

# Global Clean Energy Technology Insight

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## Inflation Reduction Act: Landmark climate and energy security bill supercharges solar and energy storage industry in the United States

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### Key implications

**The Inflation Reduction Act (IRA) is a reconciliation bill that unlocks \$370 billion in climate and energy investment in the United States**, supporting a diversity of technologies and solutions. It was passed by the US Senate on 7 August 2022, was passed by the House of Representatives on 12 August 2022, was signed by President Joe Biden on 16 August 2022, and will now become law.

- **Two major components of the bill are the technology-neutral extensions of the Investment Tax Credit (ITC), which now includes standalone storage for the first time, and the solar Production Tax Credit (PTC)**, which hasn't been available for solar photovoltaic (PV) projects since 2006. The current ITC was scheduled to expire in 2024, but the IRA will keep both the ITC and PTC at full credit values until 2033 at the earliest. Notably, if the United States has not reduced its emissions by 75% from 2022 levels in 2032, the ITC and PTC will remain at the full credit value until the emissions goal is met.
- **The IRA dramatically improves PV project economics across all segments, triggering a major upward review of the installation outlook.** The utility-scale sector will experience the biggest boost. Previously, the market was expected to record a sharp slowdown following the expiry of the ITC, but the ITC extension and PTC renewal will lead to many new projects and robust additions throughout the second half of the decade.
- **The inclusion of standalone energy storage in the ITC will reshape the energy storage market overnight** as a litany of projects in new markets will become viable that were not beforehand. The extension of the credits to 2030 or beyond instills confidence in investors and developers to continue building throughout the decade.
- **In a widely anticipated move to localize supply chains, the bill also provides long-awaited incentives to develop local manufacturing for both solar and batteries**, in an effort to boost energy security, create local jobs, and reduce supply chain bottlenecks. However, it will take several years for enough local capacity to be built to ease current supply constraints.

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## Major policies to be introduced by the IRA

The main bill provisions impacting the solar and energy storage industries are

- **Extension and expansion of the Investment Tax Credit (ITC).** This incentive has been a key driver of the US solar and energy storage market. It was previously scheduled to fall to 10% in 2024 but will now remain at 30% until 2033 at the earliest. It has also been expanded to include standalone energy storage facilities.
- **Extension and revitalization of the Production Tax Credit (PTC).** The PTC extension gives a 1.5 cent/kWh base incentive to generate from qualified resources until 2033. Solar is now a qualified facility and has not been since 2006. The PTC has been a major driver for wind and was successful at helping it to be competitive and scale when it was a less mature market.
- **A two-tiered structure, which has minimum requirements to achieve the full credit value, now implemented for both the ITC and PTC.** Moreover, the structure also includes new categories of “bonus” credit percentage adders, which could theoretically boost the ITC to 50% and increase the PTC value by 20%, and establishes provisions for direct pay and transferability.
- **Introduction of incentives for domestic production of renewable energy components.** These incentives include tax credits for production of critical battery minerals, battery cell manufacturing, and for the full solar supply chain (solar-grade polysilicon, wafers, thin film or crystalline cells and modules, inverters, and other components).
- **Expansion of the existing \$7,500 credit for electric vehicles (EVs) beyond the existing 200,000 vehicle cap per manufacturer.** The bill also requires that 40% of the critical minerals used in the batteries be extracted and processed in the United States or with a free trade agreement (FTA) partner, or recycled in North America, and that final assembly of the vehicle must take place in the United States.

See the “IRA policy provision details” section of this Insight for full details on the policy changes.

## Solar market outlook

### IRA dramatically improves solar PV economics, leading to a significant increase in the demand outlook

The renewal of the PTC means that the solar industry will have an active ITC and PTC at the same time, which has not happened since 2006. The industry is far more mature than it was 15 years ago, so this combination will enable existing companies to expand at faster rates from significantly improved project economics.

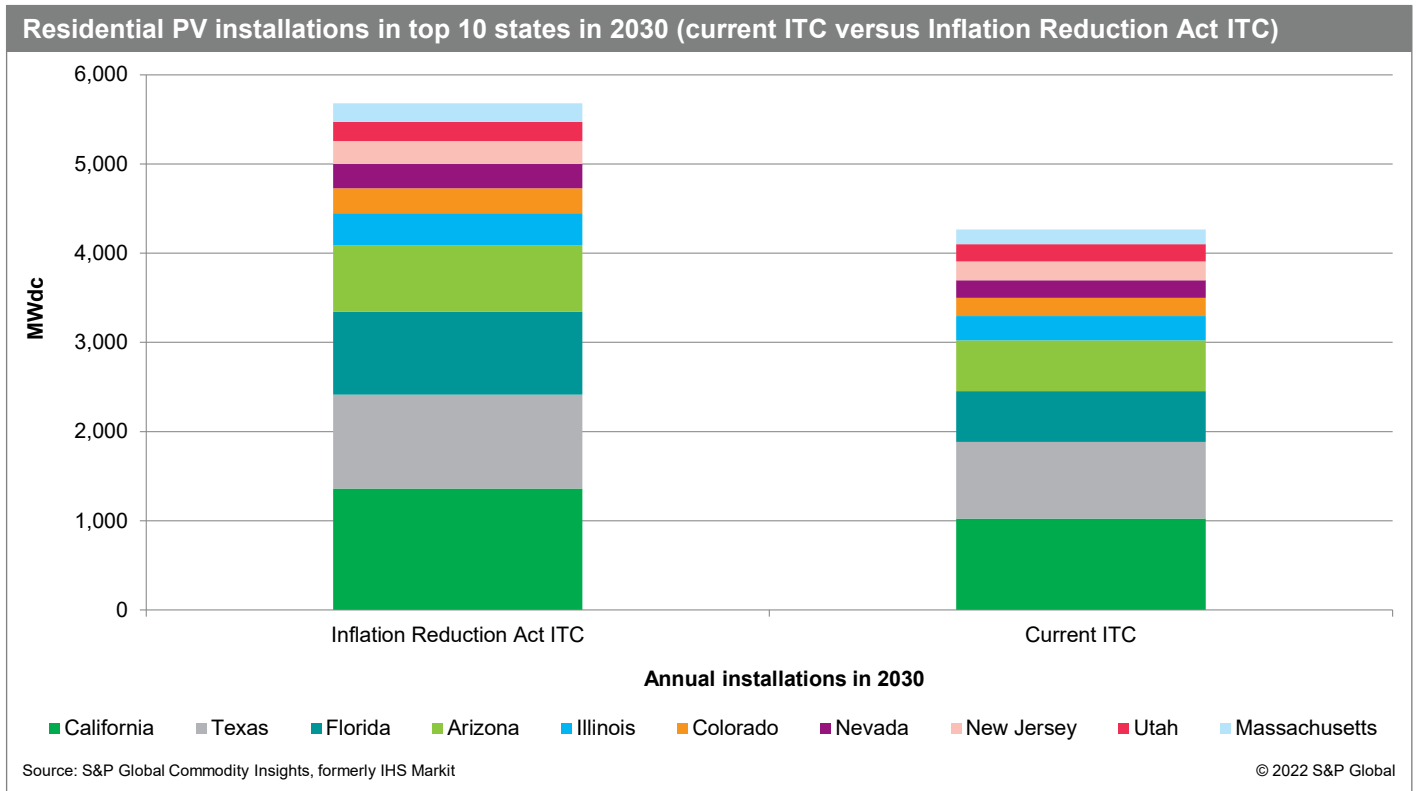
**Utility-scale solar:** When combined with “adders” for additional incentives around domestically produced components, low-income communities, and “energy communities,” projects could be eligible for a 50% ITC or 20% greater PTC rate per kilowatt-hour. The renewal of the PTC means that the solar developers will need to choose between claiming the ITC or PTC according to individual project economics. IHS Markit will soon publish updated forecasts for utility-scale to 2030, which will increase dramatically.

**Commercial solar:** Projects in this segment have historically been driven less by economics because corporate sustainability metrics for “green” marketing purposes have been equally important as the financial return from going solar. Regardless, interconnection costs have created a financial hurdle in the commercial and community solar space. Relative to the size of a project, necessary interconnection upgrades account for a far larger proportion of the total system cost than in the utility-scale sector. However, the IRA now enables interconnection costs for projects less than 5 MWac to be included as part of the “qualified investment”

covered under the ITC. That is a major win for small-scale developers and should further boost installations, especially in the Northeast, where interconnection costs and appetites for commercial and community solar are among the highest.

**Residential solar:** As with other sectors, the US residential solar market is poised to experience explosive growth. If the IRA is signed into law, installations in the top 10 states in 2030 would increase by roughly 1.2–1.6 GWdc (25–35%). As a whole, the US residential market is predicted to reach roughly 6 GWdc in annual installations by 2030 under the current ITC scenario and 8 GWdc under the IRA ITC scenario.

Figure 1



Overall, many states have established appealing net-metering policies and other local incentives that encourage distributed solar deployment. Some states and electric utilities, however, have moved toward sub-retail rate remuneration schemes, billing structures that incorporate fixed charges, and rigid aggregate capacity caps, which all aim to inhibit growth in certain areas. Ultimately, the degree of the ITC expansion’s impact will depend on the evolution of state and local policy landscapes.

Despite the precise outlook for residential solar in each region still being heavily influenced by the structure and availability of net metering, the implementation of the IRA represents a significant boost to the outlook.

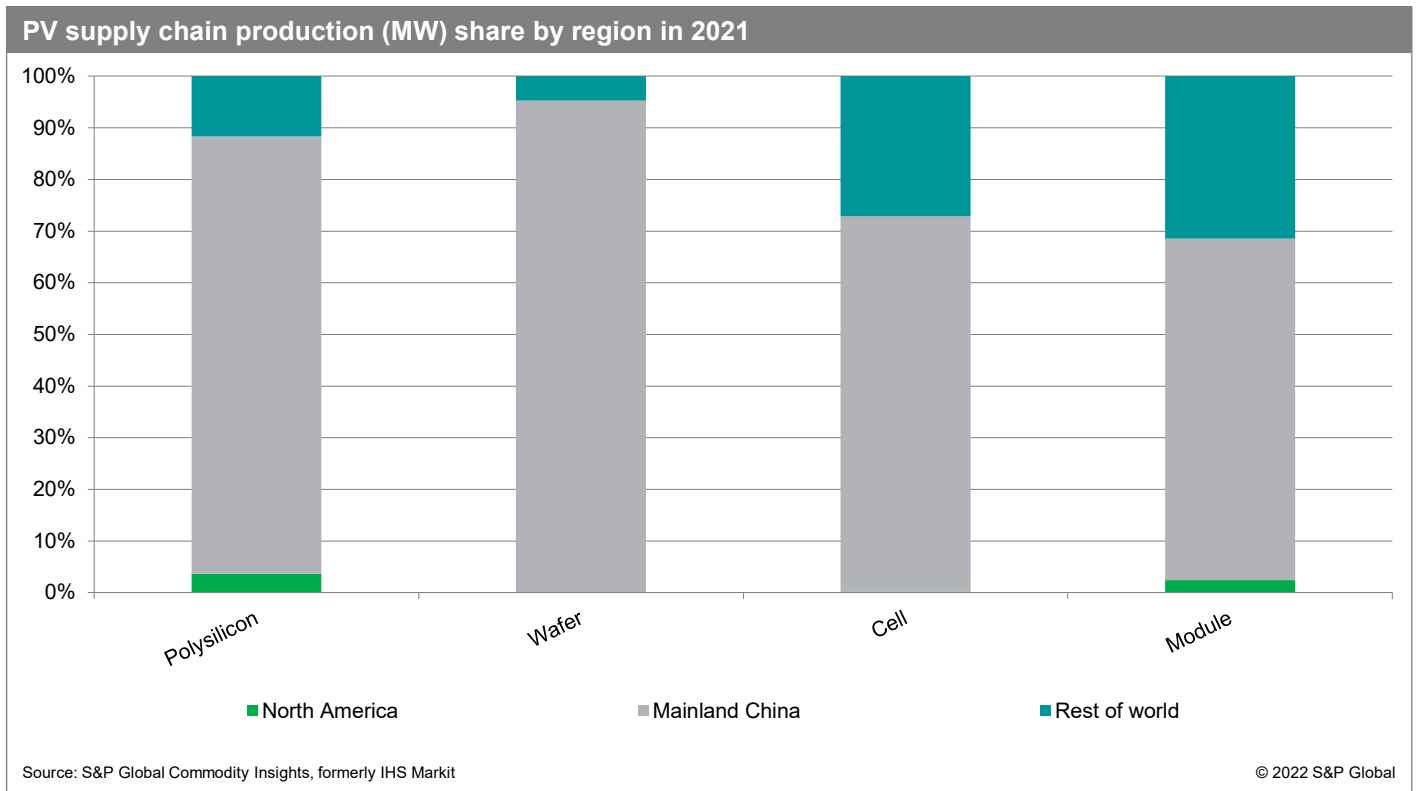
## Solar manufacturing outlook

### Policy stability to boost local manufacturing investments and reduce supply chain bottlenecks caused by a massive surge in demand

With the US solar industry currently plagued by supply chain challenges and lack of policy visibility regarding imports from Southeast Asia, the IRA introduces policies that aim to reduce reliance on imported goods and promote the buildout of a local supply chain. This historic change in the global solar manufacturing landscape will be further reinforced by mechanisms and initiatives beyond the incentives contained in the Advanced Manufacturing Production and Advanced Energy Project tax credits. The IRA creates an interlinkage between domestic supply chains and PTC and ITC projects via the 10% domestic content adder, which stimulates procurement of solar components derived from domestically sourced materials.

Currently, the solar industry in the United States is exposed to multiple supply risks stemming from the Withhold Release Order, Uyghur Forced Labor Prevention Act, the ongoing anticircumvention investigation pertaining to modules produced in Southeast Asia, and other potential issues. While new incentives in the IRA are sure to increase demand to unprecedented heights, developers are struggling to procure components, especially modules for current project pipelines. Even if the United States ramped up all current module manufacturing facilities to full capacity, it could only meet roughly one-quarter of the solar installation pipeline anticipated in 2022, while still having to source wafers and cells from China, Southeast Asia, and other regions.

Figure 2



Although there are potential supply chain concerns and bottlenecks, the United States is set for a significant build-out of local solar manufacturing. Given the level of incentives provided by the IRA and signals from the solar industry, the United States may be able to achieve a significant level of supply chain independence within four to six years. Companies such as Hanwha Q-CELLS have already confirmed module capacity expansions that depended on the passage of this bill. Moreover, US-based polysilicon companies have previously confirmed potential capacity expansions and partnerships with wafer and cell companies (the biggest bottleneck to domestic manufacturing supply chains in the United States) in the United States if the bill were to pass as well. The structural balance of system manufacturers such as tracker suppliers has been an early mover, with Nextracker and GameChange Solar announcing US-based manufacturing expansions. To date, there is limited solar and energy storage inverter manufacturing capability because many suppliers consolidated manufacturing locations as prices decreased rapidly in recent years. However, some of the existing players who have domestic manufacturing, such as Yaskawa-Solectria Solar, EPC Power, Generac, and Alencon, are likely to benefit from the domestic content adder. Other major inverter players may consider onshoring in the near future to help their customers avail of the adder.

Furthermore, the Defense Production Act and a newly formed consortium of US solar companies, who have committed to spending \$6 billion to purchase 6–7 GW of domestically manufactured solar modules per year, provide a minimum level of confidence that investments in the solar supply chain will be fruitful.

Despite key hurdles for local manufacturing in the United States, such as the lack of industry knowledge for ingot manufacturing and the limited availability of solar glass and raw materials—like aluminum, graphite and quartz for crucibles, and other materials—manufacturers are positioning for entry and expansion. Ultimately, a massive spike in demand will soon hit the market, and a domestic supply chain will be necessary to ease some of the supply chain pressure in the midterm.

## Batteries manufacturing outlook

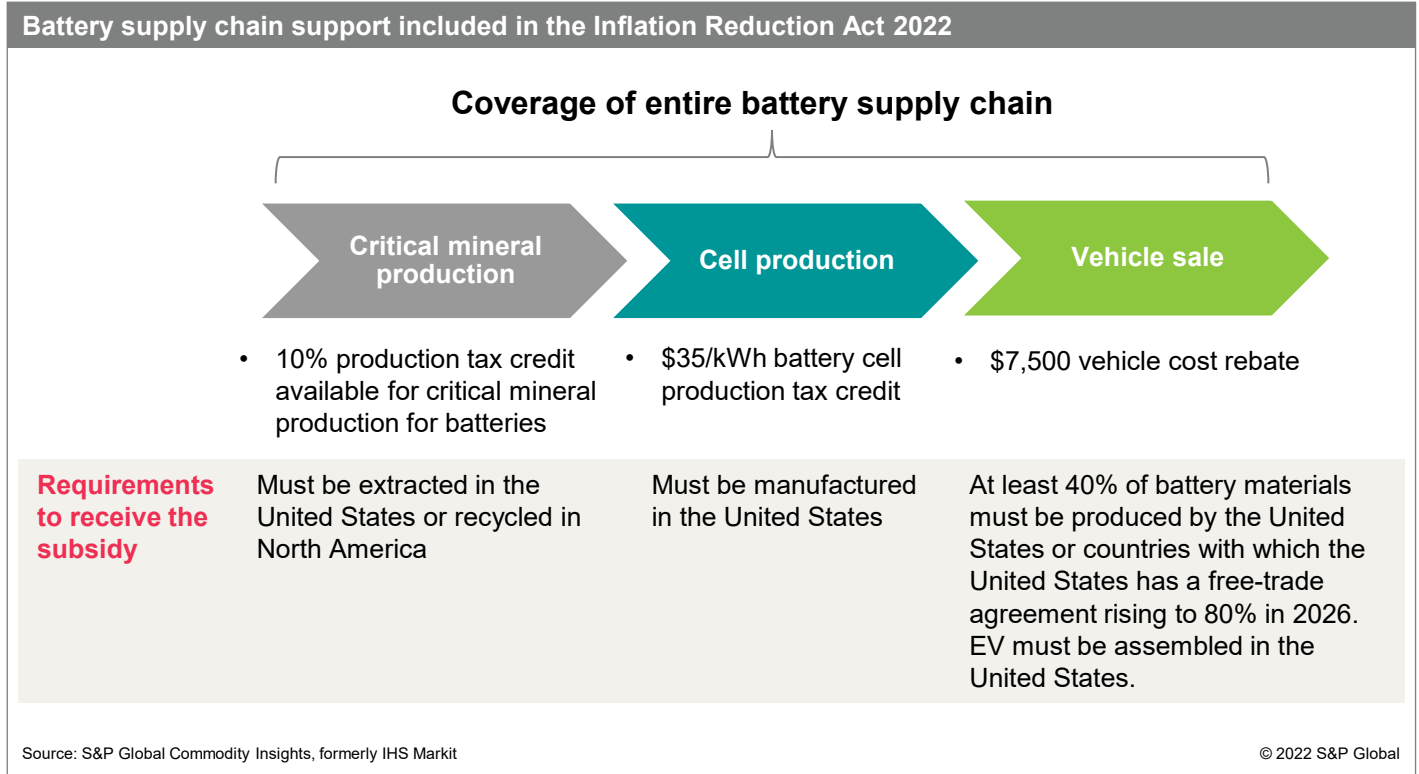
### **Multiple measures across the battery supply chain will provide a strong incentive to expand cell manufacturing facilities in the United States, but uncertainties remain regarding whether this is significant enough to draw the wider supply chain away from China**

Following growing bipartisan concern over the security of supply of critical raw materials for battery production, the IRA introduces a first major step to increase the proportion of the battery supply chain that currently sits within the United States. The IRA introduces multiple subsidies, which cover the various elements of the battery supply chain from raw material extraction to completed vehicle sale and, at each stage, add requirements for production to take place in the United States.

In total, these measures could lead to a significant overall subsidy. If each production stage can successfully take place in the United States, the measures will compound. The two production tax credits alone could lead to a significant reduction in US manufactured cell costs, as the 10% credit for critical mineral production can be applied to a wide range of raw battery materials. Combining this with the \$35/kWh tax credit for cell manufacturing, the level of subsidy could potentially account for 20–40% of the total cell cost.

The motivations for companies in the battery supply chain to build or expand facilities in the United States is clear. The cost of cells produced in the United States will reduce overnight, inevitably leading to larger-scale local battery supply in the near term. Cell manufacturing expansion is likely to be strongly favored as a result of the \$35/kWh subsidy and the fact that it can be scaled up relatively quickly. The more challenging and time-consuming aspects of scaling the battery supply chain lie further upstream, with mines typically requiring

Figure 3



at least a seven-year lead time. Equally, the 10% tax credit available for this activity is significantly lower than others in this bill. It is not, therefore, clear that the scope of the onshoring will extend further upstream than cell manufacturing in the near term as the subsidy may not be attractive enough, and there are significant lead times to expand production facilities.

### A number of key countries in the battery supply chain do not have FTAs with the United States, strengthening the drive to onshore raw material production through increased investment in recycling or mining

The \$7,500 cost rebate for EVs will only be eligible for those that have higher than 40% of battery material supply (rising to 80% by 2026 and 100% by 2028) from either the United States or countries that the United States has a FTA with.

The following notable regions do not have an FTA with the United States:

- **China**—Currently dominates global cell supply, with more than 70% of lithium refining capacity; 50% of nickel refining; and significant presence in the mining of lithium, cobalt, and nickel. Note: China is also denoted as a foreign entity of concern, making any supply of critical minerals from China ineligible for subsidies.
- **Indonesia**—Currently the largest producer of nickel, accounting for more than 40% of supply.
- **Argentina**—Will account for 15% of lithium mining capacity by 2025.
- **Democratic Republic of Congo**—Will account for more than 65% of cobalt mining capacity by 2025.



Indeed, the only countries that the United States does have an FTA with that could make a significant impact to battery raw material supply are Australia and Chile. The three countries combined (including the United States) will account for more than 50% of global lithium mining capacity by 2025, but this proportion is significantly lower for both nickel and cobalt. Since nickel and cobalt are not used in lithium-ion batteries with lithium iron phosphate (LFP) cathodes, it may be easier for vehicles using these batteries to get the EV subsidy.

It is unlikely that significant new battery material facilities will be available in the United States prior to 2030, owing to the long lead times to develop mines. Because of this, continued reliance on raw materials from countries without FTAs is inevitable in the short term, leading to a limited availability of the \$7,500 vehicle rebate and, therefore, potentially low impact on overall EV demand.

### **The supply of batteries to the stationary storage sector will continue to be heavily influenced by EV demand, and the proportion of US produced cells eligible for the vehicle grant will dictate availability in the longer term**

The impact this bill will have on total battery demand in the United States remains to be seen; however, US battery cell manufacturing is likely to increase rapidly and will become more cost competitive. This cost reduction will be equally compelling for both the EV and stationary storage industries, and both industries stand to benefit from cell manufacturing expansions in the United States. However, any increases to EV demand, resulting from this bill or otherwise, will continue to have the potential to divert lithium-ion battery supply from the stationary sector owing to the substantially larger demand and greater buying power wielded by automotive manufacturers.

While it is likely that there will be limited supply of batteries that are eligible for the EV subsidy in the near term because of the stringent raw material requirements, in the longer term, if the proportion of cells that are eligible increases, then the availability of US cells to the stationary storage industry is likely to be impacted.

## Front-of-the-meter energy storage installation outlook

### **The extension of the ITC to 2030 and inclusion of standalone storage facilities will change the front-of-the-meter energy storage landscape overnight**

The storage landscape in the United States will change overnight due to standalone facilities becoming eligible for a 30% credit for the first time and the extension of the existing solar-plus-storage ITC through 2030. Overall, front-of-the-meter energy storage projects will benefit in every state and market. Areas with lucrative solar irradiation, transmission constraints, and opportunities for arbitrage will experience a notable benefit.

The expansion of the ITC to include standalone storage levels the playing field between standalone and solar-plus-storage installations and may enable new applications to become cost effective.

Currently, a notable amount of solar-plus-storage projects are developed at the same point of interconnection owing to cost synergies, without necessarily operating the assets together. This has meant that the storage component could take advantage of the ITC but operate independently. However, with the expansion to standalone ITC, those installations that were historically collocated but operated separately will no longer have a tax incentive to be developed at the same site. Instead, following the implementation of the IRA, solar and storage assets could be developed in separate locations that best suit each facility without incentive penalty.

For this reason, standalone facilities will have significant growth potential near urban areas, where revenues could be higher, but solar project developments are not convenient or possible. Equally, there will likely be an increased use case for transmission and distribution deferral and constraints as a result of this expansion because, for the most part, this application necessitates that the storage asset is standalone as it needs to be located at a substation or similar.

## The definition of solar plus storage may blur with separate financial opportunities

Many solar and solar-plus-storage developers may elect to utilize the PTC instead of the ITC now, as it can be more lucrative. Since only one tax credit structure can be chosen per project, solar-plus-storage developers have a lot to consider.

New tax structures for solar-plus-storage projects may develop thanks to the introduction of the solar PTC. There will now be two possible ways to structure solar-plus-storage developments:

- **Solar plus storage under a combined ITC**—This is currently the only option. The benefits are utilizing the same point of interconnection and that the battery can be used to firm the capacity, shift load, or operate independently. Currently, there is a notable percentage of projects that operate the battery independently. The main drawback in this scenario is that the battery may not be placed at the ideal node to participate in the market.
- **Solar under PTC, storage under separate ITC**—It is unclear whether this model will be feasible; however, in the past, the US Internal Revenue Service (IRS) has made exceptions for assets that hold and then sell commodities with the same point of sale intent and timeframe. Investors and developers will likely need more guidance from the IRS before moving forward with this setup. The main benefits would be getting the best tax incentives for both the solar and the storage in terms of present value of the tax credit while still having the cost and operational synergies of being geographically adjacent. The main drawback is the possibility that the IRS clarifies that this is not acceptable. If this is the case, then the solar would need to be sold to an unrelated third party, which means that developers could start forming strong partnerships to individually develop the solar and storage and each get their respective credit.

## Solar-plus-storage installations will continue to form an important part of the outlook

Plenty of facilities will continue to opt for the ITC for both the solar and storage components. Given the significant demand for peak capacity in various markets, it is still expected that the solar-plus-storage segment will continue to grow in the United States—particularly as there will continue to be a need to firm renewable capacity at the source, mitigate curtailment, and take advantage of cost synergies by using the same point of interconnection. In addition, the standalone expansion also means that energy storage additions to existing solar facilities will be eligible, meaning that retrofitted systems may become increasingly common.

### Behind-the-meter energy storage installation outlook

## The expansion of the ITC will slightly increase demand for residential storage in the short term and lead to sustained growth past 2030

The original residential ITC was previously scheduled to fall to 0% in 2024 and was not available for standalone storage. The IRA will now expand the ITC to 30% and extend it until 2032, including both residential solar and standalone storage. This means that rather than expecting a dip in installations in 2024 with gradual growth



in installations out to 2030, we will likely see sustained growth in installations out past 2030. The impact of the 10-year standalone storage ITC extension will be most apparent in the latter half of the decade as the market moves from early adopters of energy storage technology to more mainstream adoption. Just by virtue of a stronger residential solar forecast out past 2030, residential energy storage will benefit, as homeowners typically purchase energy storage in conjunction with solar.

Most of the forecast new installations will continue to be solar-plus-storage installations rather than standalone storage, despite the introduction of a standalone energy storage ITC. This is because the benefits of residential storage are more fully realized when paired with solar. Even with a full ITC tax credit, the economics for installing either solar plus storage or storage alone do not pencil out for the average homeowner, with typical payback periods for solar plus storage past 10 years and payback periods for storage only installations even longer. Most homeowners that install residential batteries do so for resiliency/grid independence purposes, and with a standalone battery, there is no way to recharge the battery after it has been depleted in the event of an outage until the utility restores the grid. However, in specific situations where grid outages tend to be shorter in duration and the goal is to avoid any interruptions in service, standalone storage may be the right fit for a homeowner. Likewise, if the roof space is not available or well-suited for solar panels but the homeowner still wants the benefits of time-of-use (TOU) rate arbitrage and backup, standalone storage may make sense.

### **Retrofitting energy storage could become a major driver for residential installations as they will be eligible for the standalone ITC**

With a standalone ITC, there will also be a trend of more retrofitted residential energy storage (e.g., new energy storage attached to old solar panels). Retrofitted installations were not originally covered by the ITC, which only covered energy storage installed within the same tax year as the solar panels. This trend of retrofitted storage will be more pronounced in mature solar markets where net metering incentives are reduced or suspended, such as Hawaii. With reduced incentives to export solar, homeowners often prefer to store and use the energy generated from their panels.

### **The standalone energy storage ITC will tip the scale of previously financially unfeasible commercial and industrial (C&I) energy storage projects**

For C&I installations, there will likely be an increase in installations for solar-plus-storage projects but, in particular, an increase in standalone storage projects. C&I customers tend to be most interested in managing demand charges and high TOU rates, which can be achieved through standalone storage and without necessarily needing to be collocated with solar. Previously, to get a tax credit for energy storage, customers had to install solar, which led to longer payback periods. Unlike residential installations, C&I installations also benefit from the additional adders offered under the Section 48 commercial ITC. Beyond the 30% ITC offered in the IRA, additional tax credits can be received for using domestically manufactured content in the project, placing the project in a qualified energy community, and developing projects in low-income communities. As C&I customers often make purchase decisions from a purely economic perspective, the creation of a standalone ITC with additional adders will help make more projects economically attractive.

In the past, the lack of standalone storage credits led to more solar-plus-storage projects, particularly in key markets like Massachusetts, where there were additional incentives given for solar-plus-storage projects. With the updated legislation, there will likely be an increase in energy storage-only installations in areas with high demand charges and significant TOU rate differentials.

## Behind-the-meter energy storage installations will become more geographically diverse

There will be increased diversification in the states/regions where residential and C&I energy storage installations occur. Energy storage installations have traditionally been concentrated in specific states with strong incentive programs, like in California with the Self-Generation Incentive Program (SGIP). With the addition of a 30% ITC for standalone energy storage, many new standalone storage projects will now pencil out without the need for additional incentives, thus leading to greater geographical diversity.

Similarly on the residential side, Hawaii and California currently make up most of the residential energy storage installations in the United States. As these two markets become saturated, and incentives reduce the cost of systems in less established markets, there will be greater geographical diversity in installations. Historically, while incentive programs and changes in net metering policies have driven residential energy storage installations, another key driver for energy storage has been for resiliency/backup purposes. Given the increasing appetite for resiliency in certain areas with higher likelihood for grid outages (such as Texas or states vulnerable to hurricanes), the Gulf Coast will likely record a bump in energy storage installations with a sustained 30% residential ITC over the decade.

## Potential headwinds lead to less bullish updates to the forecast in the short term

The legislation's impact to the forecast in the next two years will likely be less drastic for residential installations as the majority of new forecast additions will continue to be solar-plus-storage projects, which were already receiving some form of the tax credit. In addition, the latest figures from the Bureau of Economic Analysis show that the US economy has experienced two consecutive quarters of negative growth, typically an indicator of a recession. While this metric is not necessarily representative of the US economy as a whole (as it does not consider other key indicators like employment growth and industrial activity), this signal may force homeowners and businesses to cut back on nonessential purchases like energy storage in the short term. As there is no drop in the ITC offered past 2030, concerned homeowners and companies have the flexibility to defer purchasing behind-the-meter energy storage.

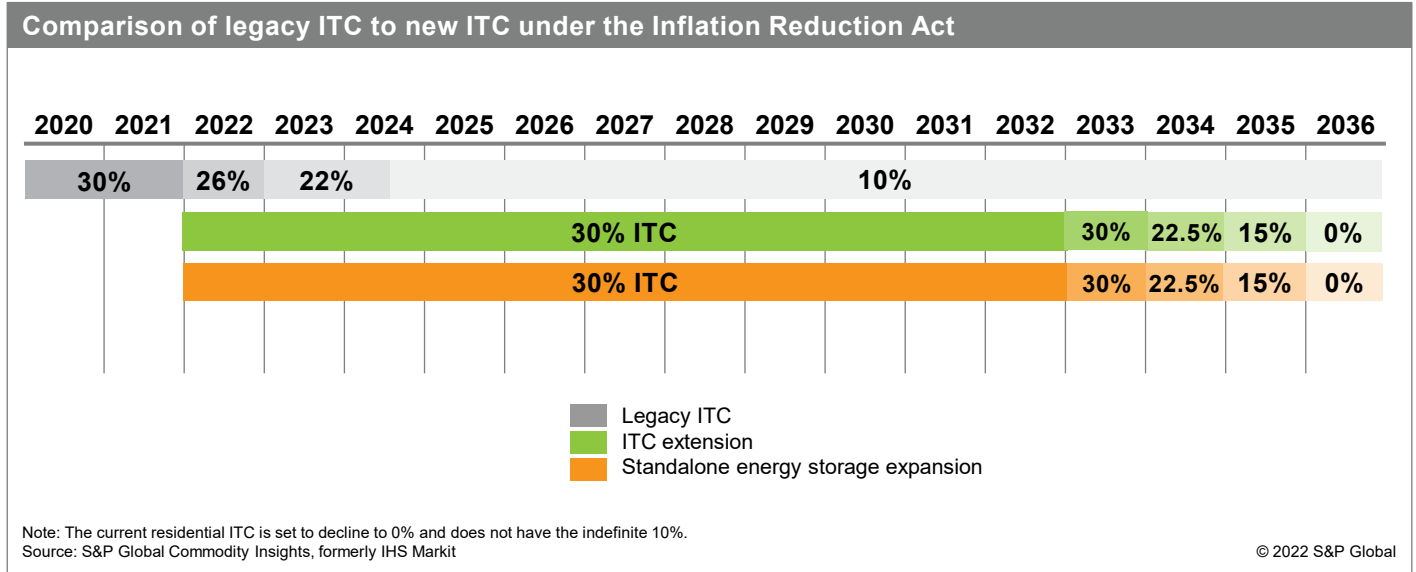
## IRA policy provision details

### The extension and expansion of the ITC

The ITC incentivizes solar and storage development by giving developers a tax credit for a percentage of the total cost of a facility. Currently, the ITC applies to renewable projects and energy storage projects paired with a renewable generation asset. Under the new bill, the ITC would be expanded to include standalone energy storage facilities.

The ITC is currently set to be reduced to 10% in 2024. The passing of this bill would reset and push the tapered tax credit incentives to 2030 or until the US electricity sector emissions are reduced to 25% of the emissions in 2022, whichever is later. IHS Markit expects that roughly 1,200 GW of wind and solar would be needed to accomplish this, and roughly 35 GW of solar and wind were installed in 2021. With many obstacles to grow the annual rate of installation to roughly 120 GW on average to hit those emissions targets, it is likely that the credits will be available for the foreseeable future, barring congressional action withdrawing them.

Figure 4



There are many additional and new components to the ITC in the IRA. First, there are labor requirements to get the full credit, which is five times the base credit. Other additions and changes include adders to increase the overall tax credit percentage, the expansion of eligible energy property to be included in the cost basis for the tax credit, and changes to credit compensation and the eligible ways to utilize it.

- **Two-tiered system:** Facilities intending on obtaining the full credit for the ITC or PTC must pay laborers prevailing wages at rates based on the location where the project is sited. Another requirement is that apprentices must complete a minimum percentage of the overall construction or repair work. This percentage begins at 10% and climbs to 15% in 2024. Failing to meet these requirements yields the base value of the credit. For the ITC, that would be a 6% overall credit instead of 30%, and 20% of the PTC rate instead of 100%.
- **Adders:** The IRA also includes potential adders to increase the overall tax credit percentage. There are three ways to increase the overall tax credit received: using domestically manufactured content in the project, placing the project in a qualified energy community, and developing projects in low-income communities.
  - The domestic content adder offers a 10% additional credit to the ITC or PTC for projects utilizing domestic iron, steel, or other materials. This also includes manufactured products like inverters. Before 2025, the requirement to secure the domestic content adder is 40% of the adjusted cost of the project must be attributable to domestically sourced product, increasing incrementally to 55% by 2028.
  - Projects placed on energy community sites can receive a 10% additional credit for the ITC and the PTC. Qualified energy community sites are brownfield sites, areas with current or historic employment in the conventional fossil fuel industry, and locations where coal mines or generation plants have closed.
  - Facilities located in low-income communities, low-income residential buildings, and on tribal land are also eligible for a 20% adder; however, this is only applicable for the ITC.

- **Interconnection energy property:** Certain interconnection equipment is now considered energy property eligible for the ITC under the IRA. However, only facilities that have a net output of 5 MW or less are eligible for this additional benefit. This will be largely beneficial to community solar and C&I applications of solar and storage. This inclusion of energy property for interconnection will be a huge boost for projects less than 5 MW, as interconnection costs are a much larger portion of the overall capex for these projects compared with larger systems.
- **Direct pay and credit transfer:** Tax-exempt entities can qualify for direct payments from the ITC or PTC. This caveat will allow for niche development opportunities for municipalities and other tax-exempt entities. The earlier version of this bill, the Build Back Better Act, allowed for direct compensation for a cash refund if there was not enough tax liability to take advantage of the credit. Instead, in this version, tax paying entities can sell the excess tax credits to an unrelated third party. This is beneficial as it may negate the need for complex tax equity structures. However, it is unclear how many credits will be on the market and how saturated it may be. The more saturated this credit market is the less valuable the ITC and PTC is for project developers that have no further tax liability.
- **Section 25D residential clean energy credit:** Previously, Section 25D of the code included a tax credit for homeowners installing residential solar, with energy storage also qualifying if installed as part of the original solar system and charging from the panels. Homeowners could then apply the tax credit for both systems to their income taxes. Originally set to phase out in 2024, the update to the tax code due to the IRA includes a 10-year extension of the residential solar tax credit as well as the creation of a standalone energy storage credit for systems with at least 3 kWh of capacity. Solar or storage installed after 31 December 2021 and before 1 January 2033 will have a 30% ITC, those installed after 31 December 2032 and before 1 January 2034 will get 26%, and those installed after 31 December 2033 and before 1 January 2035 will receive 22% ITC.

## Clean electricity production credit (PTC)

The IRA extends the PTC for all previously eligible technologies such as wind and hydropower. The PTC for solar PV expired in 2006, but the new bill makes solar eligible again. Additionally, the IRA creates Section 45Y, which extends the timeline of the PTC beyond 2024.

In Section 45Y, production credits will accrue for a period of 10 years after the qualified facility is placed in service. Projects are eligible to claim the PTC if construction begins by the “applicable year,” either before 2033 or the calendar year in which the Secretary determines that annual greenhouse gas emissions in the United States are equal to or less than 25% of emission levels in 2022, whichever comes later. Once the “applicable year” is reached, the PTC will remain at 100% for the first year after and start to step down by 25% increments in the second and third year. The PTC will phase out entirely by the fourth calendar year after the “applicable year.”

Similar to the ITC, the full PTC credit of 1.5 cents per kilowatt-hour of electricity requires a set number of apprentice hours and a minimum labor wage threshold. Failure to meet those requirements will result in a reduced credit, worth 0.3 cents per kilowatt-hour produced. The Secretary may also determine an “inflation adjustment factor” to adjust the per-kilowatt-hour credit rate for electricity produced at the end of each calendar year. Additionally, the PTC has the same 10% adders for “energy communities” and “domestic content” as the ITC, but not the “low income” adder.

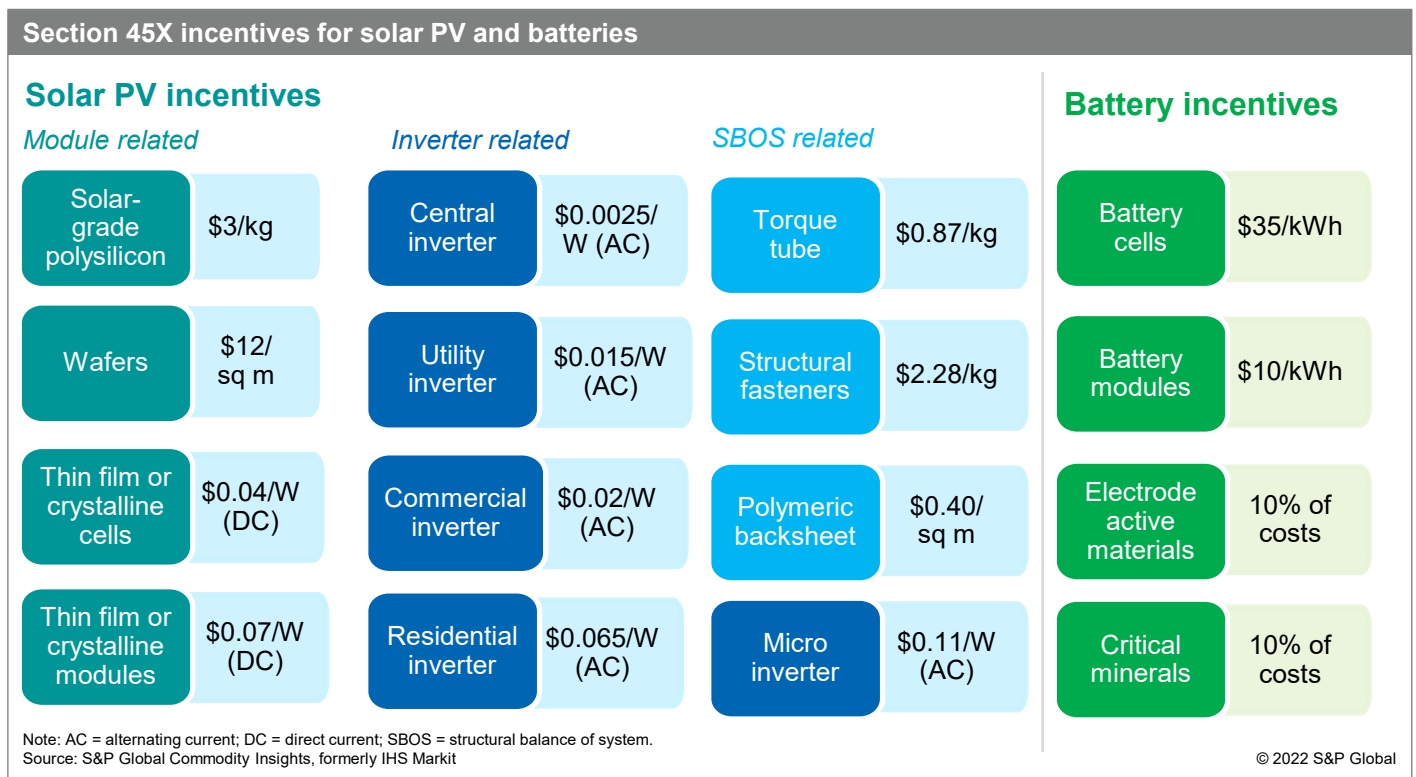
Ultimately, qualified facilities can only claim one tax credit, meaning the ITC and PTC are mutually exclusive.

## Manufacturing incentives

The IRA provides more than \$50 billion to on-shore clean energy manufacturing by establishing broad investment and production-based manufacturing incentives across a spectrum of clean energy technology components and critical minerals. The development of clean energy manufacturing supply chains will reduce the risk of future price shocks by relieving supply chain bottlenecks.

**Advanced manufacturing production tax credit (45X):** The Section 45X credit establishes new tax credit rates for various eligible clean energy components. The credit values for each component remain at the maximum rate until the beginning of 2030, at which time they step down by 25% per year until expiring in 2033. Critical minerals, however, will remain at the maximum credit rate indefinitely. Section 45X applies only to components produced within the United States and sold to an unrelated entity after 2022. Incentives for battery energy storage system (BESS) and solar PV components can be found in the graphic below.

Figure 5



In general, only tax-exempt entities can claim a direct-pay option for credits. However, under 45X, some taxpaying entities can elect for direct payment in lieu of the Section 45X production credit for the first five years of the crediting period.

Moreover, the section 45X credit cannot be claimed if the production facility has also claimed the 48C credit (see below).

**Advanced energy project credit (48C):** The Section 48C credit has been revived and expanded, allocating \$10 billion to advanced energy projects, \$6 billion of which is allocated to qualified investments not located within “energy communities.” Effective 1 January 2023, the Section 48C credit applies to industrial or manufacturing facilities used for the production or recycling of clean energy systems and components, including energy

storage systems and components. The credit includes projects that re-equip, expand, or establish an industrial facility for the processing, refining, or recycling of critical materials. The tax credit base rate is 6%, and 30% for entities satisfying prevailing wage and apprenticeship requirements. Entities seeking to receive Section 48C credits must apply and receive certification from the Secretary and place the project in service within two years of receiving the certification. Facilities that were allocated Section 48C investment credits are ineligible for Section 45X production credits. Taxpayers are not eligible for 48C if they receive credits under Section 48D, the clean electricity investment credit.

## **Electric vehicle (EV) subsidies**

The existing \$7,500 credit for EVs has been expanded beyond the existing 200,000 vehicle cap per manufacturer, and stringent eligibility requirements have been introduced:

- Not less than 40% of the critical minerals used in the batteries should be extracted and processed locally in the United States or with an FTA partner, or recycled in North America. This requirement will ramp up by 10% each year to 80% in 2026.
- Final assembly of the vehicle must take place in the United States.



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