

# Clean Energy Tax Credits & Changes Made by the IRA

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Two federal tax credits—the investment tax credit (ITC) and the production tax credit (PTC)—have played a significant role in catalyzing development of clean energy projects. The ITC, which assumed its current form in the Energy Policy Act of 2005,<sup>1</sup> allows a project sponsor to earn a certain percentage in credits for funds invested in qualified property used for generating and distributing clean energy.<sup>2</sup> The PTC, created in 1992 and modified many times since,<sup>3</sup> is for facility owners and is earned annually proportional to the kilowatt hours (kWhs) generated from wind, biomass, geothermal, solar, small irrigation, municipal solid waste, hydropower, or marine/hydrokinetic installations for the first 10 years after a facility is placed in service.<sup>4</sup> By number of projects, the ITC has most often been used to fund solar projects while the PTC has been most commonly used for wind projects.<sup>ii</sup>

The Inflation Reduction Act (IRA),<sup>5</sup> passed in August 2022 after protracted negotiations,<sup>6</sup> made several changes to the ITC and PTC. In this paper I summarize these changes, which include:

- Replacing the current ITC and PTC with technology-neutral credits and extending their duration until the later of 2032 or the achievement of specified emission targets;
- Restructuring the ITC and PTC to be transferable and, for some entities, refundable;
- Making receipt of the ITC and PTC at current levels conditional on paying a minimum wage and hiring a minimum number of apprentices; and
- Coupling the ITC and PTC with “bonus” credits to encourage developers to use domestic materials and build in “energy communities,” as well as providing additional bonus credits for qualifying ITC projects in environmental justice communities.
  - Importantly, the bonuses stack, so a project that meets *all* the requirements could cover up to 60% to 70% of project costs using the tax credits.

In addition to these changes to the ITC and PTC, the IRA also introduced additional credits to the Internal Revenue Code (the Code)<sup>iii</sup> aimed at promoting clean energy projects not previously covered by the ITC and PTC.

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<sup>ii</sup> One key reason that different credits were used for solar versus wind is that the PTC expired for solar projects in 2006 and was only renewed in the IRA. See *infra* notes 48 and 46. Another reason the credits have historically been structured differently for the two technologies is solar projects typically require higher upfront costs to build at scale, while wind projects require additional maintenance costs and thus benefit from receipt of credits throughout the life of the project. See, e.g., Karsten Neumeister, [Solar vs. Wind Power: The Ultimate Showdown](#), EcoWATCH (Mar. 17, 2022) (explaining the differences between the two technologies).

<sup>iii</sup> Like other provisions of the tax Code, the Internal Revenue Service (“IRS”) is the key agency charged with enforcing the provisions added or modified by the IRA, while the Treasury is charged with drafting and issuing regulations and guidance clarifying implementation. See [Tax Code, Regulations, and Official Guidance](#), INTERNAL REVENUE SERV. (IRS) (last updated Jan. 18, 2023).

If used to their full capacity, the credits in the IRA could create a sea change in clean energy financing. However, estimates of the exact financial impact vary widely (as discussed in the final section of this paper). Official scoring from the Joint Committee on Taxation (JCT)<sup>iv</sup> and the Congressional Budget Office estimated the IRA would result in \$391 billion in government investment in energy security and climate change programs.<sup>7</sup> But Goldman Sachs concluded that the same bill would usher in an “energy revolution,” estimating total projected government spending at \$1.2 trillion and spurring an additional \$3 trillion in private investment.<sup>8</sup>

This paper is intended for both general and technical audiences. I explain the central changes to the ITC/PTC in text but provide more details in the accompanying tables.

### **Adding ITC Categories and Extending the Timeline**

Prior to the passage of the IRA, the expiration of the ITC and PTC meant the credits were primarily only available to fund clean energy projects that were already underway. In order to take advantage of these credits, construction had to have started<sup>v</sup> between 2006 to 2024, depending on the technology. Some technologies were also progressively phased out in the years leading up to the deadline, meaning they were only eligible to receive a reduced credit. Moreover, given the complexity of financing such projects, several years may elapse between conception and construction.<sup>vi</sup> As a result, even developers seeking financing when the credits were technically still available were impacted by the impending expiration of the credits.

The IRA extended the ITC and PTC such that the credits are now available for most projects for which construction begins before 2025. The IRA also revised the scope of the credits to include more technologies, and it increased the amount of the credits for some technologies that were already covered. **Table 1** summarizes the technologies eligible for the ITC, the percentage of project costs that are covered, and key changes to these credits in the IRA. **Table 2** provides a similar analysis for PTC-eligible technologies. As detailed following the tables, the IRA replaced the traditional ITC and PTC with new

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<sup>iv</sup> The Joint Committee is staffed by economists, attorneys, and accountants, and assists Congress Members from both parties in drafting tax legislation and assessing its impact at various parts of the legislative process. See [Overview](#), JOINT COMM. ON TAX’N.

<sup>v</sup> Previous IRS guidance has clarified that construction will be deemed to have started construction once either “physical work of a significant nature” has begun on the project or if the taxpayer has spent at least 5% of the total projected project cost, and if effort and/or expenditure is continuously maintained from that point forward. Notice 2021-05, 2021-3 I.R.B. 479 § 2.04. Moreover, the IRS has provided a safe harbor allowing projects to automatically satisfy the continuity test if placed in service within ten years of construction starting. *Id.* § 4.01. While this Notice pre-dates the IRA, it extends and clarifies a series of prior Notices implementing the ITC and PTC, see *id.* at 1, n.1, which increases the likelihood that these tests will be extended to the adjusted PTC and ITC as well as the replacement credits, § 45Y and § 48E.

<sup>vi</sup> See Philip Fletcher, [What Does it Take to be a Project Finance Lawyer?](#) MILBANK, TWEED, HADLEY & McCLOY LLP (2013) (noting that “[t]he process of closing project financings is necessarily drawn out” and explaining the logistical challenges that make project finance lifecycles longer than for other types of deals). The added uncertainty surrounding claiming the ITC or PTC stemming from the long lifecycle of project finance deals may be partially mitigated by the IRS’s relatively permissive interpretation of when construction has begun, including a generous safe harbor allowing construction on the project to be deemed continuous if placed into service at any point within ten years of construction beginning. See *supra* note v. That said, this mitigation is incomplete even assuming these interpretations were to be extended to the new credits: a developer that is truly uncertain as to whether it would receive the credits at all would be unlikely to sign the necessary contracts to secure financing, let alone begin physical work or expend resources on the project.

technology-neutral credits, which will continue to be available until at least 2035—well after the post-IRA ITC and PTC expire.

In order to understand the tables below, it is important to consider the structure of the wage and apprenticeship “bonus” introduced by the IRA, described in greater detail in a later section. The IRA reduced the amount of both credits by a factor of five,<sup>9</sup> but allows the taxpayer to multiply the new credit amount by five if the project meets the wage and apprenticeship specifications.<sup>10</sup> Thus, while technically a bonus in the sense that theoretically taxpayers could claim the PTC and ITC without meeting the wage and labor specifications, it functions more like a requirement in that taxpayers *must* meet these specifications in order to continue receiving the same tax benefits as under the pre-IRA status quo.

*In Tables 1 and 2 below, the post-IRA percentages and amounts provided are conditional on meeting the wage and apprenticeship specifications.*

**Table 1: Changes to Eligibility and Rates in The Pre-IRA ITC (§ 48)**

Technology	Energy Percentage (and related timing limitations)	
	Pre-IRA <sup>vii</sup>	Post-IRA <sup>11</sup>
Qualified fuel cells <sup>12</sup>	0-30% (variation based on timing of construction and placement into service) <sup>13</sup>  For each project type, the deadline for commencement of construction was 2024. <sup>14</sup>	30% <sup>15</sup>  The IRA also eliminated the majority of the phase-outs that reduced the percentage based on timing of construction and placement into service <sup>16</sup> and extended each of the commencement deadline by one year, to 2025. <sup>17</sup>
Solar energy for electricity, cooling, or heat generation <sup>18</sup>		
Solar energy used for illumination <sup>19</sup>		
Qualified small wind energy property <sup>viii</sup>		
Waste energy recovery property <sup>20</sup>		
Microturbines <sup>21</sup>	10% <sup>22</sup>	30% <sup>23</sup>
Combined heat and power systems <sup>25</sup>		The deadline for commencement of construction is 2025. <sup>24</sup>
Equipment used to produce, distribute, or use energy from geothermal deposits, the ground, or groundwater <sup>26</sup>		10% <sup>28</sup> The deadline for commencement of construction is 2035. <sup>29</sup>
Energy storage technology <sup>30</sup>	Not eligible	30%; <sup>31</sup> commencement of construction required prior to 2025 <sup>32</sup>
Qualified biogas property <sup>33</sup>		
Microgrid controllers <sup>34</sup>		
Interconnection property, including any “addition, modification, or upgrade to a transmission or distribution system” <sup>35</sup>	Not eligible	10%; <sup>36</sup> commencement of construction required prior to 2025 <sup>37</sup>
Clean hydrogen <sup>ix</sup>	Not eligible	6–30%, depending on the amount of carbon dioxide equivalent (CO <sub>2</sub> e) <sup>x</sup> emitted per kilogram of hydrogen <sup>38</sup> (newly added in the IRA); <sup>39</sup> commencement of construction required prior to 2025 <sup>40</sup>

<sup>vii</sup> The pre-IRA energy percentages are dictated directly as 30% for specified categories and 10% for other energy property. 26 U.S.C. § 48(a)(2)(A) (2021). (As a stylistic note, this piece refers to the Code as it existed prior to passage of the IRA by specifying the year. Where the year is omitted, the citation refers to the current Code provision.)

<sup>viii</sup> Qualified small wind energy property is defined as using a turbine with nameplate capacity of 100 kw or less. *Id.* § 48(c)(4)(A)–(B). On November 17, 2023, Treasury released Proposed Regulations clarifying which offshore wind components qualify as energy property for purposes of the ITC. [Prop. 26 C.F.R. § 1.48-9\(f\)\(5\)\(iii\)](#). The Proposed Regulations would include power conditioning and transfer equipment (e.g., subsea cables and voltage transformers) but exclude transmission and distribution equipment. *Id.*

<sup>ix</sup> Qualified clean hydrogen refers to hydrogen produced in the U.S. for sale and use (to be verified by an unrelated party) as part of the taxpayer’s ordinary course of business; to qualify, the production process must result in “a lifecycle greenhouse gas emissions rate” of less than or equal to 4 kg of CO<sub>2</sub>e per kilogram of hydrogen. 26 U.S.C. § 48(a)(15)(D) (referencing the newly created clean hydrogen credit, § 45V); *id.* § 45V(c)(2). A taxpayer may alternatively elect to receive the production credit for hydrogen under § 45V, see *supra* notes 152–154, but may not receive both credits. *Id.* § 48(a)(15)(B),(C)(ii)(II). Additionally, receiving the ITC for hydrogen also precludes the taxpayer from receiving the credit for carbon capture and storage for any carbon capture equipment used at the facility. *Id.*

<sup>x</sup> CO<sub>2</sub>e refers to “the number of metric tons of [carbon dioxide] emissions with the same global warming potential as one metric ton of [any] greenhouse gas.” [CO<sub>2</sub>e Definition](#), U.S. ENV’T PROT. AGENCY.

**Table 2: Changes to Eligibility and Rates in the Pre-IRA PTC (§ 45)**

Technology <sup>41</sup>	Pre-IRA Amount/kWh	Post-IRA Amount/kWh	Pre- and Post-IRA No. of years	Pre-IRA Expiration	Post-IRA Expiration
Wind	1.5 cents <sup>42</sup>	1.5 cents <sup>43</sup>	10 <sup>44</sup>	1/1/2022 <sup>45</sup>	1/1/2025 <sup>46</sup>
Closed-loop biomass <sup>xi</sup>					
Geothermal energy <sup>xii</sup>					
Solar			5 <sup>47</sup>	1/1/2006 <sup>48</sup>	
Open-loop biomass <sup>xiii</sup>	0.075 cents <sup>50</sup>				
Municipal solid waste <sup>xiv</sup>		0.075 cents <sup>49</sup>	10 <sup>53</sup>	1/1/2022 <sup>51</sup>	
Qualified hydropower production <sup>xv</sup>					
Marine and hydrokinetic renewable energy <sup>xvi</sup>					

**Notes:**

- (1) For the above, “expiration” refers to the day before which construction on the project must begin in order to qualify for the credit. “No. of years” refers to the number of years for which the project can earn the credit following placement into service.
- (2) Unlike the ITC, which may be subject to recapture if the original owners sell the facility within five years,<sup>54</sup> producers who purchased the facility after it was placed into service may still earn the PTC.<sup>55</sup>
- (3) Small irrigation power projects qualify for the PTC for projects placed into service before 10/3/2008.<sup>56</sup> This was the only category listed above for which the deadline was not extended by the IRA. Given the long-passed deadline, lack of extension, and small volume of projects, it is omitted from the table, for ease of comprehension.

<sup>xi</sup> Closed-loop biomass refers to “any organic material from a plant which is planted exclusively for purposes of being used at a qualified facility to produce electricity.” *Id.* § 45(c)(2).

<sup>xii</sup> Geothermal energy refers to energy produced from a “geothermal reservoir consisting of natural heat which is stored in rocks or in an aqueous liquid or vapor (whether or not under pressure).” *Id.* §§ 45(c)(4), 613(e)(2).

<sup>xiii</sup> Open-loop biomass refers to (i) “agricultural livestock waste nutrients,” i.e., “[b]ovine, swine, poultry, and sheep” manure and litter” and “bedding material for the disposition of [such] manure,” or (ii) “any solid, nonhazardous, cellulosic waste material or any lignin material” derived from forest-related resources, solid wood waste material, or agriculture sources. *Id.* § 45(c)(3).

<sup>xiv</sup> Any facility that uses municipal waste to produce electricity may qualify, whether via gas derived from the biodegradation of municipal solid waste or otherwise. See *id.* § 45(d)(6)–(7). “Municipal solid waste” has the same meaning as defined under the Solid Waste Disposal Act, except that it excludes commonly recycled paper. *Id.* § 45(c)(6); 42 U.S.C. § 6903(27).

<sup>xv</sup> See 26 U.S.C. § 45(c)(8) (detailed description of qualifying hydroelectric and nonhydroelectric projects).

<sup>xvi</sup> Marine and hydrokinetic energy refers to energy from (i) “waves, tides, and currents in oceans, estuaries, and tidal areas,” (ii) “free flowing water in rivers, lakes, and streams, (iii) free flowing water in an irrigation system, canal, or other man-made channel,” (iv) “ocean thermal energy conversion,” or (v) “pressurized water used in a pipeline (or similar man-made water conveyance) which is operated . . . for agricultural, municipal, or industrial consumption, and . . . not primarily for the generation of electricity,” if such energy is not derived using a “dam, [mechanical] diversionary structure, . . . or impoundment.” *Id.* § 45(c)(10).

### *Transitioning to a Technology-Neutral Regime*

Even with the extensions under the IRA, the current versions of the ITC (§ 48) and the PTC (§ 45) will apply only to projects with construction starting before 2025, after which they will effectively be replaced by newly-introduced § 48E and § 45Y, respectively. In a novel legislative design, the new credits will explicitly remain available until greenhouse gas emissions are reduced: they will be phased out over three years, starting in “the later of (A) the calendar year in which the Secretary [of the Treasury] determines that the annual greenhouse gas emissions from the production of electricity in the United States are equal to or less than 25 percent of the annual greenhouse gas emissions from the production of electricity in the United States for calendar year 2022, or (B) 2032.”<sup>xvii</sup>

A key feature of both § 48E and § 45Y credits is they are technology neutral, meaning they apply to any facility generating zero CO<sub>2e</sub>,<sup>xviii</sup> regardless of the technology used to produce energy. **Table 3** further elaborates on the qualification requirements. It also notes other ways in which the specific features of the new credits mirror the features newly introduced for the traditional PTC (§ 45) and ITC (§ 48).

**Table 3: Qualification Requirements and Features of § 45Y and § 48E**

Code	Credit Amount	Direct Pay & Transferability	Wage & Apprenticeship	Other Req'ts or Bonus Credits
§ 45Y	Up to \$0.015 per kWh of electricity produced at a facility generating zero CO <sub>2e</sub> , for the first 10 years the facility is placed in service. <sup>xix</sup>	Transferability for all non-applicable entities; <sup>57</sup> direct pay for applicable entities <sup>58</sup>	Both <sup>59</sup>	Bonus credit for domestic content <sup>60</sup>
§ 48E	Up to 30% of the basis of an energy storage facility generating zero CO <sub>2e</sub> and associated infrastructure for interconnection of such facility to the electricity grid. <sup>61</sup>	Transferability for all non-applicable entities; <sup>62</sup> direct pay applicable entities <sup>63</sup>	Both <sup>64</sup>	Bonus credit for domestic content <sup>65</sup> and where located in an environmental justice area <sup>66</sup> or energy community <sup>67</sup> (rules similar to the ITC in each case)

In theory, transitioning to a technology-neutral regime should allow projects to function more efficiently. Navigating complex technology-specific requirements may have a distortionary effect on the structure of many projects or, at a minimum, increase project costs to ensure compliance.

<sup>xvii</sup> 26 U.S.C. §§ 45Y(d)(2)–(3), 48E(e)(2)–(3). The existing ITC and PTC will remain in the Code, however, and will remain relevant to PTC-eligible projects constructed before 2025, which will continue to receive § 45 credits against their annual production for the duration of the project. Sections 45 and 48 are also cross referenced heavily in the new technology-neutral ITC and PTC provisions. Additionally, the fact that §§ 45 and 48 will not be repealed leaves open the possibility that a future Congress could choose to reinstate them by merely adjusting the dates. *Cf. supra* notes 48 and 46 (noting that the IRA reinstated the PTC for solar projects).

<sup>xviii</sup> See *supra* note x.

<sup>xix</sup> *Id.* § 45Y(a)(1),(a)(2),(b)(1)(A)–(B),(b)(2)(A). In order to get the maximum amount per kWh, a facility must meet the applicable wage and apprenticeship requirements and have a maximum net output of 1 MW. *Id.* § 45Y(a)(2)(B),(a)(9),(a)(10). The credit is also not available for facilities qualifying for credits under § 45 (PTC), § 45J (advanced nuclear power), § 45Q (carbon sequestration and storage), § 45U (nuclear power), § 48 (ITC), § 48A (advanced coal projects), or § 48E (clean electricity). *Id.* § 45Y(b)(1)(D).

However, the new technology-neutral regime introduces uncertainty in two areas.

First, the statute is largely silent on the methodology used to calculate the greenhouse gas emissions rate (defined as CO<sub>2</sub>e/KWh<sup>68</sup>). It provides that for *fuel combustion and gasification projects*, the calculation shall “tak[e] into account lifecycle greenhouse gas emissions,” and incorporates by reference the lifecycle analysis methodology used in fuel regulation under the Clean Air Act,<sup>69</sup> but provides no further instructions for other technologies.<sup>xx</sup> In addition, recent fierce debate about how to calculate emissions for the hydrogen credit added under the IRA (see the final section of this paper)<sup>xxi</sup> demonstrates that merely specifying whether or not the calculation of the greenhouse gas emission rate shall require lifecycle analysis will not end the debate over methodology.

Second, while the statute directs the Treasury to publish a “zero emissions table” annually<sup>70</sup> and provides that a facility using a technology that is not in the table can petition the Treasury for a determination,<sup>71</sup> it does not specify the process for doing so or the criteria that Treasury may consider. The ease of the process and the willingness of the Treasury to approve technologies not in the table will determine whether there is, in effect, a default technology requirement even under the new technology-neutral regime. Forthcoming Treasury guidance will hopefully clarify both points.

## Direct Pay and Transferability

### *Pre-IRA: Tax Equity Market Challenges*

Ironically, a key difficulty historically in administering the ITC and the PTC is that they have been too generous. The credits work by offsetting existing tax liability, and many developers do not have enough tax liability to offset on the date the project is placed in service (needed for the ITC) or in the early years of operations (needed for the PTC).<sup>xxii</sup> In

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<sup>xx</sup> A clue toward explaining the difference in instructions can be found by looking to the new credits specifically introduced by the IRA for clean hydrogen, which also provides that emissions shall be measured using the lifecycle analysis method from the Clean Air Act. *Id.* § 45V(c)(1)(A). Since projects that qualify for § 45V would likely also qualify for § 45Y under the tech-neutral regime, and since a lifecycle analysis looks at emissions “related to the full fuel cycle,” 42 U.S.C. § 7545(o)(1)(H), thus resulting in a higher rate than a point-in-time analysis, it stands to reason that the methodology prescription for fuel combustion and gasification projects in § 45Y may be meant to ensure hydrogen projects are subject to the lifecycle analysis regardless of the credit that they elect to use.

<sup>xxi</sup> The debate is over whether to adopt a “three-pillar” approach, which would condition receipt of the hydrogen credit upon (1) “procure[ment] [of] clean energy [from the grid] on an hourly basis to match their consumption, (2) “procure[ment] [of] electricity from newly built clean resources beyond those required to meet state-mandated clean energy goals,” and (3) “procure[ment] [of] clean energy . . . from sources close enough to the producer to be deliverable.” Colton Poore, [Without guidance, Inflation Reduction Act tax credit may do more harm than good](#), PRINCETON UNIVERSITY (Dec. 20, 2022). Proponents of this approach argue, based on research from Princeton, that failure to implement these conditions will result in “clean” hydrogen producers either using very carbon-intensive production processes themselves and/or using up existing renewable energy on the grid, causing fossil fuel producers to increase production to meet demand. *Id.*

<sup>xxii</sup> The inability of most developers to efficiently utilize the credits is attributable to their sheer size, which may amount to 30-40% of the total capital stack. See, e.g., DAVID FELDMAN AND MARK BOLINGER, [EMERGING OPPORTUNITIES AND CHALLENGES IN FINANCING SOLAR](#) 3, 16 (2016) (noting that many developers cannot efficiently monetize the ITC); Keith Martin, [Solar tax equity structures](#), NORTON ROSE FULBRIGHT (Dec. 14, 2021) (same). On average, construction costs for utility-scale solar projects range from \$500,000 to \$700,000 per MW. See Tom Daniels and Hannah Wagner, [Regulating Utility-Scale Solar Projects on Agricultural Land](#), KLEINMAN CENTER FOR ENERGY POLICY (Aug. 11, 2022). Many such projects may generate

addition to the credits, most projects eligible for the ITC or PTC also benefit from an accelerated depreciation schedule for tax purposes,<sup>xxiii</sup> which can reduce existing tax liability. However, like the credits, this benefit cannot be fully used without sufficient tax liability. As a result, many developers split ownership with a “tax equity investor”—often a large bank or major corporation<sup>xxiv</sup>—with sufficient liability to take advantage of the credits and depreciation.

As of 2019, the tax equity market was about \$20 billion annually.<sup>72</sup> Tax equity investors are motivated by the financial gains, as well as the public relations benefit of participating in such projects, with the two top investors—Bank of America and J.P. Morgan—both touting their historical contributions to clean energy through tax equity investing in their annual proxy statements filed with the Securities and Exchange Commission.<sup>xxv</sup>

While there are several ways to structure joint ownership between a developer and tax equity investor,<sup>73</sup> among the most common is a “partnership flip” structure in which the tax equity investor is allocated 99 percent of the income and loss as well as 99 percent of the credits<sup>xxvi</sup> for a fixed number of years, or until the tax equity investor reaches its target yield, at which point the developer may exercise an option to buy out the tax equity investor’s interest.<sup>xxvii</sup>

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over 100 MW, with the largest projects generating over 400 MW. See *id.*; see also MARK BOLINGER, JOACHIM SEEL, CODY WARNER, AND DANA ROBSON, [UTILITY-SCALE SOLAR, 2022 EDITION: EMPIRICAL TRENDS IN DEPLOYMENT, TECHNOLOGY, COST, PERFORMANCE, PPA PRICING, AND VALUE IN THE UNITED STATES](#) 10 (Sep. 2022) (describing a recently completed utility solar project with 420 MW capacity). Thus, the most expensive utility-scale solar projects could cost nearly \$300 million, corresponding to an ITC of \$90 million. For reference, Exxon, one of the largest energy companies in the world, had tax liability equal to \$51.6 million in 2022. See Exxon Mobil Corporation, [Annual Report \(Form 10-K\)](#) (Feb. 22, 2023).

<sup>xxiii</sup> The depreciation schedule provides a tax deduction that can be applied over the life of an asset, reflecting the decline in value. See *id.* § 167(a) (defining the depreciation deduction). If an asset may be depreciated for tax purposes at a faster rate than its actual decline in economic value over time, this provides tax value, due to the time value of money (i.e., the principle that a dollar today is worth more than a dollar in the future). ITC-eligible projects specifically may be depreciated on an accelerated basis, with the entire value of the asset depreciable over five years. *Id.* § 168(e)(1),(3)(B)(vi)(I).

<sup>xxiv</sup> As of 2017, the five largest tax equity investors were JPMorgan, Bank of America, GE Financial Services, US Bank, and Citigroup. Alex Tiller, [INSIGHT: Tax Equity Remains an Under-Utilized Tool for Corporate Tax Strategy](#), BLOOMBERG TAX (Jan. 29, 2019, 9:01 AM). Large companies may also act as tax equity investors, such as Amazon, Google, Patagonia, and Toyota. *Id.*; see also, e.g., [Google invests \\$300 million in U.S. residential solar projects](#), REUTERS (Feb. 26, 2015, 9:15 AM); Emma Foehringer Merchant, [A Facebook First: Tech Giant Invests Directly in a Renewable Project](#), GREENTECH MEDIA (May 30, 2019).

<sup>xxv</sup> See, e.g., Bank of America, Annual Meeting Proxy Statement (Form DEFR14A) (Mar. 3, 2023) (noting that Bank of America was “a top renewable energy tax equity investor in the [US]” in 2015, and, through its investments, “contributed to the development of approximately 41 gigawatts of total installed renewable wind and solar energy capacity in the [US]”); J.P. Morgan, Annual Meeting Proxy Statement (Form DEF 14A) (Apr. 5, 2019) (noting that, from 2003 to 2018, “JPMorgan Chase committed or arranged over \$21 billion in tax equity financing for wind, solar and geothermal energy projects in the [US]”).

<sup>xxvi</sup> Treasury Regulations require that allocation of tax credits mirrors the income and losses of the partnership. 26 C.F.R. § 1.704-1(b)(2)(ii). However, income and losses need not reflect cash distributions. See *id.* § 1.704-1(b)(1) (noting that a “partner’s distributive share of [] income, gain, loss, deduction, or credit (or item thereof)” may be determined either by the partnership agreement or “in accordance with such partner’s interest in the partnership”).

<sup>xxvii</sup> See *Solar tax equity structures*, *supra* note 73 (general description of the flip, including a variation on the theme in which the tax equity investor specifies a particular annual cash distribution, reserving the remainder of the cash flow for the developer).



However, while tax equity investors have used this structure to provide significant financial support for decades,<sup>xxviii</sup> helping to catalyze clean energy development, the arrangement has inefficiencies.

One inefficiency is, in order to take advantage of the credits, a tax equity investor must be a bona fide partner, meaning they “must have a ‘meaningful stake in the success or failure’ of the enterprise.”<sup>xxix</sup> As a result, tax equity investors and project developers are forced to navigate a labyrinth of rules for qualification as a true partner, which do not necessarily conform to an optimal financing structure. **Table 4** details the safe harbor requirements that tax equity investors must meet to qualify for the PTC,<sup>74</sup> which are also typically followed by investors in other PTC and ITC-qualifying projects, given the absence of a similar safe harbor for these projects.<sup>xxx</sup>

Failure to meet these requirements may prevent a tax equity investor from receiving the PTC for a given tax year or, in the case of the ITC, may lead the IRS to recapture the credit.<sup>75</sup> Furthermore, where there is uncertainty as to whether a tax equity investor may qualify as a “real partner,” it may affect price, especially if the tax equity investor requires the project developer to indemnify it against the risk of recapture of the ITC or disallowance of the PTC.<sup>76</sup> In some cases, the tax equity investor may also require a “cash sweep” to make it whole in case of this eventuality, and may require this payment be made before the developer pays its lenders, in turn requiring the developer to indemnify the lender against the possibility of credit disallowance or recapture.<sup>77</sup>

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<sup>xxviii</sup> While the ITC in its current form, and thus the associated tax equity market, has only been around since 2006, tax equity financing has existed for wind energy, traditional energy generation, and low-income housing since the 1980s and was used to finance other infrastructure, such as rail cars, as early as the 1950s. DAVID FELDMAN AND MARK BOLINGER, [EMERGING OPPORTUNITIES AND CHALLENGES IN FINANCING SOLAR](#) 3, 10 (2016).

<sup>xxix</sup> *Historic Boardwalk Hall, LLC v. Comm’r*, 694 F.3d 425, 449 (3d Cir. 2012) (citing *TIFD III–E, Inc. v. United States*, 459 F.3d 220, 232 (2d Cir.2006)); see also *Comm’r v. Culbertson*, 337 U.S. 733, 740 (1949) (seminal Supreme Court case defining a partnership as “an organization for the production of income to which each partner contributes one or both of the ingredients of income—capital or services”—during the tax year, and finding an entity’s intent to provide such “ingredients” in the future insufficient for participation in the partnership) (emphasis added).

<sup>xxx</sup> The IRS noted in a memorandum from the Office of Chief Counsel that the “safe harbor” for PTC qualification does not apply to ITC-qualifying projects, but it then went on to evaluate whether a particular project seeking to qualify for the ITC would meet the Rev. Proc. 2007-65 safe harbor requirements. Chief Counsel Advice (CCA) Memorandum 201524024; see also *PROJECT FINANCE LAW REVIEW* 156 (David F. Asmus, ed., 3rd ed. 2021) (noting that “the renewables industry largely applies the [PTC] rules across technologies in the absence of any other technology-specific guidance”).

**Table 4: Requirements for Tax Equity Investors to Qualify for the PTC**

Capital Commitment Requirements	Risk Requirements
<p>For the duration of its ownership of a partnership interest, a tax equity investor must maintain:</p> <ul style="list-style-type: none"> <li>• at least a 1% interest in “each material item of partnership income, gain, loss, deduction and credit”<sup>xxxv</sup></li> <li>• a “minimal unconditional investment” of at least 20% of fixed and reasonably anticipated contingent capital contributions<sup>78</sup></li> <li>• at least 75% of capital contributions must be “fixed and determinable” with regard to amount and certainty of payment<sup>79</sup></li> </ul>	<p>The developer, investors, and related parties may not have a contractual right to purchase, or cause another party to purchase, the tax equity investor’s share in the project within five years or for less than fair market value.<sup>xxxii</sup></p> <p>Additionally, “the [d]eveloper, the turbine supplier, any power purchaser, or any other project participant” may not guarantee the tax equity investor:</p> <ul style="list-style-type: none"> <li>• a fixed allocation of the PTC<sup>xxxiii</sup></li> <li>• available wind resource<sup>xxxiv</sup></li> <li>• recuperation of loss on the investor’s “minimal unconditional investment”<sup>80</sup></li> </ul>

A second inefficiency in the tax equity market arises from a principle of partnership taxation, which prohibits a partner from being allocated tax losses—in particular, those from accelerated depreciation—that exceed the partner’s economic contribution to the project,<sup>xxxv</sup> unless that partner agrees to restore the capital account to zero in the event of a liquidation. This is known as a “deficit restoration obligation,” or “DRO.”<sup>81</sup> Credits like the ITC or PTC are not considered to be contributions for this purpose.<sup>82</sup>

Since the tax equity investor’s main contribution to the project is the value of the credits (which the project would otherwise be unable to use), tax equity investors will need to take a DRO in most cases. The IRS has recently begun to crack down on partners’ ability to take DROs, largely by subjecting tax equity investors to net worth tests in advance in order to ensure their ability to pay in case the partnership liquidates.<sup>xxxvi</sup> Both the real possibility of needing to satisfy a DRO in bankruptcy, as well as the IRS tests for whether an investor may take on a DRO in the first place, create friction in the market, drying up tax equity investors’ appetite to sponsor new projects and making tax equity financing more expensive.

In addition to these two inefficiencies, a more straightforward problem with using tax equity markets is the risk that comes with market fluctuations divorced from the clean

<sup>xxxv</sup> Rev. Proc. 2007-65, 2007-45 I.R.B. 967, § 4.02. Additionally, for each year of ownership, the tax equity investor must maintain a minimum interest in material items of partnership income and gain equal to at least 5% of the maximum share it will earn in any taxable year. *Id.*

<sup>xxxii</sup> *Id.* §§ 4.05–.06. Fair market value must be “determined at the time of exercise of the contractual right to purchase” the interest; it may be based on contractual arrangements other than power purchase agreements, provided that such contracts are negotiated at arm’s length, or on power purchase agreements with unrelated parties. *Id.* § 4.05.

<sup>xxxiii</sup> *Id.* § 4.07. Long-term power purchase agreements with unrelated parties, however, are not considered guarantees and are permissible. *Id.*

<sup>xxxiv</sup> *Id.* Such hedges may, however, be provided by an unrelated party, i.e., a weather derivative contract, provided the tax equity investor pays the premium on such a contract directly. *Id.*

<sup>xxxv</sup> This contribution is measured by the “capital account,” which includes capital contribution and profits, less losses and distributions. 26 C.F.R. § 1.704–1(b)(2)(iv)(b).

<sup>xxxvi</sup> See generally Eric Yauch, [Partners Beware Changes to Deficit Restoration Obligation Rules](#), TAX NOTES (Oct. 11, 2019) (overview of 2019 IRS rules).

energy industry as a whole. That is, financing may dry up not due to fundamental changes in the assets in which tax equity investors are investing, but instead because of tax equity investors' own weak balance sheets, and a related limited capacity to put capital to work,<sup>xxxvii</sup> which may arise in periods of economic recession.

Given all the uncertainties tax equity financing presents the cost of borrowing for clean energy developers increases—often prohibitively so.

### ***Post-IRA: Direct Pay & Transferability Opportunities***

The IRA made two changes to the structure of the ITC and PTC to reduce clean energy developers' reliance on inefficient tax equity markets.

**First, the IRA allows certain “applicable entities” to claim the ITC and PTC directly for cash, without requiring that the credits be used to offset existing tax liability.<sup>xxxviii</sup>** This “direct pay” option<sup>xxxix</sup> is available to four categories of “applicable entities”: (1) tax-exempt organizations, (2) states (and political subdivisions thereof), (3) Tribal governments and Alaska Native Corporations, and (4) the Tennessee Valley Authority and other rural electricity cooperatives.<sup>83</sup> Prior to the IRA, such “applicable entities” were eligible for the credits, but had low or no taxable income,<sup>xl</sup> forcing them to partner with tax equity investors. Post-IRA, these entities may receive cash equal to the value of the credits, as long as they meet requirements, including pre-registration of the technology for which they seek the credit.<sup>84</sup>

**Second, for developers not eligible for direct pay,<sup>85</sup> the IRA made both the ITC and PTC “transferable,” meaning they can be sold to any unrelated party.<sup>86</sup>** This change, too, should reduce reliance on tax equity markets by allowing investors to get the majority of the tax benefit through an arms-length transaction, rather than through “co-investing” as required under a partnership flip structure.

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<sup>xxxvii</sup> See generally [Should “Direct Pay” For Renewable Energy Subsidies Be a Legislative Priority?](#) SEGUE SUSTAINABLE INFRASTRUCTURE, LLC (July 13, 2021) (blog written by project finance “industry veterans” arguing that “a direct pay option would have on one of the biggest existential risks for any project relying on a tax credit – the mere availability of – or access to – tax equity”); see also [COVID-19 Impacts on Tax Equity Markets](#), SOLAR ENERGY INDUSTRIES ASSOCIATION (Nov. 2020) (factsheet from solar lobbying association noting decline in tax equity financing during COVID).

<sup>xxxviii</sup> IRA § 13801(a), 136 Stat. 2003–09 (codified as 26 U.S.C. § 6417) (explaining that the “applicable entity making an election . . . shall be treated as making a payment against the tax imposed by subtitle A (for the taxable year with respect to which such credit was determined) equal to the amount of such credit”); see also 26 U.S.C. § 6417(b)(2),(10) (defining the PTC and ITC to be among the credits eligible for direct pay).

<sup>xxxix</sup> Statutorily, it is referred to as “elective payment.” See generally 26 U.S.C. § 6417.

<sup>xl</sup> Despite official “tax-exempt” status, these entities may be taxed on revenue generated through activities unrelated to their mission, known as unrelated business taxable income (“UBTI”). See *id.* § 512.

However, while transferability and direct pay both expand opportunities for clean energy financing, they are unlikely to completely displace the tax equity market for several reasons:

- As noted previously, direct pay for the ITC and PTC is limited to certain applicable entities, and thus on its own remains insufficient to displace the tax equity market.<sup>xli</sup>
- Changing the structure of the credits does not allow developers to monetize depreciation. As mentioned previously, much of the value to tax equity investors is the ability to deduct the entire value of the project in the first five years.<sup>87</sup>
- While transferability theoretically opens the market for players other than tax equity investors to purchase the credits, in practice there is less interest in purchasing transferred ITC credits because of the potential for the IRS to recapture the credit.<sup>88</sup>
- Due to the timing of filing opting for direct pay rather than partnering with a tax equity investor may delay receipt of cash, particularly for the PTC, since the credit is applied for annually.<sup>89</sup>
- Forthcoming guidance from Treasury will determine the robustness of transferability markets by elaborating on which entities are eligible to purchase credits.<sup>xlii</sup> This will in turn affect whether developers decide to sell their credits, as well as the price at which they sell them.

Thus, while transferability and direct pay have expanded the opportunities available to many developers, at the individual project level, tax equity will remain the most efficient—and in some cases, the only—way to fully monetize depreciation and credits. This dependence on outside investment preserves economic distortions mentioned above and may limit market appetite for clean energy investment.

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<sup>xli</sup> Notably, *all* entities are eligible for direct pay for new production credits available for carbon sequestration and storage (§ 45Q), clean hydrogen (§ 45V), advanced manufacturing (e.g., battery storage) (§ 45X). See *infra* notes 144, 151, and 159. However, since these credits apply to a lower volume of projects than those covered by the ITC and PTC, this is also insufficient on its own to displace tax equity.

<sup>xlii</sup> In particular, Treasury is currently considering two issues of consequence to market robustness. First, while nothing in § 6418 specifically restricts applicable entities from purchasing credits, the statute is silent as to whether they may elect direct pay for purchased credits under § 6417. See Section 6417 Elective Payment of Applicable Credits, 88 Fed. Reg. 40,528, 40,538 (2023). Under Treasury's Proposed Regulations, *id.*, such "chaining" is not permitted. If this position were reversed (either entirely or just for certain applicable entities), eligible applicable entities would have a strong incentive to enter the transfer market, which would increase demand and decrease the spread between the face value and purchase price of the credit. Second, the Proposed Regulations provide that the passive activity credit rules under § 469 will apply to credits purchased in the transferability markets. 88 Fed. Reg. at 40,541. Thus, any individual, estate, trust, closely held corporation, or personal service corporation that purchases credits under § 6418 can only use such credits to offset the portion of their tax liability that is allocable to passive activities. 26 U.S.C. § 469(a),(d)(2). If adopted in the Final Regulations, this rule will reduce the pool of potential credit purchasers given that such entities often have minimal passive income.

## **Labor and Materials**

The IRA operates through both incentives and requirements. First, the IRA functionally imposes wage and apprenticeship requirements necessary to receive the ITC and PTC at pre-IRA levels. The statute also provides an additional “bonus” credit to projects that use a threshold amount of “domestic content,” (i.e., domestically produced steel, iron, and manufactured products). In this section, I explain the requirements, benefits, and associated penalties for each category.

### ***Wage and Apprenticeship “Requirements”***

As mentioned previously,<sup>90</sup> the IRA introduced new wage and apprenticeship requirements that projects with a maximum net output of at least 1 MW<sup>91</sup> must meet in order to receive the ITC or PTC at pre-IRA levels. While officially a bonus, projects that fail to meet these requirements will receive one-fifth the amount or percentage they received prior to the IRA’s passage. The wage and apprenticeship are nearly identical for the ITC and the PTC.<sup>92</sup> **Table 5** presents the requirements for both provisions, noting differences where applicable.

**Table 5: Wage and Apprenticeship Requirements to Qualify for ITC/PTC at Pre-IRA Status Quo**

Wage Requirements <sup>93</sup>	
<b>Requirement</b>	Laborers/mechanics employed by the taxpayer in project or facility construction shall be paid <b>wages equal to at least prevailing rates</b> . <sup>94</sup>
<b>When</b>	The ITC is earned by the developer at the time the project is placed in service, and thus must meet the wage requirements for the 5-year period immediately following that date. <sup>95</sup> The credit may be subject to recapture if the project fails to meet the wage requirements during that period without subsequent cure. <sup>96</sup>
	The PTC is earned annually proportional to the kWh produced that year, <sup>97</sup> and thus the taxpayer must certify that the wage requirement is satisfied each year. <sup>98</sup>
<b>Penalty<sup>99</sup></b>	<b>If taxpayer fails to meet the above</b> , it can cure within 80 days <sup>100</sup> by paying the laborer/mechanic the difference between what they were paid and what they were owed under the requirements, with interest <sup>101</sup> <i>and</i> a \$5,000 penalty to the Treasury per underpaid laborer/mechanic. <sup>102</sup> (If the Secretary of the Treasury deems the underpayment to be intentional, the payment to the laborers is tripled and the payment to the Treasury is doubled. <sup>103</sup> )
Apprenticeship Requirements <sup>104</sup>	
<b>Requirement</b>	The taxpayer or any contractor or subcontractor performing construction work on the project who employs at least four laborers <sup>105</sup> must hire at least one qualified apprentice. <sup>xliii</sup> Apprentices must perform at least 10-15% (depending on timing of construction <sup>xliiv</sup> ) of total labor hours <sup>xliv</sup> on the project. <sup>xlvi</sup>
<b>Good Faith Exception</b>	Projects are exempted from the requirement only if their request for apprentices was denied or ignored by the registered apprenticeship program. <sup>106</sup>
<b>Penalty</b>	Penalty to the Treasury of \$50 per labor hour required that was not performed by an apprentice. <sup>107</sup> (If the Secretary of the Treasury deems the underpayment to be intentional, the payment to the Treasury is multiplied by ten. <sup>108</sup> )

### ***Domestic Content Incentives***

The ITC and the PTC may both be increased by up to 10% (10 percentage points for the ITC and 10 percent of the credit amount for the PTC) as long as “any steel, iron, or manufactured product which is a component of such facility was produced in the US.”<sup>xlvii</sup> In order to qualify, the taxpayer must submit a certification statement to the Treasury

<sup>xliii</sup> A qualified apprentice must be participating in an apprenticeship program registered under the National Apprenticeship Act. *Id.* §§ 45(b)(8)(E)(ii) (defining “qualified apprentice”), 3131(e)(3) (apprenticeship registration requirements). Additionally, a certain percentage of the apprentices must be journey workers, per Department of Labor and state requirements. *Id.* § 45(b)(8)(B).

<sup>xliiv</sup> Ten percent is required if construction starts before 2023, 12.5% if during 2023, and 15% if after. *Id.* § 45(b)(8)(A)(ii).

<sup>xliv</sup> Excluding hours by foremen, superintendents, owners, or bona fide administrative staff. *Id.* § 45(b)(8)(E)(i).

<sup>xlvi</sup> *Id.* § 45(b)(8)(i) (introducing the basic requirement).

<sup>xlvii</sup> *IRA* § 13101(g), 136 Stat. 1910–12 (codified as 26 U.S.C. §§ 45(b)(9), 48(a)(12)). The bonus credits for domestic content, like the normal ITC and PTC, see *supra* notes 11 and 97, will be reduced by one-fifth if the project or facility fails to satisfy the requisite wage and labor requirements. See *id.* §§ 48(a)(12)(C) (implementing differential bonus credits for ITC-qualifying projects that do and do not qualify as “energy projects” meeting the related wage requirements), 45(b)(9)(A) (noting that the PTC domestic content bonus credit is determined *after* application of preceding sections, including § 45(b)(6) implementing the qualified facility requirements).

that it meets the requirements in accordance with the “Buy America” regulations, which were originally promulgated pursuant to a series of statutes authorizing additional appropriations for highway construction if the relevant materials were produced in the US.<sup>109</sup>

The first step to qualify for the credit is to determine which project components are either steel/iron or manufactured products, a process simplified through IRS guidance classifying common components into these two categories for utility-scale solar, land-based wind, offshore wind, and battery energy storage projects.<sup>110</sup> Following the classification, the qualification process for steel/iron components is strict but straightforward;<sup>111</sup> by contrast, determining eligibility under the manufactured product test is more complex, since it involves determining the cost as well as place of manufacture and/or origin for *all* project components.<sup>112</sup>

To qualify for the bonus, 100% of any structural steel and iron used to construct the facility must be produced in the United States,<sup>113</sup> *and* at least 40% of the total cost of “manufactured products” used to construct the facility must “mined, produced, or manufactured” in the U.S.<sup>114</sup> (Offshore wind projects may meet a lower threshold of 20% of the cost of manufactured products used in the construction of the facility, but such facilities must still meet the 100% structural steel and iron requirements.<sup>115</sup>)

Starting in 2024, the domestic content functions as a requirement, rather than merely a bonus, for applicable entities with a maximum net output of at least 1 MW.<sup>116</sup> If such applicable entities fail to produce 100% of all structural steel and iron and 40% of all manufactured products domestically, the *entire* ITC or PTC credit (not just the bonus amount) will phase down to 90% for facilities beginning construction in 2024, 85% for facilities beginning construction in 2025, and 0% for facilities beginning construction after 2025.<sup>117</sup> The statute provides exceptions to this rule for “relevant steel, iron, or manufactured products . . . not produced in the [US] in sufficient and reasonably available quantities or of a satisfactory quality,” or where purchasing such materials would increase the cost of the facility by more than 25%.<sup>118</sup> However, Treasury has yet to issue guidance clarifying these exceptions. For all other entities (meaning non-applicable entities), the domestic content rules are only used for purposes of determining the domestic content bonus. That is, all non-applicable entities can still claim the full ITC or PTC—just not the bonus credit—even if they do not meet the domestic content requirements.

## Geography-Based Bonus Credits

The IRA offers two sets of “bonus” credits to incentivize construction of clean energy in particular areas.

First, the statute offers a bonus credit to projects qualifying for either the ITC or the PTC that are constructed in “energy communities.” This designation includes both areas that developers may avoid due to the presence of hazardous waste (i.e., brownfield sites) and two categories of regions that may otherwise be hard hit by a clean energy transition (areas with high levels of employment in fossil fuel-related industries and areas formerly occupied by coal-generating facilities<sup>xlviii</sup>).

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<sup>xlviii</sup> IRA § 13101(g), 136 Stat. 1912 (codified as 26 U.S.C. §§ 45(b)(10), 48(a)(14)).

Second, the statute allows the Secretary of the Treasury to allocate “environmental justice solar and wind capacity” to certain ITC-qualifying solar and wind facilities in low-income areas, making them eligible to receive an additional bonus credit.<sup>xlix</sup>

I describe both types of credits in this section.

### *Energy Community Credits*

As with the domestic content bonus credit, ITC and PTC qualifying projects and facilities may also receive a bonus credit of up to 10% if they are constructed in an “energy community.”<sup>i</sup> This designation includes three subcategories,<sup>ii</sup> described in **Table 6** along with the requirements for certification.

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<sup>xlix</sup> *IRA* § 13103, 136 Stat. 1921–24 (codified as 26 U.S.C. § 45(e)).

<sup>i</sup> 26 U.S.C. §§ 45(b)(11)(A), 48(a)(14)(A)–(B). As with the domestic content bonus credit, the bonus credit for energy communities will be reduced by one-fifth if the project or facility fails to satisfy the requisite wage and labor requirements; the respective implementation of this reduction for the ITC versus the PTC also mirrors that of the domestic content bonus credit. See *supra* note xlvii.

<sup>ii</sup> *Id.* §§ 45(b)(11)(B) (defining the energy community categories for PTC-qualifying projects), 48(a)(14)(A) (applying the energy communities categories defined in § 45 to ITC-qualifying projects).



**Table 6: Requirements to Qualify for Additional Energy Community Bonus Credit**

Category	Description	Certification & Data Requirements
<b>Brownfield Sites</b>	Real property of which the “expansion, redevelopment, or reuse” may be <b>“complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminants”</b> (except where environmental agencies have already initiated clean-up proceedings or closure or where the site is under the “jurisdiction, custody, or control” of the U.S. government). <sup>iii</sup>	The site must meet <u>one</u> of the following conditions: <sup>119</sup> <ul style="list-style-type: none"> <li>• Previously assessed and determined to be a brownfield site by federal, state, territory, or federally recognized Indian tribal government, <u>or</u></li> <li>• ASTM International Environmental Site Assessment finding the presence of hazardous substances<sup>iii</sup></li> </ul>
<b>Fossil Fuel Employment</b>	A metropolitan or non-metropolitan statistical area <sup>iv</sup> with <b>at least 0.17% direct employment or at least 25% local tax revenues related to the extraction, processing, transport, or storage of coal, oil, or natural gas</b> (at any time since 2010) <u>and</u> an <b>unemployment rate at least equal to the national average</b> . <sup>120</sup>	The fossil-fuel employment rate is defined as the percentage of people in the region employed in jobs classified under eight related census categories. <sup>121</sup> However, in a recent Notice, the Treasury sought guidance on calculating the percentage of fossil fuel related revenues attributable to a particular region, acknowledging that business activities are often conducted across many different regions. <sup>122</sup>  The unemployment rate will be based on the annual rate for the calendar year, released by the U.S. Bureau of Labor Statistics each April. <sup>123</sup> As such, Fossil Fuel Employment will be determined each year in May. <sup>124</sup>
<b>Census Tracts with Retired Coal Facilities</b>	A census tract in which a <b>coal mine has closed</b> since 2000 or <b>coal-firing EGU has been retired</b> since 2010 (or a census tract directly adjoining thereto). <sup>125</sup>	The census tract boundaries are based on the 2020 Census; <sup>126</sup> a “directly adjoining” census tract is one in which the boundaries touch at any single point. <sup>127</sup>  Mine closure is determined based on the Mine Data Retrieval System maintained by the U.S. Department of Labor’s Mine Safety and Health Administration. <sup>128</sup>  Data on coal-firing EGUs is drawn from databases maintained by the U.S. Energy Information Administration. <sup>iv</sup>

<sup>iii</sup> *Id.* § 45(b)(11)(B)(i) (referencing the definition of “brownfield” sites under Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. § 9601 *et seq.*); 42 U.S.C. § 9601(39) (defining brownfield sites). The “remediation or closure” exception above encompasses a wide range of actions under CERCLA as well as the Solid Waste Disposal Act and 42 U.S.C. § 6901 *et seq.*, the Toxic Substances Act, 15 U.S.C. § 2601 *et seq.* See 42 U.S.C. § 9601(39)(B).

<sup>iii</sup> Depending on the nameplate capacity of the project, the relevant assessment may be either an ASTM E1903 Phase II Environmental Site Assessment or an ASTM E1527 Phase I Environmental Site Assessment. *Id.* § 5.02(2),(3).

<sup>iv</sup> Metropolitan statistical areas and non-metropolitan statistical areas are determined, respectively, by the Office of Management and Budget and the U.S. Bureau of Labor Statistics. Notice 2023-29, 2023-20 I.R.B. 1. § 3.03(1)(a),(b).

<sup>iv</sup> *Id.* § 3.04(2)(b). Specifically, in order to qualify for the credit, the retired facility must be classified in EIA Form 860 (if retired from 2010–2015) or EIA Form 860M (if retired from 2016–2022) as having a Technology” of “Conventional Steam Coal” or “Coal Integrated Gasification Combined Cycle,” or “as having a primary fuel source code of anthracite coal, bituminous coal, lignite coal, refined coal, coal-derived synthesis gas, subbituminous coal, and waste/other coal.” *Id.*

### ***Environmental Justice Credits***

The IRA established a bonus credit increasing the ITC by 10 to 20 percentage points for qualified solar and wind facilities<sup>lvi</sup> in one of four types of communities, described in **Table 7**.<sup>129</sup> In addition to falling within one of the categories in the table, in order to qualify for the bonus credit, the Secretary of the Treasury must also “allocate” an amount of environmental justice solar and wind capacity limitation to the particular project.<sup>lvii</sup>

In total, the secretary may allocate up to 1.8 gigawatts of direct current capacity annually for 2023 and 2024, with any unused capacity from 2023 eligible to be carried forward into 2024.<sup>130</sup> A project to which an allocation is made is ineligible to claim the bonus credit if placed into service more than four years later.<sup>lviii</sup>

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<sup>lvi</sup> A qualified solar and wind property is one with a maximum net output of 5 MW and which otherwise qualifies for the ITC or, alternatively, a wind energy project placed in service after 1994 and with construction beginning before 2025. 26 U.S.C. §§ 48(e)(2) (defining “qualifying wind and solar”), 48(a)(3)(A) (defining qualifying solar), 45(d)(1) (defining qualifying wind).

<sup>lvii</sup> 26 U.S.C. § 48(e)(4). The Secretary may also make an allocation to multiple projects in a single application if all placed in service by a single taxpayer. *Id.* § 48(e)(4)(A).

<sup>lviii</sup> *Id.* § 48(e)(4)(E). The credit the project can claim is further limited by its own capacity: the amount of the bonus may not exceed the ratio of the allocation to the total megawatt nameplate capacity of the facility. *Id.* § 48(e)(1)(B). This limitation is similar in structure to similar limitations placed upon the ITC with respect to particular technologies. See *supra* notes 13 (capacity limitations for fuel cells) and 22 (capacity limitations for microturbines and combined heat and power systems).

**Table 7: Requirements to Qualify for Additional Environmental Justice Bonus Credit**

Type of Community	Description	Bonus Credit Amount (% increase in ITC)
Low-income community <sup>131</sup>	<p>A census tract (or equivalent county division) is a <b>low-income community</b> if it is designated as such by the Treasury Secretary,<sup>lix</sup> or meets the following description:</p> <ul style="list-style-type: none"> <li>• Poverty rate is at least 20%</li> <li>• Median family income is no more than 80% of the statewide family income (or the greater of the statewide and the metropolitan area median family income, if the tract is within a metropolitan area)</li> </ul>	10% <sup>132</sup>
Indian land <sup>133</sup>	<p>Land qualifies as <b>Indian land</b> if it meets one of the following definitions:</p> <ul style="list-style-type: none"> <li>• located “within the boundaries of an Indian reservation, pueblo, or rancharia”</li> <li>• held in trust by the U.S. for the benefit of a tribe or individual Indian</li> <li>• held by a Tribe, individual Indian, dependent Indian community, or Alaska Native Corporation</li> <li>• located in a census tract in which the majority of residents are members of an Indian tribe or are Alaska Natives</li> </ul>	10% <sup>134</sup>
Qualified low-income residential building project <sup>135</sup>	<p>A facility is part of a <b>qualified low-income residential housing project</b> if it is installed on a residential building within a covered housing project established by certain federal statutes<sup>lx</sup> and the financial benefits of the electricity produced are allocated equitably among the occupants.<sup>lxi</sup></p>	20% <sup>136</sup>
Qualified low-income economic benefit project <sup>137</sup>	<p>A facility is part of a <b>qualified low-income economic benefit project</b> if at least 50% of the financial benefits of the electricity produced (including that distributed below market rate) is provided to households below 200% of the poverty line or 80% of area median gross income.</p>	20% <sup>138</sup>

## Additional Credits for Technologies Beyond Wind and Solar

The IRA introduced an assortment of credits for technologies other than those qualifying for the ITC and PTC. **Table 8** summarizes each of these new credits, along with the features they share with the ITC or PTC.<sup>139</sup>

<sup>lix</sup> The Secretary may identify “targeted populations” to be treated as low-income communities even if they do not meet the indicated quantifiable metrics. *Id.* § 45D(e)(2); 12 U.S.C. § 4702(20).

<sup>lx</sup> The relevant statutes are the Violence Against Women Act of 1994, the Housing Act of 1949, and the Native American Housing Assistance and Self-Determination Act of 1996. *Id.* § 48(e)(2)(B)(i).

<sup>lxi</sup> In a Proposed Rule published June 30, 2023, the Treasury and IRS proposed that at least 50% of the total financial benefits be passed on, acknowledging that “not all the financial value of the net energy savings can be passed on to building occupants because a certain percentage can be assumed to be dedicated to lowering the operational costs of energy consumption for common areas, which benefits all building occupants.” 88 Fed. Reg. 35,791. In terms of equitable allocation, the Proposed Rule also clarified that a project could qualify either by “distributing equal shares among the qualified residential property’s units that are designated as low-income under the covered housing program, or by distributing proportional shares based on each dwelling unit’s electricity usage.” *Id.*

**Table 8: New Credits Created by the IRA for Specific Technologies**

Code	Technology	Direct Pay	Credit Amount	Wage & Apprenticeship	Other Req'ts or Bonus Credits
§ 30C	Alternative Fuel Vehicle Refueling	For applicable entities, to the extent the relevant property is subject to a depreciation allowance <sup>140</sup>	30% of the cost of “qualified alternative fuel vehicle refueling property,” <sup>141</sup> with cap per item of \$100,000 limitation per item subject to a depreciation allowance (\$1,000 cap otherwise)	Both <sup>142</sup>	Must be in a low-income area or non-urban area <sup>143</sup>
§ 45Q	Carbon Capture and Sequestration	For <i>all</i> entities, for equipment placed in service in 2023 or later <sup>144</sup>	\$10–36 per metric ton of qualified carbon oxide, depending on the method of capture <sup>145</sup>	Both <sup>146</sup>	
§ 45U	Non-Advanced Nuclear Power <sup>147</sup>	For applicable entities <sup>148</sup>	\$0.003 per kWh of electricity produced at a nuclear facility owned by the taxpayer and sold to an unrelated person <sup>149</sup>	Wage only <sup>150</sup>	
§ 45V	Clean Hydrogen	For <i>all</i> entities <sup>151</sup>	Product of 20–100%, <sup>152</sup> \$0.60, and kg of hydrogen produced during the 10-year period after such facility was originally placed in service <sup>153</sup>	Both <sup>154</sup>	
§ 45W	Commercial EVs (for a Tax-Exempt Entity)	For state, local, and tribal governments (but not Alaska Native Corporations), <i>and their instrumentalities</i> , tax-exempt entities other than farmers’ coops, and foreign entities. <sup>155</sup>	The lesser of (a) excess purchase price of the vehicle over and above a comparable vehicle (in terms of size and use) powered by gasoline or diesel, <i>or</i> (b) 15–30% of the basis <sup>156</sup> of the vehicle, subject to a maximum of \$7,500 for a small vehicle or \$40,000 otherwise. <sup>157</sup>	None	
Code	Technology	Direct Pay	Credit Amount	Wage & Apprenticeship	Other Req'ts or Bonus Credits

§ 45X	Advanced Manufacturing Credit	For <i>all</i> entities <sup>158</sup> Election is treated as made for the following 4 years (provided the final year is in 2022 or earlier) but may be revoked. <sup>159</sup>	The credit covers a vast array of technologies, each with their own dollar amount and metric of measurement. <sup>160</sup>	None	
§ 45Z	Clean Fuel Production	For applicable entities <sup>161</sup>	Up to \$1 per gallon produced at a facility producing highway vehicle fuel, or up to \$1.75 per gallon produced at a facility producing aircraft fuel, <sup>162</sup> multiplied by $\frac{(50 - \text{emissions rate})}{50}$ , where all units are expressed in kg of CO <sub>2e</sub> per mmBTU and the emissions rate is determined by the Secretary of the Treasury and published annually via regulation <sup>163</sup>	Both <sup>164</sup>	Only applies where clean fuel is produced within the United States <sup>165</sup>
§ 48C	Industrial / Manufacturing Facility for Production / Recycling of ITC-Qualifying Energy Property <sup>166</sup>	For applicable entities <sup>167</sup>	30% of the basis of the facility qualifying for the credit <sup>168</sup>	Both <sup>169</sup>	
<p><b>Notes:</b></p> <p>(1) Where applicable, wage and apprenticeship requirements mirror those described above for the ITC and PTC.</p> <p>(2) All credits in the table are transferable (as long as the transferor is not an applicable entity),<sup>170</sup> with the exception of 45X credits during the years that an entity elects for direct payment.<sup>171</sup></p> <p>(3) As described in the section above on direct pay for the ITC and PTC, “applicable entities” refers to: (a) tax-exempt entities; (b) state, local, and tribal governments (incl. Alaska Native Corporations); and (c) rural electricity cooperatives (incl. TVA).<sup>172</sup></p>					

## Variation in Financial Projections

As explained at the beginning of this paper, analysts’ estimates of how much the IRA tax credits will cost the government range widely, from almost \$400 billion to over \$1 trillion.<sup>lxii</sup> As this section further explains, the disparity in estimates is due both to issues of data availability and uncertainty inherent in the structure of the credits themselves as to how often they will be used and for how long they will be available.

<sup>lxii</sup> See *supra* text accompanying notes 7–8.

First, as explained further below, the new ITC (§ 48E) and PTC (§ 45Y) will be phased out once greenhouse gas emissions from US electricity production have been reduced by 75% compared to 2022.<sup>173</sup> Tying the credits to sector-wide emissions reductions creates uncertainty regarding their cost over time given the difficulty of estimating precisely when the specific targets will be met.

Second, the tax credits are uncapped, meaning there is no limit to the number of projects that may take advantage of the credits as long as they meet the requirements, and uptake projections depend on uncertain assumptions about the construction and operation of novel technology. Even assuming there is available data on current usage,<sup>lxiii</sup> it may be difficult to predict sizable jumps in utilization of particular technologies. For example, in estimating the total number of projects that would claim the hydrogen credits offered by the IRA,<sup>lxiv</sup> JCT relied primarily on a database of known clean hydrogen facilities<sup>lxv</sup> maintained by the International Energy Agency.<sup>174</sup> In May 2021, when JCT developed initial revenue estimates for budget reconciliation,<sup>175</sup> there were only 16 reported clean hydrogen projects in the database, and most were research or experimental facilities.<sup>176</sup> As of May 2023, there were 114 clean hydrogen projects listed, and the average project capacity in kilowatts was higher as well.<sup>177</sup> Compounding the difficulty of estimation, the popularity of certain technologies may increase either as an endogenous reaction to the availability of the tax credits themselves or due to exogenous market forces that impact supply or demand, such as the pace of technological development or the availability/price of particular inputs. Moreover, in its modelling, JCT expressly ignores the impact of one set of potentially influential exogenous factors: changes in other (non-tax) regulations or state or federal law.<sup>178</sup> For example, EPA's new proposed vehicle emission standards<sup>179</sup> could, if finalized, increase uptake of credits for electric vehicles.<sup>180</sup>

Finally, the estimate from Goldman Sachs highlights another feature of the IRA that makes it difficult to predict the IRA credits' overall impact: beyond the actual tax expenditures, the existence of the ITC, PTC, and similar credits in the IRA will make it economically feasible to fund projects to build certain technologies, which would otherwise not happen. In addition to the anticipated government spending, Goldman also estimates that the IRA credits will trigger “double the amount of energy produced by the shale revolution 15 years ago.”<sup>181</sup> While it is not possible to predict how much clean energy will be funded and developed as a result of the IRA, early market reports show increased investment from the private sector in both existing renewable technologies like solar and wind, as well as new technology such as industrial-scale battery storage and industrial-scale hydrogen.<sup>182</sup>

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<sup>lxiii</sup> In some cases, the estimation problem is further compounded by a lack of available data. For example, estimates from Argonne National Laboratory, which as of May 2023 predict a total battery manufacturing capacity of almost 1,000 gigawatt hours as of 2033, were not available when JCT was estimating uptake of the advanced manufacturing credit in providing 2021 revenue estimates. *Id.* at 14.

<sup>lxiv</sup> Clean hydrogen projects may currently elect to claim either the ITC (§ 48) or the hydrogen-specific credit (§ 45V). See *infra* note ix. Similarly, they will likely qualify for the tech-neutral version of the ITC and will be able to elect whether to claim this credit of § 45V. See *infra* note xx.

<sup>lxv</sup> See *infra* note ix (Code definition of clean hydrogen). While what constitutes “clean” hydrogen is contentious, see *infra* note xxi and accompanying text, much of the debate so far has centered around calculation of emissions rates rather than focusing on the definition of “clean hydrogen” provided in the Code.

<sup>1</sup> The first version of the ITC was passed in 1978, Energy Tax Act of 1978, Pub. L. No. 95-618, § 301, 92 Stat. 3194–99 (1978), but only became permanent in the Energy Tax Act of 1992, Pub. L. No. 102-486, § 1916(a), 106 Stat. 3024 (1992). The credit was increased from 10% to 30% under the Energy Policy Act of 2005, where it has generally remained since for most technologies. Energy Policy Act of 2005, Pub. L. No. 109-58, § 1337, 119 Stat. 1038 (2005).

<sup>2</sup> 26 U.S.C. § 48(a).

<sup>3</sup> Molly F. Sherlock, *The Renewable Electricity Production Tax Credit: In Brief*, CONG. RSCH. SERV. (Apr. 29, 2020).

<sup>4</sup> 26 U.S.C. § 45(a).

<sup>5</sup> Inflation Reduction Act of 2022, Pub. L. No. 117-169, 136 Stat. 1818 (2022) [herein *IRA*].

<sup>6</sup> See, e.g., Summer Concepcion, [Manchin threatens to back repeal of major climate and tax measure over Biden's energy policies](#), NBC News (Apr. 25, 2023) (detailing the political negotiations between Senator Joe Manchin and other Senate Democrats in the lead-up to the Act passing); Luke Broadwater, [Manchin Clashes with Biden Administration Over Climate Law](#), N.Y. Times (May 16, 2023) (same).

<sup>7</sup> [Estimated Budgetary Effects of Public Law 117-169, to Provide for Reconciliation Pursuant to Title II of S. Con. Res. 14](#), CONGRESSIONAL BUDGET OFFICE (Sep. 7, 2022) (estimating total energy security expenditures will cost \$391 billion); see also [CBO Scores IRA with \\$238 Billion of Deficit Reduction](#), COMMITTEE FOR A RESPONSIBLE FEDERAL BUDGET (Sep. 7, 2022) (summary from a nonpartisan NGO breaking down the final scoring). McKinsey, a global consulting firm, published a similar estimate. [The Inflation Reduction Act: Here's what's in it](#), MCKINSEY & COMPANY (Oct. 24, 2022) (estimating total energy security expenditures will cost \$394 billion); see also Beth Kindig, [First Solar and Other Renewable Energy Stocks That Benefit From \\$400 Billion IRA Bill](#), SEEKING ALPHA (Jun. 28, 2023) (citing the McKinsey analysis in estimating the effect of the bill on the private sector).

<sup>8</sup> [The US is poised for an energy revolution](#), GOLDMAN SACHS (Apr. 17, 2023).

<sup>9</sup> See *infra* notes vii and 42.

<sup>10</sup> See *infra* notes 11 and 43.

<sup>11</sup> Post-IRA, the energy percentages are given as 6% for the specified categories and 2% for other energy property, 26 U.S.C. § 48(a)(2)(A), but subsequently provides that these percentages shall be multiplied by five if the project has “a maximum net output of less than 1 MW of electrical . . . thermal energy” and meets prevailing wage and apprenticeship requirements (further detailed below). *Id.* § 48(a)(9).

<sup>12</sup> Section 48 defines this as “an integrated system comprised of a fuel cell stack assembly, or linear generator assembly, and associated balance of plant components which converts a fuel into electricity using electrochemical or electromechanical means,” with nameplate capacity of at least 0.5 kW and electricity-only efficiency greater than 30%. *Id.* § 48(c)(1)(A),(C).

<sup>13</sup> *Id.* § 48(a)(2)(A)(i)(I)–(V) (2021). For projects of these types, the credit shall be 26% if constructed from 2020-2022 and 22% if constructed in 2023. *Id.* § 48(a)(6)(A),(7)(A) (2021). Additionally, for projects constructed of these types constructed between 2020-2023 which are not placed into service before 2026, the credit shall be 10% for solar projects or 0% otherwise. *Id.* § 48(a)(6)(B),(7)(B) (2021). The credit for fuel cells is further limited by capacity, with an aggregate cap of \$1,500 per 0.5 kw (left unaltered by the IRA). *Id.* § 48(c)(1)(B). Additionally, both before and after the IRA, credits for wind facilities with construction starting between 2019-2022—except offshore wind facilities, *id.* § 48(a)(5)(F)—are reduced by 20-60% (relative to the credit otherwise applied) depending on the construction timing. *Id.* § 48(a)(5)(E) (2021). The IRA neither changed this provision nor extended it to facilities constructed later.

<sup>14</sup> 26 U.S.C. §§ 48(a)(2)(A)(i)(II) (electricity/heat-generating solar), 48(a)(3)(A)(ii) (light-generating solar), 48(c)(1)(D) (fuel cells), 48(c)(4)(C) (qualified small wind energy), 48(c)(5)(D) (waste energy recovery property) (2021).

<sup>15</sup> *Id.* § 48(a)(2)(A)(i)(I)–(V).

<sup>16</sup> The only remaining cap was limiting the credit to 26% for projects for which construction began after 2019 and which were placed into service before January 21, 2022. *IRA* § 13102(a), 136 Stat. 1914 (codified as 26 U.S.C. § 48(a)(6)). Compare *supra* note 13.

<sup>17</sup> *IRA* § 13102(a), 136 Stat. 1913–14. The changes are codified at the provisions noted *supra* note 14, with the exception of the expiration date for the fuel cells, which was codified as 26 U.S.C. § 48(c)(1)(E) in the updated version of the Code.

<sup>18</sup> 26 U.S.C. § 48(a)(3)(A)(i) (used to “generate electricity, heat or cool (or provide hot water for use in) a structure, or provide solar process heat”). The exception to the general rule is that this credit may not be applied for solar energy used to heat a swimming pool. *Id.*

<sup>19</sup> *Id.* § 48(a)(3)(A)(ii) (2021) (used “to illuminate the inside of a structure using fiber-optic distributed sunlight”).

<sup>20</sup> Waste energy recovery facilities are property generating electricity from buildings or equipment with a primary purpose other than electricity generation, and with capacity less than or equal to 50 MW. 26 U.S.C. § 48(c)(5)(1)–(2).

<sup>21</sup> A qualified microturbine property is defined as a stationary microturbine power plant—i.e., “an integrated system . . . converting fuel into electricity and thermal energy”—with nameplate capacity of less than 2,000 kw and electricity-only generation efficiency of 26%. *Id.* § 48(c)(2)(A),(C).

<sup>22</sup> *Id.* §§ 48(a)(2)(A)(ii),(3)(A)(iv)–(v) (2021). The credit for qualified microturbines is further limited by capacity, with an aggregate cap of \$200 per kw (left unaltered by the IRA). *Id.* § 48(c)(2)(B). The credit for combined heat and power systems is also limited by capacity, proportionally reduced by the amount which system capacity exceeds either 15 MW or mechanical energy capacity of 20,000 horsepower (or equivalent). *Id.* § 48(c)(3)(B).

<sup>23</sup> *Id.* §§ 48(a)(2)(A)(i)(IX),(3)(A)(iv)–(v).

<sup>24</sup> IRA § 13102(a), 136 Stat. 1913–14 (codified as 26 U.S.C. §§ 48(c)(2)(D) (microturbines), 48(c)(3)(A)(iv) (combined heat and power systems)).

<sup>25</sup> A combined heat and power system is one which the same energy source generates at least 20% of its total useful power in the form of electrical power or mechanical shaft power and at least 20% of its total energy in the form of thermal energy. *Id.* § 48(c)(3)(a)(i)–(ii). The “total useful electrical, thermal, and mechanical power produced by the system at normal operating rates” must be greater than 60% of the lower heating value of the fuel sources for the system, *id.* § 48(c)(3)(A)(iii),(C)(i), and the system must have a capacity of less than 50 MW and mechanical energy capacity of less than 67,000 horsepower (or equivalent), *id.* § 48(c)(3)(B)(iii). The same system cannot be both a “waste energy recovery property” and a “combined heat and power system,” but if a single system meets the capacity and energy efficiency requirements, it may elect to be treated under either category. *Id.* § 48(c)(5)(C).

<sup>26</sup> *Id.* § 48(a)(3)(A)(iii),(vii).

<sup>27</sup> *Id.* §§ 48(a)(2)(A)(ii),(3)(A)(vii) (2021).

<sup>28</sup> *Id.* §§ 48(a)(2)(A)(ii),(3)(A)(vii).

<sup>29</sup> IRA § 13102(b), 136 Stat. 1914 (codified as 26 U.S.C. § 48(a)(3)(A)(vii)).

<sup>30</sup> Energy storage technology is defined as (i) “property (other than property primarily used in the transportation of goods or individuals and not for the production of electricity) which receives, stores, and delivers energy for conversion to electricity,” with at least 5 kw nameplate capacity (with some leeway for facilities placed in service prior to enactment of the provision), or (ii) a system “directly connected to a heating, ventilation, or air conditioning system” that remove or adds heat to a storage medium for subsequent energy provision. *Id.* § 48(c)(A)–(C). A combined heat and power system may not also be classified as energy storage technology, and swimming pools and buildings are ineligible for such classification. *Id.* § 48(c)(C)(ii). Proposed Regulations released on November 17, 2023 enumerate and further define three categories of energy storage: electrical energy storage property, thermal energy storage property, and hydrogen energy storage property. [Prop. 26 C.F.R. § 1.48-9\(e\)\(10\)\(i\)–\(iv\)](#).

<sup>31</sup> IRA § 13102(f), 136 Stat. 1914–16 (codified as 26 U.S.C. §§ 48(a)(3)(A)(i)(VII)–(VIII), 48(c)(6)–(8)).

<sup>32</sup> The IRA extended the deadline for beginning construction in order to qualify as a “qualified investment credit facility” by one year, from January 1, 2024 to January 1, 2025. *Id.* § 48(a)(5)(C)(ii). Interestingly, this actually *reduced* the window for offshore wind, which, prior to the IRA, could qualify as long as construction began up to January 1, 2026. 26 U.S.C. § 48(a)(5)(F)(i)(I) (2021); IRA § 13101(e), 136 Stat. 1906 (striking the previously included date extension).

<sup>33</sup> Biogas property is defined as a system which converts biomass into gas of at least 52% methane for sale or productive use (including property used to clean or condition such a system). *Id.* § 48(c)(7)(A)–(B).

<sup>34</sup> Microgrid controllers are parts of—or used to monitor and control the energy resources of—equipment generating 4-20 MW of electricity and which is capable of connecting with or operating independently from the electrical grid (and which is independent from the bulk-power system). *Id.* § 48(c)(8)(A)–(B).

<sup>35</sup> *Id.* § 48(a)(8)(B). Microgrid controllers, *see id.*, are excepted from this definition.

<sup>36</sup> IRA § 13102(j), 136 Stat. 1918 (codified as 26 U.S.C. § 48(a)(8)).

<sup>37</sup> *See supra* note 32.

<sup>38</sup> The energy percentages are as follows: (a) 1.2% if 2.5–4 kg CO<sub>2e</sub> per kg of hydrogen; (b) 1.5% if at least 1.5 and less than 4 kg CO<sub>2e</sub> per kg of hydrogen; (c) 2% if at least 0.45 and less than 1.5 kg CO<sub>2e</sub> per kg of hydrogen; (d) 6% if less than 0.45 kg CO<sub>2e</sub> per kg of hydrogen. *Id.* § 48(a)(15)(A)(ii) (establishing the energy percentages in reference to the four categories of hydrogen facilities established by § 45V); *id.* § 45V(b)(2)(A)–(C) (denoting the thresholds for each of the four categories of hydrogen facilities). As with the other categories of credits, the energy percentages are to be multiplied by five if the project otherwise meets prevailing wage and apprenticeship requirements. *See supra* note 11.

<sup>39</sup> IRA § 13204(c), 136 Stat. 1940–41 (codified as 26 U.S.C. § 48(a)(15)).



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- <sup>40</sup> See *supra* note 32.
- <sup>41</sup> See 26 U.S.C. § 45(c)(1) (list of eligible technologies).
- <sup>42</sup> Pre-IRA, the Code stated directly that PTC-eligible projects could receive a credit equal to 1.5 cents per kWh, *id.* § 45(a) (2021).
- <sup>43</sup> Post-IRA, the Code allows a credit of 0.3 cents per kWh, multiplied by 5 for facilities with less than 1 MW of output and which meet all applicable wage and hour requirements. *Id.* § 45(a),(b)(6). A prior phaseout applying to facilities which were constructed beginning 2017-2021, *id.* § 45(b)(5), was neither deleted nor extended post-IRA. *Id.* § 45(a),(b)(6). A prior phaseout applying to facilities which were constructed beginning 2017-2021, *id.* § 45(b)(5), was neither deleted nor extended post-IRA.
- <sup>44</sup> *Id.* § 45(a)(2)(A)(ii).
- <sup>45</sup> *Id.* § 45(d)(1),(2)(A),(3)(A),4(B) (2021).
- <sup>46</sup> *Id.* § 45(d)(1),(2)(A),(3)(A),(4),(6),(7),(9),(11)(B).
- <sup>47</sup> *Id.* § 45(b)(4)(B).
- <sup>48</sup> *Id.* § 45(d)(4)(A) (2021).
- <sup>49</sup> *Id.* § 45(b)(4)(A).
- <sup>50</sup> *Id.* § 45(b)(4)(A).
- <sup>51</sup> *Id.* § 45(d)(6),(7),(9)(A),(11)(B) (2021).
- <sup>52</sup> See *supra* note 43.
- <sup>53</sup> See *supra* note 44.
- <sup>54</sup> *Id.* § 50(a)(1)(B).
- <sup>55</sup> See *id.* § 50(a)(6) (defining “investment credit property,” to which the recapture rules apply as limited to credits determined under Subpart E, which includes *id.* §§ 46–50).
- <sup>56</sup> *Id.* § 45(c)(1)(F),(c)(5),(d)(5).
- <sup>57</sup> *Id.* § 6418(f)(1)(A)(vii).
- <sup>58</sup> *Id.* § 6417(b)(8).
- <sup>59</sup> *Id.* § 45Y(g)(9)–(10).
- <sup>60</sup> *Id.* § 45Y(g)(11).
- <sup>61</sup> *Id.* § 48E(a),(b). In order to get the maximum credit, a facility must meet the applicable wage and apprenticeship requirements. *Id.* § 48E(a)(2)(A)(ii). The credit is also not available for facilities qualifying for credits under § 45 (PTC), § 45J (advanced nuclear power), § 45Q (carbon sequestration and storage), § 45U (nuclear power), § 48 (ITC), § 48A (advanced coal projects), § 48B (gasification), or § 48E (clean electricity). *Id.* § 48E(b)(3)(C). See also *supra* note 156 (defining basis).
- <sup>62</sup> *Id.* § 6418(f)(1)(A)(xi).
- <sup>63</sup> *Id.* § 6417(b)(12).
- <sup>64</sup> *Id.* § 48E(d)(3)–(4).
- <sup>65</sup> *Id.* § 48E(a)(3)(B).
- <sup>66</sup> *Id.* § 48E(h) (rules similar to those for the ITC).
- <sup>67</sup> *Id.* § 48E(a)(3)(A).
- <sup>68</sup> *Id.* §§ 45Y(b)(2)(A); 48E(b)(3)(B)(ii) (incorporating by reference the procedures pertaining to greenhouse gas emissions rates under § 45Y).
- <sup>69</sup> *Id.* §§ 45Y(b)(2)(B) (providing that the lifecycle analysis should be done via the method provided by Clean Air Act § 211(o)(1)(H) (42 U.S.C. 7545(o)(1)(H))).
- <sup>70</sup> 26 U.S.C. §§ 45Y(b)(2)(C)(i), 48E(b)(3)(B)(ii).
- <sup>71</sup> *Id.* §§ 45Y(b)(2)(C)(ii), 48E(b)(3)(B)(ii).
- <sup>72</sup> Alex Tiller, [INSIGHT: Tax Equity Remains an Under-Utilized Tool for Corporate Tax Strategy](#), BLOOMBERG TAX (Jan. 29, 2019, 9:01 AM).
- <sup>73</sup> See generally Keith Martin, [Solar tax equity structures](#), NORTON ROSE FULBRIGHT (Dec. 14, 2021).
- <sup>74</sup> See generally Rev. Proc. 2007-65, 2007-45 I.R.B. 967.
- <sup>75</sup> 26 U.S.C. § 50 (ITC recapture rules).
- <sup>76</sup> See PROJECT FINANCE LAW REVIEW 159 (David F. Asmus, ed., 3rd ed. 2021).
- <sup>77</sup> *Id.*
- <sup>78</sup> *Id.* § 4.03.
- <sup>79</sup> *Id.* § 4.04.
- <sup>80</sup> *Id.* § 4.03.
- <sup>81</sup> *Id.* § 1.704–1(b)(2)(ii)(c).
- <sup>82</sup> *Id.* § 1.704–1(b)(4)(ii).
- <sup>83</sup> *Id.* § 6417(d)(1).
- <sup>84</sup> See *id.* § 6417(a); [Elective Pay and Transferability Frequently Asked Questions: Overview](#), INTERNAL REVENUE SERVICE (last updated Jun. 14, 2023).

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- <sup>85</sup> See 26 U.S.C. § 6417(f)(2) (defining eligibility for transferability to exclude applicable entities eligible for direct pay).
- <sup>86</sup> *IRA* § 13801(b), 136 Stat. 2009–12 (codified as 26 U.S.C. § 6418) (explaining that “the transferee taxpayer . . . shall be treated as the taxpayer for purposes of this title with respect to such credit”); see also 26 U.S.C. § 6418(f)(1)(A)(ii),(ix) (defining the PTC and ITC to be among the credits eligible for transferability); *id.* §§ 267(b), 707(b)(1) (defining “related” persons).
- <sup>87</sup> See *supra* note xxiii and accompanying text.
- <sup>88</sup> See [Key Takeaways: State of the Tax Equity Market and Post-IRA Sources of Funding](#), MCDERMOTT WILL & EMERY (May 21, 2023) (webinar).
- <sup>89</sup> See Brian Murphy, [Tax equity in a direct-pay world](#), ERNST & YOUNG (Mar. 2, 2022).
- <sup>90</sup> See *supra* text accompanying notes 9 and 10.
- <sup>91</sup> See 26 U.S.C. §§ 45(b)(6)(B)(i), 48(a)(9)(B)(i) (allowing projects with less than 1 MW of maximum net output to qualify for the full credit without meeting the wage and apprenticeship requirements); [Prop. 26 C.F.R. § 1.48-13\(e\)\(1\)–\(5\)](#) (providing technology-specific rules for applying the one-megawatt exception).
- <sup>92</sup> *IRA* § 13101(f), 136 Stat. 1907–10 (codified as 26 U.S.C. §§ 45(b)(7)–(8), 48(a)(10)–(12)).
- <sup>93</sup> 26 U.S.C. §§ 45(b)(7)(A), 48(a)(10)(A).
- <sup>94</sup> The tax Code cross references 40 U.S.C. subchapter IV, which provides that the Secretary of Labor shall determine the prevailing wage rate. 26 U.S.C. §§ 45(b)(7)(A), 48(a)(10)(A).
- <sup>95</sup> *Id.* § 48(a)(10)(A).
- <sup>96</sup> *Id.* § 48(a)(10)(C). Proposed Regulations released on November 17, 2023 provide additional information on what events may trigger recapture. [Prop. 26 C.F.R. § 1.48-13\(c\)\(3\)–\(9\)](#). Under the Proposed Rules, whether there has been a recapture event will be determined annually for each year during the five-year period after the property is placed in service. *Id.* § 1.48-13(c)(3)(ii)(B). The amount of the recapture will be 100% if the recapture event occurs after the first years and will decrease by 20% each year thereafter, but the taxpayer will not be subject to any additional penalties. *Id.* § 1.48-13(c)(3)(iii),(4)(ii). If a credit is transferred and subsequently recaptured, the eligible taxpayer must notify the transferee and the transferee will be responsible for the subsequent tax increase, but no additional penalties. *Id.* § 1.48-13(c)(3)(iii),(8).
- <sup>97</sup> 26 U.S.C. § 45(a).
- <sup>98</sup> *Id.* § 45(b)(7)(A)(ii).
- <sup>99</sup> *Id.* §§ 45(b)(7)(B) (setting out the cure and penalty requirements for the PTC), 48(a)(10)(B) (cross-referencing the PTC requirements for the purpose of ITC implementation).
- <sup>100</sup> *Id.* § 45(b)(7)(B)(iv).
- <sup>101</sup> *Id.* § 45(b)(7)(B)(i)(I). The interest rate is the Federal short-term rate plus 6%. *Id.* §§ 45(b)(7)(B)(i)(I)(bb), 6621.
- <sup>102</sup> *Id.* § 45(b)(7)(B)(i)(II).
- <sup>103</sup> *Id.* § 45(b)(7)(B)(iii).
- <sup>104</sup> *Id.* §§ 45(b)(8) (setting out the apprenticeship requirements for the PTC), 48(a)(11) (cross-referencing the PTC requirements for the purpose of ITC implementation).
- <sup>105</sup> *Id.* § 45(b)(8)(C) (minimum employment requirement).
- <sup>106</sup> *Id.* § 45(b)(8)(D)(ii).
- <sup>107</sup> *Id.* § 45(b)(8)(D)(i).
- <sup>108</sup> *Id.* § 45(b)(8)(D)(iii).
- <sup>109</sup> 26 U.S.C. § 45(b)(9)(A) (referencing certification requirements); 49 C.F.R. § 661.6 (outlining certification requirements for steel, iron, and manufactured products as part of the Buy America regulations promulgated pursuant to 49 U.S.C. § 5323(j)); Notice 2023-38, 2023-22 I.R.B. 872, § 5.01 (clarifying that the taxpayer must submit an actual certification statement).
- <sup>110</sup> Notice 2023-38, 2023-22 I.R.B. 872, at 14–15, tbl. 2.
- <sup>111</sup> *Id.* § 3.02.
- <sup>112</sup> *Id.* § 3.03.
- <sup>113</sup> 26 U.S.C. § 45(b)(9)(B)(ii) (providing that application of steel and iron credit shall be applied in accordance with the Buy America regulations); 49 C.F.R. § 661.5(b) (defining the relevant requirements for steel or iron qualification); see also 26 U.S.C. § 45(b)(12)(B) (applying the steel and iron requirements outlined for PTC-qualifying projects to projects qualifying for the ITC).
- <sup>114</sup> 26 U.S.C. § 45(b)(9)(B)(iii),(C); see also *id.* § 48(a)(12)(B) (applying the manufactured product requirements outlined for PTC-qualifying projects to projects qualifying for the ITC).
- <sup>115</sup> *Id.* § 45(b)(9)(C)(ii).
- <sup>116</sup> *Id.* § 454(b)(9)(B)(ii) (excepting projects with less than 1 MW of maximum net output).

- <sup>117</sup> *Id.* § 45(b)(10) (defining the phase out for PTC-qualifying facilities); *id.* § 48(a)(13) (applying the PTC phaseout to ITC-qualifying projects).
- <sup>118</sup> *Id.* § 45(b)(10)(D).
- <sup>119</sup> Notice 2023-29, 2023-20 I.R.B. 1 § 5.
- <sup>120</sup> 26 U.S.C. § 45(b)(11)(B)(ii).
- <sup>121</sup> Notice 2023-29, 2023-20 I.R.B. 1 § 3.03(2). The eight categories are given by the following 2017 North American Industry Classification System (“NAICS”) codes: 211 (Oil and Gas Extraction); 2121 (Coal Mining); 213111 (Drilling Oil and Gas Wells); 213112 (Support Activities for Oil and Gas Operations); 213113 (Support Activities for Coal Mining); 32411 (Petroleum Refineries); 4861 (Pipeline Transportation of Crude Oil); and 4862 (Pipeline Transportation of Natural Gas). *Id.*
- <sup>122</sup> Notice 2023-29, 2023-20 I.R.B. 1 § 3.03(4).
- <sup>123</sup> *Id.* § 3.03(3).
- <sup>124</sup> *Id.*
- <sup>125</sup> *Id.* § 45(b)(11)(B)(iii).
- <sup>126</sup> Notice 2023-29, 2023-20 I.R.B. 1 § 3.04(1); 83 Fed. Reg. 56277.
- <sup>127</sup> *Id.* § 3.04(2)(c).
- <sup>128</sup> *Id.* § 3.04(2)(a). Mines listed in the Mine Safety and Health Administration were excluded where the location data was insufficiently precise to locate the mine conclusively within the listed county and state. *Id.*
- <sup>129</sup> IRA § 13103, 136 Stat. 1921–24 (codified as 26 U.S.C. § 48(e)).
- <sup>130</sup> *Id.* § 48(e)(4)(B)–(D).
- <sup>131</sup> *Id.* §§ 48(e)(2)(A)(iii)(I), 45D(e).
- <sup>132</sup> *Id.* § 48(e)(1)(A)(i).
- <sup>133</sup> *Id.* §§ 48(e)(2)(A)(iii), 25 U.S.C. § 3501(2).
- <sup>134</sup> 26 U.S.C. § 48(e)(1)(A)(i).
- <sup>135</sup> *Id.* § 48(e)(2)(B).
- <sup>136</sup> *Id.* § 48(e)(1)(A)(ii).
- <sup>137</sup> *Id.* § 48(e)(2)(C).
- <sup>138</sup> *Id.* § 48(e)(1)(A)(ii).
- <sup>139</sup> This table excludes §§ 45Y and 48E, which functionally replace the PTC and ITC, respectively, and are detailed above.
- <sup>140</sup> *Id.* §§ 6417(b)(1), 30C(d)(1).
- <sup>141</sup> “Qualified alternative fuel vehicle refueling property” refers to infrastructure used to for charging, or storing and dispensing fuel, in order to power vehicles depending on alternative fuel; a vehicle is considered to run on alternative fuel where such fuel is (1) at least 85% by volume “ethanol, natural gas, compressed natural gas, liquified natural gas, liquefied petroleum gas, hydrogen,” (2) at least 20% by volume is biodiesel, with the remaining content of the mixture contains either diesel or kerosene, or (3) electric. *Id.* § 30C(c)(1); 26 U.S.C. § 179A(d) (2013).
- <sup>142</sup> 26 U.S.C. § 30C(g).
- <sup>143</sup> 26 U.S.C. § 30C(c)(3). “Low-income” is defined using the same definition as applies to the ITC and PTC, see *supra* notes 131–lix and accompanying text, and whether the area is “urban” is based on census classification, 26 U.S.C. § 30C(c)(3)(ii).
- <sup>144</sup> *Id.* § 6417(b)(3),(d)(1)(C).
- <sup>145</sup> *Id.* § 45Q(a),(b)(1).
- <sup>146</sup> *Id.* § 45Q(h).
- <sup>147</sup> See *id.* § 45U(b)(1)(B) (excepting advanced nuclear facilities). An “advanced nuclear facility” is one for which the Nuclear Regulatory Commission approved the reactor design after December 31, 1992 (and a “substantially similar design of comparable capacity” was not previously approved). *Id.* § 45J(d)(2). Advanced nuclear facilities are eligible for a production credit of 1.8 cents per kilowatt hour of electricity for the eight years after the facility was placed in service (subject to a national limitation that may be prescribed). *Id.* § 45J(a). While similar in many ways to the production credits added by the IRA and listed in this table, § 45J was introduced by the Energy Policy Act of 2005. See Energy Policy Act of 2005, Pub. L. No. 109-58, § 1306, 119 Stat. 997–99 (Aug. 8, 2005). Notably, § 45J, along with other production related credits not introduced by the IRA, are not available for direct pay or transfer. See *generally* 26 U.S.C. §§ 6417, 6418.
- <sup>148</sup> *Id.* § 6417(b)(4).
- <sup>149</sup> *Id.* § 45U(a). The credit may be further reduced by gross receipts from electricity sold to an unrelated person and produced by a facility receiving payments based on a federal, state, or local government program based on zero-emission, zero-carbon, or air quality attributes. *Id.* § 45U(a)(2),(b)(2).

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- <sup>150</sup> *Id.* § 45U(d).
- <sup>151</sup> *Id.* § 6417(d)(1)(B).
- <sup>152</sup> The percentage varies based on CO<sub>2</sub>e per kilogram of hydrogen. See *supra* note 38 for further elaboration on the applicable percentage to apply.
- <sup>153</sup> *Id.* § 45V(a),(b).
- <sup>154</sup> *Id.* § 45V(e).
- <sup>155</sup> *Id.* §§ 6417(b)(6), 168(h)(2)(A), 521. This definition of tax-exempt and political entities largely overlaps, but importantly diverges, from the definition of “applicable entities” in the IRA. Compare *supra* note 83 and accompanying text.
- <sup>156</sup> Basis is a measurement of the taxpayer’s “capital investment in [a] property for tax purposes,” and is often equivalent to the cost at time of purchase. [Topic No. 703, Basis of Assets](#), INTERNAL REVENUE SERV. (last updated Jun. 15, 2023).
- <sup>157</sup> *Id.* § 45W(a)–(b). Fifteen percent of basis will be considered if the vehicle is powered by a gasoline or diesel engine, or 30% otherwise. *Id.* § 45W(b)(1)(A). A “small vehicle” is defined as less than 14,000 pounds. *Id.* § 45W(b)(4).
- <sup>158</sup> *Id.* § 6417(d)(1)(D)(i).
- <sup>159</sup> *Id.* § 6417(d)(1)(D)(ii).
- <sup>160</sup> See § 45X(a)(1) for the full list of available credits, including for photovoltaic cells, photovoltaic wafers, solar grade polysilicons, polymeric backsheets, solar modules, wind energy components, torque tubes, structural fasteners, inverter, electrode active materials, battery cells, battery modules, applicable critical minerals.
- <sup>161</sup> *Id.* § 6417(b)(9).
- <sup>162</sup> *Id.* § 45Z(d)(4)(A),(5)(A)(i).
- <sup>163</sup> *Id.* § 45Z(a)(1)–(3)(A), (b)(1)(A)–(B)(i). In order to get the maximum amount per gallon, a facility must meet the applicable wage and apprenticeship requirements. *Id.* § 45Y(a)(2)(B),(a)(9),(a)(10). To qualify for the credit, the facility must also produce transportation fuel with a emissions rate less than 50 kg of CO<sub>2</sub>e per mmBTU. *Id.* § 45Z(d)(5)(A)(ii).
- <sup>164</sup> *Id.* § 45Z(f)(6)–(7).
- <sup>165</sup> *Id.* § 45Z(f)(1).
- <sup>166</sup> See *id.* § 48C(c)(1) (defining what constitutes a “qualifying advanced energy project,” and which is thus eligible for the credit).
- <sup>167</sup> *Id.* § 6417(b)(11).
- <sup>168</sup> *Id.* § 45C(a). The credit is also not available for facilities qualifying for credits under § 45Q (carbon sequestration and storage), § 45V (clean hydrogen), § 48 (ITC), § 48A (advanced coal projects), or § 48E (clean electricity). *Id.* § 48E(b)(3)(C). See also *supra* note 156 (defining basis).
- <sup>169</sup> *Id.* § 48C(e)(4)–(6).
- <sup>170</sup> *Id.* § 6418.
- <sup>171</sup> *Id.* § 6417(d)(1)(D)(iii).
- <sup>172</sup> *Id.* § 6417(d)(1)(A).
- <sup>173</sup> See *infra* text accompanying note xvii.
- <sup>174</sup> [FACTORS CONSIDERED WHEN ESTIMATING THE REVENUE EFFECTS OF THE ENERGY PROVISIONS OF PUBLIC LAW 117-169 AND SUBSEQUENT DEVELOPMENTS](#), JOINT COMM. ON TAX’N 9 (2023) [herein JCT METHODOLOGY REPORT].
- <sup>175</sup> *Id.* at 3.
- <sup>176</sup> *Id.* at 9.
- <sup>177</sup> *Id.*
- <sup>178</sup> *Id.* at 8 (“[C]ertain factors that may affect future revenues are assumed to stay constant, such as Federal regulations and foreign and State laws.”).
- <sup>179</sup> Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light Duty and Medium-Duty Vehicles, 88 Fed. Reg. 29,184 (May 5, 2023).
- <sup>180</sup> See JCT METHODOLOGY REPORT at 9 (discussion of the effects of the proposed emission standards).
- <sup>181</sup> *Id.*
- <sup>182</sup> Ethan Howland, [Private equity to play growing role in renewable energy, storage and other cleantech](#): *S&P Global*, UTILITY DIVE (Apr. 19, 2023).