
The Energy Cloud Transformation

NAESCO Conference

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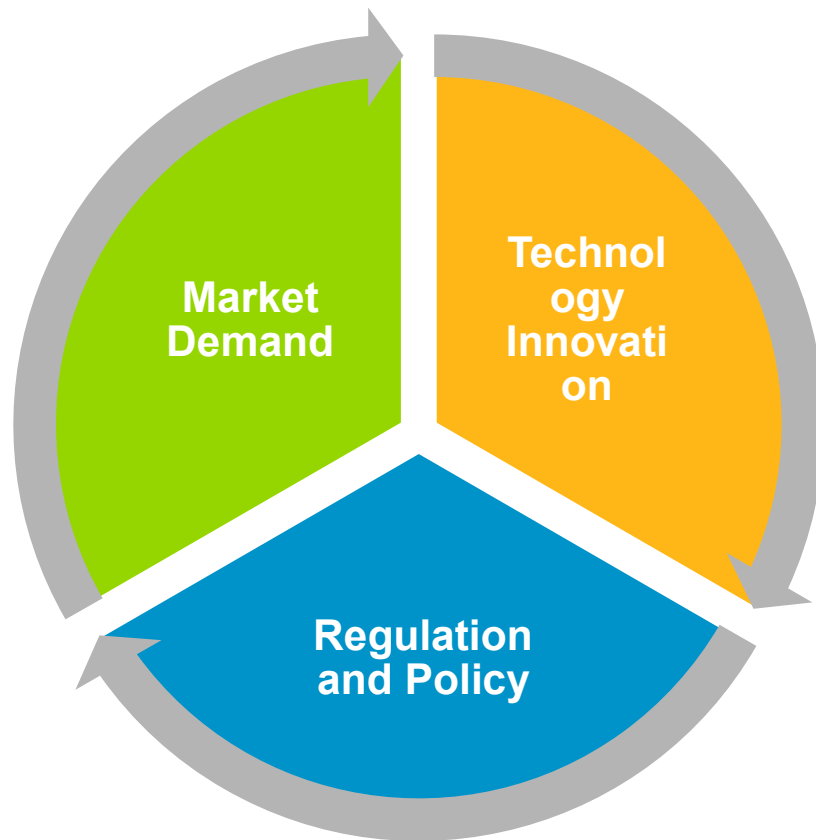
AGENDA

- I. **Electric Grid Transformation**
- II. **Distributed Energy Resources**
- III. **New Energy as a Service Business Models**

Energy Transformation at a tipping point

Disruption is a prevailing and uncompromising threat to our industry.

Multiple megatrends underpin utility industry transformation:



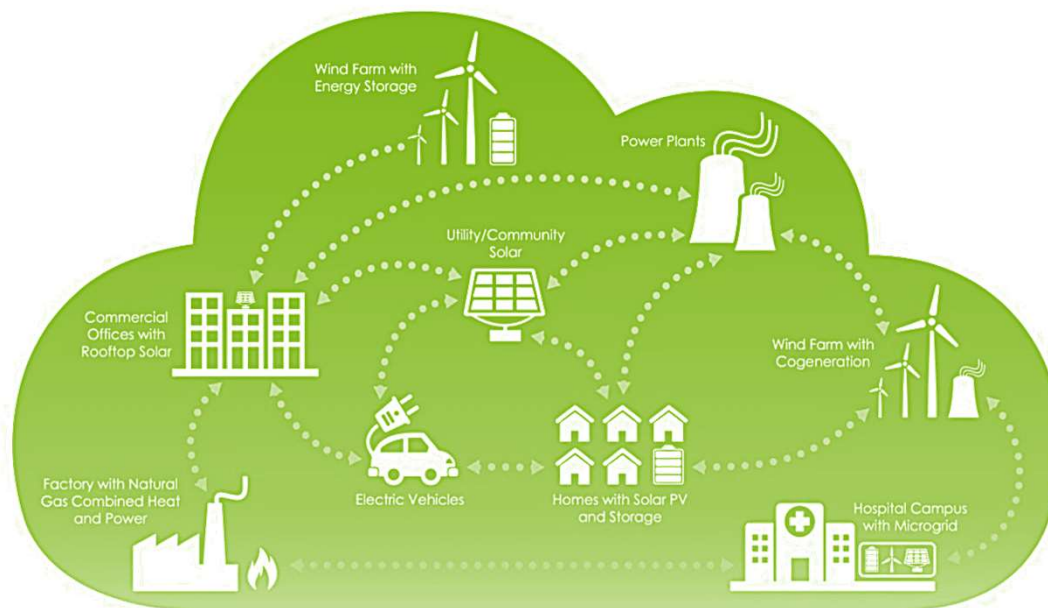
1. Greater customer choice and demand for more (sustainable) energy options
2. Increased policies and regulations to reduce carbon emissions
3. Shifting power-generating sources
4. Search for shareholder value: new ventures and increased M&A
5. Regionalization of energy
6. Merging of mega industries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

The energy cloud

Toward a clean, decentralized, intelligent & mobile grid

PAST: Traditional Power Grid
Central, One-Way Power System

TODAY: The Energy Cloud
Distributed, Cleaner, Two-Way Power Flows



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Source: Navigant

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

Impacts on utilities

Understanding the impacts of new dimensions

The Energy Cloud
Beyond safe, reliable and affordable

Impact Dimensions

INTELLIGENT

The increasing connectivity, controllability, and automation of energy-consuming devices through the use of sensor technology, communications infrastructure, and software applications available to users (e.g., smart cities, smart homes, and IoT) as well as integration of data analytics capabilities.

DISTRIBUTED

The increased proliferation of DER (including energy efficiency, DR, distributed storage, distributed generation, and EVs) brought about by technology advancements and increased customer desire for control over energy usage.

CLEAN

The global movement to reduce GHG/carbon emissions through federal or state legislative, regulatory, or other policy efforts as well as increased social pressures and/or customer demands.

Basic power products for Residential and C&I

- Safe
- Reliable
- Affordable



Individualized Energy Products and Services

- Clean
- Distributed
- Intelligent

Customers

Regulation and Policy

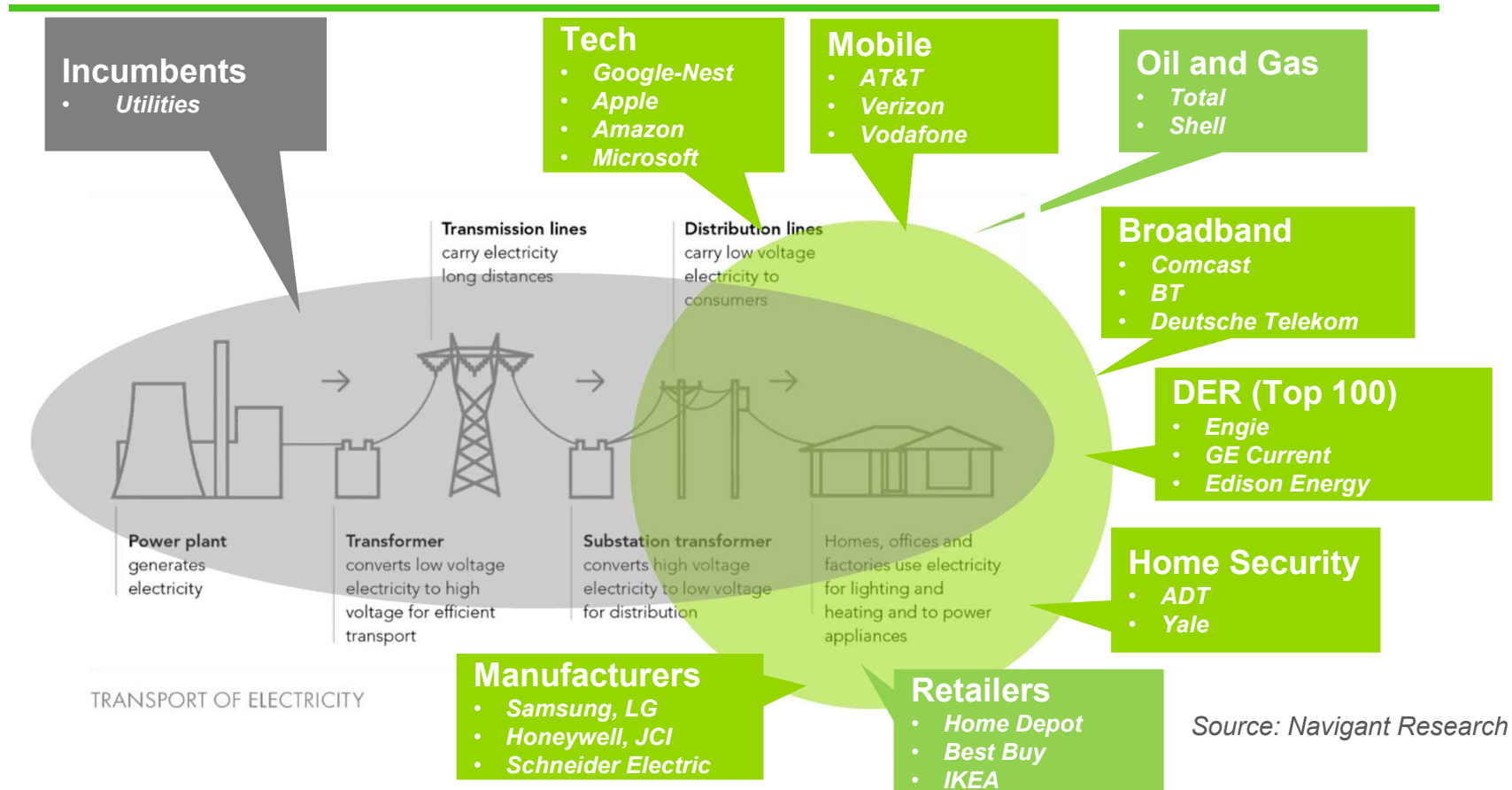
Technology

Business Models

Operations

Competition at the edge of the grid

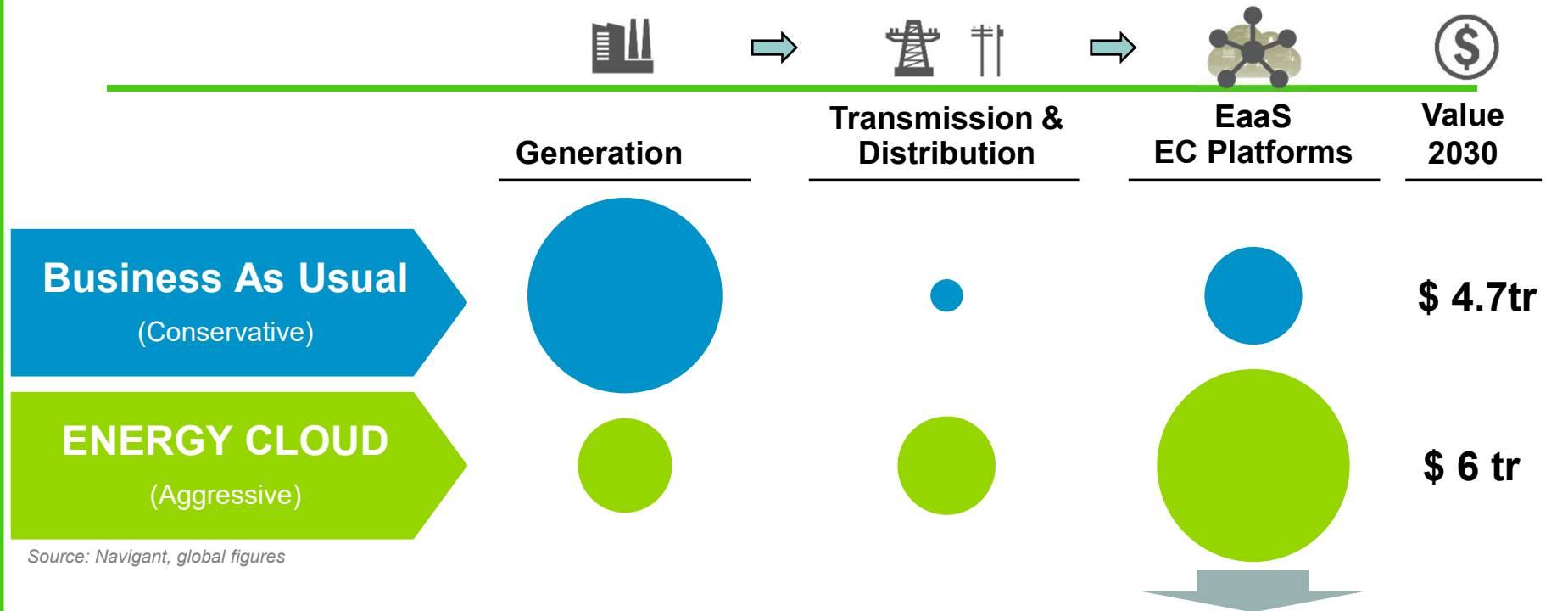
Utilities face competition from non-utilities for customer engagement



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

Value shifts to T&D, EAAS and EC Platforms

but...Large and at scale disruptors competing for the last mile



Source: Navigant, global figures



Disruptors are cash heavy, thriving in-house R&D engines, own the customers relationships...

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Distributed Energy Resources change the way we produce and use power



Distributed Generation

Demand Response



Distributed Storage

Energy Efficiency



Microgrids

Electric Vehicles



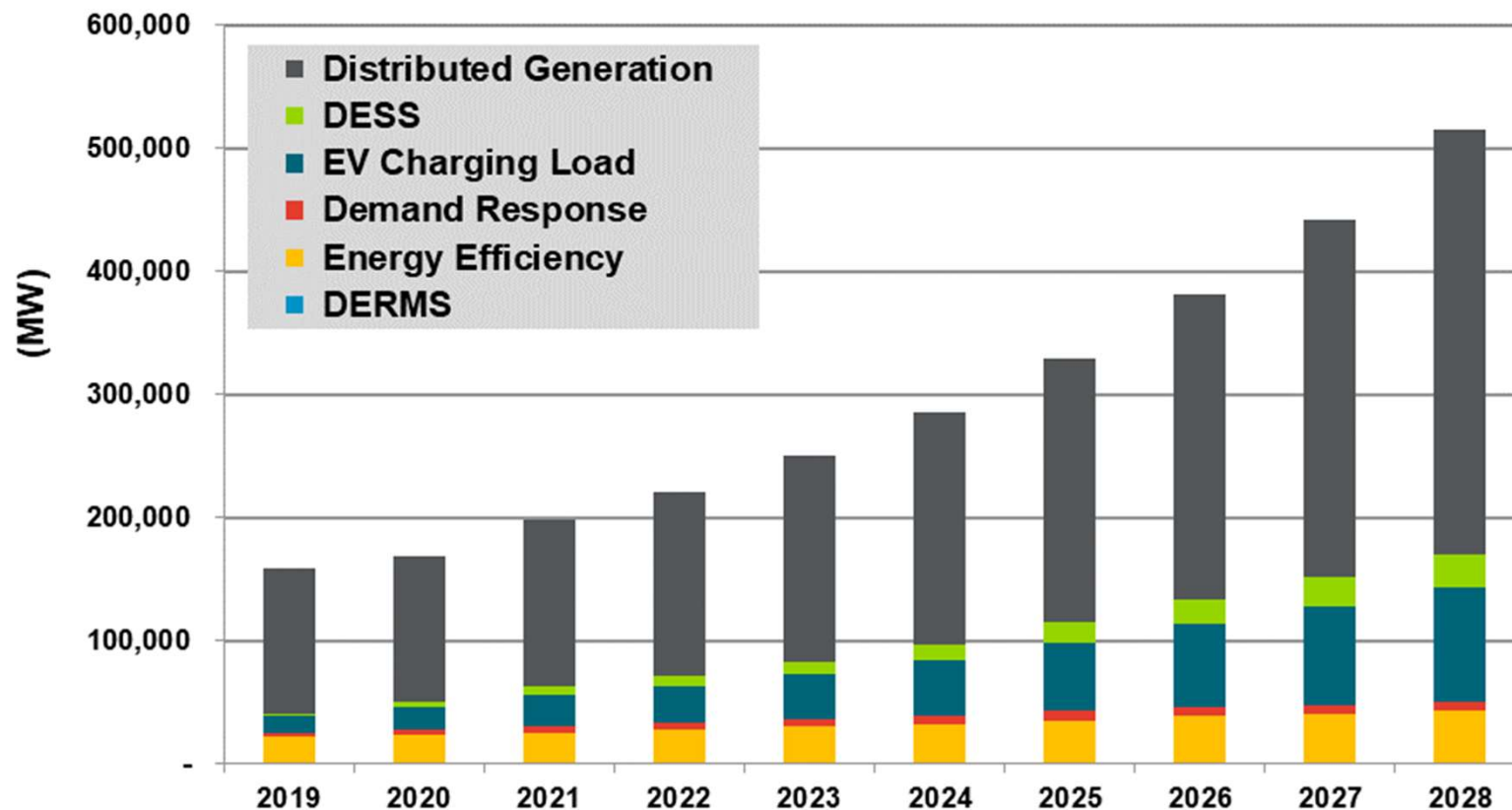
Solar

Resources can be utility, customer, or 3rd party owned on the grid in front of the meter or customer owned behind the meter.

DER will be disruptive to the industry

- Global DER deployments are expected to reach 158 GW this year
- Over 300 GW of distributed generation capacity expected to be installed in 2028

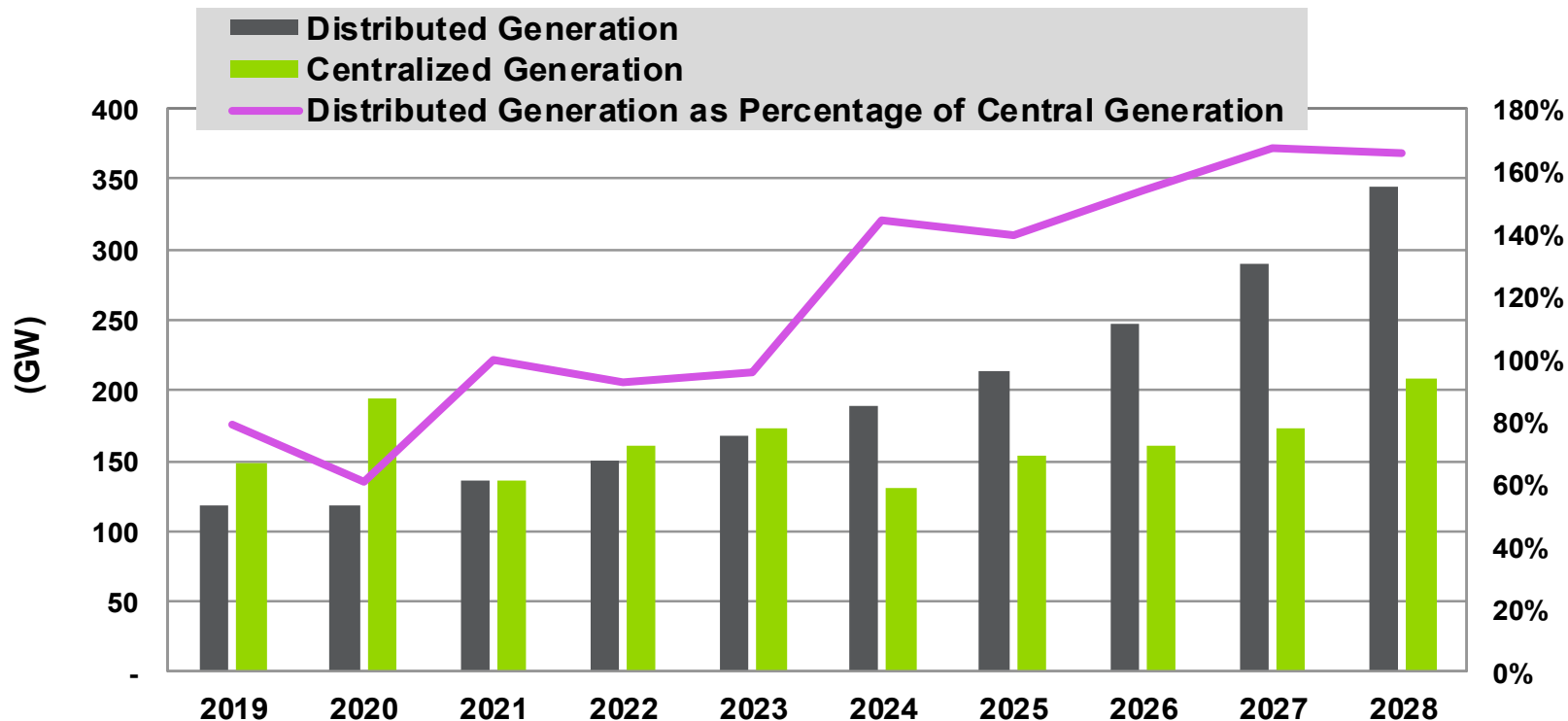
Annual Installed DER Power Capacity Additions, World Markets: 2019-2028



DER vs. Centralized Generation

New global DER generation capacity deployments will outpace the deployment of new centralized generation capacity

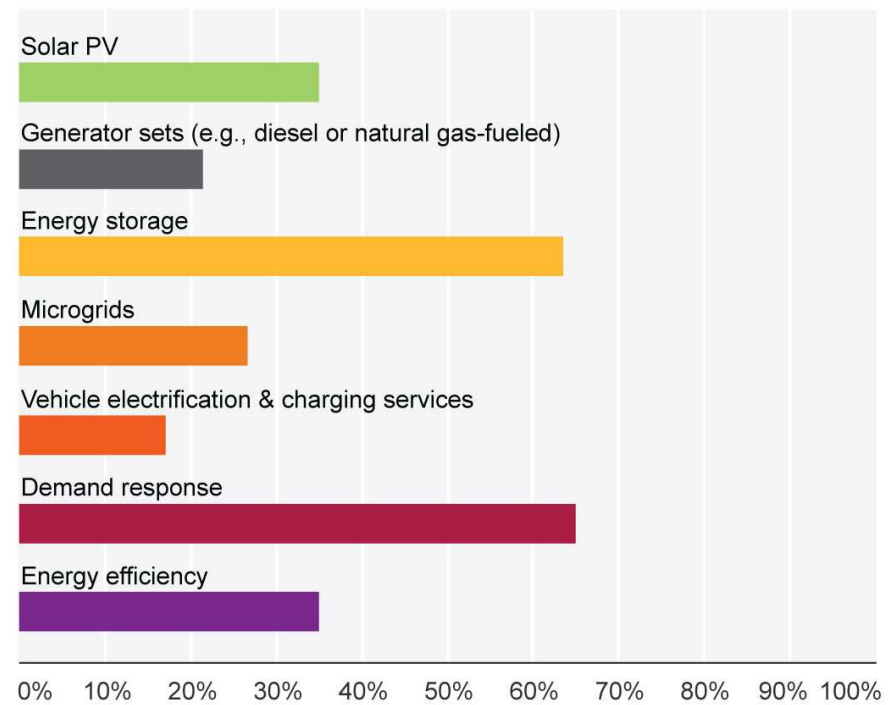
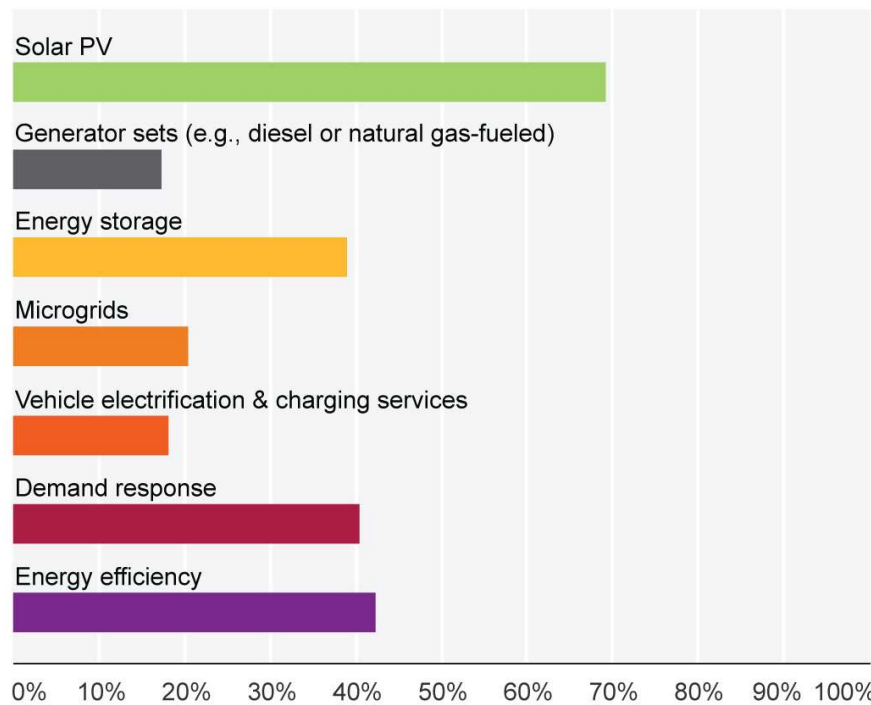
Distributed and Central Generation by Capacity Installation, World Markets: 2019-2028



A recent survey reveals the most prevalent and useful DER for utility operations

Which will be the most prevalent DER in terms of capacity by 2025?

Which DER will be the most useful to utility operations by 2025?



Source: Navigant Consulting/Public Utilities Fortnightly 2017 Survey

Energy Cloud platforms

By 2025...

- DER will grow **3-5x** faster globally than central station generation giving rise to virtual power plants (VPP) and other aggregation networks

iDER



- Residential and commercial customers will invest more than **\$50 billion** in behind-the-meter integrated energy assets to take advantage of B2G opportunities

BUILDING2GRID



- Electric vehicles will be the single largest addition of energy demand to the grid globally, exceeding **200 TWh**

TRANSPORTATION 2GRID



- Annual global revenue from IoT devices will grow 4x generating nearly **\$750 billion** in cumulative revenue

INTERNET OF ENERGY



- Global revenue from TE software used in VPPs expected to exceed **\$5 billion**

TRANSACTIVE ENERGY



- Global utilities will invest more than **\$700 billion** upgrading their information technology, communications networking and automation capabilities

NEURAL GRID



- The smart city technology market will be worth more than **\$600 billion** with annual revenues growing almost 2.5x

SMART CITIES



...and **orchestrators** will be the fastest growing and most profitable business model category across the utility value chain by leveraging assets and customer networks

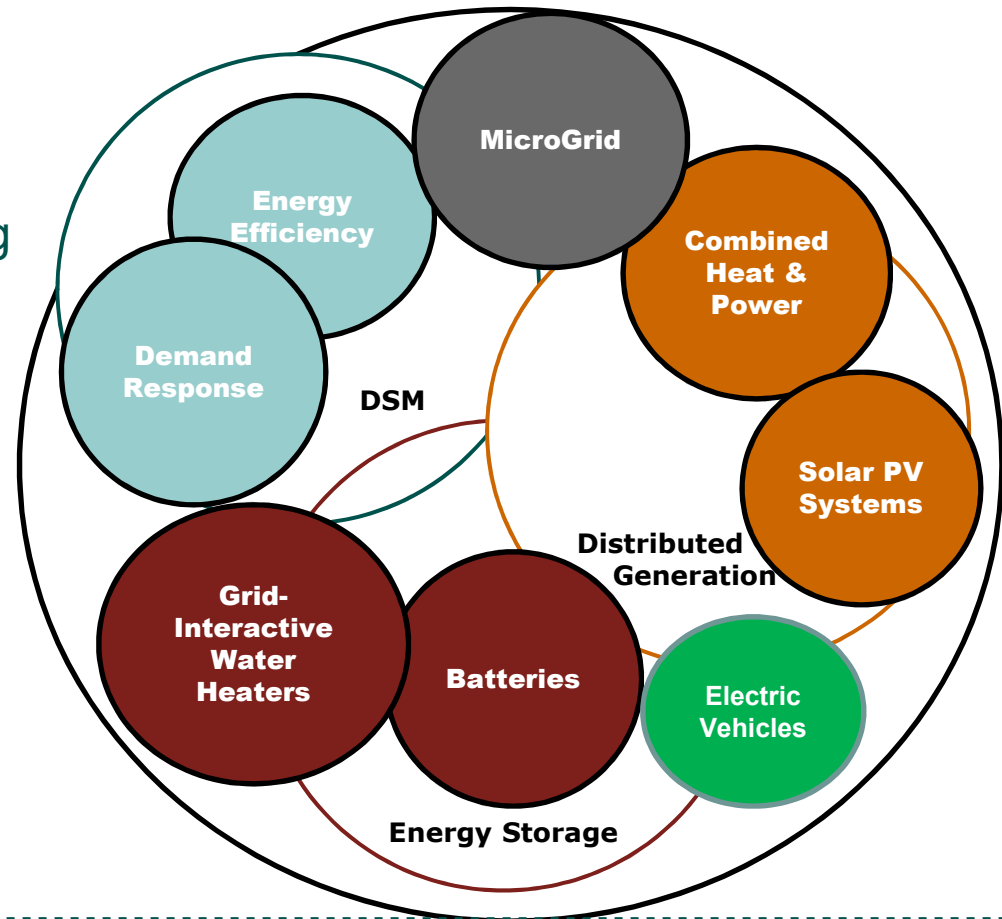
ENERGY CLOUD ORCHESTRATOR



Source: Navigant

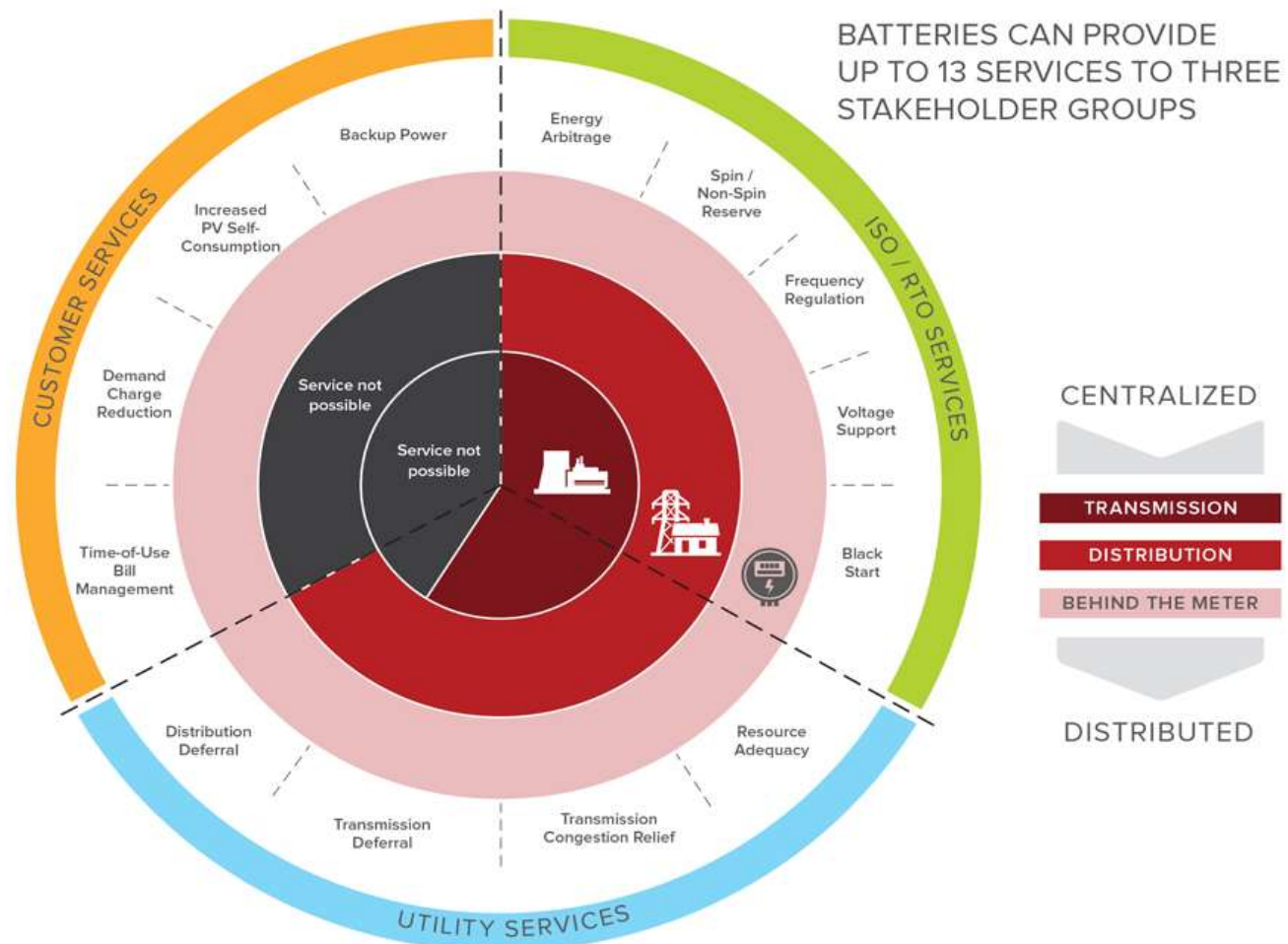
Integrated Distributed Energy Resources (IDER)

A program design type that delivers the benefits of *multiple DERs* to both *customers and the grid* using similar technology intervention and/or a linked incentive while leveraging complementary program delivery resources and infrastructure.



The Rise of Virtual Power Plants (VPP)

Energy storage-enabled VPPs may emerge as a significant class of DER that lead the power grid toward more distributed generation.



Source: Fitzgerald, Garret et al. October 2015. *The Economics of Battery Energy Storage*, Rocky Mountain Institute. <https://rmi.org/wp-content/uploads/2017/03/RMI-TheEconomicsOfBatteryEnergyStorage-FullReport-FINAL.pdf>.

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Evolving C&I utility customer needs

C&I customers seek cost-effective, customized, and comprehensive energy solutions that can guarantee energy use reduction and savings without capital expenditures or impact to their day-to-day operations.

DELIVER COST REDUCTIONS	IMPROVE SUPPLY QUALITY	IMPROVE SUSTAINABILITY	DRIVE SCALABLE SOLUTIONS	SIMPLIFY OPERATIONS
C&I customers under pressure to reduce total energy expenditures with minimal capital expenditures (i.e. financing flexibility)	An increased focus on resiliency and redundancy of supply requires dependable solutions	An increased focus on sustainability and regulatory compliance (e.g. renewables, GHG) requires a comprehensive energy strategy	Large customers seek scalable enterprise-wide solutions to monitor, benchmark, and optimize energy costs	Corporate energy management functions have become complex and customers seek to simplify operations and refocus on core business

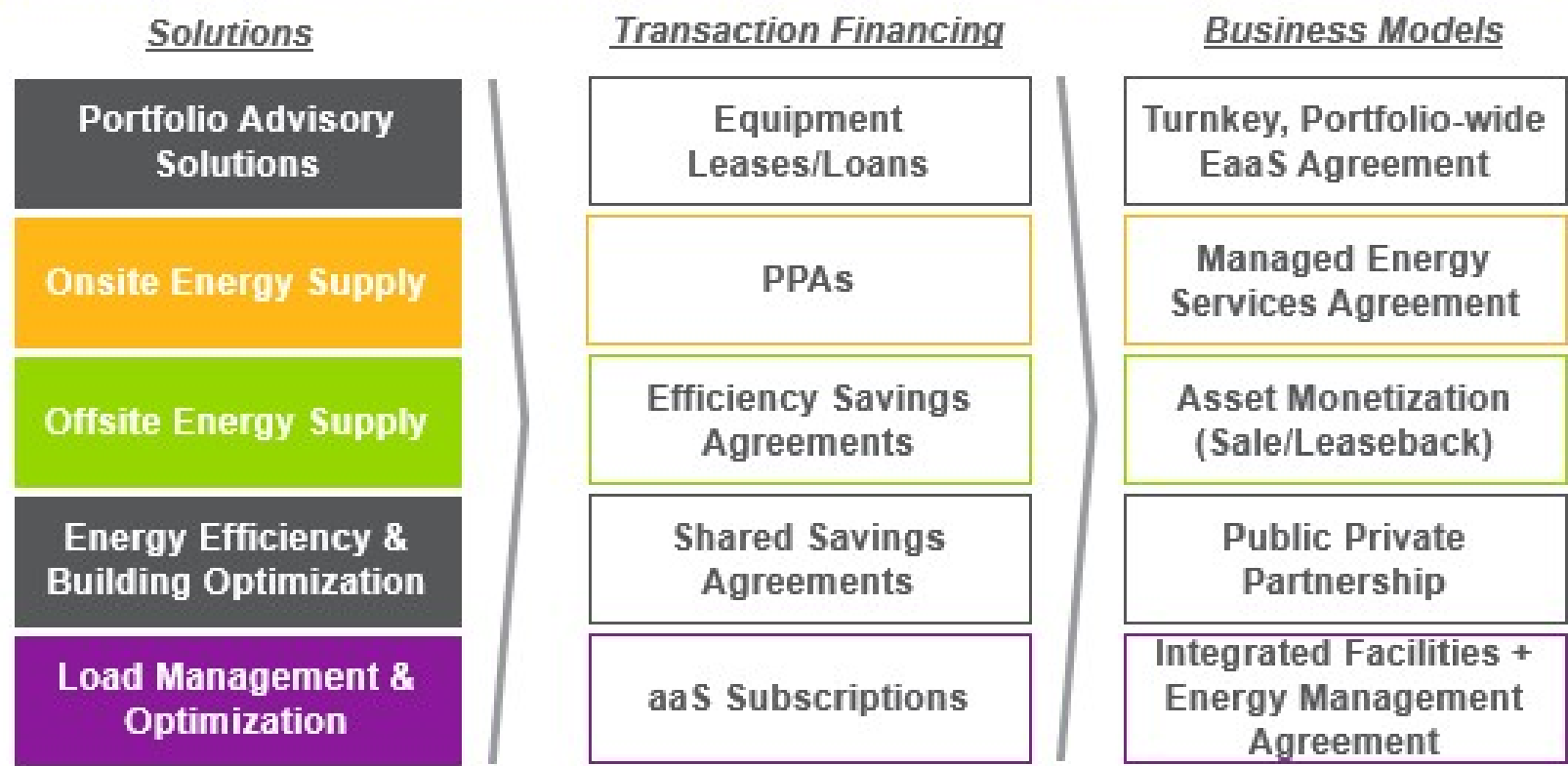
Emerging Trends for large C&I customers:

- Move to lower carbon energy and DER
 - Onsite distributed generation, solar PV
 - Demand response, energy storage, microgrids

Many evolutions are taking place in the current C&I energy services market on both the supply side and the demand side.

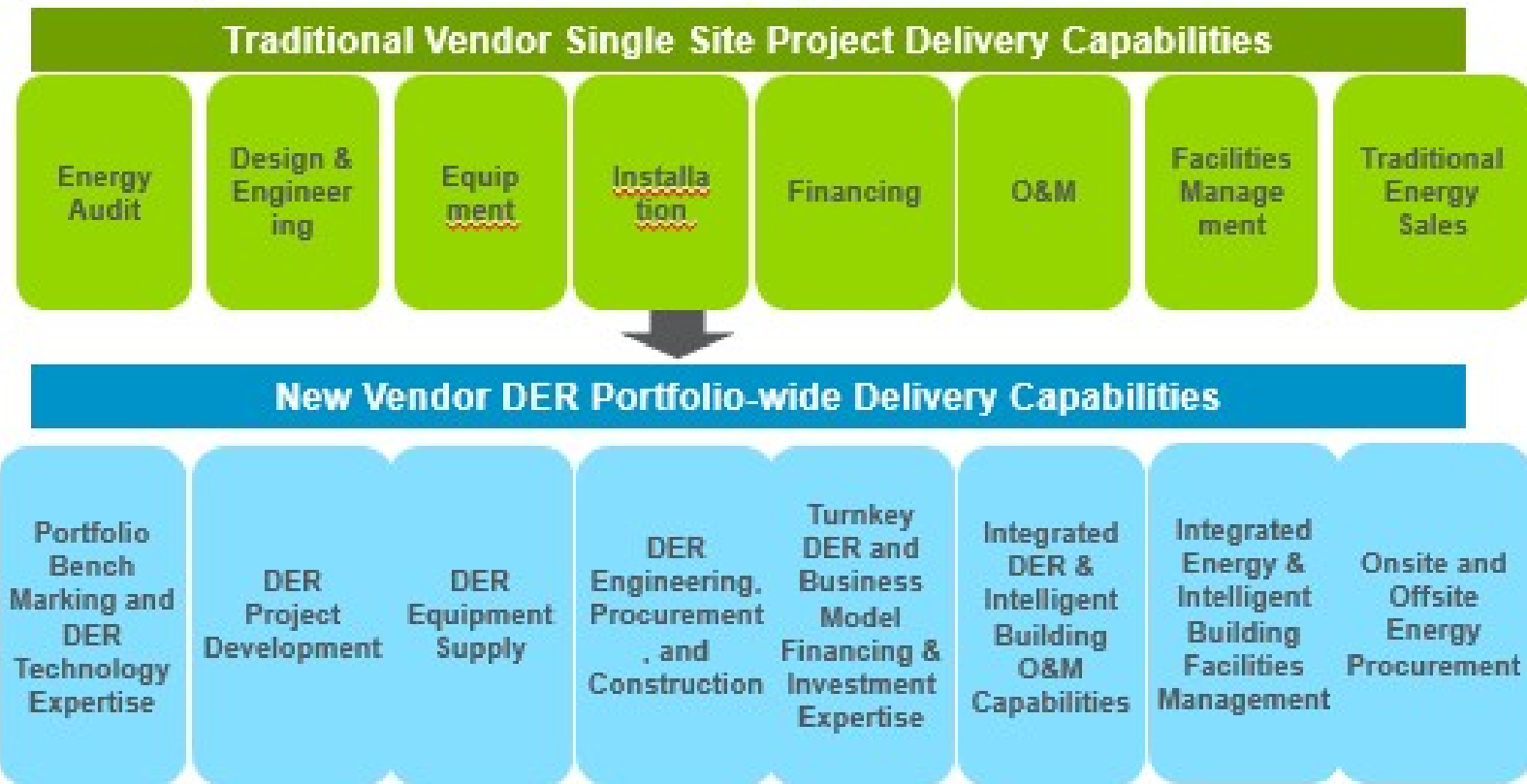
Flexible financing options create business model value

The deployment of these new portfolio-wide solutions across a broad set of financing transaction options to complement fee for service options enables new business models.



New business models will require new vendor capabilities

Vendors will need to develop new in-house or partnership capabilities across the full spectrum of portfolio-wide solution delivery options.



Evolution of DER Business Models

Business Model	PRODUCT-ORIENTED	SUBSCRIPTION-BASED	SOLUTIONS PROVIDER	NETWORK
Examples	HVAC Lighting	BEMS SaaS offerings	Software plus IoT, bundled services	Building-to-grid, integrated DER
Approach	Point	System	Platform	Ecosystem
Business Impact	Efficiency and operational improvements in siloes	Cohesive management strategies for buildingwide optimization	Facilities become flexible business assets that meet core business challenges of specific customers	Two-way, leveraged value across and between the network platforms
Technology Foundation	Automation and controls	Analytics	Integrated management and services	Network communications
	Pre-2005	2005-2012	2012-2018+	

A move towards Orchestrated DER creates vendor value

Delivery of business model options can drive improved customer retention and improved margins due to long term, higher margin recurring revenue service contracts towards more digitalized platform solutions.



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