SIEMENS
Ingenuity for life

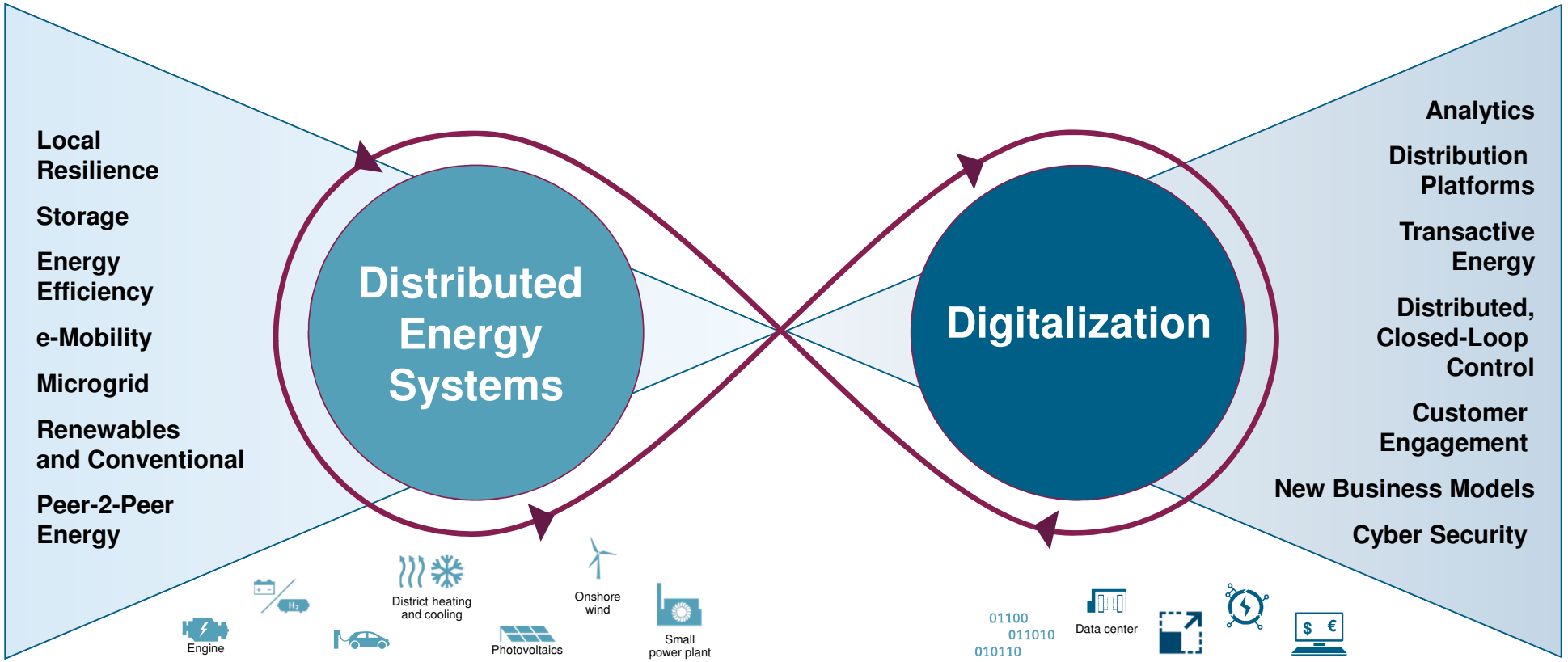
Grid Modernization to enable Distributed Energy Solutions

unrestricted © Siemens AG 2017

usa.siemens.com/digitalgrid

Michael Carlson

Grid Digitalization required to Enable Distributed Energy Growth

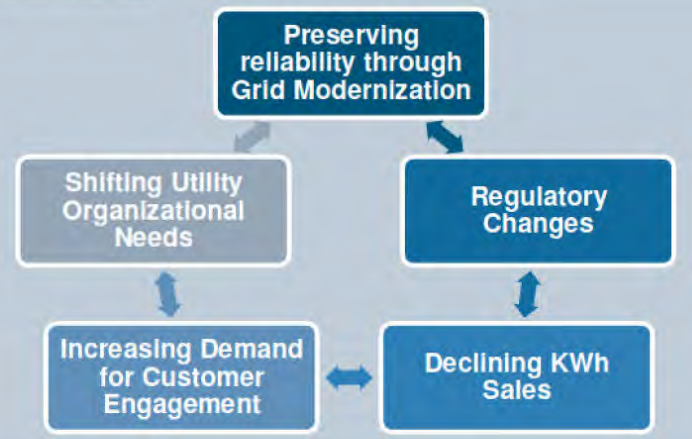


Restricted © Siemens AG 2017

DER Overview

SIEMENS

Utility DER Challenges



DER-driven Business Transformations

Energy Supplier

The energy suppliers ensure safe, reliable, and affordable energy to their customers based on a deterministic rate base mechanism.

Energy Integrator

Driven by customer demand, energy suppliers evolve to manage intermittent energy generation from third-party suppliers and consumers.

Energy Service Provider

Rise of the Prosumer, combined with many 3rd energy choices, leads energy suppliers and integrators to become distribution service providers.

Siemens Portfolio

DER Strategic Business Planning

- Cost Avoidance & Valuation of Network Assets by Location
- DER Project specific viability - technical or economic
- Grid Modernization Evaluation Study
- New Business Model Evaluation

Integrated DER Network Planning

- Distribution Network Capacity Evaluation enabling prosumer interaction
- Integrated distribution planning (T&D)

DER Grid Operations

- Real-time visibility with increased data (ADMS)
- Integrated DER Mgmt for grid reliability (ADMS)
- Distribution grid optimization with DERs (DEMS)

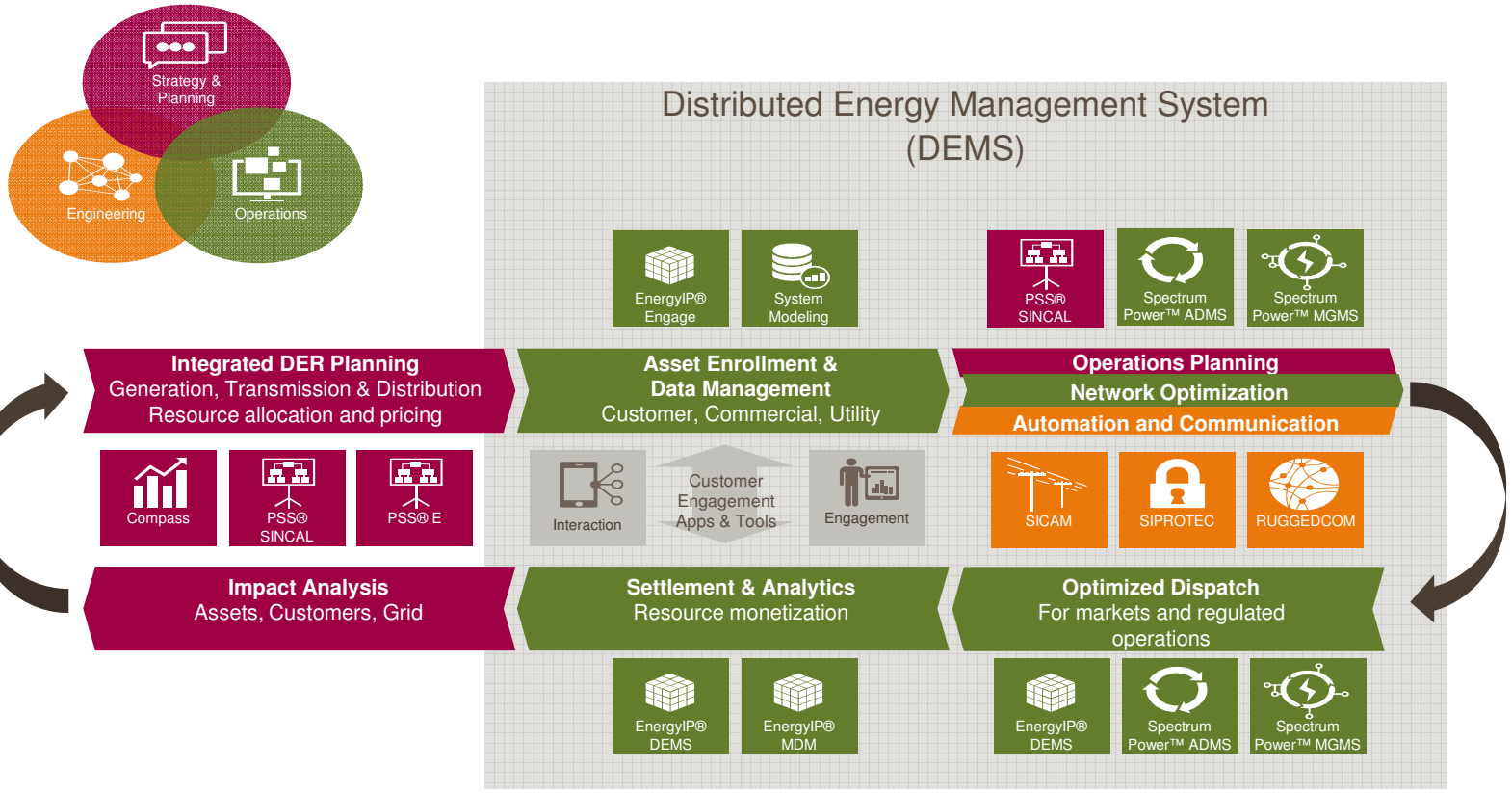
DER Grid Modernization

- Distributed Automation
- Power Quality
- Asset Monitoring
- Advanced Metering Infrastructure
- Renewable Smoothing
- Ancillary Services

Prosumer Enablement

- Microgrid
- Demand Response or Virtual Power Plant
- Utility Process Changes
- Energy Market (EMM) for Distribution

DER requires Planning – Operations – Settlement Integrated Solutions



Key Objectives

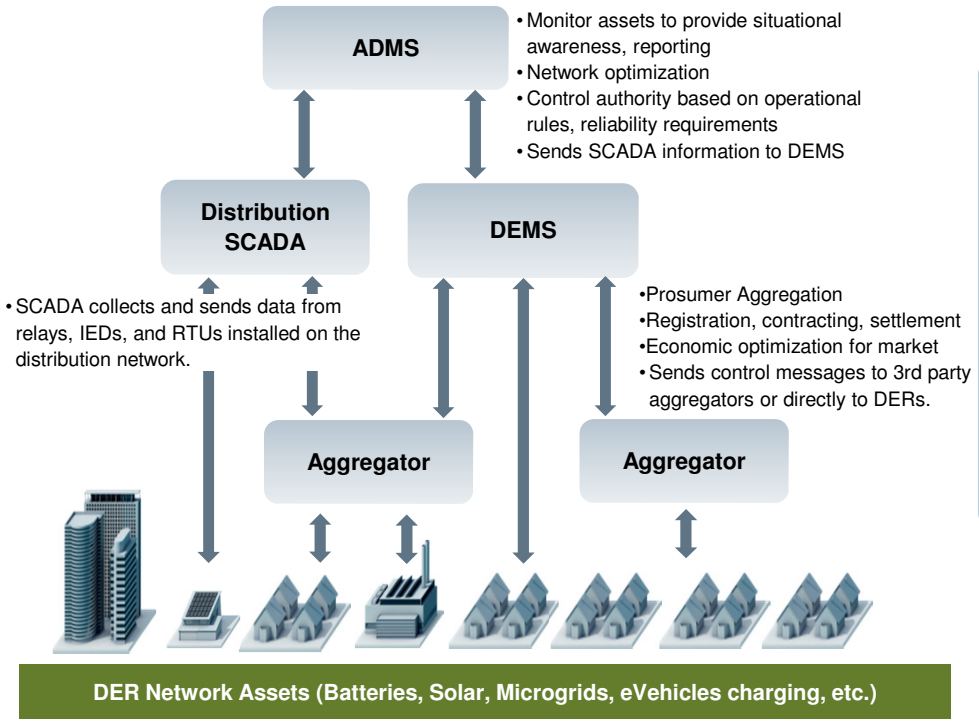
- **Include DERs in cross-functional planning**
- **Ensure grid modernization and resiliency**
- **Integrate and enable distributed energy resources**
- **Engage customers and enable prosumers**
- **Optimize network operations with system economic opportunities**

Restricted © Siemens AG 2017

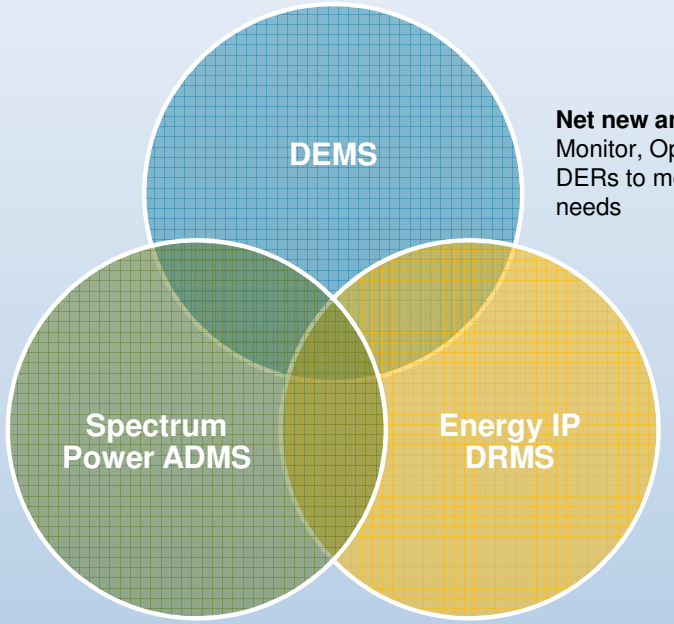
Combining Operational And Prosumer Business Management Functionality

SIEMENS

Future-StateTechnology Architecture



Distributed Energy Management System (DEMS)



Net new and emerging
Monitor, Optimize and Dispatch DERs to meet grid and market needs

Control and optimization of utility grid assets:
- Network optimization
- Economic optimization

Program management and control of consumer resources & Demand Response:
- Prosumer Aggregation
- Registration, contracting, settlement
- Fair play (consumer optimization)

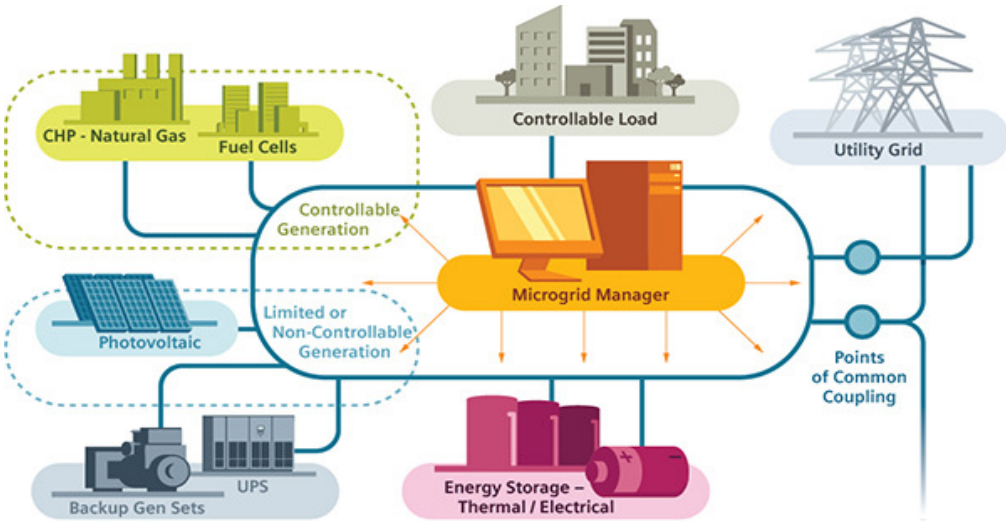
Restricted © Siemens AG 2017

Leveraging Advanced Microgrid Control Functionality in a Flexible, Secure and Reliable Way

SIEMENS

Within the microgrid there is a hierarchy of ***data, communications, and control***; from the physical asset control systems to the centralized supervisory control layer, Siemens provides the following functionality:

- **Monitor and Control** all Assets: SCADA
- **Balance Supply and Demand**: Frequency Control
- **Manage** Sufficient and Safe Voltage: Voltage Control
- **Schedule** Generation & Storage
- **Transition** between Island and Grid-connected States
- **Manage** a Black Out Situation: Black Start Restoration
- **Respond** to Utility's Demand Response Request
- **Optimize** the Microgrid for Maximum Asset Utilization



Restricted © Siemens AG 2017

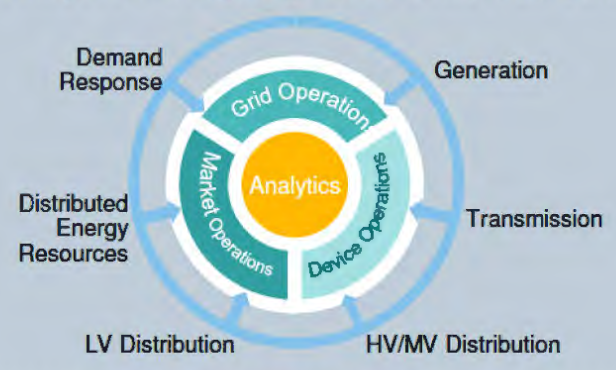
Optimized Distributed Energy requires Advanced Analytics

SIEMENS

The Data Tsunami Challenge

The Opportunity beyond AMI

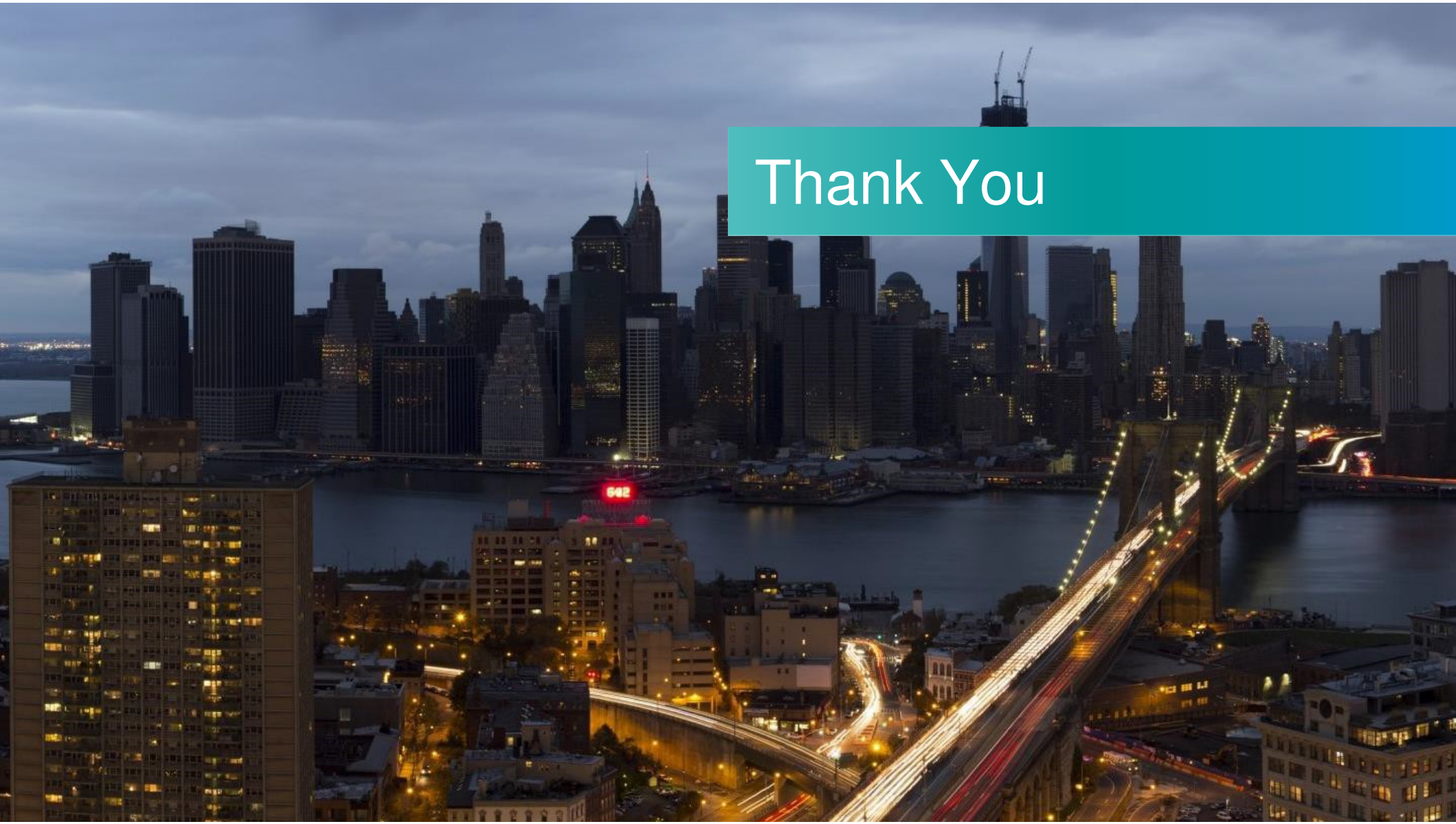
Vision: "Analytics-in-Everything". At the heart of the transactive grid



Siemens Solution Scope

- Revenue Protection
- Power Quality
- Load Forecasting
- Equipment Load Management
- Grid Loss Detection
- Asset Topology Mapping (coming soon)
- Distribution load
- Consumer load
- Events and Outages
- Water and gas leaks
- Data collection
- Aggregations across 20+ common dimensions
- SQL access to aggregations and computational summaries

Deploying Worldwide


Thank You