

Crux 2024 Mid-Year
Transferable Tax
Credit Market
Intelligence Report

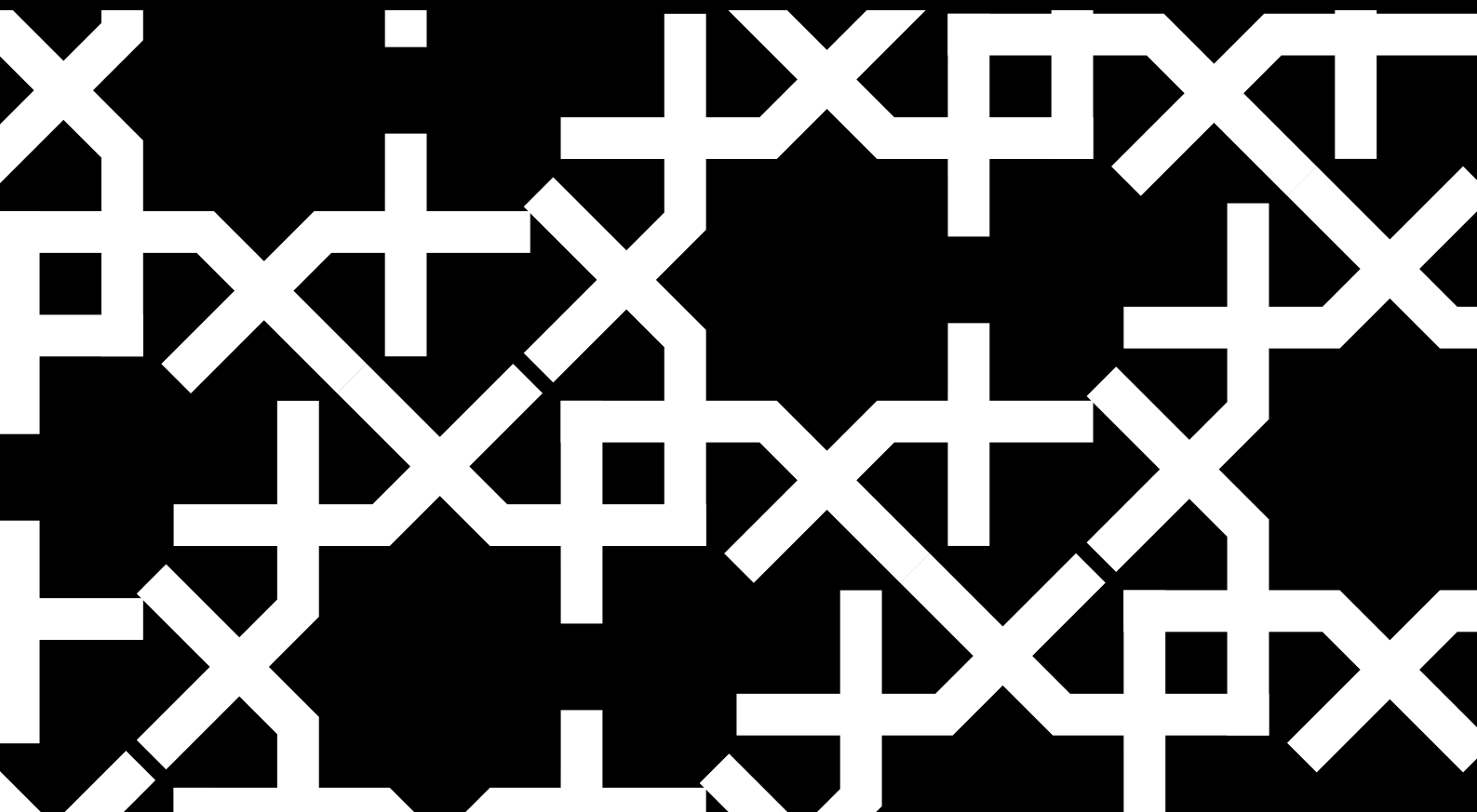


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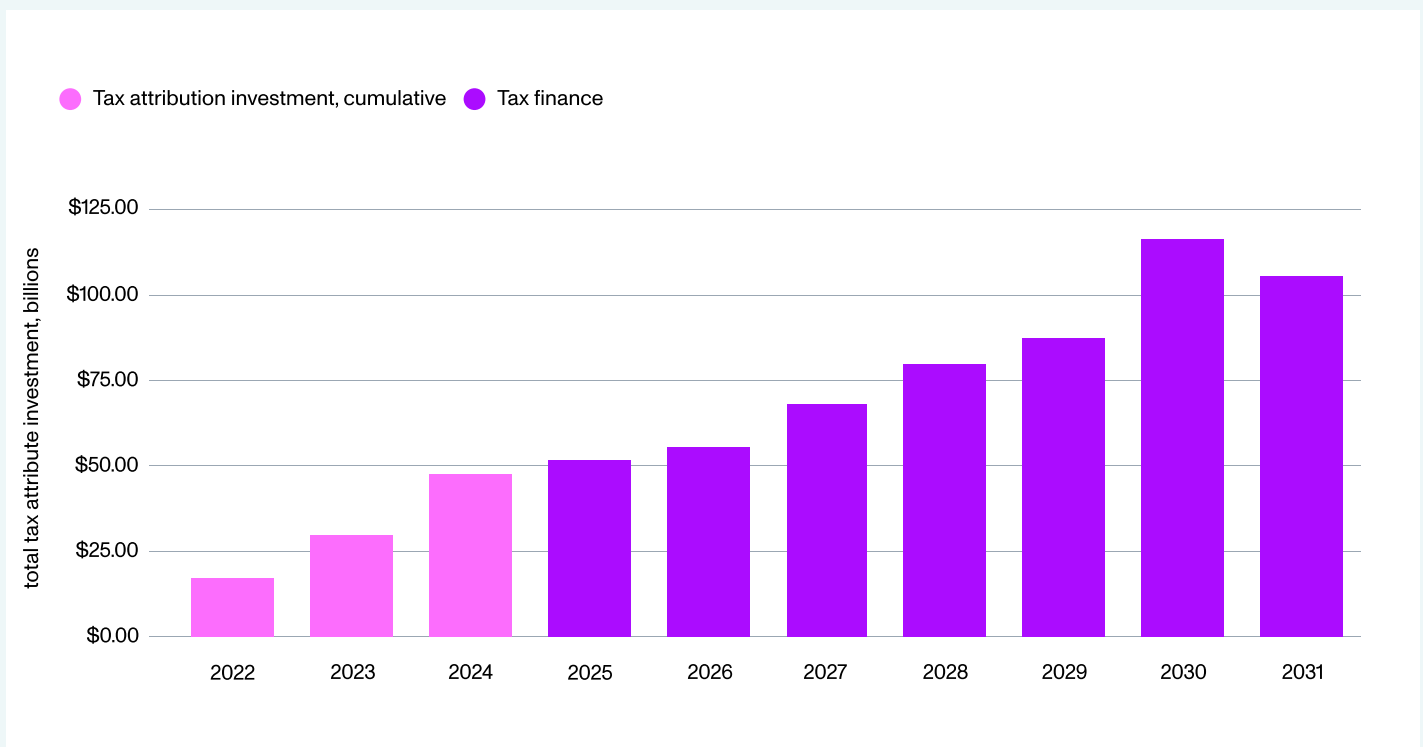
Introduction

Introduction

Just over 12 months ago, in June 2023, the US Treasury Department published initial guidance governing the market for transferable clean energy tax credits. Transferability, a new provision created by the Inflation Reduction Act (IRA) of 2022, enables companies accessing a dozen different clean energy tax credits to sell them to an unrelated buyer for cash. This new tool is transforming the way that clean energy developers and manufacturers obtain financing, monetize tax attributes, and grow their operations.

Expanded tax credits, coupled with more efficient monetization pathways, are fueling the energy transition. Crux estimates that total transfer activity in 2023 totaled \$9 billion, with projections from Evercore ISI indicating that the market could expand to \$100 billion annually by 2030. In 2024, Evercore forecasts that total tax credit investment, including tax equity and transfer deals, will reach around \$45 billion (Figure 1). Of this total, Crux estimates that transferred credits will total \$20-\$25 billion for 2024¹. A share of transferred tax credits are syndicated out of tax equity partnerships, and a portion of those credits are retained by tax equity investors to meet their own tax liabilities.

Figure 1. Total tax attribute investment (historical) and forecast of total deal volume



The report is organized in three sections, covering market pricing and competition, tax credit supply and bonus adders, and demand dynamics and the forward market.

Market pricing and competition:

This section includes analysis of pricing and deal sizes, tax credit pricing drivers, and the prevalence of insurance. It highlights that the first half of 2024 saw strong pricing due to a high volume of deals in conventional wind, solar, and storage credits, as well as in advanced manufacturing tax credits, which are generally perceived as “familiar” to some buyers or lower-risk.

Tax credit supply and bonuses:

This section summarizes the distribution of transacted tax credits by technology type and contrasts with the distribution of tax credit deals in 2023. The report identifies solar and storage Investment Tax Credits (ITCs) and wind and advanced manufacturing Production Tax Credits (PTCs) as highly transactable credits. It also examines factors affecting supply, such as direct pay options and regulatory guidance for new tax credits like the nuclear PTC.

Tax credit demand and the forward market:

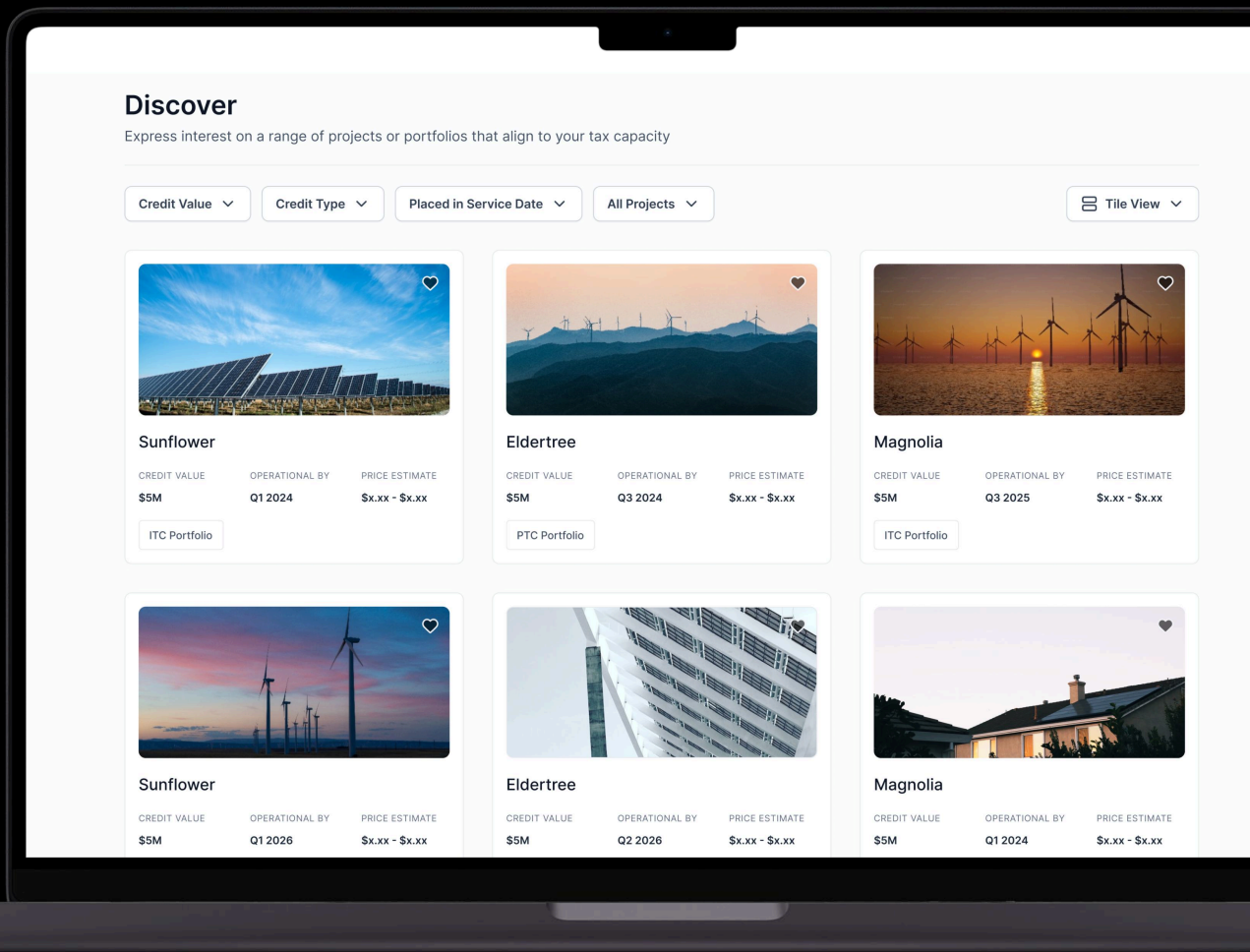
This section covers trends in buyer activity and factors likely to influence buying behavior in the second half of the year. It identifies the primary motivators driving demand, and the benefits of competitive sales processes to achieve higher prices and market efficiency. It examines the share of deals year-to-date with a forward commitment component and the pricing trends observed in forward deals.

¹ Over the last 10 years, the tax equity market has been around \$18-\$22 billion in annual deal volume (including the value of tax credits and depreciation). Crux data indicates that approximately 15% of the current transfer market is made up of tax credits syndicated out of a tax equity partnership (often referred to as “t-flips” or hybrid tax equity, among other terms). Crux’s tax credit monetization estimate reflects the tax equity share of the market plus transfer deals (and less t-flips).

About Crux

Crux is a sustainable finance technology company changing the way clean energy and decarbonization projects are financed in the U.S. The company's first offering is a platform for buyers, sellers, and intermediaries to transact and manage transferable tax credits. Our platform offers market and price transparency combined with the largest network of developers and manufacturers, tax credit buyers, and intermediaries. We are already working with hundreds of partners, have \$12 billion of credits currently available for sale, and provide instantaneous access to billions of dollars of active buy-side interest. To date, Crux has facilitated deals across solar, standalone storage, microgrids, bioenergy and renewable natural gas, and advanced manufacturing. Our purpose-built tools and authoritative standards for risk mitigation and due diligence are informed by billions of dollars of transaction data, ultimately driving standardization, efficiency, and liquidity in this nascent industry.

To learn more about Crux and the market for transferable tax credits, visit cruxclimate.com





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Survey structure & analysis

Survey structure and analysis

In June 2024, Crux conducted a survey of participants in the market for clean energy tax credits. Crux distributed the survey to a wide range of market participants, and ultimately received over 100 responses from diverse perspectives, including small developers, large financial sponsors and institutions, utilities, advisors and intermediaries, tax equity investors, and first time tax credit buyers.

Survey respondents were asked qualitative and transaction-related questions regarding their experiences and activities in the tax credit market.



Qualitative questions

All respondents were asked questions about their planned or completed tax credit transactions in the first half of 2024. Qualitative questions included the respondent's primary business activity, planned market engagement, their perception of the key benefits of a tax credit transaction, and most common obstacles facing a tax credit transaction.

Transaction questions

For respondents who indicated they had or expected to complete transactions in 2024 tax credits in the first half of this year, they were asked detailed questions about up to three deals.

Crux augmented reported survey transaction data with transaction data from the Crux platform and any publicly announced transactions for which sufficient data was available to support analysis. In the first half of 2024 there were only two publicly announced deals that fit these parameters and were included: Vesper Energy's \$590 million Hornet Solar financing and TransAlta's PTC sale announcement. For deals that include a forward component (including PTC strips and forward sales of ITCs), Crux considered only the 2024 portion of the deal in order to calculate overall 2024 deal volume and average pricing for 2024 credits.

Summary of analysis

The report includes summaries of transaction data, including aggregate deal size, total deal volume by technology type, and average pricing by credit type. An extended version of this report — shared with Crux customers, partners, and survey respondents — includes additional data regarding average deal size and pricing by technology and credit type. Unless otherwise stated, average gross pricing reflects weighted averages by deal size. Crux excluded deals where either deal size or pricing was not available or not reported from average pricing analysis, but included them in aggregate deal summaries.

This report analyzes supply and demand dynamics, market pricing and trends for 2024 tax credits and the forward market for 2025 (or later year) tax credits. It excludes 2023 tax credit transactions from the analysis, even if they occurred in 2024, to avoid distortion of average marketing pricing, as these credits typically transact at relatively high prices. Analyzing pricing, supply, and demand trends by credit year allows for the most accurate basis of comparison across deals.



03

Executive summary

Executive summary

As the market for transferable tax credits takes off, participants on all sides of it seek more insight.

This report unpacks the current state of the market for 2024 tax credits based upon a database of over \$6.8 billion in transactions of 2024 tax credits closed in the first half of 2024, including deals reported by more than 100 market participants, Crux's commercial deal activity, and publicly announced deals.

This is a meaningful increase in the size of the data set from our [2023 Market Intelligence Report \(MIR\)](#), which identified \$3.5 billion of specific transactions. The Mid-Year MIR is another material step towards building liquidity and transparency into the tax credit market. Crux estimates this dataset reflects 65-75% of market activity, and is the most comprehensive tax credit transfer data set.

A few key findings:



2024 is off to a strong start — and expect a stronger finish:

The 2024 clean energy tax credit market continues to grow and develop depth and liquidity. From our data, **Crux projects the overall volume of transferable tax credit transactions in the first half of 2024 is between \$9-11 billion. Deal volume will likely continue to accelerate through year end, ultimately reaching \$20-\$25 billion** exceeding prior estimates for the year. Notably, this includes credits sold out of tax equity partnerships and other joint ventures.



Supply skewed towards more established technology types in 1H2024, but is changing:

95% of reported deals in 1H2024 were for wind, utility-scale solar or storage, and advanced manufacturing credits. The supply of utility-scale tax credit inventory has largely been committed or already purchased. However, overall demand is growing rapidly, and buyers have become increasingly sophisticated in their approach to tax credit transactions. If supply of highly transactable tax credit types presents a constraint in 2H2024, other tax credit categories are likely to make up a larger share of the market, particularly advanced manufacturing (45X) credits, renewable natural gas (RNG), distributed generation, and residential solar projects. Similarly, regulatory guidance could help unlock some large credit categories, like the 45U nuclear PTC, which could release billions of dollars of new PTCs into the market. As year end approaches, some tax equity sponsors may also find themselves long or overbought credits, and sell credits in the second half.



Average pricing exceeds 2023, in part due to rising average deal sizes:

Tax credit pricing in the first half of 2024 was notably strong, averaging over 95 cents for PTCs and 92.5 cents for ITCs, versus 94 and 92 cents, respectively, in 2023. Average deal sizes (\$55 million for ITCs and \$85 million for spot PTCs) exceeded the typical deal size in 2023 (\$20 million and \$60 million, respectively). One contributing factor: the types of commonly-transacted credits have changed. In 2023, Crux's data set included more biogas/RNG credits and electric vehicle (EV) charging credits, as well as a larger share of advanced manufacturing credits. As-yet unsold inventory, much of which may be smaller or derived from novel technologies, may trade at lower prices than the credits which have transacted year-to-date.



Deal size and insurance continue to play a dominant role in market pricing:

Mid-sized deals (valued between \$5 and \$25 million) occupy a highly liquid place in the tax credit market, but nonetheless saw lower average pricing than the market overall: 93.7 cents for PTCs and 91.8 cents for ITCs. The use of insurance in ITC deals, though common, tends to be correlated with lower pricing compared to deals with parent indemnification, specifically for deals under \$25 million. The most probable explanation for this finding is that the deals that include parent indemnification are almost certainly backed by an investment grade seller/sponsor, and thus tend to trade at a premium price. Insured deals, by contrast, could represent a sample of projects backed by smaller and mid-sized developers or those otherwise unable to provide strong indemnities.



Prevalence of competition and market transparency:

Competitive sales processes are increasingly common, with two-thirds of market participants engaging in some way, including through bank-led processes and platform listings. Competitive deals are 67% more likely than bilaterally-negotiated deals to achieve above-market pricing, which underscores the benefits of selling credits in an open market, even if the sellers have direct access to some tax credit buyers. For tax credit buyers and their advisors, a large and liquid tax credit marketplace supports deal discovery and ensures that buyers can prioritize credits meeting their needs — particularly price, timing, and creditworthiness of the seller.



Buyers are starting to look at 2025 deals:

Buyers, particularly those with a relatively high degree of certainty regarding their 2025 tax liabilities, could be well-served by looking seriously at 2025 tax credit supply. Doing so now ensures that they can engage with the widest range of sellers and obtain advantageous pricing. Crux data indicates that forward commitments tend to transact at a 1-3 cent discount to 2024 tax credit deals. About 25% of 2024 reported deals included a forward component, defined as full or partial purchase of future year tax credits. The observed price discount is representative of the relative value of a forward commitment to a seller who can use the commitment to secure lower cost financing. About 40% of deals with forward commitments were used to secure financing, according to Crux's data.



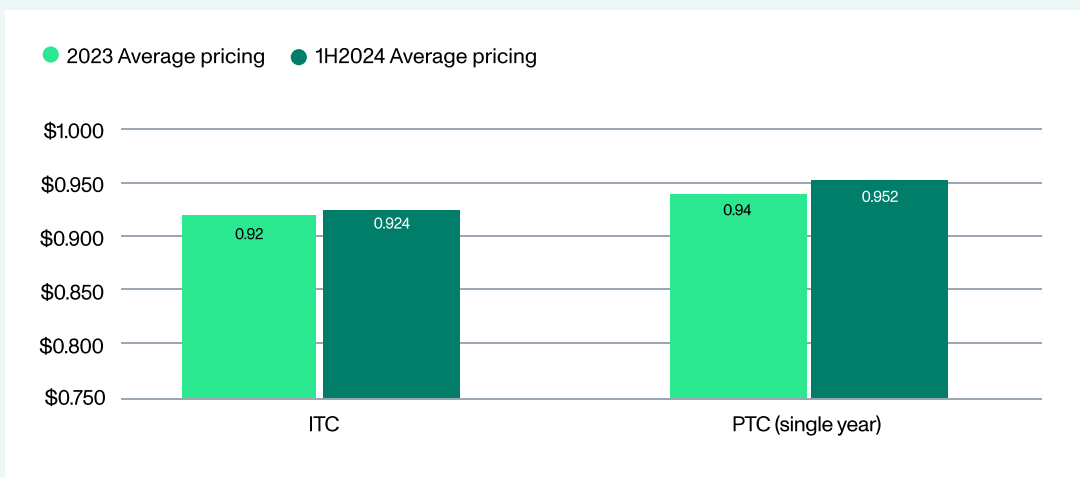
04

Market pricing & competition

Market pricing & competition

Somewhat unexpectedly, tax credit pricing for 2024 credits was, on average, higher than in 2023. In the first quarter, it seemed likely that a rush of new credits could drive down average pricing, while Congress debated a tax bill that could reduce federal tax liability for many corporations, stifling demand. Despite the resultant slow start, rapidly rising demand drove a record number of transfer deals that settled at high prices. Figure 2 illustrates **average ITC pricing in the first half of the year was 92.4 cents (versus 92 cents in 2023) and average PTC pricing was 95.2 cents (versus 94 cents in 2023).**

Figure 2. Average pricing for 2024 relative to 2023 ²



Source for 2023 data is the 2023 Market Intelligence Report

Note: PTC reflects spot purchases of 2024 PTCs, and excludes strip deals longer than 2 years

² Average pricing should be considered through the lens of average deal size. Larger average deal sizes in 1H2024 versus 2023 helped support higher average pricing. When adjusting for deal size, as in Figures 4 and 6, ITC pricing actually shifted slightly downward. PTC pricing trended upward.

A variety of factors can influence credit pricing for a given deal, including technology type, seller balance sheet, placed in service (PIS) certainty, developer experience, insurance packages, payment timing, and level of seller indemnification. Key themes driving pricing so far this year include:

1 . The deals closing in the first half of 2024 are larger than 2023 and skew towards highly transactable technologies.

Wind, solar, storage, and advanced manufacturing credits dominated the market in 1H2024. Tax credit supply is likely to become more diverse throughout the remainder of the year. The most in-demand credits were the first to move in the market, and are likely to remain popular, though supply is increasingly scarce.

2 . Pricing in 1H2024 is influenced by larger deal sizes.

Average ITC deals in 2024 exceed \$50 million (compared with \$20 million in 2023) and average PTC deals exceed \$85 million (compared with \$60 million in 2023). These large, higher-priced deals have the effect of increasing the weighted average price. Smaller deals haven't gone away — deals under \$50 million represent almost 40% of deals in the data set — but smaller credits are likely to see rising demand and deal velocity in 2H2024 as the market grows more heavily weighted towards demand.

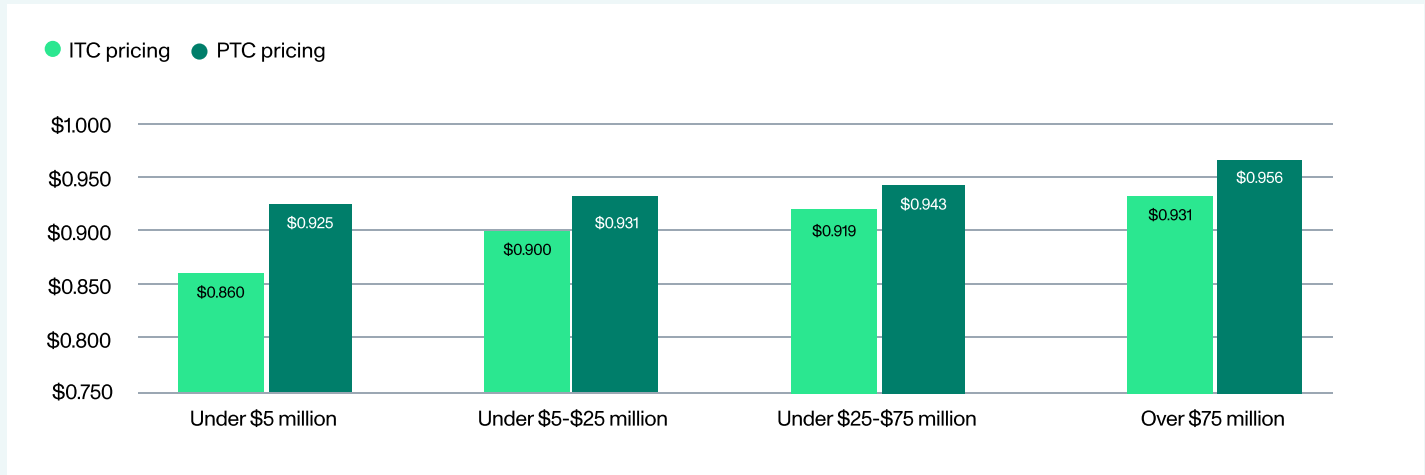
3 . The market has embraced competition and market transparency.

Over 70% of tax credit deals in the first half of 2024 were sold through a competitive process.

Deals engaged in competitive processes are able to maximize deal outcomes for both parties, including aligning on timing, price, and certainty. Deals which engage in competitive processes are two-thirds more likely than bilateral deals to achieve better-than-average pricing. For buyers, an open market allows them to gain access to the widest range of opportunities, compare risk and return, and secure credits meeting their specific needs — including technology type, deal size, fiscal year timing, and other factors which can make an analog or bilateral process difficult to navigate.

As Figure 3 illustrates, deal size is an important driver of pricing for both ITCs and PTCs. Pricing tends to vary most across small deals (under \$5 million), as recapture and basis risk, relevant only to ITCs, has an outsized role in small credit pricing in a market segment where insurance is difficult or not economically viable to procure.

Figure 3. Average 2024 deal pricing by deal tranche



On the following pages, Figures 4 and 6 illustrate complete market pricing curves for 2024 PTC and ITC deals, compared to market pricing curves for 2023. The PTC curve is relatively flat across deal sizes, while ITC pricing varies more materially by deal size.



PTC pricing trends

In 2024, PTC pricing is trending slightly higher than in 2023. Pricing on deals typically ranges from around 91 cents to as much as 96 cents on the largest deals. This pricing curve is generally representative of wind and advanced manufacturing deals, which price towards the higher end of the market. Other PTC-eligible technologies, such as carbon capture and sequestration (CCS)/direct air capture (DAC) (45Q) and hydrogen (45V) are highly likely to transact at prices that are below the market curve.

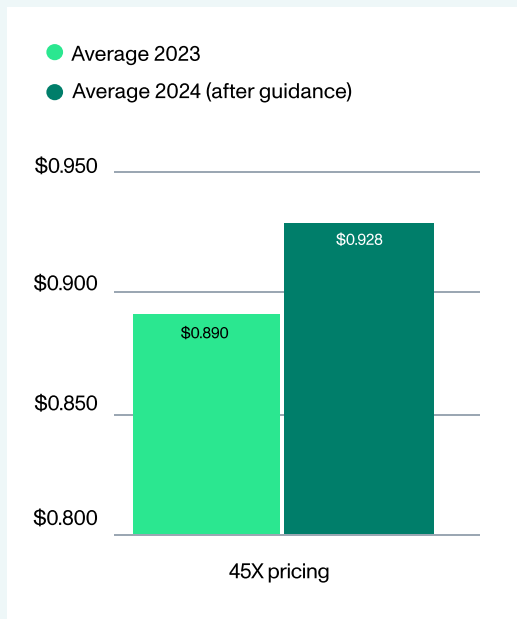
Figure 4. Market pricing curve for PTC deals



Factors affecting pricing: Regulatory guidance

The IRS has been busy releasing regulatory guidance related to the administration of the IRA and the suite of newly eligible tax credit generating technologies. Regulatory guidance can change the market perception of newly eligible tech types. 45X advanced manufacturing tax credit market pricing reflects this effect. The IRS published initial regulatory guidance for the 45X tax credits on December 14, 2023. Prior to the release of that guidance, average 45X pricing was 89 cents per dollar of tax credit (Figure 5). In the six months following the release of guidance, 45X has averaged 92.8 cents, an increase of nearly 4 cents.

Figure 5. Average 45X credit pricing before and after release of IRS guidance



45X PTCs price competitively and sell quickly, but the data indicates that market pricing is typically slightly discounted relative to wind PTCs. Buyers are focused on several items when evaluating 45X credits: familiarity with the credit technology, any uncertainty related to eligibility, and the strength of the seller’s parent company. While 45X pricing has increased markedly since late 2023, deals such as the one between FirstSolar and Fiserv for \$700 million in 45X PTCs at 96 cents, are the exception rather than the rule in terms of transaction size and price. Pricing curves for 45X PTCs relative to wind PTCs are available in the extended version of the report.

Throughout the 45X deals facilitated by Crux ([example 1](#), [example 2](#)), we’ve seen parties on all sides of the market better understand this technology, leading to an increasingly standardized transaction process. As this continues, the discount to wind PTCs may continue to narrow. Over the coming years, expect 45X deal sizes to increase as manufacturers bolster domestic capacity in response to the tax credit incentive.



ITC pricing trends

ITC pricing in 2024 ranges from 85 cents at the low end of the market to around 95 cents at the highest end. This pricing range is broadly comparable to 2023. There is a very wide range of ITC-eligible technologies. Pricing on solar and storage deals has largely converged towards the market curve. Bioenergy deals tend to clear at a cent or more below the average solar/storage price. Other eligible technologies — hydrogen fuel cells, electrochromic windows, microgrids, geothermal facilities, and others — are typically priced at a discount to the well-known ITCs due to a relative lack of liquidity for these technologies. Nonetheless, these technologies are transacting and attracting tax credit buyers.

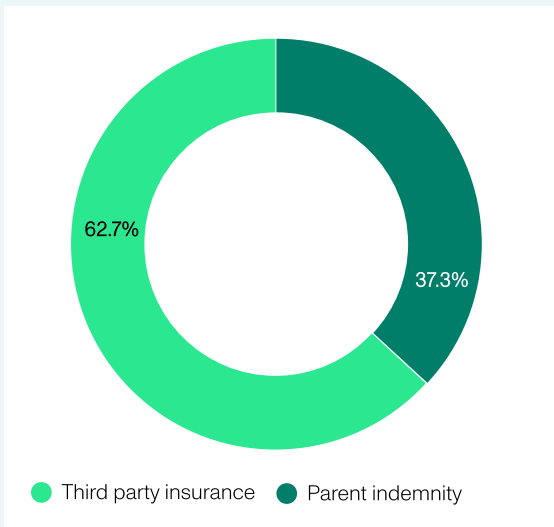
Figure 6. 2024 ITC pricing curve



Factors impacting pricing: Insurance

Tax credit insurance is a common feature for deals, particularly ITC deals. 70% of ITC deals reported partial or comprehensive third-party insurance coverage. This reflects a slightly lower proportion of ITC deals than observed in 2023 (74%), which is likely related to the size and strength of sellers transacting in 1H2024. Only 20% of PTC deals report insurance, and this statistic varies significantly by the underlying technology — all CCS/DAC deals in our sample have insurance and 40% of advanced manufacturing PTC deals do. No wind deal reported insurance. Figure 7 illustrates the prevalence of insurance among ITC deals.

Figure 7. Share of ITC deals reporting either parent indemnification or insurance



Sellers usually cover the cost of insurance. As such, they may prefer to offer the tax credit buyer indemnification or a parent guarantee, but some buyers won't accept indemnities in lieu of insurance. Sellers that are able to offer parent guarantees and indemnities in lieu of insurance tend to be larger, creditworthy entities.

Premium pricing on mid-size deals with strong financial sponsor

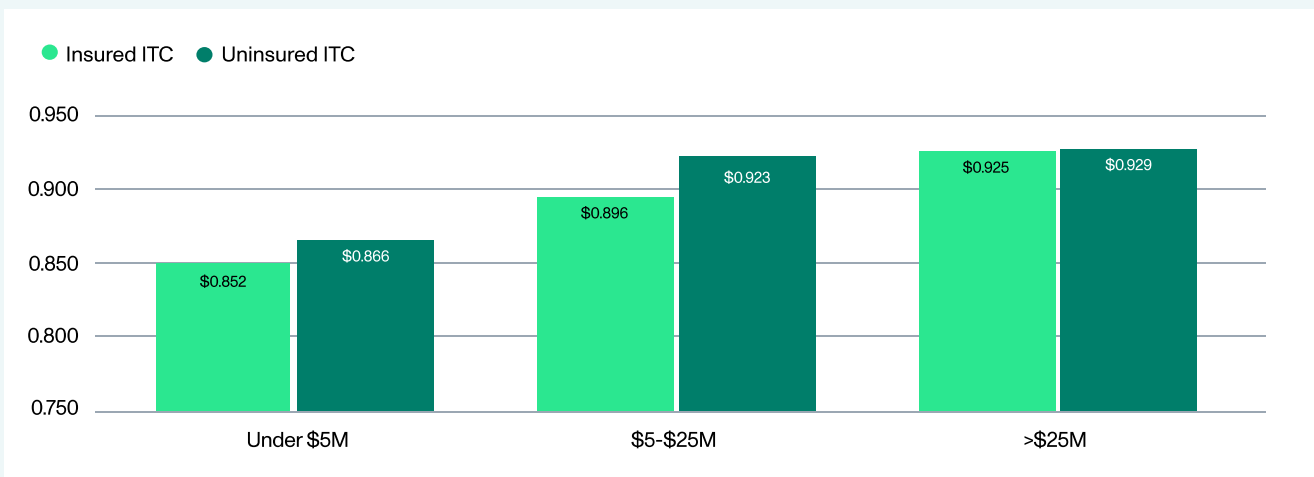
Mid-sized deals (\$5-\$25 million in notional value) that have a parent indemnification typically price at a premium to similarly-sized insured deals (Figure 8). Credits from sellers with the financial footing to indemnify their tax credits may be regarded as a premium product in the market, and command a premium price.

These deals show the greatest difference between seller-indemnified and insured deals, with indemnified deals pricing 2.7 cents higher on average. The discount for insured deals largely disappears for deals over \$25 million in notional value. The correlation between insurance and price may serve as a stand-in for the investment rating of the seller sponsor, whereby deals with high-quality sponsors price at a premium. Mid-size and larger (>\$25 million) indemnified deals price around 92-93 cents. Mid-size insured deals, average just under 90 cents.

Insurance on the smallest deals is less common

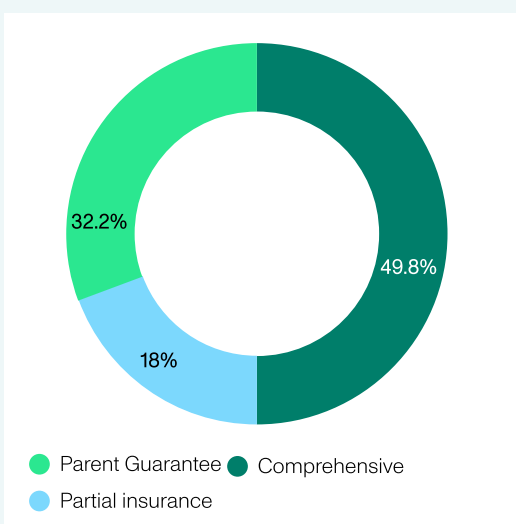
Small deals (<\$5 million) are least likely to be insured. 55% of small deals report insurance, compared to 85% of mid-sized deals and 75% of larger ITC deals. Insurance options are limited for deals with notional value under \$3 million, and can be costly if available. The lack of insurance can shift risk onto the buyer and helps explain the lower prices small credits tend to receive, but insurance doesn't ameliorate this discount.

Figure 8. Cost differentials for insured and uninsured ITC deals



Insurance typically provides a range of indemnities to the tax credit buyer. Crux published a [comprehensive analysis of emerging standards in tax credit transfer due diligence](#), and found that transaction risks can be distilled into a concise list of key issues. Virtually all deals require some indemnification by the seller to the buyer regarding these issues, either through insurance or a parent guarantee. In some cases, buyers may accept partial indemnification from the seller, supplemented by third-party insurance. Of the insured deals, about 75% obtain comprehensive insurance, and 25% report partial insurance. Overall, 68% of ITC deals reported insurance in 1H2024 (Figure 9).

Figure 9. Insurance coverage in ITC deals, 2024



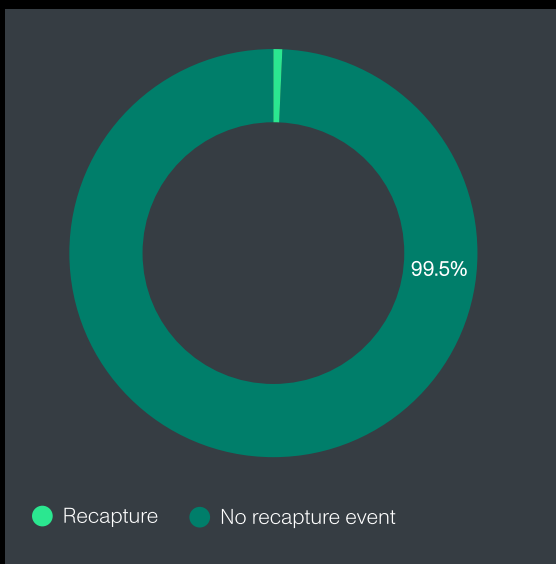
In the case of ITC deals, insurance policies typically cover the risk of recapture; tax credit eligibility and qualification for bonuses; and the ITC basis including a step-up. PTC insurance policies most commonly cover qualification issues, especially for newly eligible tax credit technologies. For CCS credits, insurance will cover recapture risk — or the risk that the geologic site no longer effectively sequesters injected carbon dioxide.

Featured data: Emerging risk mitigation and due diligence standards

In June, Crux published a comprehensive white paper covering emerging standards for risk mitigation and due diligence in tax credit transactions, based on data from 35 institutions representing experience with more than 500 tax credit transactions, including advising on tax equity partnerships and tax credit transfers. The report found that:

- Transparency and early alignment on due diligence is a key driver of a successful tax credit transaction;
- Key transaction risks — including tax credit eligibility, basis calculation, and recapture risk — are increasingly well understood;
- Law firms and advisors are generally in alignment with one another regarding appropriate risk mitigation strategies, such as insurance or indemnification;
- And advisors tend to perform different roles in the due diligence process, which can influence their approach. Advisors can provide an initial tax opinion, conduct comprehensive due diligence on a transaction, or provide insurance coverage.

Figure 10. Insurance coverage in ITC deals, 2024



Source: Crux Risk Mitigation and Due Diligence White Paper

One key finding from the report is that recapture is a low-probability event, occurring in about 0.5% of transactions overseen by advisors. Additionally, a recapture event is typically not a full recapture of a tax credit, but most often a partial recapture of a share of equipment removed from service. Figure 10 reflects the estimated historical incidence of any recapture event for an ITC, based on advisors' reports. Past is not necessarily prologue, however, and future recapture incidence may be higher than this estimated rate, especially when considering the range of new technologies eligible for the ITC. And, given the volume of credits sold in more recent years, there is not a comprehensive data set to observe.

The effect of market transparency on pricing and deal dynamics

Transparency is a unique feature of the transferable tax credit market. Historically, tax credits monetized through tax equity partnership structures did not allow developers the opportunity to compare one tax credit “buyer,” or investor, on an apples-to-apples basis. By simplifying the tax credit sale process, transferability allows sellers to solicit a range of comparable bids and optimize their sale process. Transparency is also an essential part of the credit discovery process for buyers and their advisors — providing visibility into the credits available for purchase, market pricing, and anonymity.

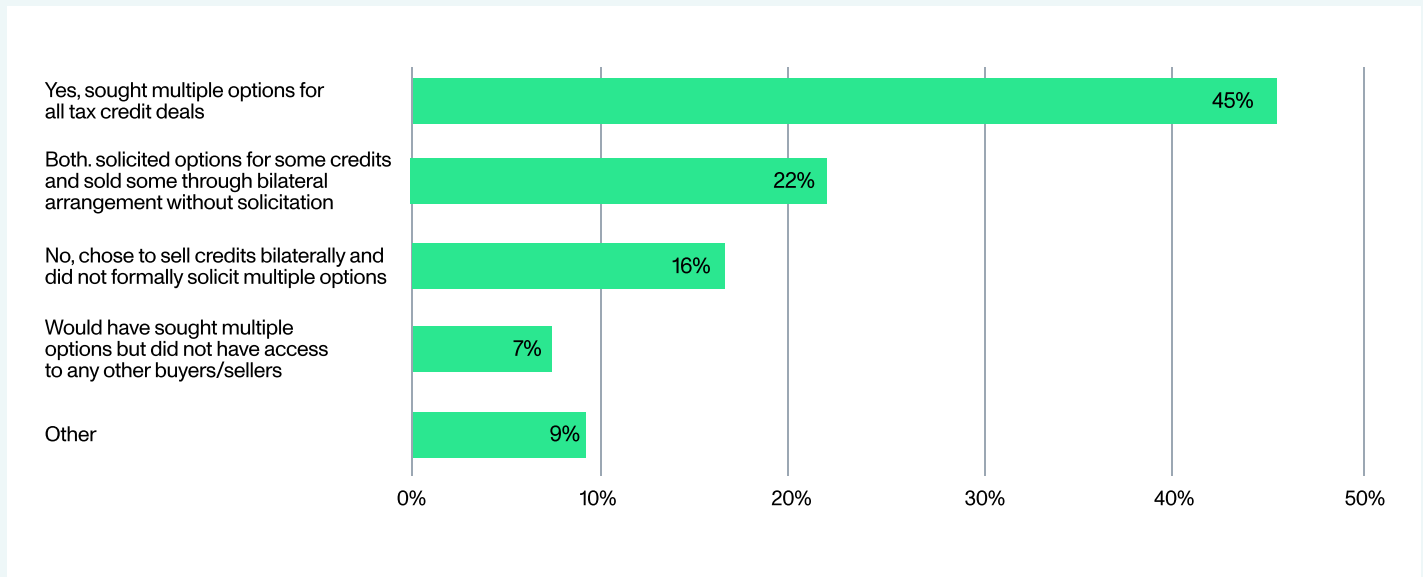
Technology is a critical part of enabling a transparent and competitive market. On Crux, buyers and their advisors are able to see the entire tax credit market. Sellers can ensure that their credits are seen by the widest range of buyers. Bidding is anonymous, allowing all parties to align on commercial terms before exchanging confidential information. Transaction liquidity is significantly improved with digital transaction management software to streamline the due diligence and closing process.

Technology-enabled competition accelerated tax credit market liquidity in the first half of 2024. Buyers and advisors on Crux have placed more than \$6 billion in non-binding bids in the first half of the year.

The market is most liquid and transactable within the current tax year — 2024 and 2023. Most buyers have yet to bid on 2025 (or later) credits in earnest, though their attention will likely turn to these credits in the second half of 2024.

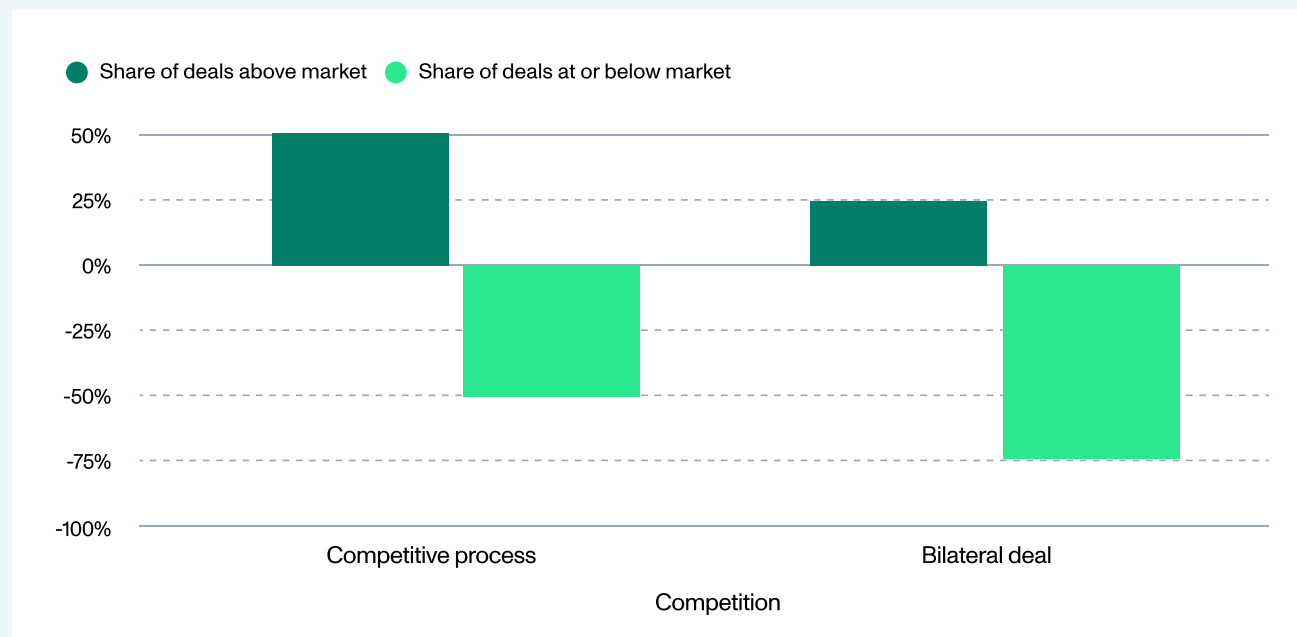
Two thirds of market participants (including buyers, sellers, and advisors) pursued a competitive sales process in 2024 (Figure 11). Only 16% of market participants report transacting through bilateral arrangements alone. For buyers, the competitive process enables them to engage with the widest selection of tax credits and sellers — more than would be accessible through an entirely bilateral process. With a wider selection, buyers can downselect for a range of attributes including credit type, technology, size, year, and payment terms. If a deal is lost for one reason or another, it is much easier to replace those tax credits with others of a similar profile without going “back to the drawing board.”

Figure 11. Share of participants that engaged in a competitive process to buy or sell tax credits



For sellers, running a wide, transparent, and competitive process allows them to optimize their tax credit deal across price, timing, and other negotiated terms. Data illustrate that competition continues to support deal optimization. Figure 12 reflects the proportion of deals with settled pricing above the calculated market price for a given deal³ — over 50% of competitive transactions versus 25% of bilaterally negotiated transactions. Conversely, 50% of competitive deals settled at or below the calculated market price, and 75% of bilaterally negotiated deals settled at or below the calculated market price. Of course, many factors influence the settled deal price. Crux has observed that market transparency can provide significant benefits to all parties involved — ensuring that buyers and sellers are able to find counterparties that align with their commercial needs.

Figure 12. Share of competitive deals and bilateral deals with above-market pricing



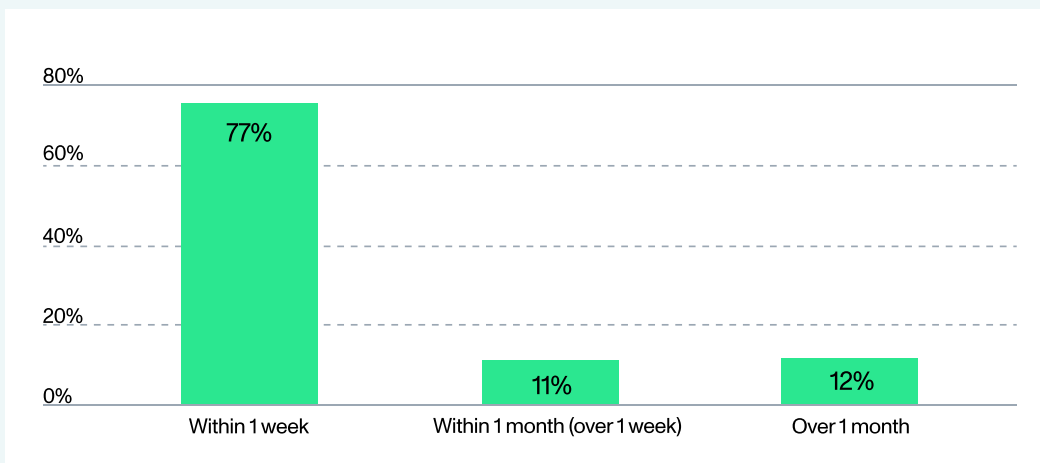
³ Market pricing is calculated based upon the tax credit type and deal size using pricing curves in Figures 4 and 5.

Though 91% of sellers report price is a key factor to optimize, sellers value a range of deal characteristics. Some sellers optimize on payment timelines, accepting a lower price for a deal that is funded sooner. Sellers may also prioritize counterparties with whom they have a broader commercial relationship. Sellers are increasingly discerning between buyers that are ready to transact and those who may be inexperienced with transactions, wishing to avoid reinventing the wheel from deal to deal. As a result, inexperienced buyers benefit from partnering with experienced advisors.

Software is critical for advisors, buyers, and sellers seeking to tap into a transparent market. Market velocity and liquidity is accelerating significantly, with the most attractive credit deals transacting in as little as a few weeks ([example](#)). Discovering credits, bidding on them, and countering (if necessary) is happening faster than ever thanks to technology.

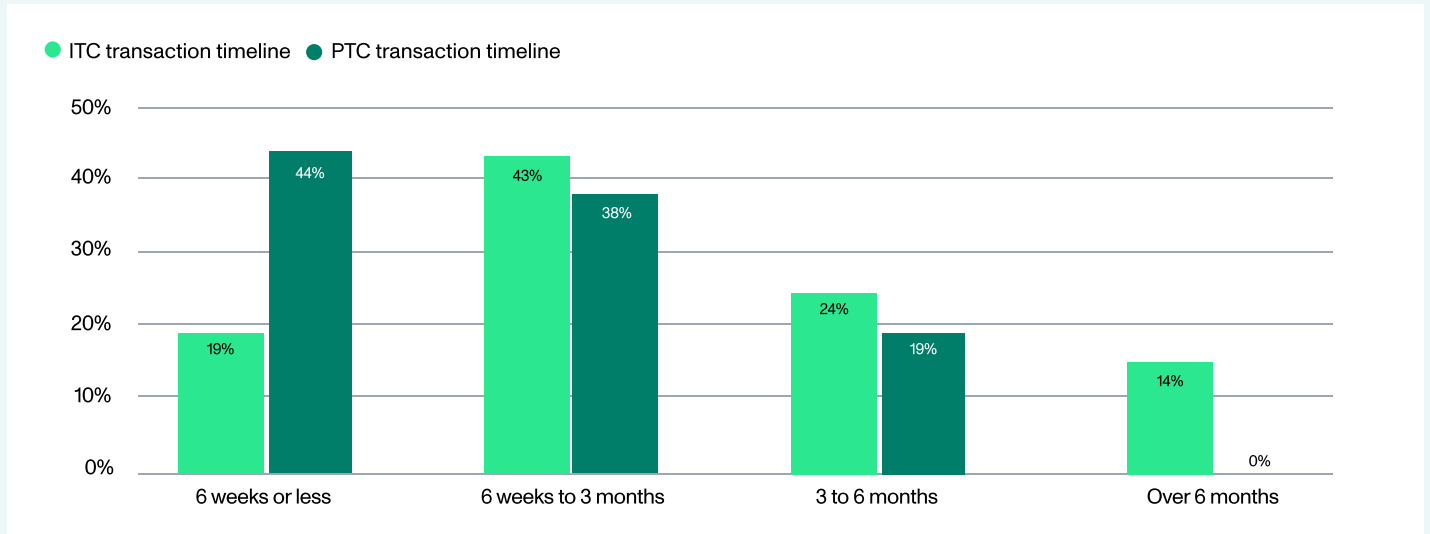
63% of all credits on Crux have received at least one bid, including 91% of 2023 credits. 77% of credits that received a bid on Crux received their first bid within a week of listing. Figure 13 depicts bidding timelines on Crux for all tax credits that have received bids. The median time to bid is just over 3 days, and projects that receive a bid will typically receive bids from multiple counterparties.

Figure 13. Time to first bid for credits receiving a bid on Crux (percent of credits)



Crux’s dynamic and transparent marketplace is leading to greater deal velocity and more robust outcomes for all parties involved. Transaction timing is accelerating beyond the time to initial bid, as well. The dataset for this report indicates that the median tax credit deal was completed in between 6 weeks-3 months in 2024 — less than half the time of a typical tax equity transaction. Figure 14 illustrates the distribution of reported deal timing across PTC and ITC deals.

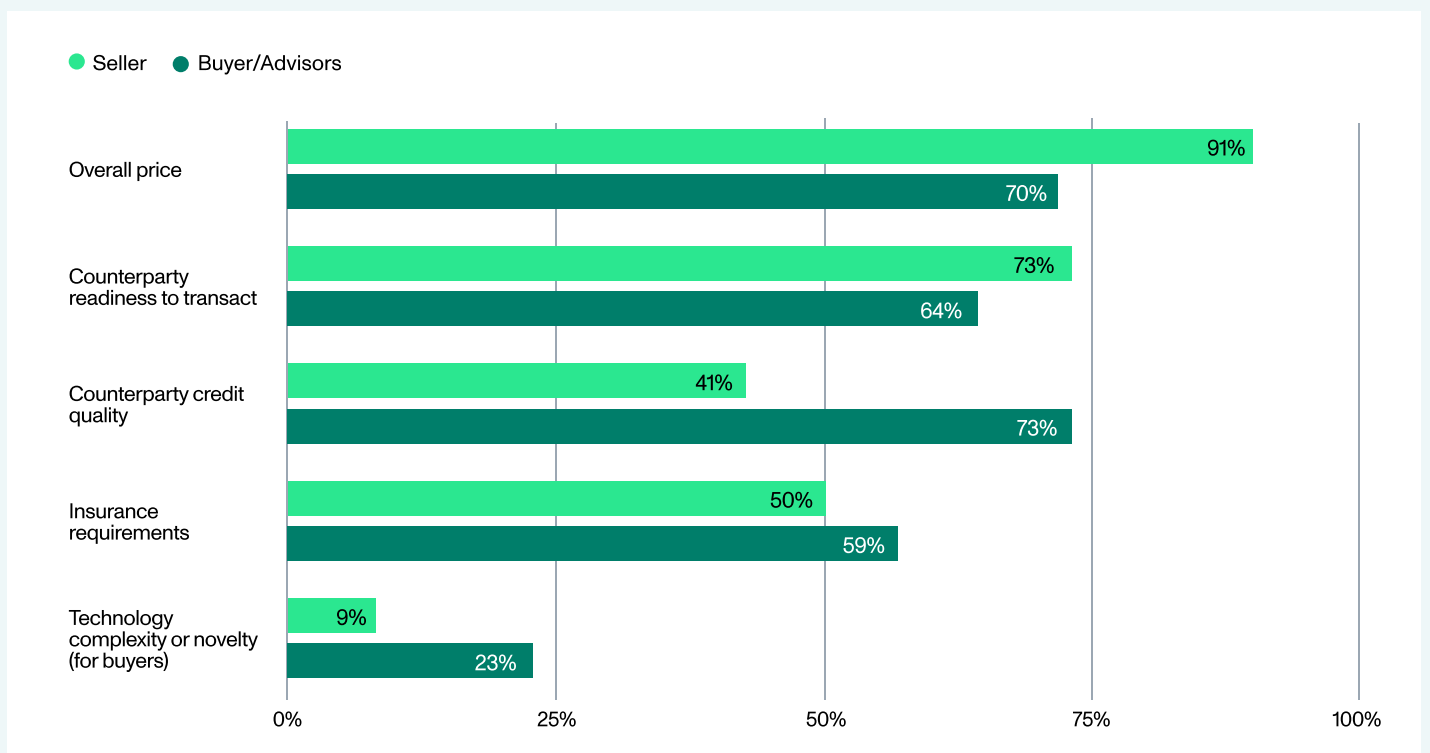
Figure 14. Reported transaction timeline for ITC and PTC deals, 2024



Nearly 50% of PTC deals reportedly closed within 6 weeks (as measured from term sheet to signed docs), and no PTC deal reportedly took over 6 months to complete. ITC deals took longer in general, but more than 60% report closing in 3 months or less.

Speed is important to all sides of the deal — buyers, their advisors, and sellers. Buyers and sellers prioritize counterparty readiness to transact when reviewing bids or bidding on credits. 73% of sellers reported readiness as a top factor, as did 64% of buyers and advisors. For sellers, only price was a more important criteria — 91% reported overall price as a top consideration. Buyers and advisors prioritize seller credit quality most highly, 73% of the time, followed by price (70%) and transaction readiness (Figure 15).

Figure 15. Factors considered by buyers and sellers when evaluating bids/bidding on credits





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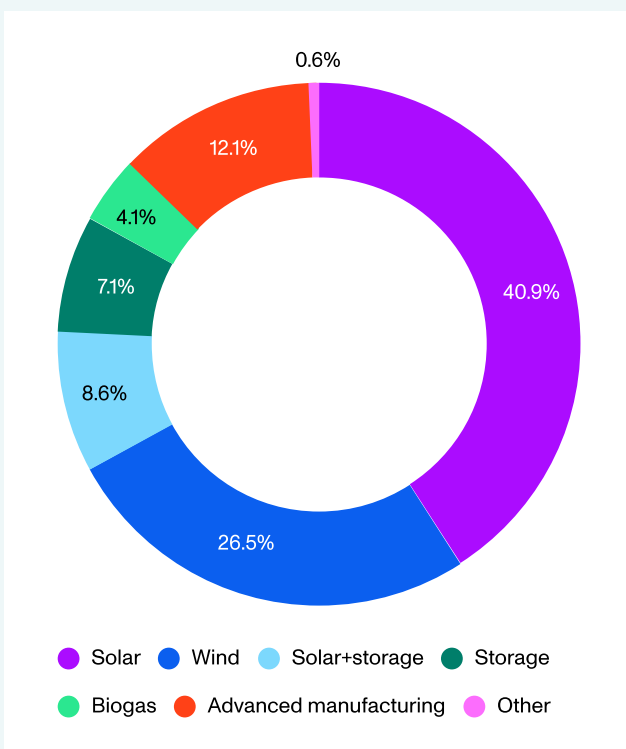
Tax credit supply

Tax credit supply

For ITCs, tax credit supply is fundamentally tied to the tax credit-eligible projects entering service in a given year. PTC supply is determined by the production profile of PTC-eligible generating projects and facilities. For the purpose of this report, supply can be thought of in two segments: the supply of 2024 tax credits that has already been purchased by buyers and the supply of 2024 tax credits that remains available.

It is clear that the market for tax credits is increasingly liquid and emerging as a dominant tool to monetize clean energy tax credits. Solar, storage (including combined solar and storage credits), biogas ITCs, and wind or advanced manufacturing PTCs comprised the bulk of deals in the first half, around 99% of the 1H2024 transaction data set (Figure 16). The balance of the market was made up of carbon capture/direct air capture, 30C electric vehicle charging infrastructure, electrochromic windows, and other technologies.

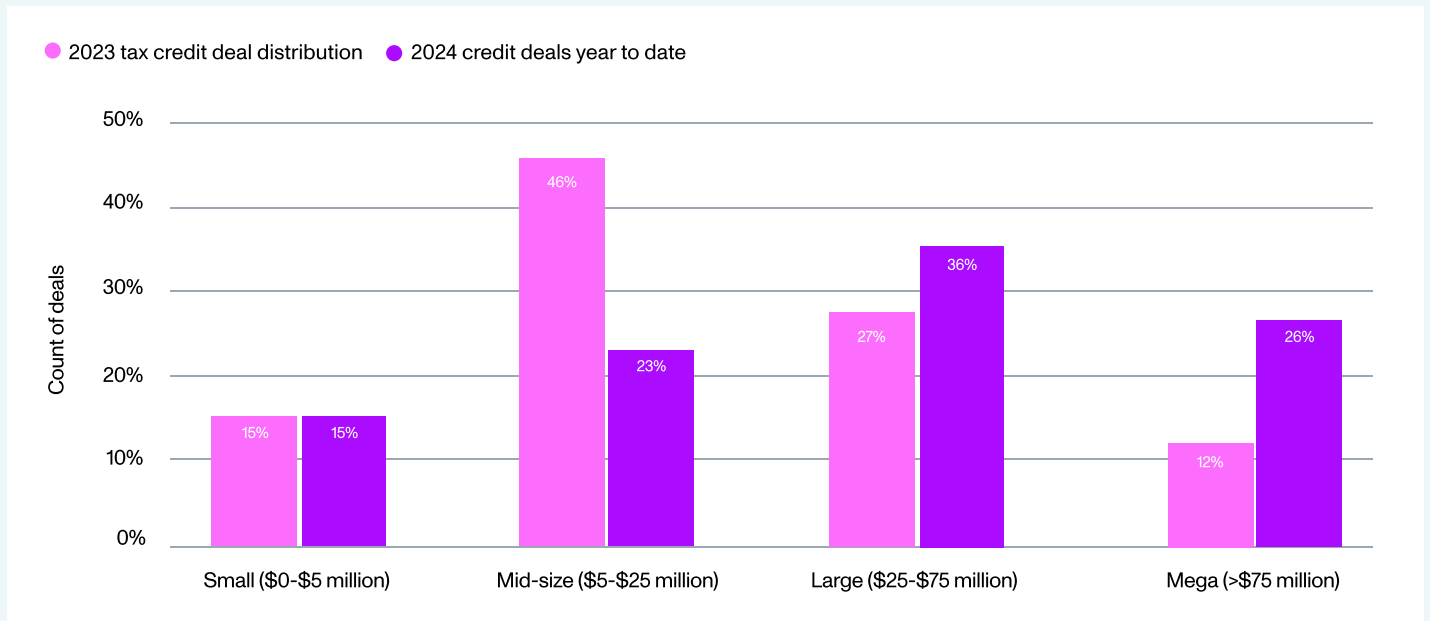
Figure 16. Share of transacted tax credits by technology type



The supply of tax credits is significantly more diverse than the profile of tax credits which have transacted year to date. In the second half of 2024, Crux expects to see a more diverse set of sellers transact, with significant growth in 45X advanced manufacturing, 45U nuclear credits, and biogas credits; the supply of 2024 credits from utility-scale wind, solar, and storage projects will likely become increasingly constrained.

Larger deals moved more quickly in 2024, with the average tax credit deal in the first half being over \$60 million in notional value. Figure 17 illustrates the distribution of credit deals by size in the 1H2024 dataset, compared with the distribution of deal sizes in 2023.

Figure 17. Distribution of deals by size, sold year to date 2024 and full year 2023

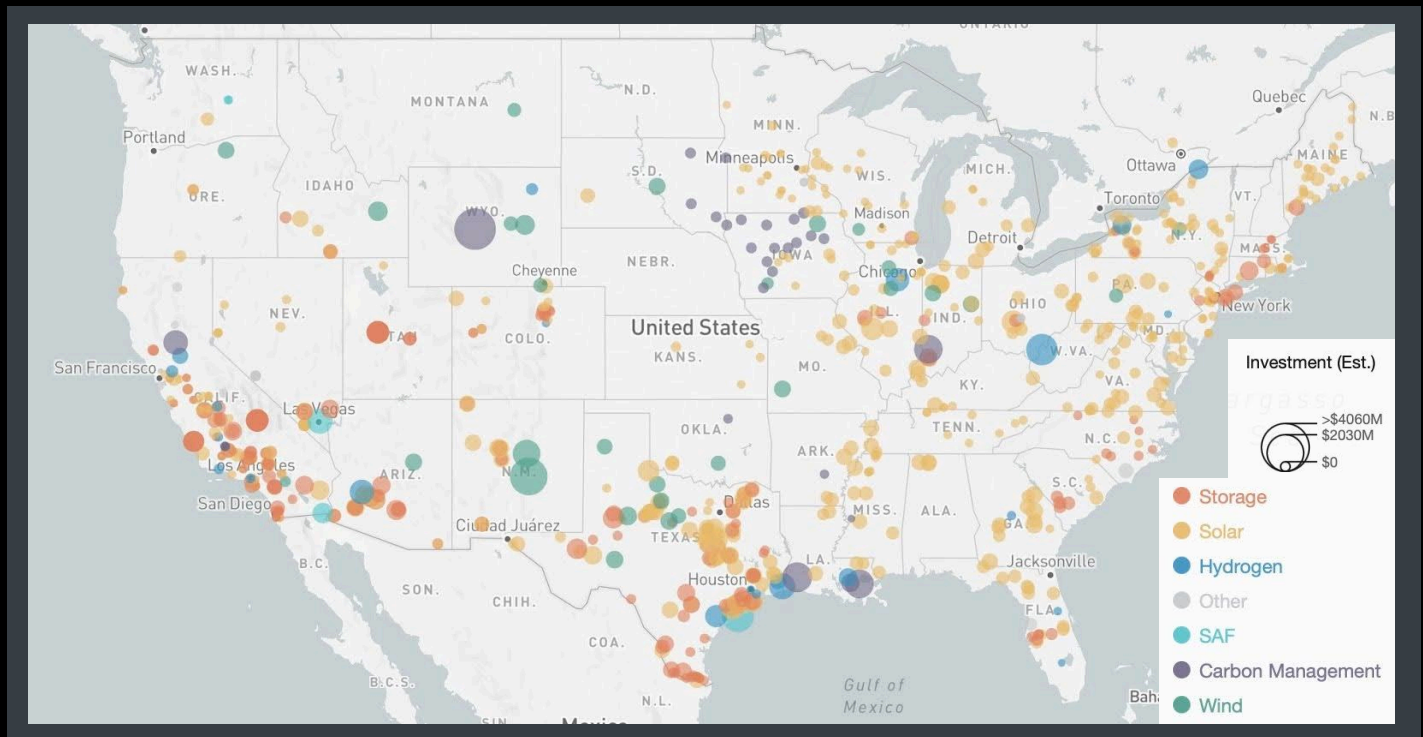


Historically, Crux has found that transferability represents a significant opportunity for smaller developers to efficiently monetize their tax credits, and that around 80% of deals are under \$50 million in notional value. By the end of 2024, this proportional distribution may trend towards 2023, but it is clear that, as of mid-year, larger transactions have moved most quickly and first.

Featured data: Tax credit supply reflects booming investment in clean energy and manufacturing

The ability to monetize tax credits is driving the surge in new investment across the US. The Clean Investment Monitor (CIM) – a joint project of the Rhodium Group and MIT’s Center for Energy and Environmental Policy Research (CEEPR) – tracks quarterly investment in clean energy and industrial decarbonization projects as part of the CIM’s “Energy and Industry” segment (Figure 18) and clean tech manufacturing facilities (Figure 19). Their analysis reveals how the IRA and clean energy tax credits are driving the proliferation of a diverse array of new projects across the US.

Figure 18. Map of energy and industrial decarbonization investment announcements (past 4 quarters)

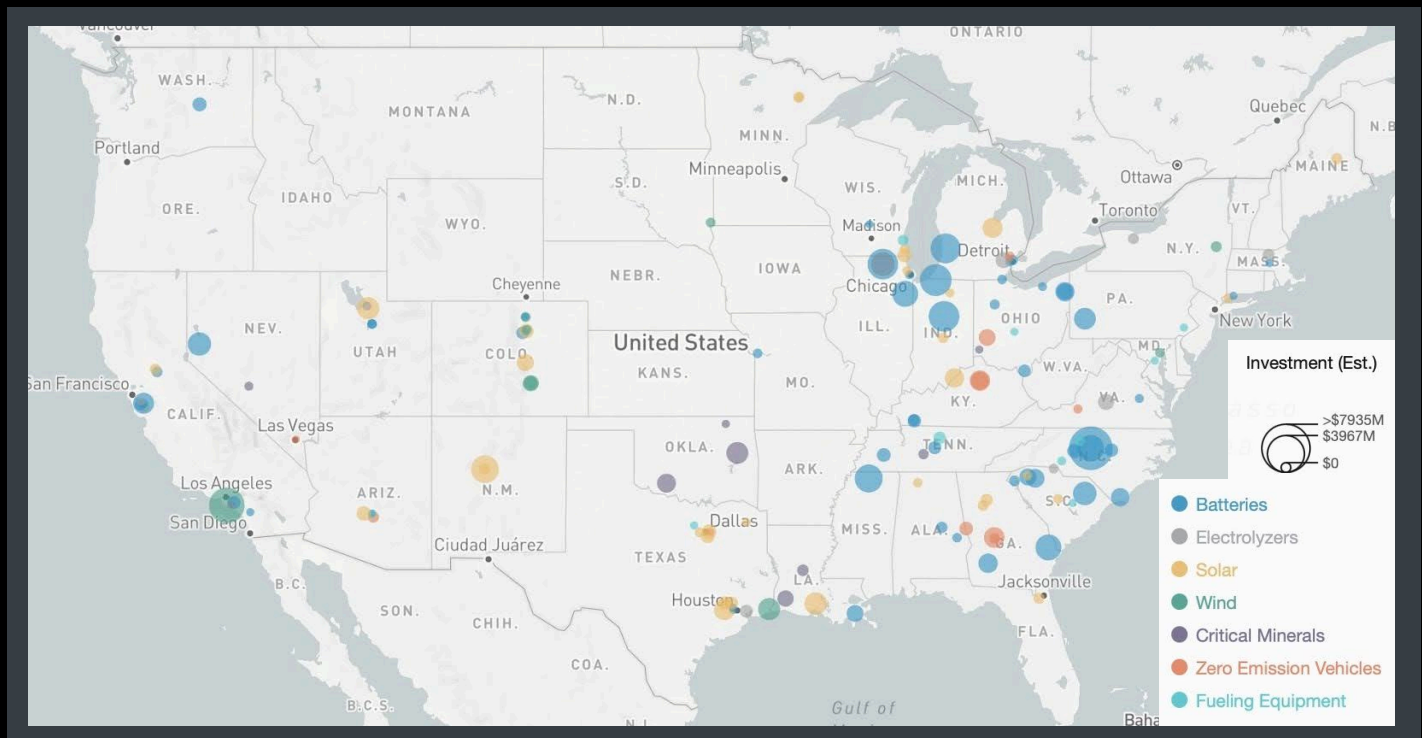


Source: Rhodium Group/MIT CEEPR Clean Investment Monitor

Solar leads the way in clean energy investment. CIM data indicates that solar facilities have attracted \$40 billion in actual investment in the last 12 months. Storage is the second largest energy technology attracting investment, at \$21 billion over the last four quarters. Wind has received a smaller share of investment, but wind facilities typically elect the PTC and sell their tax credits over long periods of time — 2024 wind tax credits are the product of investments in facilities that entered service over the last decade.

Newly-eligible technologies, such as hydrogen (which can claim either the 45Q or 45V tax credit) and sustainable aviation fuels, are also beginning to attract investment. Tax credits from these facilities are clustered in future years, when the facilities enter service or, in the case of SAF, after the 45Z tax credit comes into effect next year. Over time, the tax credits generated by these technologies should be expected to make up a larger share of transferable tax credit supply — up to as much as 50% of total tax credit supply, according to [analysis by Evercore ISI](#).

Figure 19. Map of clean tech manufacturing announcements (past 4 quarters)



Source: Rhodium Group/MIT CEEPR Clean Investment Monitor

Over the last 12 months, 33 states have attracted over \$66 billion in announced investment in manufacturing infrastructure, including facility expansions, investment in greenfield infrastructure, and critical mineral recycling, refining, and production. These facilities have access to valuable 45X advanced manufacturing PTCs.

Factors affecting supply: bonus adders and safe harbor

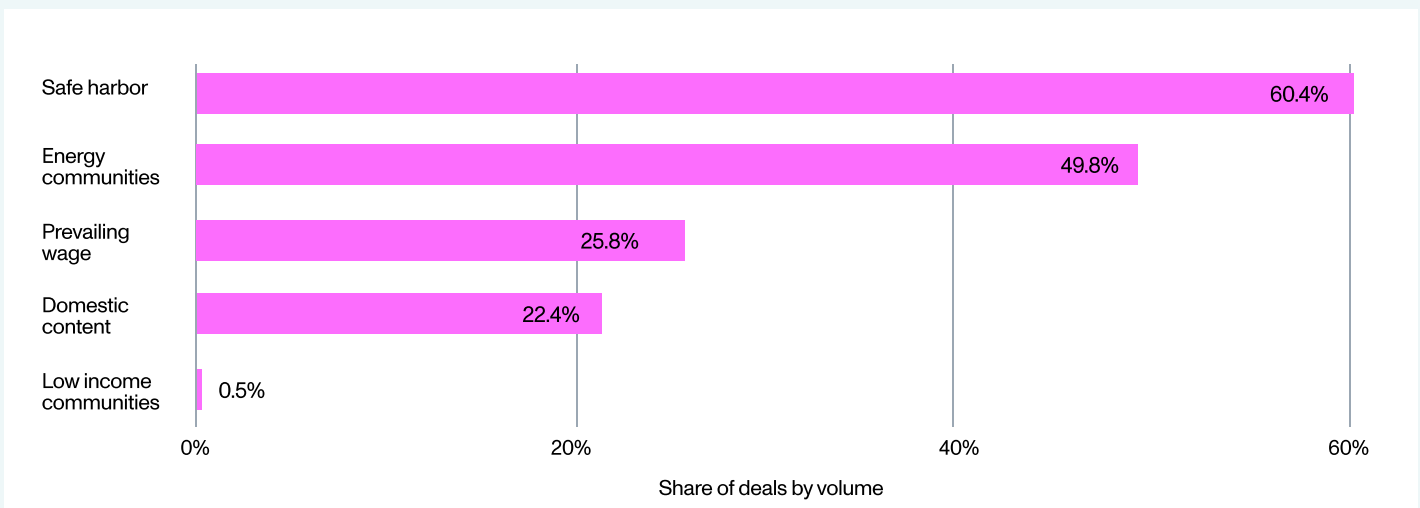
A variety of PTCs and ITCs are able to increase credit values by satisfying certain requirements, including a bonus for meeting prevailing wage and apprenticeship requirements, and bonuses for constructing projects in designated energy communities, meeting domestic content requirements, and/or developing projects that serve low income customers or are on tribal land.

Prevailing wage and apprenticeship (PWA)

For the majority of projects, the PWA bonus is extremely valuable. ITC-eligible projects increase the base value of their credit to 30% from 6% by satisfying PWA requirements. For the section 45 PTC, the base rate of 0.3 cents is increased five times to 1.5 cents by meeting PWA requirements and is adjusted for inflation.

Historically, projects have been able to elect a safe harbor to claim the tax credit rate inclusive of the PWA benefit if they began construction prior to January 2023, when the IRS released initial guidance regarding PWA compliance. Crux data indicates that the safe harbor is still extremely common for tax credits sold in 2024 (Figure 20). Over 60% of projects report that they meet the safe harbor and do not separately qualify for PWA. Just over 25% of projects indicate that they did meet PWA requirements. There are a share of credits (especially 45X) which are not required to meet the PWA bonus and do not need to qualify for the safe harbor to obtain full value for their credits. These credits represent approximately 15% of the data set, which indicated neither the safe harbor or PWA.

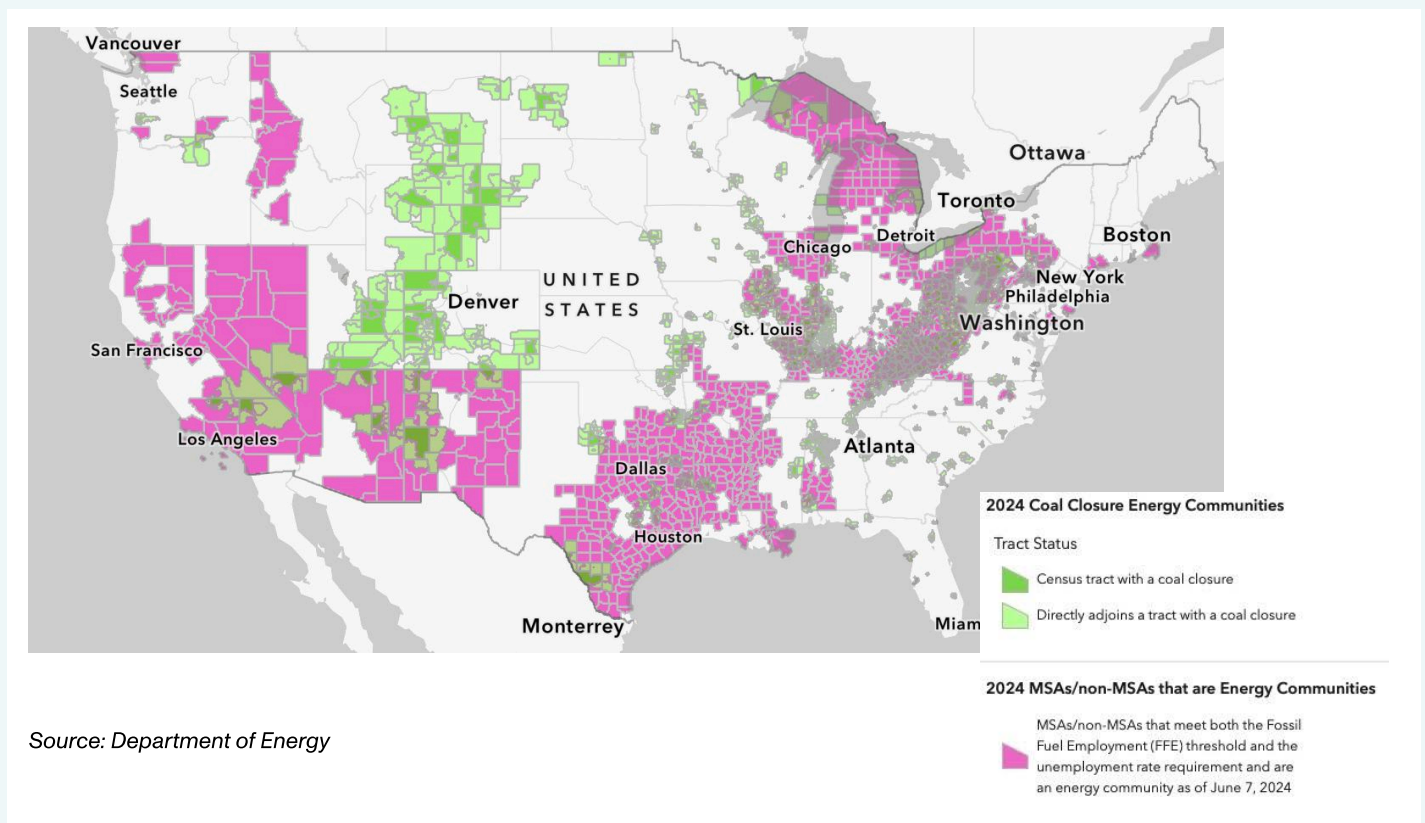
Figure 17. Distribution of deals by size, sold year to date 2024 and full year 2023



Energy communities bonus

The second most commonly reported bonus is the energy communities bonus. Energy communities are considered any census tract in which a coal plant or mine closure has taken place (and any adjoining census tract), or any metropolitan statistical area that meets a particular fossil fuel employment and unemployment threshold. Much of the Western US and East Texas qualify as energy communities, as does Appalachia and parts of the Upper Midwest (Figure 21). To qualify for these bonuses, a project must be located within the energy community and be placed in service after December 31, 2022.

Figure 21. Map of energy communities, 2024



Source: Department of Energy

Domestic content (DC)

Over 20% of credits in the 2024 data set included a domestic content bonus. To qualify for the DC bonus, a project must meet one of two sets of criteria: one for manufactured products and one for steel and iron. Steel and iron construction materials that are integral to the projects' structure must be sourced entirely in the US. Manufactured products and components (MPC) must meet the adjusted percentage rule. If the share of domestically produced and sourced components relative to total MPC costs is equal to or greater than the required adjusted percentage, then the project can qualify for the DC bonus adder. The adjusted percentage rule increases from 40% for projects beginning construction prior to 2025 (or 20% for offshore wind projects) to 55%.

In May 2024, the IRS [published a notice](#) introducing a new elective safe harbor for the DC bonus. The safe harbor allows projects to substitute the IRS's calculated factors for MPCs in lieu of independently calculating the MPC manufactured cost. Projects still have an obligation to purchase domestically produced materials, and would discount the MPC factor proportionally if not all of the supplied product came from a US manufacturer.

Factors affecting supply: direct pay and alternatives

Direct pay is an alternative tax credit monetization pathway for a subset of tax credits: the 45X advanced manufacturing credit, 45Q carbon capture and sequestration credit, and 45V hydrogen credit. Owners of facilities claiming one of these tax credits can choose (for a certain period of time) to get dollar for dollar reimbursement on their tax credits from the IRS after making their annual tax filing. These entities face a choice between monetizing their tax credits through direct pay or selling them (at some discount) via transferability. Despite the discount, many direct pay-eligible entities choose to transfer their tax credits to secure faster payment timing and predictable revenue, as the buyer and seller agree on payment timing at terms up front. However, a seller must make their direct pay or transferability election annually, and so some sellers may hold off transferring tax credits until later in the year, once they've decided which election to make.

Factors affecting supply: nuclear PTC regulation

Regulatory guidance is crucial for tax credit supply and affects pricing trends. The IRS has issued guidance for most tax credit categories but not for the new nuclear production tax credit (45U). Either draft guidance or a notice is likely to be released in the second half of 2024, potentially unlocking hundreds of millions of dollars in nuclear PTCs. The credit is \$15/MWh (for facilities meeting prevailing wage and apprenticeship requirements) until gross receipts reach \$25/MWh, then phases out to \$0/MWh at \$43.75/MWh. The [IRS sought industry comments](#) in 2022 regarding the calculation of "gross receipts" and other 45U issues but hasn't issued guidance yet. Questions such as which power hub should be used to calculate "gross receipts" and whether power hedges should be included in the "gross receipts" calculation loom over the ultimate valuation of 45U for nuclear power plants and their owners.

Factors affecting supply: previous year tax credits

2023 credits occupy space in the supply landscape, as buyers are able to purchase these credits and either carry them forward to the current year or effectively "take" the credit in 2024 by recognizing the purchase as an overpayment of 2023 taxes. This practice can help balance a potential oversupply of tax credits (either at a macro level or for an individual seller), but the supply of 2023 tax credits heading into 2024 was extremely low. While 2023 transactions continue to occur, they make up a small share of the overall market.



06

Tax credit demand & the forward market

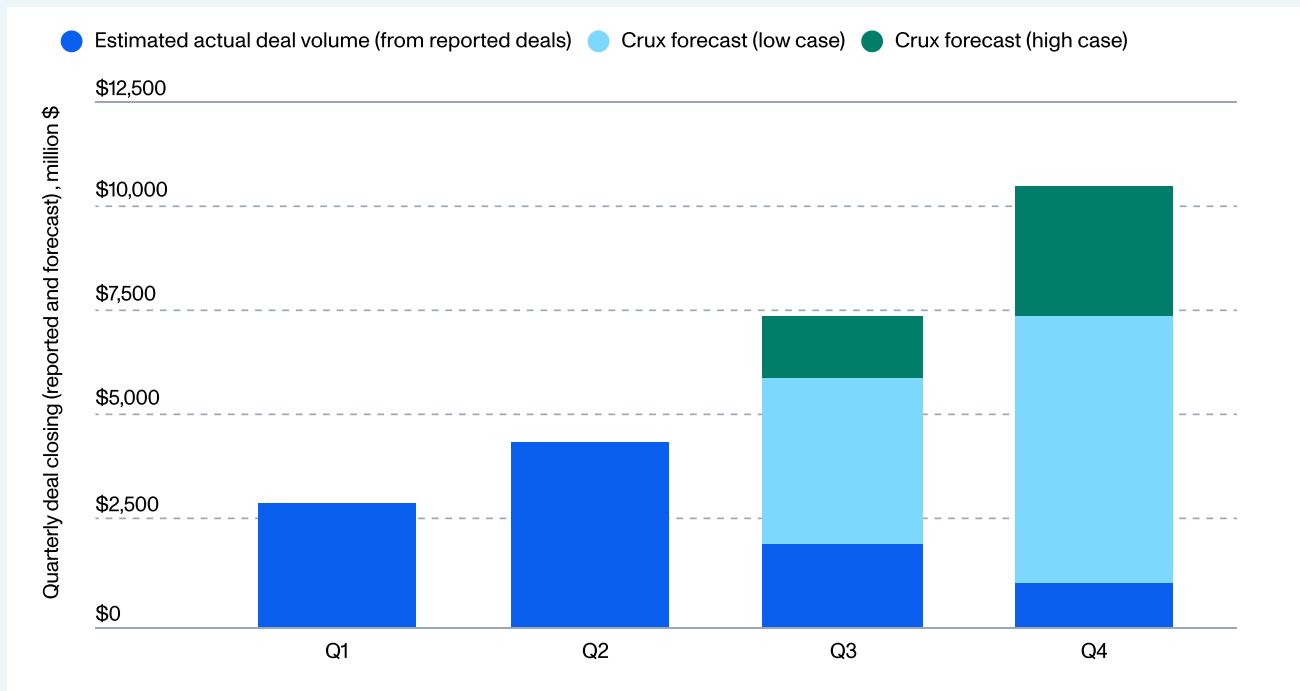
Tax credit demand and the forward market

Market demand for tax credits has grown substantially since June 2023, when the IRS issued draft guidance governing tax credit transferability and buyers began to pursue tax credit purchases. From a full year market estimate of \$7-\$9 billion in 2023 to our estimate of \$9-11 billion in 1H2024 deal activity (and \$20-\$25 billion in total 2024 transfers), it is clear that buy side interest is substantial and growing.

Most deals initiated in 1H2024 closed in the first and second quarter, though market participants indicate that a minority are set to close in 2H2024. Figure 22 reflects the approximate quarterly deal volume based upon transactions which have been executed in the first half of the year as well as our forecast for 2H2024.

After a slower start in Q1, buyer participation in the market accelerated in Q2. Buyers may have held off in Q1 due to uncertainty around the potential extension of certain tax credits, most notably the research and development tax credit (R&D) but, when Congress failed to pass the tax extender bill, buyers increasingly turned to transferable clean energy tax credits to manage their tax liabilities.

Figure 22. Actual and forecast quarterly deal volume in 2024 tax credits



Note: PTC deals often fund on a quarterly “as generated” basis, but are indicated as funding in the quarter in which the deal closed.

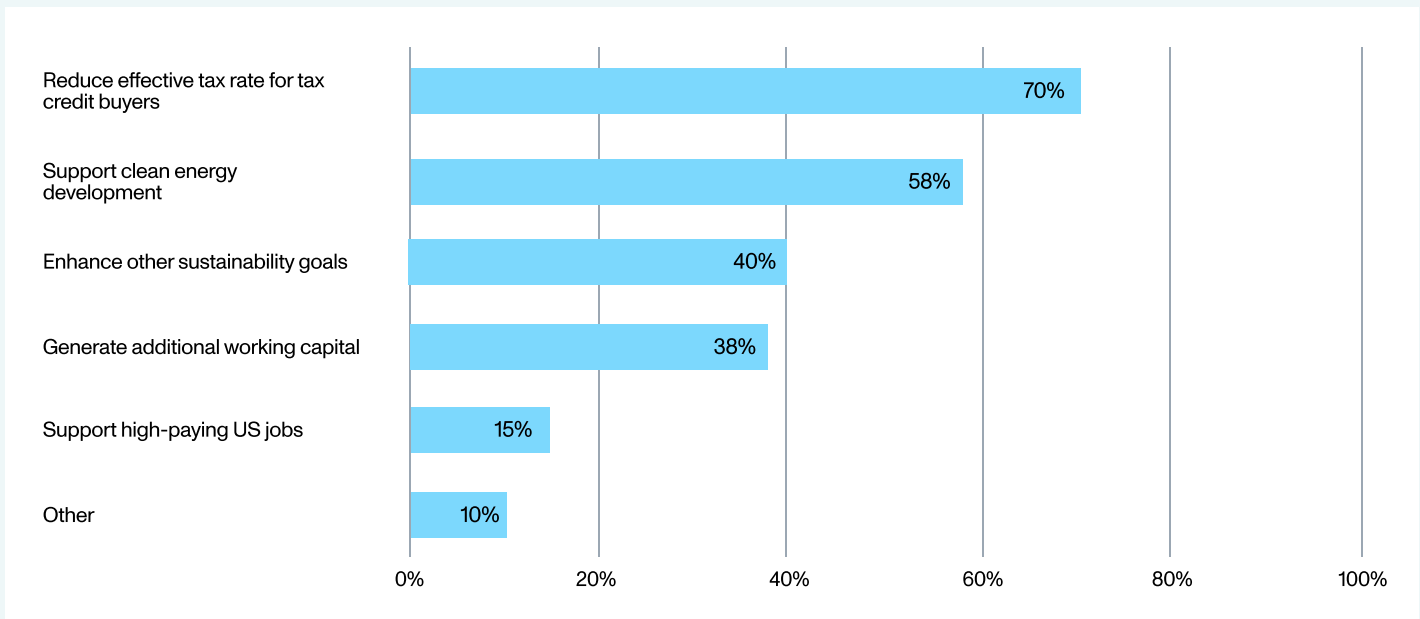
Many projects that expect to enter service in the second half of 2024 will sell their credits earlier in the year, but the transaction may not be funded until the project is placed in service. Crux projects that buy-side interest in the second half will exceed 1H2024, even in excess of the deals that are scheduled to close during that period.

Based upon our estimated \$9-\$11 billion in deal volume in the first half of 2024, Crux forecasts another \$11-\$14 billion in deals through the remainder of the year, bringing total transfer deal volume to \$20-\$25 billion. Supply, rather than demand, is likely to be the primary constraint on the market. The higher end estimate is predicated upon the availability of 45U tax credits (subject to regulation) and proportion of direct pay-eligible credits (45X and 45Q in particular) that elect to sell in the transfer market.

Motivations for tax credit buyers

Interest in tax credits amongst corporate taxpayers is expanding rapidly. 70% of buyers and their advisors report that the primary reason to engage in a transaction is to manage the buyer’s tax liabilities (Figure 23). 58% report supporting clean energy development as a primary goal, and 40% note that the transaction may help the buyer enhance other sustainability goals.

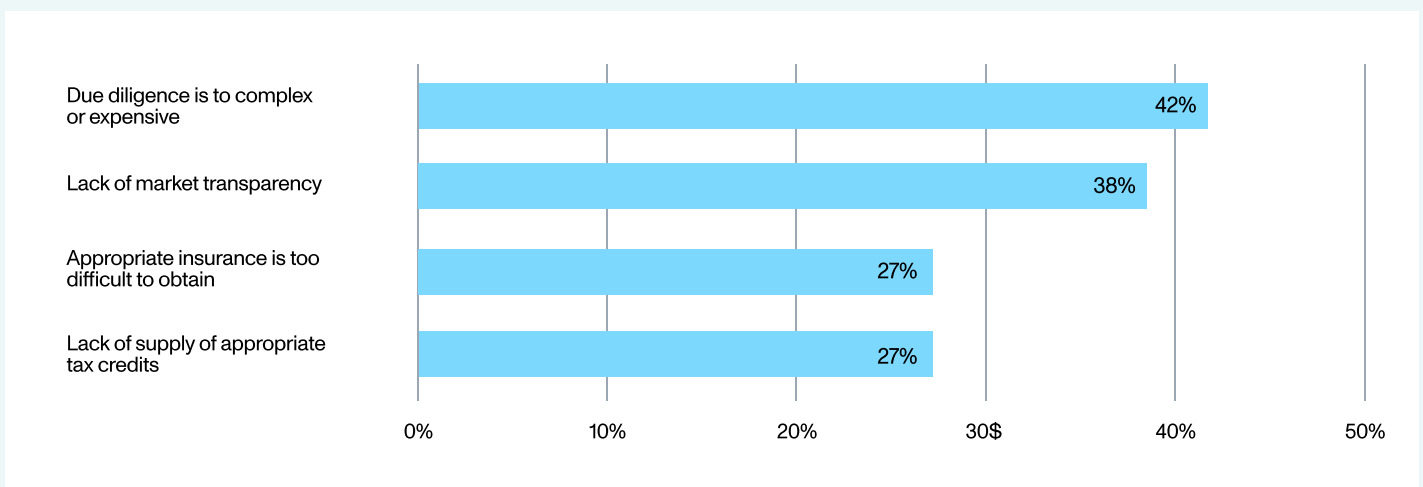
Figure 23. Reasons reported by buyers and advisors to pursue tax credit purchases



The economic case for tax credit transactions remains the most significant demand-side driver in this market. As more buyers learn of transferability and become confident in their own tax liabilities and the ability to transact, it is likely that this market will continue to grow.

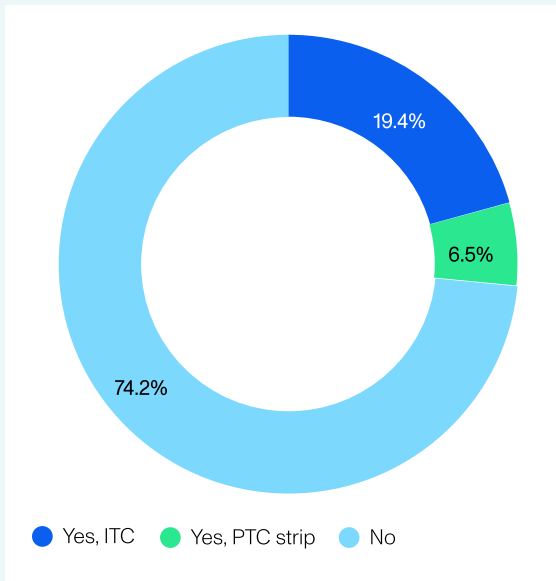
Another driver of increased demand: deals are getting easier. When asked in 2024 what kinds of obstacles they experienced, 42% of buyers and advisors noted that due diligence is too complex or expensive (Figure 24). This is a significantly smaller share than the 60% of buyers and advisors who indicated that due diligence was too complex or expensive in 2023. For the most part, findings reveal that due diligence practices are simplifying relative to last year. However, there are select cases where complexity is increasing — particularly for credits that include bonuses like PWA or domestic content, where guidance is still evolving.

Figure 24. Top transaction obstacles according to buyers/advisors



Tax credit supply is likely to become a larger issue for buyers in the second half of the year. Buyers who have contemplated entering the market closer to year-end (when tax liabilities are more certain) may find a somewhat limited supply of credits available to purchase, potentially at higher prices. As a consequence, it is likely that buyers will begin pivoting to 2025 in the near term. The supply of future year tax credits is substantial, and a significantly lower volume of 2025 credits have yet transacted, giving earlier buyers some market opportunity.

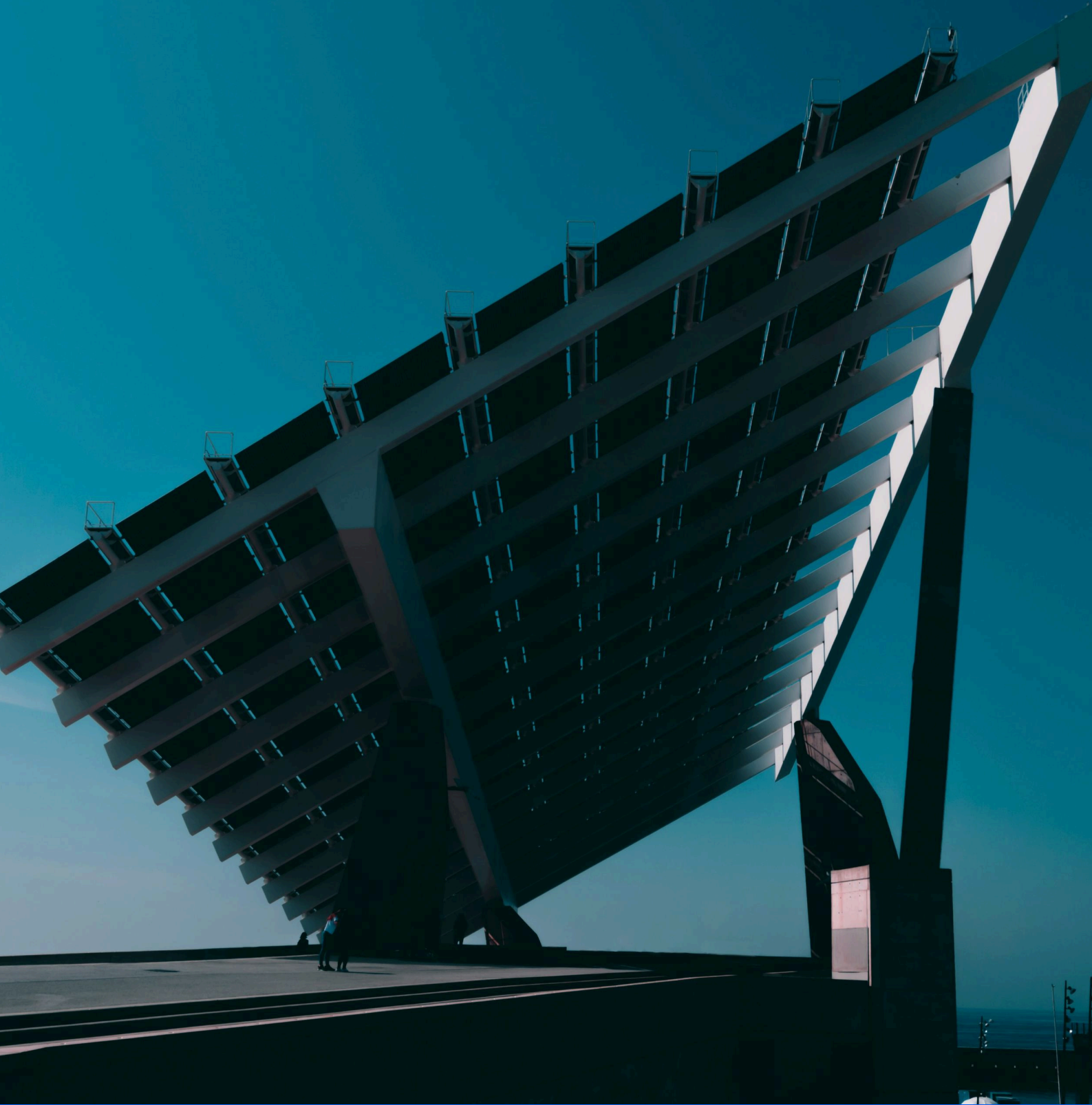
Figure 25. Proportion of 2024 deals including a forward commitment



Tax credits can only be paid for in the year in which they are generated by the seller, but it is an increasingly common practice for buyers to make forward commitments to purchase tax credits in future years. This practice can encompass the purchase of a PTC strip (including the current year PTCs and commitment to purchase future years), or a pure forward commitment to purchase tax credits in a future year. Credit sellers may separately take out bridge loans against the commitments. Figure 25 reflects the proportion of deals in the 2024 data set that include forward components.

In 2024, around 75% of deals in the 1H2024 data set did not include any forward component, while 25% did. About 6.5% of reported deals with a forward commitment included a PTC strip (or future year PTCs) and the remaining 19.4% were ITCs that will be generated in 2025 or later.

Sourcing tax credits early and/or committing to purchase a longer-dated strip of PTCs can enable a buyer to lock in higher quality credits. Additionally, Crux has found that deals with forward commitments tend to price slightly below deals without a forward component — a difference of 1-3 cents. This difference reflects the benefit to the seller of achieving greater cash flow certainty (which can be used to obtain attractive financing) and minimizing the risk of a future market disruption that could negatively affect pricing.



07

Conclusion

Conclusion

The 2022 Inflation Reduction Act (IRA) is the biggest investment in clean energy by any nation in the history of the world. It makes principal use of tax credits to enhance domestic clean energy production, security, and resilience, and to supercharge American manufacturing of key advanced components.

Since 2022, the private sector has announced over \$300 billion in investments in clean energy manufacturing and deployment, creating hundreds of thousands of new jobs. And the pace of growth is getting even faster. In the first quarter of this year, the United States saw a record \$71 billion invested in clean energy and transportation. That's a 40% increase over the first quarter of 2023.

Transferability has emerged as a powerful new market mechanism to drive investment into clean energy infrastructure and manufacturing. In the 13 months since credit transfers began to take place, tens of billions of new private sector investment has flowed into clean energy and decarbonization projects across the United States.

In fact, 35 states have attracted over \$70 billion in investment in new manufacturing infrastructure, including facility expansions, investment in greenfield infrastructure, and critical mineral recycling, refining, and extraction. These facilities have access to valuable 45X PTCs and are some of the fastest growing parts of the clean energy economy. Investment in clean energy manufacturing since the passage of the law exceeds cumulative investment in the five years preceding it.

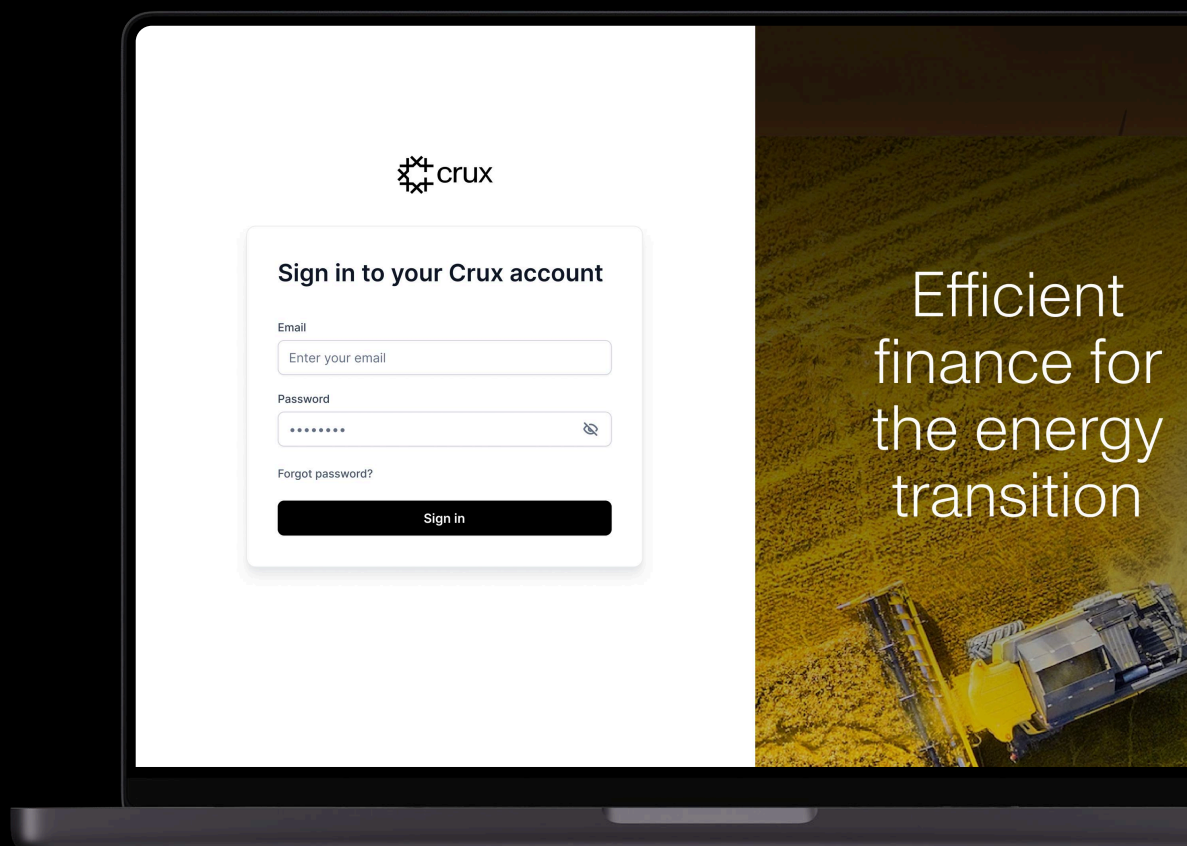
Transferability has fundamentally changed the way projects are financed and allows for greater flexibility and market participation. We've seen hundreds of new market entrants of all sizes invest across multiple technology types, including categories that did not previously receive tax credits. Anticipated regulatory guidance on some of these newly eligible tech types will further invigorate the market with additional supply in the second half of the year.

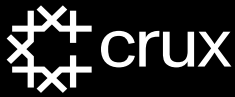
With increased participation comes competition. Over 70% of tax credit deals in the first half of 2024 were sold through a competitive process, ultimately maximizing deal outcomes for both parties, including optimized timing, price, and certainty. Technology has emerged as a crucial facilitator of a transparent market.

Crux’s mission is to create a more efficient and interconnected market for sustainable finance, which will require transparency, liquidity, and standardization. Our platform offers market and price transparency combined with the largest network of developers and manufacturers, tax credit buyers, and intermediaries. Our purpose-built tools and authoritative standards for risk mitigation and due diligence reduce complexity and overall cost. By streamlining these transactions, the market can invest in more projects, faster development, and increased alignment of interests across the economy.

As the market continues to evolve, the role of clean energy tax credits will be increasingly crucial in financing the energy transition. We hope that this report enables all prospective participants — tax credit sellers, buyers, and intermediaries — to seize the opportunity at hand.

If you’d like to learn more about Crux and engaging in the market for transferable tax credits, [get in touch today](#).





Unpack the findings with Canary Media

Crux's CEO Alfred Johnson and Policy & Research Strategist Katie Bays will join Canary Media's Executive Director Eric Wesoff to unpack this expanded and updated overview of the nascent transferability market.

August 7th at 2pm ET

[Join us HERE](#)

How the Dynamic Tax Credit Transfer Market is Unlocking the Energy Transition

Wednesday, August 7, 2024 · 2:00 p.m. | Add to calendar
Event will be recorded

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