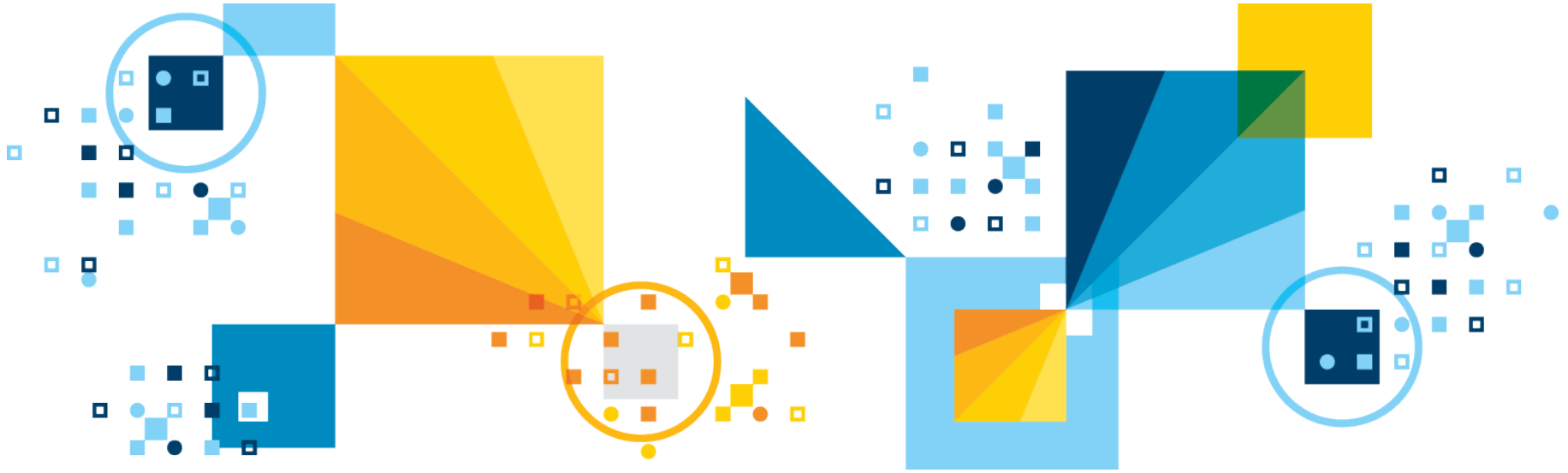
Anders Quitzau, Innovation Executive, IBM
28. maj 2014

Transforming Energy and Utilities through Big Data & Analytics



What is changing in the Energy and Utilities industry?

The grid gets older

60% of electric grid assets will need replacement in this decade

Alternative energy enters the mix

Global installed wind power capacity increased by 12.4 percent to more than 318 gigawatts in 2013

Smart meters become mainstream

In 2020, all Danish electric utilities will have smart metering infrastructure (AMI) installations

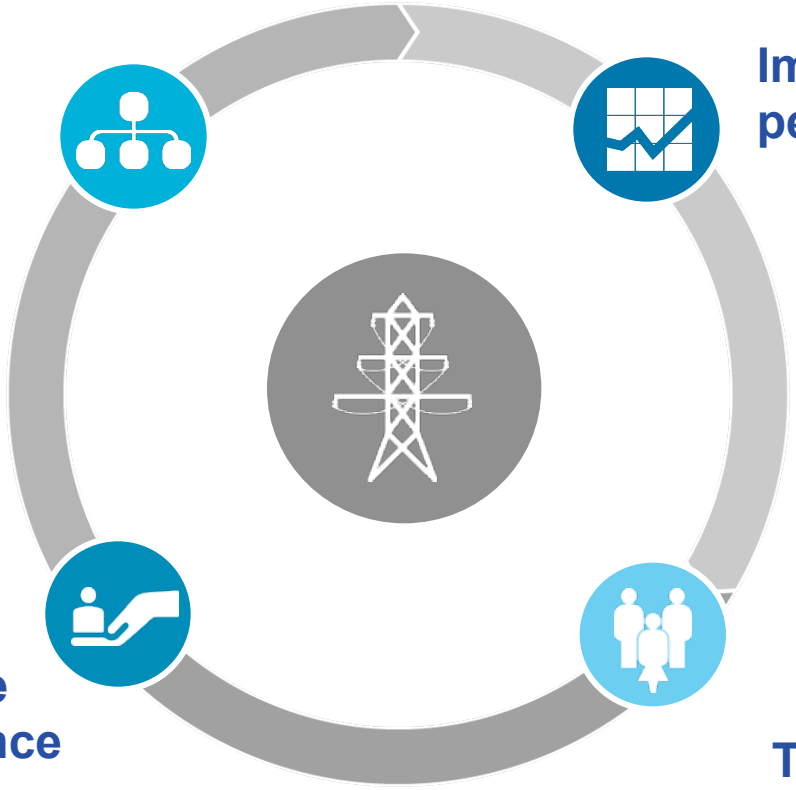
Consumers want more control & insight into energy consumption

The number of U.S. customers capable of accessing information on their energy use online increased from 5.4M in 2010 to 17.5M in 2012

To sustain growth, leaders across energy & utilities are prioritizing four imperatives…

Transform the utility network

Improve generation performance

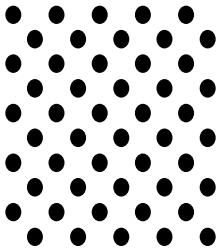
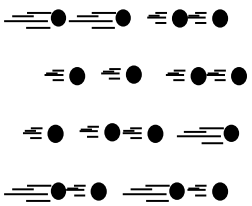
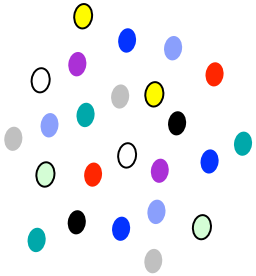
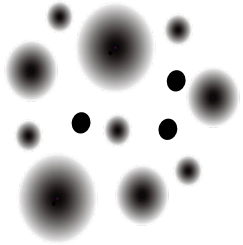


Continually improve operational excellence

Transform customer operations

Big Data is not 'just' data, there are a few new considerations

Big Data | Open Data

Volume	Velocity	Variety	Veracity	Visibility	Value
					
Data at Rest	**Data in Motion**	**Data in Many Forms**	**Data in Doubt**	**Data in the Open**	**Data of Many Values**
Terabytes to exabytes of existing data to process	Streaming data, milliseconds to seconds to respond	Structured, unstructured, text, multimedia	Uncertainty due to data inconsistency & incompleteness, ambiguities, latency, deception, model approximations	Open data is generally open to anyone. Which raises issues of privacy. Security and provenance	Large range of data values from free (data philanthropy to high value monetization)

'Big data' is defined by IBM as any data that cannot be captured, managed and/or processed using traditional data management components and techniques

Big data makes a big difference

Organizations using big data and analytics are up to

23x

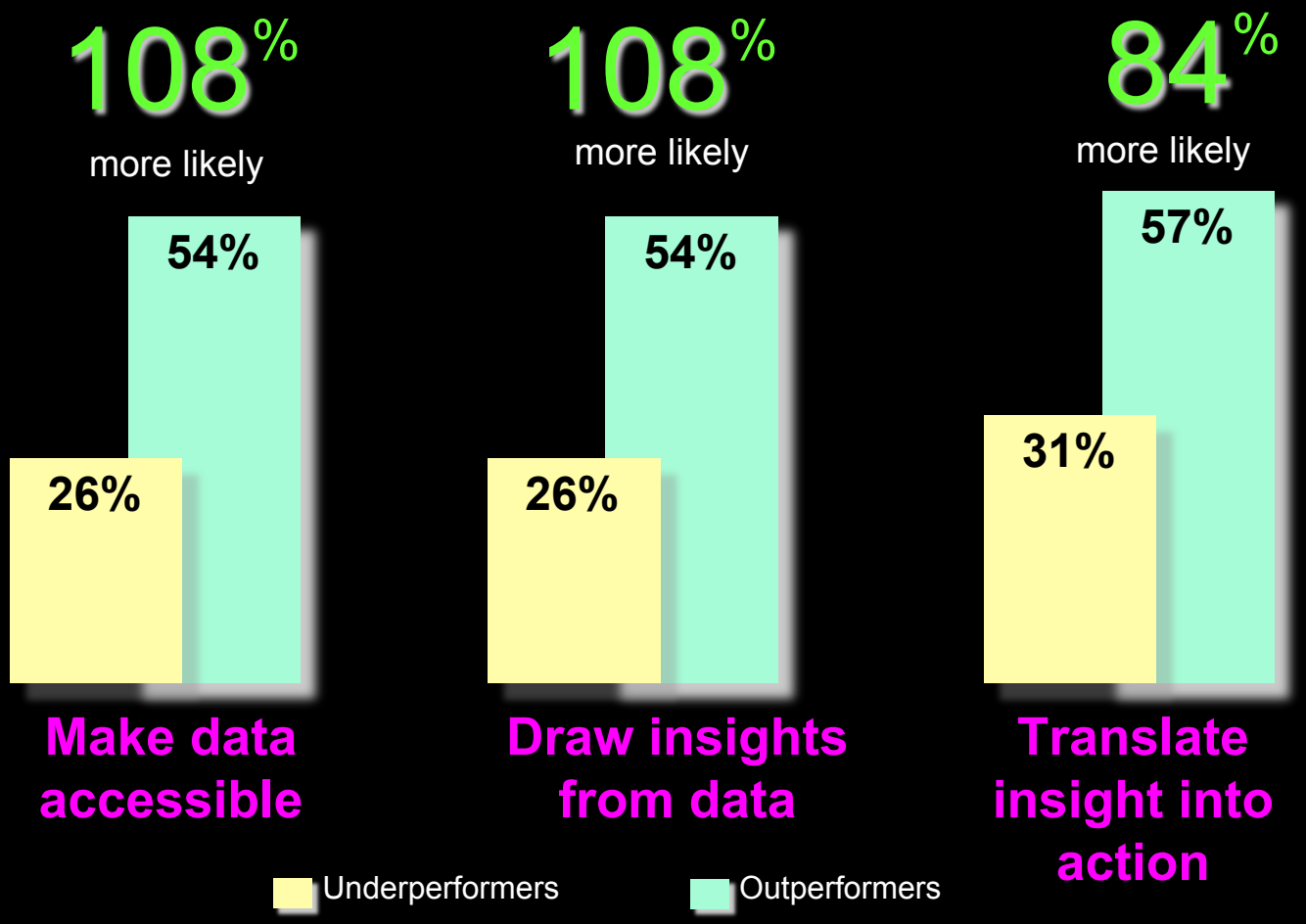
more likely to report they are

substantially outperforming their competitors

than those who do not use big data and analytics

Source: *Analytics: The real-world use of big data*, a collaborative research study by the IBM Institute for Business Value and the Saïd Business School at the University of Oxford.

Using **data**, outperformers **excel** in **three key areas**



Source: *Leading through connections, Insights from the 2012 Global Chief Executive Officer study,* IBM Institute for Business Value

Big Data & Analytics capabilities help utilities leverage data to meet the challenges of a connected world

Data is emerging as the world's newest resource for competitive advantage

Decision-making is moving from the elite few to the empowered many

As the value of data continues to grow – current systems won't keep pace

Data explosion

In the utilities industry, the number of connected devices – participants in the "Internet of things" – is growing exponentially:

45%

Compound annual growth rate, 2010-2015

Cost and pricing pressures

By 2050, the Electric Power Research Institute estimates that the average electric bill will probably go up by about 50 percent if the smart grid *is* deployed.

ca. 400%

is the expected increase in the average electric bill if the smart grid *is not* deployed

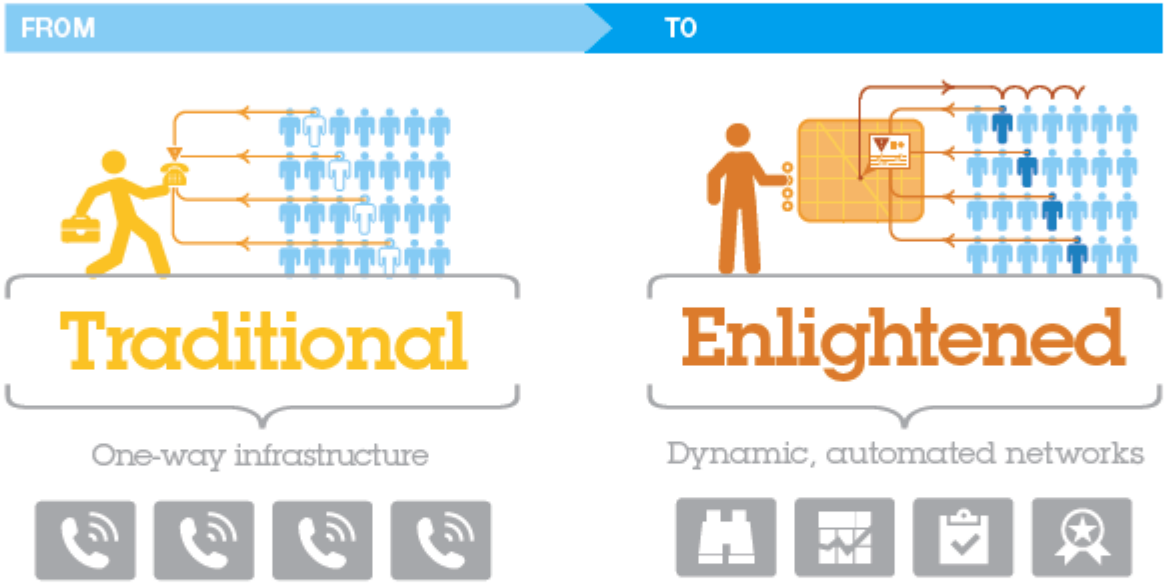
Increasing consumer expectations and concerns

>50% of surveyed consumers with an opinion expect smart grid technologies will lower total household costs for energy use. But . . .

49%

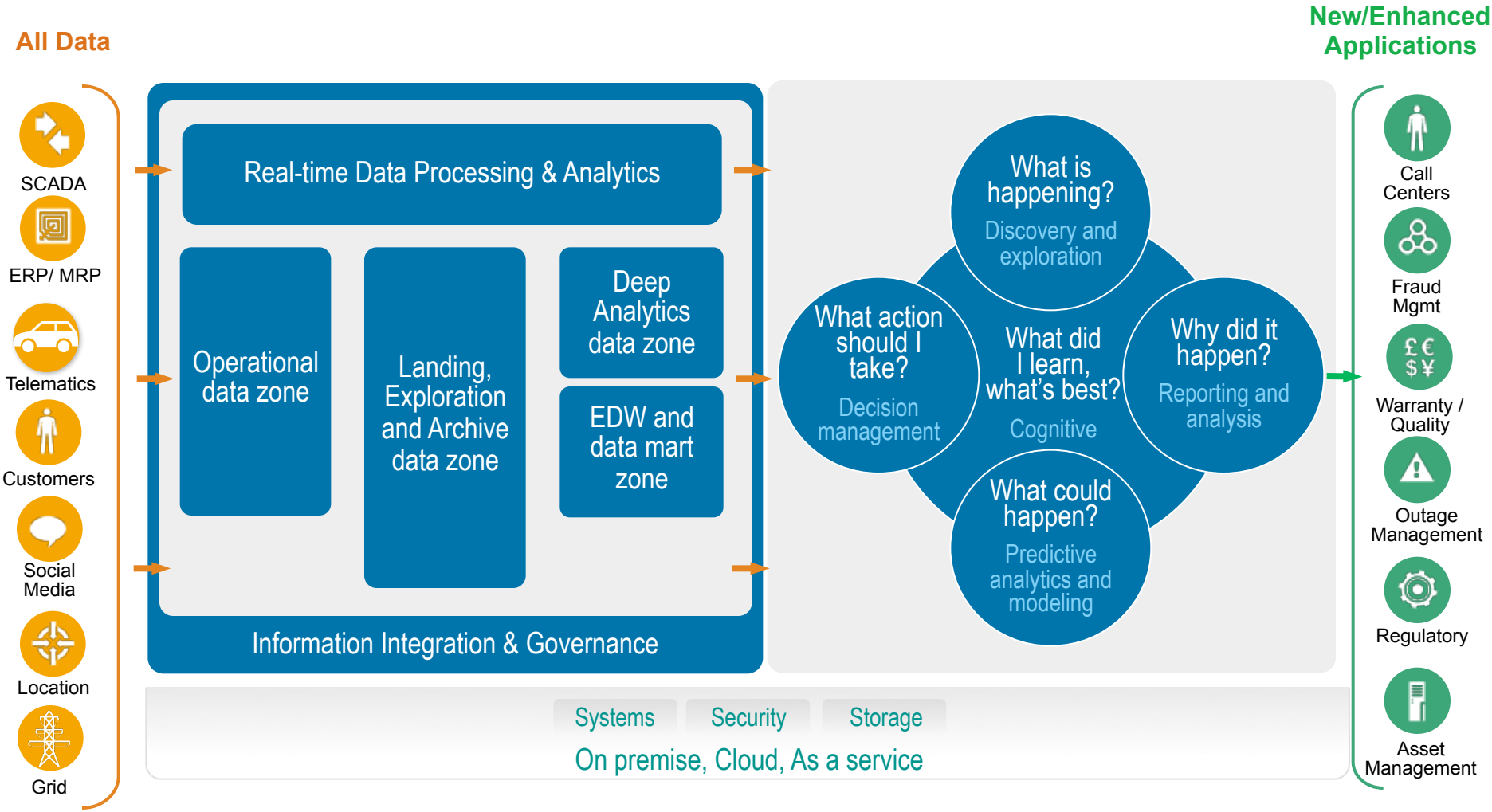
of consumers were concerned that erroneous smart meter readings would result in overcharges

Big data & analytics are transforming energy and utilities



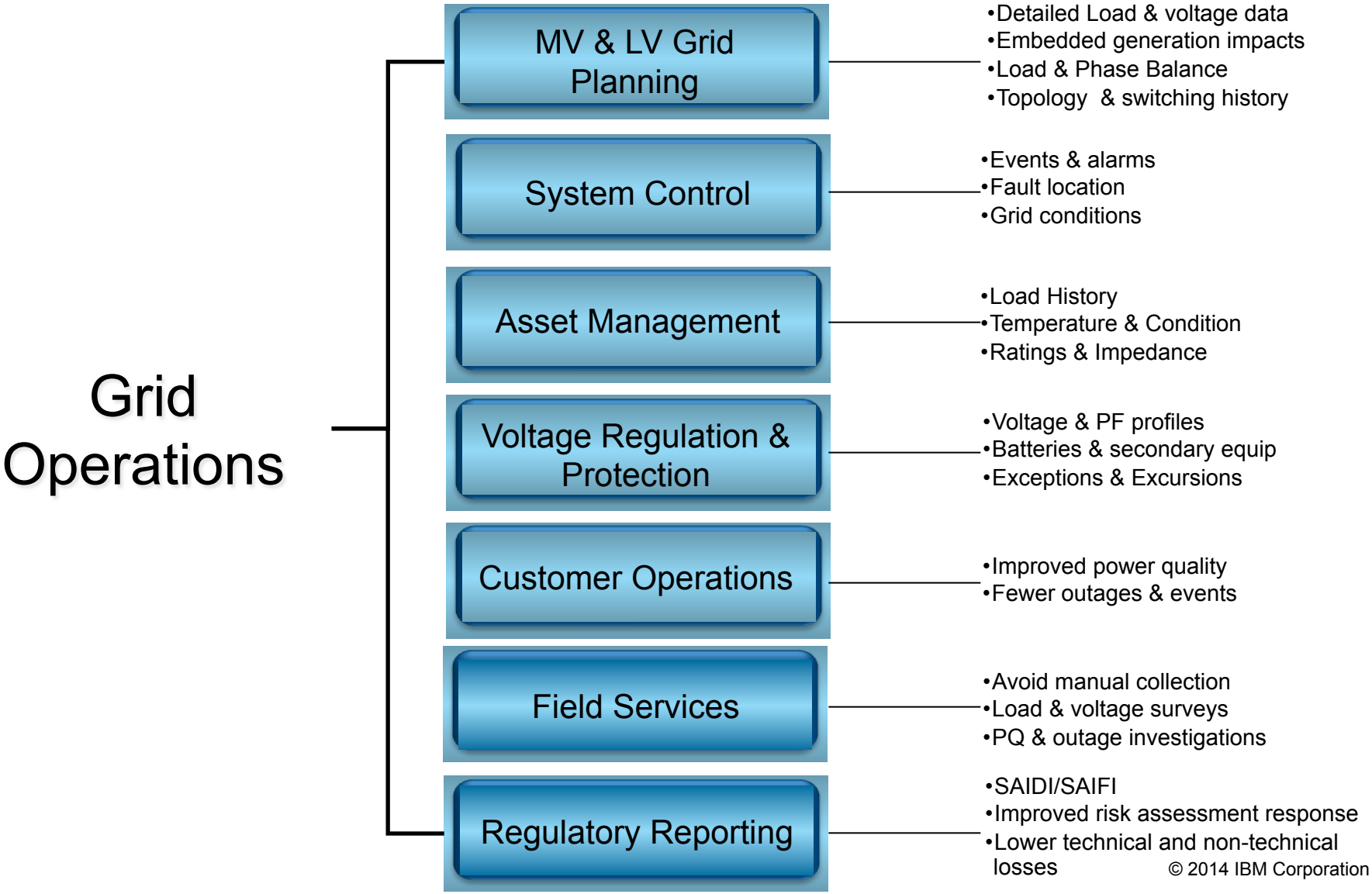
Energy and Utilities are turning knowledge into power by using big data & analytics to better understand and shape customer usage, improve service levels and availability, and detect and prevent energy theft.

Big data & analytics capabilities are required to address these challenges and opportunities

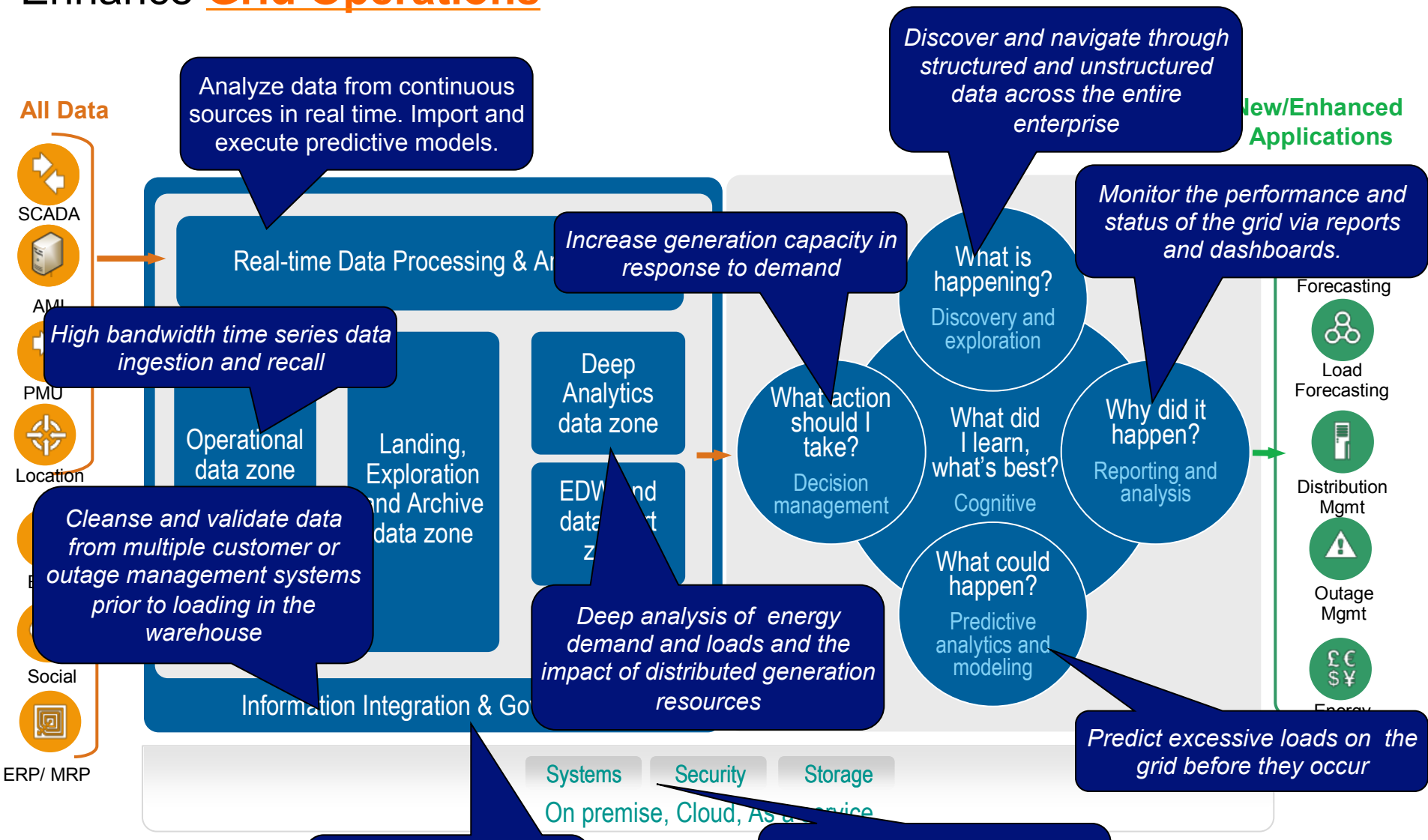


Key usage patterns for big data & analytics have emerged

Big data & analytics capabilities can drive real business value from Grid Operations



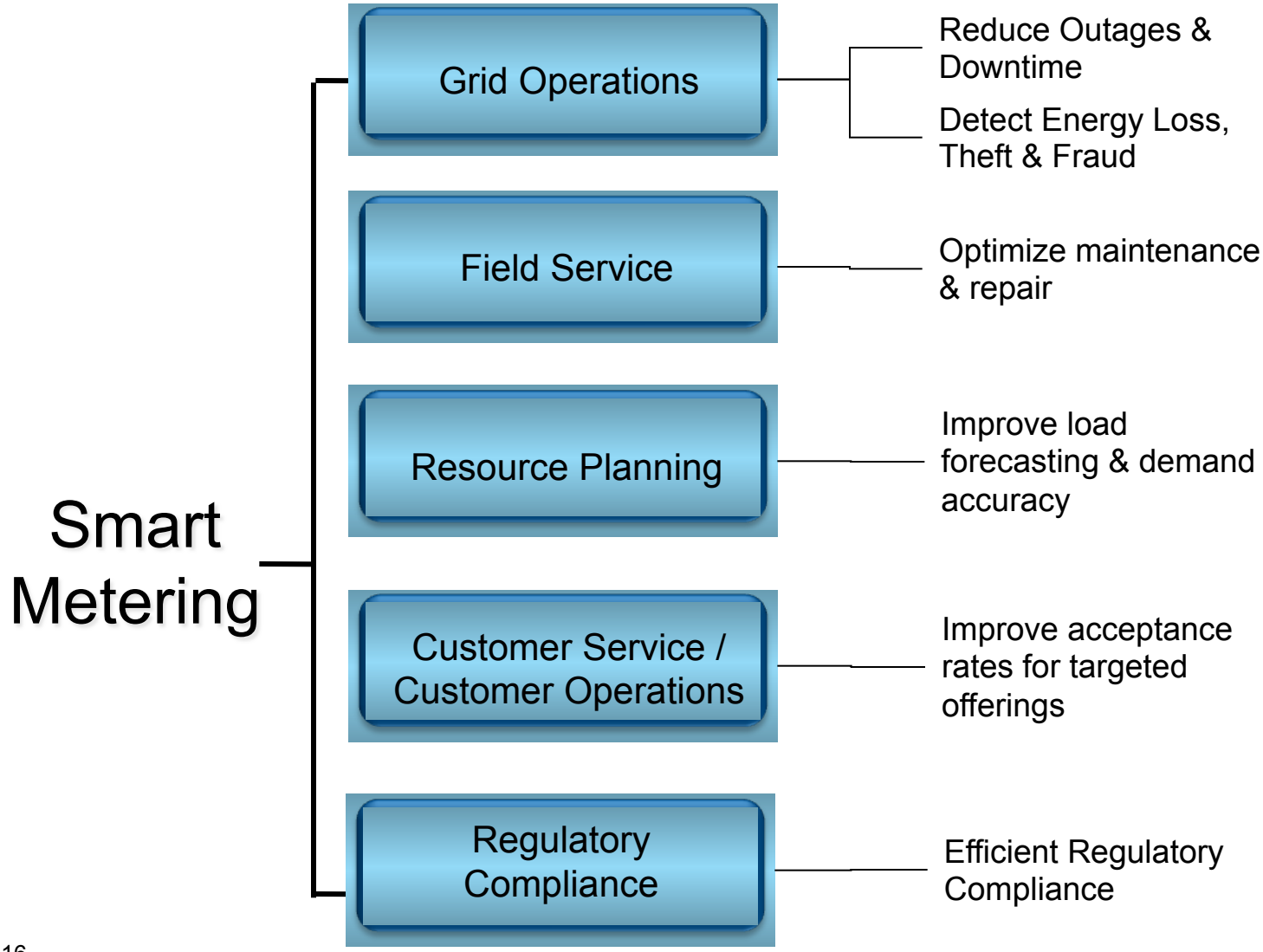
Enhance Grid Operations



Big data & analytics capabilities are transforming Grid Operations

How can I uncover anomalies in cell relay signals to predict and prevent power outages?	How can I manage the load capacity of the grid without relying on manual calculations ?	How do I integrate renewable energies on the grid and forecast energy consumption ?
Anticipate outages	**Manage the flow of power through the grid automatically**	**Simulate energy demand**
Energy utility company in the United States	***Australian Power Company***	***Utility company in France***
•Synthesized and analyzed a large stream of data from 5,500 cell relays and 2.3 million smart meters •Predict and prevent operational issues •Respond to outages more efficiently by dispatching crews to the right place at the right time	•Implemented a rules engine and advanced analytics to continually calculate the theoretical load limits of assets within the grid network •Extended asset life and subsequent deferred unnecessary capital investment via better asset load ratings.	•Forecasts national demand every 30 minutes for a full year in advance, versus daily in the past •35 million load curves analyzed and modeled in near-real time

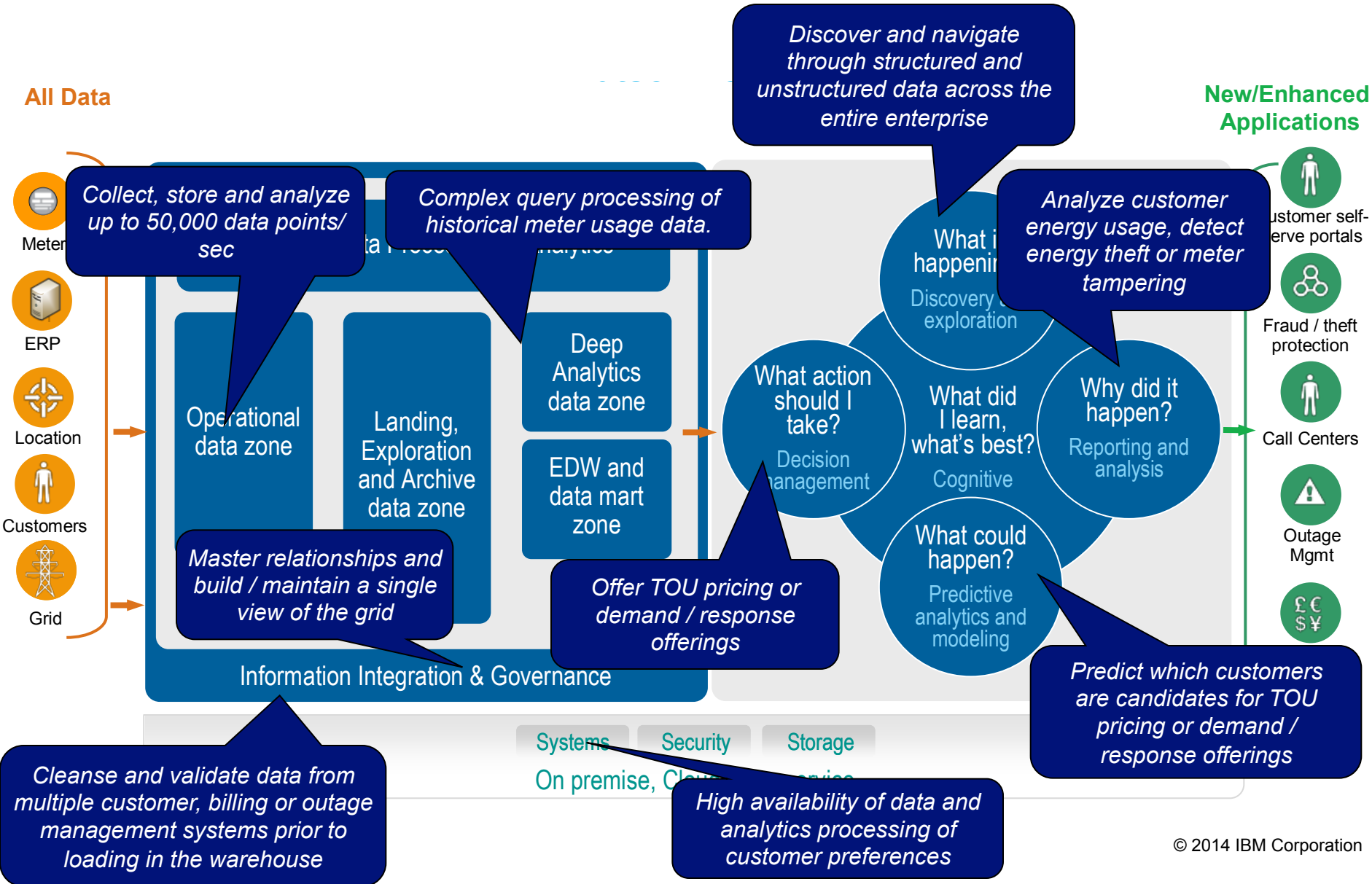
Big data and analytics capabilities drive real business value from **Smart Meter** data



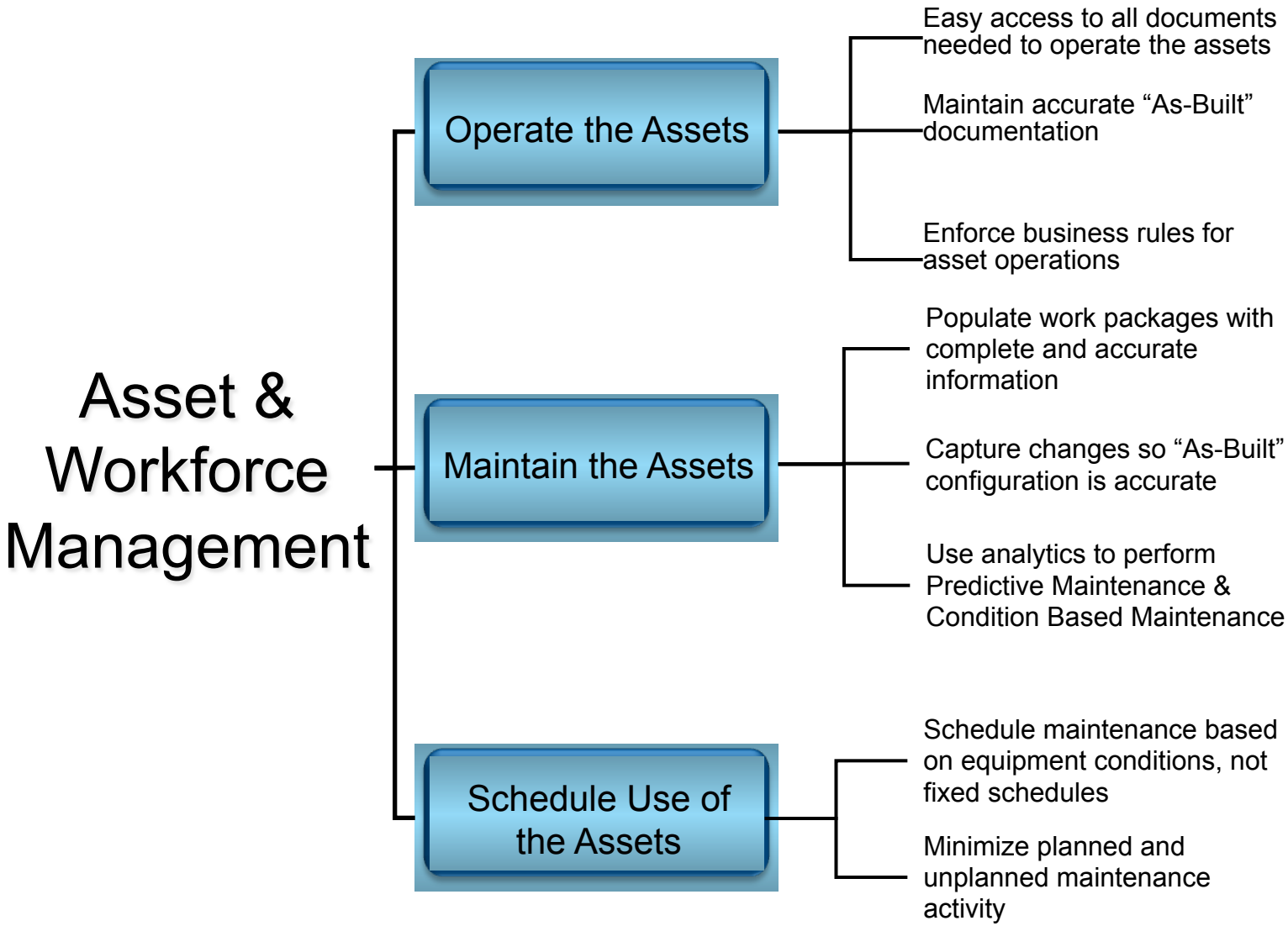
Big data & analytics turns Smart Meter data into actionable insight

How can I give customers more control over their energy use ?	How can I manage the load capacity of the grid without relying on manual calculations ?	How can I use smart meter data to reduce energy consumption?
Help customers reduce energy consumption	**Manage the flow of power through the grid automatically**	**End-to-end management of the grid**
US distributor & transmitter of electricity	***Battelle*** *The Business of Innovation*	***Large California Utility***
•Used smart meter data for a customer web portal, where customers can access their personalized information and learn how much electricity •Reduced load times by more than 95 percent •Decreased query times more than 97 percent •Reduced TCO from 1.3 TB to 350 GB	•Gathered & analyzed smart grid data representing diverse terrain, weather & demographics •50% drop in short-term peak loads •15% drop in overall peak loads •10% reduction in electricity bills	•Implemented a smart meter infrastructure that provides real-time, integrated view of the grid •Will reduce demand on the grid by about 1,000 megawatts •Will reduce greenhouse gas emissions by at least 365,000 metric tons per year

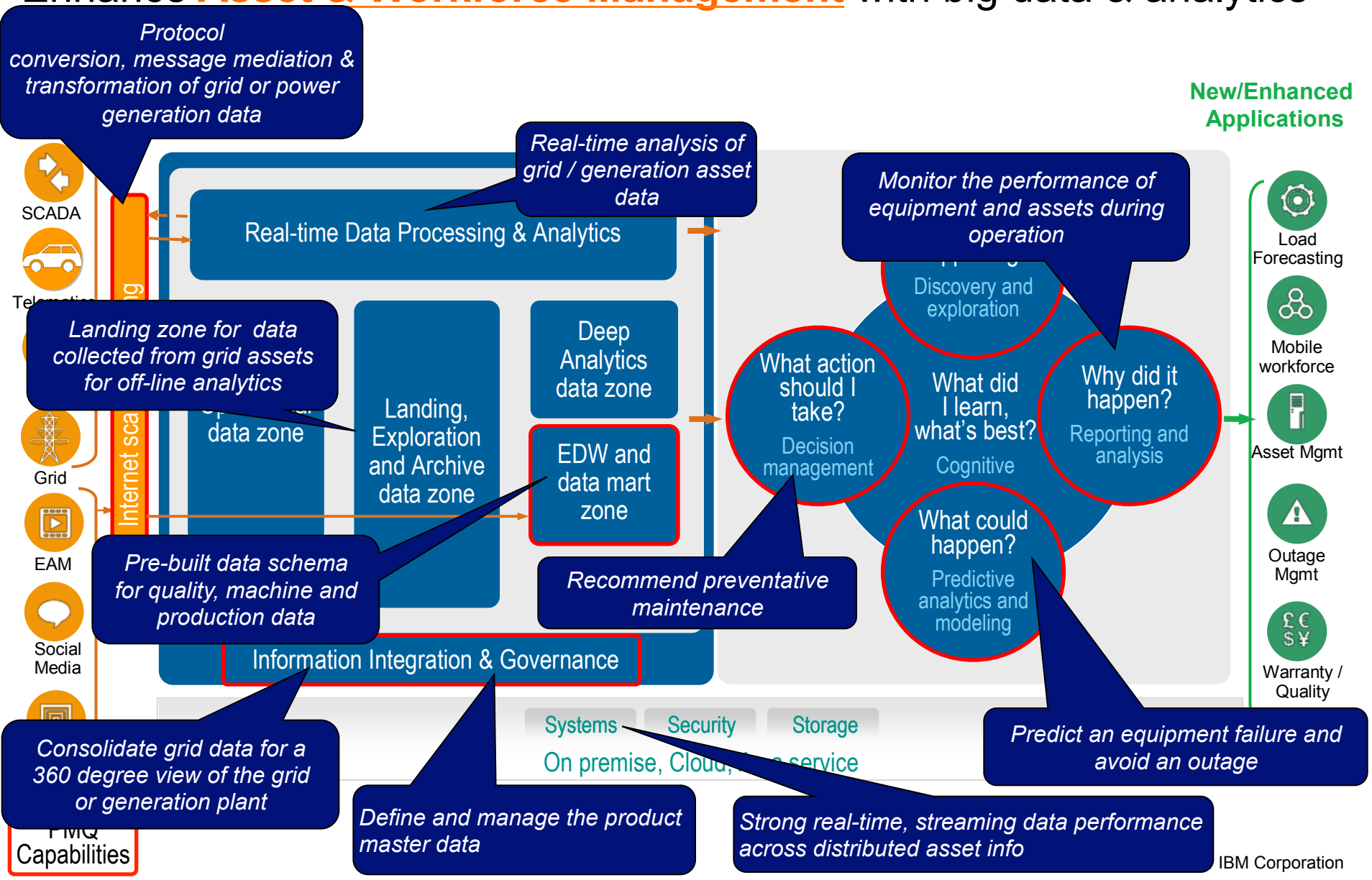
Gain insight from Smart Meter big data



Asset & Workforce Management drives real business value for utilities



Enhance Asset & Workforce Management with big data & analytics



Big data & analytics is transforming Asset & Workforce Management

How do I reduce unscheduled maintenance costs?	How do I measure the risk of failure and optimize repair / replacement work?	How can I minimize down time related to asset maintenance?
Early failure detection	**Asset & Workforce Management Optimization**	**Analytics Driven Mining Asset Management**
Gas Turbine Manufacturer	***Water Utility Company***	***Large Mining Company***
•Used text mining methods for extracting insights from unstructured sources	•Used advanced analytics to identify potential problems based on location, time, weather and maintenance history	Performed analytics on data from trucks / mining equipment, weather, operational performance and ore price to assess asset health
•Achieved 90% failure prediction accuracy for gas turbine compressor subsystem •Identified 11 month early warning of production and supplier issues	•25%+ increased crew utilization; 10-15% fuel savings • 30-50% savings on selected inspection and preventive maintenance	Estimated $3B increased profit on $30B operation •Reduced 10-day failure probability to less than 1%

How to move strategically to transform your business

Build a culture that infuses analytics everywhere

- Find the most compelling use-cases and the business sponsor
- Enable and motivate your people
- Infuse analytics into key business processes
- Deploy the full range of analytics

Be proactive about privacy, security and governance

- To trust the insights you have to trust the facts. Big Data also requires data governance
- Privacy and security to protect the data
- Enable risk-aware decisions

Invest in a big data & analytics platform

- Build towards a platform for all data and analytics
- Analyze data in motion
- Cultivate new partnerships and roles

ibmbigdatahub.com/industry/energy-utilities