# Time to Shine?

# Evaluating the Economic Feasibility of Energy Storage Retrofits

**Prepared for**

**the Developer**

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## Executive Summary

The threat of climate change looming ever closer has spurred the public and private sectors into action. In many states, legislators have implemented Renewable Portfolio Standards ("RPS") that mandate solar carve outs in order to accelerate the transition to a cleaner energy mix. The private sector has recognized this as an incredible opportunity to make a profit while generating immense goodwill. However, renewable energy investments often call for complex project financing structures in order to take advantage of the tax incentives that subsidize these investments. This report leverages the author's experience in the solar C&I space to envision a hypothetical scenario where a generic C&I Developer ("the Developer") is looking forward to see what their next move should be. Using a proprietary model developed for the report as well as analyzing current market activity, the report develops recommendations for initiatives on both the sell side and buyside.

## Acknowledgements

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## Disclaimers

Any recommendations and conclusions in this report are made solely by the author and do not necessarily reflect the opinion or endorsement of the Developer. Publication does not imply that the Developer nor its representatives will accept or implement any strategic recommendations found here within.

## List of Abbreviations

| | |
|---|---|
| CapEx | Capital Expenditures |
| C&I | Commercial & Industrial |
| Developer | Generic C&I Developer |
| EBITDA | Earnings Before Tax, Interest, Depreciation, Amortization |
| ESG | Environmental, social, and governance |
| GW | Gigawatt |
| IRS | Internal Revenue Service |
| ITC | Investment Tax Credit |
| kW | kilowatt |
| kWh | kilowatt hour |
| MW | Megawatt |
| MWh | Megawatt hour |
| NEM | Net Energy Metering |
| OpEx | Operating Expenses |
| PPA | Power Purchase Agreement |
| PV | photovoltaic |
| REIT | Real Estate Investment Trust |
| RPS | Renewable Portfolio Standards |
| SMART Program | Solar Massachusetts Renewable Target Program |
| SREC | Solar Renewable Energy Credit |
| UN PRI | UN Principles for Responsible Investment |

## Introduction

In 2006, Congress passed a law enacting the solar Investment Tax Credit ("ITC"), a 30% tax credit on residential and commercial solar. This rebate would spark a revolution in the solar industry as developers and tax equity investors took notice, as the ITC encouraged adoption of the costly technology. The increase in installations led to better technology and a more mature market as stakeholders became experts in pricing solar projects, creating a positive feedback loop accelerating the prevalence of solar in the United States as an alternative to conventional fuels.

The results were, and are still, staggering. Since the ITC came into effect, the cumulative installation of photovoltaic ("PV") solar has grown approximately 33.5x in the past decade, with an average annual growth rate of 49%[1].

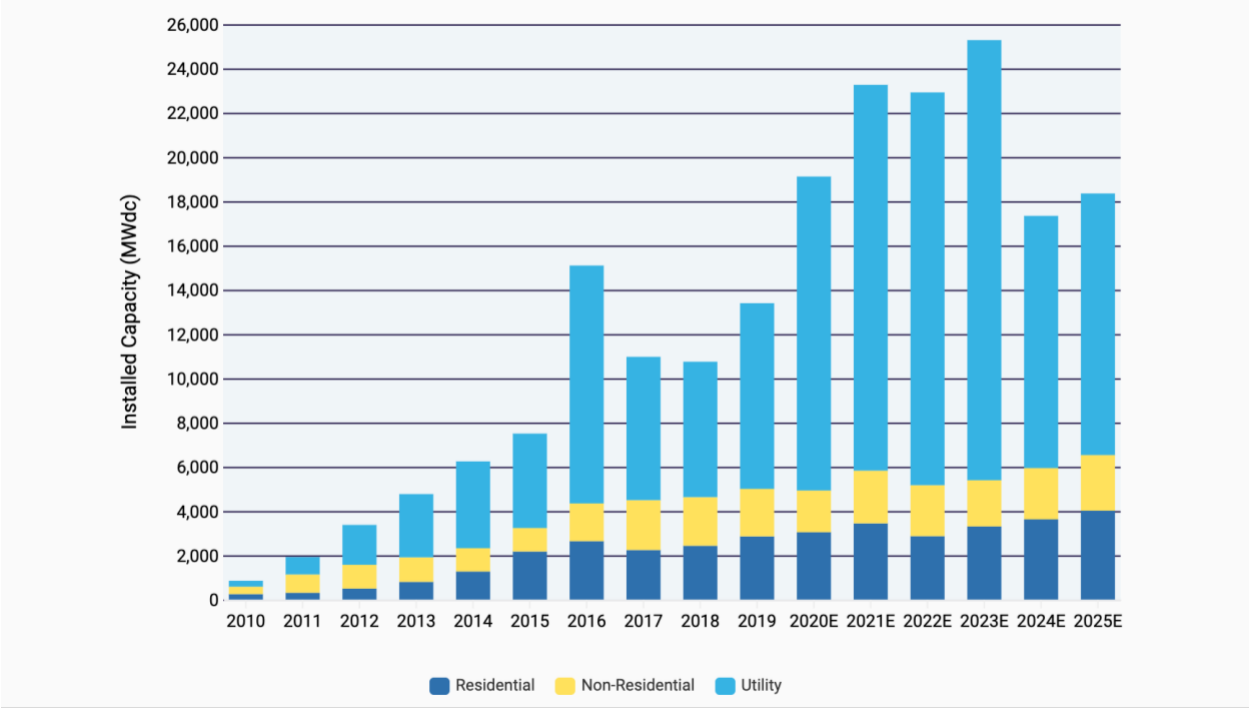



**Figure 1. U.S. Solar PV Deployment Forecast**

Source: Wood Mackenzie & SEIA[2]

This astronomical growth has kept pace, and in December of 2020 the ITC was extended yet again for another 2 years in a bipartisan move by Congress as part of the COVID-19 relief bill [3]. This was a significant step for mainstreaming solar as a financial investment; solar had become a proven technology, and tax equity investors in search of above-market returns, otherwise known as "alpha," were attracted to solar's promise of stable, long-term cashflows.

Socially-conscious investing is not a new concept, given the longevity of practices such as Islamic finance [4]. In recent years it has enjoyed a resurgence in mainstream attention from both private and public institutions such as Blackrock CEO Larry Fink's letter to shareholders declaring that socially minded investments are a necessary component of fiduciary duty [5]. Buzzwords such as ESG ("Environmental, Social and Governance") and Triple Bottom Line increasingly appear in companies' 10-Ks.

The UN Principles for Responsible Investing ("UN PRI") has "more than 3,000 signatories representing $103 trillion in assets under management as of April 2017" [6], but critics have pointed out that since the agreement is not legally binding, signing it could be motivated by the desire for positive PR and goodwill rather than from a place of sincere commitment to ESG values[7]. In 2018 the PRI managing body, cognizant of this risk, cracked down and put nearly 10% of its signatories on notice due to delinquency, and implemented more stringent requirements that "at least half a fund manager's assets be covered by a responsible investing policy and for there to be explicit commitment to the issue by senior managers," [8] lending membership more heft and credence. Buzzwords and public commitments "to be green" confer a halo effect, but do not always mean action. Financial service companies such as MSCI have developed benchmarking tools to evaluate if companies have truly worked on integration of key issues, commitment to key values, and positive impact [9].

This enthusiasm for sustainable investments comes with a stumbling block— the challenge of entering and exiting renewable projects. In order to be cost competitive in the United States, renewable energy projects are currently subsidized by a complex patchwork of incentives that vary state by state.

However, in the same spirit of capitalism that allowed polluters to flourish, companies have sprung up to address market inefficiency of identifying solar systems and rolling them up into conventional funds that traditional investors can buy into. Solar C&I developers have benefited from this run, attracting institutional backing from major asset managers such as BlackRock[10] as they scramble for solar assets in an increasing return-compressed environment. Developers looking to enhance returns are exploring battery storage retrofits on their preexisting solar sites, utilizing an Internal Revenue Service ("IRS") private ruling allowing later battery retrofits to qualify for ITC if charged 100% by solar energy. The IRS ruling states that they "conclude that the Battery cost is a 'qualified solar electric property expenditure' when installed in a taxable year after the taxable year in which the installation of your other Solar Energy System Components are completed… Earlier installations of qualifying property do not affect the availability of the credit for qualifying property in later years" [11]. This is a significant boon to the future of battery storage technology, as the ITC can do for battery storage in 2019 what it did for solar in 2006. The cost of batteries has fallen sharply over the past seven years with an expected levelized cost of $101/kWh by 2023 despite rising competition for lithium, but the ITC can encourage tax equity investors to revisit existing investments in search

of additional returns.

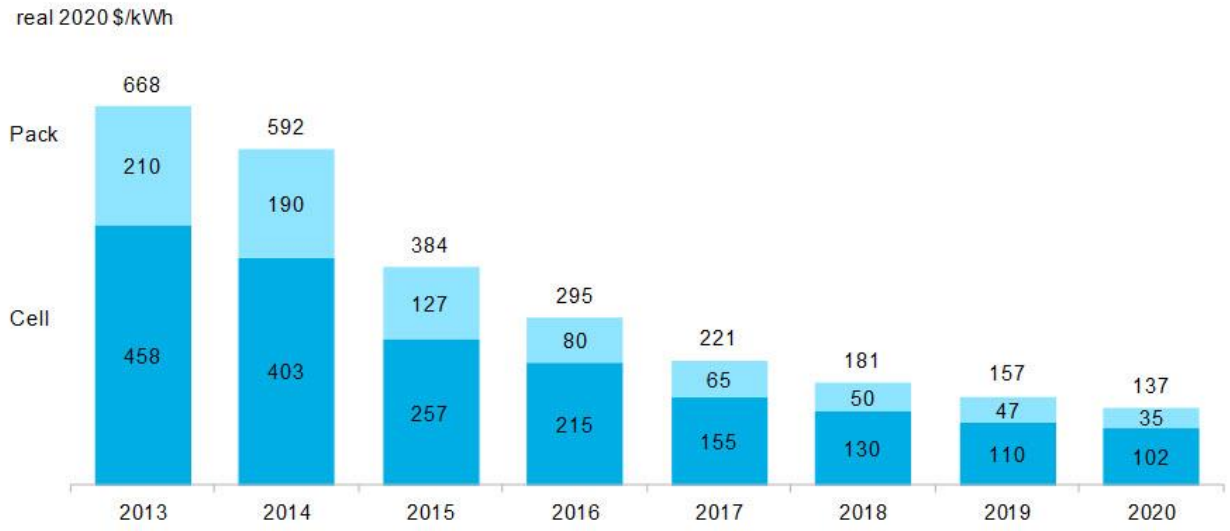



**Figure 2. Falling Battery Prices**

Source: Bloomberg New Energy Finance[12]

## Why This Report?

Today is a unique opportunity at the intersection of sustainability and Wall Street to leverage financial tools to accelerate renewable energy's growth in the United States. This growth is likely to slingshot when coupled with battery storage. Recent advances in technology as well as falling costs have made solar batteries an attractive add-on to solar systems that offer enhanced reliability as well as a whole host of other benefits. In order to address and take advantage of the evolving trends in the Commercial & Industrial ("C&I") solar landscape, the Developer wants to assess the financial and technological viability of storage-based optimization at project locations in California and Massachusetts. In theory, installing energy storage would make renewable energy more reliable and cost-competitive, especially when the sun is not at its zenith.

## The Client: The Developer

This master's project was completed as the capstone for the Masters of Environmental Management program at the Nicholas School of the Environment, using a hypothetical scenario for a generic solar C&I developer based on the author's experience working within the solar C&I industry, as well as her time working in banking advising renewable developers.

## Project Description

Leveraging a range of market forecasts, this study will evaluate the potential impact of storage-based optimization at C&I solar project locations by examining the client's current financial model used to evaluate C&I projects, and then presenting recommendations while considering multiple implementation scenarios. The report is a holistic exercise, and will integrate current market and political considerations into the final recommendation.

Ultimately, the study will recommend whether the Developer should further explore energy storage solutions at its solar installations in the California and Massachusetts markets, and include a short-term industry forecast to supplement the Developer market research and solidify long-term strategic planning.

# Background

## Incentives

Government funding has played a critical role in nurturing new technology they can stand on their own economically. The Energy Policy Act of 2005 created one of the biggest and most enduring subsidies for solar, which was a 30% Investment Tax Credit for residential and commercial solar energy systems for two years [13], excluding ineligible costs such as interconnection upgrades [14]. Per a 2018 Private Letter Ruling, the IRS determined that energy storage was also eligible for ITCs, a boon for early adopters of the promising technology [15].

The ITC has received several extensions, and was scheduled to start sunsetting in 2020. Due to COVID-19's dramatic shutdown of everyday and slowdown of market activity, legislators voted to extend the ITC another 2 years, with a 26% ITC credit for projects that begin construction in 2021 and 2022, a 4% stepdown in 2023, and a flat 10% credit for commercial customers from 2024 on [16], but the expectation is that the levelized cost of solar will continue to fall and eventually more than compensate for the loss in subsidies [17].

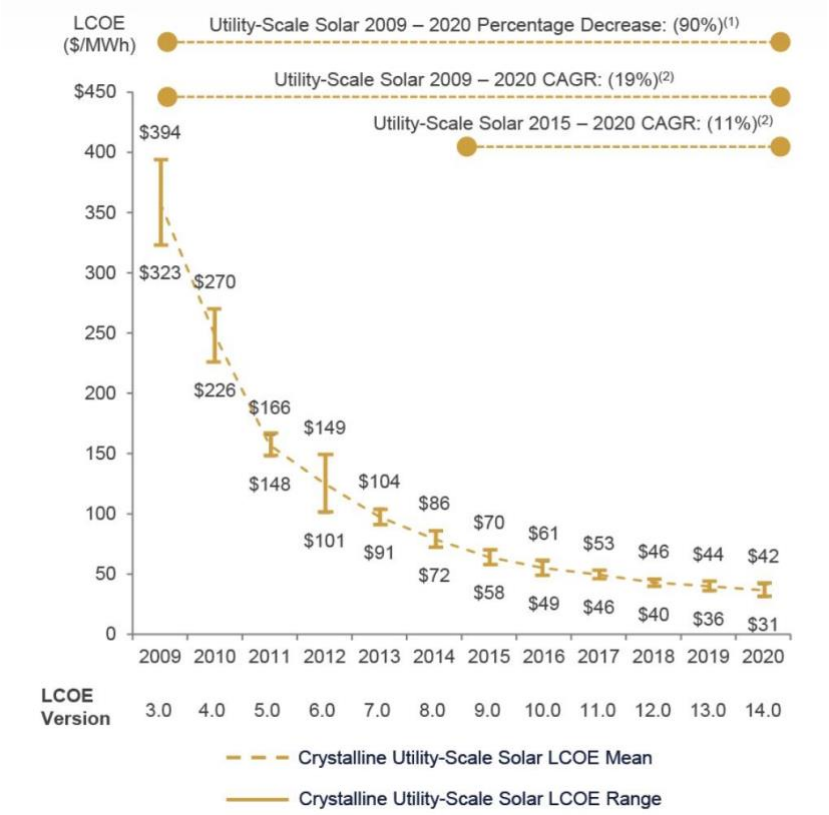



**Figure 3. Levelized Cost of Utility-Scale Solar**

Source: Lazard[18]

Other incentives such as Solar Renewable Energy Credits (SRECs) and sales tax exemptions are more straightforward to take advantage of, but vary state by state [19]. In states with Renewable Portfolio Standards (RPS), policy mandates that the state will source a specified percentage of their total electricity use from renewables by a target date [20]. In some states, legislators have created SREC markets to incentivize people to install solar proactively. Under the SREC scheme, certificates are "created" for every megawatt hour ("MWh") of solar electricity produced. They are separate from the underlying electricity generated, and can be sold to electric providers looking to meet their solar RPS requirements [21]. Customers are incentivized to install solar now rather than later, because the policy establishing SREC markets

often have provisions mandating that the value of SRECs will fall over time [22] in an effort to reward early adopters. A major difference between ITCs and of SRECs is that SRECs are performance-based incentives that pay accrue over a longer time horizon rather than a lump sum subsidy disbursed at the beginning of the solar system's lifetime.

### Financing Structures

A crucial component of leveraging the subsidies is *how* the savings are paid out. The ITC is not a true rebate in the sense that the customer or investor receives a check in the mail equivalent to 30% of the total system cost, but the savings come from a tax reduction equivalent to that 30%. This is a critical distinction, because it means that the customer must have tax appetite. If the customer's taxes aren't high enough, then they can't capture the benefits. But that isn't the end of the line. A tax-exempt customer can find a tax equity sponsor that they can structure a relationship with so that they receive money from the tax equity sponsor, while the counterparty can see the savings in their tax bill [23]. Other financing structures include:

- Power Purchase Agreement ("PPA")- the Investor deals with the developer but then enters a PPA contract with the customer. The investor gets both the tax benefits and incentives, but the client gets green energy at a fixed rate
- Sale-Leaseback- the customer goes to an Equipment Leasing Bank which will buy the solar system from the developer and leases it back to the customer at a discounted rate. In this case, the bank gets the tax benefits, while the clients receive the incentives (such as the SRECs generated from the system)
- Inverted Lease/Partnership Flip- the developer will sell equity in the Project Company to the investor, who are entitled to the long-term cashflows in return for financing the construction costs and pocketing a developer fee [24]

- Taxable Real Estate Investment Trusts ("REITs")- the parent REIT can create a taxable subsidiary for the purpose of harvesting the tax benefits[25]

The incentive landscape is complex and ever shifting, but there many ways to utilize them. This is where the Developer's core competency shines. By offering an easy to navigate platform built to manage and seamlessly exit investments, the Developer is empowering investors to go green.

California and Massachusetts are a study in contrasts. Sunny California seems like a haven for solar while Massachusetts evokes cold, dreary winters. However, Massachusetts has a robust Solar Massachusetts Renewable Target Program ("SMART") that offers above market electric rates, with an energy storage adder, to solar systems selling back to the grid versus California's relative lack of incentives.

Massachusetts currently runs the SMART Block Program, which offers fixed "based compensation rates that decline as capacity blocks are filled" [26]. These compensation rates are Performance Based Incentives; rates are paid on a $/kWh basis, and vary across energy providers [27]. In addition to the base rate, the SMART program offers a variable Energy Storage adder "that is based on the ratio of storage capacity to solar capacity as well as the duration of the storage" which are subject to "minimum performance standards will apply to ensure that grid benefits are realized" [28]. With over 24 gigawatts ("GW") of capacity installed, California is the undisputed leader when it comes to solar [29], but the incentives differ from Massachusetts' higher rate scheme. California is one of the few states to offer Net Energy Metering ("NEM"), which allows solar system owners to sell excess electricity back to the grid, as well as the Self-Generation Incentive Program rebate. Politically, there is tremendous support, such as the

California Energy Commission's new requirement that all new homes must integrate solar power starting in 2020 [30].

## Battery Storage's Promise

Solar's biggest obstacle as a viable successor to conventional energy sources has been matching peak solar production to peak energy consumption, but how can we out-engineer Nature? This daily mismatch between peak solar generation and energy demand has been referred to as the "duck curve," [31] which is seen in the following chart.

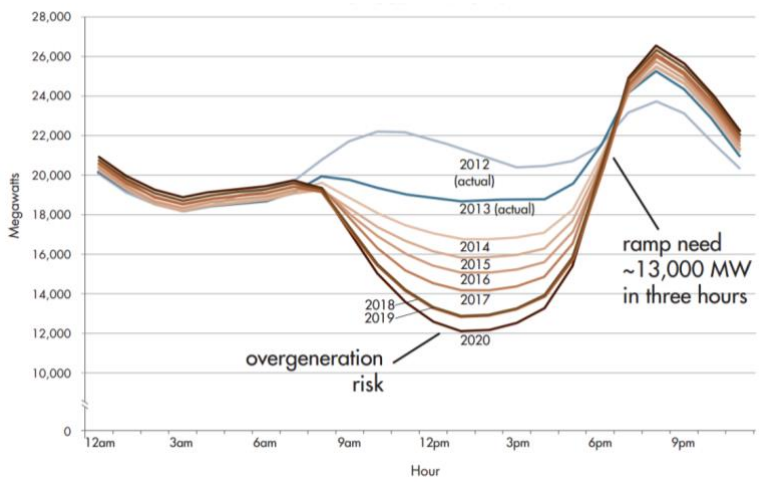



**Figure 4. The Duck Curve**

Source: Denholm, O'Connell, Brinkham, Jorgenson [32]

The duck curve graphs time and solar generation, and reveals two key issues: the inability to ramp up production to meet demand, and overgeneration during peak solar hours. At first blush, overproduction sounds like a non-issue; how can more of a good thing be bad? The reality is that if the PV system overproduces electricity, the excess is often lost and can threaten reliability and grid flexibility[33,34]. In response, PV developers and operators have been prompted to scale down proposed systems or the existing system output in order to minimize this threat. This downsizing has been dubbed "curtailment," seen as a problem unique to renewables due to the

uncontrollable nature of the energy supply in contrast to dispatchable power's conventional fuel resources [35].

While curtailment is beneficial up to the point where it can the need for costly grid upgrades just to "prevent a few hours of curtailment a year [which] may not be a prudent use of resources" [36], downsizing can negatively impact solar's financial picture. Less generation would mean declining production, which naturally leads to smaller revenue streams from electricity generation as well as fewer SREC credits. Smaller production numbers can lead to two different outcomes. Incorporating curtailment scenarios could artificially deflate a solar system's rate of return below the firm's internal hurdle rate, discouraging investment. A less rosy projected return could mean declining rates of solar investment, even if the underlying economics are still the same. The inverse would be that smaller production numbers could lead where demand is oversubscribed by eager developers who overbuild more than is necessary.

Battery storage solves the duck curve conundrum by redistributing electricity production to meet demand throughout the day, which can help reduce costly peak demand charges [37].

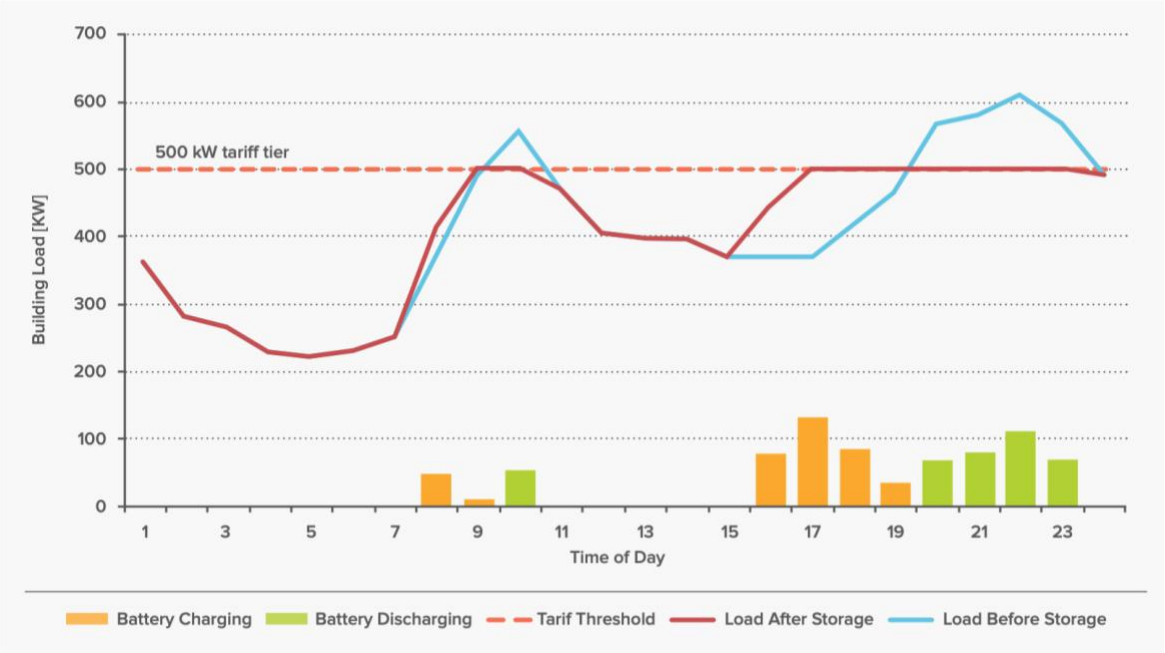



**Figure 5. Battery Storage Smooths the Production Curve**

Source: Fitzgerald, Mandel, Morris, Touati [38]

Demand charges reflect the highest amount of power the customer needed in *any one* given 15-minute interval in a month, and is billed separately from energy usage to fund utilities' infrastructure needed to meet customers' peak load [39]. If the site has a battery, the customer could strategically deploy stored energy during peak consumption in order to lower their demand peak, and subsequently this bill charge. While there is no consensus on their quantifiable benefits [40], many see battery storage as a panacea, not just to the duck curve conundrum, but across almost every level of electricity production and consumption [41].

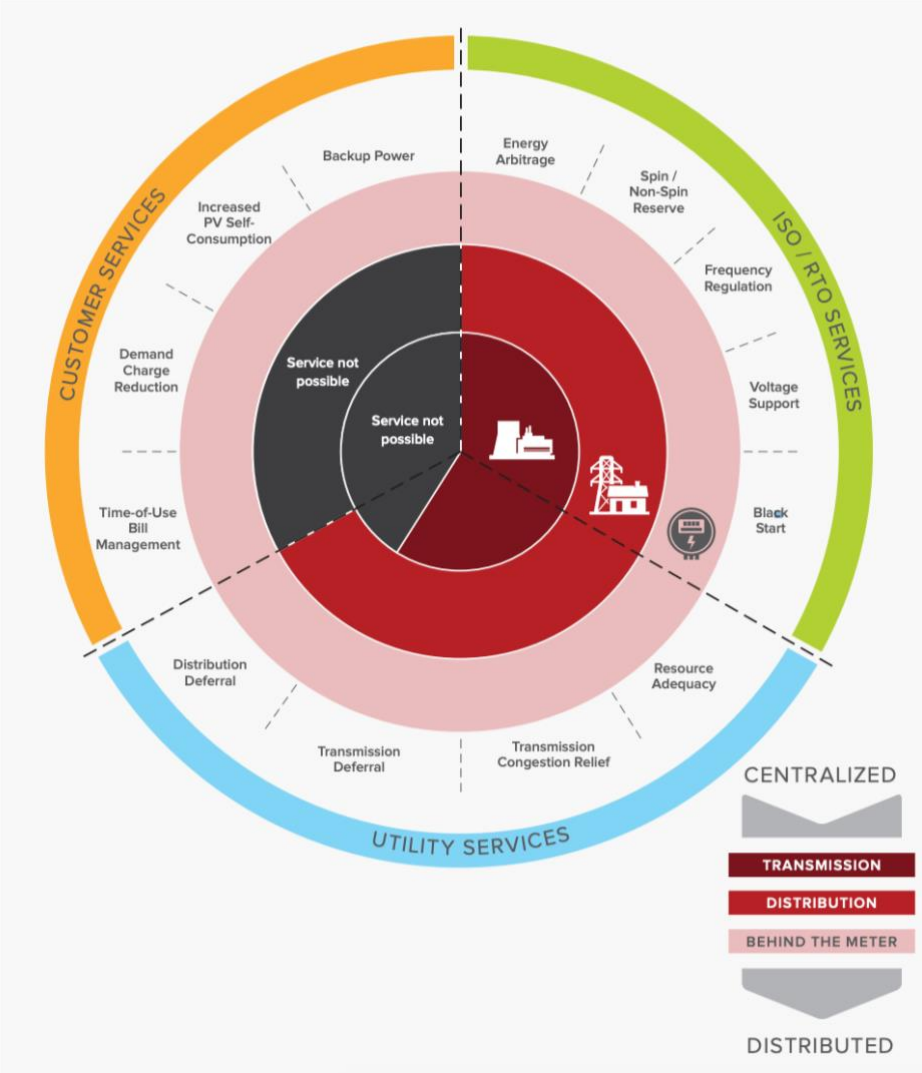



**Figure 6. Battery Storage Use Cases**

Source: Fitzgerald, Mandel, Morris, Touati [42]

Lithium-ion batteries may be the key for renewable energy storage and electric vehicles, but they also have many other uses, which his means increased competition for materials like lithium and cobalt, which are mined in limited places around the world. While manufacturers such as Tesla have announced plans to reduce cobalt in their batteries to zero [43], sourcing these minerals are likely to continue to set battery prices in the near future. Despite these costs, as society becomes increasingly aware of the existential risk that climate change poses, there has been a shift towards cleaner, albeit pricier alternatives.

Similarly to solar in the past, there is a spate of incentives offered by public and private actors in the hopes of spurring further adoption of battery storage technology, which improves the economics for the Developer who is interested in retrofitting their sites with energy storage. Battery storage qualifies for the ITC [44], and when it comes to California and Massachusetts there are additional economic adders. In 2017 California extended the Self Generation Incentive Program, which subsidizes large scale storage above 10kW [45], and major utilities now include storage in their Electric Resource Plans and RFPs. PG&E is considering replacing legacy fossil fuel plants with massive storage facilities, such as PG&E [46]. In Massachusetts, the SMART program offers an additional storage adder on top of their generous fixed electric rate [47]. These subsidies have contributed to battery prices falling from nearly $1000/kWh in 2010 to an estimated $137/kWh in 2020.

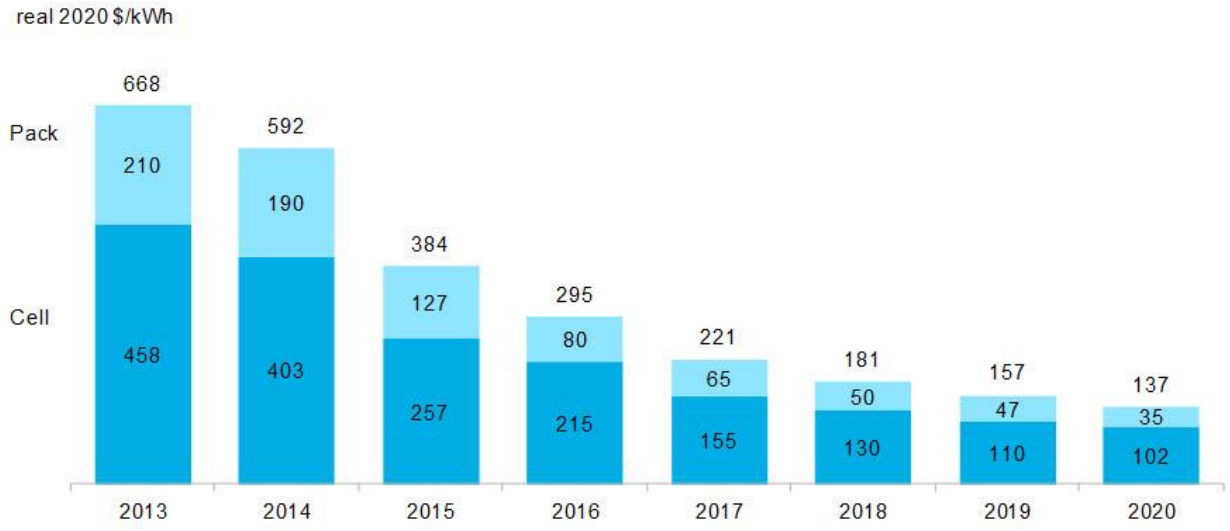



**Figure 7. Falling Battery Prices**

Source: Henz [48]

This increasing affordability expands batteries' appeal to a growing consumer base, further spurring demand [49].

## The Developer's Model

In order to evaluate if storage has reached the point of viability for the Developer for California and Massachusetts sites, it will be necessary to use their internal model to understand the framework of how the Developer values potential deals [50]. The model itself is an Annual Pro Forma sheet, which takes the upfront expense of battery storage and "smoothens" it over the years with depreciation and associated revenue. There are few assumptions driving the outputs, and with major project value levers including: Equipment cost under Capital Expenditures ("*CapEx")*

1. Installation cost under *CapEx*
2. Grants under *Cash Incentives*
3. Host Customer Revenue in the *Value Assumptions* tab

Inputs are hard coded in blue, and calculations are in black. The Equipment and Installation costs are likely taken from contractor quotes, and are not dynamic to sensitivities such as margin or state taxes; a result of a lack of in-house capability to develop projects.

In order to create a more robust model that can reflect a range of scenarios, capability needs to be added for more granular calculations of decline in solar system production, eventual cost to replace equipment, and built-in state-specific rebates for the California and Massachusetts markets.

## Optimizing the Model

The generic model provided is a simplistic pro forma that is hard to walk through, and toggle returns. The assumptions are not clearly laid out, and testing the impact to returns by adjusting key levers such as revenue, capacity, and operating costs is not immediately obvious. A better laid out model makes it easier for a C&I developer to evaluate solar projects and do sensitivity analyses to determine if the proposed projects will do well in upside and more critically downside scenarios.

The built out model has 5 tabs:

1. Instructions - Has the color key which helps the user understand how inputs are either hardcoded, calculated, or called from another sheet. It also offers a description of the model's purpose.
2. Dash - The Dashboard is where the user will input values for the project they're evaluating, as well as have the option to adjust the sensitivities in the Sensitivity Table at the bottom. Key inputs have a cell comment explaining the function and describes what outputs are driven by that given input.
3. Operations - The Operations tab is where returns are shown, as well as where Pre-Tax IRR is calculated. This tab calculates the base case, labelled as Active Case, as well as all sensitivity cases, but only the Active Case is open. The sensitivities are collapsed but can be opened and inspected in case the user wants to see more granularly the impact changing certain levers has on the revenue, generation, or operating expense profile. Sensitivity Cases have adjustments to Earnings Before Tax, Interest, Depreciation, Amortization ("EBITDA") calculations, with the following:

- Generation: The +/- % inputted in the Sensitivity Table in the Dash Tab flows to line 88 in “Operations” as “Generation Haircut.” This impacts lines 90 and 93, P50 Net Generation and P99 Net Generation Respectively.
- Revenue: The +/- % inputted in the Sensitivity Table in the Dash Tab flows to line 155 in “Operations” as “PPA Modifier.” There is a new line added above on line 154 called “Base PPA Price” which is adjusted by the PPA Modifier, and flows down to line 156 “Effective PPA Price” which is used to calculate PPA Revenue.
- Without Storage Adder: There is an “OFF” switch on the “Dash” tab sensitivity table, this flows to line 216 “Storage Adder Toggle” which turns off Storage Adder Revenue. In addition, ITC and CapEx need to be adjusted to assume reduced capital costs without the additional battery storage costs. Line 228 “ITC” recalculates the ITC benefit off of line 235 “Equipment Costs” which takes Levered Project Costs net Battery Storage Costs.
- ITC Credit: The +/- % inputted in the Sensitivity Table in the Dash Tab flows to line 284 in “Operations” as “ITC (%)”, which flows down to line 285 “ITC” where it is recalculated based on the same CapEx as base case, but with a different ITC benefit percentage.
- CapEx: The +/- % inputted in the Sensitivity Table in the Dash Tab flows to line 384 in “Operations” as “CapEx Modifier” which adjusts “Equipment Costs” the line below on 349 as well as “ITC” on line 341.
- Operating Expenses (“OpEx”): The +/- % inputted in the Sensitivity Table in the Dash Tab flows to lines 412-418 for “OpEx.”

4. Outputs - The Outputs tab shows the Active Case Pre-Tax IRR and the results of the Sensitivity Analysis in both table and graph form, which can easily be ported to PowerPoint or Word if the user desires, to better support her analysis in her day to day role at the Developer.
5. Assumptions - The monthly diurnal curves for MA and CA are displayed, which are taken from PVWatts, as well as reference rate sheet from the MA SMART program.
    - Monthly Diurnal Curves: Go to PVWatts, a free government provided solar generation calculator (https://pvwatts.nrel.gov/), and enter the address, size, and PV type to be installed. In this case the model uses 6500 kW DC, Fixed (open rack), and for Boston, MA and Los Angeles, CA. Go to results and download Monthly Results, and calculate the monthly percentage of annual generation by using the AC System Output (kWh). The nameplate capacity is not critical to update if running the model for other sizes as the percentages will hold constant.
    - MA SMART Program: This chart is meant as a rate reference guide for what rates projects would qualify for in specified electric utility territories within MA, for a given nameplate capacity in kW AC. The prices are quoted on a "Block" basis as to incentivize development now, with higher rates in earlier blocks as PV installation prices are higher today, and are assumed to come down in the future. The rates go down as well as the user installing the projects will need less of an economic incentive to make back the cost of the project, as well as meet target returns.

## Assumptions

**MA -** The following assumptions drive the MA case scenario:

The Monthly Diurnal Factor curve is taken by going to PVWatts, entering Boston MA as the address and calculating the monthly percentages from the monthly kWh values given as the result. The location shows the estimated solar monthly diurnal factor curve for Boston, MA specifically. If the Developer were to evaluate projects elsewhere in MA, the user should go to PVWatts, enter the specific address of the site and pull the site-specific curve to have more precise inputs for analysis.

**Monthly Diurnal Factors**

| Monthly Diurnal Factors | MA |
|---|---|
| Active Case | 1 |
| 1 | 6.13% |
| 2 | 7.05% |
| 3 | 9.01% |
| 4 | 9.45% |
| 5 | 10.51% |
| 6 | 10.36% |
| 7 | 11.01% |
| 8 | 10.09% |
| 9 | 8.82% |
| 10 | 7.26% |
| 11 | 5.33% |
| 12 | 4.99% |

The model assumes lower retail electricity prices in Boston, MA:

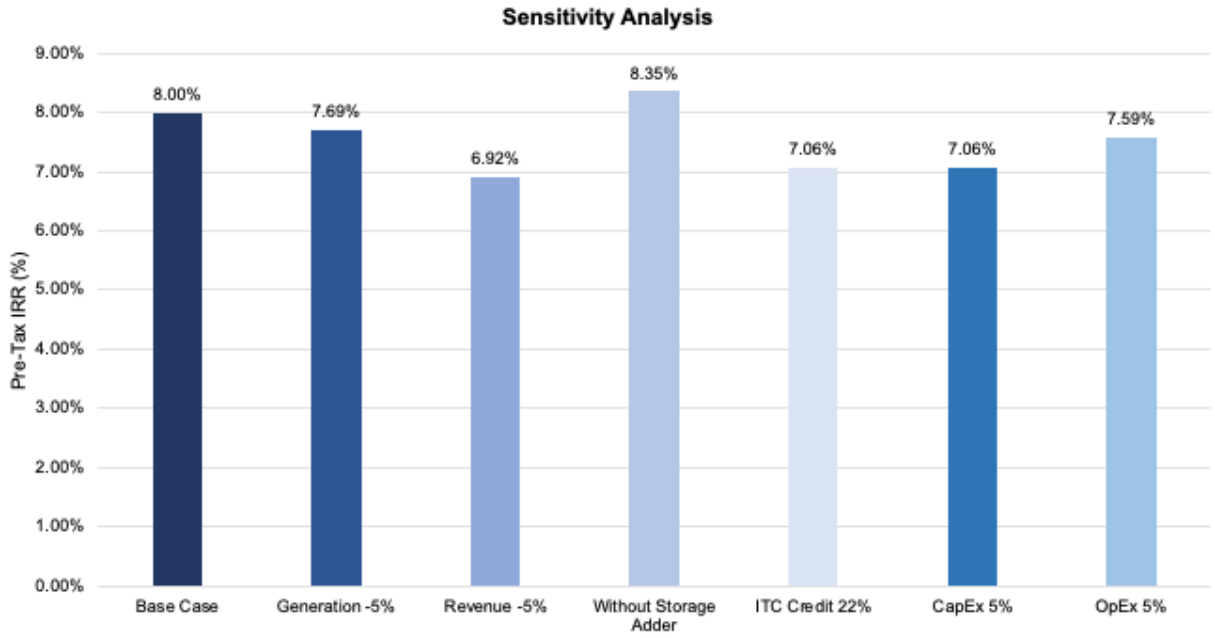
| Revenue Contracts | Units | Inputs |
|---|---|---|
| **Contracted** | | |
| Active Case | | 1 |
| Start Date | *Date* | 09/30/22 |
| Term | *Years* | 10 |
| End Date | *Date* | 09/30/32 |
| Price | *$ / MWh* | $100.00 |
| **Storage Adder** | | |
| Active Case | | 1 |
| Start Date | *Date* | 09/30/22 |
| Term | *Years* | 10 |
| End Date | *Date* | 09/30/32 |
| Price | *$ / MWh* | $5.00 |
| **Merchant** | | |
| Active Case | | 1 |
| Start Date | *Date* | 10/31/32 |
| Term | *Years* | 5 |
| End Date | *Date* | 10/31/37 |
| Price | *$ / MWh* | $50.00 |
| **RECs** | | |
| Active Case | | 1 |
| Price | *$/ MWh* | - |

Operating Expenses assumptions are the same across the MA and CA case:

| Operating Expenses ($000) | $/kW | Cost | Start Yr | End Yr | Esc. |
|---|---|---|---|---|---|
| Asset Management | $20.00 | $130.00 | 1 | 20 | 2.00% |
| NOC Fee | $5.00 | $32.50 | 1 | 20 | 2.00% |
| O&M | $4.00 | $26.00 | 1 | 20 | 2.00% |
| Insurance | $7.00 | $45.50 | 1 | 20 | 2.00% |
| PILOT/Property Tax | - | $3.27 | 1 | 20 | 2.00% |
| E-Curve Licensing Fee | - | - | 1 | 20 | 2.00% |
| Other 1 | - | - | 1 | 20 | 2.00% |
| Other 2 | - | - | 1 | 20 | 2.00% |

An 8% return is achieved with a Developer Fee of $525,000 for a total Levered Project Cost of $8.98M.

| Case | Change (%) | Pre-Tax IRR | Delta (bps) |
|---|---|---|---|
| Base Case | | 8.00% | 0 |
| Generation -5% | -5% | 7.69% | (30) |
| Revenue -5% | -5% | 6.92% | (108) |
| Without Storage Adder | OFF | 8.35% | 36 |
| ITC Credit 22% | 22% | 7.06% | (94) |
| CapEx 5% | 5% | 7.06% | (94) |
| OpEx 5% | 5% | 7.59% | (41) |


Sensitivity Analysis
Pre-Tax IRR (%)
9.00%
8.00%
7.00%
6.00%
5.00%
4.00%
3.00%
2.00%
1.00%
0.00%
8.00%
7.69%
6.92%
8.35%
7.06%
7.06%
7.59%
Base Case
Generation -5%
Revenue -5%
Without Storage Adder
ITC Credit 22%
CapEx 5%
OpEx 5%

**CA -** The following assumptions drive the CA case scenario:

The Monthly Diurnal Factor curve is taken by going to PVWatts, entering Los Angeles LA as the address and calculating the monthly percentages from the monthly kWh values given as the result. The location shows the estimated solar monthly diurnal factor curve for Los Angeles, CA specifically. If the Developer were to evaluate projects elsewhere in CA, the user should go to PVWatts, enter the specific address of the site and pull the site-specific curve to have more precise inputs for analysis.

| Monthly Diurnal Factors | CA |
|---|---|
| Active Case | 2 |
| 1 | 6.50% |
| 2 | 6.52% |
| 3 | 8.71% |
| 4 | 9.30% |
| 5 | 9.91% |
| 6 | 9.19% |
| 7 | 10.19% |
| 8 | 10.15% |
| 9 | 8.87% |
| 10 | 7.88% |
| 11 | 6.83% |
| 12 | 5.94% |

Retail power prices are higher in LA than in Boston, MA so revenue contract assumptions are higher:

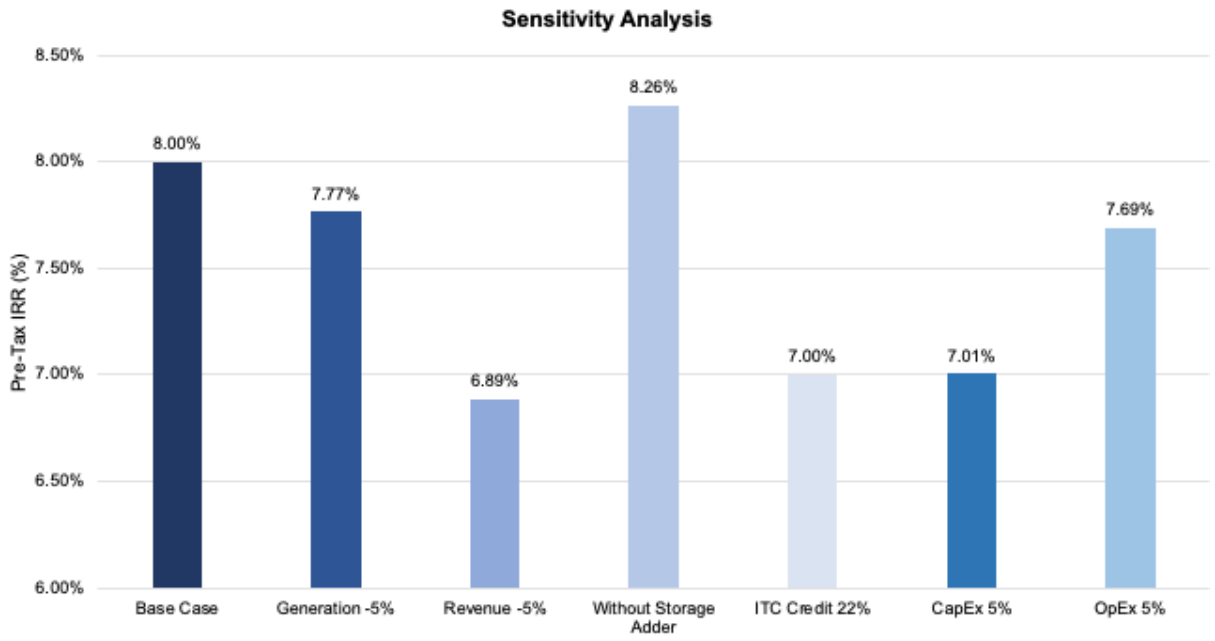
| Revenue Contracts | Units | Inputs |
|---|---|---|
| **Contracted** | | |
| Active Case | | 2 |
| Start Date | *Date* | 09/30/22 |
| Term | *Years* | 10 |
| End Date | *Date* | 09/30/32 |
| Price | *$ / MWh* | $135.00 |
| **Storage Adder** | | |
| Active Case | | 1 |
| Start Date | *Date* | 09/30/22 |
| Term | *Years* | 10 |
| End Date | *Date* | 09/30/32 |
| Price | *$ / MWh* | $5.00 |
| **Merchant** | | |
| Active Case | | 1 |
| Start Date | *Date* | 10/31/32 |
| Term | *Years* | 5 |
| End Date | *Date* | 10/31/37 |
| Price | *$ / MWh* | $50.00 |
| **RECs** | | |
| Active Case | | 1 |
| Price | *$/ MWh* | - |

Operating Expenses assumptions are the same across the MA and CA case:

| Operating Expenses ($000) | $/kW | Cost | Start Yr | End Yr | Esc. |
|---|---|---|---|---|---|
| Asset Management | $20.00 | $130.00 | 1 | 20 | 2.00% |
| NOC Fee | $5.00 | $32.50 | 1 | 20 | 2.00% |
| O&M | $4.00 | $26.00 | 1 | 20 | 2.00% |
| Insurance | $7.00 | $45.50 | 1 | 20 | 2.00% |
| PILOT/Property Tax | - | $3.27 | 1 | 20 | 2.00% |
| E-Curve Licensing Fee | - | - | 1 | 20 | 2.00% |
| Other 1 | - | - | 1 | 20 | 2.00% |
| Other 2 | - | - | 1 | 20 | 2.00% |

A 8% return is achieved with a Developer Fee of $4.03M, for a total Levered Project Cost of $12.48M.

| Case | Change (%) | Pre-Tax IRR | Delta (bps) |
|---|---|---|---|
| Base Case | | 8.00% | 0 |
| Generation -5% | -5% | 7.77% | (23) |
| Revenue -5% | -5% | 6.89% | (111) |
| Without Storage Adder | OFF | 8.26% | 27 |
| ITC Credit 22% | 22% | 7.00% | (99) |
| CapEx 5% | 5% | 7.01% | (99) |
| OpEx 5% | 5% | 7.69% | (31) |




The report is looking at MA and CA as the scenario cases because they represent a range of environmental and political variation. While Massachusetts may have lower retail prices than California, its established SMART program enables for a certain surety of future cash flows as developers can look up projected power prices based on size and what Block their project qualifies for. In California the incentive programs vary by region of the state, but this uncertainty is offset by higher retail rates in populated areas such as Los Angeles or the Bay Area.

Once the model has been created, a meaningful analysis occurs by comparing the cases across the same metric, in this case the same target return. Assuming the client Developer is looking for an 8% Pre-Tax Unlevered Return, we will optimize the model to achieve this for both the MA and CA cases by adjusting the Developer Fee line in the Dash Tab which will increase overall project cost.

For the MA case, an 8% return is achieved at an overall Levered Project cost of $8.98M compared to the CA case's 8% return at an overall Levered Project cost of $4.03M. Assuming that CapEx and OpEx are held equal, this is a difference of $3.5M in Development Fee going to

the Developer. It's important to note that this has two different meanings, depending if we are analyzing a project for the purpose of acquisition or sale. From the perspective of an acquirer, the Massachusetts case is much more attractive for two reasons:

- More "bang for the buck" - the Developer would see the same return for a lower price, the money saved could be used to invest in another project
- Surety of returns - the SMART program means that all projects of the same size, utility territory, and Block will receive the same rate so the Developer knows the project's Offtake is the market price, with an investment-grade offtaker

However, if the Developer was considering where to build a project and put up for sale, the California case is much more attractive for several reasons:

- Sellers' market - There is a scramble for assets right now as fund managers are looking to diversify their portfolios away from conventional power plants as well as satisfy their investors' ESG criteria, so their return thresholds are lower as funds compete for the same assets on the market
- Higher development fee - the higher Offtake price enables the project to support a higher Development Fee, compensating the Developer for the risk they took on by finding an Offtaker to sign a PPA contract with versus submitting an application into a statewide-program

## Strategic Considerations

The Developer  is currently exploring the viability of storage in both acquisition and development of storage-equipped solar systems in the California and Massachusetts markets.

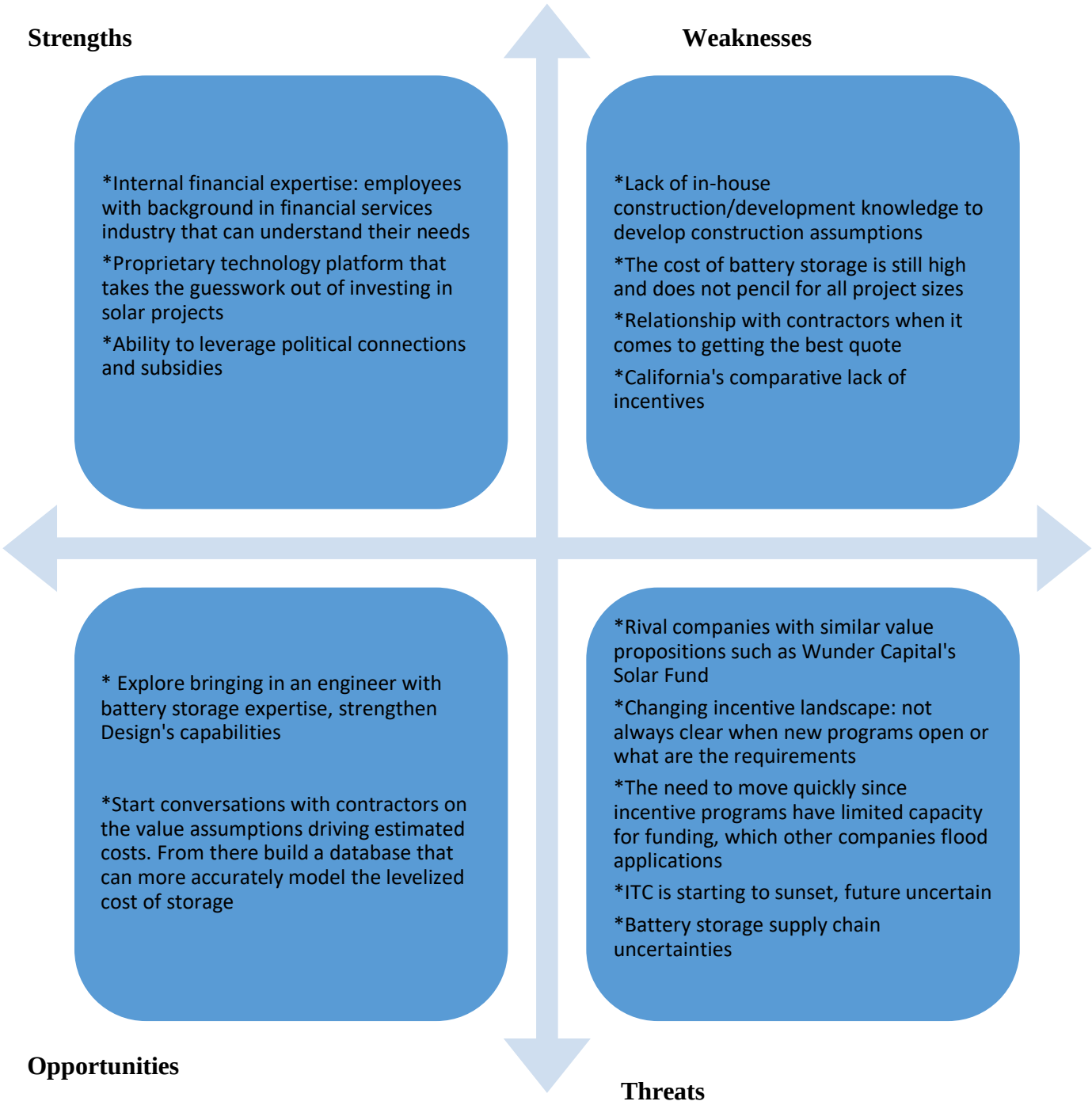
For acquisition, the Developer plans to:

- Purchase assets directly from leading energy storage developers;
- Engage with leading software-focused firms to optimize project economics.

For optimizing sites the Developer already owns, the client plans to:

- Solicit, or bid out to, companies for storage installation projects;
- Work with existing customers and stakeholders to restructure or augment current contractual relationships;
- Analyze and value future acquisition opportunities with the additional storage component [51].

Surveying the landscape will better help the client strategize next steps.



### Massachusetts versus California: Incentive Overview [52,53]

| MA SMART Program | CA Self Generation Incentive Program |
|---|---|
| • FiT, performance-based incentive<br>• Steady, predictable cash flows: above-market contracted rate for electricity generated for 20 years<br>• Rebates vary by utility provider and Block<br>• Additional rate adder for battery storage | • Rebate that declines based on battery size, $82 million in rebates for large scale storage is currently available<br>• Rebates vary by utility provider and time bidding into the program thus encouraging first-mover advantage<br>• Extended to 2026 with an estimated additional $620 million available for rebates over time |

The team encourages the Developer to expand their scope for potential battery storage sites beyond California and Massachusetts. Given that the ITC is set to expire soon and the first come, first served nature of many states' incentive programs, the Developer should move as embrace battery storage now rather than taking a wait and see approach with pilot sites in MA. Given the fragmented nature of the solar C&I market and major funds compete for assets to meet internal mandates to increase their renewables allocation, the Developer can leverage their experience in the space evaluating projects to build and sell by raising to start a solar Asset Acquisition portfolio. The appeal of the portfolio would stem from the Developer's resources identifying smaller projects to roll into their portfolio and market to clients who do not have the time or resources to evaluate dozens of C&I projects a month, and sell membership interests into.

This new business arm is primed to thrive, as recent policy has supported the future of the C&I market. The ITC extension passed as part of the December COVID relief bill, as well as the U.S. rejoining the Paris Climate Accord has primed renewables to continue being an area focus

in the US. Pro-renewables legislation introduced February in the US House of Representatives that would allow elective payments rather than tax credits for renewable energy projects could change the face of renewable project financing, if tax equity investors no longer become necessary to fully capture the financial benefits of a project.

Looking at the solar and storage market in the beginning of 2021, it is apparent that there are a diverse set of players and transaction types, including but not limited to[54]:

- Contracted / operating portfolios in the market (i.e. Cubico)
- Development stage / NTP transactions on single assets
- Storage-only installers are now in the market for capital (i.e. FlexGen), which was not as frequent in prior years
- Both strategic and financial investors are showing interest in distributed platforms (i.e. EDFR/EnterSolar, Allstate/Greenskies Clean Focus)
- Large strategics previously not in the US renewables market are entering the market by acquiring large solar and storage portfolios (i.e. Total)
- Increasing appetite for ESG investments has driven an uptick in SPAC vehicles targeting renewable-focused assets
    - Developers have been exploring their ability to tap the SPAC market (i.e. Intersect Power)
- Fundraising activity has been robust
    - According to *Inframation*, funds focused on renewables/energy transition/energy impact are expected to raise north of $20 billion this year

## Recommendations & Next Steps

Time is of the essence when it comes to capturing incentives in an uncertain political landscape. While future administrations may mean the dawn of another era of solar incentives, for now the Developer needs to position itself to capture incentives that are starting to phase out as well as prepare for capped incentive programs that will open at the beginning of next year. The Developer's size give itself nimbleness to quickly push initiatives through company leadership, which will be a significant asset when it comes to strategic planning.

The Developer is at a crossroads, trying to determine what their next steps should be. They have previously been successful developing projects nationwide but the C&I market is fragmented and competitive which makes it hard to establish domination nationwide as various shops have their own regions of expertise. Despite the competition, it is still a very favorable time for the buildout of renewables. The current political climate remains in support of solar development with the December 2020 extension of the ITC. More unusually, this is a time where mainstream financial investors are valorizing renewable investments for not just economic reasons but also strategic reasons. This has created a scramble for assets, compressing returns as bidders compete for a limited pool of assets available.

The Developer needs an objective diagnostic tool in order to compare disparate projects in different states and incentive programs. The Developer's generic model was superficial, and didn't have the functionality built to run sensitivity analyses, or to quickly and easily compare projects by switching cases and visually comparing outputs. The updated model driving this Report has been built out to provide a much more comprehensive and standardized analysis. Rather than a single pro-forma tab, it has several tabs breaking out inputs, calculations, and results in both data table and chart form. The user is able to use their best judgement comparing inputs. For example, if they were comparing two projects located in urban areas– one in

California and one in Massachusetts but the developer-quoted PPA rate was $200/MWh higher for the Massachusetts project, the user can draw on their knowledge of the two power markets and flag that as an item for discussion during the due diligence process.

Solving for the same development fee serves as a good yardstick for comparing the projects' merits. In the case of solving for an 8% return for both the California and Massachusetts projects, the California project yields a Development Fee of $4.025M compared to the Massachusetts project Development Fee of $525k, a startling difference of $3.5M. This difference, compounded over a portfolio of C&I projects either acquired by the Developer or sold by the Developer, could make a world of difference for the Developer's bottom line. From the seller's perspective, the additional $3.5M multiplied out in revenues received from sales could fund other business arms or an acquisition of a rival C&I company in order to expand the Developer's footprint in the fragmented C&I market. From the buyer's perspective, the additional $3.5M multiplied out in purchase price paid could mean a smaller portfolio in terms of asset size due to paying a premium – reflecting the issues that compression of returns poses for investors. However, this compression can be offset by adding a new revenue stream to existing solar projects.

Retrofitting projects with battery storage is a one-time CapEx that offers immense value-add opportunities to preexisting projects. In areas where backfeeding is not allowed, storage enables the project to store excess energy and discharge in less sunny hours to reduce loss and maximize the percentage of the generated energy being used. If a project sells power onto the grid versus a contracted PPA, batteries are an attractive option to maximize returns as energy generated during off-peak hours can be stored and sold back into the grid during on-peak hours, shaping the revenue stream to be more weighted towards on-peak pricing. Battery storage can

also provide risk mitigation if the project delivers energy to places where a steady supply is crucial, such as a hospital or grocery store – if the power goes out the battery discharge and ensure no loss in energy delivery.

It's clear that rather than the slowdown many previously predicted for solar C&I with the ITC expected to sunset starting in 2021, did not occur. The global pandemic led to a retreat to safer investments in the energy and infrastructure, and the increasing occurrence of supposed "Black Swan" events, such as the Texas freeze that occurred February 2021, underscore how fast the world is changing in response to climate change. These factors have buoyed pro-renewable sentiment and accelerated the "clean energy" transition, as financial institutions and major companies alike are jumping in bed with developers to meet ambitious ESG goals. The Developer is well suited to take advantage of existing incentives such as ITC and tax equity financing, can reposition itself on the acquisition side by launching a solar acquisition fund, sign a massive corporate PPA with a company like Amazon or Microsoft, or on the project developer and seller side by acquiring other C&I developers to start consolidation in the space to achieve pricing efficiencies.

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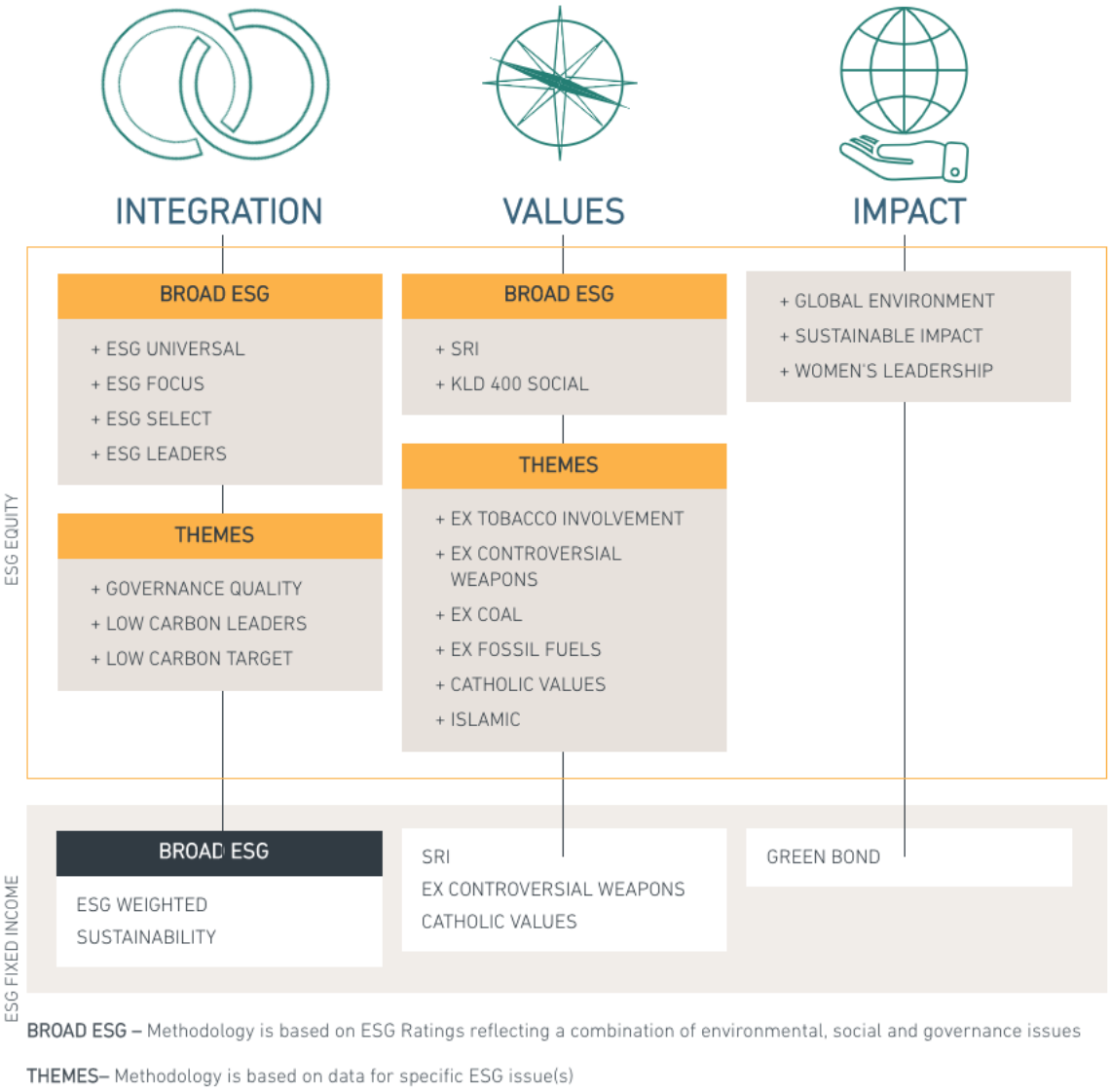
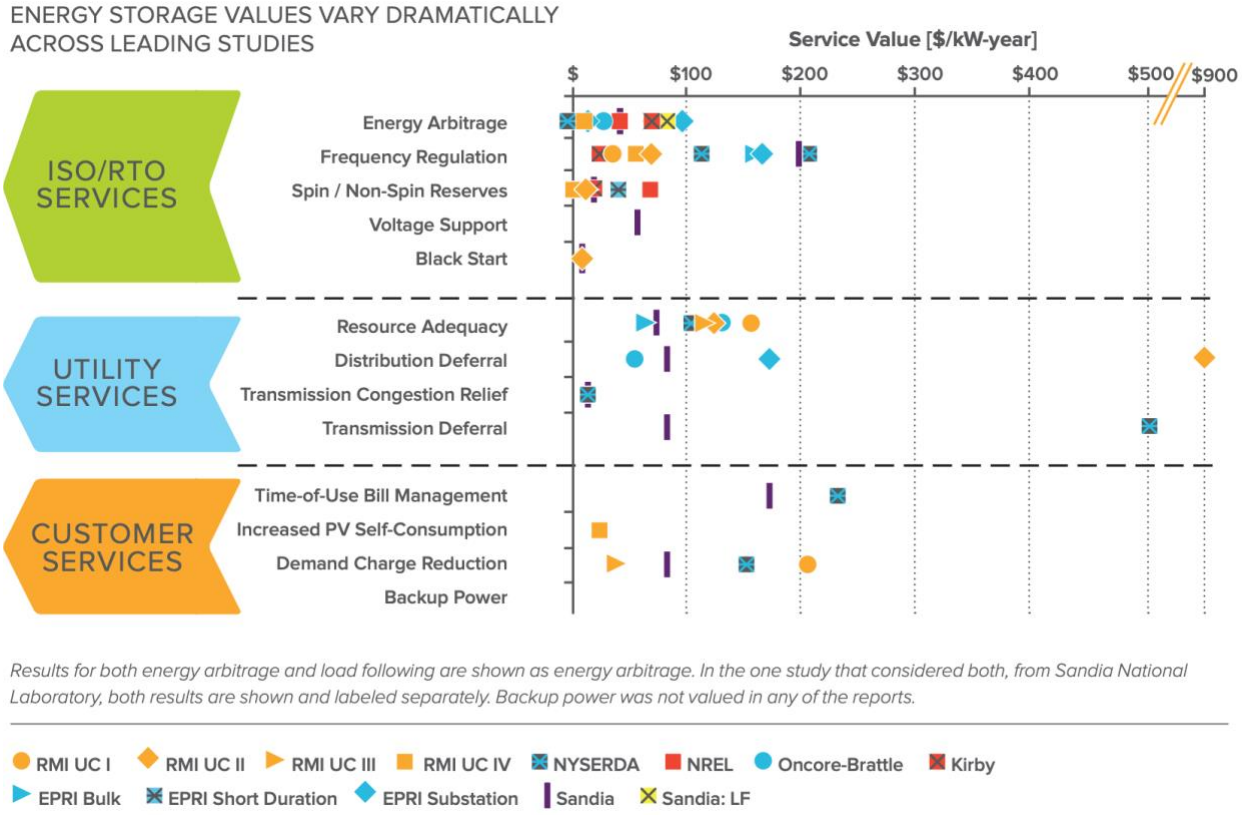
# Appendix

## Appendix I. The Universe of MSCI ESG-Related Indices [55]

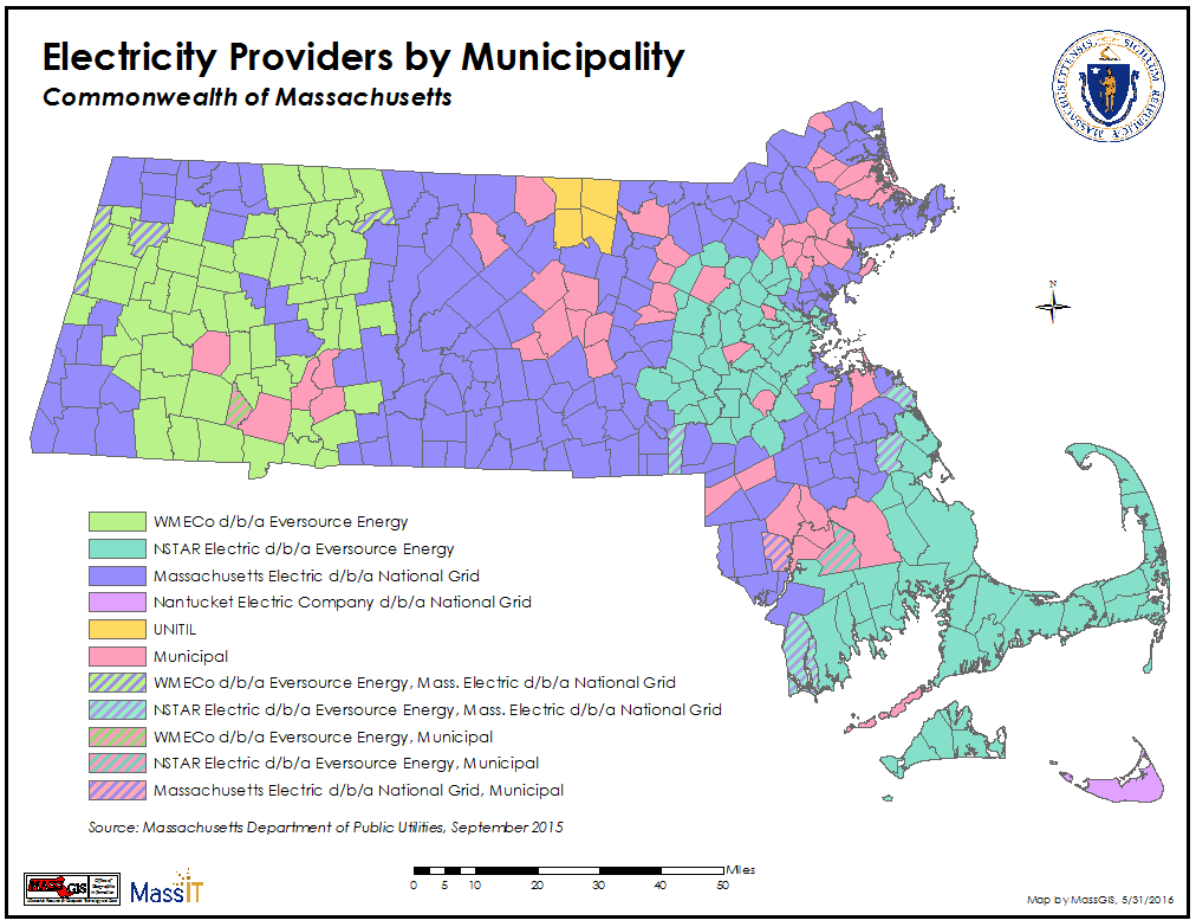


## Appendix II. Studies Disagree About Valuating Energy Storage Benefits [56]




*Results for both energy arbitrage and load following are shown as energy arbitrage. In the one study that considered both, from Sandia National Laboratory, both results are shown and labeled separately. Backup power was not valued in any of the reports.*

## Appendix III. Massachusetts Energy Provider Service Territory Map [57]




## Appendix IV. Massachusetts SMART Program Storage Adder Calculation [58]

(c) Energy Storage Adder. A Solar Tariff Generation Unit that co-locates with an Energy Storage System shall be eligible to receive a variable adder to its Base Compensation Rate.

1. Energy Storage Adder Multiplier. The energy storage adder multiplier shall be $0.045/kWh and shall decline pursuant to 225 CMR 20.07(2).
2. Energy Storage Adder Formula. The variable energy storage adder for Solar Tariff Generation Units paired with Energy Storage Systems that meet the requirements of 225 CMR 20.06(1)(e) will be calculated using the following formula:

$$\text{Energy Storage Adder} = \left[\frac{\left(\frac{\text{Nominal Rated Power Capacity of Energy Storage System}}{\text{DC Rated Capacity of the Solar Photovoltaic System}}\right)}{\left(\left(\frac{\text{Nominal Rated Power Capacity of Energy Storage System}}{\text{DC Rated Capacity of the Solar Photovoltaic System}}\right) + \exp\left(0.7 - \left(8 * \left(\frac{\text{Nominal Rated Power Capacity of Energy Storage System}}{\text{DC Rated Capacity of the Solar Photovoltaic System}}\right)\right)\right)\right)}\right] * \left[0.8 + \left(0.5 * \ln\left(\frac{\text{Nominal Rated Useful Energy of the Energy Storage System}}{\text{Nominal Rated Power Capacity of Energy Storage System}}\right)\right)\right] * \text{Energy Storage Adder Multiplier}$$