A rede elétrica inteligente como pré-requisito para IOT

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ENERGIZED
• +50% energy consumption by 2050 due to urbanization, Industrialization, digitization.
• Electricity to grow twice faster than energy consumption
• 2.3 bn people do not have either access or reliable access to electricity

EFFICIENT
• 3X efficiency needed to solve climate change
• 82% of untapped energy efficiency in buildings
• 50% of untapped energy efficiency in industry

CONNECTED
• 10X more incremental connected devices than incremental connected people by 2020
• 50bn connected things by 2020
• Software runs everything

Schneider makes life Safe, Reliable, Efficient, Sustainable and Connected
Our 5 Smart Grid Domains

Optimize Supply and Demand

Centralised Generation

Transmission

Distribution

Utility network

Consumers

1. Flexible distribution

2. Renewable Energy Plants

3. Efficient homes (incl. EV charging infrastructure)

4. Efficient Enterprise (incl. EV charging infrastructure)

5. Demand-response

Smart Generation
(distributed & renewable)

Residential
Efficient Home

Commercial
& Industrial
Efficient Enterprise

Commercial
& Industrial
Efficient Enterprise

Industry

Buildings

Data Centre

Infrastructure

Distributed Generation
3D+E equation redefining the energy world...

1. Decarbonization

2. Digitization

3. Decentralization

MORE ELECTRIC

Global energy consumption will increase by 40% in next 25 years ... and electricity consumption will increase by 80%

Huge growth forecast for variable renewables

Solar PV and Storage are expected to count for 32% of new capacity additions by 2030

Proliferating automated devices connecting the “grid of things”
Big data integration
Internet of Things will connect 50bn devices by 2020

Expanding energy consumerism
(smart homes, self-generation, EVs, financing services)

Prosumer challenge
57% of consumers consider becoming power self-sufficient
Ensuring high efficiency in Grid operations

Providing optimal Asset Management

Enabling the digital transformation

EcoStruxure is built on proven capabilities to support new business opportunities
Open data management for seamless IT/OT convergence

Partner ecosystem

- Microsoft
- Cisco
- Esri
- Hewlett Packard Enterprise
- Energy Pool
IT and OT becoming one
Connected devices, real-time control & open software, analytics & services

**EcoStruxure.io**

<table>
<thead>
<tr>
<th>Connected Products</th>
<th>Cloud and/or On Premise</th>
<th>Edge Control</th>
<th>Apps, Analytics &amp; Services</th>
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<td>Smart Sensor</td>
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<td>Protection Relays</td>
<td>Advanced Metering Management</td>
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<td>Easergy MICOM</td>
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**Grid**

Innovation At Every Level
Fostering open interfaces and data models
Delivering core & innovative value

Efficient grid operations
- Accurate situational awareness for improved decision-making
- Reinforced network stability and voltage management
- Improved operational profitability & topline growth

Optimized asset management
- Optimized CapEx/TotEx with asset investment planning
- Risk-based asset management from predictive maintenance
- Maintenance cost optimization

Expanding business models & roles
- Accelerate DER and microgrid management
- Engage with consumers (demand side management, ancillary services, energy efficiency programs)
Advanced Distribution Management System

Fully integrated unified application for network management with unique data model

**Challenges**
- Ensure network reliability and service supply
- Optimize network operations by increasing workforce & asset efficiency
- Increase energy efficiency and reduce technical losses

**Benefits**
- Improved total cost of ownership and capital investment
- Improved safety and reliability of network operations
- Reduced peak demand and power losses
- Reduced outage time for customers
- Improved performance indicators (regulatory KPIs)
- Improved utilization of network facilities – reduced investments.

- Fully integrated with GIS Import, CIM network model, AMI, Enterprise Service BUS
- Real-time digitized workflows: Automatic Switching Plans & Volt-Var-Control, FLISR
- Supply & demand DER forecasting to reduce peak demand
- Comprehensive Outage Management System
- Virtualized user interface, simulation environment, holistic work order management
- Compliant with NERP CIP standards

SAIDI/SAIFI indicators reduced by **22%** with OMS

Energy losses reduced **4%** optimizing operational costs by €5.7 M per year

Asset performance improved providing £4M ROI in 3 years

320+ MW peak reduction (3% of system peak load)
ArcFM: GIS for Utilities

Centralized geospatial asset management. Using to power of location to solve problems.

Challenges

• Safeguard & leverage critical network and asset data
• Manage workflows more efficiently
• Access shared operational data across business (planning, operations & crews)

Benefits

• Centralized data store eliminates disparate systems to secure accurate data
• Boosts both quality and accuracy of GIS data
• Efficient decision making for operations, planning, and data maintenance
• Intuitive interface & productivity tools for efficient business processes
• Operational awareness: reduced outage duration & improve service reliability
• Streamlined engineering processes, from design to installation
• Mobile apps tell crews where to go, what to do and what information to collect

60% time savings to design network model using easy-to-use drawing tool automatically saves in GIS

Improved efficiencies in planning and work process, & reduced design labor costs

• Single source of unified, up-to-date network data
• Accessible from desktop, Web, and mobile devices
• Data is available and readily updateable in the field
• Supplies network model for: ADMS, OMS, SCADA -DMS,
Power Systems Engineering Tools
Advanced design & configuration services for IEC61850 substation automation systems

Challenges
• Complex specification, integration, and maintenance of IEC 61850 systems throughout complete life cycles.
• Complex IT/OT systems requires seamless integration
• Deliver multi-vendor systems & extensions in efficient & industrialized approach

Benefits
• Reduced CapEx from improved configuration and standardization efficiencies
• Maximized engineering by re-using applications and not configurations
• Reliable and secure design and configuration of complex systems based on recognized IEC 61850 standards

80% time savings to design network model using IEC 61850

• Manufacturer-independent engineering workbench to design and configure distributed systems
• Advanced modeling services coupled with system engineering software platform
• Customized grid components created as reference
• Vendor independent design translated into IEC61850 standardized files.
Asset Performance Management

Exceed asset performance with data collection, analysis and optimization for proactive maintenance

Challenges

• Ensure maximum performance of infrastructure assets 24/7
• Transition from managing asset lifecycles with improved maintenance visibility and standardized practices to integrated and operations-centric approach

Benefits

• Maximized economic return on power system assets
• Increased asset reliability and availability to meet production goals.
• Improved workforce efficiency and decision making
• Move from reactive to proactive/predictive maintenance & strategic planning
• Improved reliability and risk management with condition based approach
• Resource and planning optimization with improved communication, spatial view of assets, and maintenance prioritization based on failure risks
• Enables mobility with contextual information in the field, on any device

| Percentage | Description
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<tr>
<td>20%</td>
<td>Increase in asset availability</td>
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<td>30%</td>
<td>Reduction in maintenance costs</td>
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<tr>
<td>25%</td>
<td>Reduction in unplanned downtime</td>
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<tr>
<td>25%</td>
<td>Increase in planned work</td>
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Estimated unplanned downtime savings: $8.9 million

3 month payback from 700k$ investment in 6x600MW plants

• Enterprise data historian collects, stores, displays, analyzes and reports on operational data.
  • Consolidate disparate data sources
  • Bridge IT/OT gap
  • Make data available throughout the Enterprise
  • Advanced visualization tools, web solution & API

• Predictive asset analytics to monitor asset health & performance and provide early warning of equipment problems.
  • Reduce unscheduled downtime
  • Prevent equipment failures
  • Reduce maintenance costs
  • Increase asset utilization
  • Extend equipment life
  • Identify underperformance
  • Improve safety
Microgrid Energy Management System
Optimization of DER integration to forecast how and when to consume, produce, or store energy

Challenges
• Sustain high operational performance despite distributed generation disruption
• Master load curve evolutions & disruptive competitive landscape
• Create value from energy independence & microgrid/prosumer trends

Benefits
• Increases sustainability profiles by enabling greener operation and saving money while improving reliability
• Web-based user interface communicates real-time savings, earnings, & CO2 emissions data
• Proprietary predictive algorithms incorporate weather forecasts, historical DER data, real-time tariff rates, Demand Response requests, and site-specific operating constraints for dynamic scheduling updated every 15 minutes
• 72 hour ahead and automatic default operation mode schedules for system reliability

Multi-DER microgrid testbed with island capacity to ensure power resiliency

Boston One Campus microgrid, with Duke Energy reduces electricity costs by 5%

Installed with Duke Energy and Boston One Campus microgrid, with island capacity to ensure power resiliency.
PACiS: Substation Automation Systems
Digital IEC61850-compliant protection, operation & maintenance system for transmission & distribution substations

Challenges
• Distribution substations are unmanned and linked to multiple dispatch centers
• Total cost of ownership must be reduced, optimizing power quality at delivery point and at best cost.
• High level of safety, accuracy and reliability is required for operational decision-making and throughout full system lifecycle

Benefits
• High performance operations for increased uptime & situational awareness
• Increased people safety and asset security
• Capex & Opex savings from
  • System design, configuration, communication and testing based on IEC61850 standards
  • Open & flexible system for multi-vendor installations and scalable to specific requirements
  • Future-ready, to extend installation lifecycles
  • Reduced system integration costs with efficient engineering techniques & tools
  • Intuitive maintenance tool-suite

• Reliable /accurate field data collection from multi-functional IEDs
• Protection schemes for people safety & infrastructure security
• OT-embedded approach to cybersecurity
• Automated decision-making schemes to ensure power system integrity, availability & performance
• Supervision & control software interfaces for extensive operational situational awareness
• Standardized system engineering, design, communication, configuration & maintenance.

+1,600 systems installed world wide
Titanium: Advanced Metering Management
From roll out through to operation delivering meter data, LV monitoring reports and data management

Challenges
- Deploy costly and large-scale smart metering roll outs
- Increase visibility on LV feeders on distribution networks and its topology

Benefits
- Reduce deployment risks and operational costs
- Increase functionality of smart meter infrastructure
- More efficient and accurate low voltage grid operation
  - Advanced supervision & asset management of transformer station assets
  - Universal Head End for data collection, device management & events processing
- Reduces the need of manual field intervention and detect electrical association by phase
- Reduced network outages

72% of European consumers to have smart meters by 2020

- Deployment, management and integration of Smart Metering infrastructures
- Consolidates data of different meter technologies with integration of multiple head-end systems & consistent interface to utility systems
- Support entire project workflow of major rollouts
- Remote operations: connect/disconnect, firmware upgrades, device re-configuration, on-demand service requests, time-based and dynamic load control, data management for billing
- SaaS model, including cyber security for critical AMI infrastructures

+20% improved operational efficiencies from automated readings & LV network services
Distribution Automation – Easergy T300

The modular feeder automation device for a smart grid distribution automation

Challenges

- To ensure reliable power availability and reduce outage times on MV & LV network

Benefits

- Minimize supply interruptions, optimize network performance and reduce operational costs from centralized and decentralized network reconfiguration
- Simplify installation, commissioning and maintenance
- Secure control and data acquisition for network operation including substation cyber security
- Advanced fault detection: directional and non-directional over-current detection, broken, or bridged line detection, transformer (per phase), & fuse blown detection
- Volt-VAR management for real-time control and integration of distributed energy resources and power flow optimization
- Accurate data analysis to manage peak-load situations, reduce technical and non-technical losses and optimize energy efficiency with improved load flow calculations

- Advanced monitoring, control, and automation
- Latest communication technologies for remote and local operation for future-proof systems with open protocols and digital lifecycles
- An integrated all-in-one solution for MV/LV control and monitoring.
- Compact & modular design for many applications and configurable.
You are not alone...

Schneider Electric is the partner of choice
To know more about EcoStruxure Grid
EcoStruxure™ Grid

From seamless local production and integration at the grid edge, to bridging demand and supply, EcoStruxure™ Grid increases your grid’s efficiency for sustainable networks.
Smart Utility e-book
