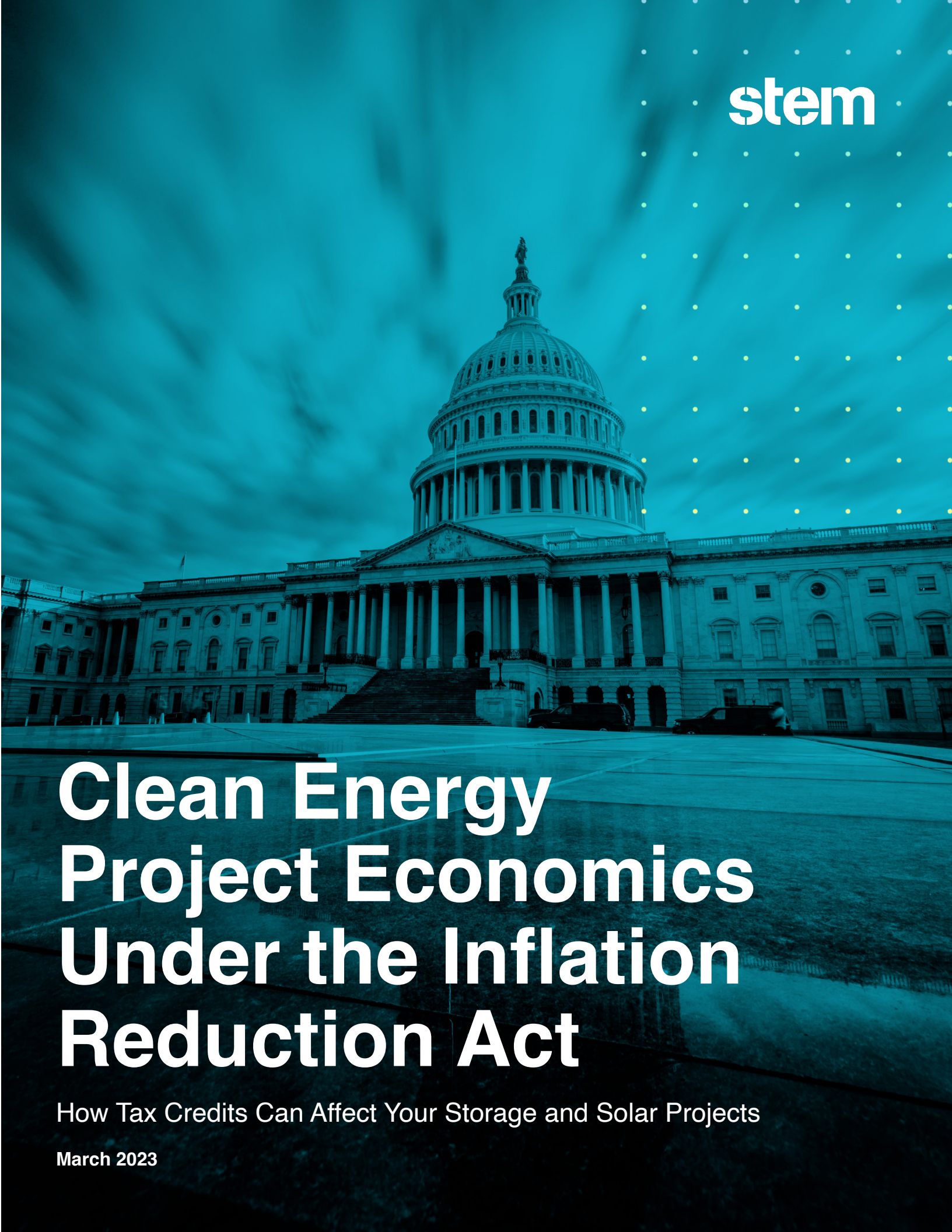

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Clean Energy Project Economics Under the Inflation Reduction Act

How Tax Credits Can Affect Your Storage and Solar Projects

March 2023

This guide provides a detailed overview of the Federal Standalone Storage Investment Tax Credit (ITC) and how it can benefit the economics of new and retrofit storage projects.

If you're a project developer, asset owner, or manager of a portfolio of renewable energy sites, you need to know the potential value of standalone storage, where it likely makes the most sense to add storage, the differences between the Storage ITC and Solar Production Tax Credit (PTC) and which may provide better project returns, and whether your project is likely to qualify for federal tax credits.

This guide is based on economic analysis by Stem's storage, policy, and regulatory experts who bring more than 2GW of storage project experience across the US.

Energy Storage Market Opportunities

The Inflation Reduction Act (IRA) became law in August 2022 and is the most significant clean energy and climate investment in US history. As part of its $370 billion investment over at least the next decade, new opportunities for economically deploying solar, storage, and electric vehicle (EV) charging are now being unlocked across the country. Soon after the IRA's passage, focus turned to the US Treasury Department, as its guidance will be critical in deploying new clean energy infrastructure nationwide. While this guidance is not yet complete, we do have visibility into many core components and their implications.

The IRA will be transformational for energy storage. Now that it no longer depends on solar to claim the ITC, storage is unleashed to be deployed across more markets – including at sites that are unfavorable to solar.

Consequently, standalone storage and storage retrofitted onto existing solar projects are both projected to grow considerably in the coming years. By 2030, new solar plus storage installations are expected to account for only 30% of commercial & industrial (C&I) storage projects, down from about 60% in 2021, according to S&P Global. Over that timeframe, standalone storage and retrofit solar plus storage are expected to grow to represent 50% and 20% of C&I storage projects, respectively.

The growth of standalone storage will likely be accompanied by geographic expansion. By 2030, S&P Global / IHS Market forecasts that a quarter of all C&I storage will be deployed outside of today's core markets of California, Hawaii, and Massachusetts.

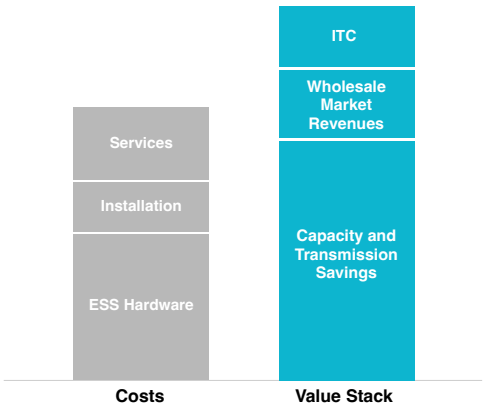
Calculating Storage Project Economics

Determining available value streams and modeling project economics is an essential first step for new and retrofit storage projects. Stem has put together sample estimated economics to provide an idea of costs with and without the ITC.

Figure 1 shows project economics for a 2.4MWh system deployed at a C&I behind-the-meter (BTM) customer site in the PJM region. In this case, the storage system can offset the customer's coincident peak (CP) charges and earn revenues through participating in PJM's wholesale market. Over an assumed 15-year project lifetime, the present value of CP savings and wholesale market revenues is about $1.8 million, whereas typical project costs – including hardware installation, operations, maintenance, and optimization services – would be about $1.6 million. That translates to a payback period of about 10 years without the ITC, and about 7 years with an ITC of 30%.

Sample Storage Economics

15-Year NPV



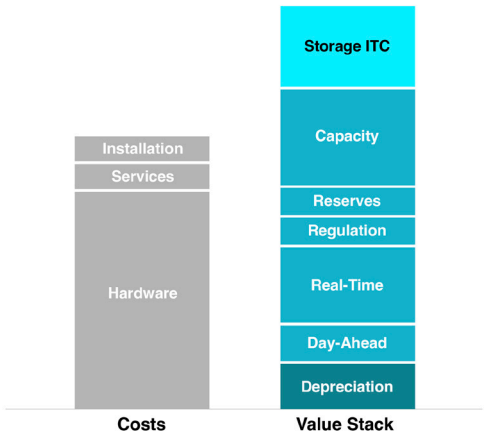
	No ITC	With 30% ITC
Storage Use Cases	Coincident Peak Mitigation Wholesale Market Participation	
System Size	1.2MW / 2.4MWh	
Revenues (NPV)	$1.8M	
Total Cost (NPV)	($1.6M)	($1.2M)
Post-Tax NPV	$137,000	$460,000
Payback	10 years	7 years
IRR	9%	16%

Figure 1: Sample storage economics of a BTM project in PJM

FTM projects see similar results, as shown in Figure 2 which highlights a sample project in ISO New England.

Sample Storage Economics

20-Year NPV



	No ITC	With 30% ITC
Storage Use Cases	ISO-NE Wholesale Market Participation	
System Size	20MW / 40MWh	
Revenues (NPV)	$18.6M	
Total Cost (NPV)	($18.2M)	($12.8M)
Post-Tax NPV	($3.1M)	$2.3M
Payback	11 years	6 years
IRR	4%	12%

Figure 2: Sample storage economics of an FTM project in ISO New England

Focusing On Incentivized Communities

A significant focus of the IRA is supporting clean energy deployment in specific communities. “Energy Communities” include brownfield sites and areas where employment and tax revenues have been linked to fossil fuel development. Projects deployed in Energy Communities are eligible for a 10% bonus adder.

The IRA also encourages deployments in low income communities, as well as on Indian lands. In February 2023, the Treasury Department released its first iteration of guidance concerning the low income ITC adder. The guidance describes four project categories that will receive either a 10% adder or a 20% adder. These include projects located in low income communities; projects located on Indian lands; qualified low income residential building projects; and qualified low income economic benefit projects. This guidance also designates a certain number of allocations to each of the four categories mentioned above, for a total of 1.8GW capacity for 2023. Subsequent guidance is expected to clarify the program’s application procedures, application criteria, definitions, and other information necessary to submit applications.

Because these adders can materially enhance project economics, Stem expects a significant shift toward deploying clean energy in these areas, as shown in Figure 3.

Stem has developed an Inflation Reduction Act Map that displays locations throughout the US that may be prime for deploying energy storage. Stem will work with you to run your portfolio through this interactive tool, providing a list of your top sites that qualify for the most credits. While all states qualify for solar plus storage credits, significant regions could qualify for both the Energy Community and the low-income adder, including the Southwest, the Gulf Coast of Texas and Louisiana, and the Northeast Appalachian.

To access Stem’s Map, visit stem.com/inflation-reduction-act-map/

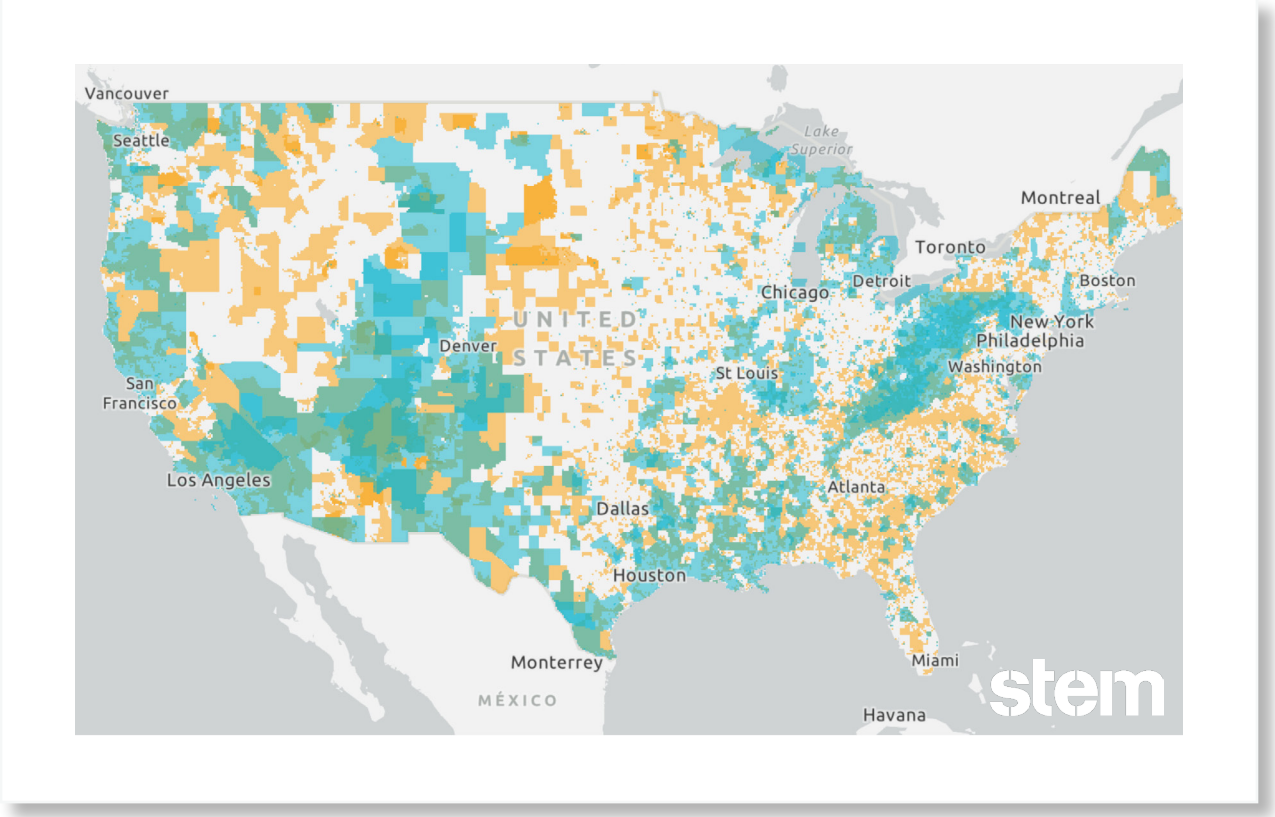


Figure 3: Use Stem’s interactive IRA Map to focus on incentivized communities

Catalyzing Standalone Storage

The value of the Storage ITC goes beyond the value of the ITC itself. Now that standalone storage no longer needs to be paired with solar, it can offer a range of benefits to customers in new markets, as shown in Figure 4.

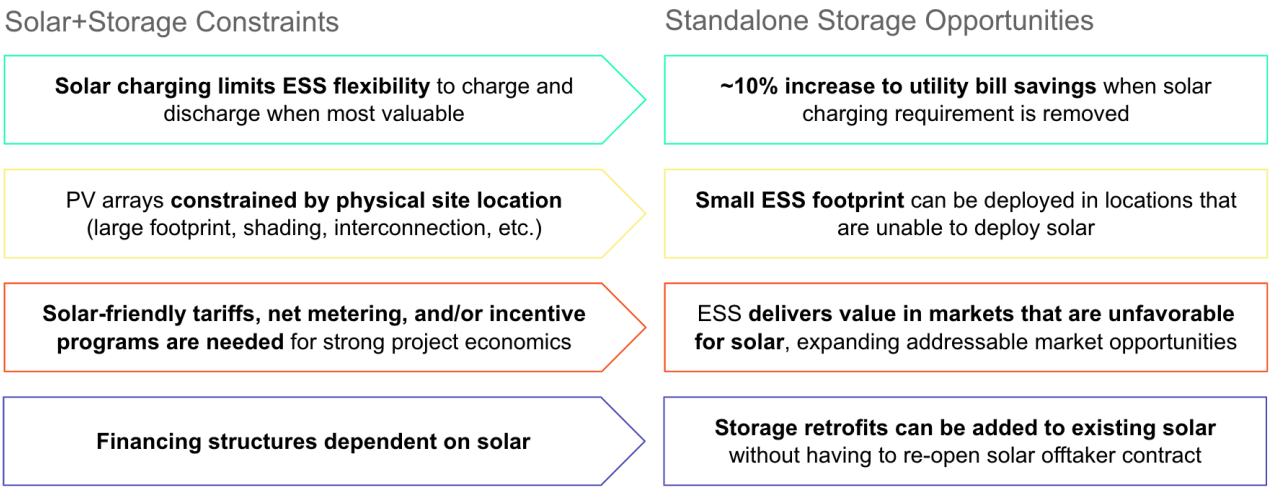


Figure 4: Untethered from solar, new market opportunities open for standalone storage

Discharge When Energy is Most Valuable

Solar charging is no longer required for new storage projects to earn the ITC, so batteries can discharge when energy is most needed and most valuable. Stem's economic modeling shows an estimated increase of approximately 10% in utility bill savings when the solar charging constraint is removed.

Deploy in Locations Without Solar Resources

A significant challenge with solar and storage projects is often that they are limited to areas with both good sun exposure and a large available footprint to accommodate solar systems. Under the new ITC, project developers can add storage systems anywhere they can benefit customers, wholesale markets, and the grid.

Standalone storage systems have a much smaller footprint than solar, and can be deployed in many locations that are not suitable for solar. Sites most suitable for storage include urban areas and pockets of high electricity demand. Removing the solar requirement opens more opportunities to add storage and earn tax credits.

Retrofit Projects Qualify for the ITC

Arguably, one of the ITC's more important benefits is that developers can add energy storage to existing solar projects with new, independent financing. Previously, developers had to re-open solar power purchase agreements (PPAs) or off-taker agreements to add storage to a solar project and earn ITC. But under the new ITC, developers can retrofit storage onto existing solar under an independent off-taker agreement – creating an opportunity to retrofit storage onto tens of thousands of megawatts of existing solar projects across the US.

Good storage retrofit candidates look similar to greenfield solar plus storage installations. For BTM projects, Stem recommends targeting sites with large loads, typically at least 400kW of peak demand, as well as a storage-friendly utility tariff – namely, one with high demand charges, high coincident peak charges, or high energy rates with a sizable time-of-use differential. For FTM projects, look for sites with favorable wholesale revenue opportunities, including locations in the ERCOT, CAISO, or ISO-New England markets. Also, look for areas with access to incentive programs or feed-in tariffs, such as NY VDER.

Additional aspects to consider for a storage retrofit include investigating whether interconnection constraints may limit how much storage developers can add to an existing solar site without incurring high upgrade costs. Also, ensure that the site has enough physical space to add a storage system. Finally, Stem recommends targeting sites where the customer or the off-taker is benefiting from their solar investment and enthusiastic about more clean energy development on site.

Capturing the Solar PTC

One of the most consequential provisions of the IRA is its extension of the Solar PTC. In many cases, the PTC is likely to be more valuable than the ITC. Whereas the ITC is an upfront tax credit that does not vary by system performance, the PTC tax credits are earned over time. Whether to choose the ITC or the PTC for a solar project depends largely on the quality of the solar resource, the cost and capacity factor of the project, and whether it is eligible for any bonus tax credits.

Table 1 shows the relative value of the PTC compared to the ITC on a net present value (NPV) basis. For solar projects with high capacity factors and low capital expenditure (CapEx) costs, the PTC may be more valuable than the ITC, as shown by the blue shaded cells. The amount of the PTC ($26/MWh in real 2022 dollars) will be adjusted upward for inflation in future years. If solar CapEx costs continue to decline over time, as is generally expected, many solar developers may opt for the PTC instead of the ITC, particularly for larger projects.

Incremental Value of PTC Relative to ITC, $/kWdc NPV

Project Assumptions

- 30% ITC
- 100% PTC
- Inflation: 3%/yr
- Degradation: 0.5%/yr
- Discount Rate: 8.0%
- Project Year: 2024

Capacity Factor (%) \ Total Installed Project Cost ($/W)	$0.75	$1.00	$1.25	$1.50	$1.75	$2.00	$2.25
16%	$60	-$15	-$90	-$165	-$240	-$315	-$390
18%	$95	$20	-$55	-$130	-$205	-$280	-$355
20%	$131	$56	-$19	-$94	-$169	-$244	-$319
22%	$166	$91	$16	-$59	-$134	-$209	-$284
24%	$202	$127	$52	-$23	-$98	-$173	-$248
26%	$237	$162	$87	$12	-$63	-$138	-$213
28%	$273	$198	$123	$48	-$27	-$102	-$177
30%	$309	$234	$159	$84	$9	-$66	-$141

US Averages

	Capacity Factor (%)	Capex Cost, Q1 2022 ($/Wdc)
C&I	16%	$1.64
Utility	25%	$1.01

Table 1: Estimated value of the Solar PTC relative to the ITC under various project assumptions
Sources: NREL, EIA, Wood Mackenzie

Determine Project Eligibility

Determining whether your project is likely eligible for tax credits is an essential first step. When you partner with Stem, we'll work with you to identify and capture all available value streams, including the ITC and PTC, determine the optimal configuration for your projects, and maximize lifetime performance and returns.

Calculate ITC Eligibility

Stem has developed economic modeling based on storage project size, in-service dates, technologies, and construction start dates. Table 2 shows the percentage of tax credits and the technologies that projects are eligible for based on MWac size.

Project In-Service Year	ITC Rate		Eligible Technologies
	For Projects <1MWac	For Projects >1MWac	
2022*	30%	30%	Solar Solar+Storage
2023 - 2032+	30% Base 10% Domestic Content 10% Energy Community 10-20% Low Income	6% Base 2% Domestic Content 2% Energy Community 5x Labor Multiplier 10-20% Low Income (<5MW)	Solar Solar+Storage Standalone Storage

*Applicable to projects placed in-service anytime from January 1, 2022 - December 31, 2022

Table 2: ITC Eligibility by System Size

Similarly, Table 3 shows example calculations with the base 6% credit.

	Base Credit	Domestic Content	Energy Community	Labor Multiplier	
	6%	2%	2%	x 5	Total ITC
Example 1	✓	X	X	✓	6% x 5 = 30%
Example 2	✓	✓	✓	X	6% + 2% + 2% = 10%
Example 3	✓	✓	✓	✓	(6% + 2% + 2%) x 5 = 50%

Table 3: Example calculations with 6% ITC base credit

Calculate PTC Eligibility

Stem created economic modeling for PTC-eligibility based on solar project size, in-service year, technologies, and construction start dates. Table 4 shows the percentage of tax credits that solar projects might earn.

Project In-Service Year	PTC Rate	
	Project Size <1 MWac	Project Size >1MWac
2023 - 2032+	100% Base 10% Domestic Content 10% Energy Community ($26/MWh in 2022)	20% Base 2% Domestic Content 2% Energy Community 5x Labor Multiplier ($26/MWh in 2022)

Table 4: Solar PTC Eligibility

Table 5 shows example calculations when taking Solar PTC versus Storage ITC. These calculations can help determine total PTC versus ITC percentages.

Solar PTC

	Base Credit	Domestic Content	Energy Community	Labor Multiplier	Total PTC %	Total PTC $/MWh*
	20%	2%	2%	x 5		
Example 1	✓	X	X	✓	20% x 5 = 100%	100% * $26 = $26/MWh
Example 2	✓	✓	✓	X	20% + 2% + 2% = 24%	24% * $26 = $6/MWh
Example 3	✓	✓	✓	✓	(20% + 2% + 2%) x 5 = 120%	120% * $26 = $31/MWh

*Based on PTC value of $26/MWh in 2022. Inflation adjustment will increase value of PTC for projects placed in service in 2023 or later.

Storage ITC

	Base Credit	Domestic Content	Energy Community	Labor Multiplier	Low Income Community (<5MW)	Total ITC
	6%	2%	2%	x 5	10%	
Example 1	✓	X	X	✓	X	6% x 5 = 30%
Example 2	✓	✓	✓	X	X	6% + 2% + 2% = 10%
Example 3	✓	✓	✓	✓	✓	(6% + 2% + 2%) x 5 + 10%= 60%

Table 5: Example Calculations of Solar PTC versus Storage ITC

How to Get Started with Stem

Stem is ready to speak with you about applying for tax credits to improve the economics of your clean energy projects and gain the most benefits.

With the right experience and know-how, Stem can help you reduce risks and complexities of building a system and increase the speed at which your projects can launch. The following overview describes the benefits of starting projects with Stem.

Design Consultation

First, we offer a consultation to determine your projects' goals and what you are trying to accomplish. We will look at current sites and understand the site's available power. Then, we'll determine if you need to upgrade any equipment. Starting now is critical!

Review Options

We can then determine the optimum configuration for your projects. Metrics and real-world data help correctly size the batteries and amount of solar panels to support your projects.

Discover Grants and Incentives

Stem helps with other federal- and state-level grants and programs that could benefit your projects. Understanding air quality management districts and available state funds, for example, can help you stack incentives and maximize your value streams.

Utilize No-cost Solutions

Stem works with partners to offer no-cost solutions, including storage-as-a-service, PPAs that integrate solar with storage, or a hybrid of both. We're here to fit your needs with varying payment and financing options.

Learn more about our AI-driven clean energy solutions and services at stem.com.

About Stem, Inc.

Stem (NYSE: STEM) is a global leader in AI-driven clean energy solutions and services.

Stem (NYSE: STEM) provides clean energy solutions and services that maximize the economic, environmental, and resiliency value of energy assets and portfolios. Stem's leading AI-driven enterprise software platform, Athena® enables organizations to deploy and unlock value from clean energy assets at scale. Powerful applications, including AlsoEnergy's PowerTrack, simplify and optimize asset management and connect an ecosystem of owners, developers, assets, and markets. Stem also offers integrated partner solutions that improve returns across energy projects, including storage, solar, and EV fleet charging.

For more information, visit www.stem.com.

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