Empowering the smart utility

Operate smart grids, decarbonize generation, and deliver innovative energy services

Presented by: Claudio Oliveira, Smart Grid Solution Architect
claudio.oliveira@schneider-electric.com
Energy is the base of life.

Life Is On
when energy is on......

We ensure energy is on by making it

• Safe
• Reliable
• Efficient
• Connected
• Sustainable
Our cities are growing.

- 80% of carbon emissions
- 75% of the Earth’s energy consumption
- 50% of the Earth’s population
- 2% of the Earth’s surface
Megatrends are provoking a rise in Energy Demand

**URBANIZATION**
+2.5 bn people in cities by 2050
*Source: United Nations, DESA*

**DIGITIZATION**
50 bn connected things by 2020
*Source: Cisco*

**INDUSTRIALIZATION**
+50% energy consumption by 2050
*Source: IEA*
Resources in the next 40 years

- Energy consumption will almost double (×1.5)
- CO₂ emissions need to be halved (÷2)
- We have to become 3 times more efficient (↑3×)

Note: Forecast for 2050 compared to 2009 levels
**Our World will be…**

**MORE ELECTRIC**
- Demand for electricity driven by sustainability, intelligent devices, and evolution of key energy consumers (motion and cooling)

**MORE DISTRIBUTED**
- Provide local energy to facilities, around positive energy and micro grids, to empower users
- Falling prices of renewable energy

**MORE CONNECTED**
- Internet of Things will connect at least 50 bn devices by 2020

**MORE EFFICIENT**
- 2/3 of energy efficiency potential remains untapped
- Buildings, industry & infrastructure end-users and datacenters all look to improve performance, efficiency and environmental footprint

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1 World Energy Outlook 2012, OECD / IEA, Internal analysis

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... and Schneider Electric is uniquely positioned to make demand efficient and connected

Integration of Energy, Automation, and Software

Simpler, more scalable and flexible industrial architectures, leveraging the best of IT technologies

INTERNET OF THINGS
- Number of connected objects expected to double in the next 5 years

1. Source Cisco IBSG April 2011 / Internet World Statistics
Our 5 Smart Grid Domains
Optimize Supply and Demand
Schneider Electric global service network delivers
End to End Services

Field Services
Global offer powered by digitization
7,500+
Service Delivery Professionals

Cloud Services
Software and connectivity provide digital services
250
Service Centers

Energy and Sustainability Services
Managed services built on deep segment knowledge
15
Service Bureaus
Challenges for electric utilities
Electric utilities are at the core of accelerating changes in the energy world
Demand for higher safety and reliability

$50-150 bn
annual cost to US economy following productivity or revenue losses linked to power outages

90%
of all power outages occur along distribution lines

Source: Bloomberg New Energy Finance
Increased renewable generation

143 GW were added to the world’s renewable electricity capacity in 2013, compared with 141 GW added by new fossil-fuel plants

140% of Denmark’s electricity was generated on 11 July 2015 by wind power and surplus was exported to neighboring countries

150% is the amount by which US non-hydropower renewable generation capacity is expected to grow by 2040

Data source: Bloomberg New Energy Finance
Data source: The Guardian
Data source: U.S. Energy Information Administration
Changing customer needs

44% of utilities’ customers are digitally engaged - Interacting through digital channels over the past year

36% of utility customers trust their energy providers to optimize their energy use

57% of consumers would consider investing in becoming power self-sufficient

Data source: Accenture
Shift from centralized to decentralized system

+1.5 million
power plants, mainly PV, now operating in Germany
Source: German Solar Industry Association (BSW-Solar), June 2015

95%
of energy producers in France are connected to MV distribution grid
Source: ERDF
Focusing on three priorities can address these challenges

**Grid Efficiency**
Enhancing efficiency of operations and investments through smart solutions and intelligent devices

**Grid Edge**
Increasing flexibility of power generation, distribution, and consumption by implementing distributed energy resource systems

**Demand Side Management**
Matching demand and supply by introducing advanced monitoring solutions and new customer services
Solutions for grid modernization

Increase your network reliability by up to 30%* by implementing integrated solutions and services

* Based on previous customer data. This is not a guarantee of future performance or performance in your particular circumstances.
Solutions for grid modernization

Distribution substation automation

- Monitoring and control system for distribution substations based on templates and open protocols for greater flexibility
- Scalable, easy to customize, and smoothly integrated in the grid
- Tested templates with embedded cyber security and redundancy for system reliability

Feeder automation

- Stand-alone system based on reclosers, sectionalizers, and controllers that detect and react to upstream and downstream events
- Fault location, isolation, and service restoration reduce outage duration and number of affected customers
- The number of operator interventions and field crew dispatches is reduced
Solutions for grid modernization

Transmission and complex substations

• Systems designed for HV and MV substations, for network supervision, protection, automation, and control
• Improve operational visibility and energy availability
• Compliant with IEC 61850 and IEC 62443 cyber security standards (Achilles Bronze certification)

Underground and overhead self-healing grids

• Self-healing systems for isolating faults and restoring energy supply
• Power is quickly restored for customers outside the affected area without operator intervention
• Zones affected by outages are reduced and voltage dips are minimized
Solutions for grid modernization

IEC 61850 engineering services

- Software platform featuring advanced services for specifying, integrating, and maintaining IEC 61850 systems throughout system life cycles
- Helps utilities industrialize operations, decrease supply variations, and facilitate grid extensions and maintenance through open and flexible system

Life-cycle services

- Comprehensive service plans for maintenance (reactive, preventive, and condition-based) and spare part management for improving service continuity and limiting downtime
- Full life-cycle solution covering modernization, recycling, and sustainability services
Solutions for asset management and operations

Cut outages and reduce maintenance costs by up to 30%* with a fully digitized asset portfolio and IT control systems

* Based on previous customer data. This is not a guarantee of future performance or performance in your particular circumstances.
Solutions for asset management and operations

Distribution SCADA

• Controls, monitors, and visualizes electric networks in real time
• Rapid fault isolation and reporting on recovery efforts
• Records events, alarms, and activities to enable simple historical tracking of network operations
• Real-time visibility helps maintain network stability and achieve reliable, secure, and efficient operational performance
Solutions for asset management and operations

Advanced Distribution Management System

• Advanced network management solution with real-time monitoring, analysis, control, optimization, planning, and training all sharing a common infrastructure, data model, and user experience

• Situational awareness of the entire service territory for improved forecast and operational decisions

• Comprehensive management approach enables increasing network reliability and resiliency, improved energy efficiency through reduced energy losses, and optimized operations
Solutions for asset management and operations

Outage Management System

- Integrated solution combining customer, calls, and incident data collection and mobile crew management
- Provides geospatial, schematic, and dashboard views of power outages, network issues, and switching operations
- Improves network reliability

Weather Intelligence

- Industry-leading, accurate weather forecasts with geographic visualization, delivered via browser, mobile, web services, or FTP
- Field crews plan maintenance interventions and avoid weather-related risks (lighting strikes, etc.)
- Load forecasting reduces power generation costs and grid instability risk
Solutions for asset management and operations

Geospatial Information System

- A single source of unified, up-to-date network data accessible from desktop, web, and mobile devices
- Timely, accurate asset and network data available to everyone, from planning department to field crews
- Enables efficient decision making for utility operations, planning, and data maintenance

Asset Performance Management

- Equipment management solution collecting asset data and integrating them into utilities’ operation and maintenance processes
- Optimized maintenance preventing failures and unscheduled downtime and extending equipment life expectancy
Solutions for cleaner generation

Accelerate deployment of renewables by up to 30%* with our pre-defined architectures and simplified connections

* Based on previous customer data. This is not a guarantee of future performance or performance in your particular circumstances.
Solutions for cleaner generation

Utility-scale Solar Plants

- Integrated power plant control systems for large-scale plants electrical balance: power collection, conversion, and injection into grid, as well as plant supervision and control
- The solution enables plants to meet the most stringent grid codes and improve operational efficiency

Turnkey Wind Farms

- A comprehensive package for wind farm management, including MV power equipment, PLCs, complete turbine-to-turbine and farm-to-grid electrical distribution and protection and control systems
- Optimizes plants operations and availability and improves reliability, security, and efficiency
Solutions for cleaner generation

- Solutions for remote operation of renewable power plants with smart analytics, process monitoring and optimization, power and weather forecasting
- Real-time information collected from field instruments and devices available in visual displays

Renewable Portfolio Management

- Integrated, real-time power control solutions for advanced protection, resource management, and grid connection
- Flexible architectures built on standard products enable reduced engineering time and easier system integration
- Improve plant reliability and increase electricity output

Hydro Plant Control Systems
Solutions for cleaner generation

Microgrid Control

- Smart solutions for microgrid management, monitoring, and protection, including Energy Management Systems, storage and renewable conversion scalable units, Demand Side Management, and weather forecasting
- More efficient and flexible unit management in terms of operation ranges, start-stops, regulation, and maintenance
- Comprehensive microgrid management increases grid stability, facilitates renewable energy integration, and optimizes energy generation and distribution
Solutions for demand management

Protect and increase utility revenues by minimizing grid losses by at least 30%* and offer new energy efficiency services to customers.

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Solutions for demand management

**Losses Detection**

- Comprehensive analytics tool for detecting losses and theft, billing or wiring errors, and phase imbalance or transformer overload
- Identifies the highest risk areas, assesses top priorities, and recommends appropriate actions
- 30-50% of non-technical losses recovered

**Advanced Metering Infrastructure**

- Smart metering systems project rollouts, remote meter configuration, reading collection, increased Low Voltage visibility, and system monitoring
- Accurate, real-time consumption measures increase service reliability and operational efficiency
- Grid operating costs are lowered
Demand response operational system designed to increase operational flexibility

- Enables consumer involvement in system balancing by aggregating and optimizing load-shedding capabilities
- The system includes network operating center with DRMS

The Wiser package includes smart energy box with ZigBee® controlled devices (thermostat, smart plugs) and services

- Collects environment data through sensors and displays detailed energy usage
- Grid efficiency is increased through consumer engagement
Solutions for demand management

- Energy-efficiency services supporting internal analytical strategies, such as financial analysis, generation analysis, sourcing strategies, and rate analysis
- Increase energy efficiency and help meet carbon reduction requirements

- Web-based platform providing utilities and customers accurate and detailed energy data to identify cost-saving opportunities
- Increases customer engagement to allow transition to new business models
- Helps utilities meet their energy-efficiency mandates and comply with regulations
Smart equipment for connected "grid of things"

Improve assets visibility and control by up to 30%* with connected devices

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Smart equipment for connected "grid of things"

Smart Grid Switchgear - Premset

• Compact and modular MV switchgear for simplified distribution network management, easy installation, and minimal maintenance

• Innovative Shielded Solid Insulation System (SSIS) provides enhanced network protection and helps maintain optimized performance in any environment

• Built-in communication and local intelligence support load management, and integrated smart metering enables asset management and transformer monitoring

• Automatic Transfer System helps reduce power supply interruptions

Premset switchgear
Smart equipment for connected "grid of things"

Easergy T300 Feeder RTU

- Powerful and flexible feeder automation devices for managing bidirectional and intermittent power flows
- Easergy T300 helps increase grid availability by reducing duration of LV outages through automatic reconfiguration
- Power quality is maintained with accurate MV and LV voltage measurement
- Modularity and remote asset management optimize installation, operation, and maintenance costs
- Network efficiency is improved through reduced technical and non-technical losses

Easergy T300 Feeder RTU
Smart equipment for connected "grid of things"

Minera SGrid Controllable Transformer

• Self-adjusting transformer automatically stabilizes output voltages to avoid voltage band violations in the context of increased distributed energy

• Easy installation, fast integration, and autonomous operation

• Wide voltage range facilitate precise regulation for specific applications

• Robust design with no mechanical parts and no power electronics for enhanced reliability and low maintenance
Smart equipment for connected "grid of things"

LV Monitoring Module and Sensors

- Wireless, self-powered meter for reactive energy measurement of power and LV feeders
- Easy-to-use monitoring of voltages for load balancing
- Increased visibility of network operations for energy efficiency and greater peace of mind
- Scalable and flexible, easily adjusted to specific network features
We co-invent solutions with utilities that fit their needs and environments and provide best-in-class global delivery and project management.
Everyday, the world’s top electric utilities use Schneider Electric solutions to deliver safe and reliable power to homes and businesses
We empower utilities for a bright, connected future

through decentralized, decarbonized energy, and flexible grids
Smart Utility ebook


POWERING AN ‘ALWAYS ON’ WORLD
HOW SMART INFRASTRUCTURES WORK