

Trends Forcing Energy

■ ■ ■ ■ Provisioning Transformation: Intelligent Grids and Smart Customers

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Executive Briefing

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Zagreb, Croatia

Energy Future?

Facts:

- **The U.S. consumes 25% of the global energy.**
- **China's population is four times the U.S.**
- **There are 100 million people elevated in the middle class in China per year.**

BAU Consequence:

- **9 years from now, the U.S. plus China will equal the world's consumption.**

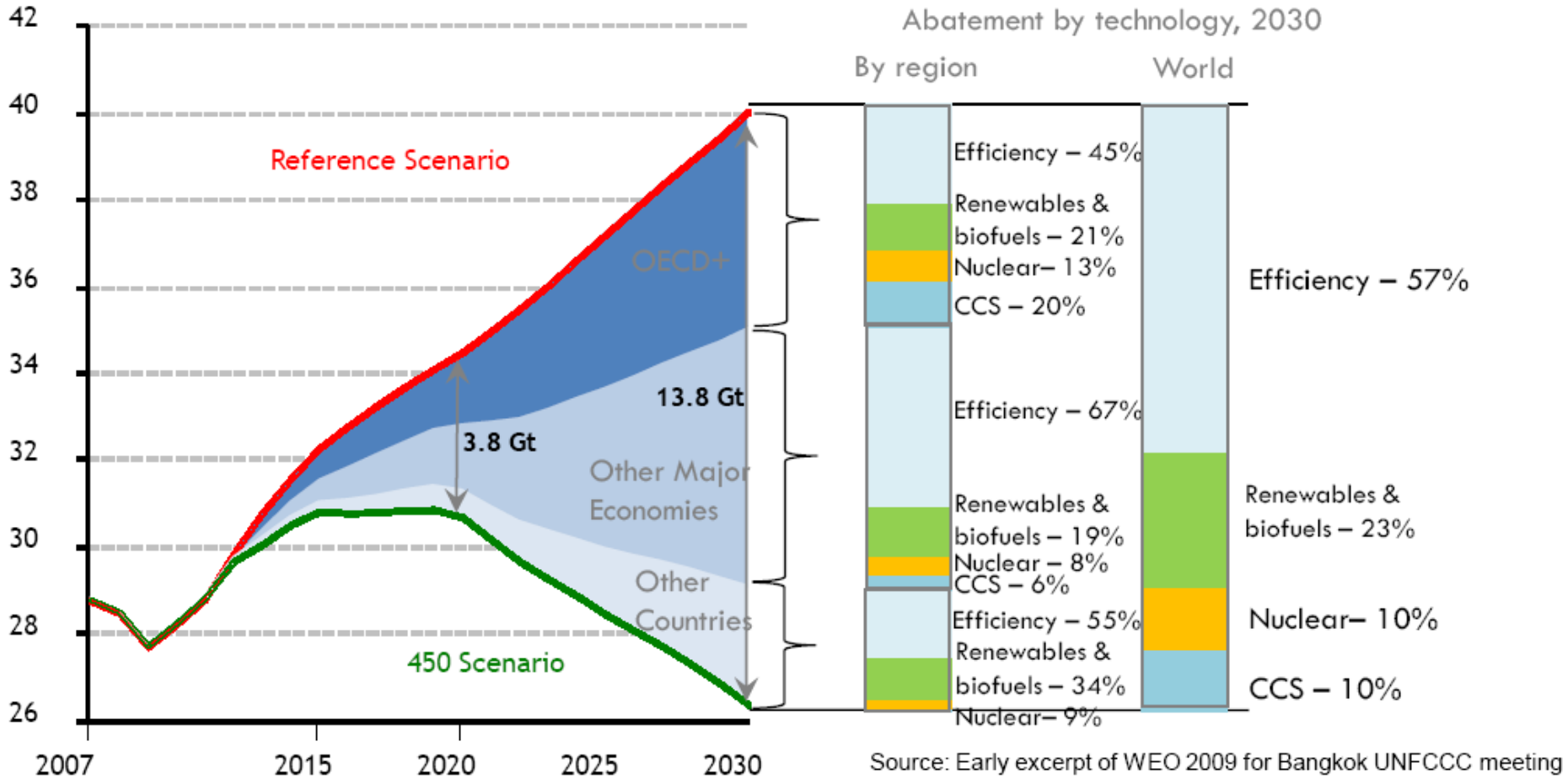
Environmental Concerns

- **In 2006, 29% of the anthropogenic CO₂ emissions came from the power sector**
- **With business as usual, that figure will increase to 38% by 2030**
- **Options:**
 - Supply side: renewable, nuclear, CCS
 - Demand side: energy efficiency, D/R
- **CO₂ emissions are now a business issue:**
 - Debate over tax versus cap and trade continues
 - Global carbon market worth approximately \$100m in 2008

CEO and Board: What is the risk? Are we doing enough?

Consumers: What is my utility company doing? What can I do?

The emissions challenge: IEA “450ppm Scenario”



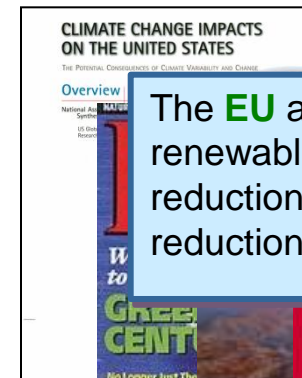
Policymakers Sentiment and Consumer Attitude

Environmental and energy sustainability concerns are forcing policymakers to:

- Promote/mandate investment in "renewables"
- Encourage utilities to offer and consumers to participate in energy efficiency programs

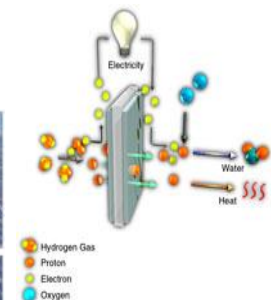
“Environmentally enlightened” consumers are getting into the driver's seat by:

- Participating in energy-efficiency programs
- Deploying renewable distributed energy resources



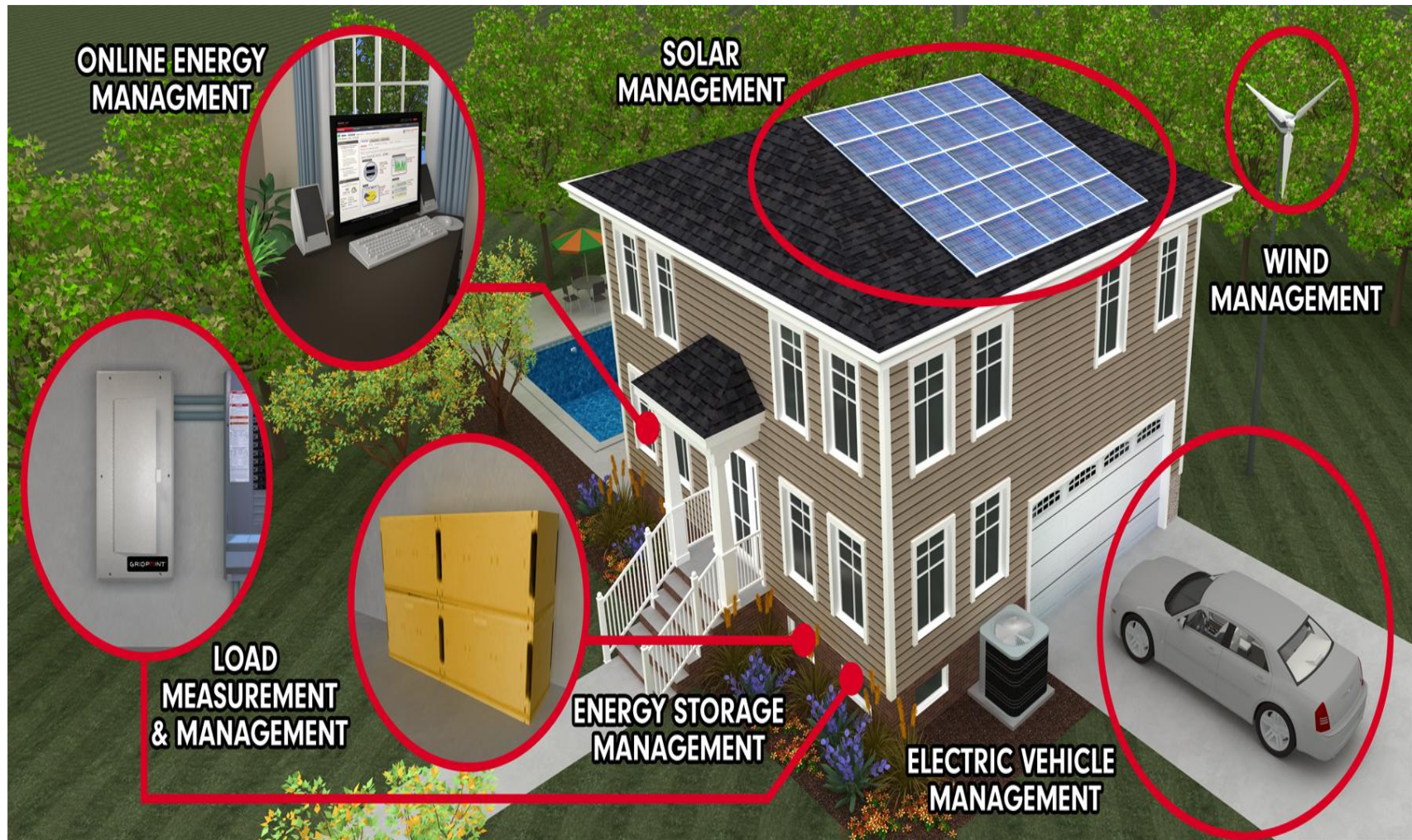
The EU announced plan 20% renewable 20% CO2 emission reduction 20% consumption reduction by 2020.

President Obama energy/environment vision:
25% renewable by 2025
80% CO2 emission cut by 2050



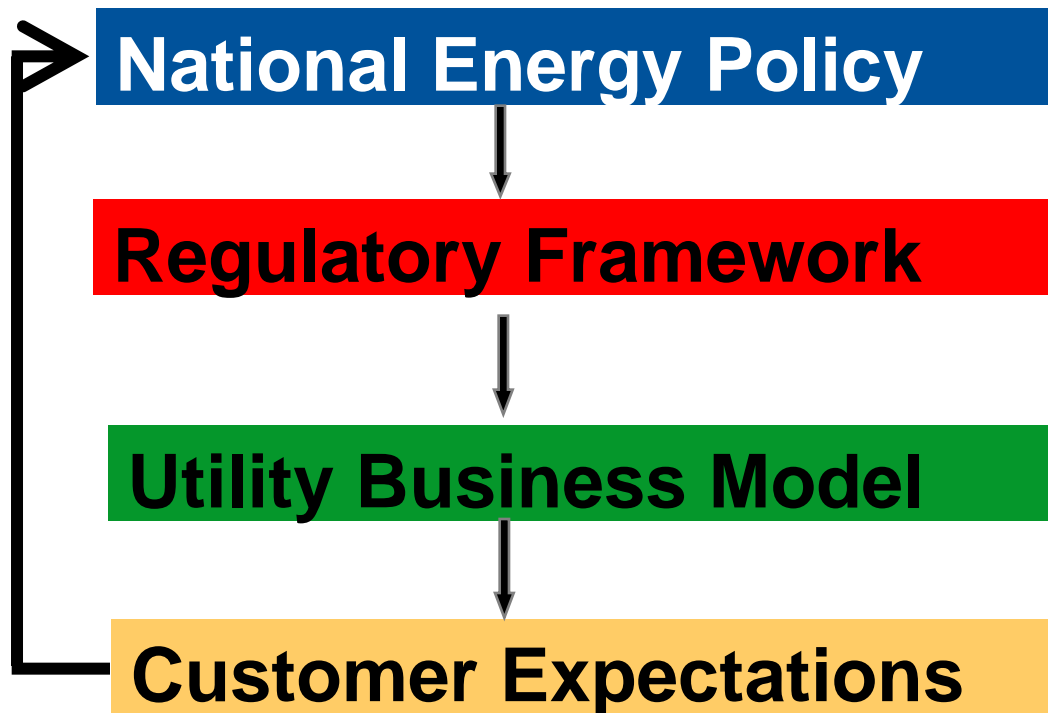
Consumers - Active Participants

Energy Technology Consumerization



Energy Industry Transformation Impediment

Energy Sector Misalignment



Global Consensus:

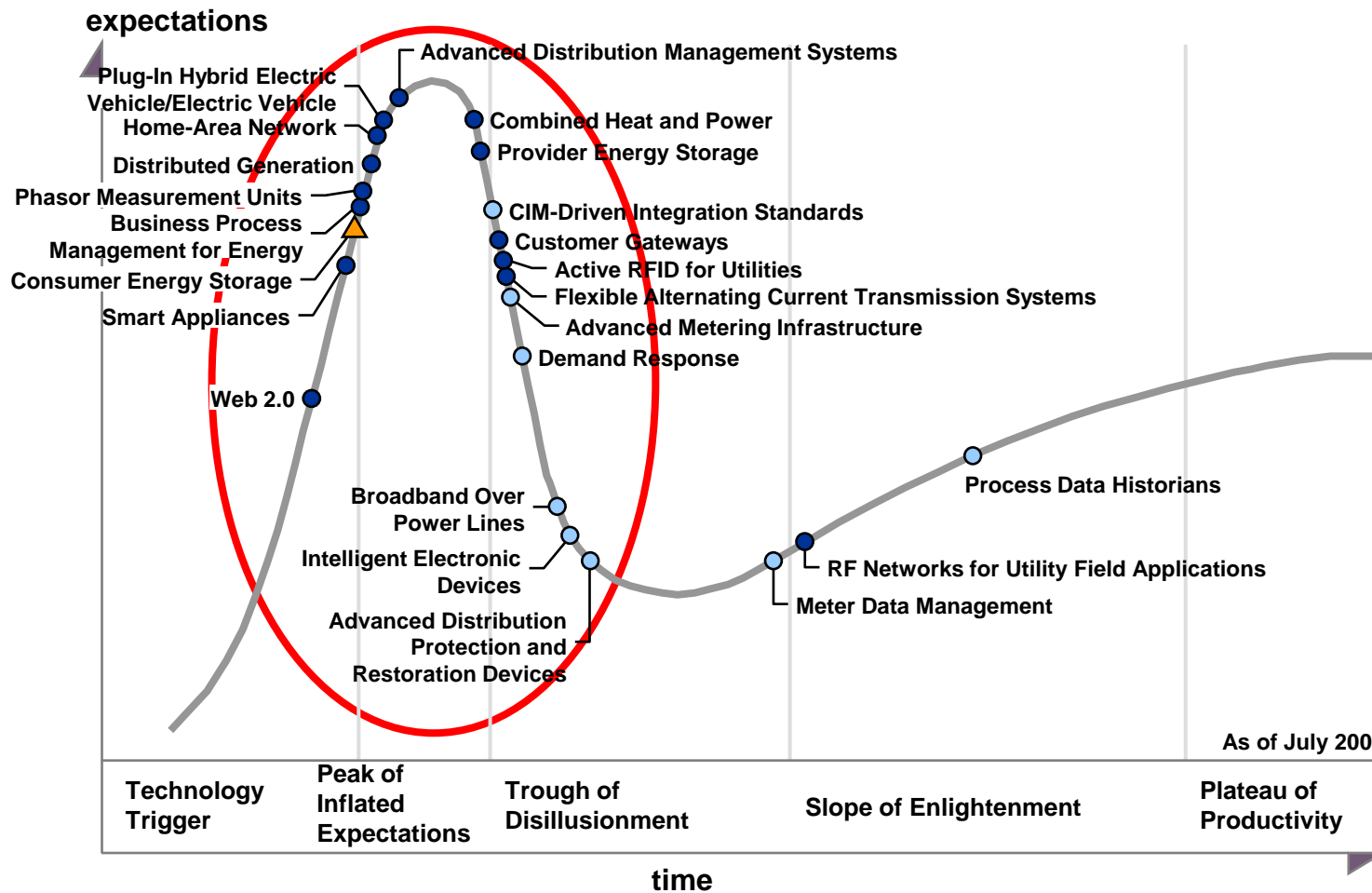
Current delivery infrastructure (and utility business model) is inadequate and does not address needs and challenges of the 21st century

■ ■ ■ ■ **Smart Grid:
Key Technology
Innovation Area:**

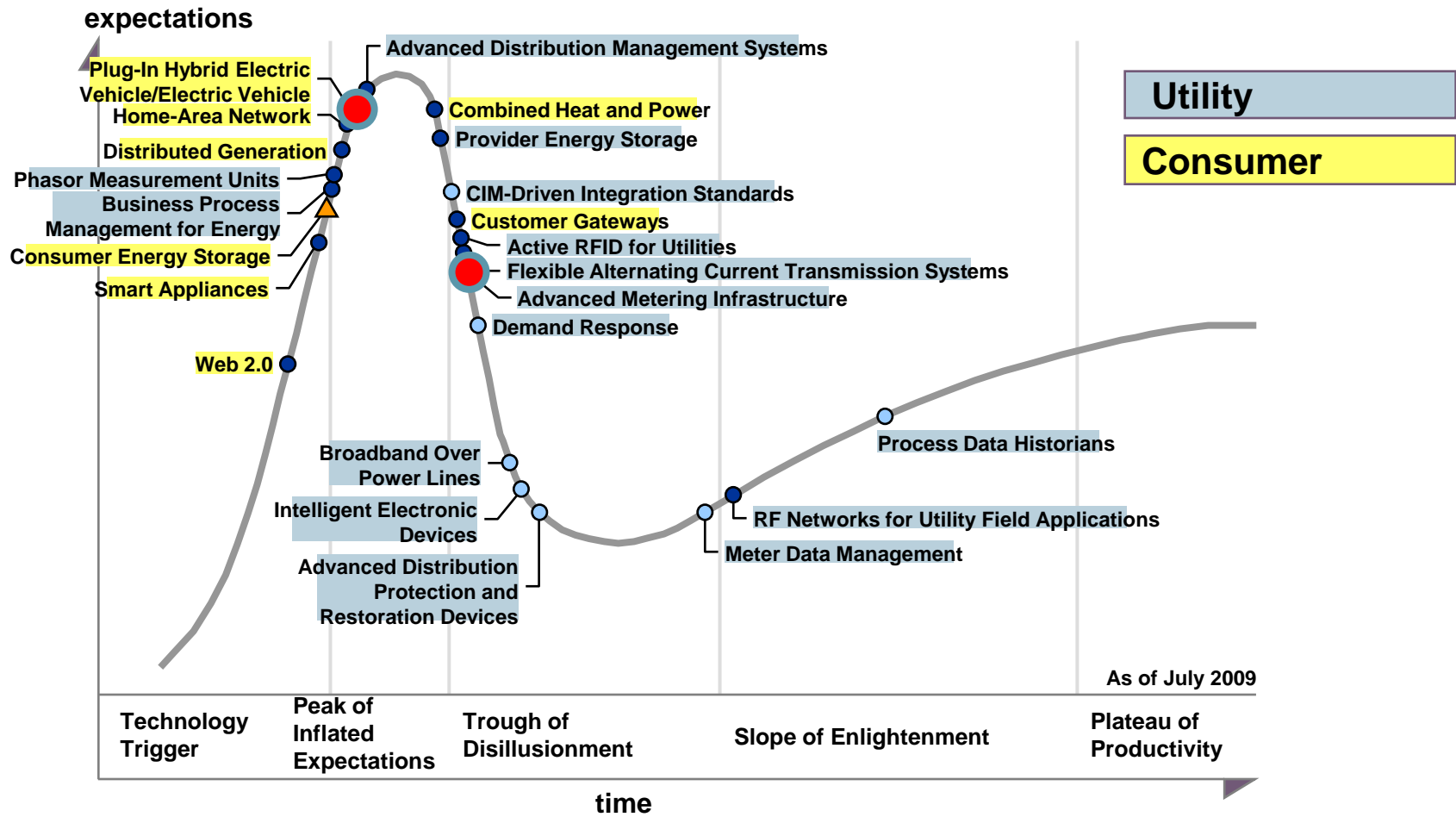
Two Sides of Smart Grid

- Infrastructure modernization to address needs for better network resilience and better use of assets via technologies that provide a way to observe and control the delivery infrastructure.
- Consumer inclusion in energy markets to address energy sustainability concerns through enablement of energy efficiency programs and energy technology consumerization. .

Smart Grid Technology Hype Cycle

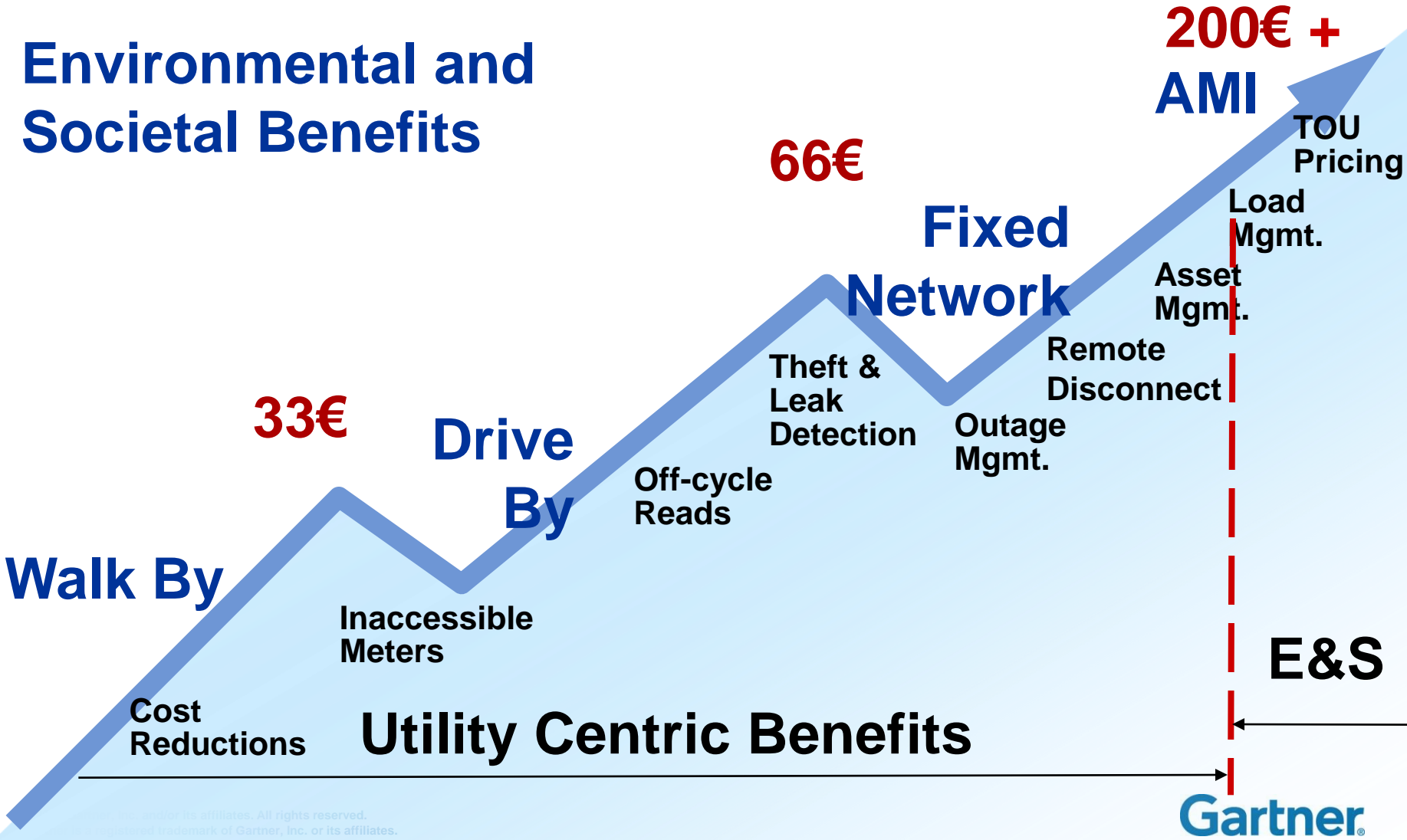


Smart Grid Technology Hype Cycle



Automated Meter Reading/Advanced Metering Infrastructure Benefits and Cost

Environmental and Societal Benefits



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Plug-in Hybrid Electric Vehicle

Addresses:

- CO2 emission abatement in transportation sector
- CO2 emission abatement in utility sector
- Utility infrastructure and resource adequacy concerns
 - Vehicle-to-grid application

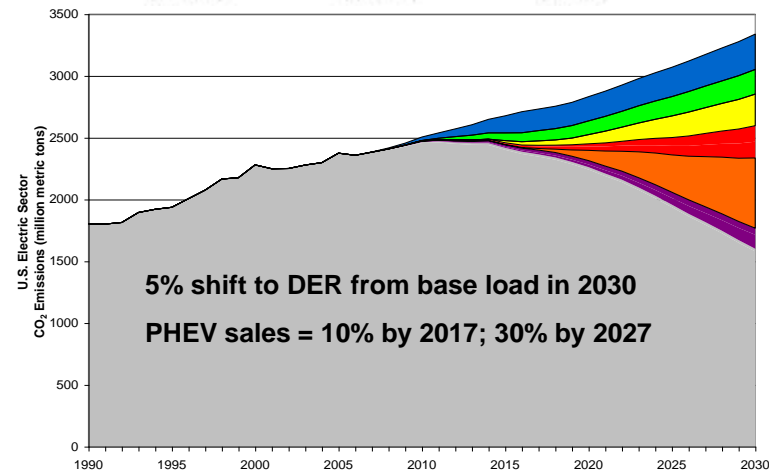
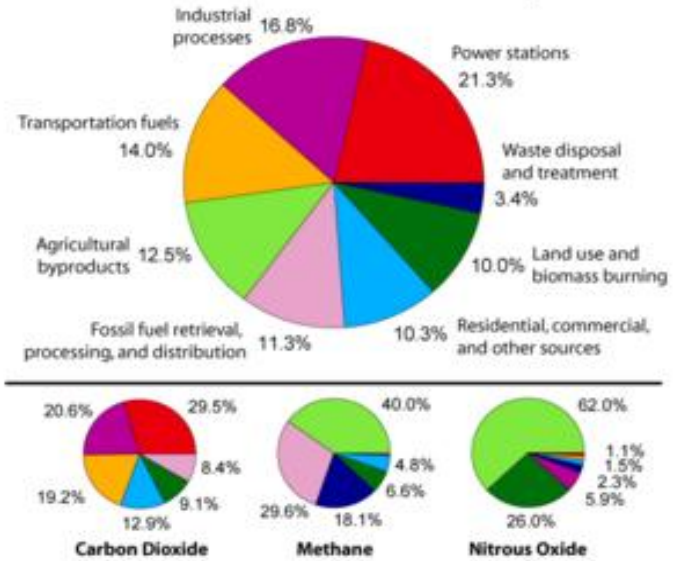
Significant Growth Potential for Utilities:

- Opportunity to enter transportation sector

Key Pilots:

- SCE-Ford, EDF-Toyota, RWE-Daimler

Annual Greenhouse Gas Emissions by Sector



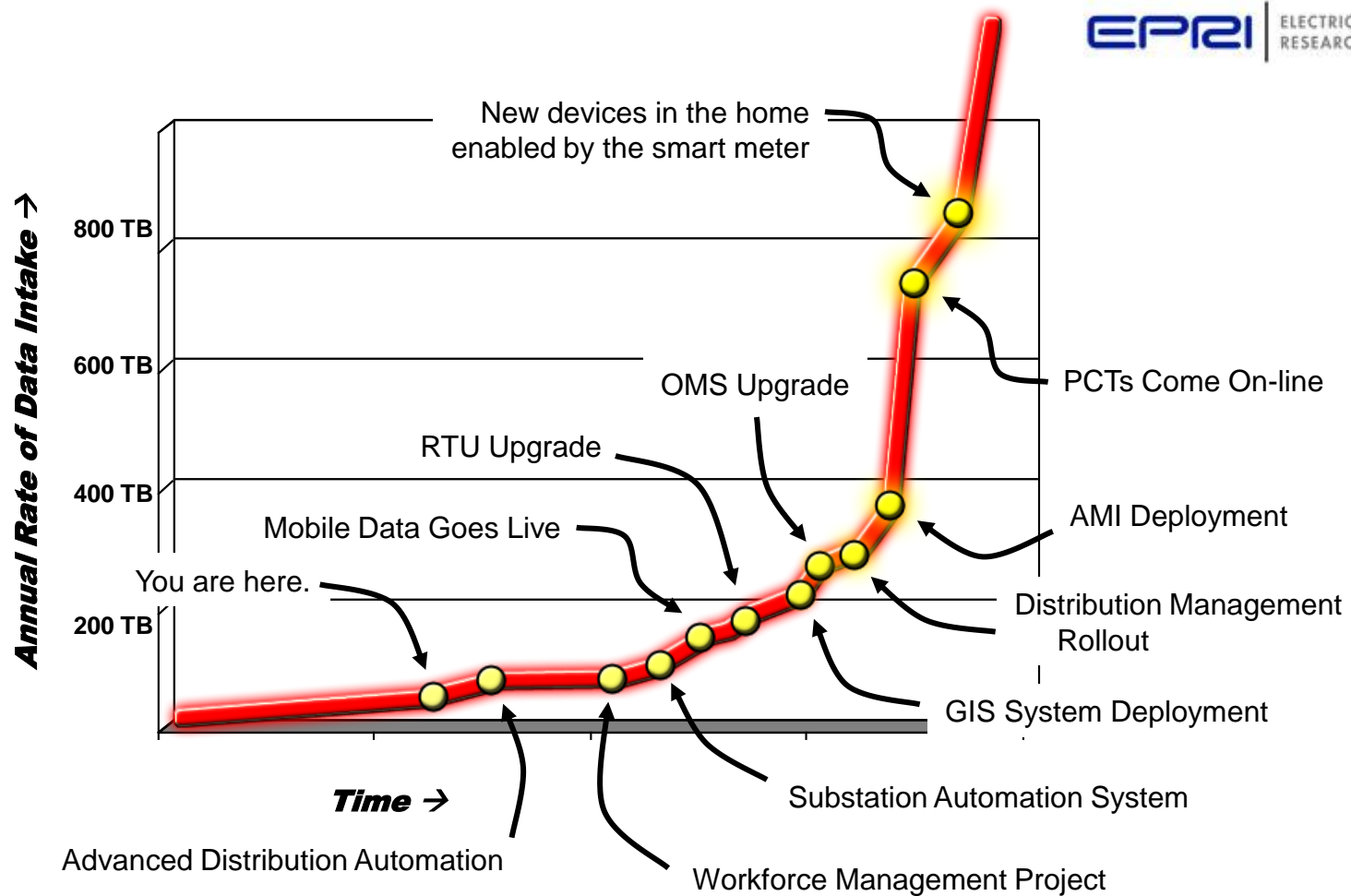
Plug-In Hybrid Electric Vehicle Is Not "Plug and Play" for Utilities

- **Disruptive**
 - Nomadic appliance (can show up anywhere)
 - Can be sink/source of energy
- **New business processes**
 - Supplying consumers not affixed to a particular premise (meter)
 - Buying from sources not affixed to a particular premise
 - Tracking/telematics and roaming charges (SIM card)
 - Transaction processing and settlement
 - Remote control charging/discharging
- **Charging Infrastructure Initiatives**
 - Better Place and Renault/Nissan
 - Should gas stations (or parking garages) sell electricity

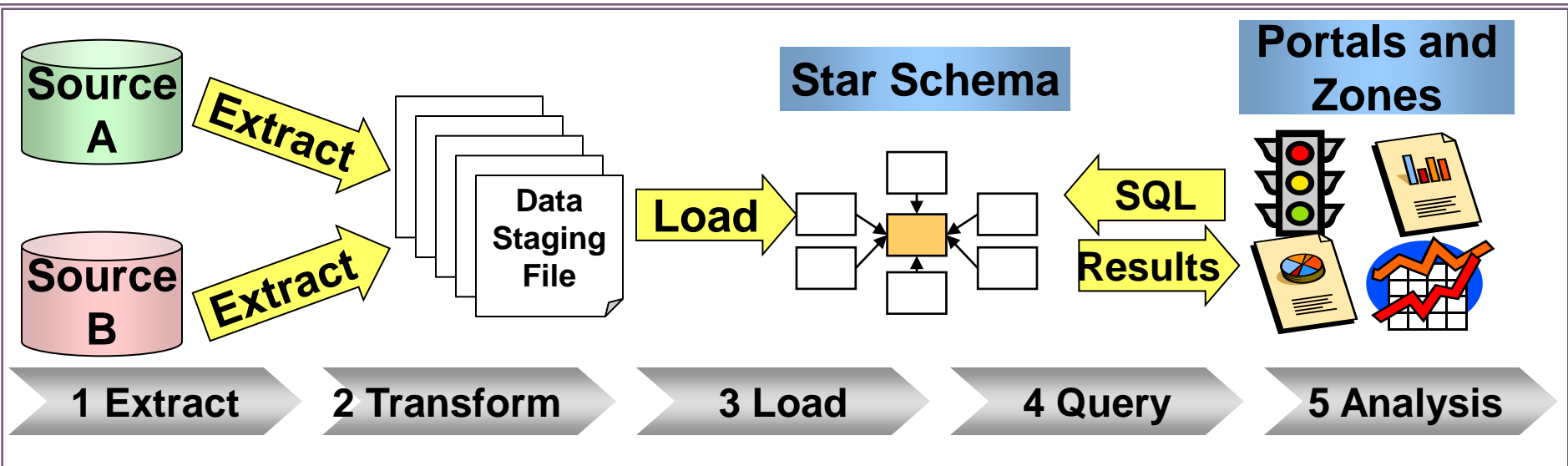


■ ■ ■ ■ IT Implications

Smart Grid Data Flood



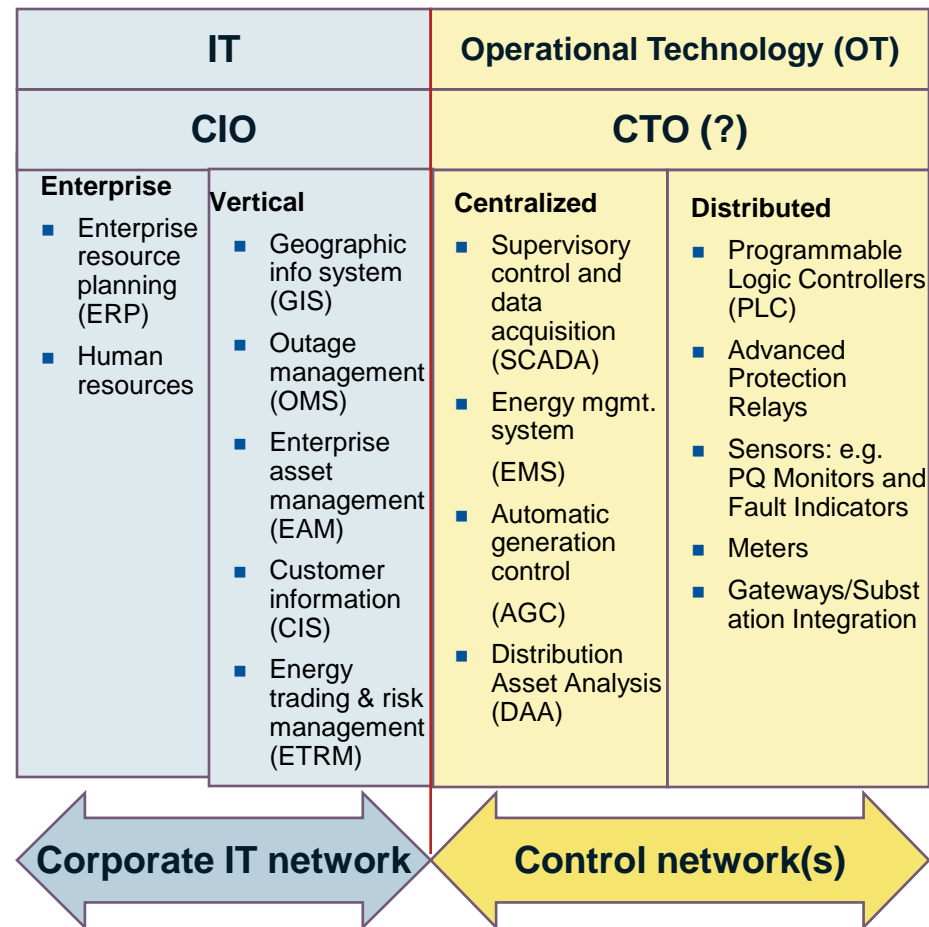
Analytics are Supporting Quest for the Real-Time Enterprise



- Analytic architectures transform operational data into useful information to improve operational efficiencies, increase reliability, enhance customer service and increase shareholder value
- Executive "dashboards" provide "real time" access to analytics and KPIs, enabling better-informed decisions and quicker actions

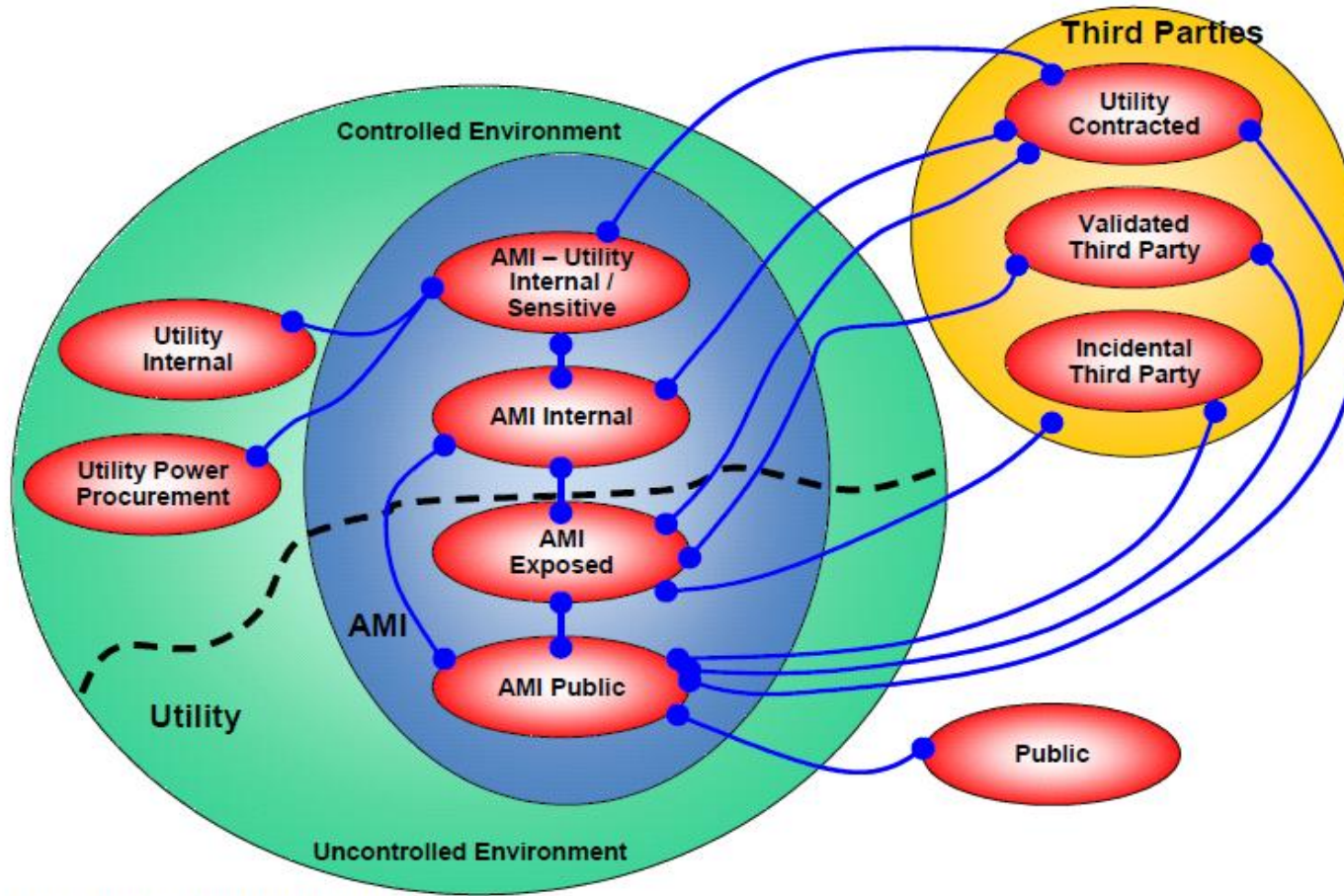
IT and OT Interaction and Governance

- Emerging opportunities are bringing IT and OT closer
 - intelligent grid, demand response, outage management systems, real-time monitoring of assets
- OT systems increasingly use standard platforms (OS, RDBMS) and protocols (IP)
- OT systems are usually outside of the scope of IT and the CIO
- The lack of a successful IT/OT governance impedes performance
- Impact on security and compliance



Smart Grid Security Implications Advanced Metering Infrastructure (AMI) Security Domains

Figure 1. AMI Security Domains



Source: Southern California Edison

Consumerization of Energy Technology: "Power to the People"

■ How many:

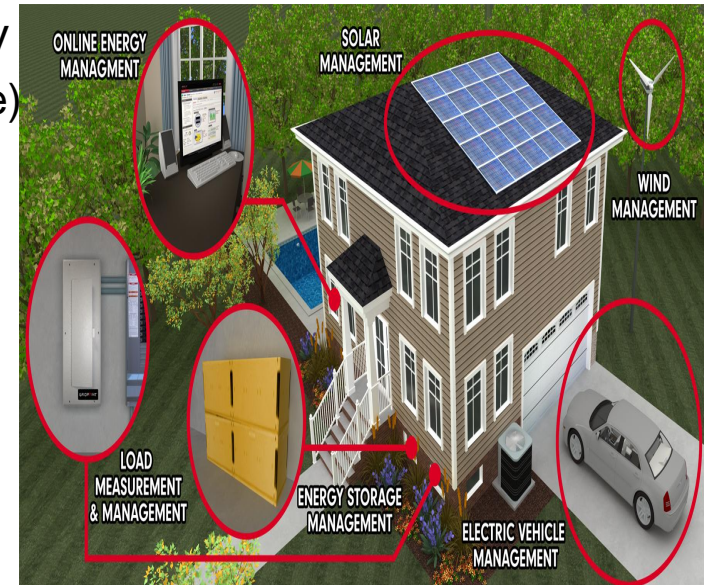
- By 2015 35% of new and 15% of existing residence will participate in energy efficiency programs.
- Transportation industry hybrid vehicle as a proxy
 - Consumer deployed DER (generation and storage)
 - single digits

■ "Knee Jerk" reaction:

- Stop it (or delay it) through bureaucratic and financial barriers

■ Best practices from other industries:

- IT evolution in last decade:
 - from restricting employee access to customer self service
- Media:
 - embracing customer participatory models (Blogs, YouTube)



Energy Efficiency → Consumer Technology Play Megavendors Stepping In

Google Power Meter



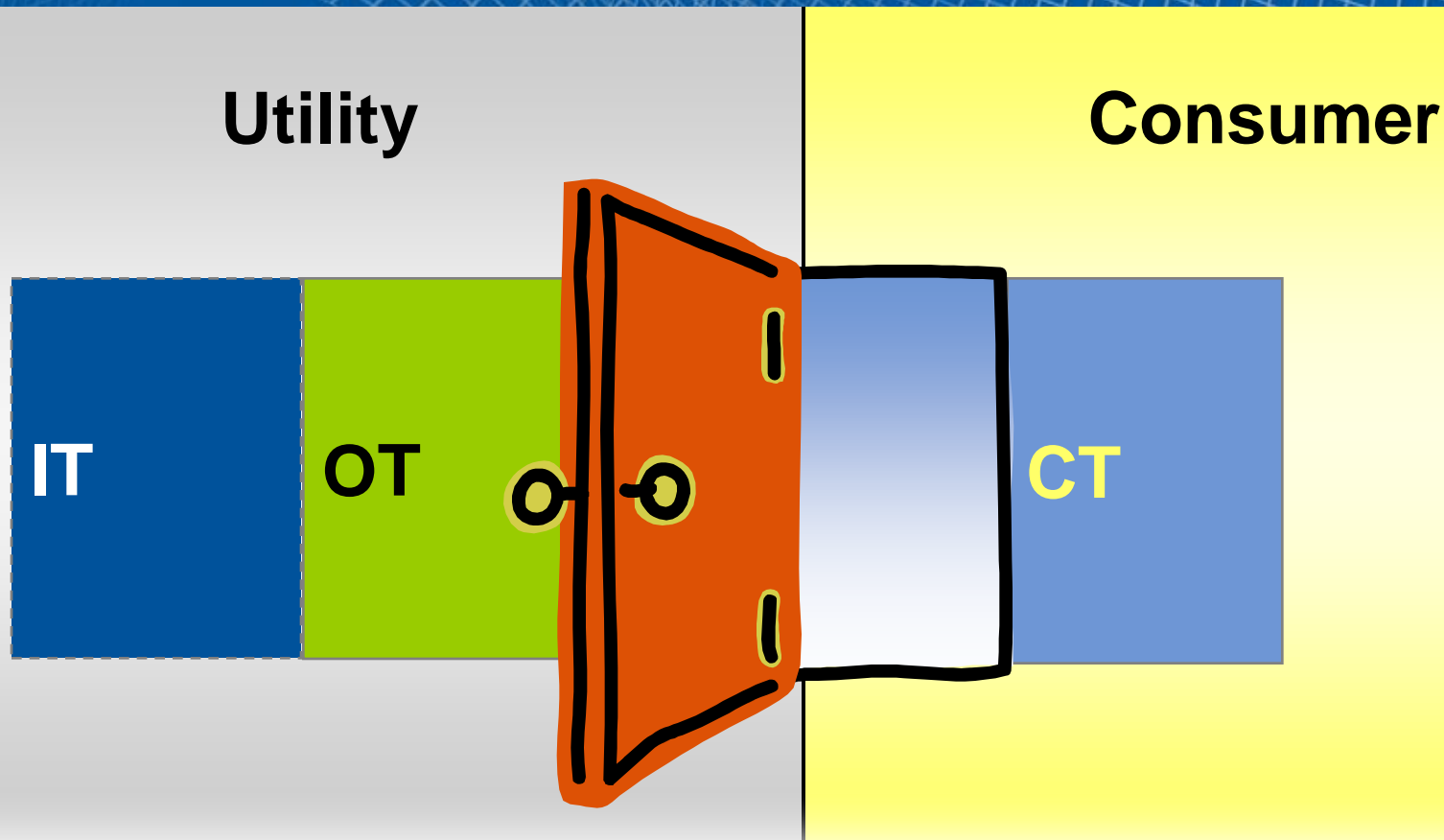
Microsoft Hohm



iPhone and twitter are coming.....



CIO Dilemma: Multiple Technology Domains



How to manage technology interaction (standards, security, governance) outside IT and outside utility enterprise?

New Need Emerges “The Information Utility”

Commodity Value Chain

Business processes that enable companies to procure energy and sell it to consumers

Business Model: Competitive energy retail

Strategy: Grow the business

Competencies: Customer mgmt., Commodity mgmt., Marketing/brand mgmt.

Energy Utility Value Chain

Asset Value Chain

Business processes that enable companies to develop, operate and maintain the assets needed to deliver energy to consumers

Energy Information Value Chain

Business Model: “Information Utility”

Strategy: Transform the Business

Competencies: IT Services in Cloud, Web 2.0

Deregulation

Business Model: Regulated energy delivery

Strategy: Run the business

Competencies: Asset mgmt., Regulatory mgmt., Work mgmt., Cost mgmt.

Energy
Sustainability
Consumerization

Related Gartner Research

- ***The Utility of the Future: The Information Utility, Zarko Sumic***
- ***AMI is the Clear Winner of the U.S. Smart Grid Investment Grant Program Competition, Zarko Sumic***
- ***Hype Cycle for Smart Grid Technologies, 2009***
Zarko Sumic, Kristian Steenstrup, Keith Harrison
- ***Microsoft Brings Consumer Energy Efficiency Into Hohm, Zarko Sumic***
- ***Utility Consumer Survey: Energy Efficiency, Do They Care and Why? , Zarko Sumic***
- ***How to Make Your Grid Smarter: An Intelligent Grid Primer, Zarko Sumic***