential protection**
- **Overcurrent protection functions (instantaneous / DT)**
- **Directional power flow protection**
- **Pole slip**
- **Over / Under excitation**
- **100 % stator ground fault THD**

Generator Control
Control and visualization package



A large user-friendly touch panel is available for mounting on the face of the cubicle to facilitate visualization, control and operation.

A scalable PLC (programmable logic controller) and optical or wired communication interface make it possible to control and operate each device either locally or via the plant control system (DCS).

Communication

- **The system can communicate with any brand of the plant‘s DCS, SCADA and visualization systems.**
- **PLC via Modbus, Profibus to be integrated into plant DCS**

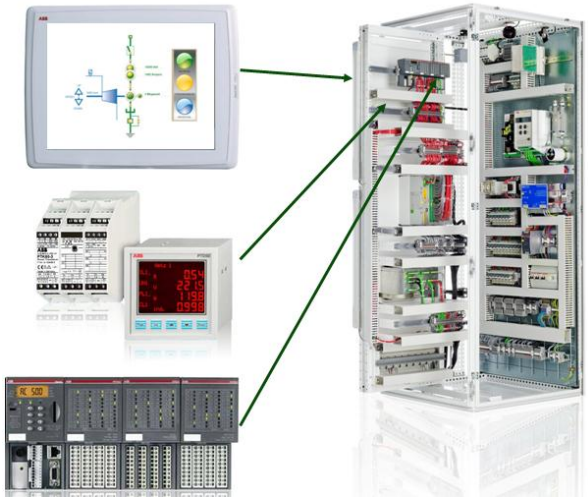
Control and protection

- **Any related processes such as generator cooling water, synchronization or excitation can be controlled from the panel. Generator stator temperature, vibration and other types of protection are integrated into the system.**

Visualization

- **All types of process variables such as generator electrical values, winding temperature, vibration, breaker positions, alarms and trends can be displayed.**

Generator Control
Operator interface – “the perfect solution”



One of the fastest touch screen panel, display module

High performance and an advanced graphic display

- **Robust construction**
- **Slim and elegant designed to withstand the hardest environments**

Seamless integration:

- **Compatible with all control systems**

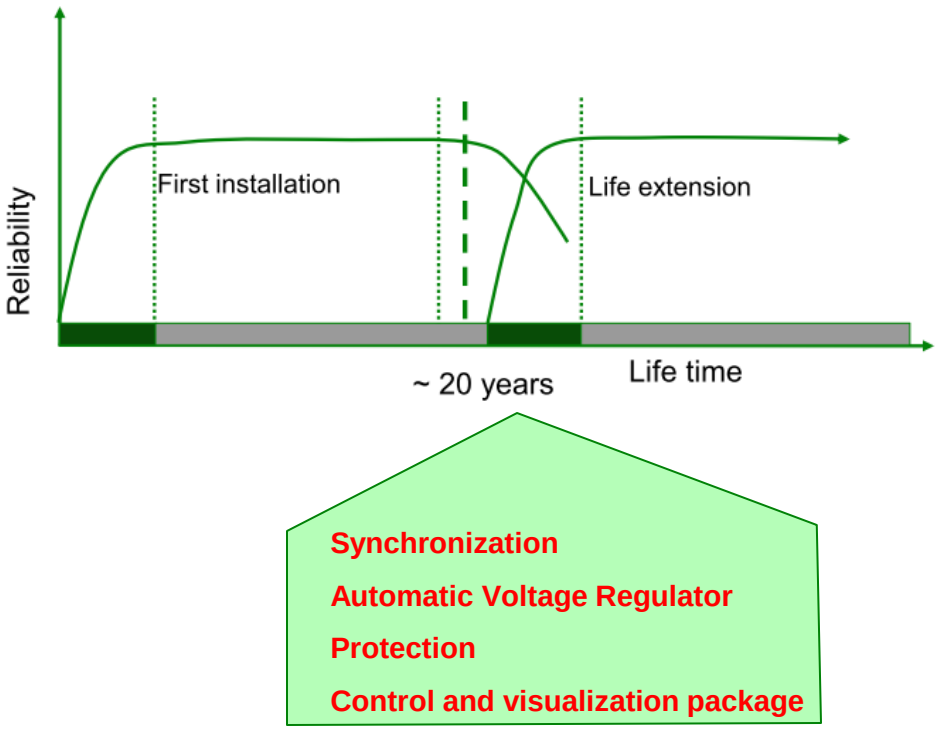
Easy engineering

- **Quick, easy and efficient engineering**
- **Integrated alarm handling**

Display module

- **Safe, reliable, compact and economical device with advanced technology**
- **Power transducers with excellent cost-performance ratio**
- **Dual measuring ranges for all current ranges and for nearly all voltage ranges**
- **Configurable measuring variables for U, I, P, Q, S, cosϕ, sinϕ, ϕ, f**
- **Display Module with up to 16 measuring values, 4 limit values**
- **Active-, Apparent-, and Reactive Power**
- **Metering of produced energy for compensation**

Generator Control
Motivation - “think about it”



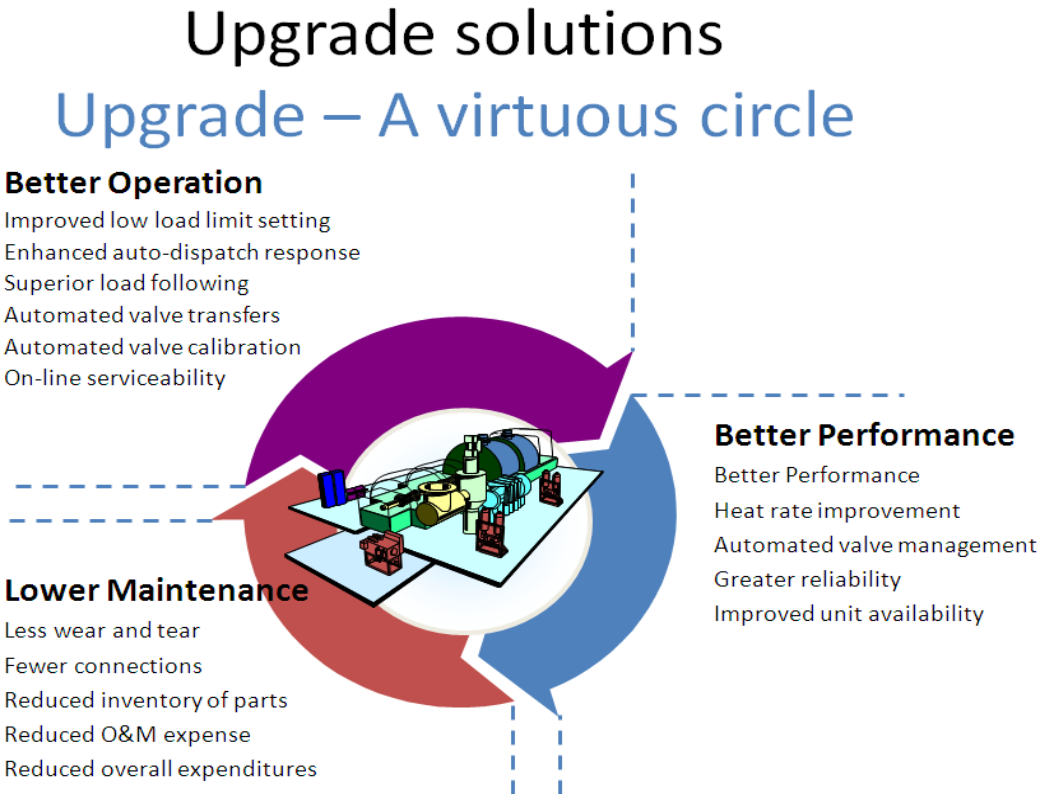
There are many reasons to upgrade older systems.

An old system means

- **Higher risk of non-process-related trips due to equipment aging outdated analog technology requires regular calibration because of drifting parameters, which can cause nuisance tripping or even worse prevent proper tripping**
- **Emergency repair, troubleshooting and spare parts are often more expensive than a retrofit solution. Unexpected long equipment outages are costly**
- **Dried out capacitors or potentiometer drift**
- **The life time will be extended by another 20 years of trouble free operation**

In the last years big steps forward in the Generator Control technology
And most generators have on this age an overhaul (inspection)

Generator Control
Motivation - “your benefits”



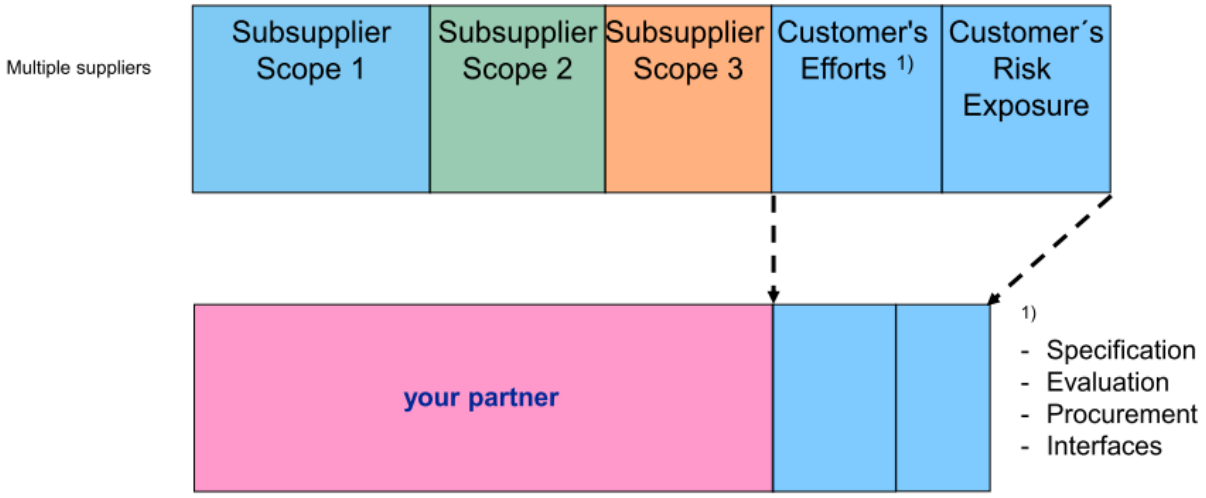
Generator Control improves uptime and cuts maintenance costs.

A life extension package ensures reliable plant operation and provides predictable results.

Generator Control
Project execution - “out of one hand”

Total cost reduction can be achieved by

- **Elimination of redundant activities / coordination by suppliers and customer**
- **Reduction of risk exposure**



Added value for your sleep time; more freedom in the night

Generator Control

Key competencies are project success - “out of one hand”

Design and engineering

Research and development from first concept to the product launch phase for keep the product competitive

Plant-specific basic engineering and preparation of the engineering documentation from experts

Comprehensive service documentation including engineering, quality assurance and operation & maintenance (O & M) documentation from our design department

Implementation, set up and commissioning

Installation of new components in the existing cabinet or in a new cabinet by adaptation to the final scope

Field wiring and cabling provided

Testing the functionality of the new components at the plant by our engineers

Adaptation of operational documentation by the engineers on site

Manufacturing and procurement

Manufacturing and procurement of components for the Product with supervision of assembly and engineering by our project management

Final witness test in accordance with international standards with our customer

Support and trouble shooting

Generator / transformer protection

Excitation system

Synchronizing / plant metering

Training and operational support for the new systems

Procurement or replacement of spare parts

The system is engineered for your needs
It fits to your installation
It is not just a black box

Generator Control
Project execution – “Integration with other solutions”

Total solution with hand checking products as example:

- **One supplier and one overall project management for control, Instrumentation and electrical systems**

Control

Systems for
service- and monitoring,
management,
diagnosis- and documentation

(Data Acquisition, Close & Open Loop Control, Diagnose- & Documentation, Protection)

Instrumentation

Field Instruments,
Control Valves &
Actuators

Electrical Systems

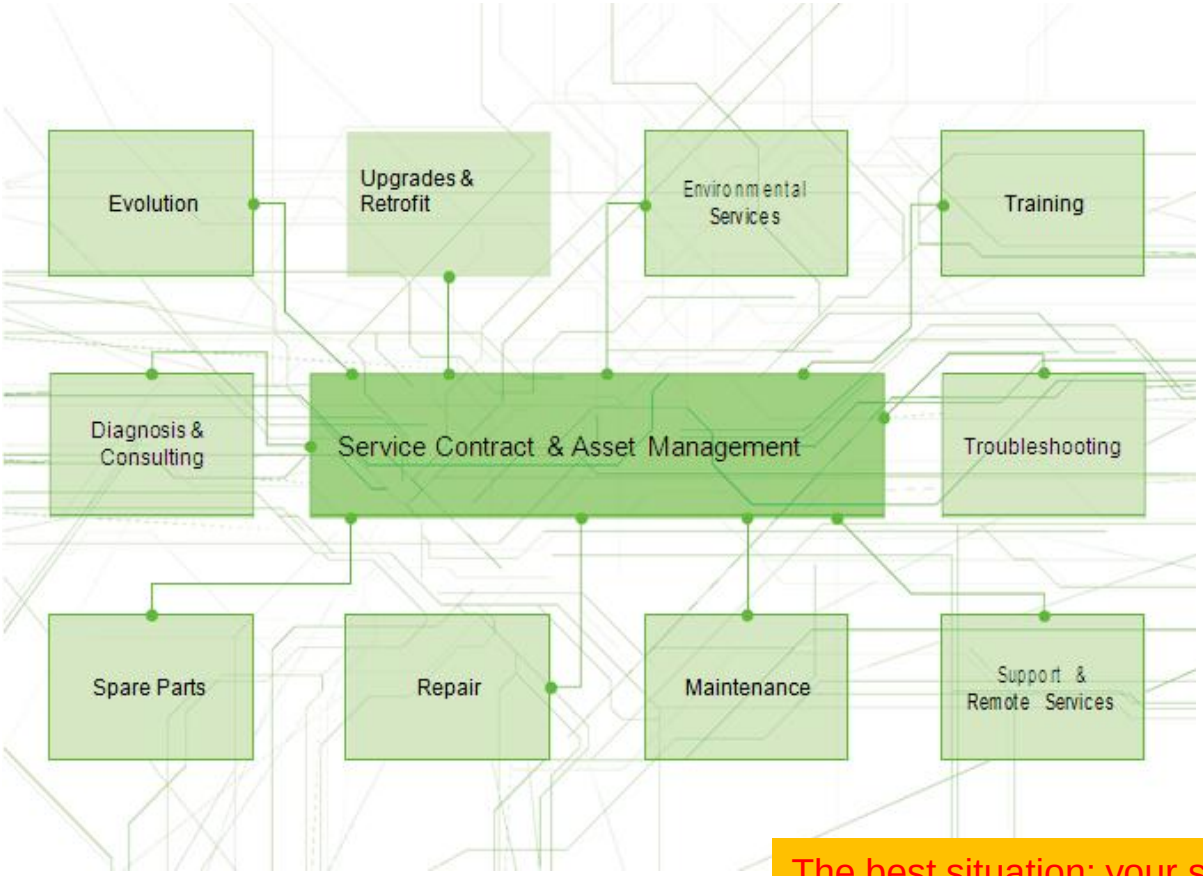
HV Substation
MV/LV Switchgear
HV/MV/LV Transformers
UPS-Systems
Illumination System
Communication Systems
Cabling
Synchronization
LV/MV Drives
Excitation Systems
Generator Protection
Generator breaker & bus duct
Emergency Power Supply

Tracking the systems for you
Keep your systems in good health
This is evolution of your installations

Generator Control
Service as key component after success installation

Your benefit

Professional life cycle services for your installed products and systems from your country

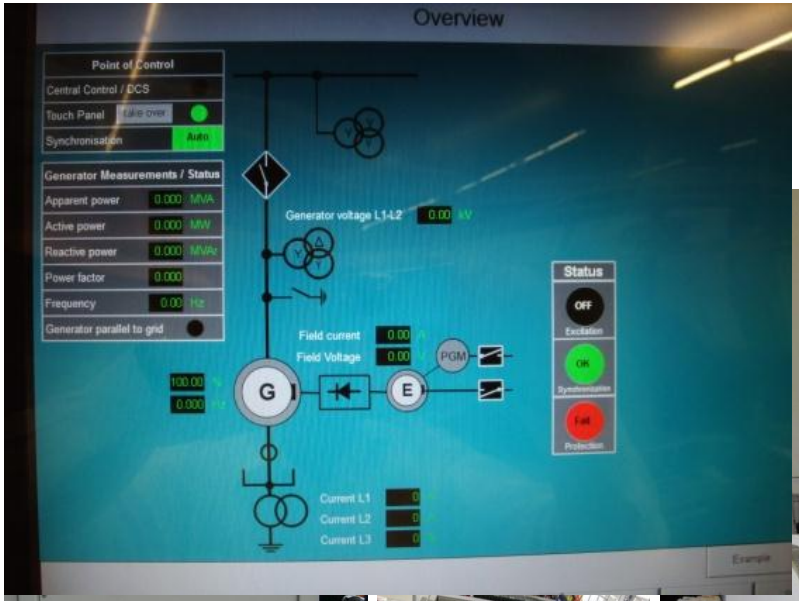


The best situation; your supplier can offer this to you?

Generator Control
Reference

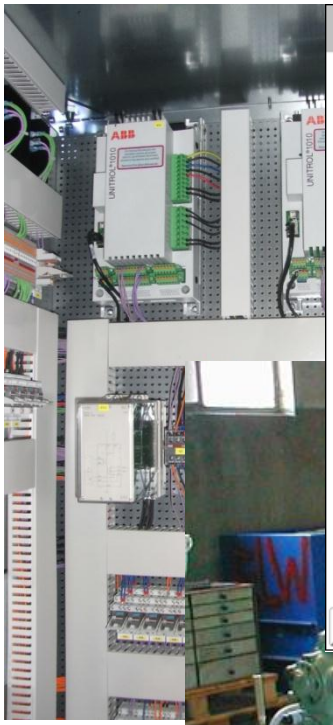
System for the Charmay Hydro Plant in Switzerland

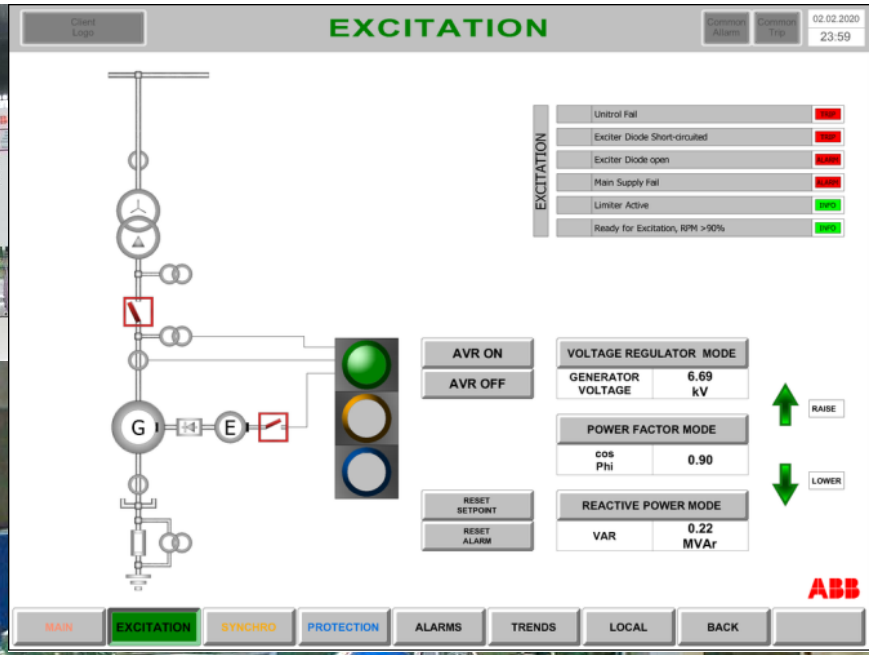
also in this solution the turbine governor and Generator control is implemented



Generator Control
Reference

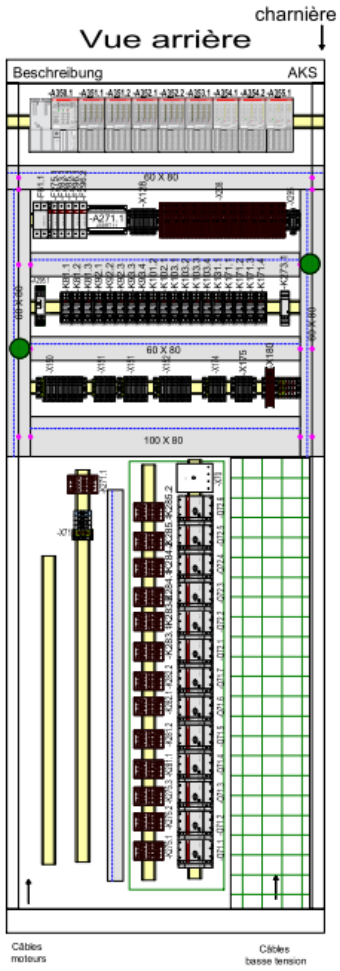
System for the Zofingen Waste to Energy Plant in Switzerland





Generator Control
Reference

Project execution “Single source”



Generator Control
Message

Generator Control message

- **Generator supervision and control in one location (same cabinet)**
- **Maximizes synergies between protection, synchronization, excitation and control**
- **High degree of standardization**
- **Engineering of your specific application**
- **Single source for project execution**
- **Common commissioning activity for the entire cabinet**
- **Service set up around the world**

- **Your system for the next 20 years**

Can you believe this?
Yes you can, you get a lot of benefits for your new Generator Control

Power and productivity
for a better world™