Cisco Smart Grid Strategy

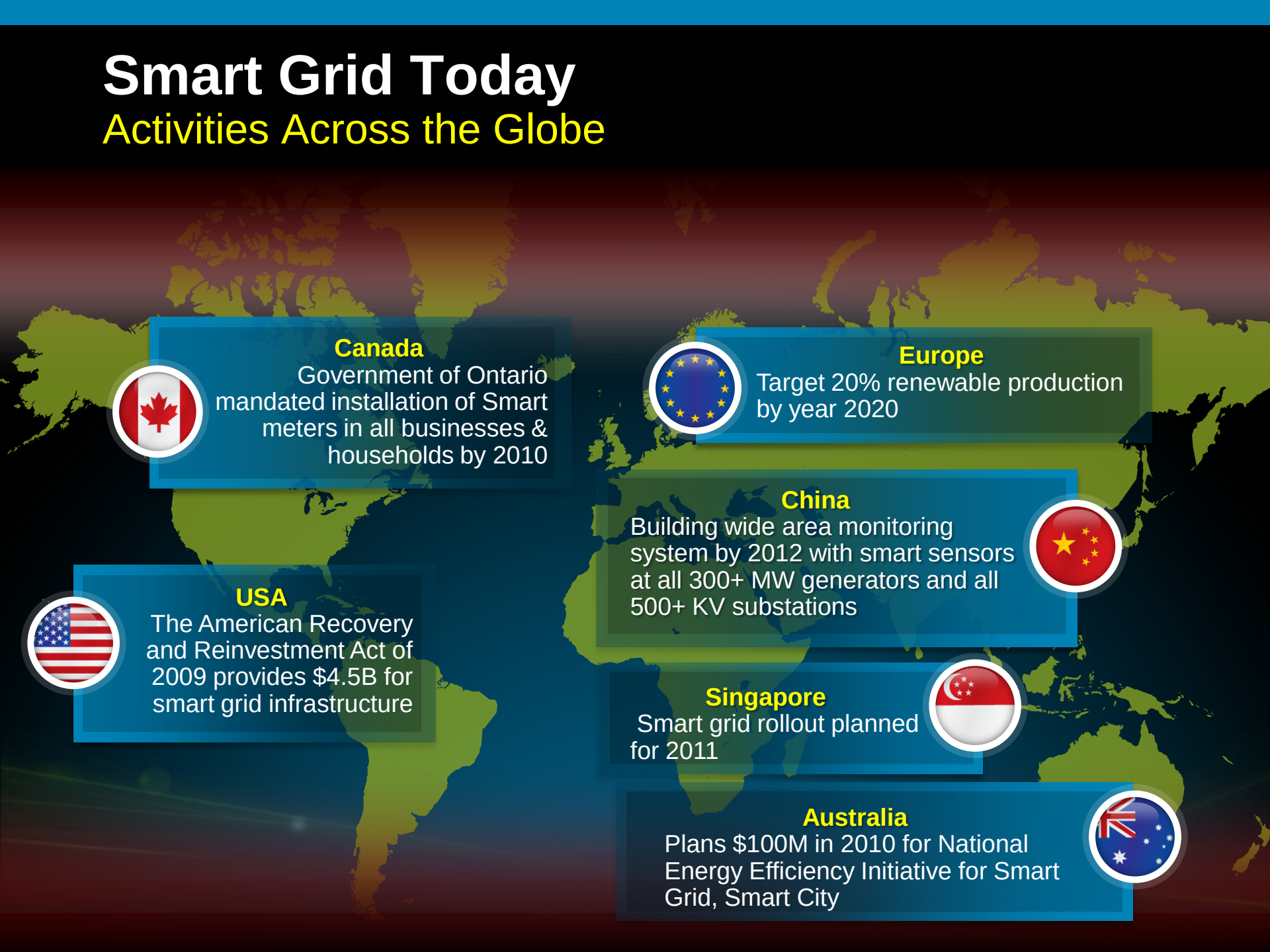
Making the Grid.. Smarter

Douglas Bellin

Industry Lead

Smart Grid Today

Activities Across the Globe



Canada
Government of Ontario mandated installation of Smart meters in all businesses & households by 2010

Europe
Target 20% renewable production by year 2020

China
Building wide area monitoring system by 2012 with smart sensors at all 300+ MW generators and all 500+ KV substations

USA
The American Recovery and Reinvestment Act of 2009 provides $4.5B for smart grid infrastructure

Singapore
Smart grid rollout planned for 2011

Australia
Plans $100M in 2010 for National Energy Efficiency Initiative for Smart Grid, Smart City

Smart Grid
Market & Regulatory Trends

Changing Supply	Changing Demand	Regulation/ Compliance	New Opportunities
			
▪ Distributed generation integration	▪ Consumer demand for renewable energy	▪ Climate change and energy efficiency goals	▪ Consumer participation in delivery chain
▪ New renewable energy resources	▪ Increase in demand and peak load	▪ Standards and interoperability	▪ New service & business models
▪ Grid reliability and efficiency	▪ Flexible pricing to shift demand	▪ Stimulus funding and rules	▪ **Smart Grid as an innovation platform**

Smart Grid
What is it?

Definition

A smart grid is the electricity delivery system from point of generation to point of consumption integrated with communications and information technology for enhanced grid operations, customer services, and environmental benefits.

Communications infrastructure enables an analog grid to become

Smart Grid Vision

Enabling Energy Service Innovation

Residential / Business

- Cost management
- Monitor and control consumption
- Corporate sustainability

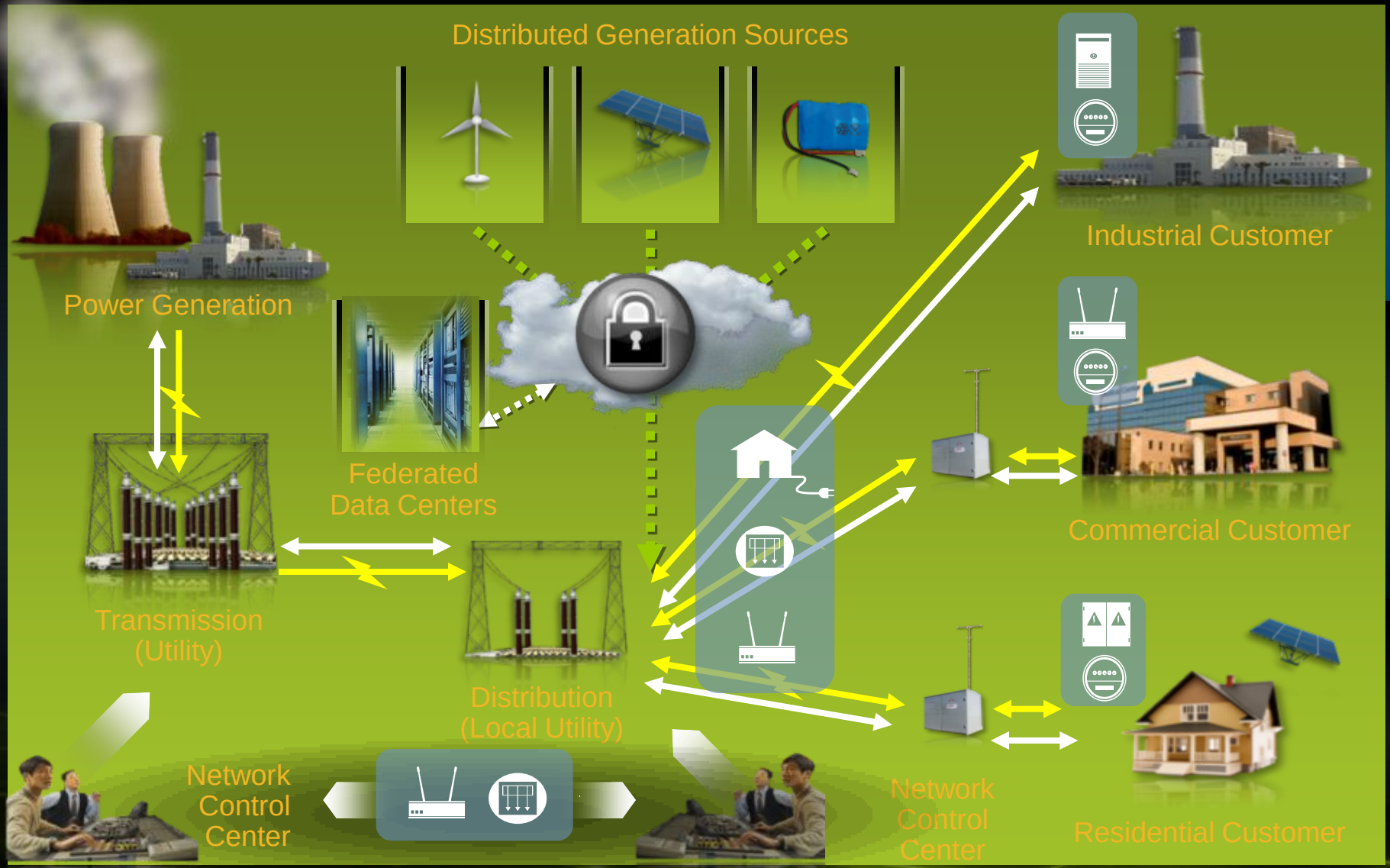
Government

- More renewable energy sources
- Lower GhG emissions
- New skilled jobs

Utilities

- Manage demand
- Reduce OpEx
- Efficient integration of renewable energy
- Regulatory compliance

Power Management
Smart Grid



Smart Grid Communication Architecture

Smart Grid Impact
Utility Business & Operations

T&D Operations

- Reliable automation of grid operations
- Fault prevention, isolation and recovery
- Visibility and control of distributed generation

IT Operations

- Technology and security architecture
- Application deployment
- Compliance and policy monitoring

Customer Service

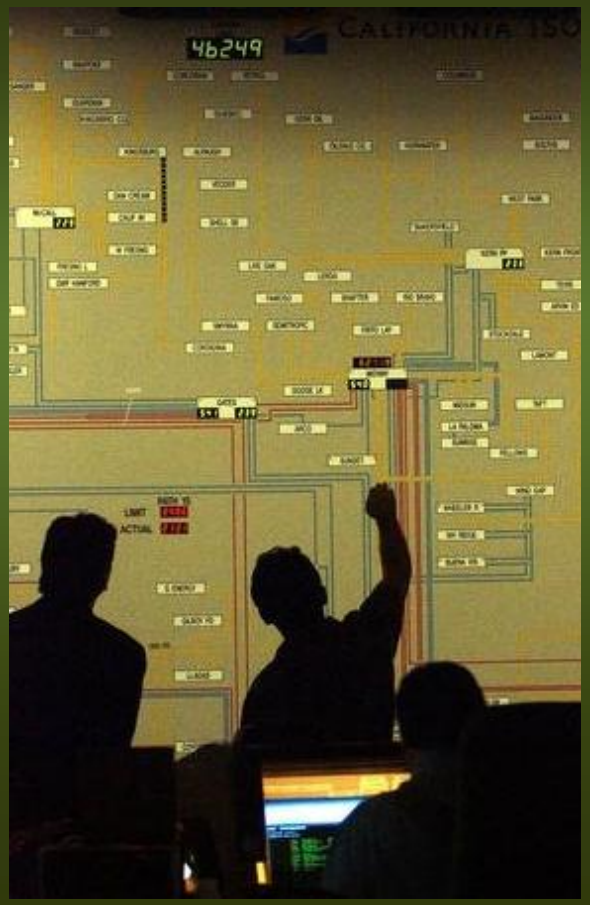
- Usage data for billing applications
- Energy management programs
- Differentiated service offering

Physical Security & Safety

- Meet regulations (e.g. NERC/CIP)
- Physical security of key facilities
- Workforce safety & emergency response

Cisco Smart Grid
Vision

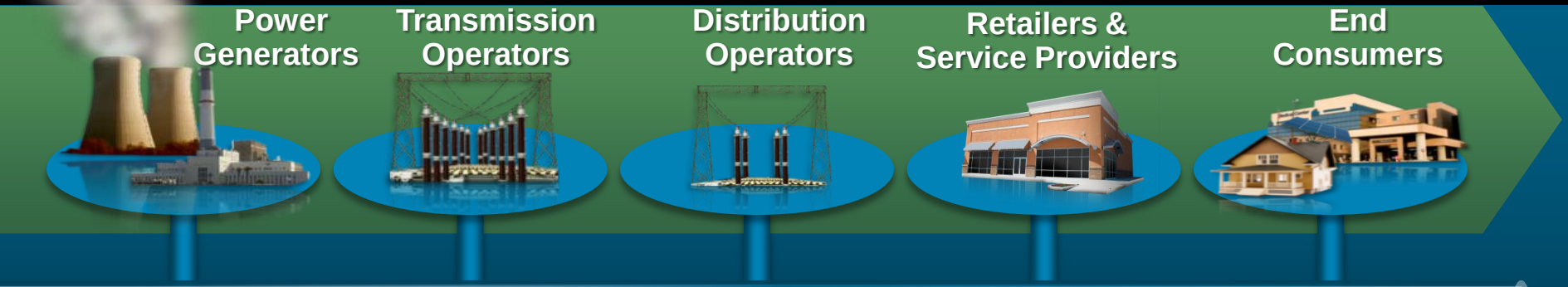
- Design and architect end-to-end communications infrastructure integrated with the power grid
- Open standards and interoperable IP communications
- Secure, reliable, and resilient network operations
- Integration of grid intelligence into the network
- Bring partners to deliver world-class, interoperable Smart Grid offerings



Smart Grid as a platform for innovation

Why IP Communications?

Secure, Interoperable, Scalable Infrastructure



Reliable, Secure and Standards-Based

Interoperable

Across vendors, standards-based

Scalable

IPv6 to address millions of devices

Secure

Data protection & system integrity

Media Independent

Support many types of media

Convergence

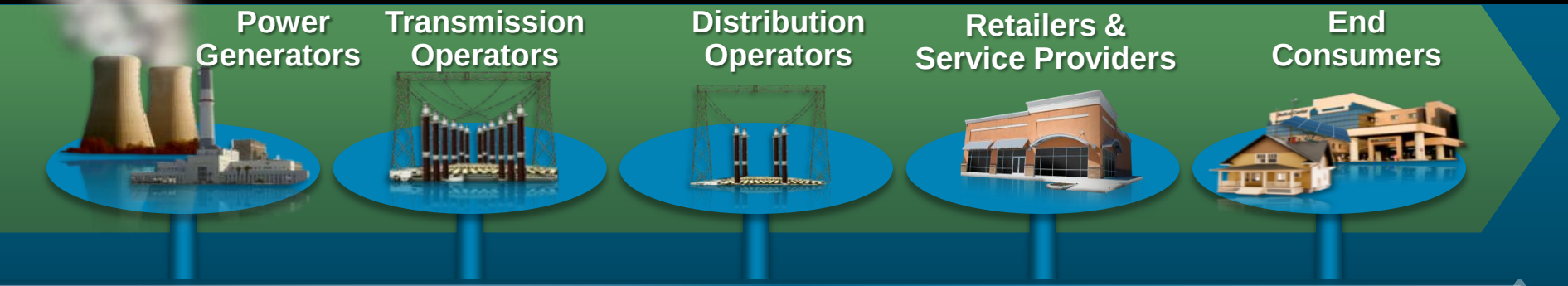
Proven consolidation of proprietary networks

Performance

Prioritize traffic, collect & analyze large amount of data

Smart Grid

End to End Network Architectures



Reliable, Secure and Standards-Based

Transmission & Substation

Operations Center

Data Center

Utility and Regional

Field Area

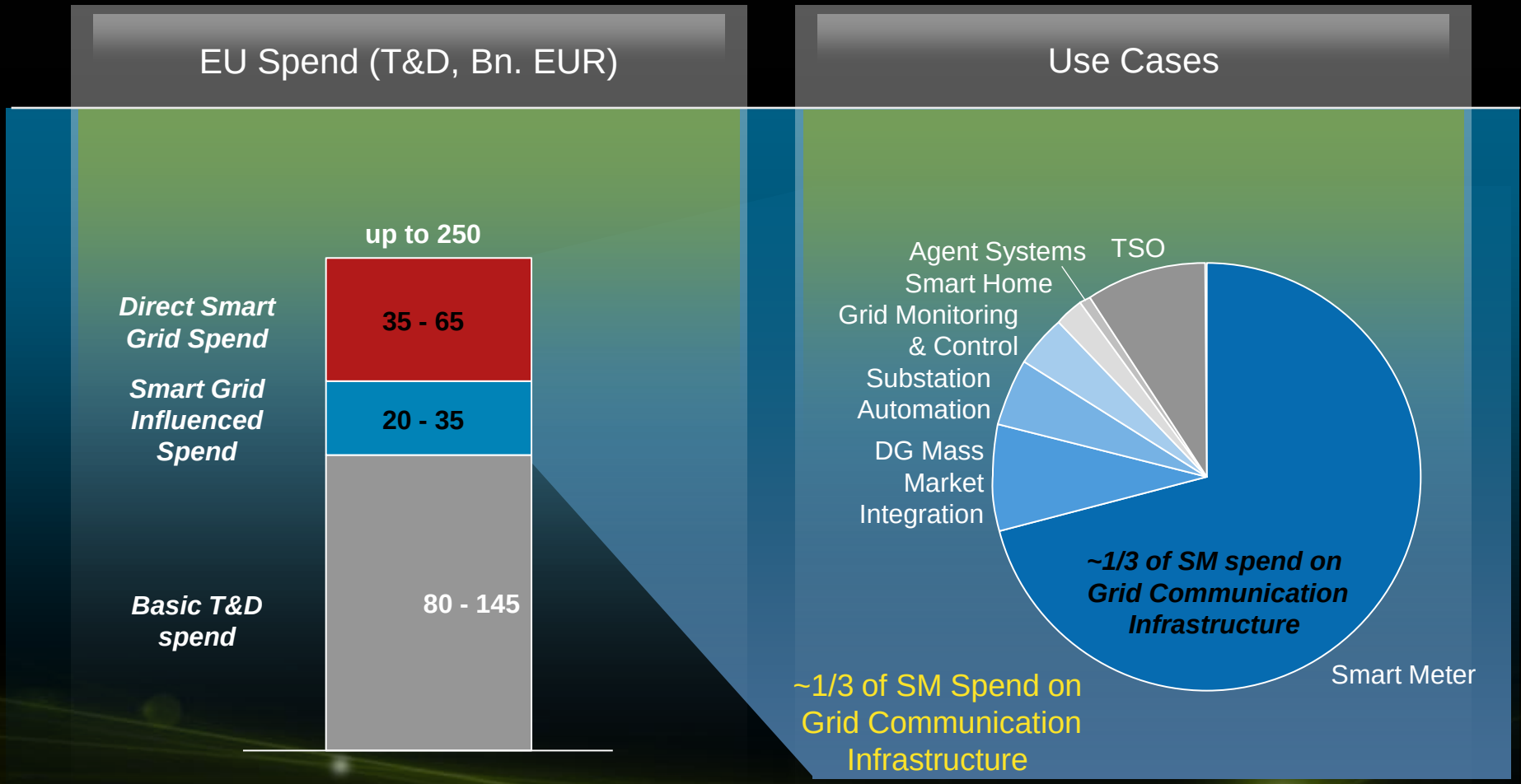
Customer Premise

(BAN / HAN)

Security | Network Management | Distributed Intelligence

Burning Platform: Smart Grid Spend to Capture up to 40% of all T&D Spend

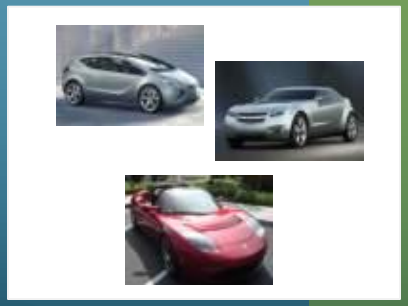
Outlook Europe, 2007–2020



Source: EU Commission Technology Platform SmartGrids, Cisco Systems

Utilities Are Challenged with a More Complex Operating Environment

Smart Grid Challenges

	Distributed Generation	EV and Storage	Home Automation / Demand Response
Change			
Challenge	▪ Intransparent build-up (geography and scale)	▪ Significant increase in offtake	▪ Integration of new applications
	▪ Timing of feedin	▪ Moving load	▪ Increased information requirements
	▪ Management of increased stochastic generation	▪ Potential for storage and feedin ▪ Technical specs defined outside utility industry	▪ Competition for ownership of innovative efficiency solutions

Utilities Will Respond Along Three Dimensions in Building the Smart Grid

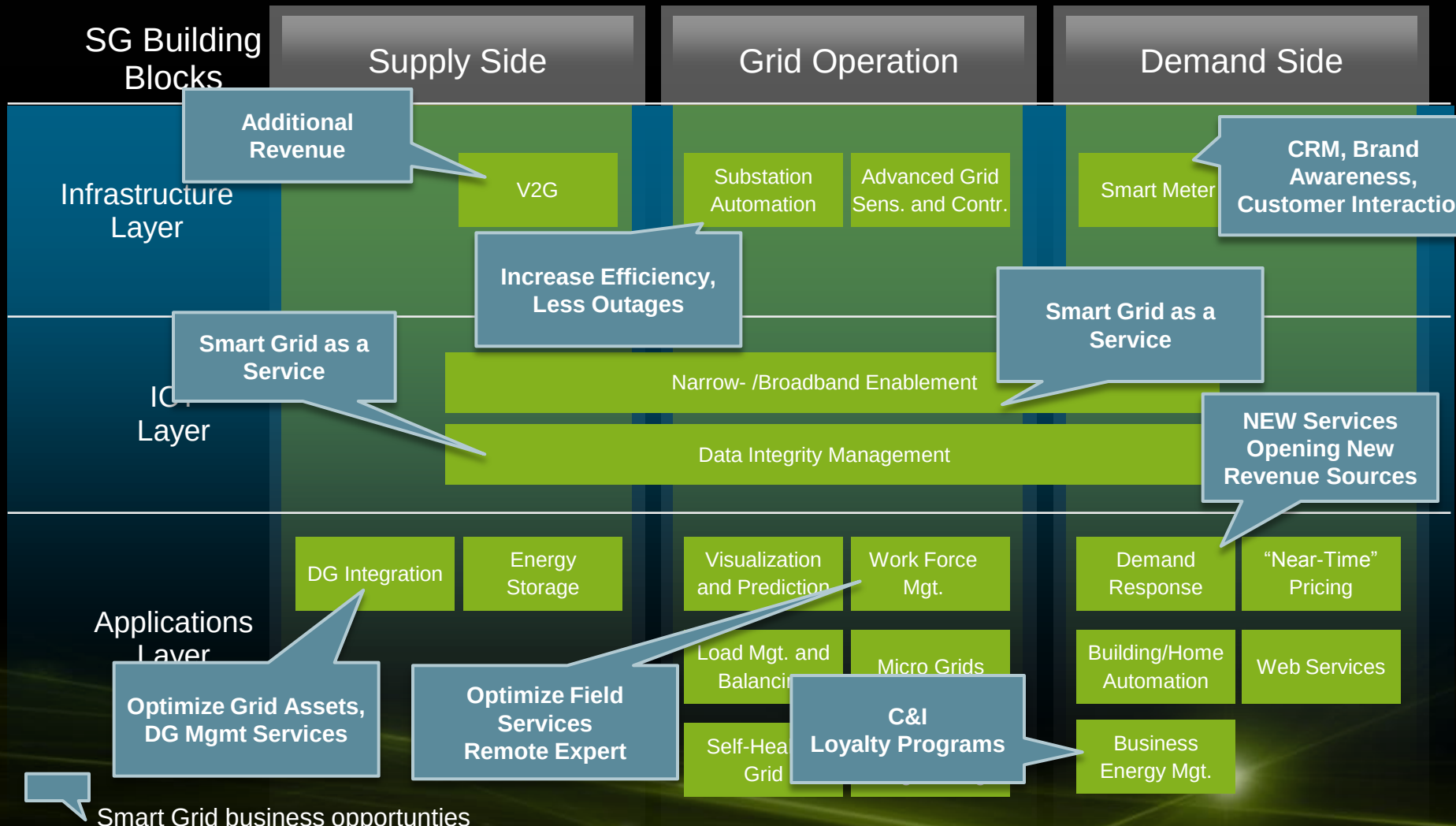
Smart Grid Building Blocks

Dimensions	Requirements	Rationale	Readiness	SG Building Blocks
	✓ ▪ Adequate capacity ✘ ▪ Transition from distribution focused to contribution capable	▪ Today's consumption supplied though no demand shifts included ▪ Physical infrastruc-ture to accommodate complex load flows		**Infrastructure Layer**
	✓ ▪ Basic system status ✘ ▪ Creation of an information rich and potentially real time operating environment	▪ Current system highly reliable in "look and see" mode ▪ Increased levels of uncertainty around system behavior		**ICT Layer**
	✓ ▪ Electricity delivery ✘ ▪ Integration of new infrastructure elements ✘ ▪ Substitution of physical with virtual capacity	▪ Stable environment with limited need for short term action ▪ Increased system stress through erratic offtake / feed-in		**Applications Layer**

✓ Available today ✘ Not available today

Innovation and Regulatory Requirements Open New Business Opportunities

Smart Grid Opportunities



Smart Grid business opportunties

Source: Newton Energy Research, ABS Energy Research, Cisco Systems

Cisco Solutions
Smart Grid Communications

Reliable, Secure and Standards-Based

Transmission & Substation

Operations Center

Utility and Regional

Field Area

Data Center

Customer Premise

- Automate Fault Monitoring and Response
- Reduce Multiple Lease Line Cost
- Controls Integration (SCADA, EMS)
- Physical and Cyber Security Compliance
- Remote Workforce Management
- Network Management & Professional Services

Cisco Solutions
Smart Grid Communications

Reliable, Secure and Standards-Based

Substation Area	**Operations Center**	Utility and Regional	Field Area	Data Center	Customer Premise
					

- RTO/ISO Operations, Transmission Operations, Distribution Operations
- Hosting of EMS, DMS, MDMS, Asset Mgmt and SCADA systems
- Network Operations Monitoring, Data Collection & Analysis
- Scalable Solutions



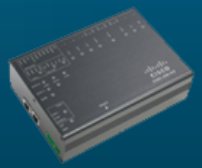



Cisco Solutions
Smart Grid Communications

Reliable, Secure and Standards-Based

Substation Area	Operations Center	Utility and Regional	Field Area	Data Center	Customer Premise
					

- Reliable Inter-Site Connectivity for Critical Process and Control Systems
- Secure Communications
- High Performance with Application Acceleration
- Common Management Platform



Cisco Solutions
Smart Grid Communications

Reliable, Secure and Standards-Based

Substation Area	Operations Center	Utility and Regional	Field Area	Data Center	Customer Premise
					

- Interoperable Options for AMI Backhaul and Distribution Automation
- Access Flexibility (WiMax, Short and Long Range Radio, Broadband PLC)
- Wireless Gateways
- Network Service Applications

Cisco Solutions

Smart Grid Communications

Reliable, Secure and Standards-Based

Substation Area	Operations Center	Utility and Regional	Field Area	Data Center	Customer Premise
					

- Data Analysis & Billing Systems
- Storage for CIS systems
- Data Protection & Security
- Scalable Solutions
- Assessment and Deployment Services

Cisco Solutions
Smart Grid Communications

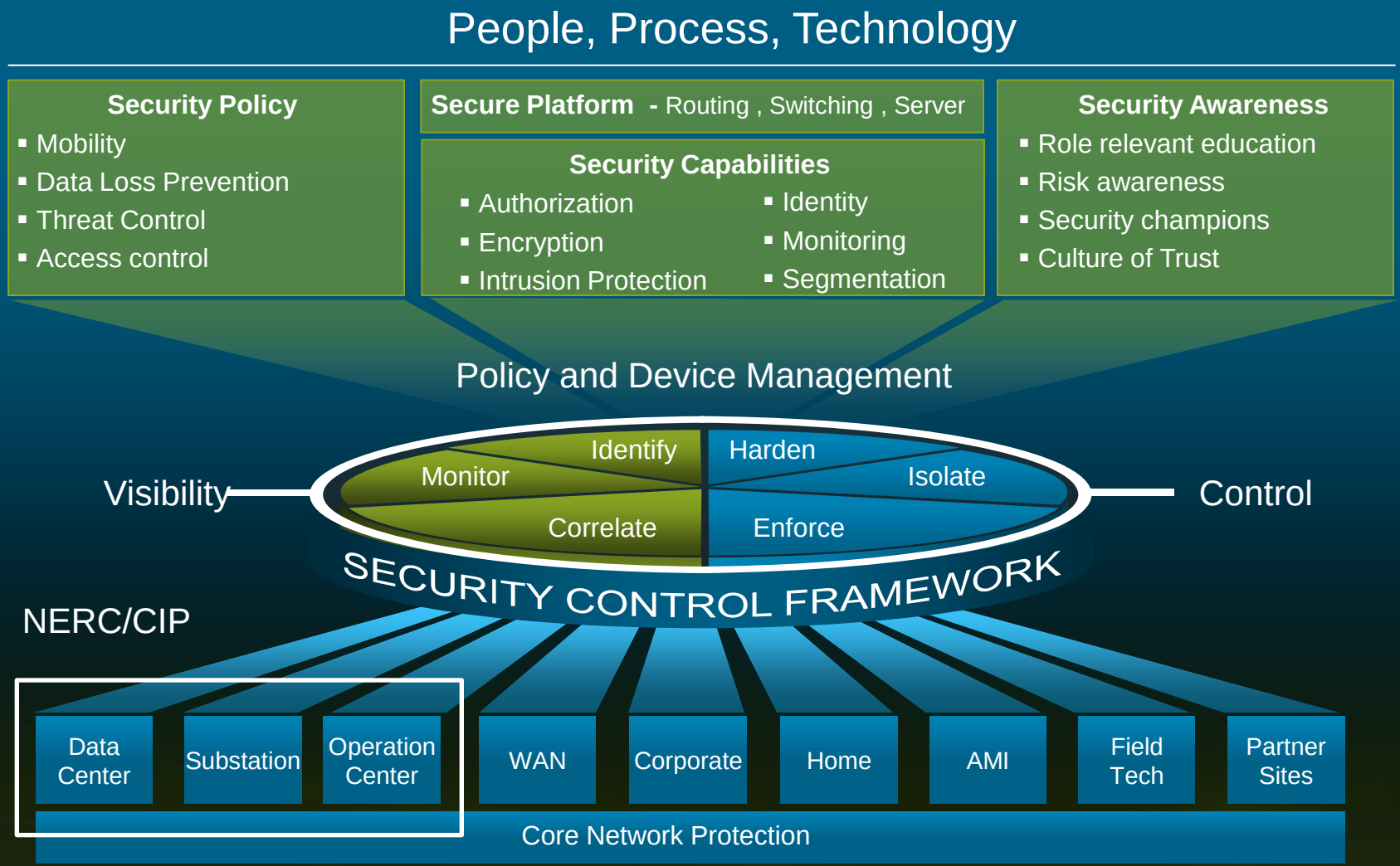
Reliable, Secure and Standards-Based

Substation Area	Operations Center	Utility and Regional	Field Area	Data Center	Customer Premise
					

- Enable Demand Response
- Residential:
  - Home Energy Monitoring and Management
  - Time-Based Pricing
- Commercial & Industrial:
  - Control Lighting, HVAC, Facility and IP-enabled devices
  - Design and Implementation Services

Security Beyond Compliance

Defense in Depth



www.cisco.com/go/designzone

Applying Lessons Learned
From Internet to Smart Grid

Ability to Scale is Critical	Open standards, owned by non-profit and industry groups enable interoperability, growth, adoption and innovation
Think Security on Day One	Retrofitting security is nearly impossible and current IP specifications mandate security consideration
Simplicity over Perfection	IP is not customized for any one application yet it can serve all applications
Innovate at Core and Edge	Open communication and programmable endpoints lead to serendipity and innovation
Government Can Help	US Department of Defense helped fund the birth of the Internet in 1969

Why Cisco?
Differentiators and Value

Utility requirement	 **Trusted and committed partner**	 **Expertise on end-to-end IP networks**	 **Smart Grid as an innovation platform**	 **Reliable,, and secure communications**
Cisco capabilities	**Smart Grid is a top company priority**	**Architected the Internet as “one network” with open standards**	**Integration of intelligence into the network**	**Fully integrated security with best-in-class products**

Building Tomorrow's Grid… Today

End-to-End Communications Infrastructure From Power Generation, to Businesses and Homes

Opening an Era of Energy Service Innovations and Efficiency

End-to-End Communications
Duke Energy

Challenge
- Create a 21st-century electrical delivery system
- Reduce separation between customers and grid
- Lower costs and carbon footprint

Solution
- End-to-end (two-way), secure, IP-based communications architecture
- Home energy management
- Distribution automation to improve grid efficiency and reliability

Expected Results
- Optimize energy usage – give users more control over power consumption
- Improved efficiency and system reliability
- Easier integration of renewable energy

Data Center and Grid Security

Oncor Electric Delivery

Challenge

- Redesign data center architecture to support smart meter deployments
- Address NERC-CIP security and compliance requirements

Solution

- Cisco Data Center 3.0 solution (consolidation, virtualization, data security)
- Physical security solution with IP video surveillance
- Network security in substation with NAC

Results

- Secure connectivity from smart meter to data center
- Resilient grid design with local and remote disaster recovery

Home Energy Management

Duke Energy

Challenge

- Design end to end Smart grid architecture
- Pilot home energy management
- Understand customer behavior

Solution

- Neighborhood Area Network integration with the Home Energy Management
- Price signaling, energy usage monitoring and device control by the Home Energy controller

Benefits

- 500 homes and businesses able to communicate with local power grid
- Reduction in monthly bills from customer monitoring and control
- Reduction in carbon emissions

Business Energy Management
NetApp

Challenge

- Reduce energy consumption in facilities, data center
- Use PG&E's Demand Response program
- Integrate multiple building systems

Solution

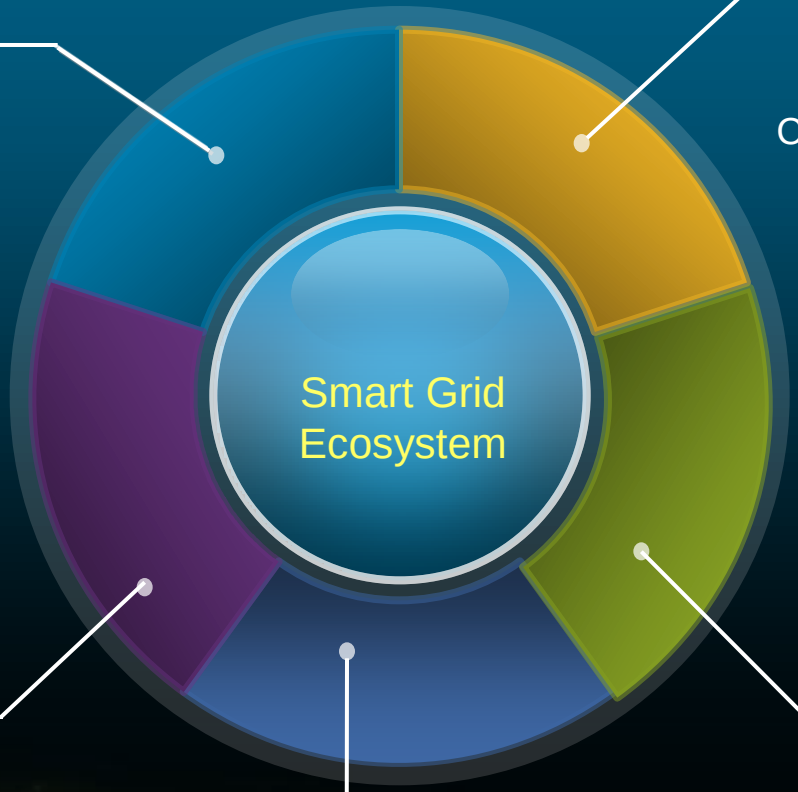
- Building Network Mediator integrated with building facility controls (lighting, HVAC, data center operations)
- Monitor pricing signals from utility and automate power consumption

Results

- 18M kWh Energy Reduction, $2M savings ROI < 1Year
- Shed 1.1 megawatt of power in 20 minutes, during demand response events

Cisco Smart Grid Ecosystem

Members Supporting IP Standards



System Integrators and Consultants

Business Process, Application Integration

Accenture
Boeing
Capgemini
HCL
Infosys
Rockwell Automation
Wipro

Technology Vendors

Smart metering, Grid Automation, Home Automation

AeroScout
Current Group
Echelon
Elster
EMC
EnergyHub
IGS
Itron
Gridiant
Gridnet
GridPoint
Landis & Gyr
LogRhythm
OATI
OpenPeak
Oracle
OSIsoft
Proximetry
PowerPlus
Pulse Energy
S&C Electric
SecureLogix
Sensei Solutions
Sensus
Skyline ATS
Veolia
Watteco

Power and Utility Integrators

Energy Infrastructure Integration

Areva T&D
GE
SAIC
Schneider Electric
Siemens Energy
Telvent

Services and Sales

Value Added Sales, Support

Coleman
World Wide Technology

Service Providers

Connectivity, Transport

Arcadian Networks
Cable and Wireless
Sprint
Verizon
VT iDirect