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This system is AC integrated with a 350 kW rooftop PV system, and is primarily used to provide Demand Charge Reduction to the customer.

The combined solar + storage system **will reduce the customers utility bill by up to 80%.**



The Notrees Wind Storage Demonstration Project is a 36-megawatt energy storage and power management system. It shows how energy storage can moderate the intermittent nature of wind by storing excess energy when the wind is blowing and making it available later to the electric grid to meet customer demand. - DOE

The Stafford Hill Solar Farm combines solar, storage and micro-grid technology in an innovative new solar project to improve resiliency and safety in communities. According to the U.S. Department of Energy, The Stafford Hill Solar Farm is the first project to establish a micro-grid powered solely by solar and battery back-up, with no other fuel source.

This installation **saves Green Mountain Power customers \$200,000 in one hour** by reducing GMP's peak.





- Dynapower IPS-500
- 500 kW/222 kWh Lithium Battery
- Dynapower Controller
- Islanded Desalination Plant,
 - No Grid Tie
 - No Other Generating Sources!

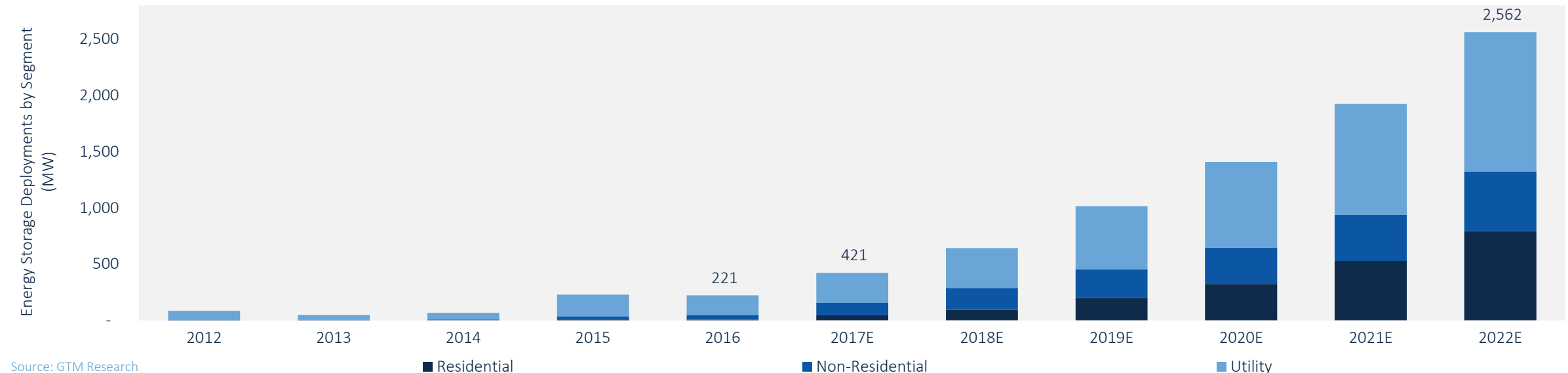




7. Energy Storage

4) U.S. Energy Storage Annual Deployments Will Reach 2.6 GW by 2022

U.S. Annual Energy Storage Deployment Forecast, 2012-2022E (MW)



- GTM Research expects the U.S. energy storage market to grow from 221 MW in 2016 to roughly 2.6 GW in 2022, almost 12 times the size of the 2016 market.
- The behind-the-meter segment will grow from a 20% share in 2016 to 52% of the annual storage market in 2022.
- California will further its dominance as the biggest storage market over the next five years, while markets like Hawaii, Massachusetts, New York and Texas will vie for the second spot. Falling storage costs will result in better economics for storage as a capacity resource and increase adoption in wholesale markets and across vertically integrated and distribution utilities.

1) Top Energy Storage Markets, 2016

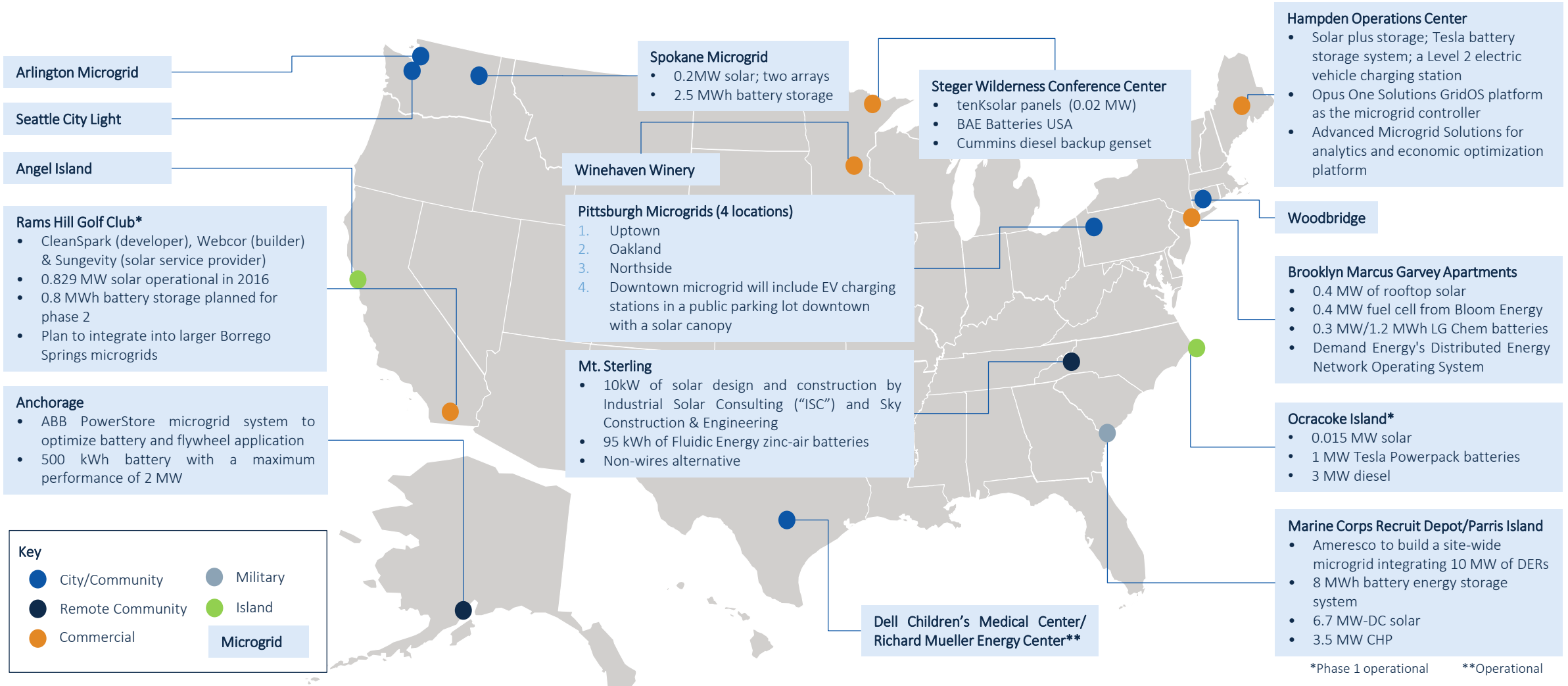
Top Three Markets by Segment in 2016 (Power Capacity)

Rank	Residential	Deployments (kW)	Rank	Non-Residential	Deployments (kW)	Rank	Utility	Deployments (MW)
1	All Others*	2,769	1	California	33,010	1	California	90.0
2	California	1,263	2	New Jersey	1,388	2	All Others*	65.2
3	Arizona	633	3	New York	1,200	3	PJM (Excl. NJ)	16.0

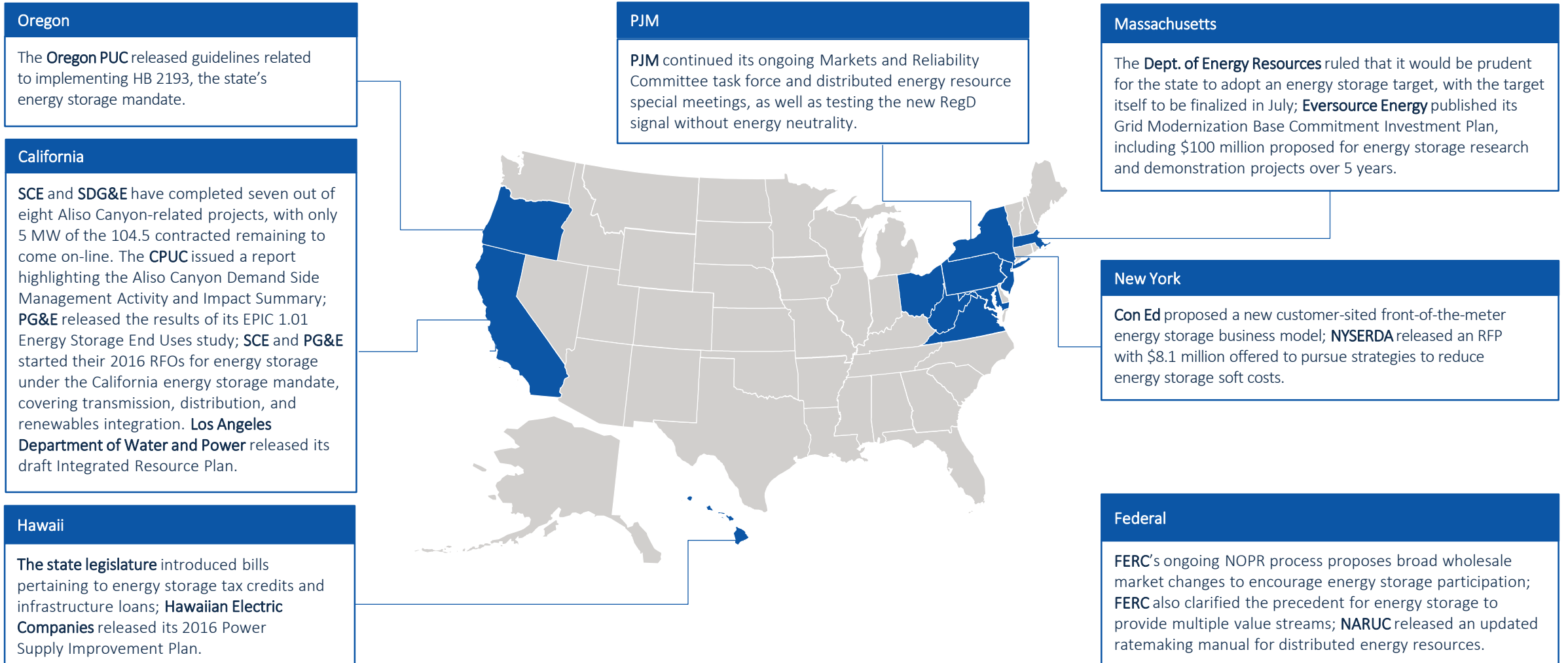
- California was the largest utility-scale market in 2016, dethroning PJM (excl. NJ), which held the position the year prior. California surged ahead in Q4 2016, entirely as a result of expedited deployments from the Aliso Canyon procurement. PJM (excl. NJ) dropped to third place, with an annual market of 16 MW in 2016 only a tenth the size of its 2015 market, 166.5 MW.
- California remained the largest non-residential market in 2016, growing 18% over 2015. The Self-Generation Incentive Program (SGIP) and high electricity prices continue to drive California's non-residential market, which was almost 24 times the size of the next largest market, New Jersey. Behind-the-meter energy storage procurements will aid California in retaining its dominance of the U.S. non-residential segment over the next few years.
- The residential market saw increased diversity in 2016, as storage system vendors began deploying projects in increasing quantities beyond the strongholds of Arizona, California and Hawaii, causing Other Markets to lead 2016. However, these individual markets are quite small. California remained the largest single-state market in 2016, a position it is unlikely to relinquish in the near future given a combination of the SGIP and shifts to new net-energy metering rules including time-of-use rates.

*GTM Research is currently monitoring eight individual markets: Arizona, California, Hawaii, Massachusetts, New Jersey, New York, PJM and Texas.

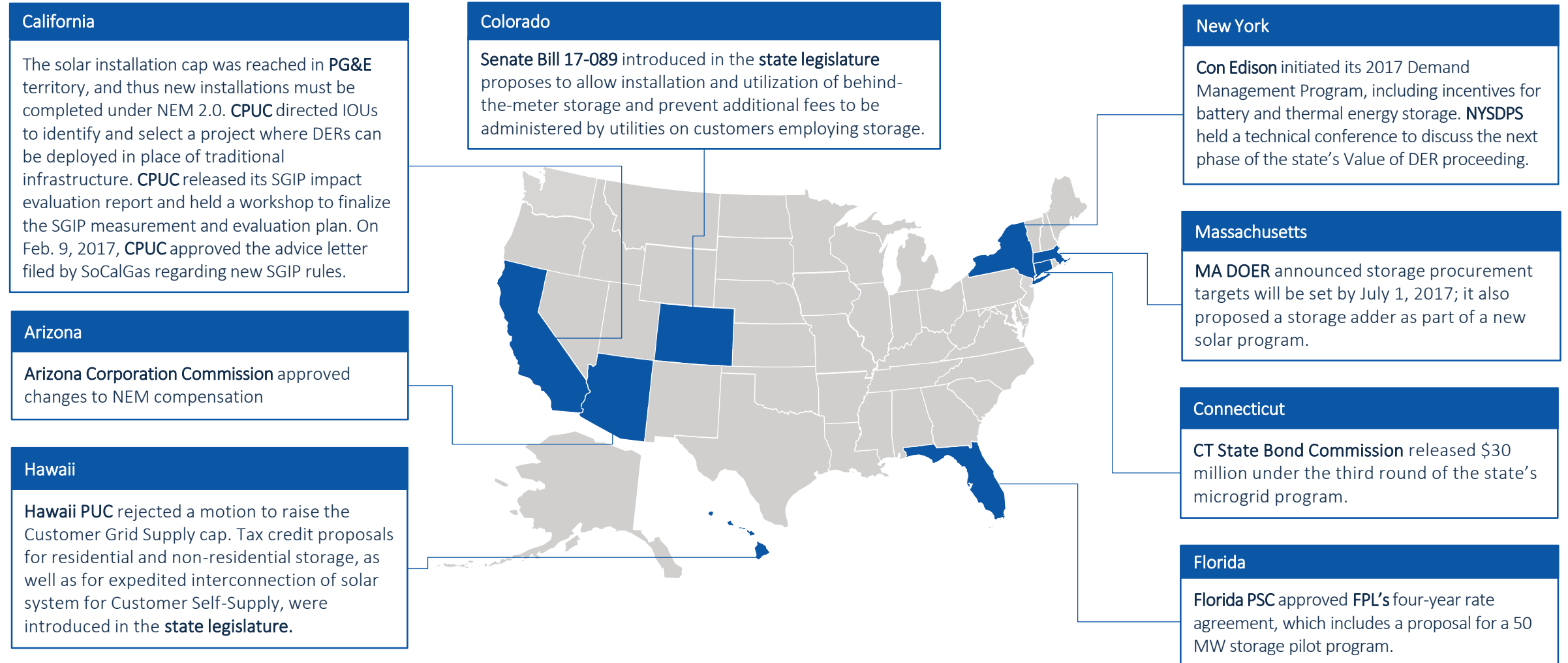
16 of 19 Newly-Tracked Planned and Operational Microgrid Deployments Include Storage



2) Front-of-the-Meter Policy and Market Developments, Q1 2017



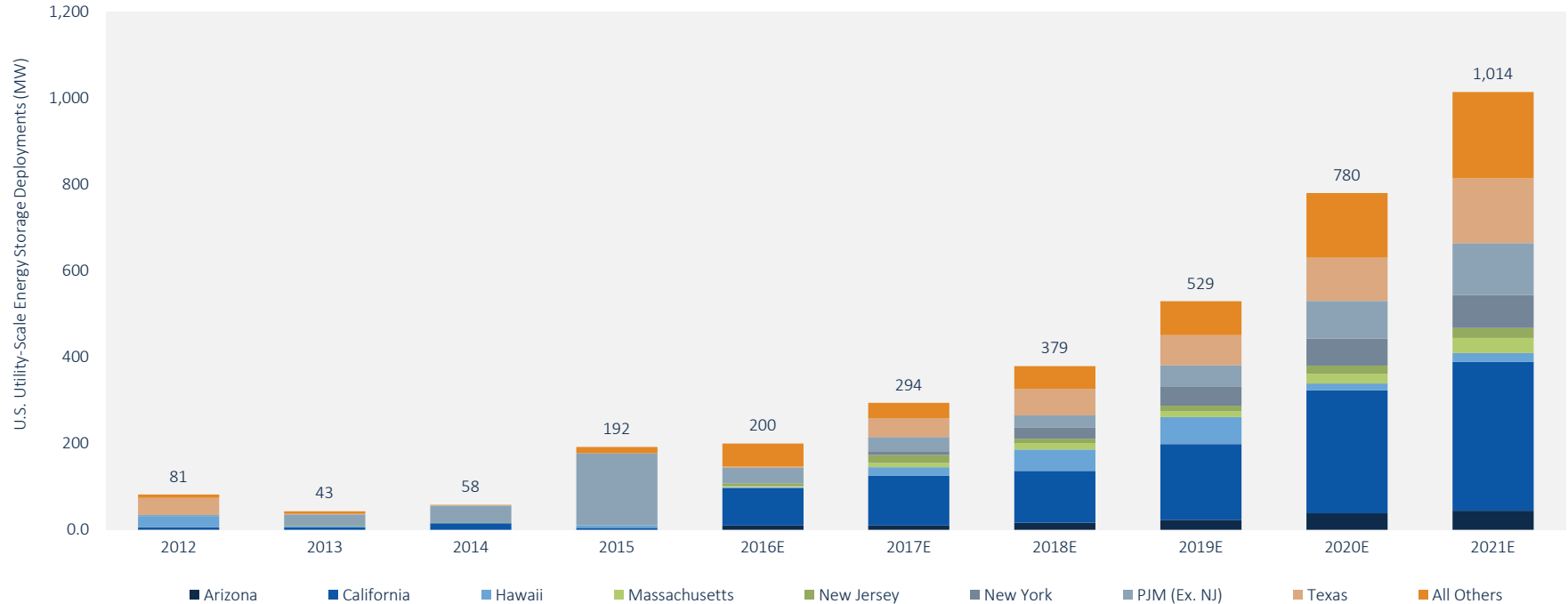
2) Behind-the-Meter Policy and Market Developments, Q1 2017



4. Utility-Scale Market Trends

Utility-Scale Market Outlook (MW)

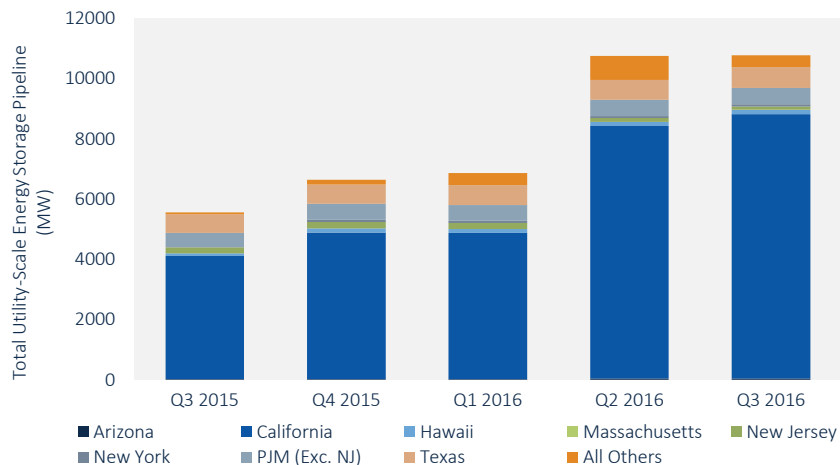
U.S. Annual Utility-Scale Energy Storage Deployment Forecast, 2012-2021E (MW)



Source: GTM Research

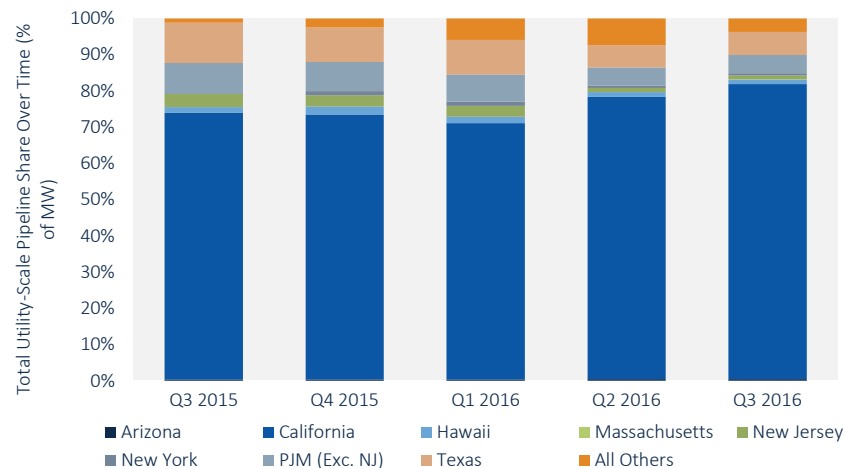
U.S. Utility Energy Storage Pipeline Over Time

U.S. Utility-Scale Energy Storage Pipeline by Market Over Time (MW)



Source: GTM Research

U.S. Utility-Scale Energy Storage Pipeline Market Share Over Time (%)



Source: GTM Research

- California continues to represent the majority of the utility-scale energy storage pipeline, increasing its share from 74% in Q3 2015 to 82% in Q3 2016.
- In Q3 2015, 99% of the U.S. pipeline was made up of projects from only six markets: Arizona, California, Hawaii, New York, PJM and Texas. Markets not on this list increasingly make up a significant share of the U.S. energy storage pipeline, representing 4% of the larger Q3 2016 pipeline. Large projects under consideration in Maine, Michigan, Minnesota and Puerto Rico, among others, show an expanding interest in utility-scale storage.
- As other states have expanded their pipelines, Texas has seen its pipeline share shrink, falling from 11% in Q3 2015 to 6% in Q3 2016.
- PJM saw a similar decline, falling from 9% of the market pipeline to 5%, as its project queue remained relatively stable at 545 MW, only a 67 MW increase from Q3 2015.

The Golden State Continues to be the Gold Standard for Utility-Scale Energy Storage

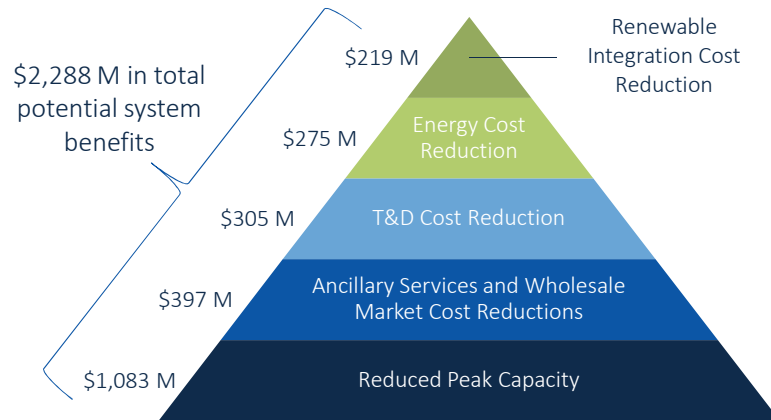
- California has once again taken significant steps forward in Q3 2016, with action taking place at the ISO level, the utility level, and in the legislature. This embrace of energy storage across decision-makers and stakeholders in the state is unprecedented in the United States, and has been cited by other states and even the United Kingdom as a model to follow. Significant activity took place in Q3 2016, including:

CAISO	Utility	Legislature
<ul style="list-style-type: none">In August 2016, FERC approved revisions to CAISO's tariffs further recognizing energy storage's unique nature.CAISO updated its "non-generator resource" category, the primary mechanism through which energy storage participates, to allow resources to submit their state of charge as a bid parameter in day-ahead markets.This ability to self-manage their state of charge when bidding will allow energy storage resources to more dynamically optimize their activity and participate more fully in the day-ahead market.This marks another example of CAISO listening and adapting to stakeholder feedback, responding quickly to energy storage's unique value proposition.	<ul style="list-style-type: none">The Aliso Canyon energy storage procurement has dominated the news cycle in the past several months.SCE has been the leader among the California utilities, procuring storage through the Aliso Canyon and local capacity requirements processes, but also awarding 70 MW of front-of-the-meter resources through its Preferred Resource Pilot.While California utilities have responded with speed to energy storage procurement requirements, it is unclear how much appetite they have for projects on their own merit.The storage target expansion specifically citing a target "up to" will show how much value utilities see in storage in a vacuum.	<ul style="list-style-type: none">California's state legislature continues to embrace energy storage, passing four bills in Q3 2016 that directly promote it, two of which impact front-of-the-meter applications.AB 33 directs the Public Utilities Commission to analyze the potential for bulk energy storage to help integrate renewable generation, a clear signal that storage could play a larger role in the state's ambitious 50% renewable portfolio standard.AB 2838 authorizes up to 500 MW of additional energy storage across the state's three main utilities, with 75% directed to come from front-of-the-meter applications.Lawmakers clearly see energy storage as a key piece in their clean energy goals, and have collaborated closely with CAISO when they cite "unprecedented changes" as a driver to act.

Massachusetts: Following in California's Footsteps?

- For the second time we may be seeing a state moving to follow California's example through legislature-driven and large-scale energy storage targets, with Oregon's procurement mandate (HB 2193) being the other recent example. Massachusetts' bill H 4568 gives the Department of Energy Resources (DOER) until the end of the year to decide whether to set an energy storage procurement target; if they move forward, it is likely to be on the order of several hundred megawatts by 2020, making it the second largest in the country.
- Concurrently, a study team commissioned as part of the Energy Storage Initiative and in consultation with the DOER and the Massachusetts Clean Energy Center (MassCEC) released the *State of Charge* report, which recommends a 600 MW target by 2025 to capture what it calculates to be \$800 million in benefits to ratepayers.

Potential System Benefits Highlighted by State of Charge



Source: State of Charge Report – Massachusetts Energy Storage Initiative

Potential Barriers, Opportunities, and Next Steps for Massachusetts

- Engaging ISO-NE in the stakeholder process is a crucial next step for Massachusetts. California owes a large portion of success to a close working relationship with CAISO, and if Massachusetts is to emulate that success, it must do the same with ISO-NE. To put the necessity of this in context, more than half of the benefits cited by the State of Charge report require wholesale market participation.
- Much still depends on the decision the DOER will make later this year on whether to set a storage target and, if so, how high to set it. A figure of around 300 MW would be proportional to California's target, and would show that policymakers are looking to that state as an example.
- Massachusetts reached another milestone this quarter, as the Sterling Municipal Light Department broke ground on a 2 MW project which would be the largest in the ISO-NE footprint and the first utility-scale battery storage project in Massachusetts. The system will provide enhanced resiliency and solar energy integration to the town.

The Common Thread – Wholesale Markets. Will FERC Take Action?

- For the past several years, adoption of utility-scale systems has been driven by the frequency regulation market in PJM, and specifically, the adoption of the RegD signal designed to make use of high-power, low-energy battery storage systems. Once a temporary cap was put in place, however, installations slowed.
- Well-defined resource types, as well as clear recognition of energy storage's unique nature as an energy-limited resource, are critical to market growth, as seen in the success stories of CAISO and PJM. Not all system operators are moving at the same pace, however.
- PJM announced in October its intention to pursue FERC approval for a seasonal capacity solution that would facilitate aggregation among resources, signaling that it sees this mechanism of aggregating seasonal resources as the best for the system despite a majority of stakeholders opposing the proposal.
- ERCOT released a presentation in June breaking down three potential categories for distributed energy resources to participate in wholesale markets, including a "DER Heavy" category which would be allowed full participation in the region's energy and ancillary services market.
- A recently installed project in Indiana provides a perfect case study for the complicated relationship between developers and system operators, as Indianapolis Power & Light (IPL) filed a complaint with FERC stating that "the MISO Tariff is unjust and unreasonable, unduly discriminatory and preferential," suggesting adopting rules similar to PJM's RegD market in the interim to ensure payments are received when the battery charges to respond to excess supply.
- While incremental changes have been the norm in wholesale markets lately, filings such as this show that the issue is coming to a head, and will likely require FERC to weigh in.

FERC Poised to Take a Leading Role

- A technical conference held November 9 on "Utilization in the Organized Markets of Electric Storage Resources" examined storage's role as a grid asset and a distribution asset, and its ability to provide multiple services.
- The conference covered a range of subjects, and served more to establish baseline stakeholder assessment of energy storage's potential role and recommended directions for regulation than to establish any next steps.
- Of particular note was discussion of compensation for energy storage, an issue at stake in IPL's complaint to FERC over MISO's tariff structure. Some panelists expressed worry that designing tariffs around energy storage could give it an undue competitive advantage over other resources, while others suggested tariffs designed in this manner are the only way to ensure energy storage is reimbursed properly for the whole suite of services provided to the grid.
- There was little consensus on multi-use cases for energy storage aside from the industry's assertion that market-based systems could allow value stacking with limited regulation and operator concern that without oversight and prioritization, assets may not behave in an optimal fashion.
- It was a positive sign for the industry to see market designers and participants sitting down and finding common ground. If the end result of continued FERC activity in this and AD 16-20 is a set of broad regulations, then energy storage could experience exponential growth as new markets and multiple use cases enable deployment across a broader range of regions and applications.
- FERC discussed dockets AD16-20 and RM16-23 at a November 17 meeting, and issued a notice for proposed rulemaking (NOPR) to open up wholesale markets for energy storage and aggregation. This will be covered in the next edition of the U.S. Energy Storage Monitor.

3) Five Trends in Store for 2017

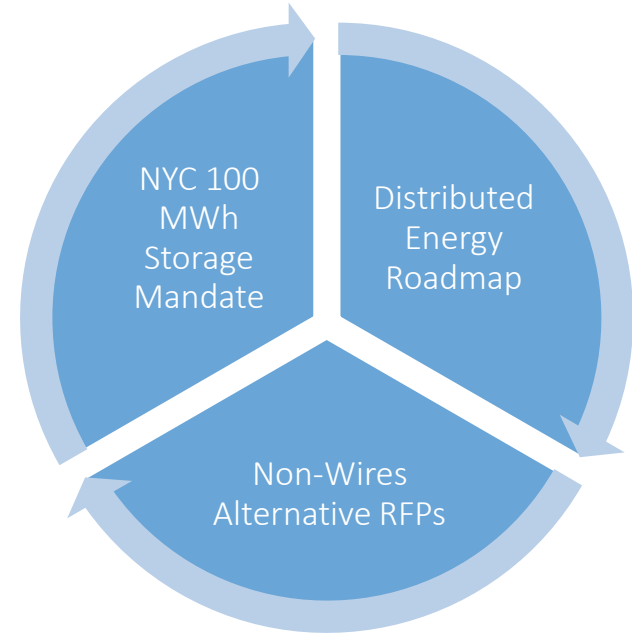
For multiple reasons, 2016 was a watershed year for energy storage in terms of megawatt-hours of storage deployments. Now the industry is gearing up for new challenges against the backdrop of a new presidential administration. To assume that 2017 will be any less critical of a year for energy policy and market changes would be incorrect. As the new Trump administration fills its energy and environment teams, it will be a source of immense anxiety in the energy community. At the time of writing this report, Scott Pruitt was confirmed to lead U.S. EPA, while the nomination of Gov. Rick Perry for U.S. DOE had gone through confirmation hearings, but hadn't been voted on by the Senate. Without staffing of the two most relevant federal agencies, and a lack of detailed White House energy agenda, it is still premature to speculate about which federal policies will directly (or indirectly) impact energy storage markets. Moves by the DOE and the EPA, as well as actions taken by the Congress and the executive branch, will be the central theme this year. Beyond the more prominent activities at these agencies that may dominate the news cycle, there are several other federal, state and regional energy storage trends to keep an eye on (arguably more closely) in 2017. The activities to watch for in 2017 are:

- The future of the Federal Energy Regulatory Commission's notice of proposed rulemaking on electric storage participation in RTO/ISO Markets
- California's Aliso Canyon energy storage performance
- State storage mandates: Massachusetts and Oregon setting targets and second-round procurement in California
- Increasing role of energy storage in resource planning and utility procurement
- Dispatchable solar and microgrids

The Wild Card: New York

- New York represents a market in flux. The state's Reforming the Energy Vision (REV) initiative acknowledges that "the electric industry is in transition," but none of the proposals put forward go far enough to establish a functioning and mature front-of-the-meter energy storage market in the state.
- Despite a broad, overarching vision and a recognition of the need for change, the market remains a maze of stakeholders and proposed changes. This complexity mirrors the fact that no one technology can exist in a vacuum anymore, but the scale of the undertaking has resulted in a multitude of divergent approaches with the hope that they will dovetail into a comprehensive overhaul.
- Front-of-the-meter energy storage could benefit from NY's distributed energy roadmap, the New York City 100 MWh of energy storage by 2020 mandate, and non-wires alternatives RFPs, but none of these provide a cohesive market structure that would allow utility-scale storage to flourish.
- The question remains whether these divergent proposals will result in true movement toward a utility-scale-storage-friendly environment. For now the question remains unanswered, though with more guidance and structure (particularly from NYISO), New York has shown it has the appetite and the top-down mandate to make energy storage work.

New York's Reforming Energy Vision: Varied Proposals Circling the Core Issues

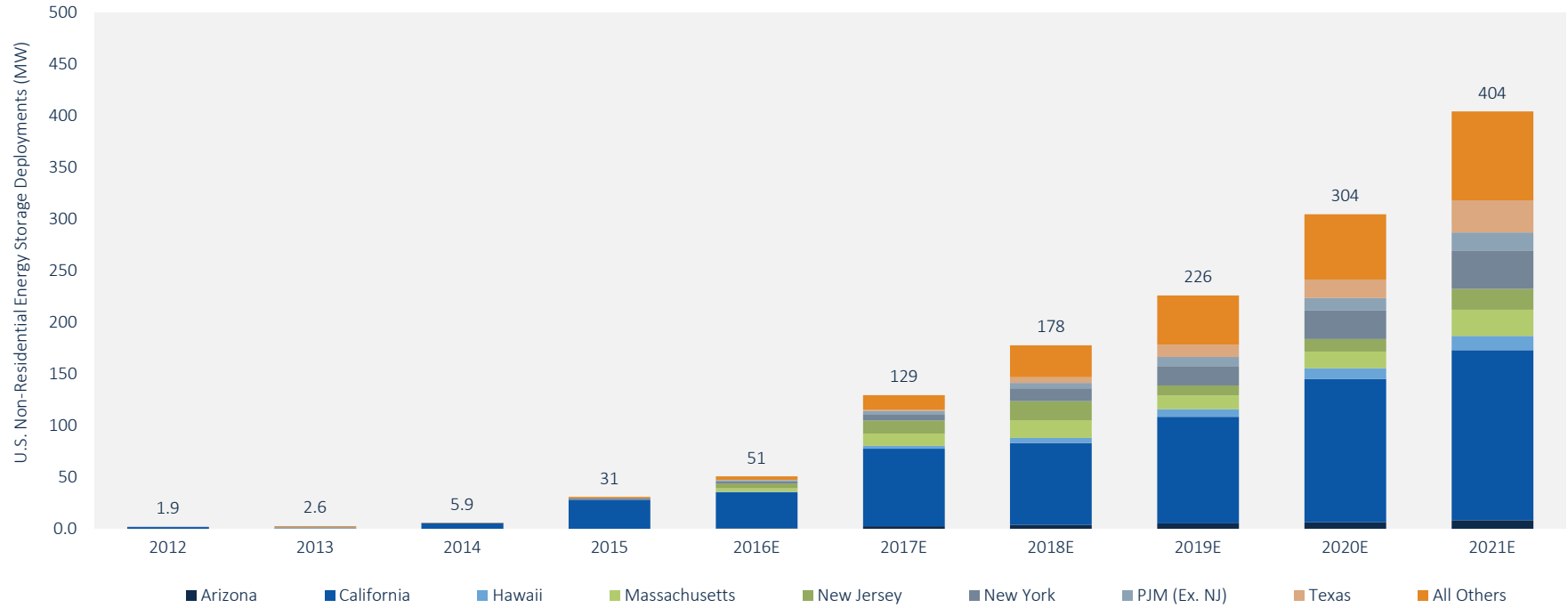


Source: GTM Research

5. Behind-the-Meter Market Trends

Non-Residential Market Outlook (MW)

U.S. Annual Non-Residential Energy Storage Deployment Forecast, 2012-2021E (MW)



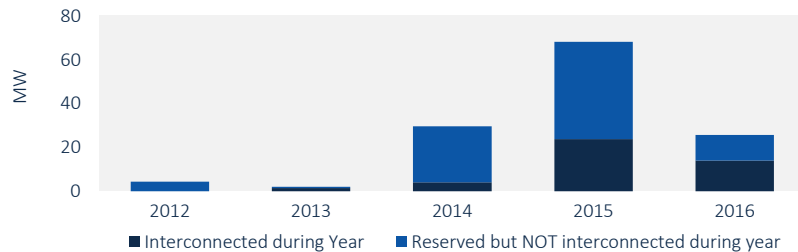
Source: GTM Research

California Non-Residential Market Developments

CPUC: Self-Generation Incentive Program

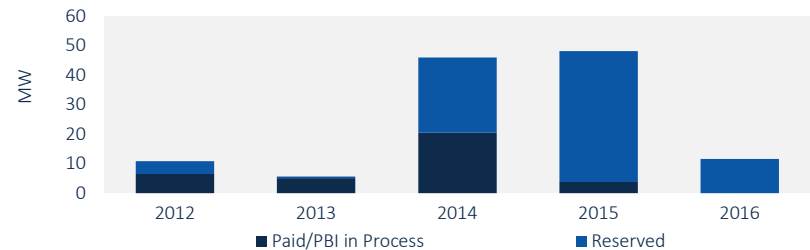
- The 2016 incentive for advanced energy storage is \$1.31 per watt (down from \$1.46 per watt in 2015) for up to 60% of eligible project costs. A shift to the new incentive structure based on \$/Wh is expected to occur in early 2017 once 50% of the 2016 program budget is exhausted and the CPUC approves the IOUs' advice letter; at this time, the average system discharge duration is expected to increase.
 - Projects receive the full incentive for up to 1 MW of capacity; larger projects receive 50% for capacity between 1 MW and 2 MW and 25% for capacity between 2 MW and 3 MW
 - Projects under 30 kW receive an upfront incentive; projects over 30 kW receive 50% upfront and 50% via a performance-based incentive
- As of late October 2016, 306 non-residential energy storage projects totaling 40 MW had received at least the 50% upfront incentive; an additional 86.3 MW across 507 projects had reserved funding; 44.4 MW of total capacity has been interconnected. The program has received 665 applications in 2016; 109 projects totaling 11.6 MW have reserved funding as of late October 2016.
- The SGIP queue continues to clear, and companies are progressively developing non-residential storage projects in light of the incentive. SGIP will remain a key driver of California's behind-the-meter storage market for the next few years, but as the business case for non-residential storage improves and financing becomes more readily available, players will increasingly pursue projects without the SGIP, given the increased project timeline required. Furthermore, utility procurements under programs like PRP and LCR are ineligible for SGIP, thus as utility procurements of non-residential storage rise, there will be an additional move toward non-SGIP non-residential energy storage projects.

Interconnected vs. Reserved Capacity by Year (MW)



Source: CPUC (SGIP), GTM Research

Paid vs. Reserved Capacity by Year of SGIP Application (MW)



Source: CPUC (SGIP), GTM Research

Non-Residential Market Outlook: Applications

GTM Research analysis suggests that there will be three broad application areas for non-residential energy storage: demand-charge management, resiliency and backup, and grid and wholesale market services

Demand-charge management: A majority of commercial and industrial customers pay as much as 50% of their electricity bills in demand charges. Energy storage offers peak demand-reduction opportunities, leading to 20% to 30% electricity bill savings in many cases. Markets with high demand-charge tariffs (upward of \$15/kW to \$30/kW) represent a particularly attractive opportunity already, and by 2021, we anticipate even markets with tariffs of \$11/kW and above will start to look attractive.

Resiliency and backup: Commercial and industrial customers can be sensitive to outages due to expensive equipment and critical facilities. States in the Northeast have established programs to increase grid resiliency, and states in the Northwest are pursuing resiliency policies, relying on energy storage along with other upgrades. However, customers with existing backup power needs may already possess this type of infrastructure in the form of diesel generators, in which case the value proposition for storage requires an additional benefit such as electricity bill reduction or reducing carbon emissions.

Grid and wholesale market services: California utilities have been at the forefront of exploring the use of energy storage for grid services, including demand response, ancillary services and local capacity. In September 2016, SCE awarded 50 MW of contracts for demand response from non-residential energy storage and energy conservation under utility's Preferred Resources Pilot program. The New York REV initiative has entered into its demonstration phase, in which several pilot projects involve energy storage. Hawaii recently introduced a demand response plan that proposes four grid services for which it could procure energy storage and other distributed resources.

California Remains the Behind-the-Meter Leader With More Utility Contracts

California remains the leader in the U.S. behind-the-meter energy storage market, both in terms of total megawatts deployed and policies that directly support the state's energy storage market. Behind-the-meter storage increasingly has a role to play in programs to provide grid services, and the outcome of policy decisions made today are priming behind-the-meter storage to play a more significant role in future grid modernization planning.

- **Second Round of SCE's Preferred Resources Pilot:** In September 2016, SCE announced 125 MW worth of contracts under its second round of the PRP program, which seeks to explore how distributed energy resources can support the electric grid. Behind-the-meter (BTM) awards included 40 MW from Advanced Microgrid Solutions (non-residential), 10 MW from NextEra (non-residential) and 5 MW from Swell Energy (residential). Procurements of this type indicate that electric utilities such as SCE are exploring the potential of aggregated BTM storage to supply value to the grid, such as via load reduction. As distributed energy resources such as behind-the-meter storage deployments increase, utilities are increasingly expected to seek to aggregate and dispatch these resources; in order for this type of plan to be feasible, utilities must start exploring the potential of these resources at smaller scale, before they become ubiquitous or risk missing an opportunity or, worse, have to deal with potential challenges that arise as DER deployment reaches critical mass. Results of SCE's PRP will provide useful results for other utilities examining use cases for aggregated BTM energy storage.
- **AB 1637:** In August 2016, the California State Legislature proposed amendments to AB 1637, which were approved by the governor in September 2016. The bill doubles the maximum annual collection the CPUC may authorize for the Self-Generation Incentive Program (SGIP) compared to the amount authorized for the 2008 SGIP, authorizing an additional \$249 million for the program. Though SGIP funds technology other than storage, policies approved in June 2016 created a 75% carve-out for energy storage, meaning that the majority of this funding will go toward energy storage. California's BTM storage market is the largest in the U.S. today, which is largely attributable to the SGIP. Increasing SGIP funding will directly influence greater BTM energy storage deployment, particularly as system prices continue to fall. However, SGIP funds historically have been exhausted quickly, and the increase in funding is likely to simply increase the near-term deployment of storage rather than extend the length of the program, as even this higher budget is expected to be rapidly subscribed. As of late October 2016, 126 MW of non-residential storage and 2.3 MW of residential storage had either received or reserved funds from SGIP; doubling the funding, coupled with storage price reductions, will lead to an additional 50+ MW for BTM storage compared to the previous scenario, with an especially strong upside for the residential segment, which has a 15% carve-out under rules expected to be implemented in early 2017.

A Quartet of Assembly Bills Further Storage Gains in the Golden State

- **AB 2861:** In September 2016, AB 2861 was approved by the governor. AB 2861 authorized the CPUC to set an expedited distribution grid interconnection dispute resolution process and resolve disputes within 60 days. The 60-day interconnection dispute resolution requirement will make the SGIP approval cycles much faster. While interconnection delays are not the only cause of long SGIP project backlogs, the average number of days for SGIP applications to get interconnected has been at least 300 days for projects under program year 2015, a large drop from the 900+ days for program year 2011. AB 2861 will reduce interconnection uncertainties that tend to add to soft costs and create barriers for wider adoption of behind-the-meter energy storage.
- **AB 2868:** AB 2868, approved by the governor in September 2016, effectively creates an additional maximum 500-megawatt mandate for the three California IOUs (PG&E, SCE and SDG&E). These storage systems will have to be located on the distribution grid, and not more than 25% (i.e., 125 MW) will be behind-the-meter, with prioritization to investments for public-sector and low-income customers. This program may rely on SGIP funds, but that is yet to be determined. Regardless, this new mandate will lead to a significant upside in behind-the-meter energy storage in Calif. in the early 2020s, as storage procured under the California storage mandate AB 2514 must be installed by 2024.
- **Resolution E-4803:** In September 2016, the CPUC issued a resolution, with modifications, to approve 2017 Demand Response Auction Mechanism (DRAM) contracts for PG&E. CPUC approved 14 contracts, but required PG&E to procure either up to its DRAM budget cap of \$6 million or to a point where there are clear outlier bids. Energy storage companies have won contracts under DRAM, and thus it is possible that PG&E could procure additional energy storage under DRAM, though storage is unlikely to account for more than a few megawatts.

California's Modified SGIP Set to Take Off Early Next Year

SGIP Advice Letter: In October 2016, SoCalGas filed an advice letter on behalf of PG&E, SCE and the Center for Sustainable Energy regarding new rules for the Self-Generation Incentive Program. The advice letter included proposed revisions to the SGIP.

Recommendations affecting energy storage include the total amount of funds set aside for the residential energy storage carve-out that will be accounted for across the four program administrator territories; the incentive step decline increasing from \$0.05/Wh to \$0.10/Wh if an incentive step is fully subscribed across all program administrator territories within 10 calendar days of opening; program administrators being unable to issue conditional reservations to a developer that has already received reservations in the active step of 20%; commercial storage systems being required to discharge the equivalent of 130 full discharges/year and residential systems being required to discharge the equivalent of 52 full discharges/year; priority selection in the SGIP lottery for storage systems paired with onsite renewables that charge 75% from the renewables, systems located in LADWP territory and systems located in West Los Angeles Local Reliability Area of Southern California Edison's service territory; and declining incentive structures for long-duration storage projects. The advice letter is awaiting approval by the CPUC, and implementation of the new SGIP rules is expected in Q1 2017.

New program rules are expected to benefit the energy storage market in Calif. by increasing competition, and they are expected to lead to an increase in the average discharge duration of behind-the-meter systems, though this will be somewhat tempered by rules regarding incentive step-downs for longer-duration systems. If changes to the allocation of funds for the residential storage carve-out are approved, then it's possible residential storage capacity could be more concentrated in one or a few regions, given the lack of requirement for each program administrator territory to adhere to the 15% carve-out.

Massachusetts Takes Charge with 'State of Charge' Study

Massachusetts has historically seen little energy storage market activity, particularly in the behind-the-meter segment. However, recent market developments position Massachusetts to become a significant market for energy storage in the next few years, though this outcome depends on final policy decisions to be made within the next six-12 months.

- **State of Charge Massachusetts Energy Storage Initiative Study:** In September 2016, the Massachusetts Department of Energy Resources (MA DOER) issued the study performed in collaboration with independent consultants. It analyzed the potential for energy storage in Mass. to fulfill multiple niches and found that 1,766 MW of advanced energy storage would maximize ratepayers' benefits, though it only recommended 600 MW be pursued by 2025, which is expected to result in \$800 million in ratepayer benefits; this disconnect results from the fact that 1,766 MW represents the ideal degree of ratepayer benefits without market barriers, while 600 MW follows from the policy recommendations outlined in the study. The report creates a framework for energy storage policy in Mass., and recommends a suite of policies to support energy storage, including incentive and rebate programs, and storage-specific rules for retail and wholesale market participation. The study will inform the upcoming state storage mandate (to be decided on by December 31, 2016), the \$10 million energy storage demonstration project RFP (to be issued in November 2016) and potentially update the MA Solar Initiative to include storage (timeline unclear). The study notes that behind-the-meter storage can provide multiple benefits to the host customer (e.g., electricity bill reduction) and the electric system (e.g., increased renewable integration). The study also notes the value of utility aggregated behind-the-meter systems to provide grid services, and it seems likely Mass. utilities will pursue DER aggregation pilots within the next one to two years. The launch of the study will likely influence greater provision of storage-centric policies in Massachusetts and encourage storage developers to deploy projects in the state, leading to an upside for the market as a whole.
- **Advancing Commonwealth Energy Storage (ACES):** The ACES program is an energy storage RFP developed jointly by MA DOER and the Massachusetts Clean Energy Center (MassCEC). Program budget was approved in September 2016, with \$10 million for storage projects and \$1 million for monitoring performance. The RFP is expected to be released in November 2016 and will seek energy storage projects to demonstrate multiple value streams. MassCEC expects ACES to fund 10 to 15 small-scale energy storage projects in order to understand different business models, with \$100,000 to \$1 million offered per project. Given the size of the program, and an expected 50% cost share from program awardees, as well as expected cost reductions, the RFP could result in up to 22 MWh of behind-the-meter energy storage in Massachusetts, a significant amount considering that to date less than 1 MWh of behind-the-meter storage is operating in the state.

Massachusetts DOER Has the Task of Setting Storage Targets

- **Potential Storage Mandate by End of 2016:** In August 2016, H. 4568 was signed into law. Under H. 4568, MA DOER will determine whether to set a storage procurement target by December 31, 2016, with procurement required by January 1, 2020. If pursued, procurement targets will be determined by July 1, 2017 and will be evaluated at least once every three years. The bill also permits utility ownership of storage. Given the results of the *State of Charge* study and opportunities for storage in Massachusetts, the procurement target may be up to 600 MW, though much of the target is expected to be for front-of-the-meter projects.
- **MA Solar Initiative May Include Storage:** In September 2016, MA DOER presented a suite of proposals for the next phase of the MA Solar Initiative, including a provision for solar-plus-storage projects, with a goal of encouraging co-located renewables and energy storage. This would take the form of an incentive adder for solar PV projects that add energy storage; however, to date the size of the incentive has not been determined, though example incentives in the presentation range from \$0.03/kWh to \$0.05/kWh. Implementing a storage adder would contribute to an upside in storage deployed on both sides of the meter, albeit with the specific size of the increase dependent upon the level at which the incentives are set and the rate of energy storage system price reductions.

New York City the First in Nation With Storage Target

New York is in the process of transitioning the state's electrical infrastructure via its Reforming the Energy Vision (REV) program. Already, a number of initiatives have included a behind-the-meter energy storage component either explicitly or implicitly, including the Brooklyn-Queens Demand Management Program and the Clean Virtual Power Plant pilot. Electrical congestion and high demand charges are pressing issues in New York City, though to date, fire and building codes have hampered the growth of the storage market. Nevertheless, New York continues to explore policies and programs that will push storage forward.

- **New York City Storage Target:** in September 2016, Mayor Bill de Blasio announced an energy storage target for New York City of 100 MWh by 2020. Energy storage has a clear role to play in New York City, an area with high electricity demand, grid congestion and aging infrastructure. To date, there has not been a specific distinction for how much of this storage will be behind-the-meter versus front-of-the-meter, though perhaps projects like the 12 MWh Distributed Energy Storage System under the Brooklyn-Queens Demand Management Program will be counted toward the target; it is likely that a significant share will be behind-the-meter given electricity demand and the desire for greater resiliency, particularly of critical infrastructure. NYC experienced electrical outages following Hurricane Sandy in late 2012, and thus prioritizing greater resiliency is a key focus of the city going forward. This policy also marks NYC as the first city in the U.S. to set an energy storage target, and it seems likely that other cities hoping to address similar challenge will follow in NYC's footsteps in the next several years.
- **Value of DER Straw Proposal and Staff Report/Recommendations (Case 15-E-0751):** In August 2016, the New York State Department of Public Service (NYSDPS) issued a straw proposal regarding the valuation of distributed energy resources (DERs), focusing on the adoption of an interim valuation methodology to be implemented in advanced of a refined DER valuation methodology to be adopted by December 31, 2018. In October 2016, the NYSDPS issued a Staff Report and Recommendations regarding DER valuation. Though the report does not focus solely on storage, the ongoing discussion in NY around "the value of D," that is, the value that DERs provide to the grid, is ongoing, and the report suggests developing a proposal in early 2017 to inform commission action on storage not paired with NEM-eligible generation. Determining an adequate valuation of DERs has massive implications for storage, as several key value streams include reducing strain on the grid at specific nodes. Therefore, determination of a value for DERs can spur additional storage deployment in the 2019 and beyond timeframe depending upon the level set. Furthermore, future proceedings addressing specifically how storage will be accounted for are key for influencing the role energy storage can play as New York pursues grid modernization programs.

Other Notable Behind-the-Meter Market Developments

Several other state markets experienced market developments affecting the state's energy storage market. New Jersey, like much of the Northeast, is focusing on increasing resiliency, with storage offering one avenue to achieve this goal. Following recent net-energy metering reforms, Nevada has become a state of greater interest for behind-the-meter energy storage, a point further cemented as the NV PUC considers an investigation of energy storage technology. Washington's Clean Energy Fund previously supported energy storage projects, and while the next phase of the program has not increased its support of storage significantly, there is still notable forward motion in developing storage as part of the state's cleantech cluster.

- **New Jersey Community Microgrid Program:** In August 2016, the New Jersey Board of Public Utilities issued a draft for the Town Center Distributed Energy Resource Microgrid Feasibility Study Incentive Program, with up to \$200,000 available for microgrid feasibility studies. While the program doesn't explicitly include energy storage, microgrids are increasingly including energy storage resources. Resiliency is a key focus for New Jersey following storms such as Hurricane Sandy, and energy storage offers the opportunity to provide additional reliability and resiliency. There have been no updates to this program as of late October 2016, and it is unclear what the timeline for feasibility studies will be; it is also unclear how subsequent phases, involving actual microgrid deployments, will be structured. Therefore, at present, it remains difficult to determine how much non-residential energy storage will be implemented as a result of the program.
- **Nevada PUC Investigation into Energy Storage (Docket 16-01013):** In September 2016, the Public Utilities Commission of Nevada issued procedural orders under the state's investigation into energy storage, which formally opened in January 2016. The orders request comments on inverter standards and requirements, communication protocols and standards, as well as whether the initiative should move forward following passage of the state's Energy Choice Initiative. Nevada has recently experienced debate around net-metering reform and the role storage can play in modernizing the grid; as such, if the investigation continues to move forward, a significant upside can be expected as the potential for storage to integrate renewables and augment the state's grid is explored, though the timeline of the investigation and the size of the potential upside remain unclear at present.
- **Updates from Washington's Clean Energy Fund 2:** In September 2016, the Washington Department of Commerce announced \$7 million in grants for clean energy projects under the Clean Energy Fund 2. The grant funding will be matched by \$12.3 million in non-state funding. Funding awardees include Demand Energy, an energy storage system and software vendor, and Battery Informatics, a startup focused on battery control systems. Specific project details have not been publicly announced, but the awards are expected to result in up to 2 MWh of additional non-residential energy storage in Washington.