The Behind-the-Meter Energy Storage Landscape 2016-2021

Market Trends, Frameworks and Evolution

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1. Key Findings

Scope and Purpose of This Report

The U.S. behind-the-meter energy storage market today is small, with combined residential and non-residential deployments in 2015 accounting for only 15% of installed capacity in megawatt terms. By 2021, however, the behind-the-meter segment will account for 50% of the annual U.S. market in MW terms, driven by a plethora of factors including improved system economics, net-energy metering reform, changes to utility rate structures, increasing viability of demand-charge management for non-residential customers, and increased interest in reliability and resiliency.

Though the U.S. energy storage value chain is still young and developing, understanding the state of today's market yields important insights that are key to comprehending both current market structures and future evolution in terms of business models, the competitive landscape and the potential of different state and regional markets in the next several years.

This report examines the current state of the U.S. energy storage market, analyzing present market trends and business models before investigating how the market will change in the next five years. The report establishes a framework to better lay out today's energy storage market players and what niches they serve, before delving into the individual competencies of each actor. The report concludes with a look at the U.S. behind-the-meter energy storage market's evolution.

The U.S. Behind-the-Meter Energy Storage Market Is in Transition

Market Is Small, but Growing

Behind-the-meter storage deployments are still low and mostly confined to a few states. Improving system economics will help drive the market, particularly as financiers become more comfortable with storage as greater amounts of performance data and illustration of value streams become available over the next few years.

Storage Financing is Emerging

C&I financing is beginning to gain traction, but no model dominates today. Residential financing is very rare at the current juncture. Large financiers still are not comfortable with storage, given its technology risk and lack of decisive economic case compared to other technologies, though as the market matures, more financing will become available.

Market Framework is Broad and Varied

- Companies are specializing in hardware and/or software, and must continue to innovate and ensure their products can interact with other technology effectively.
- Systems integrators bring multiple components together for turnkey storage systems. However, there exists a suite of systems-integration challenges confronting them today.
- Some project developers are adding storage to their portfolios, while others are companies with fully integrated systems engaging in project development. The vast majority are active only in the C&I segment.

The U.S. Behind-the-Meter Energy Storage Market Is in Transition (Cont.)

Business Model Evolution Underway

Project developers and C&I energy management service providers are increasingly adding storage to their portfolios. As value proposition and economics mature, storage will increasingly be deployed to lower customer bills and provide increased resiliency in the C&I segment.

Utilities Increasingly Turning to Energy Storage

Utilities 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.

2. Market Trends

The U.S. Behind-the-Meter Energy Storage Landscape Today

Though still nascent, the U.S. behind-the-meter energy storage market includes a plethora of actors vying for dominance. Though each is exploring a different business model and varying suites of product and service offerings, key trends and similarities have emerged that divide market players into several notable categories. Behind-the-meter energy storage has historically experienced growth in only a few key geographic markets, but as business strategies evolve and storage system prices decline, additional opportunities will appear beyond these regions.

Like solar PV before it, the behind-the-meter energy storage landscape is shifting rapidly as new business models materialize. Four historical markets have accounted for the bulk of non-residential and residential energy storage deployment, and they will remain important in the near future. Go-to-market strategies shift as market actors vie for the most effective pathway for their products or services to reach end customers. System integrators are and will remain an important part of the market, but today a suite of challenges stands as a barrier that must be pierced if the market is to scale effectively and penetrate additional geographic markets. Financing remains a hurdle for behind-the-meter energy storage, though a few companies have forged inroads in C&I financing, while others are beginning to test the waters in the residential segment; three overarching financing models are in use today in the U.S. behind-the-meter energy storage market.

CA, HI, NY and PJM Account for the Bulk of Behind-the-Meter Storage Deployments to Date

California Market Drivers

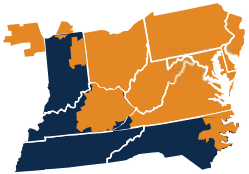
- SGIP Incentive Program
- Utility procurements including AB 2514 (1.3 GW of storage by 2020, portion must come from customer-sited resources), PRP and LCR
- Grid modernization activity via policies such as Demand Response Auction Mechanism
- High demand charges
- Residential TOU rates on the horizon for customers subscribing to net-energy metering

New York Market Drivers

- Insert teGrid modernization programs and pilot projects (e.g., NY Reforming the Energy Vision, Brooklyn-Queens Demand Management)
- Non-wires alternative RFPs from electric utilities offer opportunities for behind-the-meter storage participation
- High demand charges, particularly in New York City
- New York City's recently announced energy storage target of 100 MWh by 2020

Hawaii Market Drivers

- High electricity rates
- Revisions to net-energy metering rules: In October 2015, HECO ended traditional net metering, new customers must go on grid-supply (allows export at wholesale rate, has caps that self-supply, which encourages solar-plus-storage
- High solar PV penetration



PJM Market Drivers

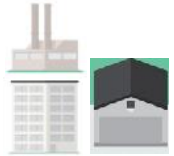
- Resiliency programs (e.g., NJ Renewable Electric Storage program)
- Significant historical deployment of behind-the-meter solar PV
- Regional interest in microgrids

Go-to-Market Strategies

Go-to-Market Strategies: Direct to End Customer

System Integrator

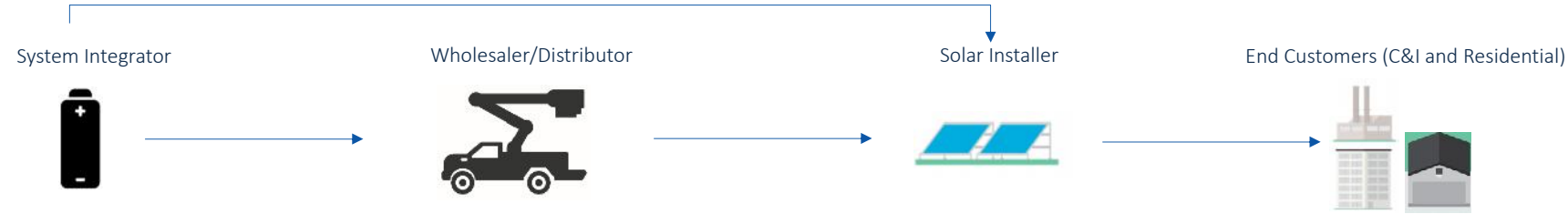
End Customers (C&I and Residential)



Examples of System Integrators Pursuing This Strategy

Structure	Advantages	Disadvantages	Evolution
System integrator sells energy storage systems directly to the end customer, whether a C&I customer (in which case the sale can take the form of a lease or PPA-esque agreement) or residential customer.	• Higher margins compared to other go-to-market strategies • Ability to target specific geographic markets and customer types • Opportunity to build relationships between system integrator and end customer	• Customer acquisition may be a challenge given lack of established channels and geographic limitations • Need to develop internal sales team and customer outreach strategy	• As the storage market matures, an increasing number of customers are likely to approach system integrators in order to purchase systems • However, this model seems unlikely to dominate the behind-the-meter storage market as channel partnerships offer a key avenue for bringing products to market

Go-to-Market Strategies: Via Wholesaler/Distributor/Solar Installer



Examples of System Integrators Pursuing This Strategy

ENPHASE · SUNVERGE · TABUCHI ELECTRIC

Structure	Advantages	Disadvantages	Evolution
System integrator sells systems either directly to solar installers, or to wholesalers/ distributors that sell systems to solar installers. The installers then sell systems to end customers and perform installation. In a few cases, the wholesaler/distributor possesses installation capabilities.	• Leverages existing wholesaler/ distributor/ installer sales channels • Potential O&M experience/capabilities from installer • Large geographic reach if system integrator working with large channel partners	• Potentially high cost of customer acquisition • Need to incur fixed costs to expand geographic reach • Without an exclusive agreement, wholesaler/distributor likely carries competitors' products	• Few system integrators perform system installation today, though some are expected to add installation services as the U.S. behind-the-meter energy storage market matures the majority will remain focused on system integration • Wholesalers/distributors and solar installers with wide geographic reach will become increasingly successful as the storage market expands into additional geographic markets

Go-to-Market Strategies: Via Developer

Examples of System Integrators Pursuing This Strategy

EnSync Energy Systems · JLM Energy · Schneider Electric · sonnen

Structure	Advantages	Disadvantages	Evolution
System integrator sells energy storage systems to developer, which in turn supplies energy storage system to end customer either through a shared savings/lease/PPA-esque arrangement or a direct sale. This structure comprises deployments at a single large site or multiple host sites, and thus often is in the range of 5+ MW. In some cases, the system integrator is also the project developer or may engage in certain portions of the project development process such as customer origination or EPC work.	• Developers typically able to bring in financing • Opportunities for larger deployments which can lead to greater revenue • Option to participate in utility procurements of behind-the-meter energy storage (e.g., LCR with SCE in Calif.) • Developer can leverage existing customer relationships if involved in other industries (e.g., building energy management, solar PV)	• Geographic scope may be limited and costs must be incurred to enter new geographies • Lack of standardization leads to need to individually design projects on a customer-by-customer basis; extra challenges exist in cases of a project with multiple host sites	• Shift from one-off projects to standardization will decrease costs, expand options for end customer types for developers and decrease project development and installation timelines • As storage market grows, developers offer avenue to acquire customers with multiple sites and thus lead to larger storage deals • Developers will increasingly partner with utilities to offer grid services from aggregated storage

Go-to-Market Strategies: Storage as Part of C&I Energy Management Package

System Integrator → C&I Energy Solutions Provider → C&I Customers

Examples of System Integrators Pursuing This Strategy

ABB Greensmith Johnson Controls

Structure	Advantages	Disadvantages	Evolution
System integrator sells energy storage systems to C&I energy services provider, which supplies them to the end customer as part of a comprehensive energy management package. In some cases, the C&I energy services provider is also the system integrator, though today this is uncommon. Installation may be provided by the C&I energy services provider or installation partners.	• C&I energy solutions provider able to bring in financing • Can leverage existing customer base as avenue for energy storage business • Opportunity to provide storage as part of a solution package, which leads to a single comprehensive sale • End customer can interface with a single provider for all solutions	• End customers often seek the most economically efficient routes for lowering electricity bills, and thus might forego storage given high costs today • Business case for storage currently limited to a few markets and customer types where demand charges are sufficiently high • Lack of standardization leads to need to individually design projects on a customer-by-customer basis	• Storage will increasingly become a part of C&I energy management packages as storage prices decline and customers begin to request storage • Storage deployments will grow as bundling offsets storage prices

Systems Integration Challenges

Systems Integration Challenges Must Be Addressed for Storage Market Development

Systems integration is a key step of the energy storage value chain, involving a marriage of components including storage medium (e.g., batteries), power conversion technology and software for system management and monitoring. However, a number of challenges exist in the market today which slice across two axes.

The horizontal axis involves steps of the systems integration process. These steps include:

- **Technology selection:** Determining the hardware and software for the energy storage system.
- **Technology integration:** Bringing components together in a fully integrated energy storage system.
- **Deploying the integrated storage system:** Installing the system in the field, ready for operation.

The vertical axis involves different categories which affect each step of the systems integration process, including:

- **Technology-related:** Concerns the technology chosen as part of the energy storage system.
- **Project-related:** Pertains to the project development process.
- **Policy-related:** Addresses regulatory effects on systems integration.

GTM Research has identified a number of systems integration challenges across these two axes. It's imperative to understand what challenges exist today in order to determine strategies to overcome these roadblocks; already, systems integrators and other market players are endeavoring to circumvent these issues.

Existing Systems Integration Challenges Cut Across Steps of Project Development

	Technology Selection	Technology Integration	Deploying Integrated Storage System
Technology-Related	Continuous innovation to ensure ongoing performance and price point improvements.	Ensuring different types of technology work together (storage medium, power electronics, etc.).	Modularity: allows for shift away from custom one-off projects (as seen today in the C&I market) toward standardization. Current need for custom design increases total project costs and timelines.
Project-Related	Proper technology choice and system sizing to ensure efficient provision of desired value streams, particularly when designing solar-plus-storage systems.	Proper system design to capture all value streams of interest and maximize the most important value stream.	Customized planning necessary for significant number of current non-residential projects.
Policy-Related	Grid/building/electrical code standards: both awareness of said codes and effect of codes on actual deployment (e.g., challenges installing lithium-ion systems in New York City).	Configuring systems to respect state laws (e.g., export limits in Hawaii).	Grid/building/electrical code standards: both awareness of said codes and effect of codes on actual deployment (e.g., challenges installing lithium-ion systems in New York City).

Market Players Already Pursuing Strategies to Address Systems Integration Challenges

In order to overcome systems integration challenges, system integrators and other market players are initiating new strategies:

- Hardware and software vendors consistently work to improve system performance. Those that win out in the market will offer both strong performance and the ability to seamlessly integrate with other technology
- System integrators are developing modular and scalable systems, which will allow companies to move away from custom one-off projects. Modular/scalable systems allow for shorter project development and deployment timelines. Additionally, such systems leave the option for customers to expand systems at a later date if they so choose, providing a potential avenue of future business for the company with lower customer acquisition costs, although customers seeking to expand their systems are unlikely to account for the bulk of projected growth.
- Energy storage system standards are in the design process. Organizations such as the Modular Energy Storage Architecture (MESA) standards alliance seek to develop energy storage standards to improve interoperability among system components and fine-tune how energy storage system communicate with utility grid control. Safety consulting and certification company UL is developing safety standards that affect energy storage including UL 1973 (battery pack safety), UL 1741 (inverter safety) and the recently announced UL 9540 (fully integrated energy storage system safety), with the first UL 9540 certification issued in November 2016. Development of communication standards will improve the ease of systems integration, as different components are more easily able to "talk" with one another. Furthermore, safety standards will ensure systems meet local codes and standards, shortening permitting and deployment time for behind-the-meter energy storage projects.
- Several policy initiatives are under discussion to determine the role energy storage can play on the grid, which may open new opportunities for behind-the-meter storage to participate in the market.
- Government policy changes concerning system safety standards are underway and may lead to wider acceptance of storage as safety protocols are established, both in terms of system design and for emergency response to catastrophes involving energy storage. In particular, a program is underway in New York City to develop protocols for dealing with lithium-ion battery fires; historically, lithium-ion batteries must be approved on a case-by-case basis in New York City, increasing project cost and extending the timeline. Developing these types of protocols will shorten project development cycles, while simultaneously ensuring greater peace of mind for facility owners and local residents.

Financing Models

Financing Models: Shared Savings

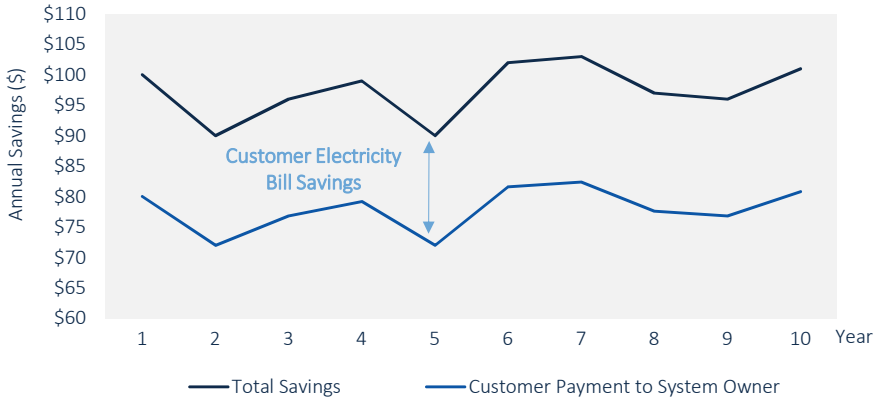
Description: Customer pays system owner a percentage of total monthly savings from reduced electric bill

Advantages: Incentive for system owner to offer greater utility bill reductions to reap higher revenue; opportunity to share revenue from grid services payments when applicable

Disadvantages: Uncertainty around revenue streams for system owner and savings for customer given potential changes in utility bills related to unforeseen events (outages, changes to utility tariff structures, etc.)

Outlook: Shared savings model fairly popular today with C&I customers, albeit in a small market. This model is likely to remain attractive in the C&I market, particularly as electricity rate modeling becomes clearer and TOU rate structures and higher demand charges grow in popularity as more distributed generation is deployed.

Shared Savings Financing Structure



Source: GTM Research. Note the above chart is an example and the values used are not representative of actual shared savings contracts.

Examples of Companies Offering this Model

DEMAND energy Take charge.

GreenCharge

Financing Models: Lease

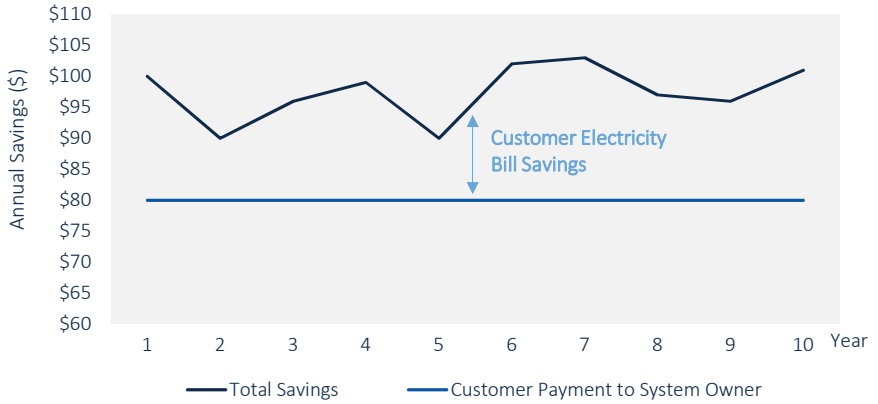
Description: Customer pays a fixed monthly fee, which may include annual escalators, to storage system owner

Advantages: Guaranteed revenue stream for system owner, clear price for customer

Disadvantages: Limited potential for customer savings and system owner revenue depending on deal structure; generally does not allow for sharing of grid service revenue with customer

Outlook: Leasing model fairly popular today with C&I customers, albeit in a small market. Model may gain greater traction in the residential segment, as residential demand charges are rare, and it has already seen some success with utility Green Mountain Power's offering of the Tesla Powerwall, though this structure can be challenging given key value streams for the residential segment (i.e., self-consumption, backup power). However, the leasing model has lost popularity for cleantech given longer time horizon for free cash flow generation; thus, leasing is not expected to dominate the non-residential segment.

Lease Financing Structure



Source: GTM Research. Note the above chart is an example and the values used are not representative of actual lease contracts.

Examples of Companies Offering this Model

Advanced Microgrid Solutions

GREEN MOUNTAIN POWER

stem

Financing Models: PPA-esque

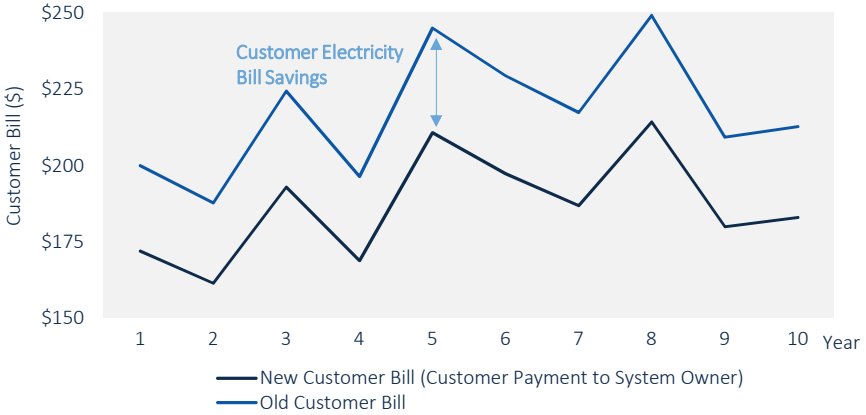
Description: Customer pays system owner a fee on a $/kWh and/or $/kW basis for usage of a solar-plus-storage system; $/kWh level set such that new customer bill is less than prior to solar-plus-storage while factoring in financing considerations. Note that the Y-axis on the above graph is based on customer bill rather than annual savings seen in the previous models, given the unique structure of PPA-esque models.

Advantages: Familiarity given similarity to solar PPA

Disadvantages: Difficult to structure given that storage is not a generating resource

Outlook: The PPA model offers customers familiarity, as it has seen success in the solar PV market. However, the structure of solar-plus-storage PPAs is still relatively new and needs to be better established in order to offer a clear value proposition for customers. This structure is likely to find more popularity if boilerplate language is created for its structure, as seen with NREL and solar PPAs. This model may see greater popularity for project developers working with utilities to supply grid services, as utilities are familiar with PPAs from the solar market. Nevertheless, the model has not yet gained significant traction in the energy storage market, though today the market is still small.

PPA-esque Financing Structure



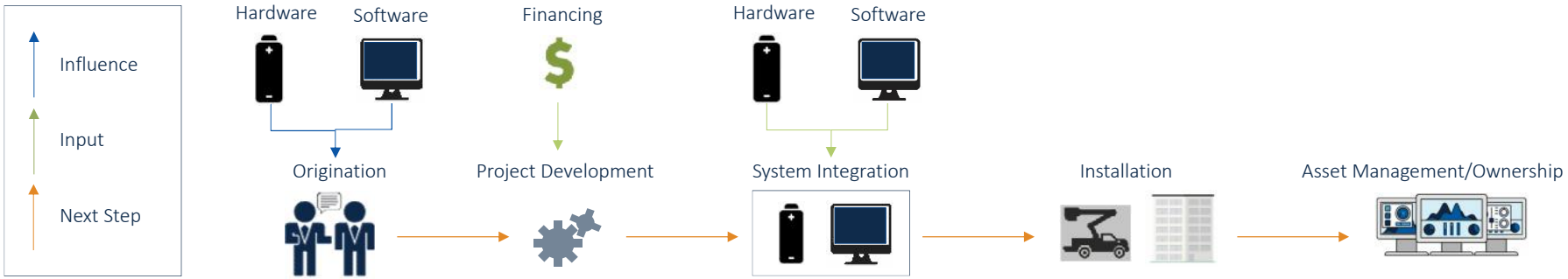
Source: GTM Research. Note the above chart is an example and the values used are not representative of actual PPA-esque contracts.

Examples of Companies Offering this Model

EnSync Energy Systems · Gexpro · S&C · SHARP

3. Behind-the-Meter Storage Framework

Steps of Downstream Behind-the-Meter Energy Storage Value Chain



It is important to understand the steps of the energy storage value chain and what influences each exert in order to attain a fuller comprehension of the behind-the-meter energy storage landscape:

- **Origination:** Customer acquisition. Can occur via an internal sales team or in conjunction with channel partners. Hardware and software selection influence what types of customers a company will pursue, particularly as specific customers will vary in their desired outcomes for energy storage (e.g., resiliency vs. electricity bill reduction via demand-charge management).
- **Project Development: D**efining the parameters of a specific energy storage installation. Includes choices around value streams, project financing, system sizing and participation in grid services if applicable. Often includes both performance and financial modeling of the chosen energy storage system at the host customer site.
- **System Integration:** Bringing together hardware and software components in a fully integrated energy storage system and ensuring that all components work correctly with one another, as well as ensuring the system performs as desired.
- **Installation:** Energy storage systems, and sometimes other components (e.g., solar PV), are installed at the host customer site.
- **Asset Management/Ownership:** Includes ongoing monitoring, operations and maintenance of the energy storage system. The host customer does not own the energy storage system in all cases (e.g., project developers or financiers owning energy storage systems).

The U.S. Behind-the-Meter Storage Landscape Is Broad and Varied

Though small, the U.S. behind-the-meter energy storage market already plays host to an array of companies representing different stages of the value chain. These companies bring different expertise to the table, with some focusing on one specific area while others embody a range of service offerings. The framework GTM Research has developed notes whether or not companies are involved with the following categories:

- **End-Customer Origination:** Does the company acquire end customers (i.e., parties that directly use/benefit from the storage system)?
- **Financing:** Does the company provide financing, either in conjunction with third-party financiers or on its own balance sheet? (Note that the former case is far more prevalent than the latter today.)
- **Project Development:** Does the company engage in energy storage project development?
- **Systems Integration:** Does the company perform systems integration?
- **Internally Developed Software:** Does the company develop energy storage software in-house? (Note that some companies will develop an internal system but still use third-party software for additional services, such as monitoring, control or aggregation.)
- **Installation:** Does the company install energy storage systems? (Note that in some cases a company may have an internal installation team, but the majority of installation work is provided by a third-party installer.)
- **Asset Management:** Does the company provide monitoring and/or O&M for energy storage systems?
- **Asset Ownership:** Does the company own energy storage systems?

Several of these companies also have utility-scale activities, though as this report focuses on the behind-the-meter market, these are not called out in the "Segment" section in the behind-the-meter storage landscape framework unless the company's primary focus is the utility-scale market.

Behind-the-Meter Energy Storage Landscape Framework

Company	Segment	End-Customer Origination	Financing	Project Development	Systems Integration	Internally Developed Software	Installation	Asset Management	Asset Ownership
ABB	C&I	✓		✓	✓	✓	✓	✓	
ADARA POWER	C&I and Residential				✓	✓			
Advanced Microgrid Solutions	C&I	✓	✓	✓		✓		✓	Historically owned systems
AES Energy Storage	C&I (though to date vast majority of work in utility-scale segment)	✓		✓	✓	✓	✓	✓	
AutoGrid	C&I and Residential					✓		✓	
BLUE PLANET ENERGY	Residential				✓	✓		✓	
BORREGO SOLAR	C&I		Provides solar financing	✓			✓	✓	

Source: GTM Research

Behind-the-Meter Energy Storage Landscape Framework (Cont.)

Company	Segment	End-Customer Origination	Financing	Project Development	Systems Integration	Internally Developed Software	Installation	Asset Management	Asset Ownership
CLEAN ENERGY STORAGE INC.	C&I and Residential		✓		✓				
concept US	Residential				✓				
CONVERGENT	C&I		✓	✓			✓	✓	✓
DEMAND energy	C&I	✓	✓	✓	✓	✓		✓	
DYNAPOWER COMPANY	C&I				✓	✓		✓	
EDISON ENERGY	C&I	✓	✓	✓			✓	✓	✓

Source: GTM Research

Behind-the-Meter Energy Storage Landscape Framework (Cont.)

Company	Segment	End-Customer Origination	Financing	Project Development	Systems Integration	Internally Developed Software	Installation	Asset Management	Asset Ownership
EGUANA TECHNOLOGIES	C&I and Residential				✓				
enbala POWER NETWORKS	C&I and Residential	Sometimes works with customers' sales arms to aid in end-customer origination				✓		✓	
ENPHASE.	Residential				✓	✓		✓	
EnSync ENERGY SYSTEMS	C&I	✓	✓	✓	✓	✓	✓	✓	
Exergonix	C&I and Residential				✓	✓			
GE	C&I (majority of focus today on utility-scale)	✓	✓	✓	✓	✓			

Source: GTM Research

Behind-the-Meter Energy Storage Landscape Framework (Cont.)

Company	Segment	End-Customer Origination	Financing	Project Development	Systems Integration	Internally Developed Software	Installation	Asset Management	Asset Ownership
Geli	C&I and Residential					✓		✓	
Gexpro	C&I and Residential	✓	✓		✓				
GreenCharge	C&I	✓	✓	✓	✓	✓	✓	✓	✓
Greensmith	C&I				✓	✓		✓	
JLM ENERGY	C&I and Residential	✓	✓	✓	✓	✓	✓	✓	
Johnson Controls	C&I	✓	✓	✓	✓	✓	✓	✓	

Source: GTM Research

Behind-the-Meter Energy Storage Landscape Framework (Cont.)

Company	Segment	End-Customer Origination	Financing	Project Development	Systems Integration	Internally Developed Software	Installation	Asset Management	Asset Ownership
LOCKHEED MARTIN	C&I	✓			✓	✓	✓	✓	
Mercedes-Benz	Residential				✓				
NEC NEC Energy Solutions, Inc.	C&I				✓				
S&C	C&I	✓	✓	✓	✓	✓	✓	✓	
Schneider Electric	C&I and Residential	✓			✓	✓	C&I only	✓	
SHARP	C&I	✓	✓	✓	✓	✓		✓	Limited ownership

Source: GTM Research

Behind-the-Meter Energy Storage Landscape Framework (Cont.)

Company	Segment	End-Customer Origination	Financing	Project Development	Systems Integration	Internally Developed Software	Installation	Asset Management	Asset Ownership
SMA	C&I and Residential				✓				
sonnen	C&I and Residential		✓		✓	✓		✓	
stem	C&I	✓	✓	✓	✓	✓		✓	✓
SUNPOWER	C&I and Residential				✓	✓		✓	
sunrun	Residential	✓	Offers solar financing				✓	✓	Owns solar systems
SUNVERGE	Residential				✓	✓		✓	

Source: GTM Research

Behind-the-Meter Energy Storage Landscape Framework (Cont.)

Company	Segment	End-Customer Origination	Financing	Project Development	Systems Integration	Internally Developed Software	Installation	Asset Management	Asset Ownership
swell	Residential	✓	✓	✓				✓	✓
TABUCHI ELECTRIC	C&I and Residential		✓		✓	Historically used internal package		✓	
TESLA SolarCity	C&I and Residential	✓	SolarCity closed a round of financing in early 2016 that will be used exclusively for storage	Expected to become larger piece of business following Tesla's acquisition of SolarCity	✓	Unclear			
Younicos	C&I	✓		✓	✓	✓	✓	✓	

Source: GTM Research

Distribution of Companies Within Landscape Framework Reflects Present Market Conditions

- The majority of companies specializing in technology (i.e., hardware such as batteries or power conversion systems, or software) are active in both the residential and non-residential market segments. This stems from the fact that a significant number of hardware and software vendors make products that work for both residential and C&I systems. Purely residential-focused companies in this category are few, as the U.S. residential market is still quite small, though there are a fair number of companies that focus solely on the non-residential market given its relatively larger size and the clearer value proposition of non-residential energy storage today.
- Systems integrators reveal a greater diversity of representation across market segments. Nevertheless, the majority of companies active in the behind-the-meter market today offer both non-residential and residential systems. In the past year, a few formerly residential-only focused companies added C&I products to their suite of offerings, likely in order to capitalize on a more robust C&I market. As the U.S. residential market is forecast to grow significantly in 2019 and beyond, companies playing in both markets will be positioned to take advantage of both market segments; furthermore, a systems integrator that can offer multiple system types will likely be more attractive to developers and installers that can rely on a single partner to supply systems for both behind-the-meter segments.
- Companies engaging in project development are heavily skewed to serving only the C&I segment. Today, project development opportunities are rare in the residential segment, particularly as the segment lacks clearly monetizable value streams and has comparatively higher system and customer acquisition costs compared to the non-residential segment. Project development companies operating in the non-residential segment have the ability to target companies that own multiple host sites, offering the opportunity to create larger deals, which can be further leveraged to provide grid services in cases where such programs are available.

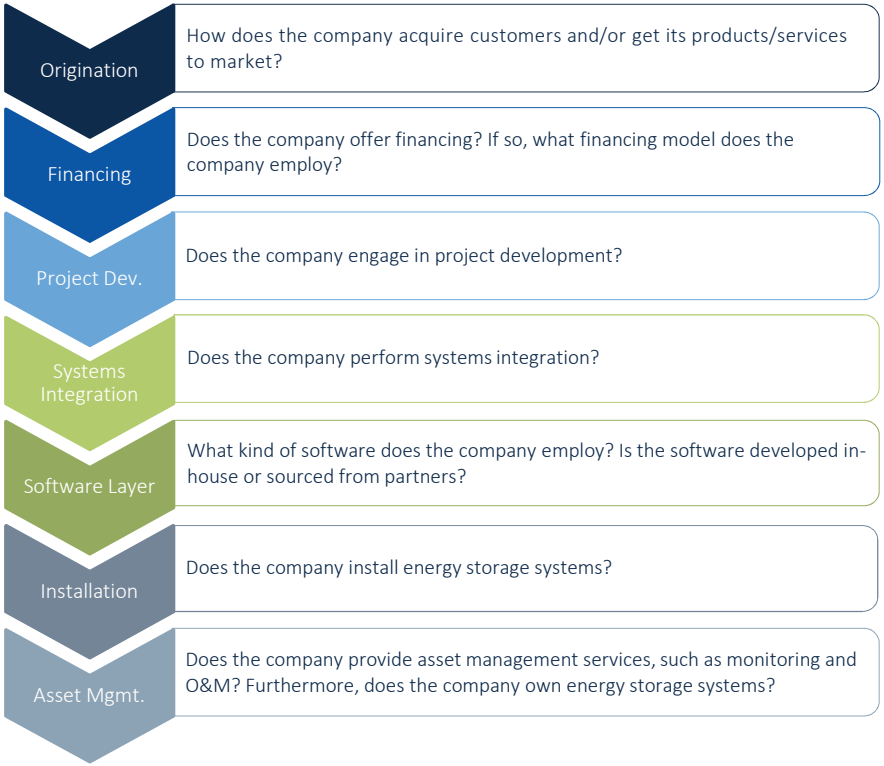
4. Competitive Landscape

7 Key Aspects to Consider When Discussing Market Players

Though young, the U.S. behind-the-meter energy storage market already boasts a significant number of key market players. These companies operate in different areas in the value chain: Some have one core specialty, while others are active in a few categories. Company sizes range from established technology conglomerates to recently founded startups, each of which has a slightly different business model. However, as established in our storage market framework, there are sufficient overlaps among companies.

There are a number of attributes that must be considered when thinking about energy storage market players, which are displayed at right.

Note that the following list is meant to identify key market players, rather than to discuss every company active in the U.S. behind-the-meter energy storage market. Companies were selected either because they have participated significantly in the behind-the-meter U.S. energy storage market or they possess internal capabilities/experience in other markets (i.e., energy management, solar PV) which position them to effectively scale their energy storage business in the next few years. Additionally, several of these companies also have utility-scale activities, though as this report focuses on the behind-the-meter market, these are not called out in the "Segments" section on each profile.



Vendor Profile: ABB

Market Segments: C&I

Business Model: ABB is one of the largest power conversion system manufacturers worldwide. ABB has moved to offering fully integrated platform and turnkey battery energy storage systems for C&I customers, though it has historically focused more on utility-scale solutions. ABB can provide EPC and O&M services as well.

Offerings: Power conversion systems (50+ kW), battery energy storage systems (250 kW to 700 kW for platform solutions and 500+ kW for turnkey/EPC).

Partners: ABB is battery-agnostic for power conversion systems, but for ABB prime projects, lithium-ion battery partners include LG Chem, Samsung and Saft. Certified to offer NGK sodium-sulfur battery solutions.

Differentiation: ABB is a large technology conglomerate with extensive experience in power and automation technology. Though ABB has only recently begun offering turnkey energy storage systems for the C&I segment, the corporation's deep understanding of energy technology including power conversion systems and control products gives the company a solid baseline from which to continue building its energy storage business. Given the company's wide reach, ABB already possesses the infrastructure to deploy systems across the U.S. and internationally.

Origination	ABB has an internal sales team for customer acquisition. ABB can offer storage as part of a portfolio of C&I energy management solutions.
Financing	Does not offer financing for energy storage systems.
Project Dev.	Engages in project development and provides system design services.
Systems Integration	Provides system integration services.
Software Layer	Provides software for control integration.
Installation	ABB can provide EPC work, but works with third-party EPCs and developers for some projects as well.
Asset Mgmt.	Can provide O&M solutions such as preventative maintenance and other care packages. ABB does not own energy storage systems.

Vendor Profile: Advanced Microgrid Solutions

Advanced Microgrid Solutions

Market Segments: C&I

Business Model: Advanced Microgrid Solutions develops turnkey energy storage projects for C&I customers and utilities. Energy storage reduces the host customer's energy bills and provides grid services for utilities.

Offerings: C&I energy storage systems (500+ kW, 2- to 6-hour duration), energy storage management and aggregation software, storage-as-a-service for host customers, fleets of assets to supply services for utility customers.

Partners: Macquarie Capital (project financing provider), Tesla (battery/energy storage system supplier), SCE (utility project partner), Shell (utility project partner), Opus One (software partner).

Differentiation: AMS offers third-party-owned storage for C&I customers that can be leveraged by local utilities to provide grid services. AMS has won several key utility contracts, notably 90 MW/360 MWh worth of contracts with Southern California Edison. Though a small company, AMS has already succeeded in establishing strong partnerships and securing a foothold in the Calif. market, though it has yet to significantly expand beyond Calif.

Origination	AMS pursues a top-down strategy to find a customer with a suite of buildings where energy storage can be deployed. AMS works with utilities to offer aggregated storage assets to supply grid services (e.g., peak load reduction).
Financing	Offers financing in conjunction with third-party financiers through energy management services agreements and utility contracts.
Project Dev.	AMS engages in project development.
Systems Integration	Generally does not integrate energy storage systems, though does integrate turnkey storage systems with on-site renewables.
Software Layer	Has an internal software layer that can perform system management and aggregation services. Also works with Opus One to address distribution-level challenges that can be solved via energy storage.
Installation	AMS works with contractors for system installation.
Asset Mgmt.	AMS manages, operates and aggregates energy storage systems. In the past, AMS has owned energy storage systems.

Vendor Profile: Demand Energy

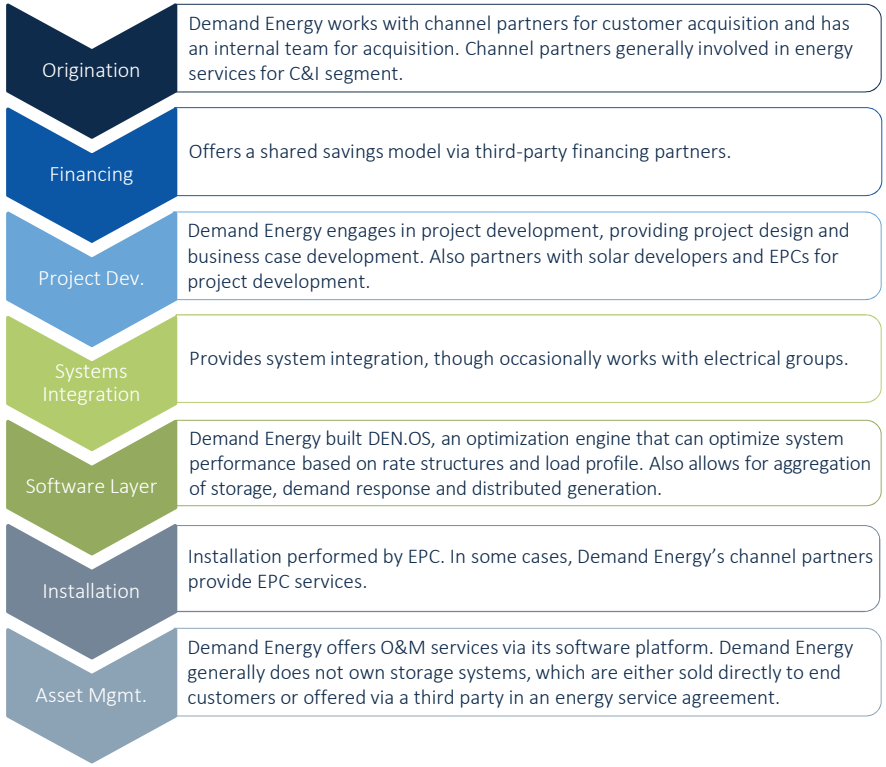
Market Segments: C&I

Business Model: Demand Energy offers integrated turnkey energy storage systems. Demand Energy offers systems via a direct purchase or via an energy service agreement. The firm has won several contracts with utilities for load reduction programs, including the Brooklyn-Queens Demand Management (BQDM) Auction.

Offerings: Demand Energy offers both lead-acid and lithium-ion energy storage systems that are integrated with the company's energy management software (DEN.OS).

Partners: EnerSys (lead-acid batteries), lithium-ion battery partner (not publicly announced).

Differentiation: Demand Energy has a significant foothold in the New York market, specifically in the New York City area, and has established strong relationships with regulatory entities to ensure an early-mover advantage, particularly in terms of having an understanding of local regulations. Demand Energy successfully won an award under the Con Edison BQDM auction for critical load relief in August 2016. However, to date Demand Energy has little presence in other state markets, though given the potential for C&I storage in New York, this is not expected to be a near-term hindrance. Demand Energy's core competencies of software, systems integration and project development position it to have a strong business model.



Vendor Profile: Edison Energy

Market Segments: C&I

Business Model: Edison Energy is a project developer active in multiple areas including customer outreach, technology selection, project analysis/proposals, EPC functions and long-term system O&M and ownership. Edison Energy was established in early 2016 following a spree of acquisitions by Edison International. The company has experience in the electricity procurement, solar PV and C&I energy management solutions spaces through its ecosystem of subsidiaries. These subsidiaries also offer key channel partnerships for developing Edison Energy's business.

Offerings: Project development services, carries a variety of energy storage systems.

Partners: SoCore Energy (subsidiary/channel partner), Altenex (subsidiary/channel partner), Delta Energy (subsidiary/channel partner), Eneractive Solutions (subsidiary/channel partner).

Differentiation: Edison Energy is a subsidiary of Edison International, a large company with a strong balance sheet built through multiple business lines. Consequently, customers will likely feel more comfortable procuring storage from Edison Energy, given the low risk that the company will not be around for the length of the system warranty. Furthermore, Edison Energy can leverage existing relationships through its subsidiaries to generate new energy storage business, allowing for rapid scale-up, particularly as energy storage technology costs continue to decline. However, to date Edison Energy is a slower mover in the storage market compared to some of its competitors.

Origination	Edison Energy acquires customers through existing relationships via the company's solar business and through an internal sales team. Subsidiaries provide an avenue for additional business generation.
Financing	Offers financing package using both third-party financiers and the company's own balance sheet.
Project Dev.	Edison Energy performs project development.
Systems Integration	Does not perform systems integration.
Software Layer	Utilizes vendor or third-party software for energy storage projects.
Installation	Edison Energy can provide EPC services. Also works with local companies as needed for project installation.
Asset Mgmt.	Edison Energy offers O&M services. Company owns energy storage systems.

Vendor Profile: Enbala

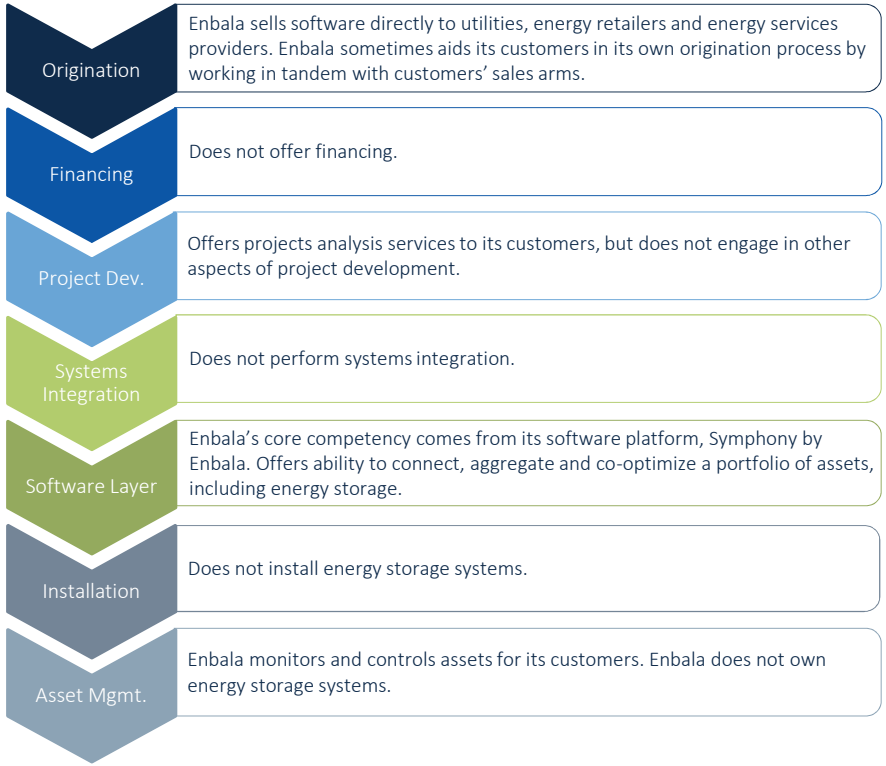
Market Segments: C&I, Residential

Business Model: Enbala is a software developer that initially focused on real-time management of load assets for frequency regulation markets, but has more recently moved into the distributed energy resource management space with its "Symphony by Enbala" platform. Enbala offers software via software-as-a-service (SaaS) or license agreements with utilities and energy service providers to provide real-time optimization and aggregation and control grid edge assets, including storage. Enbala also provides project analysis for customers to asses the technical and economic potential of projects.

Offerings: Symphony by Enbala (software platform), professional services including project analysis services

Partners: Sonnen (strategic partner)

Differentiation: Enbala's software platform allows it to control, aggregate and optimize a suite of assets, giving the firm a diversity of potential customers and not tying it to storage-only, strengthening Enbala's overall business case. Additionally, Enbala has the flexibility to work with multiple partner organizations, and can provide a value-add for utilities and energy retailers, particularly as more distributed generation comes on-line. However, Enbala's Symphony platform is still relatively new, as it was updated and rebranded with a DER management focus in February 2016. As DER deployment grows, Enbala is positioned to take advantage of multiple aspects of the market, including storage.



Vendor Profile: Enphase

Market Segments: Residential

Business Model: Enphase has historically supplied microinverters for the residential solar PV market. Enphase has recently announced a modular residential energy storage system which will be available in the U.S. in early 2017. The company sells its storage systems to solar installers, developers and third-party system owners.

Offerings: Power electronics (microinverters), modular fully integrated energy storage system (1.2 kWh, scalable), Envoy gateway software and Enlighten cloud management software

Partners: PG&E (utility pilot project partner), Spruce (Enphase supplies inverters for solar PV systems, potential for storage expansion), Vision Solar (channel partner), Eliiy Power (lithium-ion battery supplier)

Differentiation: Enphase brings expertise from the solar industry to develop both its integrated energy storage solution and channel strategy. Enphase's modular system may allow the firm to attract residential customers who currently are on the fence about adding storage to their existing solar PV systems, and offers the opportunity for customers to expand systems at a later date. Enphase is reaching the U.S. market later than some of its competitors (scheduled for Q1 2017 release), though this is unlikely to be a major hindrance as the market is still young and storage brand recognition is rare among the general populace.

Origination	Enphase sells energy storage systems to solar installers, developers and third-party system owners. Channel strategy built from existing business model developed for the solar industry. Emerging utility channel strategy.
Financing	Does not offer energy storage financing.
Project Dev.	Does not engage in project development.
Systems Integration	Enphase performs system integration.
Software Layer	Enphase offers a software layer: Envoy for data collection and in-home system monitoring, and Enlighten for remote monitoring and management.
Installation	Does not install energy storage systems.
Asset Mgmt.	Enphase monitors and manages energy storage systems via software layer. Does not own energy storage systems.

Vendor Profile: EnSync

Market Segments: C&I

Business Model: EnSync engages in origination, design, technical and financial modeling, construction management, and installation of DERs including energy storage systems, energy management systems and renewable energy generation systems. EnSync subcontracts with EPC partners that install solar PV systems as part of some C&I projects.

Offerings: Solar-plus-storage PPAs, components and systems including lithium-ion energy storage systems, hybrid lithium-ion/flow battery energy storage systems, energy management systems and software.

Partners: Holu Energy (Hawaiian subsidiary), Solar Power Inc. (PV partner)

Differentiation: EnSync is one of the few system integrators to offer hybrid energy storage systems, aiming to maximize system performance as one technology focuses on shorter duration needs (lithium-ion) and the other focuses on longer duration needs (zinc-bromide flow). EnSync's PPA offerings present additional opportunities to gain a foothold in the C&I space, given that many C&I customers are already familiar with PPAs from the solar-only space. However, to date, EnSync has not deployed its systems in volume, though it is expanding its geographic scope.

Origination	EnSync employs a mixed model that relies on both direct sales and utilizing developers and subsidiaries as channels.
Financing	Offers financing through PPA. EnSync has multiple third-party financing partners. Has sold multiple PPA projects to AEP OnSite Partners.
Project Dev.	EnSync engages in project development, including system design, technical and financial modeling, and construction management.
Systems Integration	Performs systems integration. EnSync offers hybrid energy storage solutions pairing power (e.g., lithium-ion) and energy (e.g., zinc-bromide flow) batteries.
Software Layer	Offers an internal energy storage management system known as Matrix. Allows hybridization of different storage technologies and applications (short- versus long-duration).
Installation	Installs energy storage systems. In cases of solar-plus-storage projects, EnSync selects EPCs for solar portion via competitive solicitation.
Asset Mgmt.	EnSync offers O&M services. Does not generally own systems.

Vendor Profile: Geli

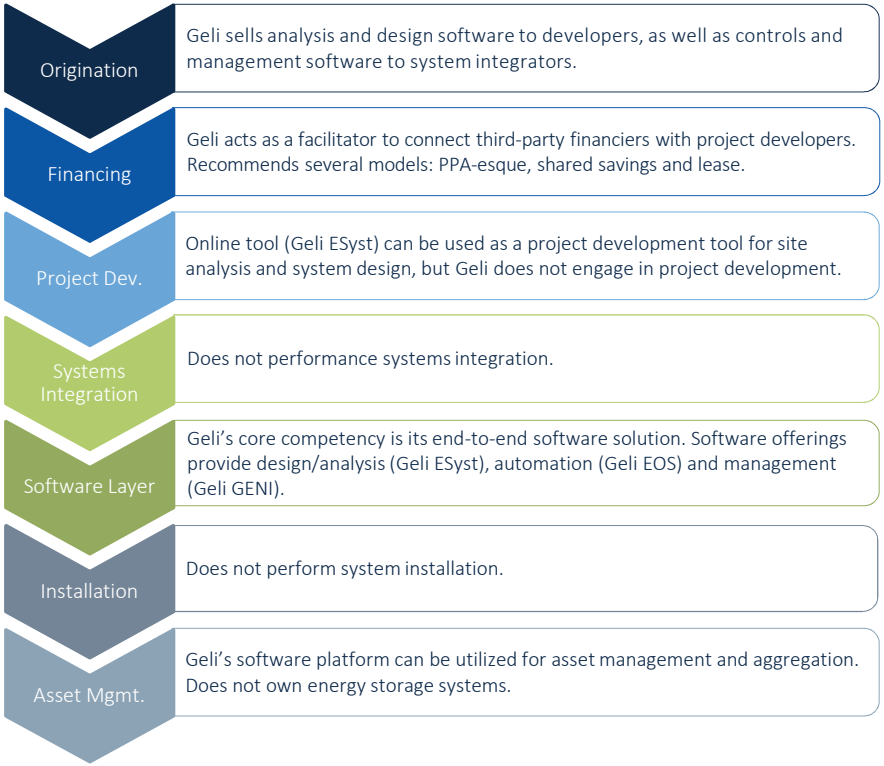
Market Segments: C&I, Residential

Business Model: Geli offers a software platform for analyzing, automating and managing energy storage systems. The company has three key software offerings: Geli ESyst, an online platform for energy storage system modeling and evaluation; Geli EOS for system control and automation; and Geli GENI for system monitoring and allowing aggregation for grid services. The company offers storage software to integrators and developers via both license and SaaS agreements.

Offerings: Energy storage analysis, control and management software

Partners: Gexpro (Geli software offered with fully integrated systems), Group NIRE (project partner), Tabuchi Electric (residential solar-plus-storage partnership), financing partners (not publicly announced)

Differentiation: Geli offers a suite of software that not only includes system management and optimization, but also has a platform for analysis, which is useful for project development and provides an additional opportunity for lead generation. Geli's platform allows for the aggregation of energy storage assets to provide grid services. Geli also possesses a few key channel partnerships, but at the moment, it is still a small company. As the storage market scales, software companies will become increasingly important, particularly as DER aggregation grows in prominence.



Vendor Profile: Gexpro

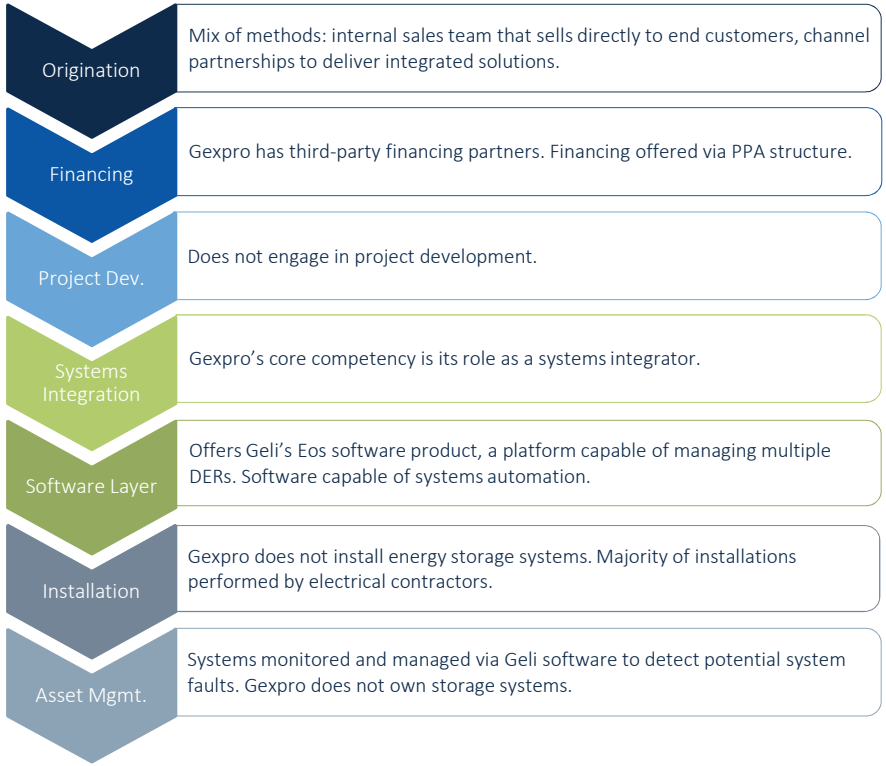
Market Segments: C&I

Business Model: Gexpro integrates and sells turnkey energy storage systems, both to solar installers and as a value proposition to C&I customers as part of an energy management package. Non-storage products sold by Gexpro include energy management systems, lighting, motors, drivers and solar PV products.

Offerings: Fully integrated 30 kW/45 kWh plug-and-play energy storage systems with energy management software from Geli included.

Partners: LG Chem (batteries), Ideal Power (power electronics), Geli (software), financing partners (not publicly announced).

Differentiation: Gexpro, as a subsidiary of Rexel, has a wide geographic reach and can offer a suite of energy management products. It is a fairly new entrant in the energy storage space and has not yet achieved significant market deployments or recognition. However, Gexpro's experience in energy management positions it to offer storage as an additional piece of an energy management package, which increases C&I market opportunities.



Vendor Profile: Green Charge

Market Segments: C&I

Business Model: Green Charge, formerly Green Charge Networks, is a system integrator and project developer that works with C&I customers. Green Charge offers financing via a shared savings model, providing customers with a no-money-down option wherein both Green Charge and the customer receive a portion of demand-charge management savings. In some cases, Green Charge also bids C&I storage systems into grid service markets with utilities, and shares the compensation earned with the host customer.

Offerings: Turnkey lithium-ion energy storage systems (30 kW/60 kWh or 250 kW/500 kWh)

Partners: Engie (majority shareholder), Ecova (channel partner), OpTerra (channel partner), Duke Energy/REC Solar (channel partner), Samsung SDI (battery supplier), Nissan (partner for second-life battery projects), Flextronics (manufacturing partner)

Differentiation: Engie acquired a majority stake in Green Charge in May 2016. As a result, Green Charge now has the backing of one of the largest IPPs and energy service companies worldwide. Thanks to Engie, Green Charge brings a stronger balance sheet to back its projects, aiding in customer acquisition. Furthermore, Green Charge now has access to a suite of sister companies, offering additional channels to acquire customers and develop new projects.

Origination	Acquires customers through three avenues: Direct sales via internal salesforce; sales channels via solar providers and energy services companies; and channel partnerships with sister companies under the Engie umbrella.
Financing	Offers a no-money-down shared savings model. Engie finances projects. In some cases, systems will provide grid services, with grid service payments shared between Green Charge and the host customer.
Project Dev.	Green Charge engages in project development.
Systems Integration	Green Charge provides systems integration internally and has a manufacturing partnership with Flextronics and several other partners.
Software Layer	Internally developed software for system operations, optimization and reporting.
Installation	Green Charge has an internal installation team, but works with EPCs for certain projects as well.
Asset Mgmt.	Provides system monitoring and O&M. Green Charge owns energy storage systems.

Vendor Profile: Greensmith

Market Segments: C&I

Business Model: Greensmith has two key areas of business: software controls and systems integration. Greensmith previously focused on software for utility-scale energy storage, but launched a C&I energy storage solution in July 2016 known as the Omni[4]. Greensmith provides turnkey storage systems as part of C&I energy management packages via channel partnerships

Offerings: GEMS software platform, Omni[4] fully integrated C&I energy storage system with four configurable sizes: 100 kW, 250 kW, 500 kW and 1 MW.

Partners: Wartsila (channel partner), other channel partners (not publicly announced)

Differentiation: Greensmith historically focused exclusively on software, but recently entered systems integration. Majority of Greensmith's experience has been in the utility-scale segment, and thus its experience in the C&I segment is limited compared to several of its key competitors. However, Greensmith has the opportunity to make inroads in the C&I segment, particularly by leveraging its software expertise in conjunction with its new storage system. Greensmith may enjoy success given its developing partnerships with players in the C&I energy management space.

Origination	Greensmith is establishing channel partnerships with companies that offer energy storage as a piece of an overall C&I energy management portfolio.
Financing	Does not offer financing.
Project Dev.	Does not engage in project development.
Systems Integration	Greensmith performs systems integration, which recently became a key piece of Greensmith's value-add.
Software Layer	Greensmith's GEMS platform offers system optimization.
Installation	Does not perform systems installation.
Asset Mgmt.	Greensmith software can be utilized for system monitoring. Does not own energy storage systems.

Vendor Profile: JLM Energy

Market Segments: C&I, Residential

Business Model: JLM Energy offers residential and C&I energy storage solutions, as well as solar PV and small wind. JLM offers battery systems based on a proprietary battery design manufactured by a third party. Company sells systems directly to end customers and through channel partners. Software stack sold directly to utilities and consultants, and can also be white-labeled for other commercial entities.

Offerings: Fully integrated residential and C&I energy storage systems (5.2 kWh to 20.8 kWh), software platform.

Partners: Ideal Power (power electronics), Fronius (power electronics)

Differentiation: JLM Energy offers both C&I and residential energy storage solutions, which sets it apart from the majority of behind-the-meter systems integrators that generally focus on only one segment. JLM Energy offers generation solutions (solar PV, small wind) as well as energy storage, and thus focuses on customers that want renewables-plus-storage, which differentiates the company in particular from several key storage-only players in the C&I space. JLM Energy's variety of offerings could equally prove a hindrance as a jack-of-all-trades, master of none.

Origination	Utilizes three sales channels: enterprise (directly to C&I customers), channel-based (solar installers, OEMs, developers) and direct sales to residential customers.
Financing	JLM offers in-house financing.
Project Dev.	JLM can perform C&I project development, though it employs a mix of strategies to bring products to market: enterprise and channel-based.
Systems Integration	JLM performs systems integration.
Software Layer	JLM Energy has an internal software platform known as Measurz. System offered as a standalone product and is included with JLM storage systems.
Installation	JLM has in-house installers though it generally works with third-party solar installers.
Asset Mgmt.	JLM provides O&M services (management and monitoring of systems). JLM does not own energy storage systems.

Vendor Profile: Johnson Controls

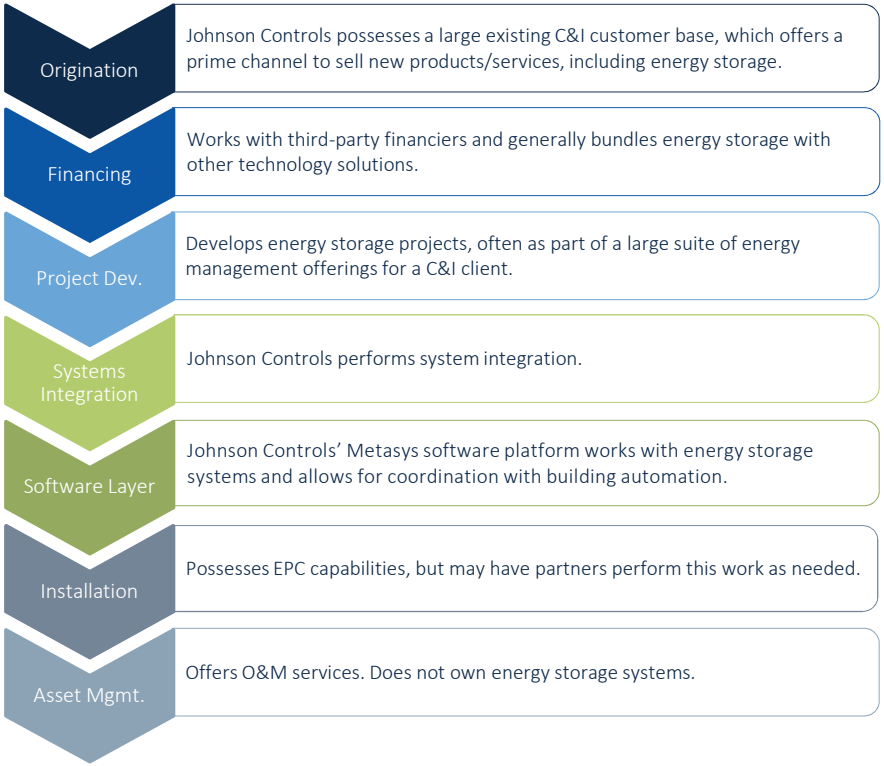
Market Segments: C&I

Business Model: Johnson Controls' core focus is providing energy solutions for C&I customers, including energy storage. Historically had a core focus in the automotive industry, a division which has been spun off as Adient. Johnson Controls has manufacturing capabilities for lithium-ion batteries and offers some portion of BOS (HVAC, fire suppression, containers). Company offers system integration, project development, EPC and O&M. Recently merged with Tyco.

Offerings: Fully integrated lithium-ion energy storage systems offered in 43 kWh, 65 kWh and 500 kWh blocks.

Partners: Multiple power electronics, financing and installation partners.

Differentiation: Johnson Controls has a large C&I customer base that has purchased energy management solutions from the companies; this creates a pre-existing customer network for Johnson Controls' energy storage solutions. Additionally, Johnson Controls' reputation in the C&I building space gives it deeper credibility with potential new customers that may purchase energy storage as part of an energy management portfolio. However, Johnson Controls has been a slow mover in the energy storage market.



Vendor Profile: Lockheed Martin

Market Segments: C&I

Business Model: Lockheed Martin is an advanced technology company with multiple business arms, including the recently established Lockheed Martin Energy, which contains the company's energy storage business unit. The company offers turnkey energy storage systems in the C&I and utility-scale energy storage markets, offering lithium-ion systems and developing a flow battery product line. Flow battery line is the product of its Sun Catalytix acquisition. Lockheed can provide certain EPC services (installation and commissioning).

Offerings: Fully integrated C&I energy storage solutions (100 kW-class and up, lithium-ion based, 1- to 4-hour systems; developing multi-MW, multi-hour flow battery systems), project development support

Partners: Lithium-ion battery suppliers (not publicly announced)

Differentiation: Lockheed Martin is a large company with a trusted brand and extensive technology expertise, which provides bankability for its lithium-ion storage systems. It already has a large existing customer base it can leverage in the C&I space, and the strength of its pedigree will allow for the acquisition of additional customers seeking energy storage solutions. Furthermore, Lockheed Martin has historically worked with military and strategic customers, which offers an additional opportunity for the company's storage business. Its flow battery arm is still developing, and this technology still needs proof of commercial bankability. Company possesses a large geographic footprint, which gives access to U.S. markets.

Origination	Lockheed Martin's customer acquisition strategy is built off both new customers via its brand strength and selling to existing customer base. Customers include utilities, IPPs and project developers.
Financing	Does not provide financing for energy storage systems.
Project Dev.	Lockheed Martin offers development support for customers via modeling to optimize system size and performance. Lockheed Martin works with developers, but is not a developer itself.
Systems Integration	Performs systems integration. Designs and manufactures lithium-ion storage systems. Lithium-ion batteries are sourced from third parties. Developing flow battery systems; flow batteries are manufactured in-house.
Software Layer	Has its own internal software platform that is able to interact with third-party software.
Installation	Lockheed Martin can perform installation and commissioning, but other EPC work is performed by third parties.
Asset Mgmt.	Lockheed Martin provides O&M and monitoring for its systems. Does not own or operate energy storage systems.

Vendor Profile: S&C Electric Company

Market Segments: C&I

Business Model: S&C Electric Company is a systems integrator that provides power electronics and control integration, and supplies turnkey C&I energy storage systems to distributors and OEM channel partners. S&C also provides EPC work, monitoring and maintenance for energy storage systems. S&C has experience in both the utility-scale and C&I segments.

Offerings: Power electronics, fully integrated turnkey energy storage systems (25 kW, 250 kW and 1.25 MW models)

Partners: IPERC (project software partner), Viridity (software partner), battery partners (not publicly announced)

Differentiation: S&C Electric Company has significant experience in the energy industry via multiple business units including automation controls and switchgear. S&C has more experience in the utility-scale segment compared to C&I, but is increasingly making inroads in the C&I market. Furthermore, S&C is an established company, which makes it attractive for customers that want to ensure their energy storage system is provided by a company with a strong balance sheet and greater likelihood of being around should the system warranty need to be honored.

Origination	S&C gets its energy storage products to market through distributors, direct sales, manufacturers' reps and OEM channel partners.
Financing	S&C offers financing via a third party. Model can be shared savings or PPA depending on the chosen financing partner and the customer's needs.
Project Dev.	Can perform project development, though this is not a core area of the company's business.
Systems Integration	S&C performs systems integration.
Software Layer	Offers a software package with storage systems. Systems configured to work with multiple software platforms. Energy storage management system embedded into S&C offering.
Installation	S&C offers a suite of EPC services including engineering, procurement and systems installation.
Asset Mgmt.	S&C offers a suite of O&M services for energy storage systems (e.g., monitoring, annual maintenance extended warranties). Does not own energy storage systems.

Vendor Profile: Schneider Electric

Market Segments: C&I, Residential

Business Model: Schneider Electric is a technology solution provider for energy management that primarily develops power conversion, electrical balance of systems (BOS) and software platforms. Operates mostly through a partner model but more recently started offering turnkey energy storage systems for the C&I market.

Offerings: Schneider Electric offers power conversion equipment for both C&I and residential customers. Company is developing its own scalable energy storage solution, the EcoBlade. Leverages established business for BOS components and energy management software.

Partners: Lithium-ion battery supply partners (not publicly announced), multiple energy storage system integrators utilize Schneider Electric power electronics.

Differentiation: Schneider Electric possesses existing relationships with C&I customers which gives it an existing channel to provide energy storage solutions. To date, Schneider Electric's experience in the residential segment is more limited compared to the C&I segment, but as the EcoBlade rollout continues, market share is expected to increase. Schneider Electric already possesses a robust distribution network built via its solar and power electronics businesses. Schneider Electric's experience with its own fully integrated energy storage solution is limited.

Origination	Residential: Channel-based and OEM partners. C&I: Mix of energy storage developers, specialized electrical channels and direct to C&I customers.
Financing	Schneider Electric does not currently offer financing for residential customers. No direct financing for C&I customers, but Schneider Electric works with partners to finance select C&I projects.
Project Dev.	Schneider Electric can perform customer origination for C&I energy storage projects, but does not provide later stages of project development.
Systems Integration	Can perform systems integration, though this is a newer portion of its behind-the-meter business.
Software Layer	Schneider Electric has developed an internal software platform for C&I storage that can operate autonomously or integrate with third-party software.
Installation	Residential: Does not perform installation. C&I: Both direct installation and partner-driven installation services.
Asset Mgmt.	Schneider Electric offers O&M software and services. Does not own energy storage systems.

Vendor Profile: Sharp

SHARP

Market Segments: C&I

Business Model: Sharp is a solutions provider offering energy storage systems, financing, EPC services and asset management for customers in the C&I segment. Its go-to-market strategy includes both channel partners and projects where Sharp acts as the developer.

Offerings: Turnkey energy storage systems (in multiples of 30 kW/40 kWh or 30 kW/80 kWh up to MW-level), EPC services, and asset management via software package. Both hybrid solar-plus-storage and storage-only offerings.

Partners: Samsung SDI (battery provider), Ideal Power (power conversion system provider), Energy Toolbase (modeling software partner), third-party financiers (not publicly announced)

Differentiation: Sharp offers a structured financing package for solar-plus-storage solutions. Offers 10-year performance guarantee as an option with 10-year O&M service agreement. Given Sharp's longevity, the company has an edge over competitors, since customers are more likely to enter into long-term agreements with companies that have a proven track record and diverse portfolio of products and services. Given the company's size and success in multiple geographic markets for other business units, Sharp will likely to able to expand its energy storage business line quickly and capitalize on new business opportunities as different geographic markets mature.

Origination	Sharp acquires customers through channel partnerships and via direct sales.
Financing	Offers a PPA-esque financing package in conjunction with third-party financing partners.
Project Dev.	Sharp engages in project development.
Systems Integration	Sharp performs systems integration.
Software Layer	Internally developed software platform for system operation and asset management. Sharp also works with Energy Toolbase to provide modeling and aid channel partners in developing storage projects.
Installation	Works with third-party EPCs for installation services.
Asset Mgmt.	Asset management services with performance guarantees are a key element of Sharp's offering. Has limited on balance sheet ownership of systems, relying heavily on third-party financing.

Vendor Profile: Sonnen

Market Segments: C&I, Residential

Business Model: Sonnen is a systems integrator that sells its storage systems via channel partners, such as solar installers. Sonnen announced a storage financing offering for the U.S. market in January 2016. The company developed an energy trading platform known as SonnenCommunity, effectively allowing Sonnen to act as an electric utility for its customers, but this platform is not currently available in the U.S.

Offerings: sonnenBatterie eco (3 kW to 8 kW, 4 kWh to 16 kWh, residential system), sonnenBatterie pro (18 kW to 90 kW, 24 kWh to 240 kWh, C&I system)

Partners: Enbala (strategic partner), Sony (battery supplier), Ideal Power (power electronics supplier), Sungevity (distribution partner), Spruce (financing partner), Outback Power (residential system inverter supplier), Autogrid (software partner)

Differentiation: Sonnen has deployed a significant number of residential systems in Germany, and thus can point to proven deployments of its technology. Furthermore, Sonnen has worked quickly to establish channel and strategic partnerships in the U.S. market, despite entering the market in late 2015. Sonnen has developed a system for electricity trading in Germany known as SonnenCommunity, which is still a small portion of its business today but provides the opportunity as an additional offering if and when it is established in the U.S. As a new entrant to the C&I space, it's unclear how Sonnen will gain market share and differentiate itself from its competitors.

Origination	Sonnen sells systems via channel partners, including solar installers and developers.
Financing	Sonnen announced a storage-only financing product in conjunction with Spruce in early 2016. Solar-plus-storage financing expected in near future.
Project Dev.	Sonnen does not engage in project development.
Systems Integration	Sonnen performs systems integration.
Software Layer	Sonnen develops software in-house. Software layer is a key piece of SonnenCommunity program (currently not available in U.S.).
Installation	Sonnen does not perform installation.
Asset Mgmt.	Sonnen provides system monitoring. Sonnen does not own energy storage systems.

Vendor Profile: Stem

stem

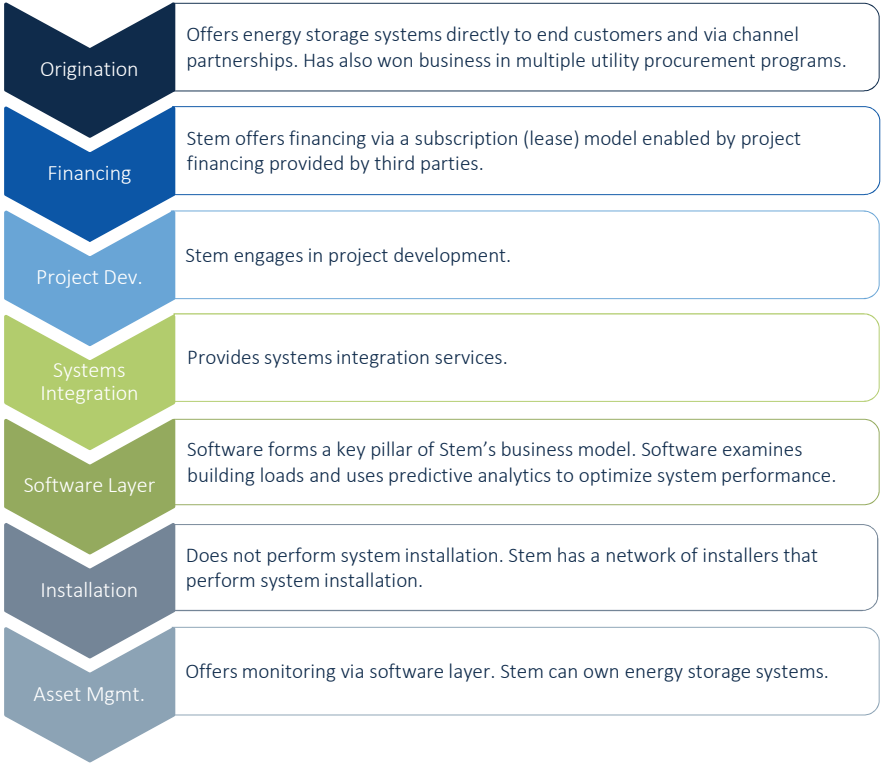
Market Segments: C&I

Business Model: Stem has three key pillars of its business: software, systems integration and customer acquisition. Stem provides storage-as-a-service for C&I and institutional customers seeking to reduce demand charges and participate in energy markets, offering a subscription-based model enabled by project financing. Stem can aggregate energy storage systems to provide grid services, for which the company receives financial compensation.

Offerings: Fully integrated energy storage systems, software that uses predictive analytics for energy storage monitoring and management, project development services.

Partners: Technology suppliers include Socomec, Tesla, Panasonic and Samsung SDI. Channel partners include Schneider/Summit Energy and SunPower. Project financing partners include Generate Capital, Starwood Energy Group and Clean Fleet Investors.

Differentiation: Stem maintains a solid foothold in the U.S. C&I energy storage market and has already demonstrated its hardware and software via a significant number of deployments. Stem's software is a key piece of its value proposition, especially via its ability to offer analysis on short intervals and optimally manage energy storage systems. As the energy storage market matures, it is possible Stem's focus could shift more toward its software business, providing a software suite for other system integrators. Stem's financing offerings have helped it secure C&I and institutional customers. Stem also runs storage-based grid service programs with five utilities.



Vendor Profile: Sunverge

Market Segments: Residential

Business Model: Sunverge acts as an energy storage system integrator. Sunverge's software allows for aggregation of multiple behind-the-meter assets to form a virtual power plant. Sunverge has developed an internal software package, and in the future may shift its focus to offer standalone software for energy storage project developers and system integrators in addition to the company's hardware offerings.

Offerings: Fully integrated energy storage systems (7.7 kWh, 10 kWh, 16.5 kWh and 19.4 kWh models), energy storage management and aggregation software

Partners: SunPower (installer partner), Kokam (lithium-ion battery supplier), Schneider Electric (inverter supplier), Con Edison (utility pilot project partner), Glasgow EPB (utility pilot project partner), SMUD (utility pilot project partner)

Differentiation: Sunverge has made key inroads in the residential energy storage market via partnerships with utilities both in the U.S. and abroad for virtual power plant pilot projects. Additional RFP award announcements are expected before the end of 2016. Furthermore, Sunverge's software platform can be applied to storage systems offered by other companies, offering Sunverge an additional business opportunity beyond hardware that is likely to be pursued in the future. Though Sunverge is a young company, it has already secured footholds in a few key U.S. markets. However, given its size, it is unclear how Sunverge will scale its hardware business as the energy storage market grows.

Origination	Sunverge employs partnerships with utilities and solar installers to bring its products to market.
Financing	Does not offer financing.
Project Dev.	Sunverge does not perform project development. For utility projects, Sunverge's partners handle customer acquisition and EPC work.
Systems Integration	Sunverge performs systems integration.
Software Layer	Implements internally developed software for energy storage system management. Software possesses DER aggregation capabilities.
Installation	Does not perform system installation.
Asset Mgmt.	Provides remote monitoring and control via its software platform. Does not own energy storage systems.

Vendor Profile: Swell Energy

Market Segments: Residential

Business Model: Swell Energy develops, sells, owns and operates residential energy storage systems. The company sells residential energy storage systems directly and through channel partnerships. Swell Energy seeks to partner with utilities to offer services via aggregated residential energy storage.

Offerings: Turnkey residential energy storage system supplied by third parties, aggregation services, EnergyShield service which combines storage, solar PV and energy management.

Partners: LG Chem (energy storage system supplier), sonnen (energy storage system supplier), Southern California Edison (utility pilot project partner), financing partners (not publicly announced). Swell is also an authorized reseller of Tesla energy storage systems.

Differentiation: Swell Energy develops projects in the residential space by partnering with utilities. The company's goal involves providing services for both the end customer and electric utilities, increasing the business case for energy storage by ensuring value stream bankability. Swell Energy is small but starting to grow, and notably won a 5 MW/20 MWh contract under SCE's Preferred Resources Pilot program in September 2016.

Origination	Acquires customers both via direct sales and channel partnerships with solar companies.
Financing	Company offers third-party financing and is actively raising funds to own and lease systems.
Project Dev.	Project development is a core piece of Swell Energy's business model.
Systems Integration	Does not perform systems integration.
Software Layer	Utilizes third-party software. Swell Energy has system aggregation capabilities.
Installation	Developing of network of installer partners including solar installer and electrical contractors.
Asset Mgmt.	Can offer a services agreement for customers to provide monitoring and maintenance. O&M services included with company-owned energy storage systems.

Vendor Profile: Tabuchi Electric

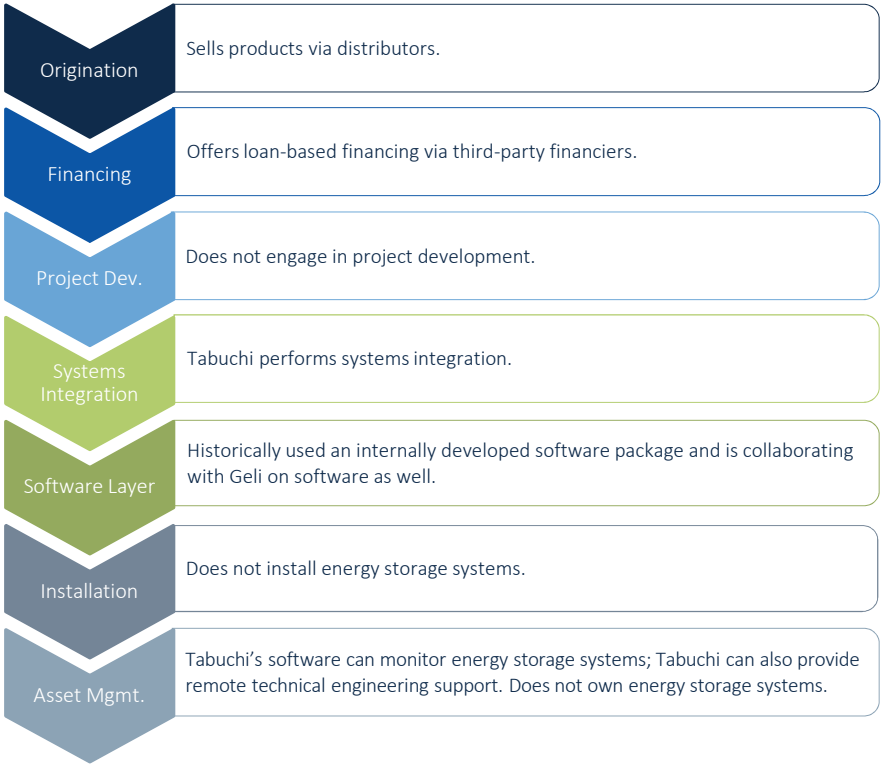
Market Segments: Residential, C&I (inverter only)

Business Model: Tabuchi Electric is a large technology manufacturer whose power electronics line includes a residential hybrid PV inverter and battery storage system and a C&I inverter. Tabuchi offers financing for its systems and works with distributors to bring its products to market.

Offerings: Residential hybrid PV inverter and battery storage system (5.5 kW/10 kWh), commercial inverter (25 kW)

Partners: Panasonic (battery supplier), Geli (software partner), Electric & Gas Industries Association (financing partner)

Differentiation: Tabuchi possesses a long history in the power electronics market, which allows the company to leverage this experience when developing fully integrated energy storage systems. Tabuchi's size and existing sales channels offer opportunities to rapidly expand its energy storage business in the U.S. Furthermore, Tabuchi can leverage learnings from its deployments in Japan over the past decade to build its U.S. business model. Tabuchi's financing package offers additional customer acquisition opportunities.



Vendor Profile: Tesla

Market Segments: C&I, Residential

Business Model: Tesla has several lines of business, including energy storage and electric vehicles. The company has a long-term goal of becoming a one-stop energy solutions provider, indicated by the acquisition of SolarCity, which adds solar PV to its product offerings. Possesses supply agreements with several project developers.

Offerings: Lithium-ion batteries, Powerwall (6.4 kWh or 13.5 kWh, 5 kW continuous/7 kW peak residential system), Powerpack (50+ kW, 100+ kWh, C&I system)

Partners: SolarCity (acquisition approved November 2016, development/installation partner), Green Mountain Power (utility partner), Advanced Microgrid Solutions (Tesla to supply batteries for AMS storage systems). Dynapower formerly supplied Tesla with inverters, but Tesla announced in October 2016 that it had begun designing and manufacturing its own inverters for its Powerpack 2 and Powerwall 2 products.

Differentiation: Tesla may be able to leverage additional business as it brings together multiple product lines, though it remains to be seen if customers seeking PV or EVs can be sold on storage as well. Tesla has secured a significant amount of SGIP funding for projects in Calif., but lacks strong channels in most other geographic markets within the U.S. Tesla's internal battery manufacturing may give it an edge in cost in several years once the Gigafactory reaches scale. The acquisition of SolarCity points to Tesla shifting focus to include a greater element of project development in its overall value proposition.

Origination	Currently most storage systems sold via solar installers, though Tesla has also formed distribution deals with at least one electric utility (Green Mountain Power in Vermont).
Financing	Tesla has not historically offered financing. However, in April 2016 SolarCity closed a round of financing for solar-plus-storage, and storage financing is expected to be pursued further in the future.
Project Dev.	Project development is currently not a core piece of Tesla's business, though the acquisition of SolarCity may cause this area to become a larger proportion of the company's overall focus.
Systems Integration	Tesla provides systems integration.
Software Layer	Develops software in-house for its EVs, but Tesla's software capabilities for energy storage are unclear.
Installation	Does not perform installation.
Asset Mgmt.	Does not own energy storage systems.

Vendor Profile: Younicos

Market Segments: C&I

Business Model: Younicos' core competencies are software development, power electronics design and systems integration for the C&I market. The company's U.S. business followed the acquisition of Xtreme Power in 2014. The company utilizes both channel-based and direct sales methods for bringing products to market. Younicos has robust utility-scale project development experience that may be leveraged for the C&I space in the future. Premiered the plug-and-play Y.Cube storage system in Q3 2015.

Offerings: Power electronics, fully integrated energy storage systems (200+ kW), energy storage management software

Partners: Multiple battery suppliers and developers. Strategic investors include Aeris Capital, First Solar and Grupo ECOS.

Differentiation: Younicos has significant experience in the power electronics, controls and software area, particularly for utility-scale energy storage. However, its experience with fully integrated systems in the C&I market is limited compared to some of its competitors. Nevertheless, Younicos has a wide geographic reach which will likely allow faster expansion into emerging markets for C&I energy storage in the U.S. Younicos also has previous relationships via its power electronics and software businesses that it may be able to leverage into future energy storage business. As a result, Younicos is expected to scale rapidly in the U.S. C&I energy storage market.

Origination	Younicos has two origination methods: channel-based and direct sales to customers seeking greater energy management solutions.
Financing	Does not offer financing as standard and currently offers no financing package.
Project Dev.	Engages in project development, though most of its experience thus far has been at the utility scale.
Systems Integration	Younicos performs systems integration. Experience as a power electronics and controls vendor factors into systems integration expertise.
Software Layer	Developed software for systems management and monitoring.
Installation	Can provide installation services, but other parties may provide EPC work as needed.
Asset Mgmt.	Younicos provides asset management via remote monitoring and control, including 24/7 operator monitoring and support. Does not own energy storage systems.

5. Market Future: Trends, Trials and Transformation

The Future of the U.S. Behind-the-Meter Energy Storage Is Bright

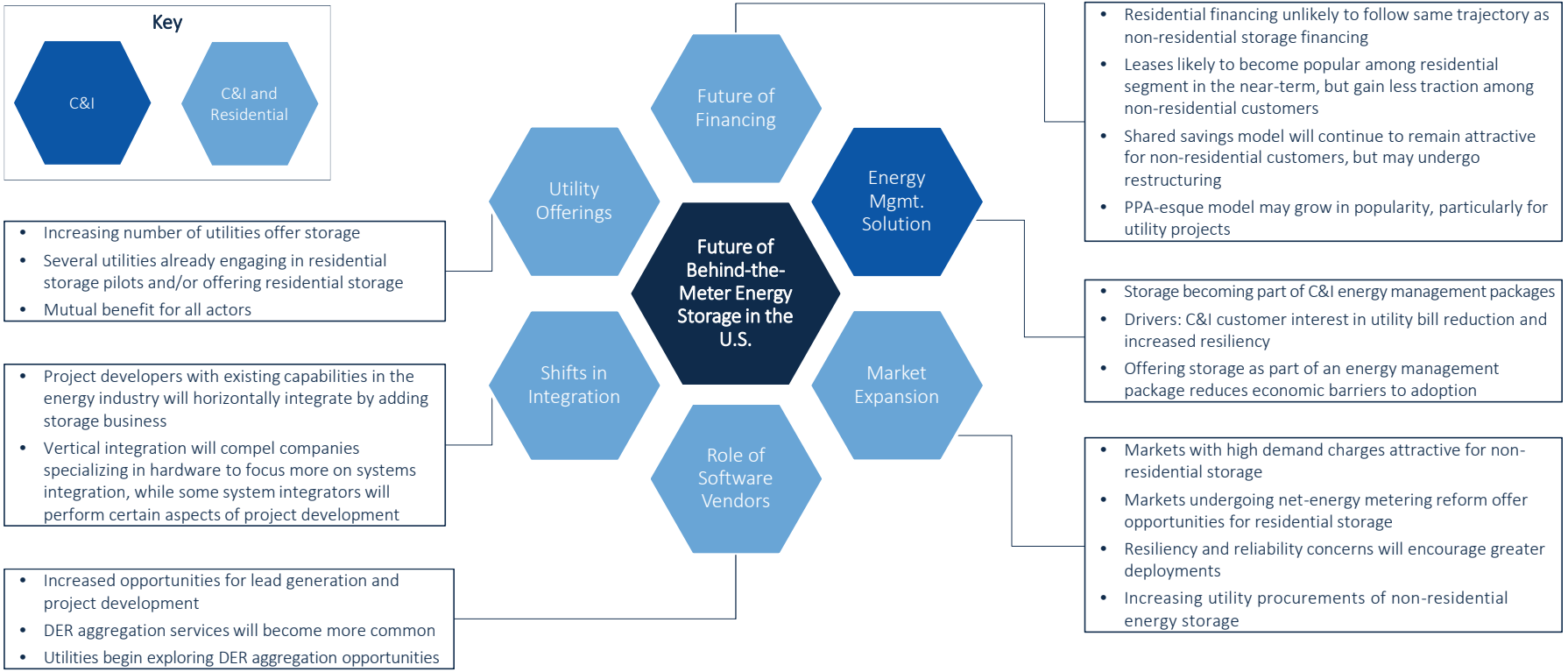
The U.S. behind-the-meter energy storage market is a young and rapidly evolving market. Regulatory changes that both directly and indirectly affect energy storage are driving some notable trends that will affect the market in years to come. Furthermore, companies are exploring new business models as they seek to gain an edge in this burgeoning field.

While there is a variety of models seen in the market today, the future is likely to see several predominant trends come to the fore. Energy storage financing, which still lacks standardized formats, particularly for the residential segment, is expected to undergo an evolution as the technology becomes better understood and financiers gain greater comfort financing energy storage as monetizable value streams emerge; today, residential energy storage financing is practically nonexistent given a lack of monetizable value streams. Non-residential storage is increasingly finding a place in energy management packages for C&I customers, a trend which will no doubt continue as more customers pursue energy management options and the cost of storage declines.

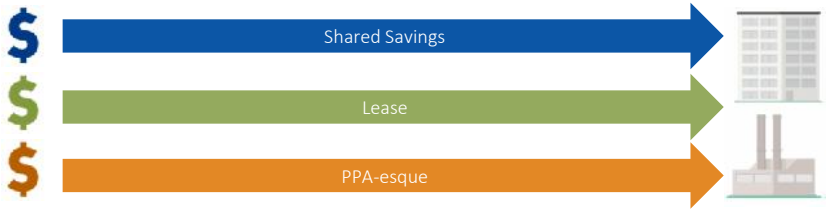
As all of this happens, new geographic markets will open in the U.S., driven by cost declines, technology improvements and new business models which allow systems to be monetized for a suite of value streams. Software vendors will play an important role in storage's future, particularly as more utilities aim to leverage behind-the-meter assets for grid services. Meanwhile, shifts in company structure will occur as the market matures, with some players adding an energy storage business line while others bring additional pieces of the value chain in-house.

Without a doubt, the U.S. energy storage market is on track for some exciting changes over the next several years.

Business Model Evolution

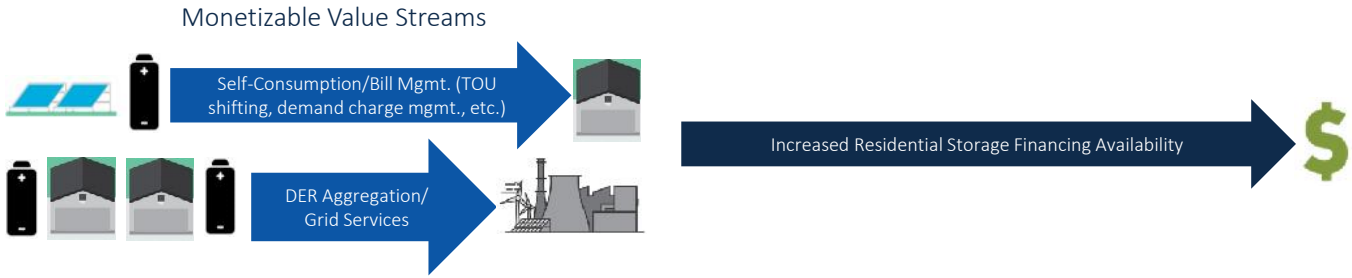


Non-Residential Financing Will Experience Important Shifts



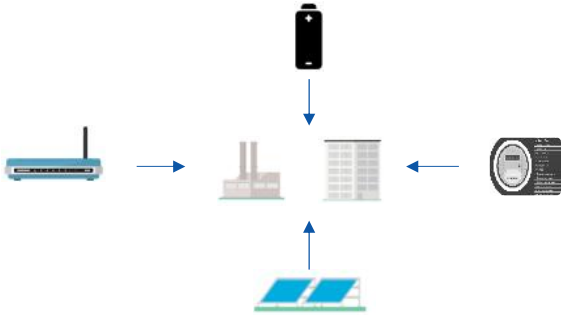
- Multiple financing options offered by project developers today for non-residential energy storage including shared savings, lease and PPA-esque models. Project developers are increasingly working to establish financing partnerships in order to scale their business, particularly as financiers become more comfortable with energy storage as project developers gain several years of performance data to cite, system prices decrease and opportunities to supply grid services increase.
- PPA-esque models expected to gain popularity given similarity to solar PPAs, but need to ensure that they are properly structured to prevent customer confusion and reduced economics for either the system owner or customer. PPA-esque model may benefit from centrally created boilerplate language, as was seen with solar PPAs. Model might be attractive for projects involving electric utilities, given utility familiarity with solar PPAs, and thus this model is expected to become more attractive for non-residential storage projects developed for utility programs.
- Lease model requires longer timeline for free cash flow and thus is unlikely to become the prime method pursued by non-residential customers. To date, it has enjoyed success in the non-residential market, although the market today is still relatively small and geographically constrained. Financiers are likely to continue to look favorably on this method in the near term, as leases guarantee fixed revenue. Long-term, the model may have additional legs if project developers continue to provide services to utilities, but they need to ensure end customers' value streams are not undermined by a desire to supply grid services, as this could lead to customer acquisition challenges.
- The shared savings model has already accounted for a significant number of non-residential storage deployments, though in a small market. This model will continue to remain attractive, particularly as it is expected to undergo restructuring to capture value streams beyond demand-charge management, such as grid services. Sharing additional revenue for grid services will be attractive for the end customer, but such a structure may deter potential financiers as cash flow is not as steady.

Residential Storage Financing Is Rare Today, but Models Are Developing



- Little residential financing is offered today, particularly as there are few project developers involved in the residential energy storage market. This is mostly attributable to the age of the market and the lack of clearly monetizable value streams for residential energy storage in most markets. Today, a significant proportion of residential storage is purchased by early adopters, who are not driven by economic concerns and generally want to own systems outright.
- Residential energy storage financing is unlikely to follow same trajectory as non-residential storage, given that demand-charge management is rarely compelling for residential customers and is unlikely to become a compelling value stream in the next few years beyond a few niche markets. Furthermore, non-residential customers usually boast stronger balance sheets, and, in some cases, have multiple locations, which leads to the ability to institute different financing options.
- Leasing models are expected to gain prominence in the near term for the residential segment, particularly via utilities that will be able to leverage residential storage for grid services. Green Mountain Power in Vermont currently offers the Tesla Powerwall to its customers, and the lease option has proved the most popular avenue. However, this model lacks legs in the long term given a lack of monetizable residential value streams.
- Within the next five years, loan products will overtake leasing. Residential energy storage will be used mainly by end customers for self-consumption, which does not match well with financing models seen in the C&I space. PPA models may also see interest in the solar-plus-storage space, but these models present some challenges around contract design. Opportunities are expected to arise for aggregated residential storage with grid service payments shared between customer and aggregator.

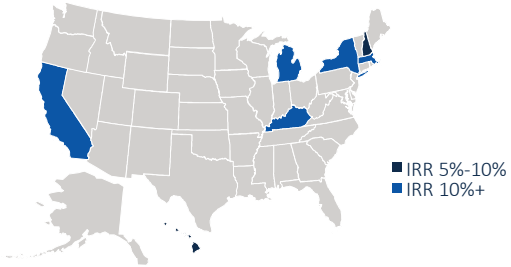
Storage Is Increasingly Finding a Place in C&I Energy Management Packages



- Storage is increasingly being added to energy management packages for C&I customers, a trend which is expected to continue, particularly as storage costs fall and the value proposition of storage becomes better understood by both vendors and customers. System integrators will partner with C&I energy management service providers to deliver solutions as part of C&I energy management packages, increasing the popularity of the go-to-market strategy of bundling storage as part of a C&I energy management package. In particular, large C&I customers with multiple host sites are expected to pursue storage as part of C&I management packages; storage can provide these customers both reduced electricity bills via demand-charge management and increased resiliency, the latter of which will be particularly attractive to customers that require uninterruptable power supplies, such as companies with large server banks (e.g., Apple, Amazon) and refrigeration (e.g., Wal-Mart, Kroger).
- Offering storage as part of an energy management package will increase rates of adoption by reducing economic barriers to adoption of energy storage, as it will be included alongside a suite of other products including lighting and building energy management solutions. C&I energy management contracts generally target bill reduction goals and other services such as improved illumination. Initially, customers can add storage to these contracts for an additional price to ensure greater bill reduction and resiliency, but increasingly as new customers are signed up in the future, storage will be a piece of the contracts from the beginning.
- Question remain about whether customers seeking additional resiliency already possess backup capabilities such as through diesel generators and, if so, what would be necessary to convince them to add storage (i.e., falling costs, opportunity to leverage storage systems for grid service payments during other times, desire to reduce carbon emissions). C&I customers concerned with environmental impact in particular are expected to abandon traditional backup generation in favor of energy storage, especially large corporate entities that have committed to meeting environmental commitments including reduced carbon emissions and increased usage of renewable electricity within the next decade.

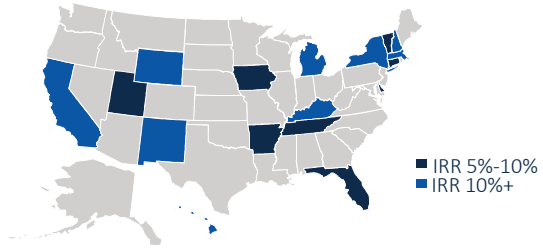
Opportunities Will Abound for Non-Residential Storage Across the U.S.

1-Hour Storage Economics, Small C&I Customer (2016)



Source: GTM Research *The Economics of Commercial Energy Storage in the U.S.*

1-Hour Storage Economics, Small C&I Customer (2021E)



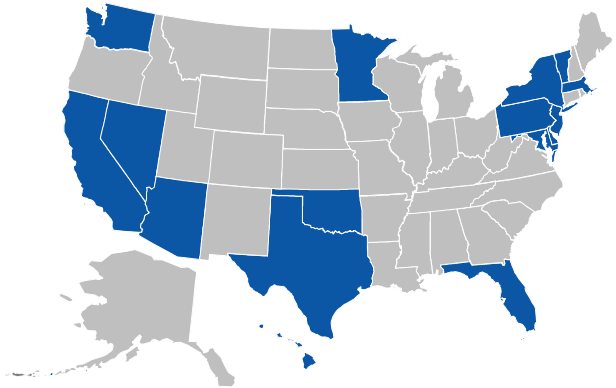
Source: GTM Research *The Economics of Commercial Energy Storage in the U.S.*

- Markets with high demand charges offer significant opportunities for non-residential energy storage. GTM Research found that economic viability of 1-hour non-residential storage systems employed for demand-charge management is expected in at least 17 U.S. states for small/medium-size C&I customers and 14 states for large C&I customers by 2021 (i.e., markets with demand charges of $11/kW-month or greater)[1].
- In the wake of natural disasters such as Hurricane Sandy, states such as Connecticut, New Jersey and New York are increasingly pursuing programs to ensure reliability of critical infrastructure. Resiliency and reliability concerns will encourage greater deployments of non-residential energy storage across the U.S., particularly in the Northeast. Government and public buildings will be the primary customers in these states to adopt renewables-plus-storage for increased resiliency.
- Utilities are increasingly issuing non-wires alternative RFPs and RFOs as they seek to upgrade grid infrastructure. Some of these RFPs and RFOs offer opportunities for non-residential energy storage, such as several issued in 2015 and 2016 regarding grid upgrades on Long Island. Utilities are also exploring opportunities for storage to supply grid services, such as via the LCR, PRP and DRAM programs in Calif. These programs will proliferate across the U.S. as other utilities draw on learnings from initial programs, and storage will increasingly play a role in such programs as economics improve and a greater amount of historical performance data becomes available.

[1] Footnote: GTM Research *The Economics of Commercial Energy Storage in the U.S.*

Residential Storage Is Expanding Into New Geographic Markets

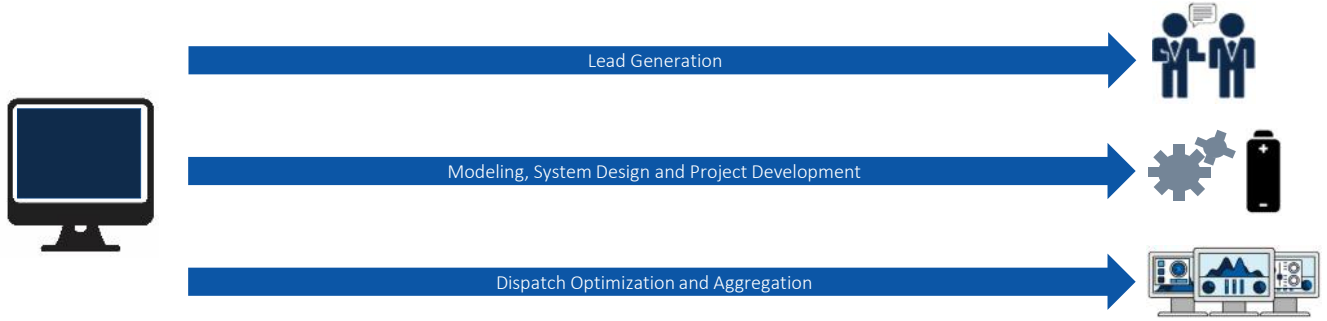
States With Rate Reforms, Net Metering and Behind-the-Meter Storage-Specific Policies Proposed or Enacted, 2016



Source: GTM Research / ESA *U.S. Energy Storage Monitor*. Note that this chart only includes states covered in the U.S. Energy Storage Monitor report.

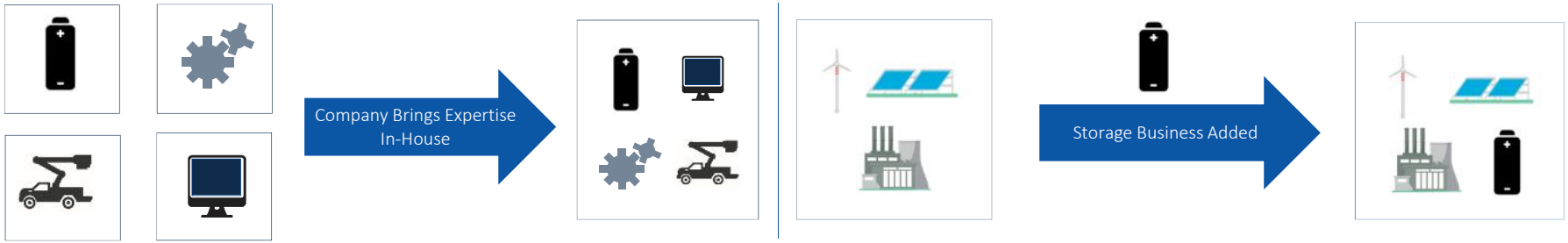
- Markets undergoing net-energy metering (NEM) reform are particularly attractive for residential energy storage as customers seek to maximize self-consumption of solar PV-generated electricity following the reduction or elimination of NEM compensation. Several markets including Hawaii, California, Arizona and Massachusetts have recently revised or are in the process of revising their NEM programs.
- In the wake of natural disasters such as Hurricane Sandy, interest in reliability and resiliency is growing in Northeastern states. Though solar-plus-storage is today a more expensive alternative to diesel generators, expected future declines in cost and additional benefits from the solar-plus-storage systems will encourage greater uptake.
- Utility rate reforms are increasingly proposing residential demand charge and time-of-use rates. Though to date few have passed, if these types of tariffs are implemented, then opportunities for residential energy storage increase, though the extent to which storage uptake occurs depends on both future storage system economics and the level at which the new rates are set.
- Utilities across the country are increasingly investigating opportunities for leveraging behind-the-meter storage for grid services.

Role of Software Vendors Will Expand in the Behind-the-Meter Energy Storage Market



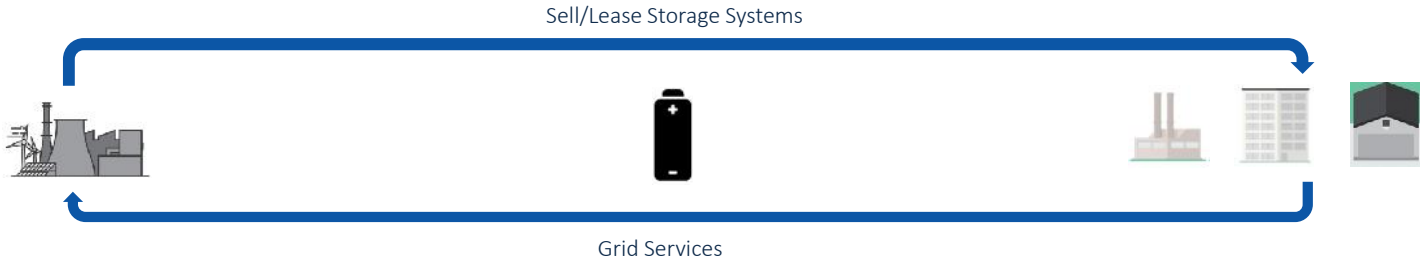
- Companies specializing in software will offer clients increased opportunities for lead generation via online modeling tools and will also offer more avenues for project development via design, analysis and optimization programs. A shift is expected where software companies will offer capabilities beyond system management alone and begin to provide software services that influence project development as well.
- An increasing number of software vendors and project developers are offering DER aggregation services, a trend which is expected to accelerate in the next two to three years. Aggregation of behind-the-meter resources will become increasingly common and compelling as more DERs are brought on-line. Furthermore, several utilities are already investigating such opportunities within programs like LCR (135 MW of behind-the-meter battery storage under 2014 LCR) and DRAM (0.9 MW of non-residential battery storage under 2016 DRAM, 2.2 MW of non-residential battery storage under 2017 DRAM) in Calif., and NY REV in New York (1.8 MW/4 MWh residential virtual power plant pilot project under development).
- DERs will increasingly provide value to the grid, and thus software vendors will continue to develop packages that optimize the dispatch of DERs. Software vendors that have historically focused on non-storage DERs or demand response alone will increasingly add storage management and dispatch to their toolkits.
- Software packages will evolve to enable better coordination of a suite of services. Software solutions that are promising but unable to optimize performance for actors on both sides of the meter (i.e., utilities and end customers) will inevitably be left in the dust.

Paths of Vertical and Horizontal Integration Explored by Different Companies



- Vertical integration will include companies already involved in the storage industry, with said integration likely to occur in a more downstream fashion. Companies focusing on hardware such as batteries or power conversion systems are increasingly starting to offer and explore fully integrated energy storage systems, and thus several may shift to becoming system integrators, which can offer cost advantages, as the new systems will rely on internally developed hardware and/or software. Similarly, system integrators may engage in some aspect of project development, most likely customer origination and project design, though few seem likely to fully shift to become project developers, and such companies are unlikely to add EPC work given the necessary requirements around workforce and capital. Project developers are unlikely to develop additional product offerings in-house; in a few cases they already possess these capabilities, and those that do not are more likely to source technology from third parties, as adding such business lines is unnecessary given the need for flexibility, the diversity of market offerings and the costs incurred.
- Horizontal integration will be explored by project developers that have historically been involved in other types of generation infrastructure projects, such as solar PV or wind. Companies like Edison Energy, NextEra and Duke/REC Solar recently added energy storage business units, and similar companies are expected to add storage to their portfolios in the next few years, particularly as storage economics improve. These companies will remain focused on project development, and will source storage systems and software from third parties.
- It remains unlikely that most companies involved in behind-the-meter energy storage will entirely vertically integrate. Sourcing some hardware or software from third parties can be advantageous, particularly where adding in-house manufacturing or development would add high costs. Furthermore, companies will need to be nimble as technology changes to ensure their storage offerings can continue to fulfill the goals of the end customers, be it in the case of system management and dispatch via software, or technological performance via hardware. Channel partnerships can offer greater ease of customer acquisition, particularly for the residential segment, and thus vertical integration will not be as common for companies focusing on the residential segment only.

U.S. Utilities Will Turn to Behind-the-Meter Storage as a New Pillar in Their Business Models



- An increasing number of utilities in the U.S. are expected to offer behind-the-meter storage. Utilities in other geographic markets, such as Australia and Germany, have added residential energy storage to their suite of products and services. In the future, a new go-to-market strategy will arise for systems integrators as they sell products via an electric utility. Future programs may involve project developers as well for purposes of assistance in customer origination, project design, system dispatch, financing and system ownership.
- Several U.S. utilities are already engaging in residential storage pilots, including Con Edison with Sunverge and SunPower in New York, and Glasgow EPB with Sunverge in Kentucky. Green Mountain Power in Vermont started offering Tesla Powerwalls for its customers in early 2016; customers have the option to allow utility access to their storage systems for grid services in exchange for a bill credit, or they can lease systems while allowing utility access. This trend is expected to accelerate as early utility pilot projects provide learnings which are used by other utilities to develop programs in conjunction with systems integrators and project developers. Utilities are expected to enter the C&I energy storage space in the future as well.
- Behind-the-meter storage offers mutual benefits for all actors:
  - Utilities gain access to new revenue streams view system sale or lease agreements, and can leverage behind-the-meter storage to provide grid services such as peak load management
  - Customers enjoy reduced electricity bills and increased resiliency
  - Systems integrators have access to a new sales channel and reduced customer acquisition costs, given that utilities already possess an established customer base
  - Project developers gain a new avenue to deploy a large amount of storage. Such relationships with utilities will likely be integral for project developers to scale residential operations, given the much smaller size of residential systems compared to C&I.

6. Conclusion

Conclusion

The U.S. behind-the-meter energy storage market is small today but is positioned for massive growth. This upcoming boom will be fueled by a cornucopia of factors, among them business-model evolution, price declines, financing changes, emergence of new geographic markets, opportunity to leverage behind-the-meter storage for grid services, storage as part of C&I energy management packages, and streamlining of software solutions.

Without a doubt, the market will experience some growing pains: Some companies will surely go bankrupt, while others will abandon specific products, services or business lines as the market matures. There is no winning business model in a single state market, let alone the U.S. as a whole, and some strategies will certainly win out over others. However, from the ashes will rise stronger players as the market scales, and new entrants will surely emerge to challenge existing players. Market actors are already exploring innovative ideas in technology design, financing, go-to-market strategies, DER aggregation and more as they work to develop business cases for behind-the-meter energy storage.

There is much to learn from the state of the U.S. behind-the-meter energy storage market as stakeholders look to the future. The next few years will be a time of learning before the market begins to scale in the early 2020s. The coming years will be an exciting time, though not without trial and error as market players experiment with variables ranging from system sizing to project ownership structure. Those actors that seize the initiative in the near term and determine the strongest path forward will secure a position for themselves in a market that's expected to rival the historically dominant utility-scale segment. Residential and C&I storage is starting to garner significant interest today, and as prices decline and business models evolve, the massive potential of this market will begin to be realized.

7. Appendix

Behind-the-Meter Energy Storage Landscape Framework Categories Description

In order to fully understand the U.S. behind-the-meter energy storage landscape, it is necessary to explore not only the companies active in the market, but also the niches each company fills. Though the market is still in its early stages, it already possesses a wide variety of players that represent a multistep value chain. As an additional level of analysis, GTM Research has separated behind-the-meter market players into three categories:

- **Technology Focused:** Companies that mainly focus on technology solutions. Includes both hardware focused players (e.g., inverter vendors) and software focused players (e.g., software developers). Several companies in this space began in the solar PV market and recently transitioned to offer technology for the storage market. Some of these vendors offer fully integrated storage solutions, but most technology focused companies that have started supplying turnkey solutions are more recent entrants to the realm of systems integration. In the case of technology conglomerates, some also perform project development, but in most cases today, this is still a smaller portion of their overall business line. These companies generally sell their products to integration focused companies, which then integrate hardware and software into a turnkey system. Technology focused companies also have a role to play when addressing systems-integration challenges, particularly those in the technology-related category, as these companies must ensure their products are continuously improved and able to interface with other technologies in a fully integrated storage solution.
- **Integration Focused:** Companies that primarily specialize in energy storage systems integration. In a few cases, these companies are also hardware vendors of some sort, but in the majority of cases they source their hardware from third parties. Integration focused players have their own internally developed software in some cases, but often design their systems to work with third-party software as well. These companies employ a suite of go-to-market strategies, including via developers, via wholesalers/distributors, via solar installers and/or via C&I energy management service providers as part of a C&I energy management package. Integration focused companies are primarily concerned with addressing the technology selection and systems integration challenges.
- **Project Development Focused:** Companies that specialize in energy storage project development. The majority of these players focus on the C&I space; almost none focus purely on the residential market, given that most residential energy storage installations are small (<10 kW) and rarely include more than one site. These companies specialize in various aspects of project development, with some focusing more on customer acquisition and project design, while others have EPC, asset management and system ownership capabilities as well. Project development focused companies generally partner with integration focused companies, offering to either sell or lease integrated storage systems to end customers. This category of companies partners with financiers in most cases to provide financing for energy storage solutions, though to date the vast bulk of financing is available only for non-residential behind-the-meter energy storage; financing packages can include shared savings, lease or PPA-esque models, and some project development focused companies work with financiers to offer multiple financing options. Financiers must be convinced of a project's viability, and thus project development focused companies must illustrate the profitability of value streams and the robustness of the storage solution to deliver on these value streams. Project development focused companies work to address systems integration challenges related to deploying the integrated storage system; furthermore, some project development focused companies engage with regulators to work toward policy changes to aid the energy storage market.

Behind-the-Meter Energy Storage Landscape Framework

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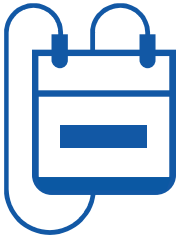

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