Intelligent Packaged Power

IEC 61850 Webinar
Intelligent Packaged Power
Elements of the Initiative

**INFRASTRUCTURE**
Dedicated team representing multiple business units

**SUPPLY CHAIN**
Agreements with key component suppliers and assembly partners

**TECHNOLOGY**
Unified Control & Visualization for Process and Power
## Electrical Equipment and Services

### Equipment
- MV/LV Switchgears From 35 Kv To 480 V
- MV / LV Motor Control Centers
- MV / LV Variable Speed Drives
- Power And Distribution Transformers
- LV Distribution And Conditioning
  - UPS and battery system, Filters, Grounding resistors, Current limiters
- MV / LV Motors
- Unified Control And Visualization Systems
  - Virtualized servers, Switches and routers, HMI devices, Controllers and I/O
- Across The Line Starters, Soft Starters
- Transformers
- Generators

### Services
- System Studies / Calculations
  - Fault level/short circuit, load flow, stability, harmonics, etc...
- Protection Coordination Studies
- E-house Engineering & Design
- Interface Engineering
- Network Consulting Services
  - Design, Configuration
- Relay Configuration & Programming
- System Engineering
  - Control system programming, HMI configuration (fixed and mobile), Historical database, Reporting
- Documentation
- Testing / Certification
- Installation And Commissioning

## Supply Chain
Intelligent Packaged Power

Why is IEC 61850 Used?

Intelligent Electronic Devices (IEDs)
Intelligent Packaged Power
Technical Strategy - Why IEC 61850?

- Uniquely positioned for Power Distribution & Electrical Infrastructure Automation
  - Industry preferred standard
  - Open standard on unmodified Ethernet
  - Vendor Agnostic
  - High Precision Time stamping
  - Flexible, redundant & secure topologies

- Parts of the Protocol:
  - SCADA / HMI data – MMS Reporting
  - High Speed Control – GOOSE

For Intelligent Electronic Devices (IEDs)

Strong parallels to EtherNet/IP in Process Control & Automation domain!
Automation of the Power Distribution System is defined by control strategies which demand different system performance / response times and system sizes.
Power Distribution Control Strategies

SCADA

Control Strategy Functions:
- Data Acquisition
- Manual Control
- Data Logging
- Visualization of Data
- Alarm Management
- SoE

Typical Industries / Markets Served:
- O&G Upstream / Downstream
- Mining / Metals
- CPW
- Building Automation
- etc.

* Control Strategy overlays are typical
Power Distribution Control Strategies
Long Time Constant Load Shed

Control Strategy Functions:
- Responding to events typically > 4 cycles (64ms)
- Typically events that won’t immediately disrupt power, but if left unattended will have a negative impact
- Electrical Capacity

Typical Industries / Markets Served:
- O&G Upstream / Downstream
- Mining / Metals
- CPW
- Facility Co-Gen
- Onsite Generation
- etc.

* Control Strategy overlays are typical
Power Distribution Control Strategies

Integrated Process Controls

Control Strategy Functions:
- Electrical information used to make process decisions
- Optimized control strategy leveraging power and process data together
- Time synchronized data allows for causality analysis

Typical Industries / Markets Served:
- O&G Upstream / Downstream
- Mining / Metals
- CPW
- Building Automation
- etc.

System Size [# IEDs] vs. System Performance [ms]

SCADA

Integrated Process Controls

Long Time Constant Load Shed

Data Acquisition Strategies
Process Control Strategies
Electrical Protection Strategies

* Control Strategy overlays are typical

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Power Distribution Control Strategies
Generator Synchronization

Control Strategy Functions:
- Auto synchronization provides ability to link onsite generation with utility power
- May be utilized for power export

Typical Industries / Markets Served:
- O&G Upstream / Downstream
- Mining / Metals
- CPW
- Onsite Generation
- etc.

* Control Strategy overlays are typical
Power Distribution Control Strategies

Black Start

Control Strategy Functions:
- Process of starting power distribution system with zero sources
- Involves bringing online turbines and generators
- Involves base loading and sequencing of loads

Typical Industries / Markets Served:
- O&G Upstream / Downstream
- Mining / Metals
- CPW
- Onsite Generation
- etc.

* Control Strategy overlays are typical
### Power Distribution Control Strategies

#### High Speed Load Shed

**Control Strategy Functions:**

- Responding to events typically < 3 cycles (48ms)
- Utilized with generator management to manage spinning reserve
- Required during transitions of power or loss of power

**Typical Industries / Markets Served:**

- O&G Upstream / Downstream
- Mining / Metals
- CPW
- Onsite Generation
- etc.

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**Integrated Process Controls**

**SCADA**

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**Long Time Constant Load Shed**

- Black Start
- Generator Sync

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**High Speed Load Shed**

- Data Acquisition Strategies
- Process Control Strategies
- Electrical Protection Strategies

*Control Strategy overlays are typical*
Power Distribution Control Strategies

High Speed Bus Transfer

Control Strategy Functions:
- Transferring motor & feeder bus loads from unhealthy to healthy bus within a cycle
- Utilizes high speed Auto Transfer Switches
- High speed peer-to-peer communications required

Typical Industries / Markets Served:
- O&G Upstream / Downstream
- Mining / Metals
- CPW
- etc.

Integrated Process Controls

Long Time Constant Load Shed

SCADA

* Control Strategy overlays are typical
Power Distribution Control Strategies
High Speed Interlock

Control Strategy Functions:
- High speed inhibit of loads or commands to loads
- Prevention of starting loads during sequencing, topology management, or Remedial Action Scheme (RAS)

Typical Industries / Markets Served:
- O&G Upstream / Downstream
- Mining / Metals
- Onsite Generation
- etc.

* Control Strategy overlays are typical
Power Distribution Control Strategies
Control Strategies Served by IEC 61850

IEC 61850 Manufacturing Message Specification (MMS):
- Large scale non-deterministic Ethernet communications
- Designed for SCADA type of networks
- Slower time constant control strategies

**Control Strategy overlays are typical**
Power Distribution Control Strategies
Control Strategies Served by IEC 61850

System Size [# IEDs]

25 50 75 100 150

112 1632486480

96

200

IEC 61850 MMS

SCADA

IEC 61850 GOOSE

Integrated Process Controls

Long Time Constant Load Shed

- Black Start
- Generator Sync
- Generator Sync

High Speed Load Shed

Interlock

High Speed Bus Transfer

Data Acquisition Strategies
Process Control Strategies
Electrical Protection Strategies

* Control Strategy overlays are typical

IEC 61850 Generic Object Oriented Substation Event (GOOSE):
- High Speed Peer-to-Peer or One-To-Many communications
- Fast acting load shedding
- "Deterministic" Ethernet communications
- Requires VLANs & configuration based upon MAC Addresses
Power Distribution Control Strategies

Control Strategies

IntelliCENTER IEC 61850 Integration Unit:
- Leverages IEC 61850 MMS
- Options for 1, 2, 3, 4 ProSoft IEC 61850 Gateways
- Supports up to 40 IEDs leveraging the PlantPAx IED models
- Multiple Integration Units leveraged together provide a scalable and flexible solution

IntelliCENTER IEC 61850 Integration Unit #1
- 25 IEDs
- 100 ms performance

IntelliCENTER IEC 61850 Integration Unit #2
- 50 IEDs
- 75 ms performance

IntelliCENTER IEC 61850 Integration Unit #3
- 75 IEDs
- 50 ms performance

Integrated Process Controls
- Long Time Constant Load Shed

Data Acquisition Strategies
- SCADA

Process Control Strategies
- Electrical Protection Strategies

Power Distribution Control Strategies
- Control Strategies
- Data Acquisition Strategies
- Process Control Strategies
- Electrical Protection Strategies

*Control Strategy overlays are typical
Intelligent Packaged Power
Extending the Connected Enterprise (Integrated Power and Process)

**SINGLE NETWORK**
Unmodified Ethernet

- Design Software
- Controllers
- HMI
- Motor Starters
- Drives
- IntelliCENTER MCC
- Intelligent Switchgear
- Intelligent eHouse

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**TECHNOLOGY**

INTELLIGENT MOTOR CONTROL

INTELLIGENT PACKAGED POWER
Standard hardware offering to deliver the IPP solution

- Co-branded Panduit network enclosure to leverage both RA and Panduit's domain expertise
Within a trusted network infrastructure the IIU (dashed line) is uplinked to the level 2/3 of the control system via the Stratix 5700 managed switch.
PREMIER INTEGRATION

▷ Single Software Tool: Studio 5000
▷ Access to All Device Parameters
▷ Eliminates Address Mismatches
▷ Multi-Vendor Integration

INTELLIGENT MOTOR CONTROL
Modern Approach
The Intelligent PP Solution

Single control platform
- Data from all devices mapped to controller
- Available for Real time
- Time stamped / synchronized to master clock

Single platform for visualization, archiving and reporting
- Reduction of implementation cost
- Automatic configuration of:
  FT View Faceplates; FT Historian Asset Framework;
  FT Vantage Point type packages
Intelligent Packaged Power
Value Proposition

**Simplification:** Single point of responsibility

**Independence:** Ability to define best combination of components

**Reduction In Cost / Risk To Project**

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<td>I/O interfaces to control system</td>
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Ability to unify electrical and process control systems \(\Rightarrow\) Eliminates redundant IT infrastructure

Market leading integration experience (with Logix)

Simplified integration to DCS \(\Rightarrow\) power as a “skid” (without Logix)
Intelligent Packaged Power
The Intelligence Behind IPP