

A nighttime photograph of a city skyline, likely New York City, with numerous skyscrapers illuminated. In the foreground, a train is moving, creating long, horizontal light trails in shades of blue, green, and yellow. The overall scene is a blend of urban architecture and modern transportation.

SIEMENS

TRANSACTIVE ENERGY AND FLEXIBILITY

Alicia Carrasco, Regulatory Affairs Director, Siemens Smart Grid
Expert Workshop Demand Response, September 11 2015, EPFL-IRGC Lausanne

Session 2: Identification of effective business models to capture the value of demand response

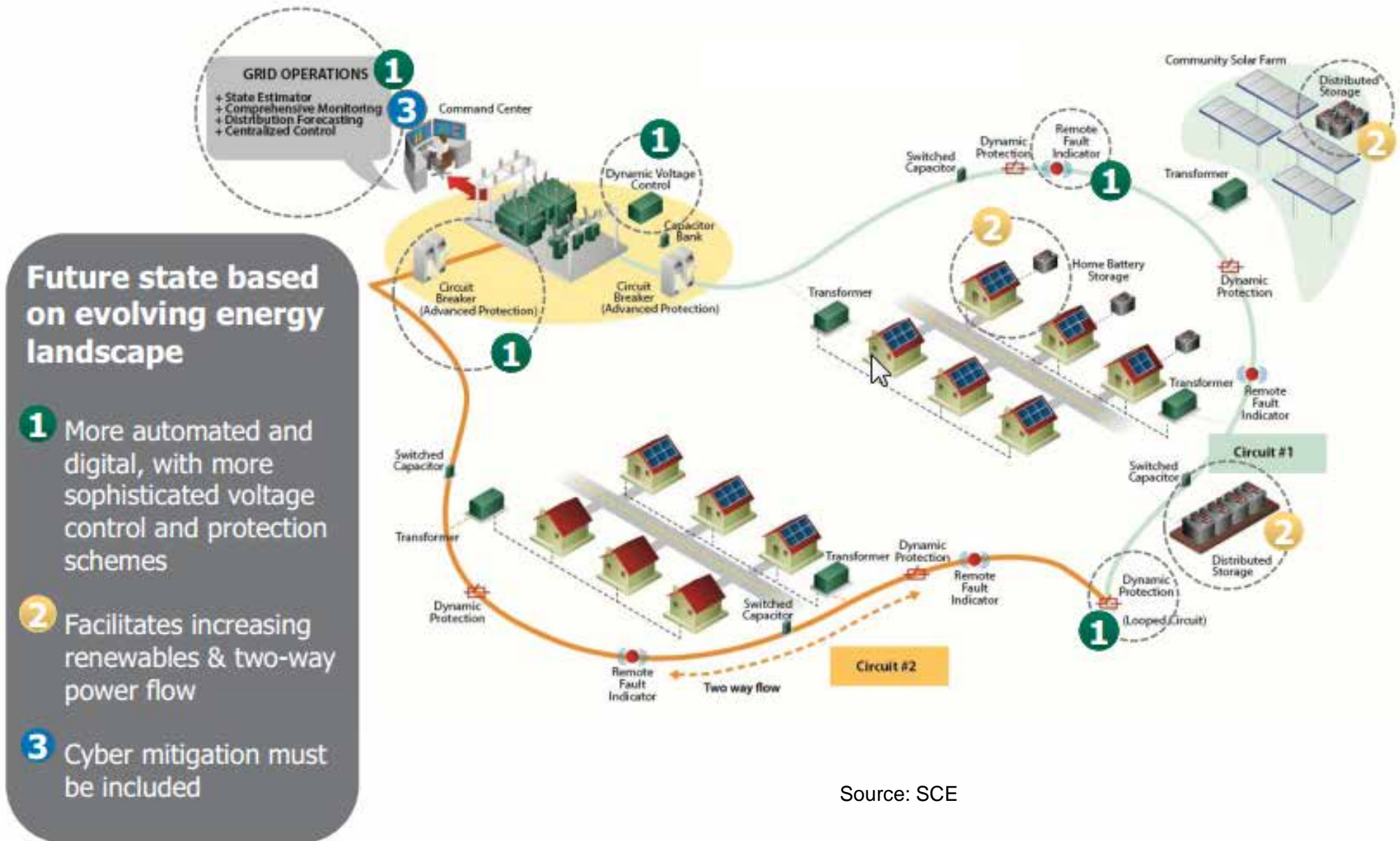
Focus

The factors that could influence the emergence of business models archetypes for demand response – Regulatory Driven Development and Model

Transactive Energy like communications and business model through which electric customers interact with their utility to buy and sell electricity based on economic and reliability signals

NY REV and DSP - Reforming Energy Vision Initiative and Distributed System Platform - towards making New York's electric system cleaner, more resilient, and more affordable

Grid of the Future Will new business models and new players replace existing businesses?



This has far reaching consequences for utilities

Technical

Grid instability increasing

The ever growing need for electricity in the world, combined with the **growing number of Decentralised Energy Resources, leads to increasing grid instability**. Since the current Power Quality in most Central European countries is very high, consumers in this side of the world aren't aware of the problems this instability can create.

smartdutch.nl

National Investigation Reveals Alarming Number of Attacks on U.S. Power Grid

An investigation by USAToday and more than 10 of its community newspapers and television stations across the country found that between 2011 and 2014 alone, there were **362 reported physical and cyberattacks by electric utilities** that resulted in partial power outages or disturbances.

theblaze.com

In the dark: 600 million people without electricity after world's biggest blackout

Half of India was plunged into darkness today when the world's biggest blackout left **620 million people without electricity**.

mirror.co.uk

Redispatching: conventional plants forced to ramp down

Last month, official statistics were published for "**redispatches**" in **Germany** – cases in which conventional power plants either have to reduce their power generation or be switched off entirely in order to protect grid stability. The **situation is escalating**.

Renewable International Magazine

This has far reaching consequences for utilities

Economic and strategic

E.ON to Split Into Two Companies

FRANKFURT – German utility E.ON SE said late Sunday it will split into two companies, with one focused on renewables and the new one on conventional energy, as the power giant aims to **address rapid changes in the energy market** and facilitate the valuation of its assets.

The Wallstreet Journal

Rise of the Prosumer: Will Homeowners Ever Be More Important Than Power Plants?

A new report concludes that policymakers and regulators are **not prepared for consumer empowerment** on the grid.

Greentech Solar

Colorado wrestles with evolving utility business models

The electric industry is evolving. New technologies are available to make the system more reliable and less costly, improve service quality and lower carbon emissions.

New customer programs, utility business models and regulations are under development across the U.S. and internationally
[...]

greenbiz.com

NY regulators propose ground- breaking new utility models under landmark REV order

Today, **utility earnings are not aligned** with optimizing distributed energy resources.

Utility Dive

Transactive Energy – Modeling the Vision?

The transactive energy model captures the evolutionary transition from the traditional model where utilities provide electricity and ancillary services to customers with minimal communications outside the monthly bill for service, to today's transitional situation where some customers self-generate and buy and sell power to the utility at fixed rates.

A system of economic & control mechanisms that allows the dynamic balance of supply & demand across the entire electrical infrastructure using value as a key operational parameter
Gridwise@

Gridwise@ Transactive Energy Framework
<http://bit.ly/1F0Kr2I>

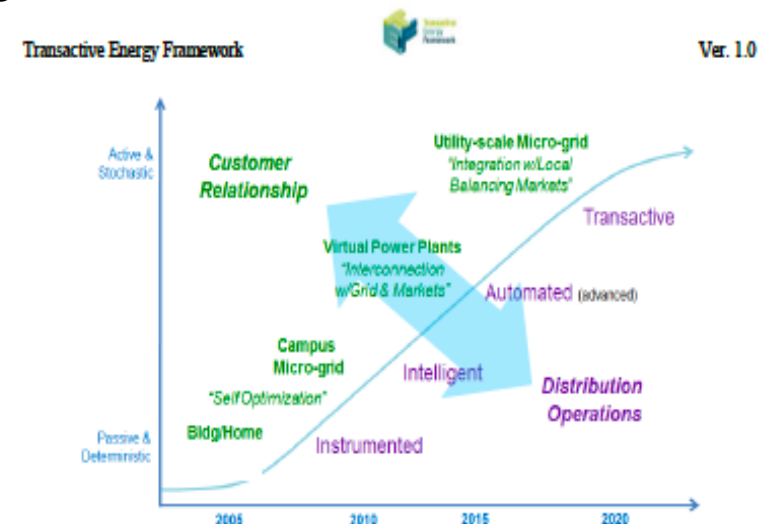
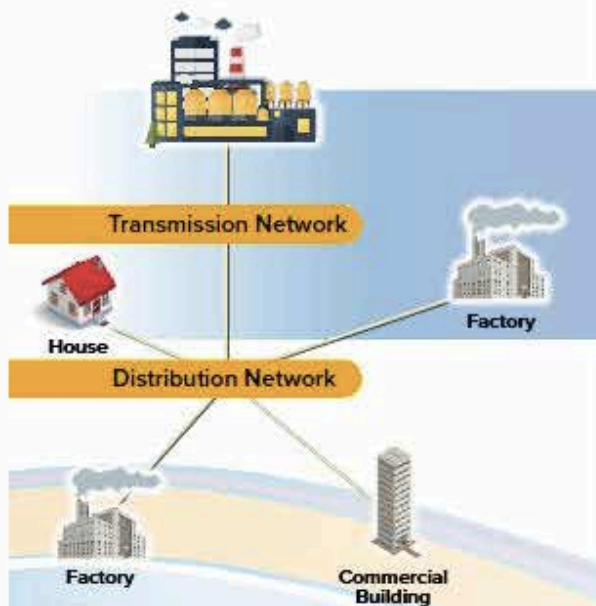


Figure 4: Stages of adoption of transactive operations for industry [18].

REV: Reforming Energy Vision NY

Yesterday's Energy Model Centralized Power



"In one of the most promising moves in the energy sector in years, New York State is proposing a way to get a head start on, and perhaps lead, a revolution in the world of electricity generation"
New York Times, "Smarter Electricity in New York" May 13, 2014

What is REV?

REV is an energy modernization initiative that will fundamentally transform the way electricity is distributed and used in New York State.

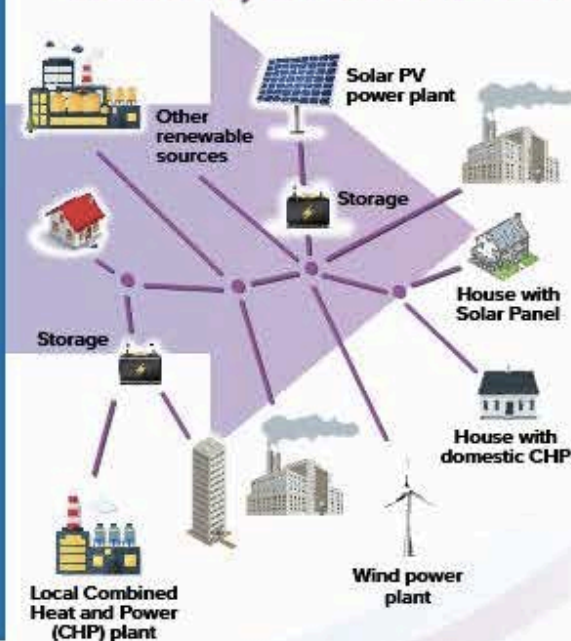
REV will build a bridge to a cleaner, more efficient and affordable energy system by:

- Creating the power grid of the future and enabling customers to better manage and reduce their energy costs
- Focusing on system efficiency, total bills, carbon emissions, technology innovations, resiliency and competitive markets around customers
- Addressing issues like rising electric bills, reliability, resiliency, emission reductions, jobs, and the low income "electric divide"

REV will help protect the environment, lower energy costs and create opportunities for economic growth.

For more information on the REV initiative, visit www.dps.ny.gov

Tomorrow's Energy Model Cleaner, Local Power



"New York Predding Utilities to Shift From Monopoly Model. The move would spur generation from thousands of smaller systems owned by individuals and other companies - notably rooftop solar panels."
Bloomberg, May 12, 2014

REV: Core Idea

REV proposes the development of a platform to create market based, sustainable products and services that drive an increasingly efficient, clean, reliable, and customer-oriented industry

Themes:

- Distributed energy resources (DERs) as a core system resource
- Increasingly customer-centric
- Market animation over mandates
- Increasing transparency and access

Key Design Principles:

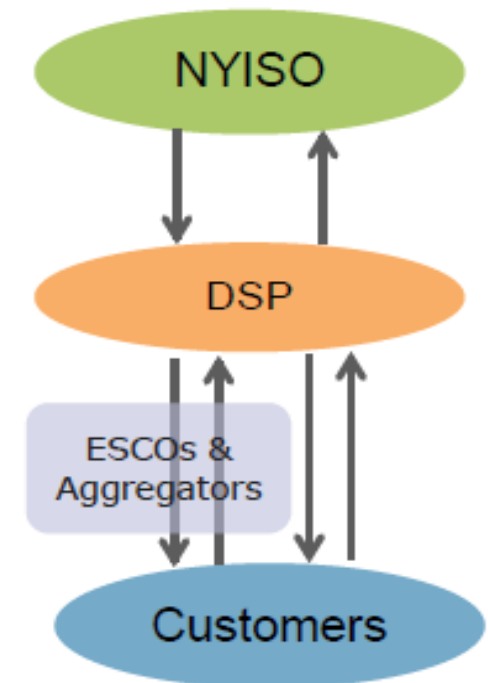
- Collaboration
- Transparency
- Standardization
- Non-discrimination
- Action-orientation

The Distributed System Platform (DSP) for end-use energy efficiency, demand response, distributed storage, and distributed generation.

The DSP is an intelligent network platform that will provide safe, reliable and efficient electric services by integrating diverse resources to meet customers' and society's evolving needs.

Key Functions of the DSP

- Design and plan distribution system that integrates DERs as primary means of meeting system needs
- Plan for and accommodate new distributed generation and demand response
- Balance production and load in real time
- Monetize system & social values
- Coordinate interactions between customers, with the distribution system and with energy services markets (DSP markets and NYISO)



REV: Objectives

REV drivers:

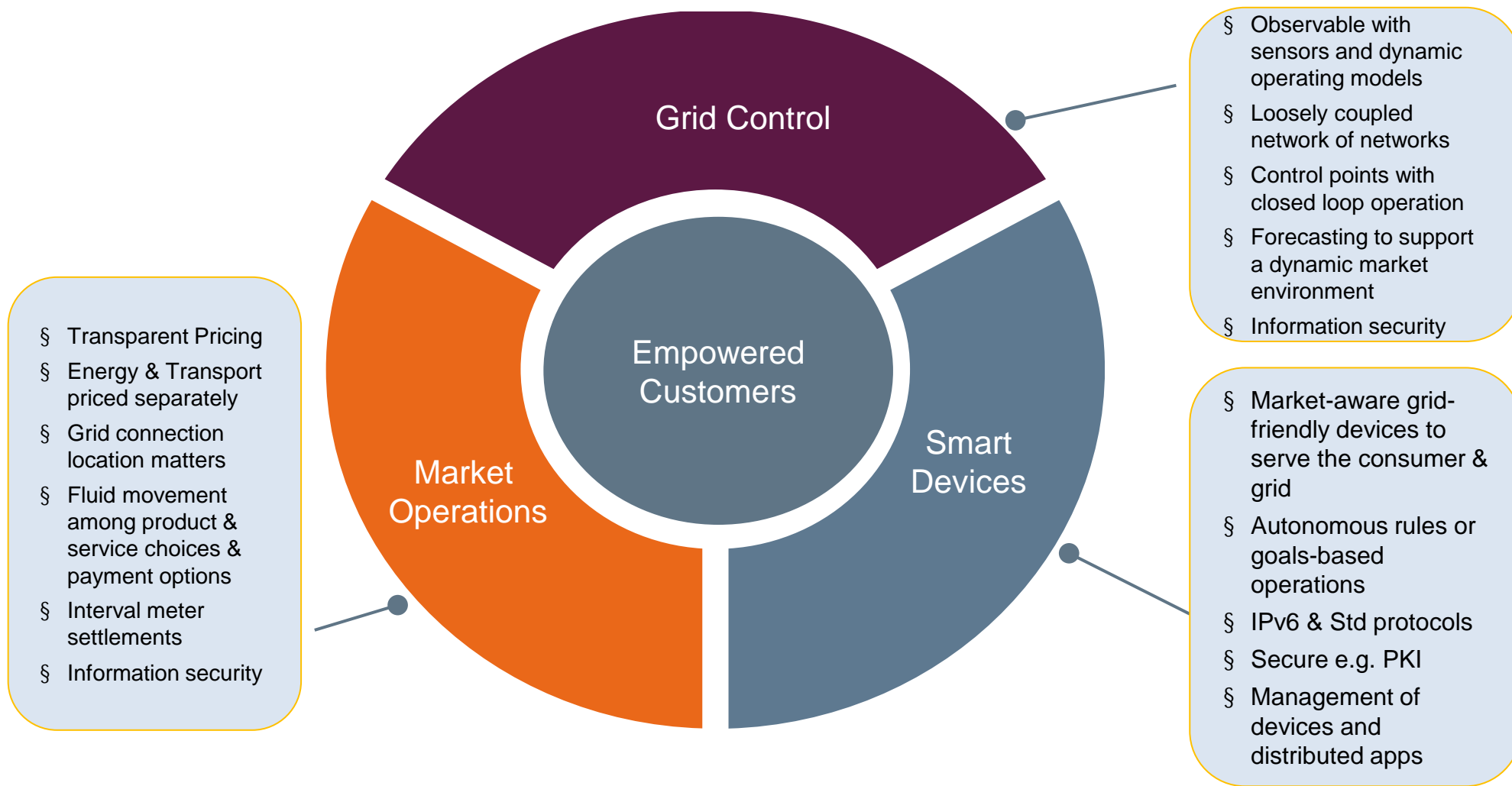
- Worsening system efficiency threatens higher prices
- Aging infrastructure and flat sales means costs cannot be recovered from increased sales base
- Aging infrastructure presents opportunity to make smart, strategic choices and avoid lock-in
- Rapidly declining costs and increasing capabilities of DERs
- Increasing DER asset base with inadequate communications drives underutilization
- Need for new reliability and resilience approaches
- Need to mitigate carbon emissions



REV policy objectives:

- Enhanced customer knowledge and tools to support energy bill management
- Market animation and leverage of ratepayer contributions
- System efficiency
- Fuel & resource diversity
- System reliability & resilience
- Reduction of carbon emissions

In Summary : Areas of focus



Transactive Distribution Grid Functions (New York)

Grid

- Real-time load monitoring
- Real-time network monitoring
- Adaptive protection
- Enhanced fault detection and location
- Outage and restoration notification
- Automated feeder and line switching (FLISR/FDIR)
- Automated volt/VAR control
- Real-time load transfer
- Dynamic capability rating
- Diagnosis and notification of equipment condition
- Power flow control
- Automated islanding and reconnection (microgrid)
- Electricity storage
- Algorithms for grid control and optimization

Customer/DER/ Microgrid

- Direct load control
- DER power control
- DER power factor control
- Automated islanding and reconnection
- Electricity storage
- Algorithms and analytics for Customer/DER/Microgrid control and optimization

Market

- Dynamic event notification
- Dynamic pricing
- Market-based demand response
- Dynamic electricity production forecasting
- Dynamic electricity consumption forecasting
- M&V for producers and consumers (premise/appliance/resource)
- Participant registration and relationship management
- Confirmation and settlement
- Billing, receiving and cash management
- Free-market trading
- Algorithms and analytics for market information and operations