

# NAVIGATING THE ENERGY TRANSFORMATION

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UNLOCKING THE GRID EDGE -  
INTEGRATING PROSUMERS, DERS AND  
BEHIND THE METER ANALYTICS



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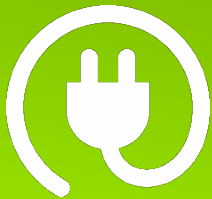
ENGERATI WEBINAR  
DECEMBER 8, 2016

NAVIGANT

# INTRODUCTION

## NAVIGANT ENERGY PRACTICE

WE COLLABORATE WITH CLIENTS TO HELP THEM THRIVE IN A RAPIDLY CHANGING ENVIRONMENT



### CLIENTS

- ✓ 50 largest electric and gas utilities
- ✓ 20 largest independent power generators
- ✓ 20 largest gas distribution and pipeline companies
- ✓ Leading oil & gas companies
- ✓ International, federal, and state government organizations
- ✓ Multiple new energy market entrants and investors



### TEAM

- ✓ With over 600 consultants globally we are one of the largest energy management consulting teams
- ✓ Consultants average 15 years of experience
- ✓ 60% have an advanced degree
- ✓ More than half have an engineering degree



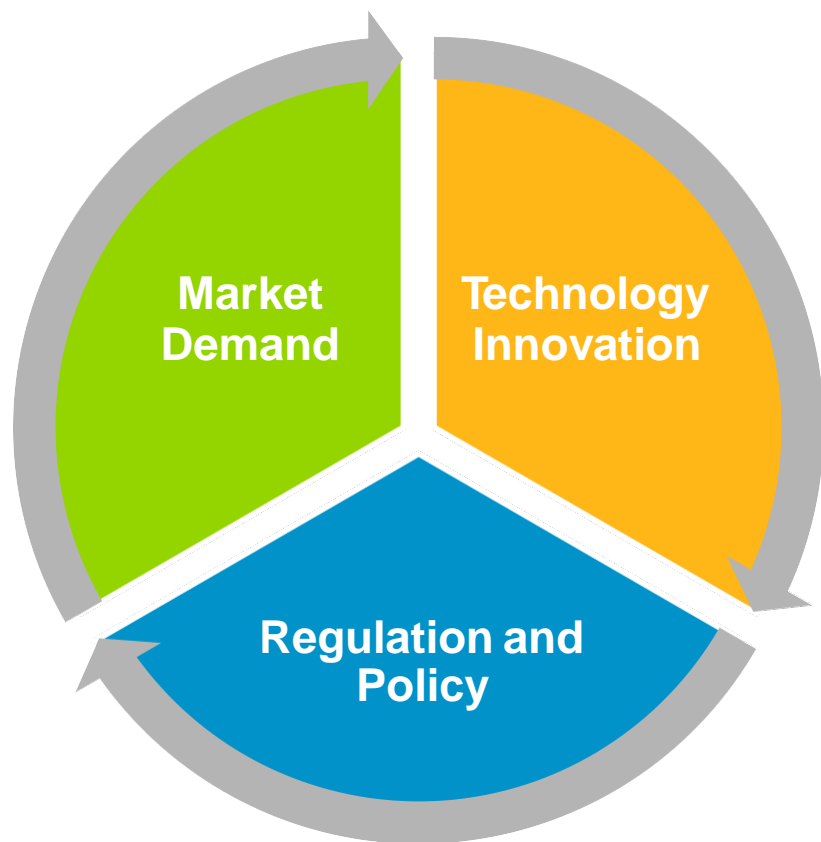
### NAME

- ✓ Among Top 10 in Vault's 2016 Best Consulting Firms for Energy
- ✓ Named "Best Advisory – Renewable Energy" in 9th and 10th Annual Environmental Finance and Carbon Finance Market Surveys

# ENERGY TRANSFORMATION AT A TIPPING POINT

## THREE FORCES UPENDING THE STATUS QUO

Disruption is a prevailing and uncompromising threat to our industry



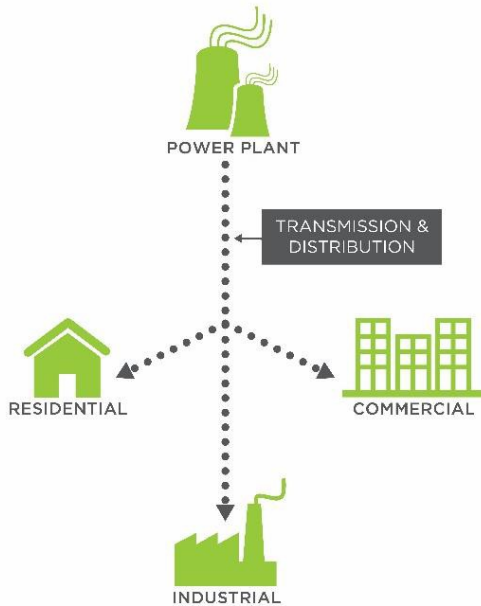
Multiple megatrends underpin utility industry transformation:

1. ***Greater customer choice and demand for more (sustainable) energy options***
2. Increased policies and regulations to reduce carbon emissions
3. Shifting power-generating sources
4. Search for shareholder value: new ventures and increased M&A
5. Regionalization of energy
6. Merging of mega industries around growth opportunities
7. ***Replacement of old infrastructure and transition toward an increasingly clean, decentralized, and intelligent grid architecture: the Energy Cloud***

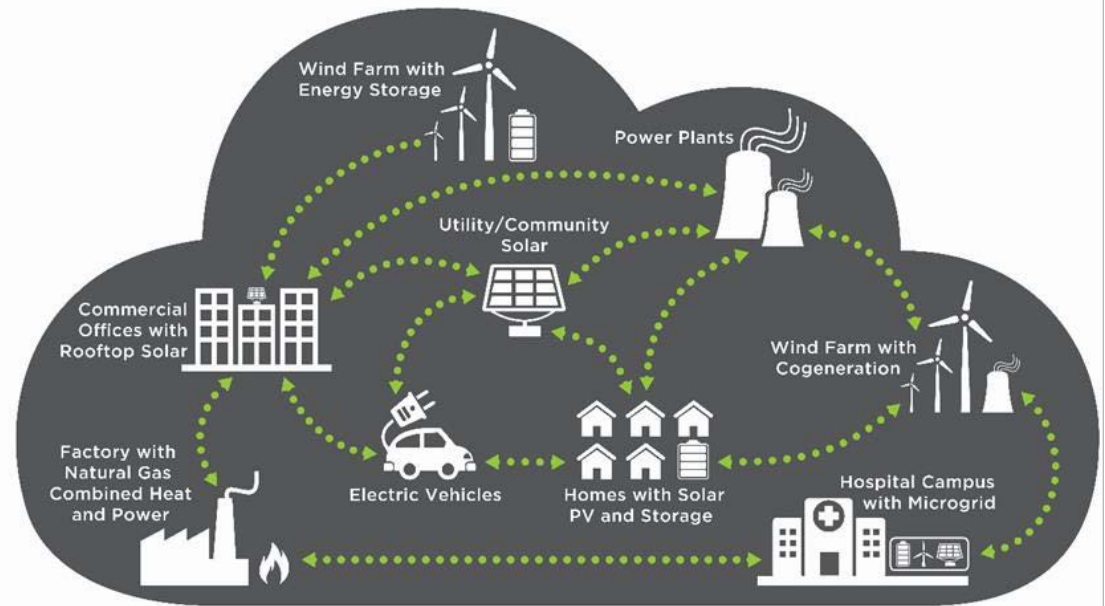
# THE EMERGING ENERGY CLOUD

TOWARD AN INCREASINGLY CLEAN, DECENTRALIZED, AND INTELLIGENT GRID

**TODAY: Traditional Power Grid**  
Central, One-Way Power System



**EMERGING: The Energy Cloud**  
Distributed, Two-Way Power Flows



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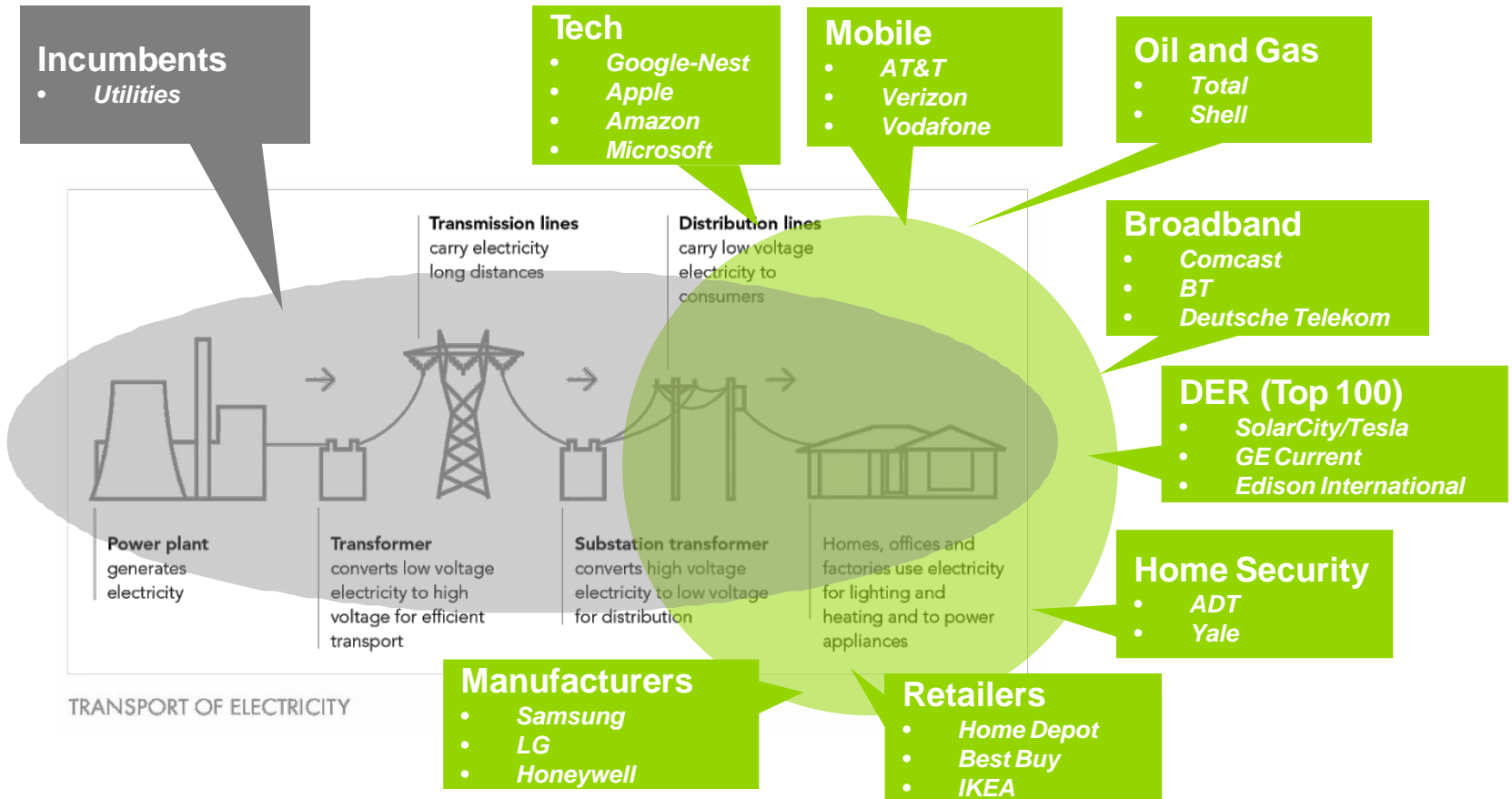
Source: Navigant

<sup>1</sup> Navigating the Energy Transformation: Building a Competitive Advantage for Energy Cloud 2.0 ([white paper](#))

# GOING AFTER THE ENERGY CLOUD VALUE

## COMPETITION AT THE EDGE OF THE GRID

### Utilities face competition from non-utilities for customer engagement



Customers used to rely on the utility, now they have more choices

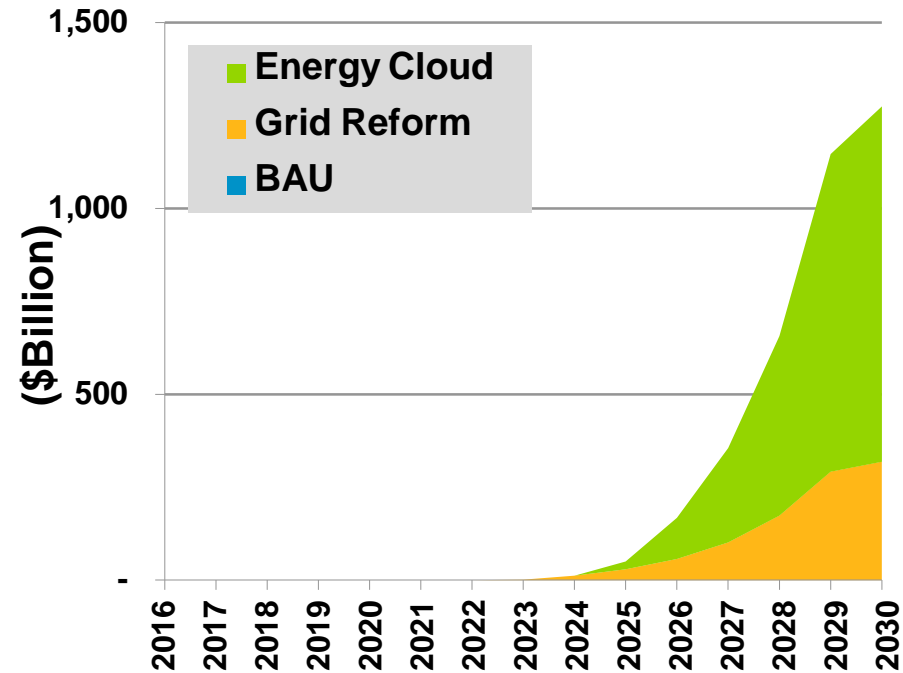
# ENERGY CLOUD VALUE

DIGITALLY ENABLED PLATFORMS WILL UNLOCK \$3 TRILLION IN NEW REVENUE

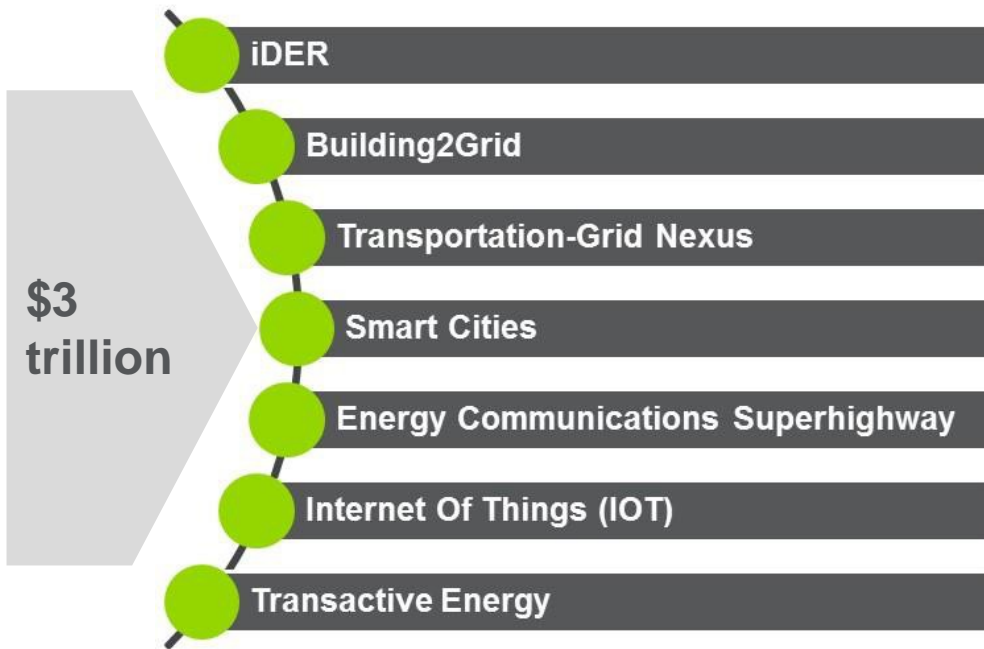
**BUSINESS AS USUAL**  
(Current)

**GRID REFORM**  
(Emerging)

**ENERGY CLOUD**  
(Future)



(Source: Navigant)



# INTEGRATED DER

*DEPLOYMENTS ACCELERATING, SURPASSING CENTRALIZED GENERATION ADDITIONS*

## Predictions:

- New annual DG capacity will surpass new centralized generation globally by 2018
- DER will grow **3-5x faster** than central station generation over the next decade
- Installed cost for PV in global markets will fall below **\$1.50 per watt** by 2024
- Virtual power plants (VPPs) will emerge as the preferred DER aggregation strategy (cumulative value will exceed **\$200 billion** by 2030)
- Bundled service offerings on the way (solar + storage, EVs + DR, etc.)
- Energy-as-a-service business model leads to increased outsourcing of energy for C&I customers



# BUILDING2GRID (B2G)

*THE SINGLE MOST UNTAPPED RESOURCE ACROSS THE GRID*

## Predictions:

- Residential and commercial customers will invest more than **\$50 billion** by 2022 in behind-the-meter integrated energy assets to take advantage of B2G opportunities
- Software will represent **more than half** of intelligent building revenue by 2020
- Software analytics will be the cornerstone of the intelligent building, transforming facilities into dynamic energy assets for the grid
- Ease of use and comfort will be key differentiating factor for market-leading solutions





# TRANSPORTATION-GRID NEXUS

## THE CONVERGENCE OF TWO BEHEMOTH INDUSTRIES

### Predictions:

- Electric vehicles will be the single largest addition of energy demand to the grid globally over the next two decades
- Road transportation electricity consumption will exceed **200 terawatt-hours** annually by 2030
- More than **100 million** light duty plug-in vehicles will be on the road in 2030
- V2G integration will deliver significant additional value (resilience, peak load)
- PEVs enrolled in demand response programs will become key resource in integrated DER landscape



# SMART CITIES

*THE WORLD IS RAPIDLY URBANIZING*

## Predictions:

- By 2050, **two-thirds** of the world's population will be living in urban environments (more than 6 billion)
- By 2030 there will be **41 megacities** with over 10 million people (compared to 28 today)
- The adoption of IoT-based city solutions **will accelerate** over the next 2 years
- The smart city technology market will be worth more than **\$600 billion** over the next decade with annual revenue growing almost 2.5x by 2025
- **Smart energy** will represent the biggest investment in smart infrastructure for cities over the next decade

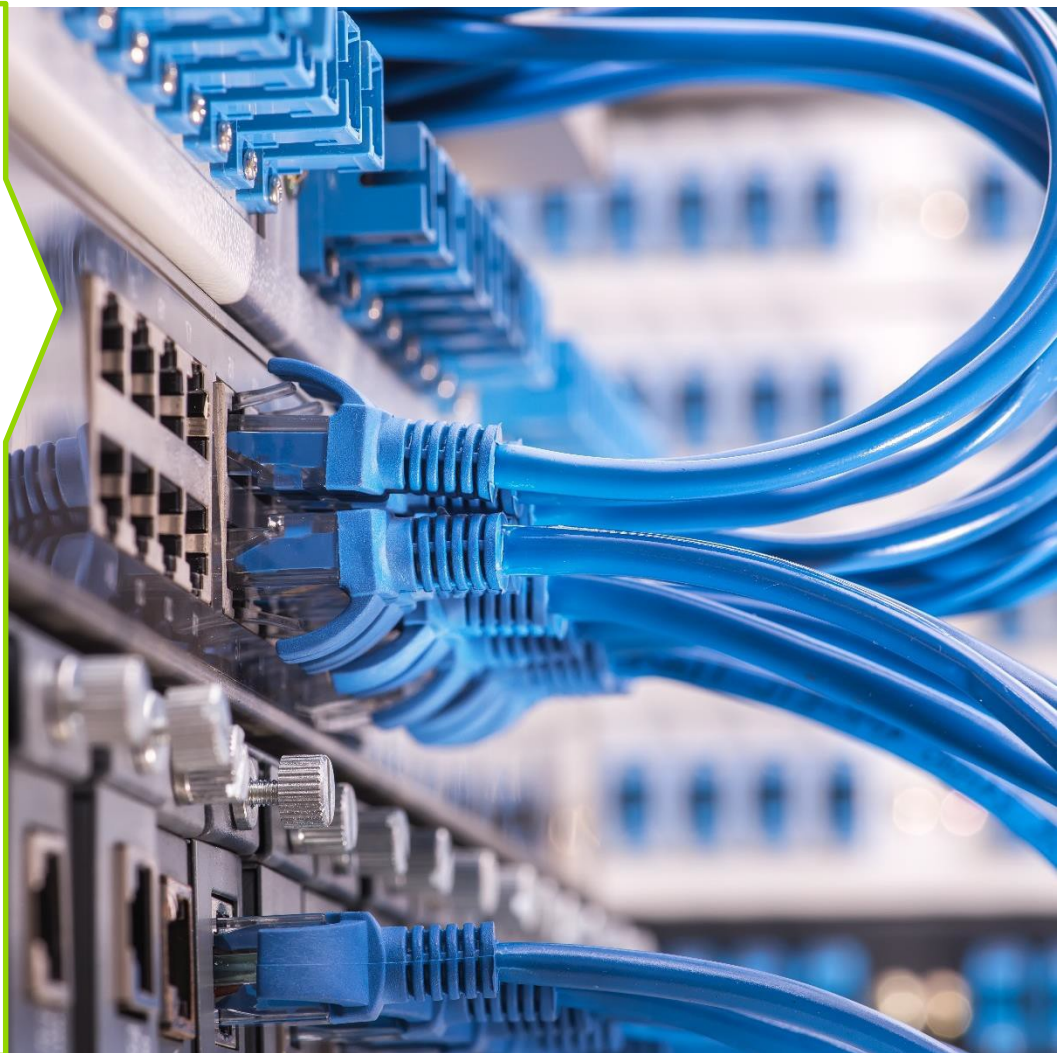


# ENERGY SUPERHIGHWAY

## THE BACKBONE OF THE ENERGY CLOUD

### Predictions:

- Network and communications infrastructure will be the backbone of the Energy Cloud (enabling automation for self-healing grids, big data analytics for operational efficiencies, improved asset management, etc.)
- Utilities will invest more than **\$75 billion** in their communications networks over the next decade
- Utilities will increasingly embrace holistic deployment of broadband connectivity (e.g., fiber-to-the-meter or dedicated spectrum)
- Utilities will need to purchase their own dedicated communications spectrum as unlicensed bands will become too crowded in the IoT future



# INTERNET OF THINGS (IOT)

*WILL TOUCHING EVERYTHING AND ANYTHING*

## Predictions:

- 500 million IoT devices deployed today growing to more than **one billion** by 2021
- Annual global revenue from IoT devices will grow 4x over the next decade generating nearly **\$750 billion** in cumulative revenue
- More than **90 million smart appliances** will be shipped annually by 2025
- **Significant M&A activity** expected following acquisitions totaling more than \$67 billion in last 2 years



# TRANSACTIVE ENERGY

## BRINGING ORDER TO CHAOS

### Predictions:

- Blockchain and other trading platforms will be used to develop peer-to-peer energy trading schemes
- By 2030, peer-to-peer trading will have replaced solar subsidies to become the primary revenue source for small-scale solar owners (i.e., capacity of <10kW)
- More than **40 million electricity customers** are expected to participate in transactive energy markets by 2030, approximately 80% of the potential market
- Global revenue from transactive energy software used in VPPs expected to exceed **\$5 billion** by 2030



# THE RISE OF THE PROSUMER

LESSONS FROM MULTIPLE INDUSTRIES ALL POINT TO GREATER PERSONALIZATION

## The customer experience continues to evolve across multiple industries

	Past	Future
<b>Products/ services</b>	Limited choice, store-front based retail	Many choices, online retail
<b>Access to information</b>	Limited; monthly billing, paper-based	Expect real-time, 24/7 access on-demand
<b>Mobile</b>	Cell phones used to make calls, send/receive texts	Smart phones and tablets; connected anytime, anywhere
<b>Personalization</b>	One size fits all	Personal tips and targeted marketing based on behavior analytics
<b>Environmental attributes</b>	Less important for typical customer	More important for more customers



# BEHIND-THE-METER ANALYTICS

## EXAMPLES IN EUROPE

- Beyond the meter: British Gas becomes a technology vendor
  - Creates British Gas Connected Home as its IoT offshoot
  - Acquires AlertMe
  - Develops smart heating system Hive – now has 300,000 customers in UK
  - Processing 30TB static data
  - Using streaming analytics to provide customers with near-real time insights into energy consumption
- Integrating the prosumer
  - GRID4EU – ERDF’s particular demonstration project looked at DER integration
  - Flex4Grid project – Stadtwerke Bonn
- Creating transactive energy markets for prosumers
  - PowerPeers
  - Centrica and Western Power Distribution
  - RWE

# UTILITY BUSINESS MODEL BOUNDARIES ARE BEING DEBATED

## Utility's role in managing distributed energy resources:

- What services can they provide to the grid? (energy, ancillary services?)
- Who should own them? (utility, customer, both?)
- How should owners of DER be compensated?
- How should the utility rate design and cost recovery model change? (e.g., decoupling, net metering, lost revenue adjustment mechanisms, etc.)
- Who determines what investments are made and where? (in the distribution grid, in DER?)
- Who should plan and operate the (physical) distribution grid to ensure optimal adoption and integration of DER? (utility, distribution system operator [DSO]?)
- Who should operate the market for DERs and the services they provide?

## Utility's ability to provide potential new utility products and services:

- Behind-the-meter energy services (e.g., home energy management)
- Premium (i.e., higher reliability/quality) power supply
- Warranties, financing for DER
- Ownership/operation of EV charging stations
- Operations and maintenance of third-party owned DER



# KEY TAKEAWAYS FOR UTILITIES

- Business model evolution will be key to survival. Innovation around new utility and vendor business models will leverage digitally enabled energy platforms and bundle non-energy value in the Energy Cloud.
- Network orchestrator business model will emerge in energy. By leveraging networks and capitalizing on high margins, it will be the fastest-growing and most profitable business model category
- Utilities are taking varied approaches to the DER threat and opportunity, in order to be successful, you have to play defense and offense.

## Play Defense

- Engage with customers (and stakeholders) to understand customer choices
- Improve customer service and grid reliability at the lowest cost possible
- Study equitable ways to charge prosumers for T&D services
- Develop utility- and community-scale renewable and DER assets to appeal to environmentally conscious and prosumer customers

## Playing Offense

- Create new revenue streams through the development of new business models, products, and services
- Transform your organization and culture to fully integrate sales, customer service, and operations
- Continue to upgrade the grid and redesign operations to facilitate the integration of DER
- Invest in emerging technologies with a focus on developing new services across the platform
- Develop a holistic approach with a long-term horizon in mind (10-15 years) and have an EnergyCloud Playbook (6-12 months)

# CONTACT

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*RELEVANT  
THOUGHT  
LEADERSHIP*

TAKE CONTROL OF  
YOUR FUTURE

North America

Europe



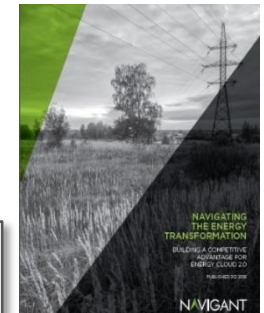
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STATE & FUTURE  
OF THE POWER  
INDUSTRY



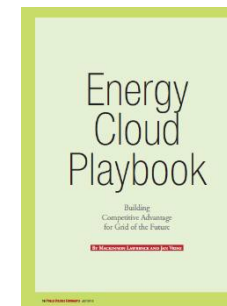
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ENERGY CLOUD  
PLAYBOOK



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