

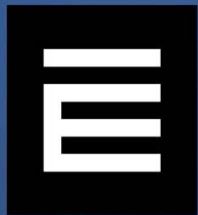
Using Battery Storage for Load Management and Demand Response

A Review of Utility Pilots and Programs

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17th Spring Conference



E Source

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What Is E Source?



How Is E Source Different?



**Unbiased
research**



**Actionable
insights**



**We speak
your language**



**Consider us an
extension of
your staff**

What We Do



Presentation Overview



Where is the market currently?

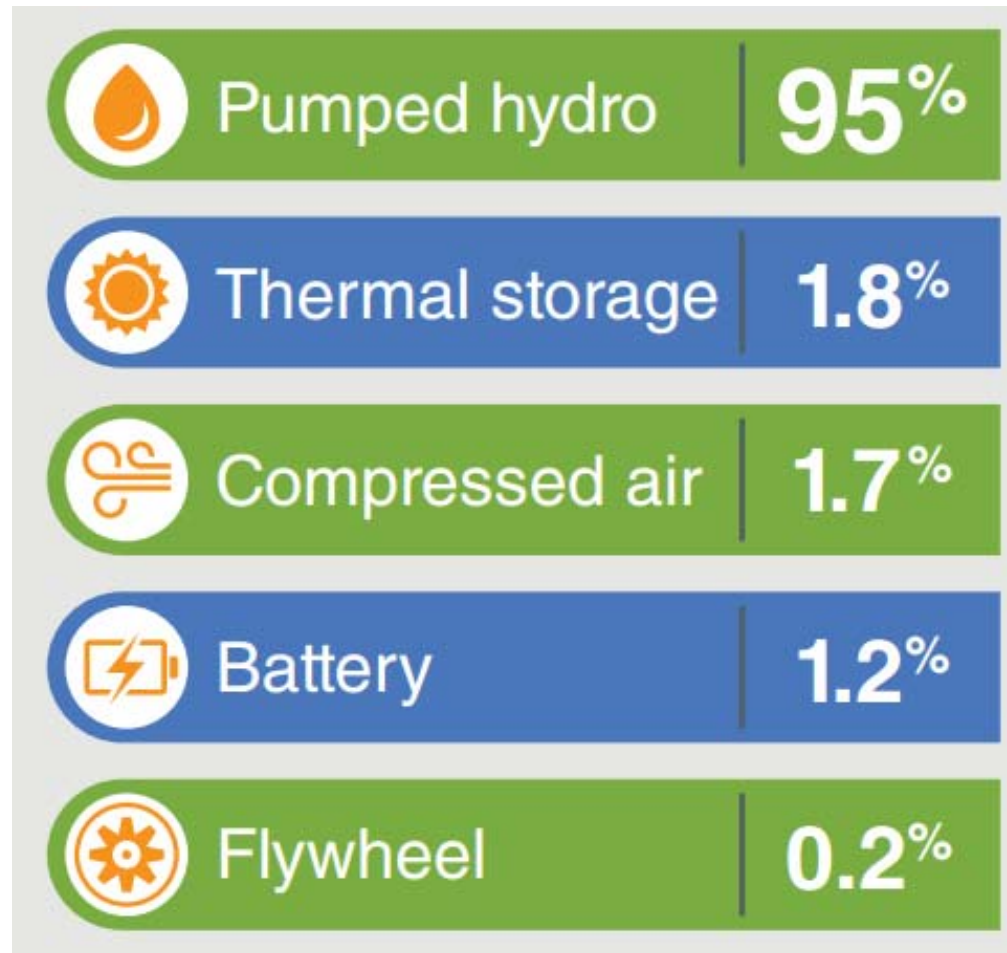


What are the forecasts for the energy storage market?



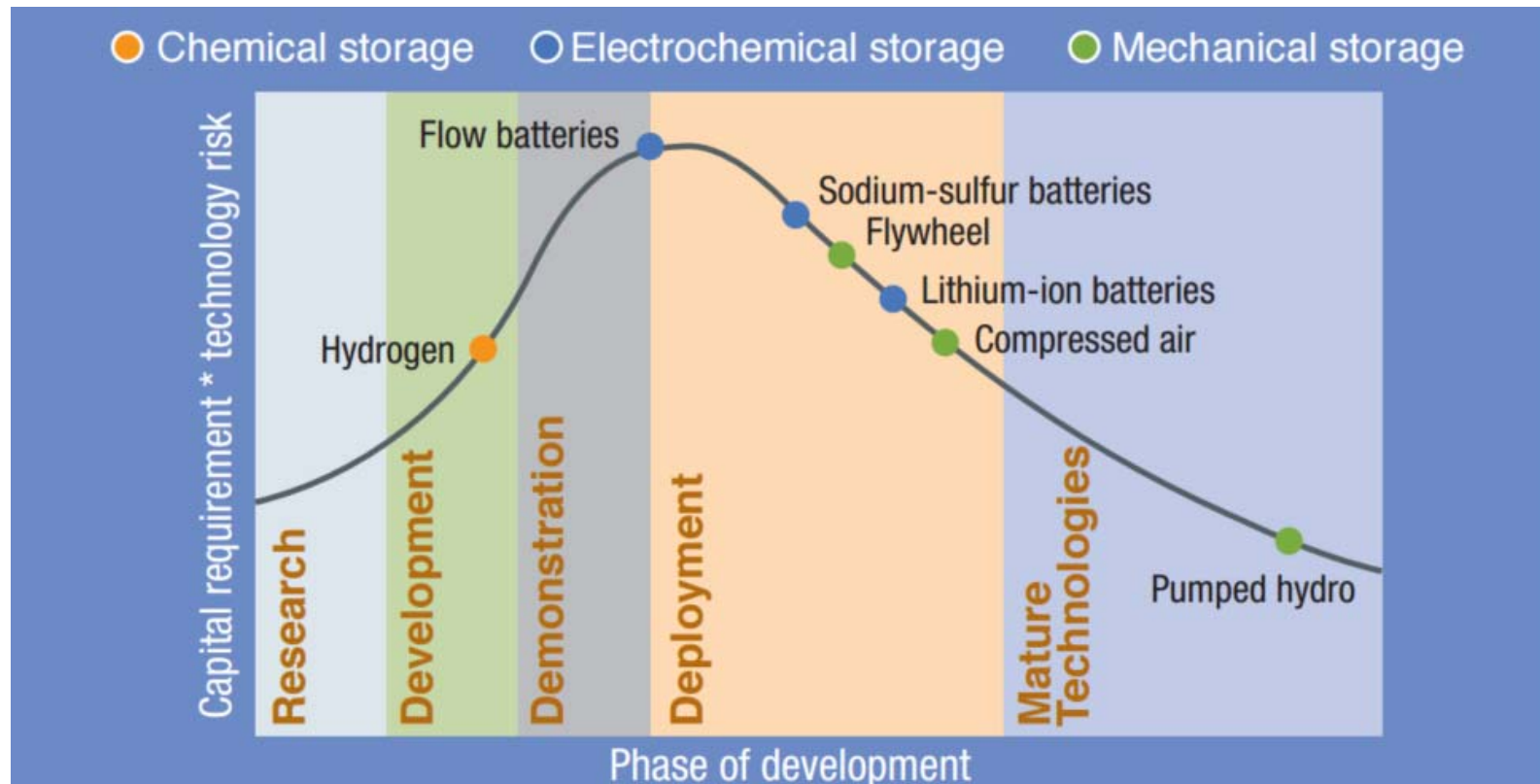
What are the current utility behind-the-meter battery-storage pilots and programs?

The Vast Majority of Existing Grid Energy Storage Is in Pumped Hydro



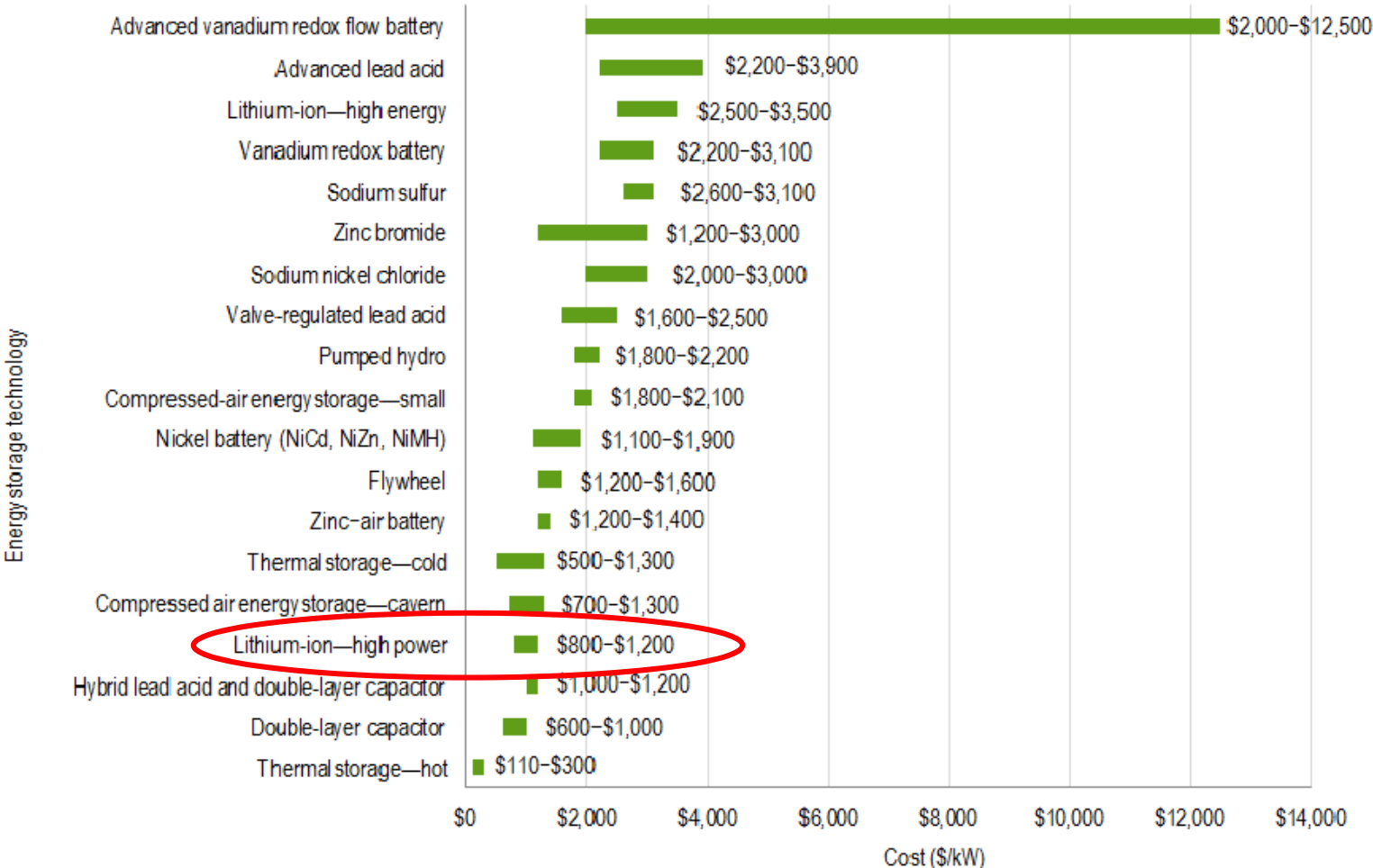
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Despite the Efforts, Battery Technologies Haven't Reached Market Maturity



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Lithium-Ion Batteries Among the Cheapest Storage Technologies

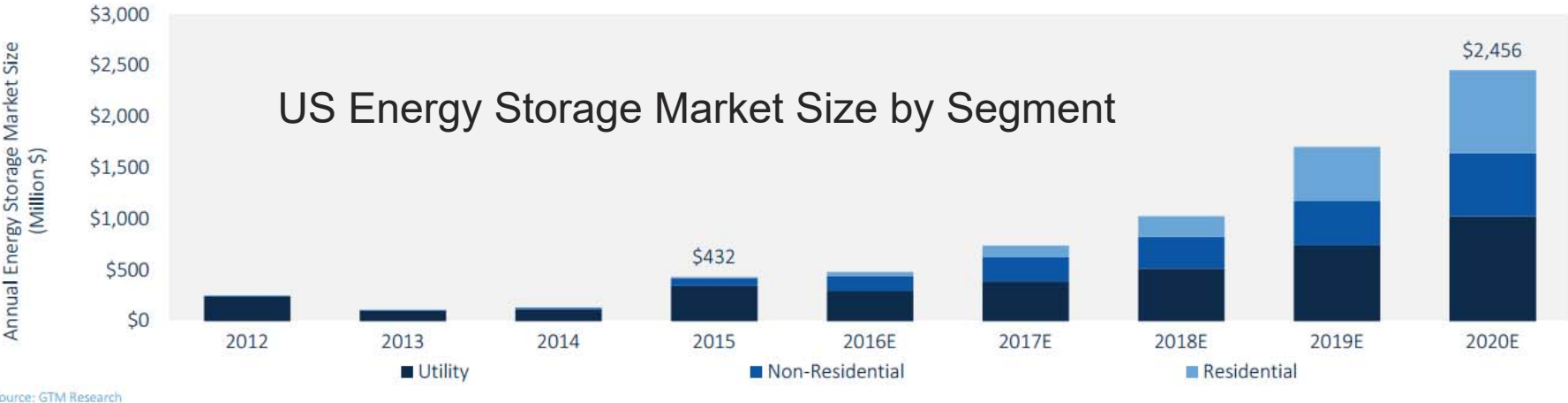
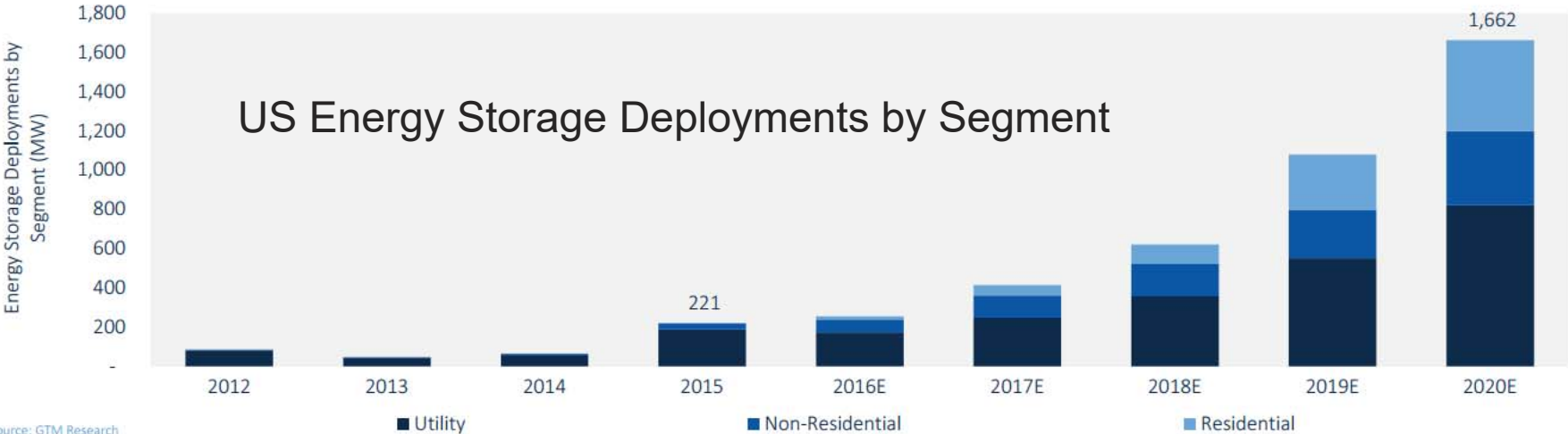


Notes: kW = kilowatt, NiCd = nickel cadmium, NiMH = nickel metal hydride, NiZn = nickel zinc.

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Significant Growth Expected in the US Market



Courtesy: GTM Research/ESA US Energy Storage Monitor: 2015 Year in Review



Behind-the-Meter Pilots and Programs for Battery Storage

Traditional rebate programs

- Load shifting
- Peak demand reduction
- Backup power

Technology pilots

- Integration of photovoltaics
- Demand-based rates
- Utility control

Behind-the-Meter Programs

| Utility | Program Name | Purpose | Description | Rebate/Incentive |
|---|------------------------------------|---|--|---|
| California Investor-Owned Utilities - Pacific Gas & Electric (PG&E), Southern California Edison (SCE), Southern California Gas (SoCalGas), San Diego Gas & Electric (SDG&E) | Self Generation Incentive Program | Customer load shifting (must be used for more than just backup) | This statewide program provides financial incentives for the installation of clean and efficient distributed generation technologies, including advanced energy storage systems. | \$1.31/watt |
| Con Edison and New York State Energy Research and Development Authority (NYSERDA) | Demand Management Incentives | Customer load shifting (program designed for system-coincident peak demand reduction) | The program seeks to achieve 125 MW of permanent peak-coincident electric load reductions by June 1, 2016 to prepare for the retirement of the Indian Point Energy Center, with battery storage one of several eligible measures. | \$600 per kW, with increased incentives of \$2,100 per kW for projects completed prior to June 1, 2016 |
| Green Mountain Power (GMP) | Tesla Powerwall | Customer backup power and utility peak load management | The program is designed to provide backup power to residential customers with a Tesla Powerwall and allows GMP shared access to discharge electricity from the battery back to the grid under peak load conditions for customers that agree. | 3 options: 1) Customers can purchase for \$6,501 and not share access with GMP 2) Customers can purchase for \$6,501 and choose to share access with GMP for a \$31.76 Monthly Bill Credit 3) Customers can rent for \$1.25 per day with shared access for GMP |
| Hawaiian Electric Company (HECO) | Customer Self-Supply | Customer load management to avoid PV systems exporting to the grid | One of two programs designed to replace net energy metering, this program enables customers to install PV systems that do not export power back to the grid. Customers can make use of energy storage devices (i.e. batteries) since all power produced must be used or stored to be used at a later time. | None, although customer self-supply systems are eligible for expedited review and approval of applications in areas with high levels of PV. |
| New Jersey's Clean Energy Program | Renewable Electric Storage Program | Customer load management | The program provides financial incentives for electric energy storage systems that are integrated with renewable energy projects installed behind-the-meter at non-residential customer sites. | \$300 per kWh of energy capacity |

Behind-the-Meter Pilots

| Utility | Pilot Name | Type | Purpose | Description | Ownership |
|--|---|------------------|--|--|--|
| Arizona Public Service (APS) | Solar Innovation Study - 75 | Technology Pilot | Testing integration of advanced technologies with demand-based rates | APS provides customers solar-plus-storage technologies plus other energy management technologies (advanced solar inverter, smart thermostat, load controllers, etc.) to test customer response to time-of-use rates and demand charges. | Utility-Owned for five year study, then transferred to homeowner |
| Pacific Gas & Electric (PG&E) | BMW i ChargeForward Program | Technology Pilot | Managed electric vehicle charging for demand response | This demand response pilot program involves PG&E notifying BMW the required load drop and BMW delaying electric vehicle charging up to one hour. Customer are communicated with via an app and can choose to opt-out if desired. | Customer Owned |
| Power Stream | Power.House | Technology Pilot | Customer backup power and utility peak load management | Power Stream installs solar plus storage where customers receive outage protection, and agree to let Power Stream control the charging and discharging of the system. The pilot is designed to test the customer, conservation, grid and utility business benefits. | 100% controlled, owned and operated by Utility |
| Sacramento Municipal Utility District (SMUD) | 2500 R Midtown | Technology Pilot | Utility load management | A partnership between SMUD, Sunverge Energy and Pacific Housing Inc. resulted in the construction of 34 single-family homes with solar and storage that are designed to be zero-net-energy. SMUD is testing the ability to monitor and control energy storage and sees the project as a research, development and demonstration project. | Customer Owned |
| Xcel Energy (Colorado) | Innovative Clean Technology-Stapleton Project | Technology Pilot | Utility load management | Xcel will install and test a series of batteries (6 on the customer side of the meter and 6 on the utility side) on an existing residential electric feeder that serves a neighborhood with a high penetration of PV. | NA |

Things to Watch

California Demand Response Auction Mechanism (DRAM)

- Green Charge Networks and Stem

California Energy Storage Mandate

- 1.3 gigawatts of storage by 2020

For More Information



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