



EcoStruxure Grid

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Schneider Electric

Life Is On when life is...

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

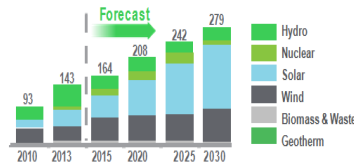
CONNECTED

- **10X** more incremental connected devices than incremental connected people by 2020
- **30bn** connected things by 2020
- **Software** runs everything

Schneider makes life Safe, Reliable, Efficient, Sustainable and Connected

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

1 Decarbonization



Huge growth forecast for variable renewables

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

2 Digitization

Proliferating automated devices connecting the “grid of things”

Big data integration
Internet of Things will connect **50bn devices** by 2020

3 Decentralization

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

Prosumer challenge
57% of consumers consider becoming power
self-sufficient

**MORE
ELECTRIC**

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

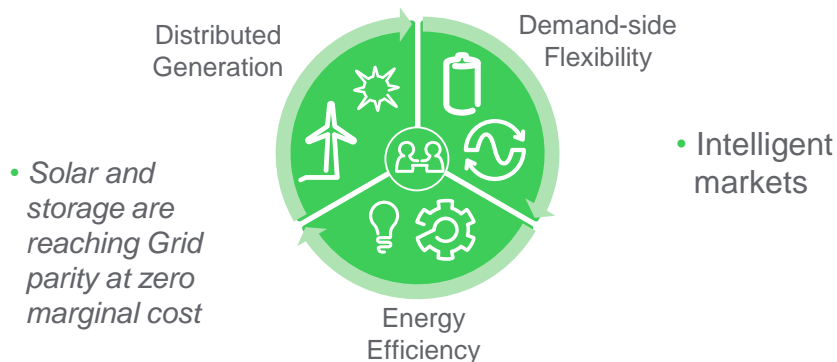


... creating unprecedented change in the power industry

By 2025 traditional centralized model will be complemented by a world of distributed energy,

Pressure on the grid

- Tomorrow's grid integrating a multitude of DER (DG, storage and flexible loads)



Disrupting existing business models

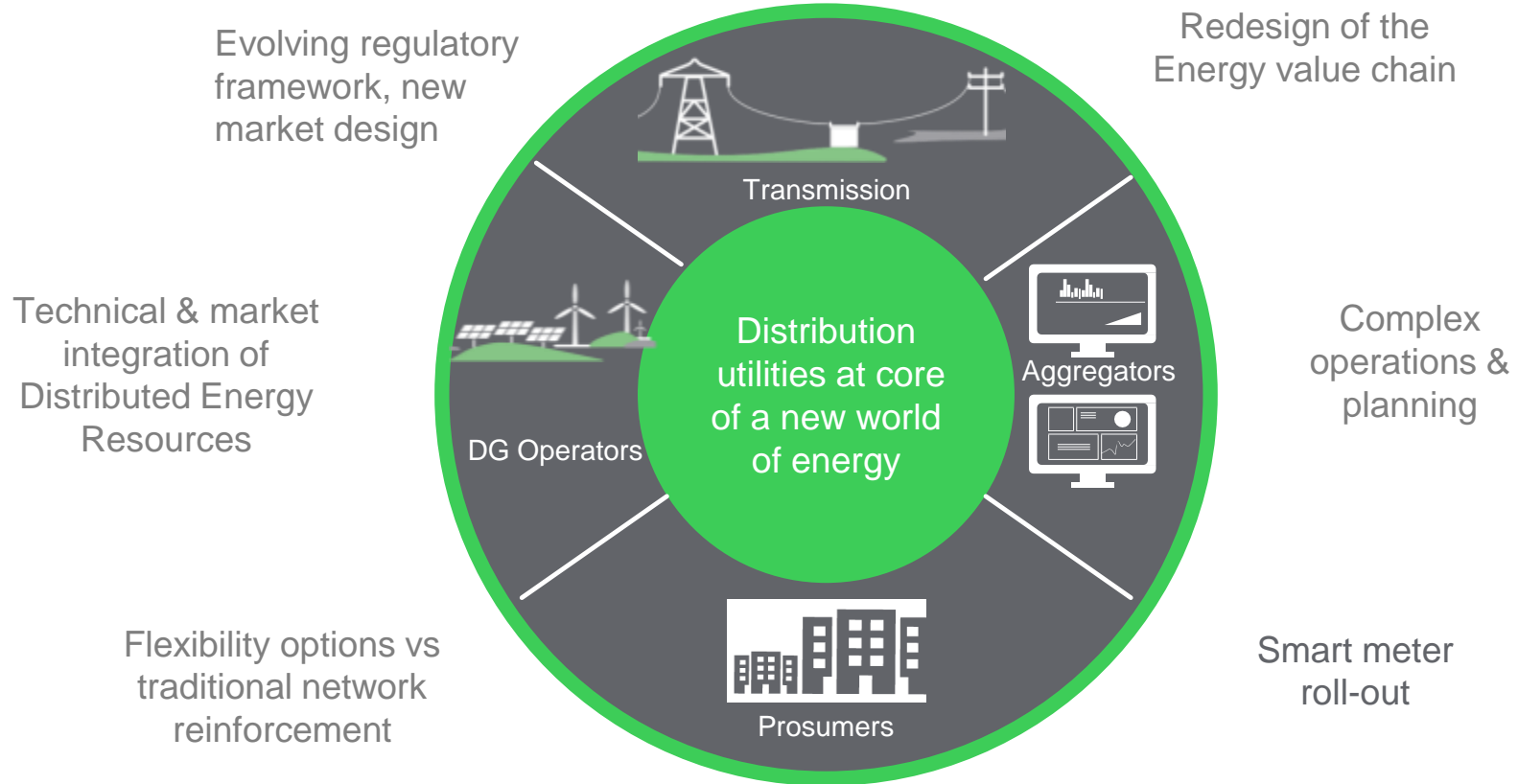
- Utility-scale generation model disruption (volatile wholesale market, and emerging capacity market)

New power grid design:

- National / Interconnections-regional
- Intermediate Microgrids (municipal, regional)
- Prosumers

New regulatory frameworks required

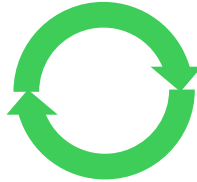
Distribution utilities are impacted by business uncertainty



Open IoT-enabled framework for digital transformation of distribution utilities

1

Providing optimized Asset Maintenance & Investment strategies



2

Ensuring reliable, efficient & safe grid operations

3

Enabling the digital transformation



EcoStruxure is built on proven capabilities to support new business opportunities





MOBILITY



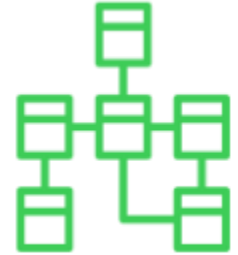
CLOUD



SENSING



ANALYTICS

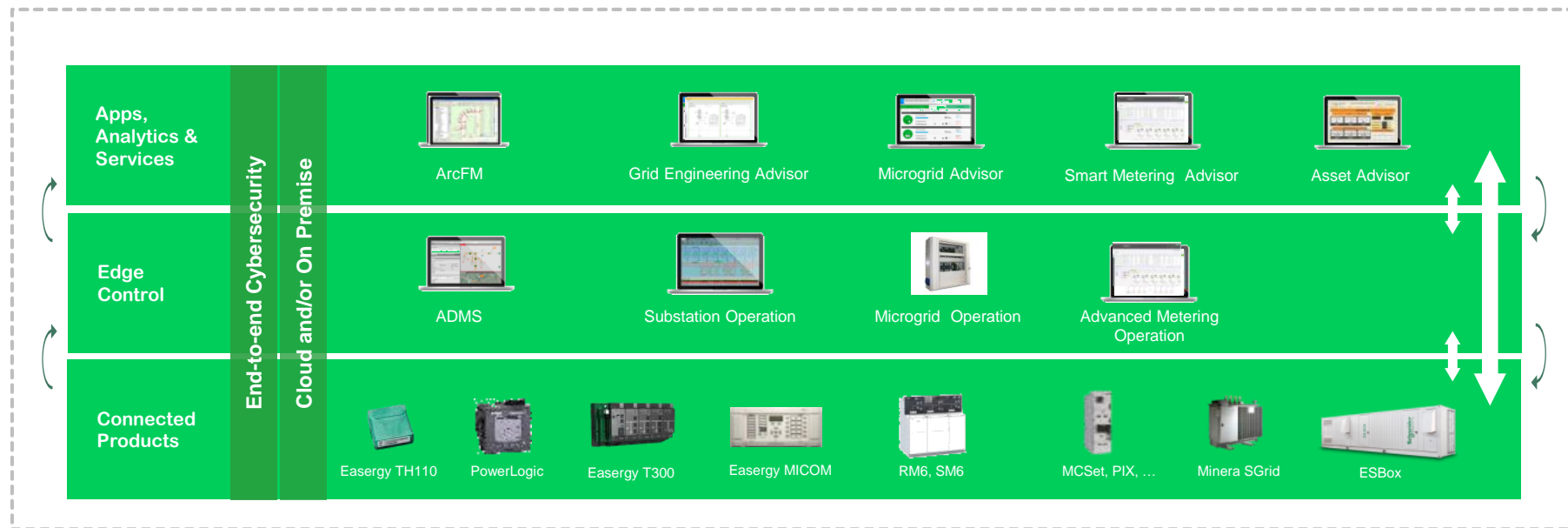


SECURITY

Open data management for seamless IT/OT convergence

Partner ecosystem





Connected devices, real-time control & open software, analytics & services

Connected products for smarter operations

Augmented with sensors, digital tools and analytics throughout lifecycles



- More precise conditioning monitoring & asset diagnostics
- Extending network observability & controllability
- Safer & more flexible field operations



Edge Control: extending data reach & control

Powerful, secure & flexible on-premise systems from high to low voltage



- High performance grid efficiency from real-time monitoring and control
- At Every Level of the Grid from HV/MV substations across distribution network and down to meters.

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Maximizing the value of data with apps, analytics & services

Actionable data for better decision-making

Integrated applications



- Common network model
- Smart Meter data retrieval
- Dynamic Protection Settings
- Asset Investment Planning

De-siloed meaningful analytics



- Grid Operations
- Asset Performance Management
- Asset Investment Planning
- Grid Model Optimization
- Revenue Optimization

Cloud Connected Digital Services



- Customizable services
 - APM as a Service
 - LV network monitoring
 - Microgrid Management

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Delivering core & innovative value



Optimized asset management

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



Efficient grid operations

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



Expanding business models & roles

- Accelerate DER and microgrid management
- Engage with consumers (demand side management, ancillary services, energy efficiency programs)

EcoStruxure ADMS

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.



SAIDI/SAIFI indicators
reduced by 22% with OMS



320+ MW peak
reduction (3% of
system peak load)



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



Asset performance
improved providing £4M
ROI in 3 years



- 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

EcoStruxure ArcFM: GIS for Utilities

Centralized geospatial asset management. Using the 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,

EcoStruxure Grid Engineering Advisor

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



- 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

20% increase in asset availability

25% reduction in unplanned downtime

30% reduction in maintenance costs

25% increase in planned work



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

EcoStruxure Microgrid Advisor

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%**



- Compatible with PC, tablet, or smartphone devices and Chrome, Firefox and Internet Explorer web browsers
- Third party data base connectivity
- Native OpenADR protocol exchanges information with other platforms including enterprise information systems, commercial aggregators, and third parties

EcoStruxure Substation Operation

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

Based on PACIS technology
+1.600 systems installed world wide



- 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.

EcoStruxure Advanced Metering Operation

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

72%
of European consumers to
have smart meters by 2020

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

caruna

+20% improved operational
efficiencies from automated
readings & LV network services



- 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

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.

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