"Empowering Sustainable Technology and Infrastructure"

greentech capital advisors

Investment Banking | Asset Management

New York | San Francisco | Zurich

EDP Innovation
Immersion Program

The Energy Revolution – Opportunities and Challenges in the Energy Sector

May 1, 2017

Executive Summary

- The utility industry is changing dramatically due to conversion in the generation mix and proliferation of consumer choices
  - Additionally, there is significant convergence between markets like storage, efficiency, distributed generation, software and energy data/ analytics
  - In response, utilities are developing energy services platforms that bring together a wide array of energy technologies
- Renewables are no longer “alternative” energy as they have become mainstream power generation resources
  - Continued cost declines and technological advances are putting renewables at grid parity in many locations
  - U.S. cumulative wind power capacity was up 262% over the time period from 2008 through 2016
  - U.S. cumulative solar power capacity was up 4,645% over the time period from 2008 through 2016
- Global investment in clean energy and technology was down slightly in 2016 after an all-time high in 2015
  - Renewables are now receiving investment at a rate of 2:1 compared to fossil fuels
  - U.S. Energy efficiency investment is up over 100% in the past ten years
- The rise of connected technologies, energy and electric vehicles has furthered the blurring between “Smart Cities,” “Infrastructure,” “Transportation,” and “IOT”

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Section 1

Introduction to GCA

Who We Are

The largest global investment bank and asset management firm focused exclusively on *Sustainable Technology and Infrastructure*

Investment Banking

Mergers & Acquisitions

- Corporate Sales
- Asset Sales
- Acquisitions
- Minority investments
- Joint ventures
- Fairness opinions

$10bn

Capital Raising

- Equity private placements
- Debt private placements
- Project finance advisory
- Co-managed public offerings

$4bn

Strategic Advisory

- Strategic consulting
- IPO preparation
- Financial restructuring
- Specialized opinions
- Independent capital markets advice

Multiple valuation and fairness opinions

Asset Management

Public Equity

- GCA Sustainable Growth Long Only Fund

$500m

Our Focus Sectors

We focus on companies which provide *Technologies and Solutions to these converging markets*

INDUSTRIAL IOT AND SOFTWARE

- Analytics
- Data Management
- Software
- Vertical Applications

RENEWABLE ENERGY

- Biofuel / Biochemical
- Biomass
- Geothermal
- Hydro
- Solar
- Wave / Tidal
- Wind

AGRICULTURE & CONSUMER

- Green consumer products
- Green chemicals
- Sustainable agriculture
- Sustainable forestry

WATER

- Water technology
- Smart Water/ Efficiency
- Monitoring and compliance
- Distribution
- Treatment

ENERGY EFFICIENCY

- Advanced Building Products
- Sustainable materials
- Demand management
- E&C / Energy services
- Storage technology
- LED lighting
- Power electronics

POWER INFRASTRUCTURE

- Energy storage
- EPC services
- O&M services
- T&D equipment

SMART GRID

- Advanced metering
- Distribution automation
- Grid communications
- Sensors / Controls Software

ADVANCED TRANSPORT / SMART CITIES INFRASTRUCTURE

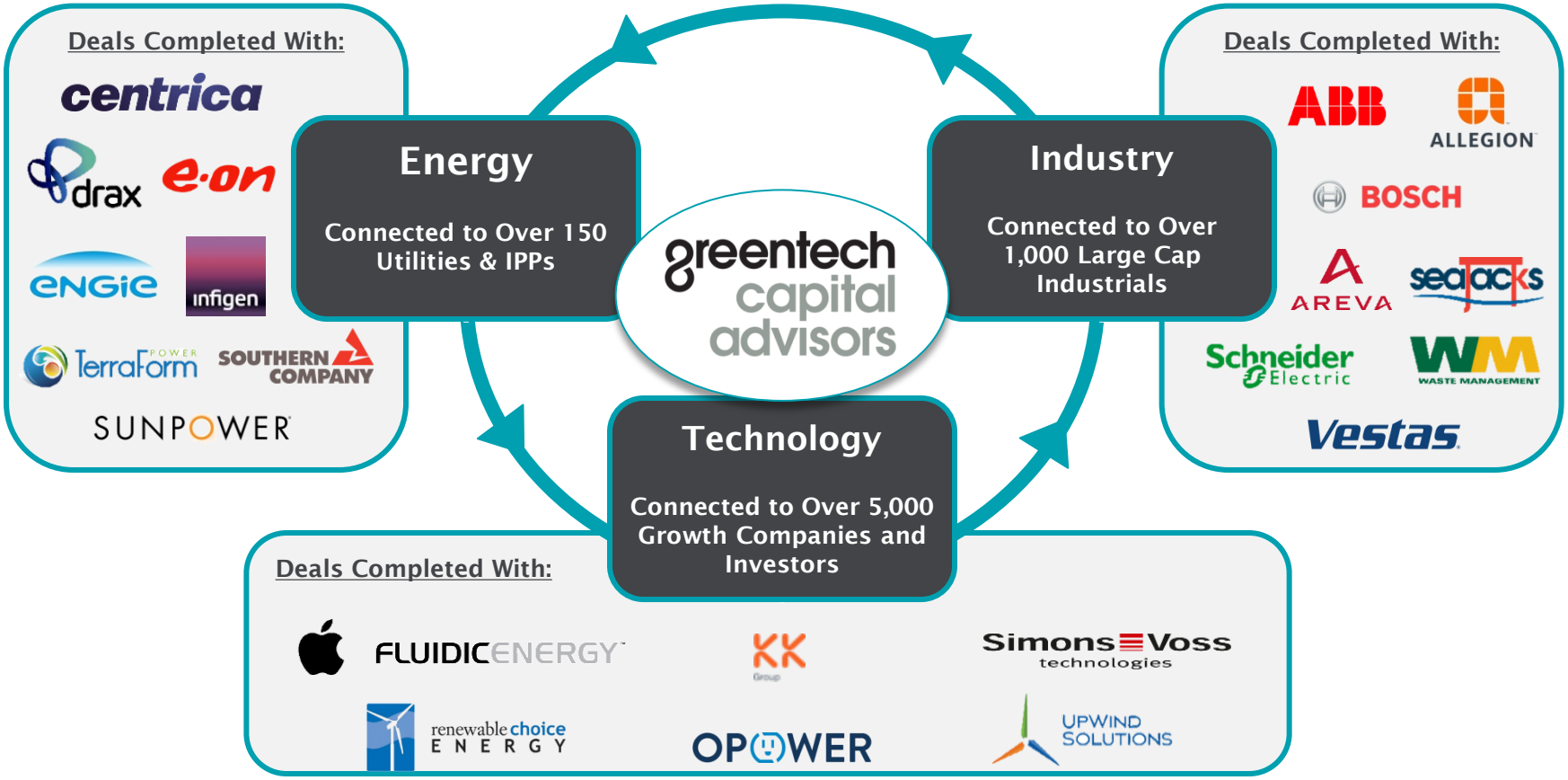
- Electric vehicles
- Emissions control
- Traffic management
- Autonomous vehicles

AIR AND ENVIRONMENT

- Pollution control
- Remediation
- Waste management
- Recycling
- Waste to energy

Where We Are Positioned

GCA connects innovators and large incumbents in Energy, Industry and Technology



GCA's Senior Team and Global Reach

We are the largest global investment bank focused exclusively on *Sustainable Infrastructure*

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GCA's partners have over 175 years of combined experience in Sustainable Infrastructure, investment banking and principal investing; seamless coordination leveraging our connectivity and relationships

Michael Horwitz, Partner

- Partner in the San Francisco office of GCA
- Focuses on energy software and services, energy efficiency and renewable energy sectors
- Former Managing Director and Head of the Energy Technology Banking team at Robert W. Baird
- Previously spent several years as Managing Director of Baird's Energy Technology research efforts
- Other prior roles include; Managing Director and Head of Clean Technology research at Stanford Group Company, and a Partner & Senior Research Analyst in Clean Technology at Pacific Growth Equities LLC
- Cited by the Wall Street Journal, Financial Times, Businessweek and appeared on CNBC to share his views of the new energy markets
- BS in Financial Economics and a BA in Philosophy from Southern Methodist University

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Section 2

Power Generation Market Evolution

The Utility Industry is Undergoing Transformative Change…

Competitive power generation markets are replacing the traditional vertically integrated utility business model

Expanding Consumer Choice — Load Defection

+

Dispatchable Load Control — Manage Peak Periods & DG

+

Sensors and ICT Technology — Real-Time Two-Way Info

1990 — 2010 — 2020 — 2030

Data and Information Collected

Centralized Power	Changing Incentives	Dynamic Power Markets
Vertically Integrated Utilities	**Rise of Energy Efficiency & Renewables**	**Demand-Side and Distributed Energy Resources**
> Utilities incentivized to make long-term capital investments in over-sized power infrastructure > Centralized generating facilities > "Cost plus" pricing > Deregulation in certain markets > One direction power flow	> Addition of renewables as a non-GHG emitting power source > Emergence of energy efficiency as the lowest-cost energy resource > Distributed generation as an alternative to centralized power > More intelligent grid edge controls > Increasing regulatory support to move away from kWh (decoupling) toward distributed energy	> Rise of the "Prosumer" > Multi-directional information flow enabled by software and communications equipment > The utility becomes a market clearinghouse in which small scale generation technologies, demand-side resource planners and consumers transact

…Mirrored by Equally Substantial Changes in the Integrated Energy Service Provider Marketplace

Various large incumbents are seeking to develop a comprehensive, integrated energy service offering both organically and via acquisitions

Market Trends

1. **Trend towards aggregated energy management** platforms driven by multi-site customer preference for standardization
2. **Competition increasing;** multiple industries touch commercial and residential buildings, and view energy management as an area of expansion
   - Building hardware companies expanding into both preventative and after market services
   - Facility maintenance companies view energy management as a core area of growth
3. **Focus on software and data** as drivers for ongoing services sales
   - Smart meter data is vastly underutilized today
   - Reduce operating expenses, e.g. truck rolls
4. **Convergence and digitization of building systems**
   - Smart middleware and flexible enterprise management software facilitates integration
5. **Intersection of distributed generation, behind the meter storage, and energy management**

Recent Strategic Activity

Acquiror	Target(s)
EDISON INTERNATIONAL	SoCore Energy, ENERACTIVE SOLUTIONS, altenex, Delta e energy
ENGIE	ecova, OPTERRA ENERGY SERVICES, greencharge networks
current powered by GE	DaintreeNetworks
SOUTHERN COMPANY	Power Secure
ORACLE	OPOWER

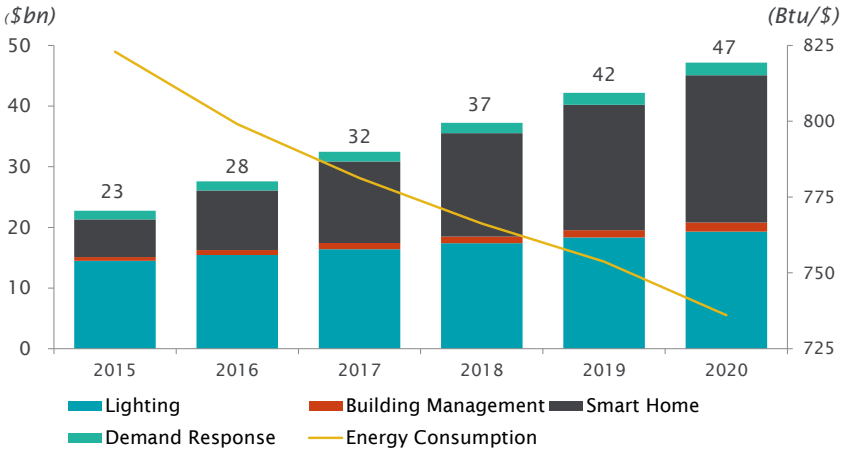
Strategic interest in energy efficiency is at an all-time high

Transition is in the Early Stages but the Shift is Already Evident

Energy efficiency is impacting retail demand and renewables are already replacing fossil fuels and nearing grid parity

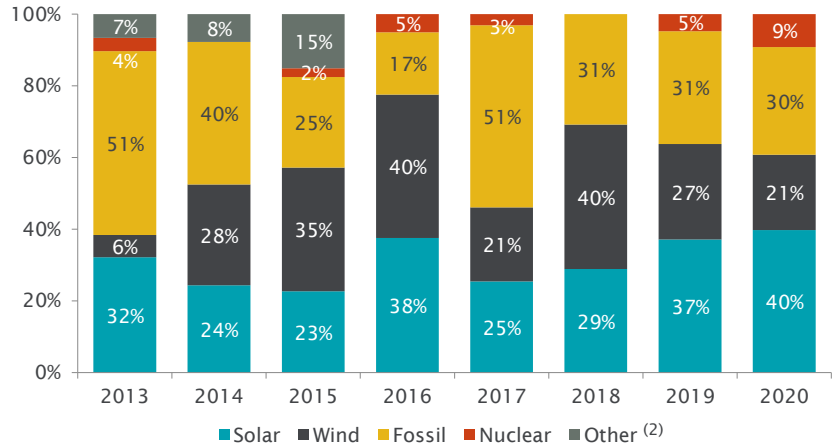
Energy Intensity to Decline ~10% by 2020

North American Energy Efficiency Market Size and U.S. Electricity Intensity(1)



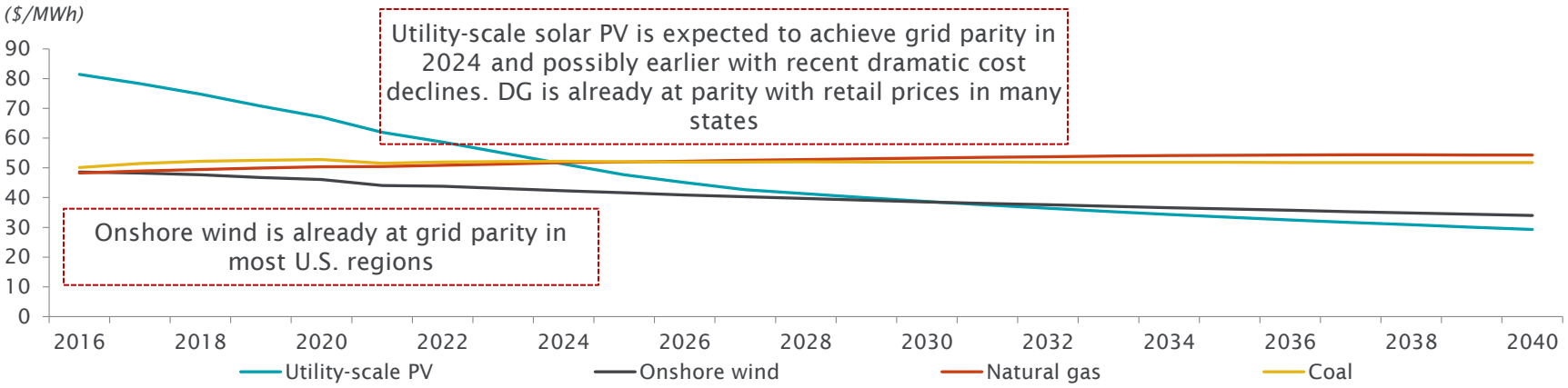
Renewables Already Account for >50% of Additions

% of U.S. Capacity Additions by Technology



Continued Cost Declines and Technological Advances are Putting Renewables at Grid Parity

U.S. Levelized Cost of Electricity by Technology



Source: GTM Research, EIA, OECD, Grand View Research, BNEF, Berkely Lab, Bloomberg Public Information, GCA Analysis.

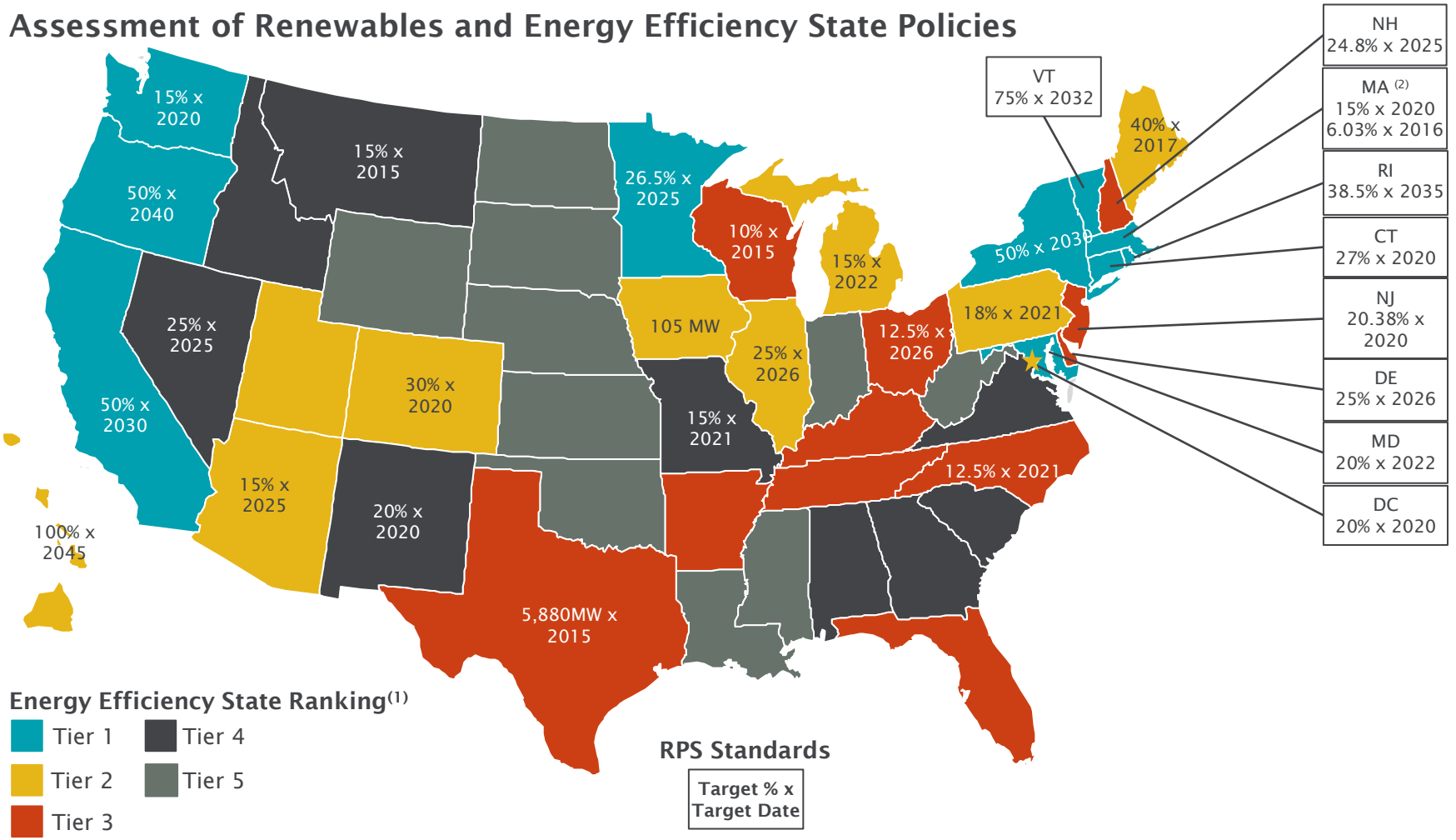
(1) Energy Efficiency is based on the estimated market size of the LED lighting, demand response, building management, smart home sectors. Energy intensity is determined by dividing retail electricity consumed by GDP (Btu/$).

(2) Other includes biomass, geothermal and hydro.

States are Rapidly Implementing Renewables and Energy Efficiency Policies

29 states have implemented RPS policies to-date and 27 have implemented energy efficiency goals – The Southeast continues to lag most other parts of the country

Assessment of Renewables and Energy Efficiency State Policies



Source: American Council for Energy-Efficient Economy, DSIRE.

Note: Rankings are based on the 2016 State Scorecard produced by the American Council for Energy-Efficient Economy. The scorecard weights a state's energy efficiency scores by: utility & public benefits programs, transportation policies, building energy codes, combined heat & power, state government initiatives and appliance efficiency standards.

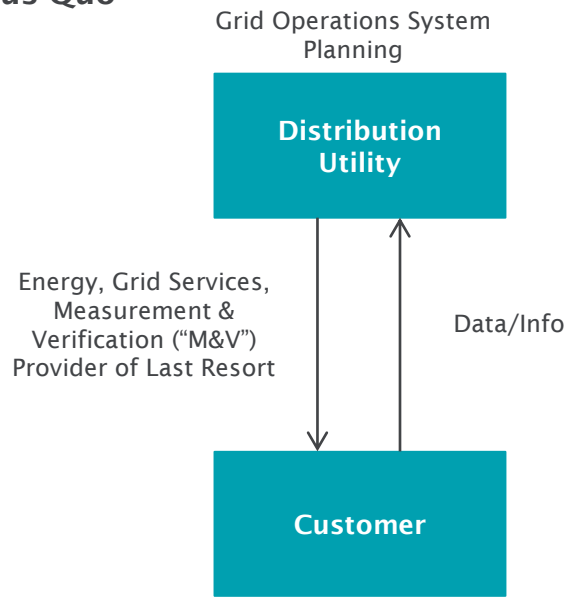
(1) Tier 1 rank refers to the top 10 states, tier 2 to states 11-20, tier 3 to 21-30, tier 4 to 31-40 and tier 5 to 41-50.

(2) MA has two programs, a 15% x 2020 policy for new resources and a 6.03% x 2016 for existing resources.

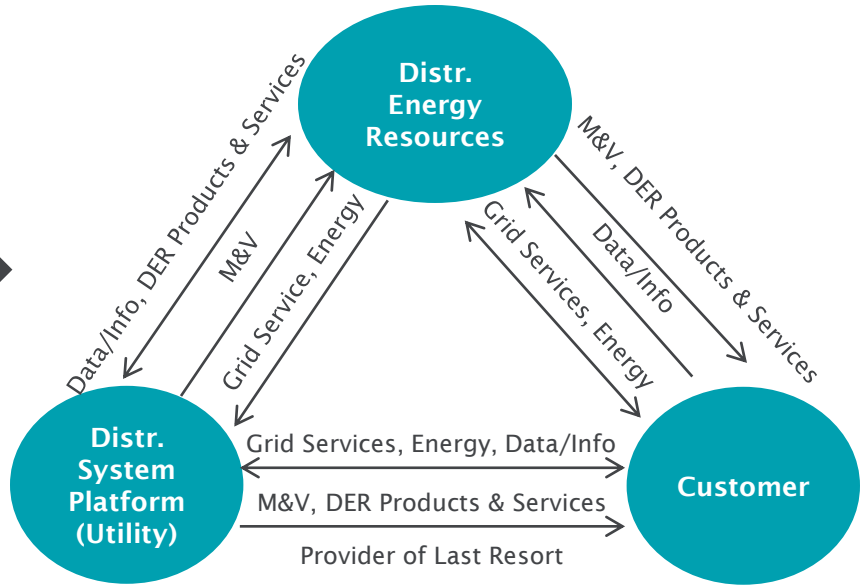
Case Study: New York

New York is undertaking a comprehensive effort to remake its energy systems and reduce carbon emissions

Status Quo



Proposed REV Market Design



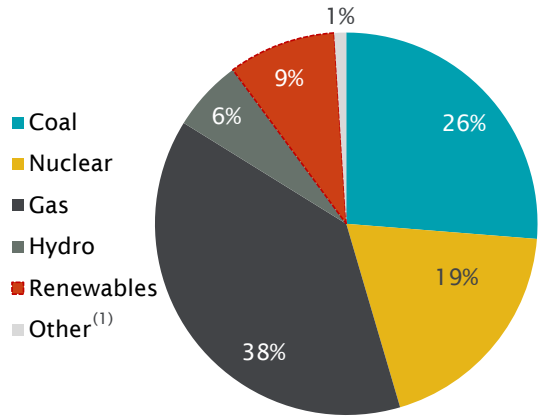
Commentary

- The most salient initiative is a program known as Reforming the Energy Vision (REV), which:
  - Instructs New York's public service commission (PSC) to develop a new vision for utilities and implement it in the next few years
  - Utilities facilitate distributed energy deployment and coordination and only own distributed generation when no other option exists (essentially a distribution level ISO)
  - Utilities incentivized for the spread of new distributed energy technologies, aligning incentives with customers
- REV, if successful, would likely spark a wave of utility reform in other states and is widely considered as one of the most important clean energy policies in the U.S. today

Renewables Are Expected to Make Up a Greater Share of Total Generation

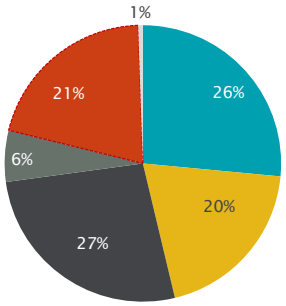
U.S. Generation Mix

Today

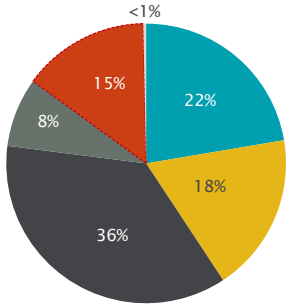


2030

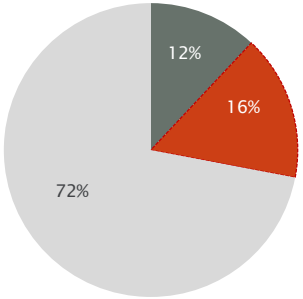
BNEF



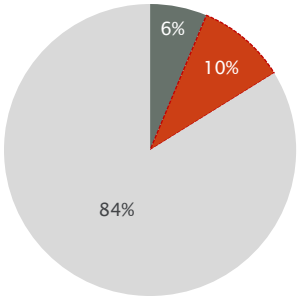
EIA(2)



Wood Mackenzie



IRENA



Renewables are expected to make up 15% of U.S. electricity generation in 2030

Source: IRENA, EIA, BNEF, Wood Mackenzie.
(1) For IRENA and Wood Mackenzie, "Others" includes coal, nuclear and gas.
(2) EIA does not provide breakdown of hydro and other renewables. Assumption of hydro based on average of BNEF, Wood Mackenzie and IRENA.

Peer Participation Assessment

Most IPPs are beginning to aggressively seek alternative energy investments, led by the more mature renewables market but with increasing focus on storage and efficiency

	Renewables	Energy Storage	Energy Efficiency
AES	High +	High +	Low -
AVANGRID	High +	Low -	Low -
Berkshire Hathaway Energy	High +	Low +	Low -
ConEdison	Low +	Mid +	Mid +
Dominion	Mid -	Low -	Low -
Edison International	Mid +	Low +	High +
ENGIE	Low +	Mid +	High +
Exelon	Mid -	Mid +	Low -
NextEra Energy	High +	High +	Mid +
nrg	Mid +	Low +	Mid +
Southern Company	High +	Low +	Mid +

Source: Company information.

Low Mid High
\+ High Strategic Focus - Low Strategic Focus

Section 3A

New Energy Sectors: Renewables

U.S. Renewable Energy Key Trends

Despite the YieldCo dislocation and SunEdison bankruptcy, the U.S. renewables market has become increasingly competitive

1 Large Market Opportunity

- The majority of U.S. states have implemented Renewable Portfolio Standards ("RPS") which mandate increased production of energy from renewable energy sources
- PTC and ITC extensions expected to drive ~47 GW of incremental wind and solar installations from 2017-2020 relative to pre-extension forecasts
- Numerous new entrants seeking scale, including AES, Cubico, Enbridge, ENGIE, Innogy, Longroad and Statoil

2 YieldCo Meltdown

- Market cap of North American YieldCos has decreased from high of ~$17bn in 2015 to ~$14bn today[(1)]
- Consolidation underway with Brookfield's acquisition of TerraForm Global and sponsorship of TerraForm Power
- Dislocation demonstrates inefficiency of public equity investors as owners for contracted renewable energy infrastructure relative to private capital

3 Corporate Offtake

- Over 6 GW of non RPS-driven procurement of renewable power in 2015-2016
- Corporate PPA structures beginning to resemble hedges, with shorter tenor (10-15 years), basis risk and fixed shaped volume (versus unit contingent)

4 Policy Uncertainty

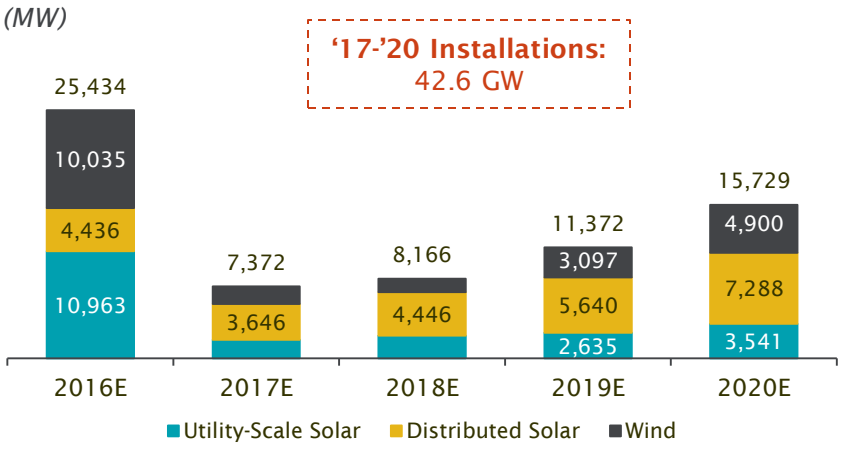
- Potential Trump agenda creates uncertainty, but GCA does not see clear, large risks to continued solar and wind growth in the U.S.
- ITC / PTC unlikely to be repealed, costs falling rapidly and states driving continued demand for renewable power

Source: FactSet as of 4/28/17.
(1) Includes CAFD, RNW, NEP, PEGI and NYLD.

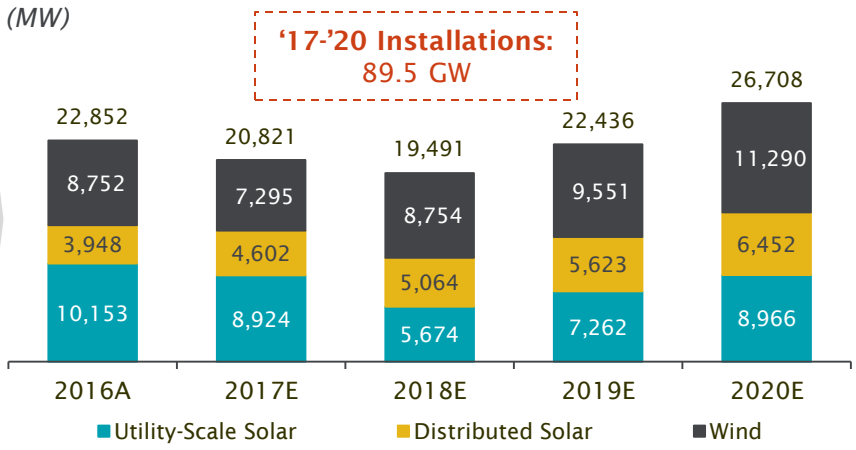
1 ITC / PTC Extension Reinvigorating U.S. Growth

Despite the ITC / PTC extension creating ~47 GW of expected incremental solar and wind installations, there is a dearth of actionable 2017 COD projects

Pre-ITC / PTC Extension



Post-ITC / PTC Extension



Commentary

- Rush to build projects in advance of the anticipated (but unrealized) ITC / PTC cliff in 2016 has led to a near-term shortage of contracted acquisition opportunities as developers "reboot"
- Extensions provide wind and solar sectors five years of runway to continue lowering LCOE in pursuit of grid parity
- ITC / PTC extension passed with bipartisan support and is not expected to be threatened by recent U.S. election results

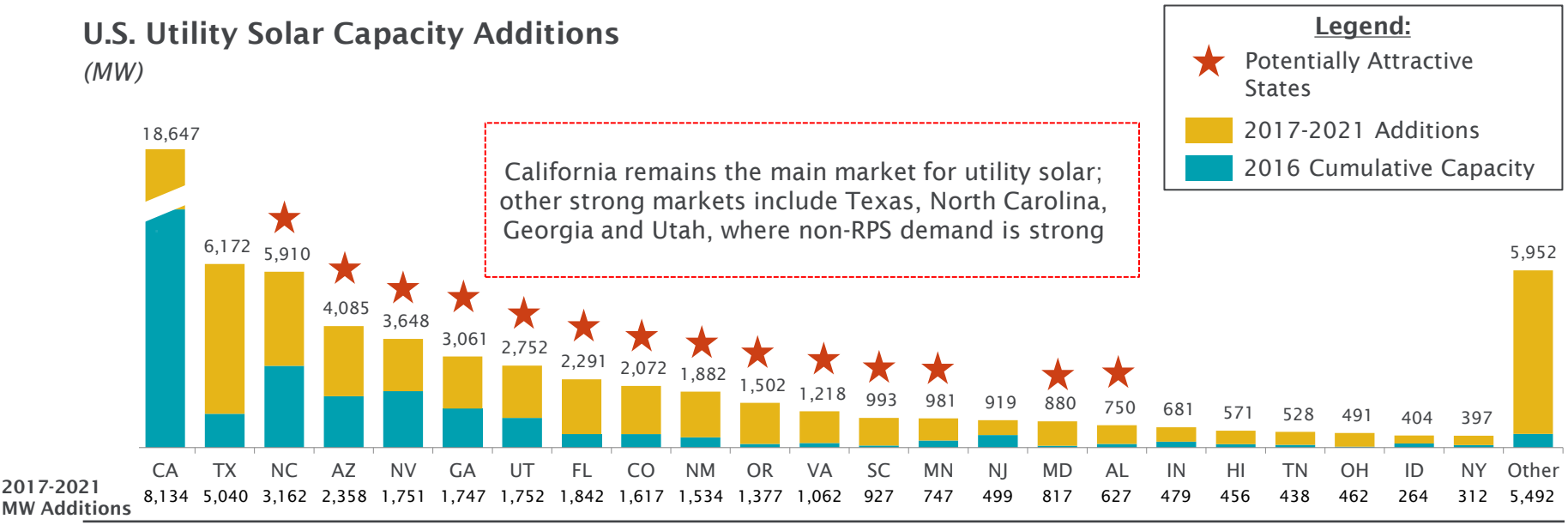
While panel manufacturers are facing pressure, the drop in system prices coupled with the ITC / PTC extension could result in even more system installations in the U.S.

Source: SNL, Bloomberg, BNEF.

1 Wind and Solar Capacity Additions By State From 2017-2021

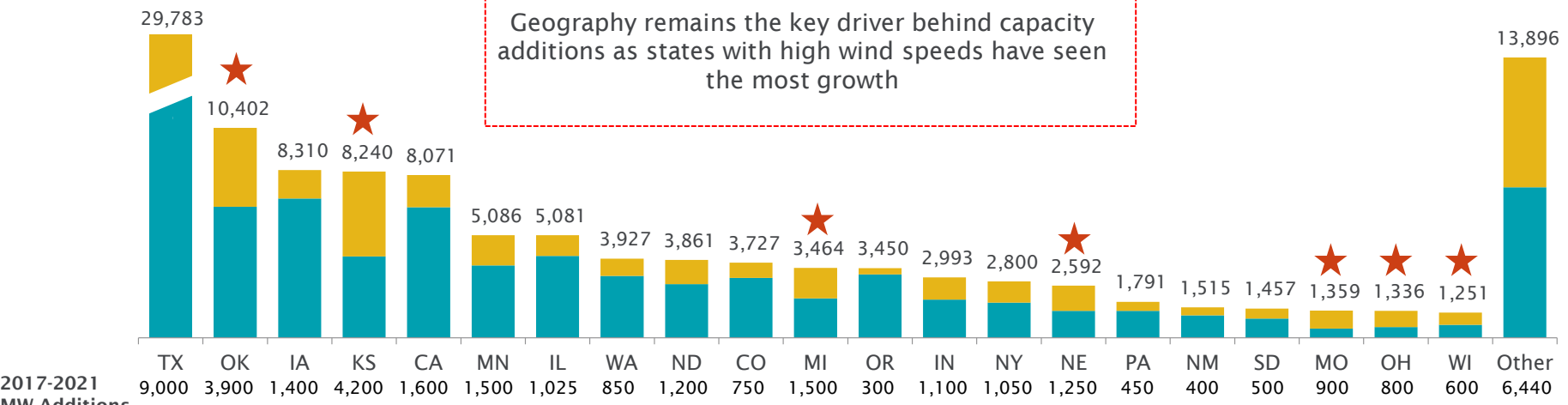
U.S. Utility Solar Capacity Additions

(MW)



U.S. Wind Capacity Additions

(MW)

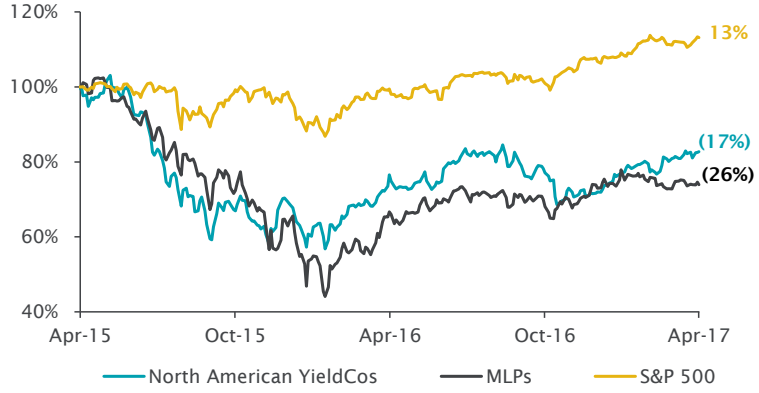


Source: GTM Research, IHS, Public Information, GCA Analysis.

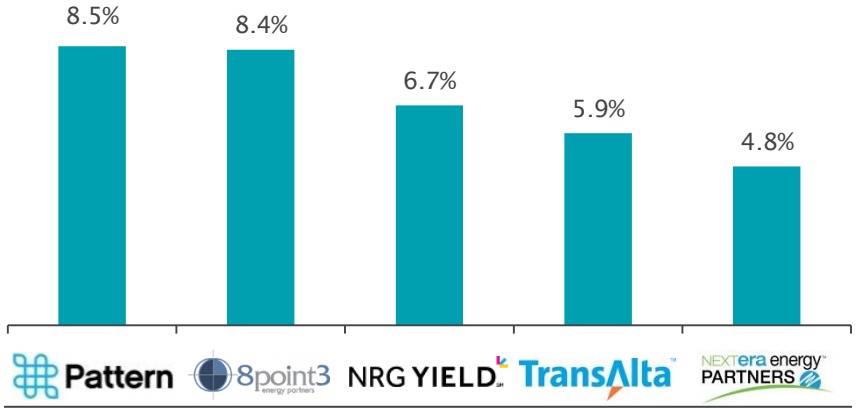
2 YieldCos Facing Headwinds

YieldCos' ability to make accretive acquisitions is tenuous given their dependence on capital markets to fund acquisitions

Indexed Stock Price Performance

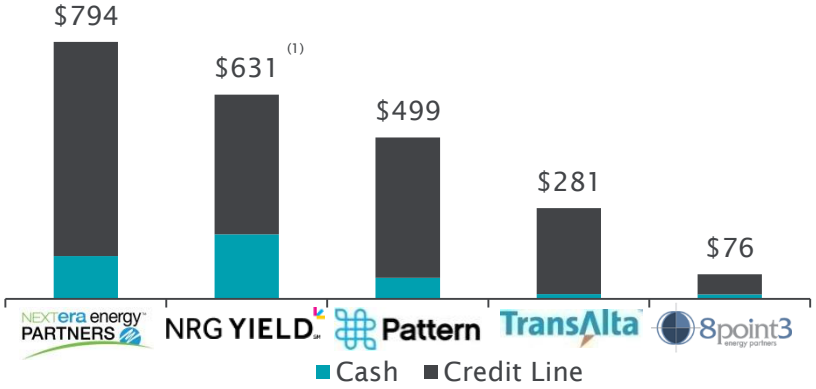


Dividend Yield (2017E DPS)



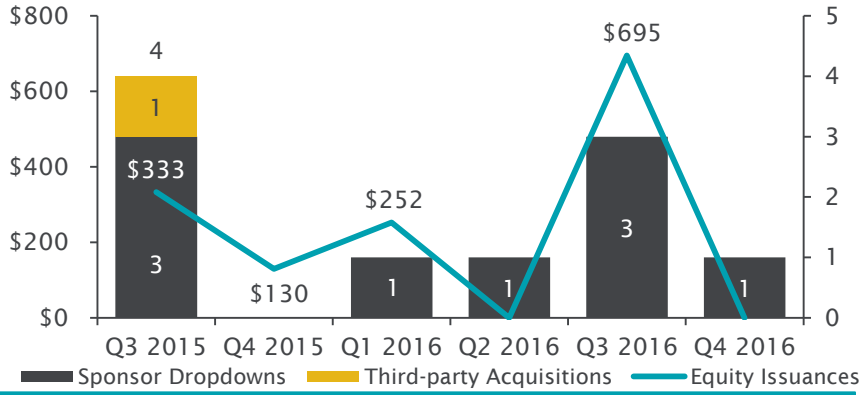
Available Liquidity

($mm)



Equity Issuances & Transactions

($mm) *(# of Transactions)*



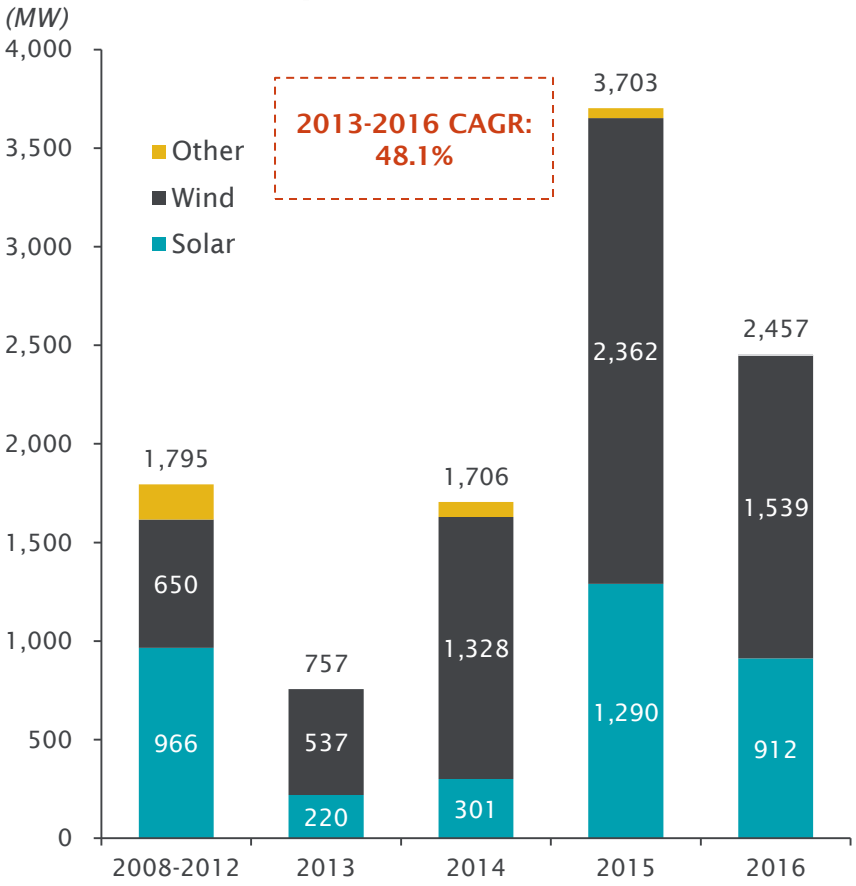
The volatility of equity capital markets has created challenges for YieldCos in competing with private capital for acquisitions

Source: FactSet as of 4/28/17.
(1) Excludes unutilized $150mm ATM capacity.

3 Corporate PPA Market Is Growing Rapidly

Low power prices have diminished the relative economics of corporate PPAs in the short term, but sustainability targets for many corporations continue to drive new deals

Announced Corporate PPAs



- Corporations are increasingly drawn to renewable PPAs for a number of reasons
  - PPAs serve as a fixed-price, long-term hedge against wholesale market fluctuations
  - Renewable energy is a lower cost alternative in multiple U.S. markets
  - Corporations are increasingly focused on sustainability goals and branding
- Corporate PPA volumes dropped to ~2.5 GW in 2016 from a record high in 2015
  - ITC and PTC extensions eliminated need to execute contracts prior to anticipated cliff in 2016
  - Lower power prices
- However, the corporate PPA market has room to grow
  - Only 20% of the Fortune 100 companies with sustainability targets have executed a corporate PPA
  - The emergence of green tariffs and aggregate PPAs will drive activity in the space

Selected Corporate PPA Counterparties

3M, Alphabet, amazon, facebook, Owens Corning, P&G, PHILIPS, Steelcase, cisco, GSA, Hewlett Packard Enterprise, IKEA, starwood Hotels and Resorts, YAHOO!, salesforce, GM, BD, KAISER PERMANENTE, CORNING, Lockheed Martin, SC Johnson, switch, DOW, Microsoft, EQUINIX, MARS, Bloomberg, Walmart

Corporate PPAs are rapidly expanding the universe of renewable energy buyers

Source: BNEF.

3 Offtake Structure Comparison

Corporate PPA structures vary and return requirements for the associated projects must be adjusted commensurately

	Utility PPA	Corporate PPA	Hedge
Tenor	> 20-25 years	> 10-15 years	> 3-12 years
Delivery Point	> Bus bar	> Bus bar or hub	> Hub
Volume	> 100% of output > Unit contingent	> 25-100% of output > Unit contingent or fixed shaped volume	> ~75% of output (P99 - 1 year production) > Fixed shaped volume
Security Requirements	> Development term: $2-5mm > Operations term: $15-20mm stepping down over time	> Development term: $2-5mm > Operations term: $15-20mm stepping down over time	> Full collateral posting of $15-20mm required at execution
Key Risks	> Counterparty credit risk > Payment of liquidated damages (COD delays, project underperformance) > Counterparty termination	> Counterparty credit risk > Payment of liquidated damages (COD delays, project underperformance) > Counterparty termination > Basis risk if delivery at hub > Generation mismatch if fixed shaped volume (production shortages during times of high pricing) > Merchant exposure for uncontracted volume	> Counterparty credit risk > Counterparty termination > Basis risk > Generation mismatch (production shortages during times of high pricing) > Merchant exposure for uncontracted volume
Returns (Unlevered, After-Tax)	> Solar: 6.5%-7.0% > Wind: 7.5%-8.5%	> Depends on structure and credit quality – similar to utility PPA or hedge if terms are comparable	> Solar: TBD – still a developing market > Wind: 9%-10%
Leading Counterparties	> Varies by region Austin Energy, Southern California Edison, PacifiCorp	Alphabet, facebook, Microsoft, amazon, IKEA, Walmart	Bank of America Merrill Lynch, citi, Morgan Stanley, Shell

4 Potential Impacts of the Evolving U.S. Policy Landscape

Trump presidency raises questions about future support for renewable energy and its competitiveness

	Issue	GCA Initial View
ITC / PTC Stability	> Potential to eliminate subsidies in favor of supporting fossil energy sources > Trump commented that "solar is expensive"	✓ **ITC / PTC unlikely to be touched** – ITC / PTC extension passed with significant bipartisan support, and set to phase out – Tax credit benefits accrue to private industry – Trump has suggested support for further tax credits to motivate private capital for infrastructure investment
Solar Power Competitiveness	> Administration support for fossil energy will threaten cost competitiveness of solar	✓ **Cost of solar stays competitive due to sharp declines** – Limit to further decreases in gas prices, which set margin in many markets – Cost of solar energy falling rapidly, and expected to be under $0.90/W before 2019 for average large projects (already under $1.00/W in some states)
Demand for Renewable Power	> Administration support for fossil energy will threaten demand for solar	✓ **Federal gov't has limited impact on renewable energy demand, if cost competitive** – Significant renewable energy demand driven by state policies – Growing corporate procurement of renewable energy, driven by cost, sustainability objectives and branding
Project Finance Cost	> Expansionary fiscal policy could trigger raising interest rates to prevent inflation	~ **Difficult to determine, but likely neutral** – Significant liquidity in project finance market with spreads at all-time lows – Rate increases could increase cost of renewables, but have similar impact on other new power generation infrastructure
Tax Equity	> Lower corporate tax rates reduce availability of tax equity	✗ **Availability of tax equity could be impacted and risk being pushed to sponsors** – Lower tax rates could reduce tax capacity and elimination of MACRS in favor of immediate 100% deduction would be difficult to efficiently monetize – Tax reform could include reduction in repatriation tax, generating tax capacity for tax equity investors as they bring cash back from overseas – Tax equity investors passing tax reform risk through to sponsors (i.e. cash sweeps)

Potential Trump agenda creates uncertainty, particularly in the tax equity market, but GCA does not see clear, significant risks to continued renewables growth in the U.S.

Source: GTM.

Section 3B

New Energy Sectors: Energy Efficiency

Energy Efficiency Market Themes and Trends

	Commentary
Proliferation of Distributed Energy Technologies	> New market entrants are providing distributed energy technologies at scale > Adoption of solar+storage is becoming more economical as technological advances drive down battery costs > Increasing number of companies are providing rooftop solar, behind-the-meter storage, and plug-in electric vehicles > Rural utilities and cooperatives in regulated markets, once a stronghold for coal, are beginning to adopt distributed infrastructure > Rise of smaller microgrids that can generate power independently of the broader grid
Expanding Consumer Choice	> Distributed energy technologies enable consumers to move a portion or all of their energy consumption off the grid > Electricity is evolving from a commodity with few producers to a robust market offered by a wide range of participants of all sizes > Multidirectional smart grid is enabling consumers to generate, store and sell their own power, becoming participants in electricity markets (Prosumers) > Consumers have an increasing array of options on electricity providers and backup generation sources
Increasing Amounts of Data	> Expansion of information and communications technology (ICT) and sensors makes it much easier to communicate, coordinate, and automate grid interactions > Increasing volumes of real-time data collection, made possible by sensors and smart meters, are enabling proactive demand-side management applications

Energy Efficiency Market Overview

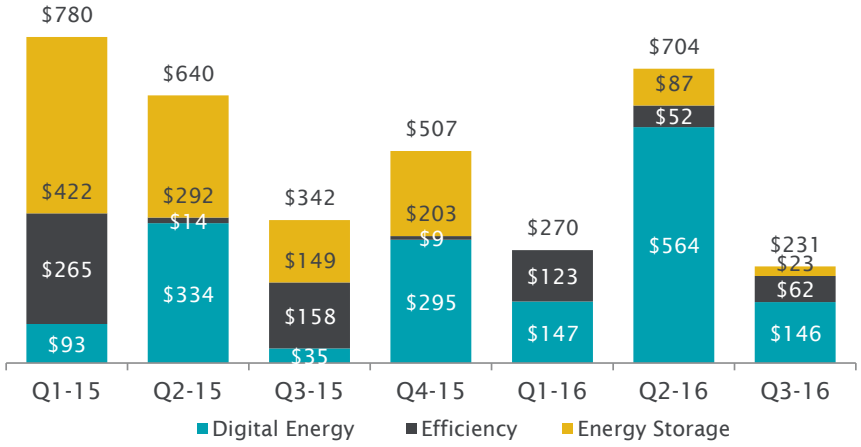
As energy efficiency markets continue to grow, competition amongst traditional utilities will emerge looking to take advantage of technology advancements

Market Trends

- Trend towards aggregated energy management platforms driven by multi-site customer preference for standardization
- Competition increasing; multiple industries touch commercial buildings and view energy management as an area of expansion
- Focus on software and data as drivers for ongoing services sales
- Convergence and digitization of building systems
- Intersection of distributed generation, behind the meter storage and energy management

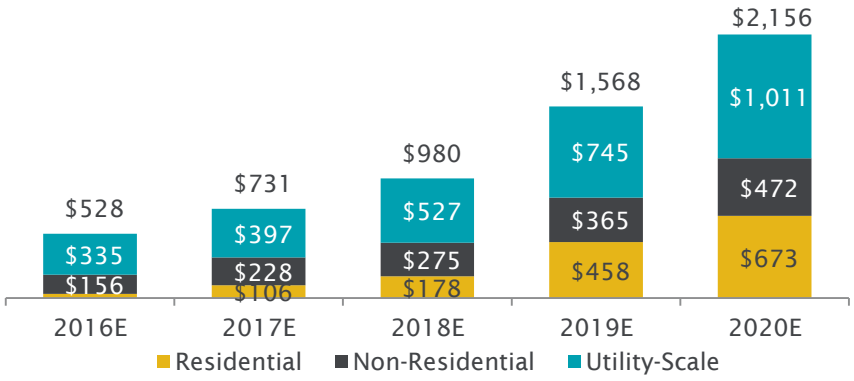
Energy Efficiency M&A Activity

($mm)



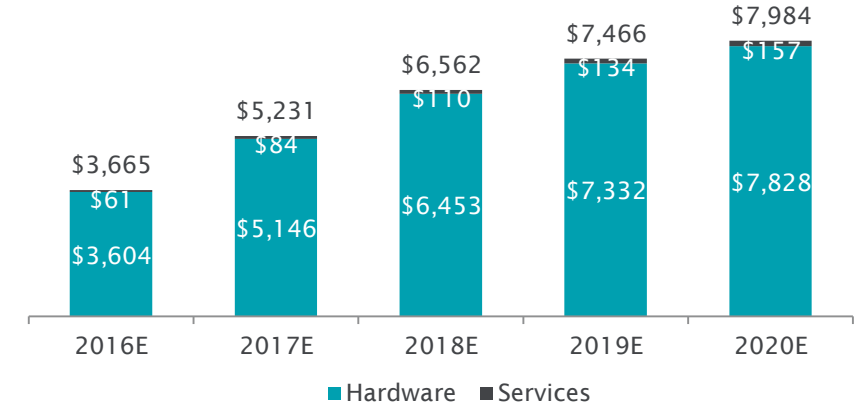
U.S. Energy Storage Market Size

($mm)



U.S. Home Automation Spend

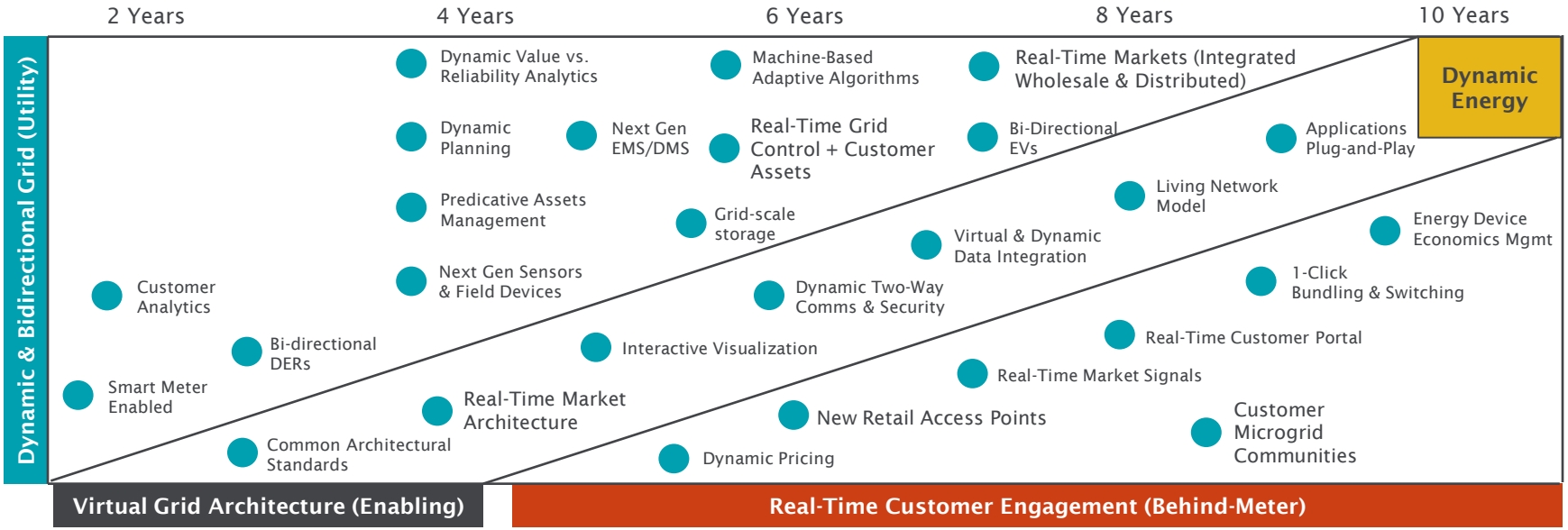
($mm)



Source: IHS Research, GTM Research, BNEF.

Energy Efficiency Market Dynamics

Grid Visualization



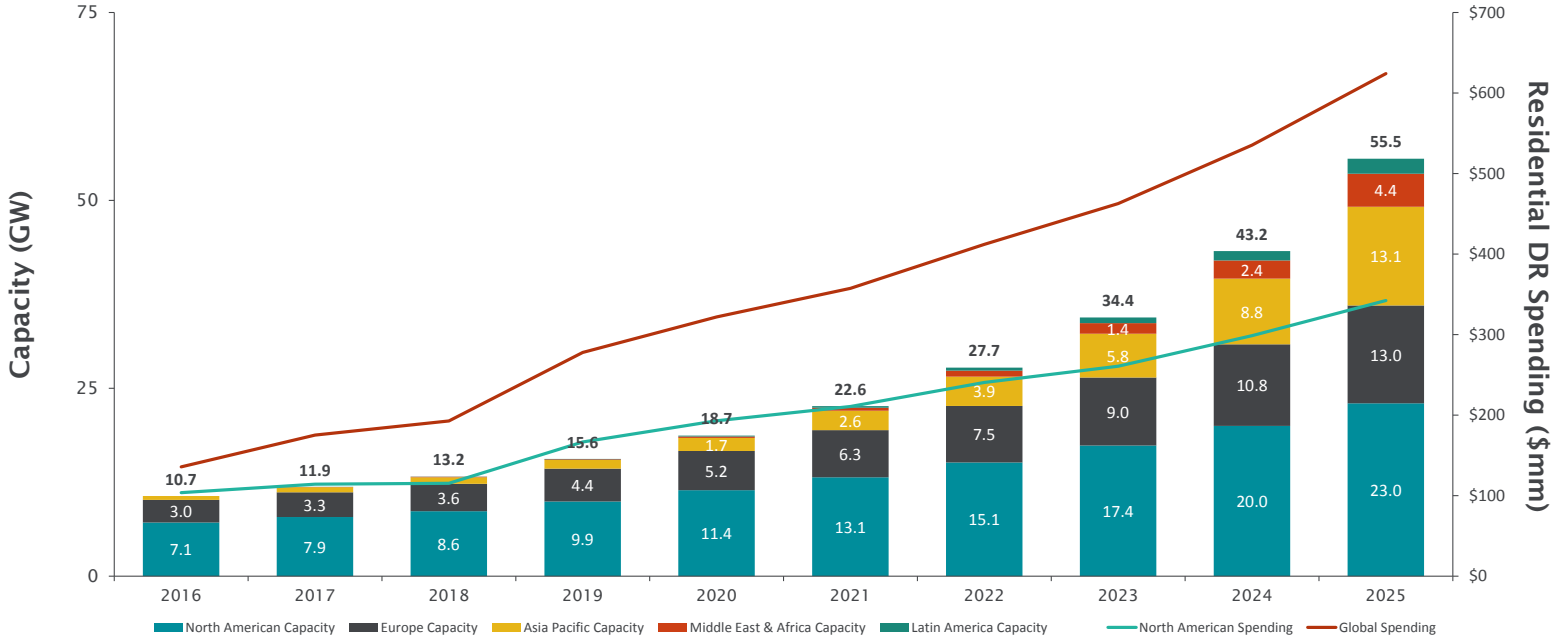
Commentary

- In the traditional utility model, the utility profits by earning a rate of return on investments in grid infrastructure
- Upstart new distributed energy technologies are disrupting this traditional utility model
  - Expanding consumer choice resulting in load defection
  - Dispatchable load control managing peak periods
  - Sensors and information and communications technology (ICT) enabling real-time two-way information sharing
- The 21st century utility will increasingly open up to competition as new providers enter the market and regulatory barriers fall
  - Supply/demand dynamics will be made on an ongoing, real-time basis by the dynamics of competitive markets
  - The value of electrons, demand shifting, voltage regulation, and capacity reserves will vary throughout the day, and from location to location, depending on grid conditions
  - New ICT services and increasing affordability of small-scale technologies will drive grid edge innovations
  - Customers will play a larger role in producing and managing their energy and eventually provide electricity services to the grid

Residential Demand Response Continues to Grow

Within the residential sector, utilities are pushing to expand their DR programs as consumers concurrently are installing more DR-enabled devices

Residential DR Capacity & Spending



North American Capacity	**7.1**	**7.9**	**8.6**	**9.9**	**11.4**	**13.1**	**15.1**	**17.4**	**20.0**	**23.0**
Europe Capacity	3.0	3.3	3.6	4.4	5.2	6.3	7.5	9.0	10.8	13.0
Asia Pacific Capacity	0.5	0.7	0.9	1.2	1.7	2.6	3.9	5.8	8.8	13.1
Latin America Capacity	0.0	0.0	0.0	0.1	0.1	0.2	0.4	0.8	1.3	2.0
Middle East & Africa Capacity	0.0	0.0	0.1	0.1	0.2	0.4	0.8	1.4	2.4	4.4
Global Capacity	**10.7**	**11.9**	**13.2**	**15.6**	**18.7**	**22.6**	**27.7**	**34.4**	**43.2**	**55.5**
North American Spending	$104	$114	$115	$167	$193	$211	$241	$261	$299	$342
Global Spending	$136	$175	$193	$278	$322	$357	$412	$463	$535	$624

- Utilities are unlikely to continue the old command and control model with new DR-enabled devices able to deliver more precise operational responses and real-time feedback on performance
- The adoption of smart thermostats by consumers is another driving force behind the advancement of residential DR

Source: Navigant Research.

Residential Demand Response Drivers

Significant industry forces are driving utilities to DR product offerings as a way to maintain growth and adapt to the changing regulatory and competitive environment

Traditional Utility Earnings Model is Under Threat

- Slowing U.S. electricity demand growth, coupled with a declining rate-payer enabled ROE to utilities puts significant pressure on operators to innovate in order to continue growth
- The rise of distributed generation and virtual metering requires a more sophisticated approach to grid management

Pressure Applied by 3rd Parties and Technology

- Shifting consumer expectations are changing how utilities are interacting with customers, creating a need for platforms that can successfully integrate their services
- Increased demand for choice, connectivity and awareness offered by new market entrants:

TESLA SolarCity SIGFOX One network A billion dreams CISCO nest

New Utility Business Model Innovations Required to Maintain Earnings

- Demand management is becoming increasingly more important for grid operators in order to balance intermittent generation from increasing number of wind and solar units
- Utilities need a strong partner with dynamic software to succeed in this changing environment

Favorable Regulatory and Policy Conditions

- Elimination of regulatory headwinds such as the dismissal of Order No.745 by the Supreme Court is enabling faster demand response growth in the U.S.
- Significant opportunities in California, where CAISO is in the midst of major enhancements to DR participation that enables integrated demand side management among utilities, where traditionally demand response and energy efficiency segments have been siloed
- Given the nature of the respective service offerings, shifts away from siloed segments opens opportunities for increased utility efficiencies

Source: Company presentation, Navigant Research.

Customers Beginning to Demand Change

Technical innovation, declining costs, and enhanced information access are causing customers to demand change

What Customers Want	Solutions
Access to data	Device-to-device communication
Supply alternatives	Solar, wind, hydro, distributed generation, virtual net metering
Increased reliability	Storage backup, distributed generation, microgrid
Control over costs	Time of use pricing Demand response
Device automation Remote monitoring and control capabilities	Smart home devices Smart metering
Environmental consciousness	Ability to use “green” power and energy efficiency

Grid and Utility Requirements

- Utility-scale / Behind-the-meter renewables
- CHP energy storage
- Grid network automation
- Smart grid software
- Customer engagement solutions
- Environmental data solutions
- Bi-directional transmissions
- Load management tools

Recent Energy Efficiency Market Activity

In a competitive environment in which utilities are transitioning into energy services companies, there is a race to bring value-added solutions to market

Acquirer	Targets	Rationale
Direct Energy (1)	alertme, ervia, Gems Sensors & Controls, NEAS ENERGY, Panoramic POWER	> Planned unbundling of Grid and Generation and Supplier businesses
DUKE ENERGY	Greensmith, PHOENIX ENERGY TECHNOLOGIES, REC SOLAR, spruce	> Building more capabilities to help customers reduce energy consumption, decrease environmental impact and achieve corporate sustainability goals
EDISON INTERNATIONAL	altenex, Delta energy, ENERACTIVE SOLUTIONS, SoCore Energy	> Integrating sophisticated new technologies with consumer electronics that give households the power to monitor and manage their electricity usage
ENGIE by people for people	ecova, greencharge networks, KiWiPOWER demand management, OPTERRA ENERGY SERVICES, TENDRIL	> Increasing energy services and smart grid capabilities, especially in the U.S. market
GE	DaintreeNetworks, sonnen	> Developing further storage, energy management and intelligent environment applications
Honeywell	elster	> Adding successful smart meter, software and data analytics solutions to the firm's existing Environmental and Energy Solutions business
Johnson Controls	EnerSys Power/Full Solutions	> Extending the firm's energy storage business especially within the industrial batteries subsector
ORACLE	OPOWER	> Enhancing their energy services business via cloud utility-services platform

Source: Company Website, Public Information, GCA Analysis.
(1) Alertme, Ervia, and Neas were all acquired by Centrica, Direct Energy's parent company.

Section 3C

New Energy Sectors: Energy Storage

Energy Storage Market – Key Trends

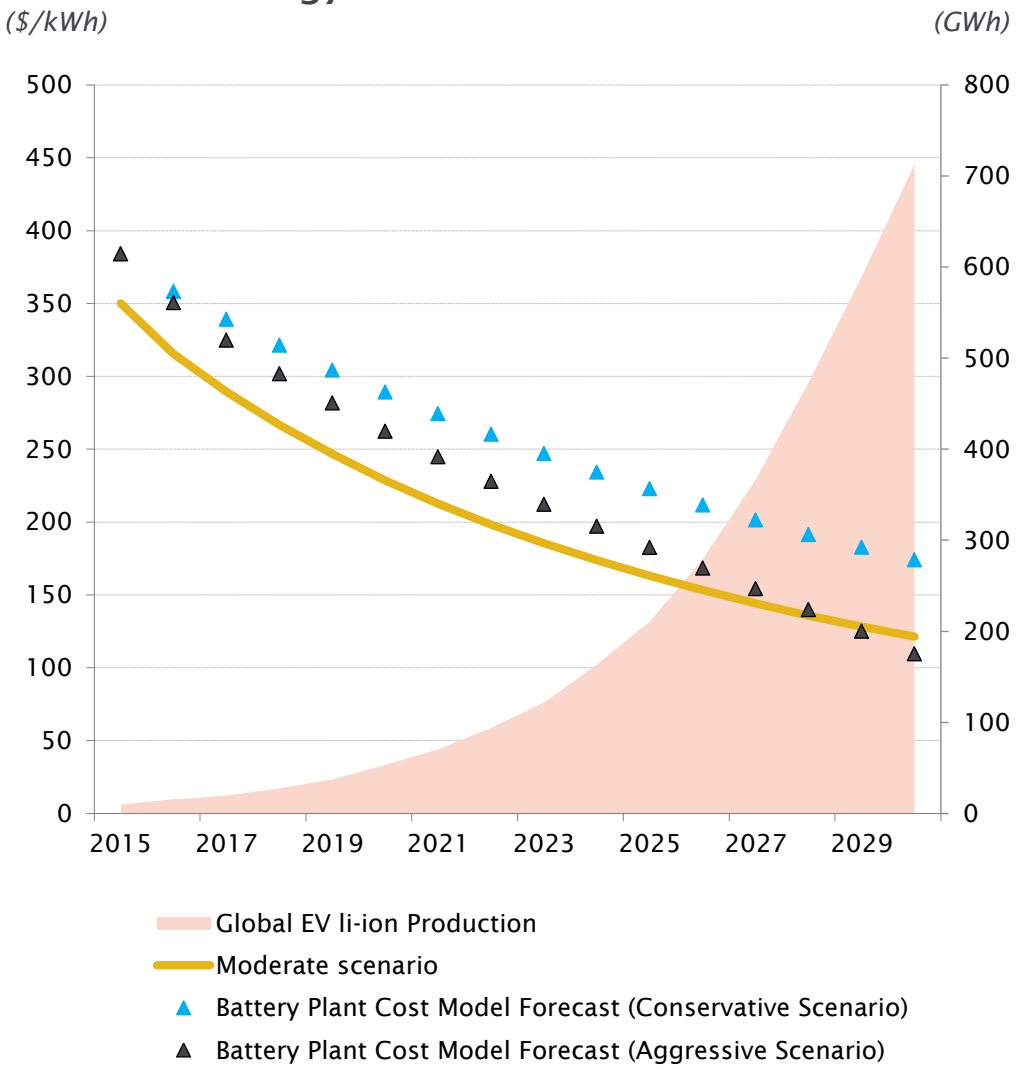
Energy storage market is undergoing high growth and structural transformation

	Overview
Costs Continue to Rapidly Decline	> Li-ion continues to dominate the market accounting for ~90% of installations in 2016 > System costs have come down ~54% over the last three years and are expected to decline another 19% over the next 2 years driven by technological improvement, higher deployment volumes, and supply chain professionalization > However, no "silver bullet" technology exists and a combination of technologies are expected to ultimately comprise the storage landscape due to differing strengths
Rapid and Prolific Growth	> By 2024, ~45 GW of energy storage is expected to be installed globally, growing at a ~40% CAGR > Over this period, ~$44bn of investments is expected to be required > Utility-scale storage is projected to grow at a 5-year CAGR of ~36% through 2021, while distributed energy storage is projected to grow at a ~72% CAGR over the same time period > By 2024, two thirds of all installed energy storage is expected to be behind-the-meter > Regulatory support, increasing electricity demand and increasing levels of renewable energy penetration will be the main drivers of growth
Business Models and Services Continue to Evolve	> New entrants continue to develop innovative software, services and revenue generation models, all of which are driving the evolution of the energy storage ecosystem > Ancillary service markets and other compensation sources are largely anticipated to evolve as incremental intermittent generation is added > State level regulatory support for energy storage continues to grow as the energy industry evolution becomes increasingly visible
Emergence of Energy Storage Financing	> Energy storage continues to develop into a standalone asset class driven by a better understanding of the risk / return profile by a growing investor universe and the minimization of technology risk > Over $2.7 billion of capital has been invested in the space in the last 12 months > Emergence of energy storage project financing funds and direct financing solutions as technology risk is overcome (Macquarie/ AMS, Stem/ Starwood)

Source: GTM Research, BNEF, I3.
(1) BNEF: includes M&A, VC/PE and public investments globally.

Costs Continue to Decline

Li-Ion Technology Cost Curve[1]



Commentary

- Li-Ion battery prices have come down by ~54% over the last three years and are expected to be reduced further
  - Based on the conservative scenario, costs are expected to decline by an additional 35% by 2025, versus an additional 48% decline in the aggressive scenario
- Energy storage balance-of-system costs have dropped by an average of 14% each year since 2010
- Cost decline is driven by
  - Increasing manufacturing scale and productivity
  - Reducing costs of materials and components
  - Increasing battery energy density and lifespan
- Decreased system costs and accumulated experience in Li-Ion technology will drive the growth of Li-Ion batteries' share in behind-the-meter projects
- Growth drivers will shift from regulation to total-cost-of-ownership

Source: BNEF.

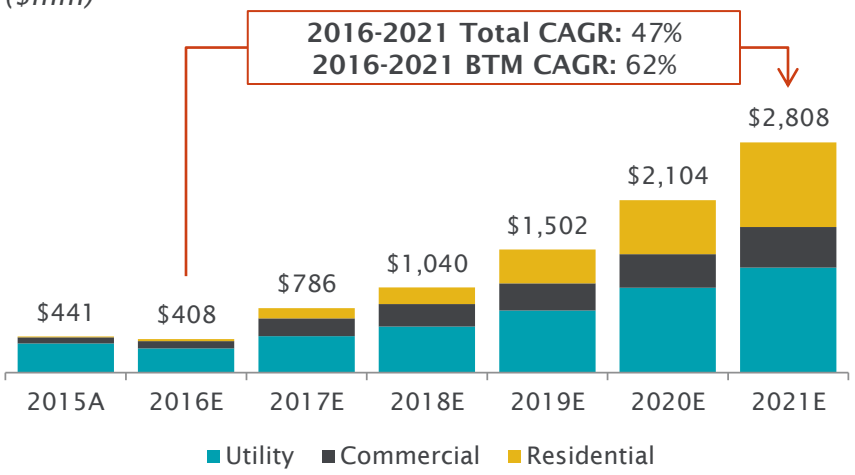
(1) Analysis is based on the premise that for every doubling of production volume, there is a corresponding drop in costs due to accumulated knowledge in manufacturing. Analysis does not include the effects of any disruptive technology.

Rapid and Prolific Growth

The global Behind the Meter ("BTM") energy storage market is expected to grow by 89% annually through 2020

U.S. Market Size

($mm)

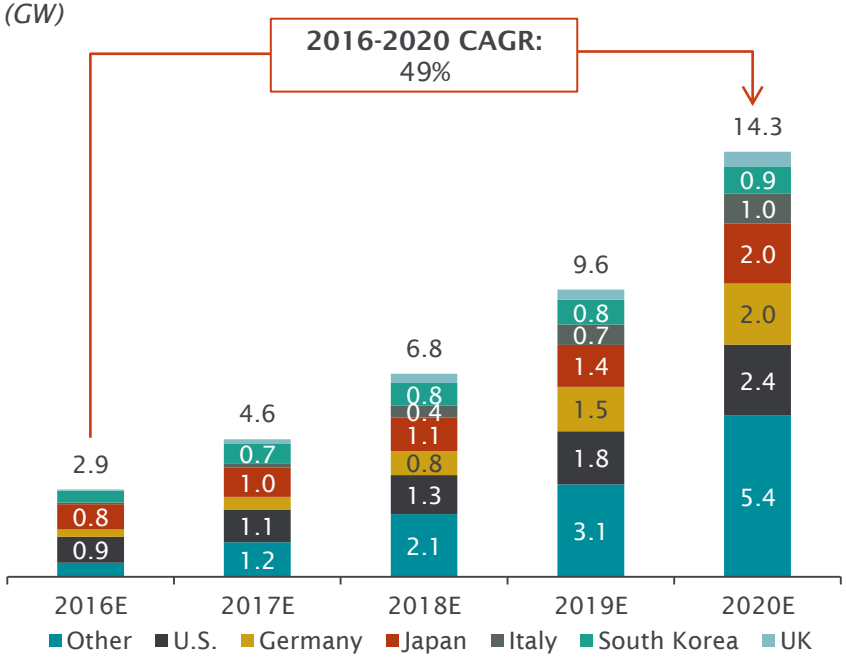


Commentary

- The global energy storage market is poised for explosive growth over the next few years, fueled by a number of factors:
  - Increasingly favorable regulatory policies
  - Increased understanding of the economic benefits of energy storage
  - Continued decline of lithium-ion battery pricing
- The U.S. BTM market is expected to reach $1,500mm by 2021, representing an average annual growth rate of 62%

Cumulative Global Installations

(GW)



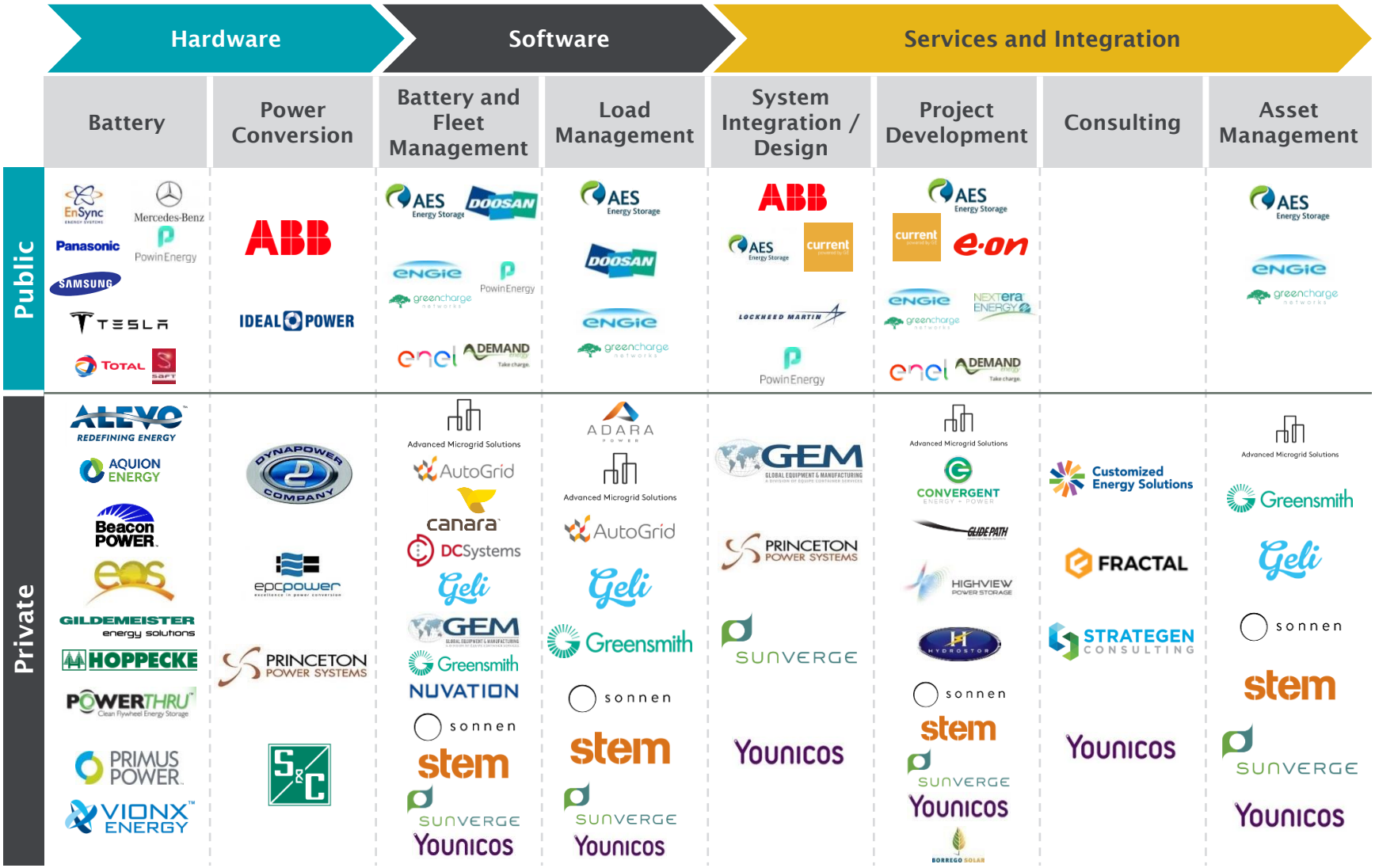
2016-'20 Energy Storage CAGR by Country

	Front-of-Meter	Behind-of-Meter
U.S.	37%	75%
Germany	65%	73%
Japan	11%	61%
Italy	35%	0%
South Korea	21%	44%
U.K.	71%	0%
Global	35%	89%

Source: GTM Research, BNEF.

Segment Expertise Developing

New entrants have continued to drive the evolution of the energy storage ecosystem



Regulatory Support Continues to Grow

Barriers

- Regulations place behind-the-meter ("BTM") storage on a different playing field than large central generators
- Regulations prohibit utilities from collecting revenue from behind-the-meter assets that provide value to multiple stakeholders, e.g. participating in the wholesale electricity market while simultaneously providing distribution upgrade deferral services
- Electricity markets designed with a marginal cost perspective are not well suited to integrate capital-intensive technologies that provide ancillary services such as energy storage

Drivers

Growing supply / demand imbalance from coal and nuclear plant retirements

Increasing intermittency from renewable energy sources

Innovations

- FERC has proposed a program that would require RTO/ISOs to create rules for energy storage to participate in wholesale markets
- The U.S. CAISO and PJM markets have both enhanced market rules that will enable more storage to be deployed
- Massachusetts recently passed an energy bill including a provision paving the way for an energy storage mandate, possibly as early as 2017
- NY Reforming the Energy Vision ("REV") is proposing changes in regulatory, tariff, and market designs and incentive structures to better align utility interests with distributed energy assets
- California recently signed four new bills into law that aim to ensure that long-duration energy storage is included in system planning, allow utilities to recover costs of distributed energy systems, permit increased spending under the SGIP and improve the interconnection dispute resolution process

The expert consensus is that the necessary additional regulatory reform will happen, but the exact timing over the next 2-3 years is unclear

Source: GCA discussions with industry consultants/ experts, EIA, BNEF, GTM Research.

Markets Continue to Evolve

Consultant/ Expert Perspectives on the Continued Expansion of the Market

"The sheer volume of installed behind-the-meter capacity creates an ***opportunity for companies to aggregate, providing grid services that would otherwise be provided by standalone utility-scale assets. This will be welcomed by regulators and market operators****, once they are comfortable that aggregated behind-the-meter storage can be relied upon, since it will allow for a more efficient electricity system. Utility-scale operators may fear that their opportunities will be snatched by behind-the-meter storage."*

–Bloomberg New Energy Finance Global Energy Storage Forecast

"The idea is that downstream ***battery storage system will provide a number of value streams and will be hugely more economical when stacking several services and capabilities****. Moreover, providing those services to support the grid will help delay required investments in front-of-the-meter in terms of new generation. If you look at it from your client's perspective,* ***you simply need sufficient volumes in order to begin to implement these other revenue streams. You need critical mass."***

–Hervé Touati, Rocky Mountain Institute

*"****Financing and new business models will allow residential and commercial storage to make up half of U.S. deployments by 2021****. Project developers and C&I energy management service providers are increasingly adding storage to their portfolios. As costs continue to come down, storage will be deployed to lower customer bills and provide increased resiliency in the C&I segment. Utilities too will begin to offer energy storage to end customers as part of their business model.* ***Behind-the-meter storage will increasingly be called upon to supply grid services, offering new opportunities for project developers, and requiring advances in aggregation and dispatch software."***

–Mike Munsell, GTM Research

*"****There is growing interest in aggregating distributed energy storage systems*** *as developers gain a better understanding of how to add secondary revenue streams to storage projects, and as technology improvements allow for better fleet management …* ***the outcome of these initiatives [PG&E supply-side pilot and CA Demand Response Auction Mechanism (DRAM)] will lead to regulatory changes that will shape how behind-the-meter storage develops and could create additional revenue streams*** *for commercial customers interested in storage, solar and/or demand response."*

–Bloomberg New Energy Finance Global Energy Storage Market Outlook

The energy storage business model anticipates (and requires) the development of grid service revenue streams

Service Offering Continues to Expand

Diverse value creation opportunity will drive broad penetration

Stakeholders	Services Provided	Applicable Energy Storage Location			Service Value Range ($/kW)[1]
		Transmission	Distribution	Behind-the-Meter	
ISO / RTOs	Energy Arbitrage	✓	✓	✓	$5 - $100
	Frequency Regulation	✓	✓	✓	$20 - $220
	Spin / Non-Spin Reserves	✓	✓	✓	$5 - $80
	Voltage Support	✓	✓	✓	$60
	Black Start	✓	✓		$10
Utilities	Resource Adequacy	✓	✓	✓	$60 - $160
	Distribution Deferral		✓	✓	$60 - $900
	Transmission Congestion Relief	✓	✓	✓	$20
	Transmission Deferral	✓	✓	✓	$80 - $500
Customers	Time-of-Use Bill Management			✓	$180 - $240
	Increased PV Self-Consumption			✓	$20
	Demand Charge Reduction			✓	$40 - $210

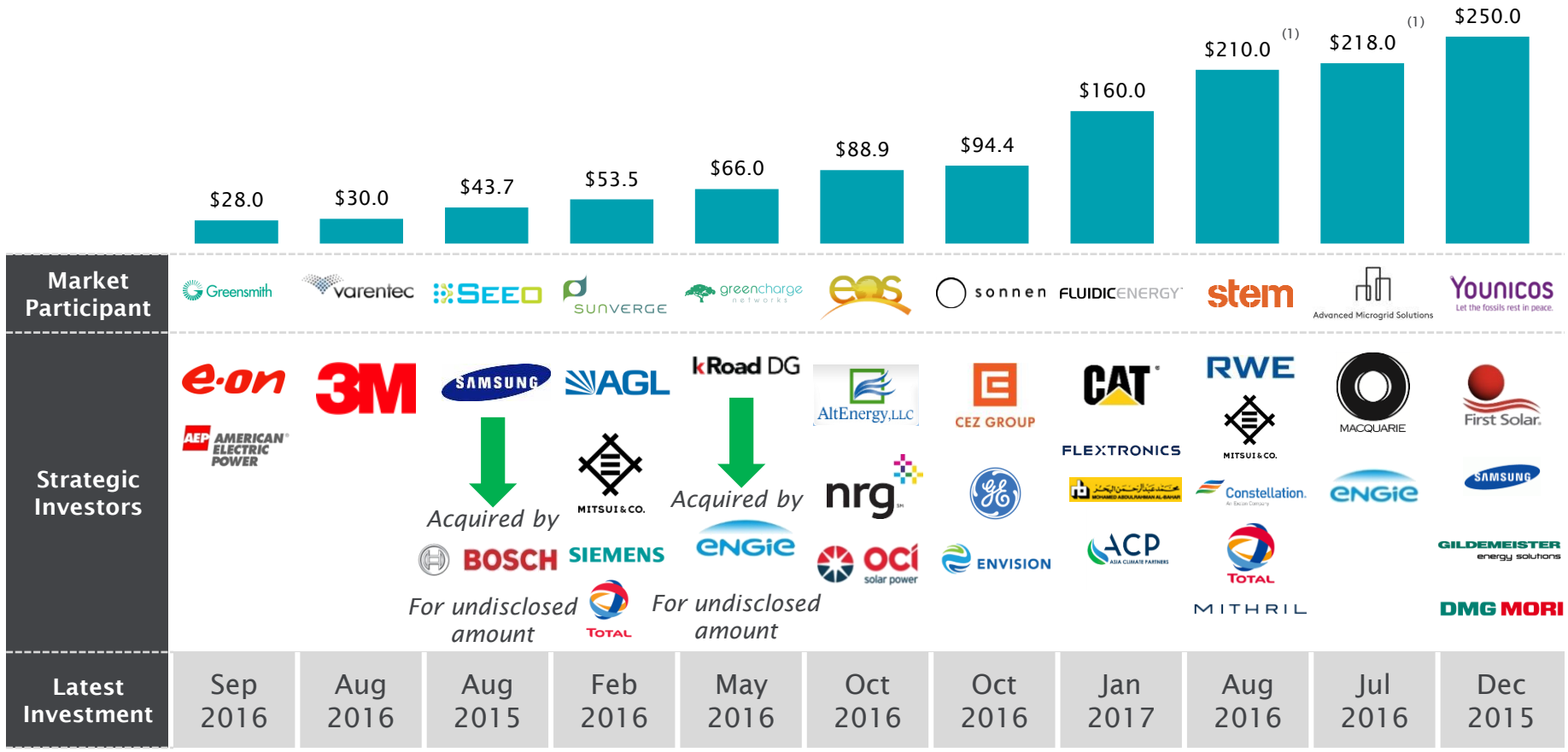
Source: Rocky Mountain Institute ("RMI").
(1) Based on RMI's "The Economics of Battery Energy Storage" report.

Emergence of Energy Storage Financing

Strategic investor interest in energy storage is resulting in increased capital allocations to the sector betting on market growth and ancillary grid services market development

Total Invested Capital

($mm)



Source: Company information, Pitchbook.

1) Approximation based on market data.

Emergence of Asset-Level Capital Commitments

Stem and Advanced Microgrid Solutions ("AMS") both received significant investments from financial sponsors during the second half of 2016

STARWOOD ENERGY GROUP

Investment in

stem

Transaction Overview

- On August 11, 2016, Starwood Energy group announced its plan to invest up to $100mm in Stem
- The proceeds will help Stem continue to increase its deployments, which stood at 75 MWh of systems as of the investment date
- The investment brought Stem's total funding to $210mm and Stem's project funding pool to more than $350mm
- In May the company received a post money valuation of $234mm

MACQUARIE

Investment in

Advanced Microgrid Solutions

Transaction Overview

- On July 11, 2016, Macquarie announced its $200mm investment in AMS
- The proceeds will be used to design, build and operate facilities at commercial, industrial and government sites
- The investment brought AMS' total funding to $218mm
- Macquarie's investment was the largest of its kind within the energy storage sector

Source: Company information, Pitchbook, Press Releases.

Section 3D

New Energy Sectors: Advanced Transportation/ Mobility

Key Trends in Advanced Transportation

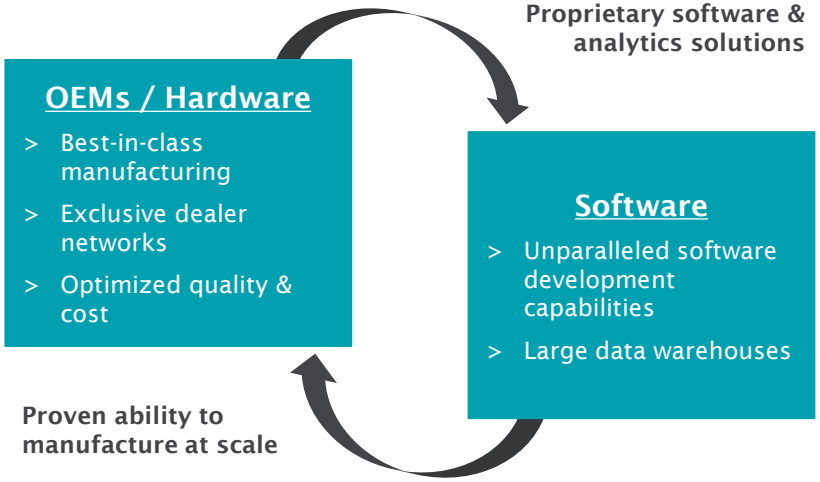
There is a paradigm shift in the broader automotive industry, enabled by the convergence of automation, software vehicle integration, and driver assistance systems

Changing Dynamics in Transportation	
Key Trend	**Why it Matters**
Blurring between "Smart Cities," "Infrastructure," "Transportation," and "IOT"	> Increased functionality of vehicles is creating an expanded ecosystem for ancillary services around vehicles; cars becoming "mobile armchairs" > New mobility business models such as car sharing rely on highly accurate map data
Rapidly changing ecosystem	> Mix between large, traditional players and emerging rapidly growing companies > Companies that have emerged through specialist roles are widening the scope of their services
Growing importance of software	> Automakers' investments in R&D are increasing rapidly, rising from 2.7% of revenue in 2000 to 4.4% in 2014 > Increasing collaboration between Detroit and Silicon Valley (e.g., GM / Lyft, Toyota / Uber)
Emergence of vehicle automation	> U.S. DOT issued comprehensive guidelines on self-driving cars in September > Several OEMs are targeting full Level 5 automation by 2020 > Uber debuted first self-driving Volvo XC90 fleet in Pittsburgh this summer and signed a non-exclusive agreement to develop fully autonomous cars by 2021
Accelerating focus on vehicle electrification	> Global sales of electric vehicles (EVs) – battery electric vehicles (BEV) and plug-in hybrid electric vehicles (PHEV) combined – increased by ~63% in Q3 2016 compared with Q3 2015, to ~176,000 units with a ~1.2% market penetration > Demand for lithium-ion batteries in Q3 stood at 5.6 GWh, a 105% increase from Q3 2015

Source: GCA Analysis, BNEF.

Increasing Hardware / Software Linkage

Neither OEMs nor tech companies have an end-to-end solution…



- Conventional car companies have lagged behind in software development but have exclusive access to dealer networks and manufacturing expertise
- Upstart Silicon Valley companies are entering the automotive industry but lack the ability to manufacture and sell cars themselves

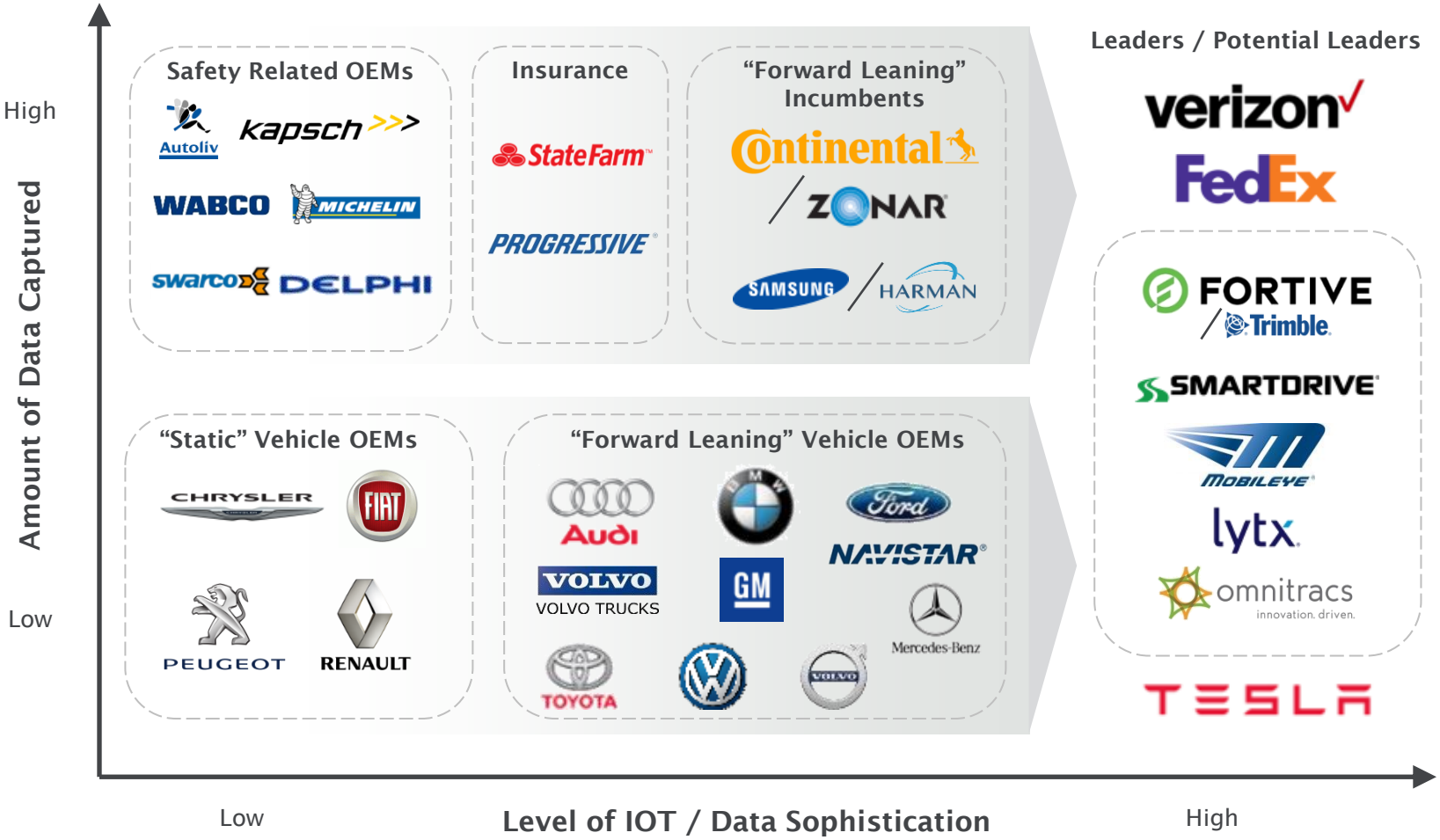
…and they are partnering with one another in response

Jan. 2016: GM invests in Lyft	GM	$0.5B	Lyft
Mar. 2016: GM buys self-driving startup	GM	$1B	Cruise
May 2016: VW invests in European ride-hailing service	VW	$0.3B	Gett
May 2016: Toyota invests in Uber	Toyota	N/D	Uber
May 2016: Apple invests in Chinese ride-hailing service	Apple	$1B	DiDi
Aug. 2016: Mobileye and Delphi partner to develop self-drive system	Mobileye	N/A	Delphi

Source: GCA Analysis, Public disclosure.

The Importance of Data: Auto Market Incumbents

Established incumbents are struggling to take advantage of the vast data they are collecting… the key goal is to turn the data into Actionable Intelligence

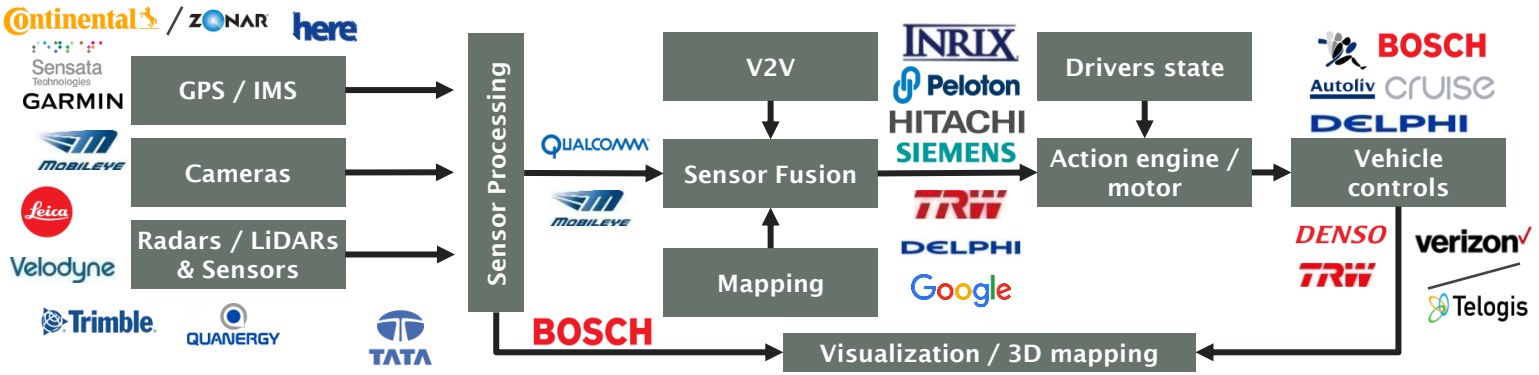


Source: GCA Analysis. Representative industry participants only included, grouped by segment.

The Need for Driving Analytics & Intelligence

Current Automotive Point Products:

Limited & Niche



Full End-to-End Software Solutions Are Needed

Sense

- Alerts
- Preemptive
- Collect Information

Understand

- Time
- Velocity
- Situation

Act

- To Act or Not
- Warn
- Control

Descriptive Analytics
What happened?

Diagnostic Analytics
Why / When / Where / How?

Predictive Analytics
What will happen?

Executive Analytics
Which action is best?

Source: GCA Analysis.

Autonomous Vehicle Market Landscape

○ → ● Low High

	Examples	Applications: Electric Vehicles	Applications: Autonomous Vehicles	Applications: Ride Sharing	Applications: Infotainment & IoT	Applications: Mapping & Sensors	Commentary
Auto OEMs *Automobile manufacturers*	Audi, BMW, Ford, GM, Honda, Hyundai, Mercedes-Benz, Nissan, SAIC, Tesla, Toyota, VW	◕	◔	◕	◕	◑	> World class manufacturing expertise with near-exclusive access to global dealer network > Significant risk of becoming redundant "metal benders", lack in-house software capabilities – currently having to reinvent their business models real time
Technology / Software *Large scale software companies*	Apple, Cisco, Delphi, IBM, Google, Microsoft, Samsung, Mobileye, Nvidia, Verizon	◔	◑	◑	◕	●	> Google is the frontrunner in driverless LDVs > Apple has scaled back Project Titan and will decide the fate of it's self-driving vehicle program late 2017 > Other software companies are prioritizing vehicle connectivity, mapping, and telematics services
Mobility-as-a-Service *Ridesharing providers*	DiDi, Gett, Lyft, Uber	◔	◑	●	◔	◕	> Uber is expanding beyond P2P ridesharing and piloting driverless vehicles > Other ridesharing competitors have gained regional traction but lack a truly global footprint > Providers are leveraging software expertise to enter strategic adjacencies (e.g., mapping, infotainment) but these initiatives are preliminary
Trucking / Fleet Management *Shipping and delivery*	Continental, FedEx, Swift, UPS, Verizon, Volvo	◕	◔	○	◔	◕	> Adopted adaptive cruise control and lane change assisting technology but have not achieved full automation > Commercialization of autonomous trucking and platooning will reduce labor costs > Entering connected car software through M&A (e.g. Continental/Zonar and Verizon/Telogis)
Connected Vehicles *Connected car ecosystem*	Airbiquity, ChargePoint, Driversiti, Lytx, Nauto, nuTonomy, Peloton, Quanergy, SmartDrive, Velodyne	○	◑	○	◔	●	> Provide various technology solutions (e.g., digital mapping, sensors, automation) to OEMs and vehicle software platforms

Source: GCA Analysis.

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