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The Renewable Electricity Production Tax Credit: In Brief

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SUMMARY

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The Renewable Electricity Production Tax Credit: In Brief

The renewable electricity production tax credit (PTC) is a per-kilowatt-hour (kWh) tax credit for electricity generated using qualified energy resources. For nonwind technologies, the credit expired at the end of 2017, so that only projects that began construction before the end of 2017 qualify for tax credits. After 2016, the PTC for wind remains available, at reduced rates, for wind facilities that begin construction before the end of 2019. Since the PTC is available for the first 10 years of production at a qualified facility, PTCs will continue to be claimed after the PTC's stated expiration date. Whether the PTC should be extended, modified, or allowed to expire as scheduled is an issue Congress may choose to consider.

Most recently, the PTC for nonwind technologies was retroactively extended for tax year 2017 as part of the Bipartisan Budget Act of 2018 (BBA18; P.L. 115-123). The PTC for wind was last extended in the Consolidated Appropriations Act, 2016 (P.L. 114-113). This legislation had extended the PTC for two years, through 2016, for all eligible technologies. Additionally, the PTC for wind was extended an additional three years, through 2019, but at reduced credit rates for wind facilities beginning construction in 2017, 2018, or 2019.

The PTC for wind and closed-loop biomass was first enacted in 1992. When first enacted, the PTC was scheduled to expire on July 1, 1999. Since 1999, the PTC has been extended 11 times. On several occasions, the PTC was allowed to lapse before being retroactively extended. In addition to being extended, the PTC has also been expanded over time to include additional qualifying resources. In 2017, closed-loop biomass, and geothermal technologies qualified for the full credit amount of 2.4 cents per kWh. Other technologies (open-loop biomass, small irrigation power, municipal solid waste, qualified hydropower, marine, and hydrokinetic) qualified for a half-credit amount, or 1.2 cents per kWh in 2017. Wind facilities starting construction in 2017 qualified for 80% of the full credit amount. Credit amounts are adjusted annually for inflation.

The Joint Committee on Taxation (JCT) estimates that in 2018, foregone revenues (or "tax expenditures") for the PTC were $4.8 billion. Between 2018 and 2022, under current law, tax expenditures for the renewable electricity PTC are estimated to be $25.8 billion. Extensions or modification of the PTC could increase or decrease the estimated tax expenditures associated with this provision.

The PTC has been important to the growth and development of renewable electricity resources, particularly wind. Tax incentives for renewables, however, may not be the most economically efficient way to correct for distortions in energy markets or to deliver federal financial support to the renewable energy sector. Tax subsidies reduce the average cost of electricity, increasing demand for electricity overall, countering energy-efficiency and emissions-reduction objectives. Subsidies delivered as nonrefundable tax incentives often require those wishing to use the credit find "tax-equity" partners to provide equity investments in exchange for tax credits. The use of tax equity reduced the amount of the incentive that flows directly to the renewable energy sector.

There are a number of policy options that might be considered related to the PTC. For example, the PTC could be allowed to expire as scheduled. Alternatively, the PTC could be temporarily extended. The extension could apply only to nonwind technologies. If the PTC is retroactively extended for nonwind technologies, the phaseout that currently applies to wind could be applied to nonwind PTC-eligible technologies. Another option would be to remove the phaseout that applies to wind starting in 2017. Other forms of PTC phaseout have been proposed in recent years, including elimination of the inflation adjustment factor. Another option would be to make the PTC a permanent feature of the tax code.

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This report provides a brief overview of the renewable electricity PTC. The first section of the report describes the credit. The second section provides a legislative history. The third section presents data on PTC claims and discusses the revenue consequences of the credit. The fourth section briefly considers some of the economic and policy considerations related to the credit. The report concludes by briefly noting policy options related to the PTC.

Description

The renewable electricity PTC is a per-kilowatt-hour tax (kWh) credit for electricity generated using qualified energy resources.[1] To qualify for the credit, the electricity must be sold by the taxpayer to an unrelated person. The credit can be claimed for a 10-year period once a qualifying facility is placed in service. The maximum credit amount for 2013, 2014, 2015, and 2016 was 2.3 cents per kWh. The maximum credit amount for 2017 and 2018 is 2.4 cents per kWh. The maximum credit rate, set at 1.5 cents per kWh in statute, is adjusted annually for inflation.[2] Wind (before applying the 2017-2019 phaseout rates), closed-loop biomass, and geothermal energy technologies qualify for the maximum credit amount (see **Table 1**). Other technologies, including open-loop biomass, small irrigation power, municipal solid waste, qualified hydropower, and marine and hydrokinetic energy facilities, qualify for a reduced credit amount, where the amount of the credit is reduced by one-half (see **Table 1**).[3]

Under current law, nonwind facilities for which construction began before January 1, 2018, may qualify for the PTC.[4] For wind facilities, the credit is available for facilities for which construction begins before January 1, 2020. However, for facilities that begin construction during 2017, the credit is reduced by 20%. The credit is reduced by 40% for facilities that begin construction in 2018, and reduced by 60% for facilities that begin construction in 2019. Before 2013, the PTC expiration date was a placed-in-service deadline, meaning that the electricity-producing property had to be ready and available for use before the credit's expiration date.

[1] The renewable electricity production credit can be found in §45 of the Internal Revenue Code (IRC).

[2] The inflation adjustment is based on the gross domestic product (GDP) implicit price deflator, where the 1992 GDP implicit price deflator is the base year.

[3] From 2012 through 2014, the half-credit amount was 1.1 cents per kWh. The half-credit amount increased to 1.2 cents per kWh for 2015, 2016, 2017, and 2018.

[4] A taxpayer may establish the beginning of construction by starting physical work of a significant nature or by meeting the safe harbor provided in the IRS Notice 2016-31, available at https://www.irs.gov/pub/irs-drop/n-16-31.pdf. Notice 2016-31 modifies IRS guidance related to continuous construction (see previous guidance in IRS Notice 2015-15, available at http://www.irs.gov/pub/irs-drop/n-15-25.pdf) to reflect the date changes enacted in P.L. 114-113. IRS Notice 2017-04, available at https://www.irs.gov/pub/irs-drop/n-17-04.pdf, modifies IRS Notice 2016-31.

Table 1. PTC Credit Rate and Eligible Renewable Technologies

2018

	Credit Rate (per kWh)	Qualifying Technologies
Full Credit	2.4¢	Wind (construction beginning before 2017), Closed-Loop Biomass, Geothermal
Half Credit	1.2¢	Open-Loop Biomass, Small Irrigation Power, Municipal Solid Waste, Qualified Hydropower, Marine and Hydrokinetic
60% Credit	1.44¢	Wind (construction beginning in 2018)

Source: IRC Section 45.

The amount that may be claimed for the PTC is set to phase out once the market price of electricity exceeds threshold levels. Since being enacted, market prices of electricity have never exceeded the threshold level and the PTC has not been phased out, nor is the PTC likely to be phased out under current law.[5]

In the past, the ability to claim the PTC was also, in some cases, limited by the corporate alternative minimum tax (AMT). Before 2018, the PTC was available for taxpayers subject to the AMT for the first four years of the credit. While the PTC could not be claimed against the corporate AMT, unused credits could be carried forward to offset future regular tax liability. While few firms were subject to the corporate AMT, this limitation may have been significant for those affected.[6] The corporate AMT was eliminated as part of the 2017 tax revision (P.L. 115-97).[7]

From 2009 through 2017, PTC-eligible taxpayers had the option of claiming the 30% energy investment tax credit (ITC) in lieu of the PTC. Property that was placed in service during 2009, 2010, or 2011, or which was placed under construction in one of these years, also had the option of claiming an American Recovery and Reinvestment Act (ARRA) Section 1603 grant in lieu of tax benefits.[8]

There are also production tax credits for Indian coal and refined coal.[9] Indian coal production facilities must have been placed in service before January 1, 2009, for coal produced before January 1, 2016, to receive credits. There is no placed-in-service limitation for coal produced and sold after December 31, 2015. Under current law, credits are not available for coal produced after 2017. The base rate for Indian coal is $2.00 per ton, but with the inflation adjustment the credit was $2.4 in 2017. For refined coal, the base credit amount is $4.375 per ton, and the 2018 credit with the inflation adjustment is $7.307 per ton. Refined coal facilities must have been placed in

[5] The threshold amount above which the PTC begins to phase out is 8 cents in statute, adjusted for inflation. Thus, the adjusted threshold amount for phaseout in 2018 is 12.86 cents per kWh. The reference price for the purposes of the PTC phaseout is the annual average contract price per kWh of electricity generated from the same qualified energy resource and sold in the prior year. The reference price for wind in 2018 is 4.85 cents. Because the reference price (4.85 cents) did not exceed the threshold amount (12.86 cents), there was no PTC phaseout. See https://www.gpo.gov/fdsys/pkg/FR-2018-04-19/pdf/2018-08201.pdf.

[6] For more, see Curtis Carlson and Gilbert E. Metcalf, "Energy Tax Incentives and the Alternative Minimum Tax," *National Tax Journal*, vol. 61, no. 3 (September 2008), pp. 477-491.

[7] CRS Report R45092, *The 2017 Tax Revision (P.L. 115-97): Comparison to 2017 Tax Law*, coordinated by Molly F. Sherlock and Donald J. Marples.

[8] See CRS Report R41635, *ARRA Section 1603 Grants in Lieu of Tax Credits for Renewable Energy: Overview, Analysis, and Policy Options*, by Phillip Brown and Molly F. Sherlock.

[9] Indian coal is coal produced from reserves which, on June 4, 2005, were owned by an Indian tribe or held in trust by the United States for the benefit of an Indian tribe or its members.

service before January 1, 2012, to qualify for credits. Refined coal facilities that were placed in service before this deadline may still be receiving credits, as the credit was allowed for production over a 10-year period.

Legislative History

The PTC was first enacted in 1992 as part of the Energy Policy Act of 1992 (EPACT92; P.L. 102-486). Since 1999, the PTC has been extended 11 times (see **Table 2**). In many instances, the PTC lapsed before being reinstated.

When first enacted as part of the EPACT92, the PTC was available for electricity generated using wind or closed-loop biomass systems. The credit was initially set to expire on June 30, 1999. In addition to extending the PTC through December 31, 2001, the Ticket to Work and Work Incentives Improvement Act of 1999 (P.L. 106-170) added poultry waste as a qualifying technology. The PTC was again extended, through December 31, 2003, as part of the Job Creation and Worker Assistance Act (P.L. 107-147). The Working Families Tax Relief Act of 2004 (P.L. 108-311) included provisions extending the PTC through December 31, 2005.

Legislation enacted later in the 108th Congress substantially modified the PTC. The American Jobs Creation Act of 2004 (AJCA; P.L. 108-357) added new qualifying resources, including open-loop biomass (including agricultural livestock waste), geothermal energy, solar energy, small irrigation power, and municipal solid waste (landfill gas and trash combustion facilities). Instead of being able to claim the PTC for the first 10 years of production, these new qualifying resources were limited to a five-year PTC period. Further, open-loop biomass, small irrigation power, and municipal solid waste facilities had their credit amount reduced by one-half. The AJCA also introduced a PTC for refined coal, with a rate of $4.375 per ton (indexed for inflation after 1992), available for qualifying facilities placed in service before January 1, 2009.[10]

The PTC was extended twice during the 109th Congress. The Energy Policy Act of 2005 (EPACT05; P.L. 109-58) extended the PTC for all facilities except solar energy and refined coal for two years, through 2007. EPACT05 also added two new qualifying resources: hydropower and Indian coal. Hydropower was added as a half-credit qualifying resource. Indian coal could qualify for a credit over a seven-year period, with the credit amount set at $1.50 per ton for the first four years, and $2.00 per ton for the last three years, adjusted for inflation. EPACT05 also extended the credit period from 5 years to 10 years for all qualifying facilities (other than Indian coal) placed in service after August 8, 2005. The Tax Relief and Health Care Act of 2006 (P.L. 109-432) extended the PTC for one year, through 2008, for all qualifying facilities other than solar, refined coal, and Indian coal.

The PTC was again extended and modified as part of the Emergency Economic Stabilization Act of 2008 (EESA; P.L. 110-343). The PTC for wind and refined coal was extended for one year, through 2009, while the PTC for closed-loop biomass, open-loop biomass, geothermal energy, small irrigation power, municipal solid waste, and qualified hydropower was extended for two years, through 2010. Marine and hydrokinetic renewable energy were also added by EESA as qualifying resources. A new credit for steel industry fuel was also introduced. This credit was set at $2.00 per barrel-of-oil equivalent (adjusted for inflation with 1992 as the base year). For

[10] The AJCA also limited the reduction in credit for grants, tax-exempt bonds, or other subsidized financing to 50% for facilities other than closed-loop biomass. For certain closed-loop biomass facilities, the ACJA made it so there was no reduction in credit for taxpayers receiving other forms of subsidized financing. The AJCA also made changes to the corporate AMT, allowing taxpayers to claim the PTC against the AMT and stipulating that a taxpayer's tentative minimum tax be treated as zero for the purposes of determining the tax liability limitation with respect to the PTC for the first four years of production.

facilities that were producing steel industry fuel on or before October 1, 2008, the credit was available for fuel produced and sold between October 1, 2008, and January 1, 2010. For facilities placed in service after October 1, 2008, the credit was available for one year after the placed-in-service date or through December 31, 2009, whichever was later.

Table 2. Renewable Electricity PTC Expirations and Extensions

Legislation	Date Enacted	PTC Eligibility Window	Lapse Before Extension?
Energy Policy Act of 1992 (P.L. 102-486)	10/24/1992	1/1/1993-6/30/1999 (closed-loop biomass) 1/1/1994-6/30/1999 (wind)	—
Ticket to Work and Work Incentives Improvement Act of 1999 (P.L. 106-170)	12/17/1999	7/1/1999-12/31/2001	Yes 7/1/1999-12/17/1999
Job Creation and Worker Assistance Act (P.L. 107-147)	3/9/2002	1/1/2002-12/31/2003	Yes 1/1/2002-3/9/2002
Working Families and Tax Relief Act (P.L. 108-311)	10/4/2004	1/1/2004-12/31/2005	Yes 1/1/2004-10/4/2004
The Energy Policy Act of 2005 (P.L. 109-58)	8/8/2005	1/1/2006-12/31/2007	No
The Tax Relief and Health Care Act of 2006 (P.L. 109-432)	12/20/2006	1/1/2008-12/31/2008	No
The Emergency Economic Stabilization Act of 2008 (P.L. 110-343)	10/3/2008	1/1/2009-12/31/2010 10/3/2008-12/31/2011 (marine and hydrokinetic) 1/1/2009-12/31/2009 (wind)	No
The American Recovery and Reinvestment Act of 2009 (P.L. 111-5)	2/17/2009	1/1/2011-12/31/2013 1/1/2010-12/31/2012 (wind)	No
The American Taxpayer Relief Act of 2012 (P.L. 112-240)	1/2/2013	1/1/2013-12/31/2013 (wind)	No[a]
Tax Increase Prevention Act of 2014 (P.L. 113-295)	12/19/2014	1/1/2014-12/31/2014	Yes 1/1/2014-12/19/2014
Consolidated Appropriations Act, 2016 (P.L. 114-113)	12/18/2015	1/1/2015-12/31/2016 1/1/2015-12/31/2019 (wind)[b]	Yes 1/1/2015-12/18/2015
Bipartisan Budget Act of 2018 (P.L. 115-123)	2/9/2018	1/1/2017-12/31/2017	Yes 1/1/2017-2/9/2018[c]

Source: Information compiled by CRS using the Legislative Information System (LIS).

Notes: For all lapse periods, the PTC was retroactively extended. See text for full details on qualifying technologies during different time periods.

a. The PTC expired in January 1, 2013, before being extended on January 2, 2013.

b. For wind facilities beginning construction in 2017, the credit is reduced by 20%. The credit is reduced by 40% for facilities beginning construction in 2018, and reduced by 60% for facilities beginning construction in 2019.

c. The extension was fully retroactive, in that the extension only covered a time period prior to the extension's date of enactment.

The American Recovery and Reinvestment Act of 2009 (ARRA; P.L. 111-5) provided a longer-term extension of the PTC, extending the PTC for wind through 2012 and the PTC for other renewable energy technologies through 2013. Provisions enacted in ARRA also allowed PTC-

eligible taxpayers to elect to receive a 30% investment tax credit (ITC) in lieu of the PTC. ARRA also introduced the Section 1603 grant program, which allowed PTC- and ITC-eligible taxpayers to receive a one-time payment from the Treasury in lieu of tax credits.[11] Under ARRA, the Section 1603 grant program was available for property placed in service or for which construction started in 2009 or 2010. The Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 (P.L. 111-312) extended the Section 1603 grant program for one year, through 2011.

The PTC for wind, which was scheduled to expire at the end of 2012, was extended for one year, through 2013, as part of the American Taxpayer Relief Act (ATRA; P.L. 112-240). In addition to extending the PTC for wind, provisions in ATRA changed the credit expiration date from a placed-in-service deadline to a construction start date for all qualifying electricity-producing technologies. The PTC, as well as the ITC in lieu of PTC option, was retroactively extended through 2014 as part of the Tax Increase Prevention Act of 2014 (P.L. 113-295).

The Protecting Americans from Tax Hikes (PATH) Act of 2015, enacted as Division Q of the Consolidated Appropriations Act, 2016 (P.L. 114-113), extended the PTC expiration date for nonwind facilities for two years, through the end of 2016. The ITC in lieu of PTC option was also extended through 2016. For Indian coal facilities, the production credit was extended for two years, through 2016. Additionally, for Indian coal facilities, the placed-in-service limitation was removed, allowing the credit for production at facilities placed in service after December 31, 2008, to qualify.[12] As part of Division P of the Consolidated Appropriations Act, 2016 (P.L. 114-113), the PTC for wind was extended through 2019. The credit was extended at current rates through 2016. For wind facilities beginning construction in 2017, the credit is reduced by 20%. The credit is reduced by 40% for facilities beginning construction in 2018, and reduced by 60% for facilities beginning construction in 2019.

The PTCs for nonwind technologies and the PTC for Indian coal expired at the end of 2016, but were retroactively extended for tax year 2017 in the Bipartisan Budget Act of 2018 (BBA18; P.L. 115-123). Absent further legislative action, the PTC for nonwind technologies and the PTC for Indian coal will not be available for facilities the construction of which begins after December 31, 2017.

PTC Revenue Cost Estimates and Claims

Estimates of the cost, or foregone revenue, associated with tax expenditure provisions can be found in the Joint Committee on Taxation (JCT) annual tax expenditure tables. Because JCT's figures are estimates, they may differ from actual amounts of tax credit claims. Between 2018 and 2022, estimated revenue losses associated with the PTC are $25.8 billion (see **Table 3**). Most of these revenue losses, $24.0 billion, are due to the PTC for wind energy. An estimated $0.8 billion is for PTCs for electricity produced using geothermal, $0.5 billion for PTCs for electricity generated using open-loop biomass, $0.3 billion for PTCs for electricity generated using municipal solid waste, and $0.1 billion for PTCs for electricity generated using qualified hydropower.[13] Over the same five-year period, the estimated revenue losses associated with the

[11] For more on the Section 1603 grant program, see CRS Report R41635, *ARRA Section 1603 Grants in Lieu of Tax Credits for Renewable Energy: Overview, Analysis, and Policy Options*, by Phillip Brown and Molly F. Sherlock.

[12] Additionally, modifications in P.L. 114-113 to the PTC for Indian coal (1) modified third-party sales requirements and (2) exempted the Indian coal credit from the AMT.

[13] The amount awarded to specific technologies may not sum to the total PTC tax expenditure estimate due to rounding.

production credits for refined coal and Indian coal are $0.1 billion each. JCT's tax expenditure estimates are based on current law. A policy that further extends the PTC would increase these tax expenditure estimates.

Information on PTC claims by corporations is available from the IRS through the 2013 filing year. For 2013, 230 corporate taxpayers claimed the PTC (see **Table 4**). Most of the credits claimed were for production of renewable electricity, with only a few claims being made for refined coal, Indian coal, or steel industry fuel.[14] In total, for 2013, taxpayers claimed PTCs of $2.8 billion. Because the PTC is paid out for 10 years, most PTCs awarded in any given year are the result of previous-year investments. Some taxpayers may not be able to use all of their tax credits to offset taxable income in a given tax year. In this case, taxpayers may carry forward unused credits to offset tax liability in a future tax year. In 2010, nearly $1.2 billion in PTCs were carried forward from previous tax years.[15]

The IRS data on PTC claims highlight the effect that policy actions taken in response to the economic downturn had on renewable energy tax credit claims. While the number of taxpayers claiming the PTC increased between 2008 and 2009, this number decreased after 2009. With the Section 1603 grant option available, fewer taxpayers claimed the PTC. While Section 1603 grants were available in lieu of the PTC, $15.5 billion in grants was claimed for technologies that otherwise would have been PTC-eligible.[16] This amount is not directly comparable to the costs of the PTC because Section 1603 grants were a one-time payment, while projects can claim the PTC for 10 years of production.

[14] The IRS data do not identify the number of taxpayers claiming the PTC for individual energy resources. The tax expenditure figures presented above, in **Table 3**, provide estimates of the amount of PTCs being claimed for coal as opposed to renewable resources.

[15] Taxpayers with limited tax liability may not have the ability to claim tax credits in a given tax year. Under the general business credit, unused tax credits can be carried back one year (used to offset positive tax liability in the previous tax year), or carried forward for up to 20 years (used to offset positive tax liability in future tax years). Carryforward data is not available for 2011, 2012, or 2013.

[16] This includes grants paid for wind, open- and closed-loop biomass, geothermal electricity, hydropower, landfill gas, trash, and marine technologies. A full list of awards can be found at http://www.treasury.gov/initiatives/recovery/Pages/1603.aspx.

Table 3. PTC Estimated Tax Expenditures

billions of dollars

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Renewable Resources	0.2	0.3	2.1	1.1	0.9	1.3	1.4	1.4	1.6	1.7
Wind Only					*0.6*	*0.7*	*1.0*	*1.1*	*1.3*	*1.4*
Indian Coal					-i-	-i-	-i-	-i-	-i-	-i-
Refined Coal					-i-	-i-	-i-	-i-	-i-	-i-
Total	***0.2***	***0.3***	***2.1***	***1.1***	***0.9***	***1.3***	***1.4***	***1.4***	***1.6***	***1.7***

	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total 2018-2022
Renewable Resources	1.5	2.6	3.2	4.3	4.8	5.0	5.0	4.9	4.6	25.6
Wind Only	1.2	2.3	3.1	4.0	4.5	4.7	4.7	4.6	4.3	24.0
Indian Coal	-i-	-i-	-i-	-i-	-i-	-i-	-i-	-i-	-i-	0.1
Refined Coal	-i-	-i-	-i-	-i-	-i-	-i-	-i-	-i-	-i-	0.1
Total	1.5	2.6	3.2	4.3	4.8	5.0	5.0	4.9	4.6	25.8

Source: Joint Committee on Taxation, annual tax expenditure tables, available at https://www.jct.gov/publications.html?func=select&id=5.

Notes: All figures are forward-looking estimates and do not reflect actual revenue losses. An "-i-" indicates a positive revenue loss of less than $50 million. Before 2008, the JCT did not disaggregate the cost of the PTC for different energy resources. Five-year sums for renewables include all eligible resources. Only wind and open-loop biomass are listed separately, as the revenue loss for all other technologies is estimated to be less than $50 million in any single year. Multi-year sums may differ from the sum of individual tax years due to rounding.

Table 4. Internal Revenue Service Statistics on PTC Claims

billions of dollars

	2008	2009	2010	2011	2012	2013
Number of Claimants[a]	253	260	246	230	180	230
Total Amount Claimed	$1.2	$1.5	$1.7	$1.8	$2.3	$2.8
Credits Carried Forward	$0.2	$0.6	$1.2	n.a.	n.a.	n.a.

Source: CRS analysis of Internal Revenue Service (IRS) Statistics of Income (SOI) line counts data, various years. Available at http://www.irs.gov/uac/SOI-Tax-Stats-Corporation-Income-Tax-Returns-Line-Item-Estimates.

a. This is the number of corporate taxpayers filing IRS Form 8835 to claim the Renewable Electricity, Refined Coal, and Indian Coal Production Credit. Credit amounts carried forward are not available for 2011, 2012, and 2013.

The effect of the economic downturn can also be seen in data on tax credit carry forwards. The amount of PTCs being carried forward more than doubled between 2008 and 2009, then doubled again between 2009 and 2010. During the economic downturn, taxpayers had less net income to offset with tax credits. Further, weakness in tax equity markets made it harder for renewable energy project developers to establish partnerships to monetize tax credits.[17]

Other available estimates provide information on the cost of a long-term PTC extension. The Congressional Budget Office (CBO) estimates that a permanent PTC (or a PTC extended through the budget horizon) for nonwind technologies would reduce revenues by $1.4 billion between 2019 and 2028.[18] Extending the Indian Coal Production Credit would reduce revenues by $0.4 billion between 2019 and 2028.[19] Extending the wind construction start date through the end of the budget window, beyond 2019, would reduce federal revenues by an estimated $6.9 billion between 2018 and 2027.[20]

Economic and Policy Considerations

The PTC was enacted in 1992 to promote the "development and utilization of certain renewable energy sources."[21] The 1999 sunset was included to provide an "opportunity to assess the effectiveness of the credit."[22] When the PTC was extended as part of a "tax extenders" package in

[17] For a discussion of tax equity markets for renewable energy tax credits during the economic downturn, see CRS Report R41635, *ARRA Section 1603 Grants in Lieu of Tax Credits for Renewable Energy: Overview, Analysis, and Policy Options*, by Phillip Brown and Molly F. Sherlock.

[18] This estimate is provided as part of the CBO's alternative fiscal scenario, where current policies are assumed to be continued. Estimates are generally provided to CBO by JCT. Additional information and detailed estimates are available in the Congressional Budget Office, *An Update to the Budget and Economic Outlook: 2018 to 2028*, April 2018, available at https://www.cbo.gov/about/products/budget-economic-data#3. An estimate is not available for the 2019 to 2028 budget window.

[19] *Ibid.*

[20] Congressional Budget Office, *An Update to the Budget and Economic Outlook: 2017 to 2027: Detailed Revenue Projections*, June 29, 2017, available at https://www.cbo.gov/publication/52801. Revenue losses would start in 2022. Further, an extension of the construction start date beyond 2019 does not remove the reduced value of the PTC. Under current law, the phaseout for the PTC reduces the value of the credit by 60% for facilities beginning construction in 2019.

[21] U.S. Congress, House Committee on Ways and Means, *Comprehensive National Energy Policy Act*, committee print, 102nd Cong., 2nd sess., May 5, 1992, H.Rept. 102-474, pp. 41-42.

[22] Ibid.

1999, Congress noted that the PTC had been important to the development of environmentally friendly renewable power, and extended the credit to promote further development of wind (and other) resources.[23] Recent extensions of the PTC reflect a belief that the tax incentives contribute to the development of renewable energy infrastructure, which advances environmental and energy policy goals.[24]

Research suggests that the PTC has driven investment and contributed to growth in the wind industry.[25] While further extension of the PTC may lead to further investment and growth in wind infrastructure, this potential is limited in the case of short-term extensions. Further, retroactive extensions provide what are often characterized as windfall benefits, rewarding taxpayers that made investments absent tax incentives.

While the PTC has contributed to increased use of renewable electricity resources, research on its contribution to reducing greenhouse gas emissions is mixed. In a 2013 report, the National Academy of Sciences estimated that removing tax credits for renewable electricity would result in a small (0.3%) increase in power-sector emissions.[26] In an evaluation of the renewable energy tax credit extensions enacted in P.L. 114-113, the National Renewable Energy Laboratory concluded that the recent extensions of tax credits for wind and solar contribute to reduced emissions, particularly if natural gas prices are low.[27]

A common rationale for government intervention in energy markets is the presence of "externalities," which result in "market failures."[28] Pollution resulting from the production and consumption of energy creates a negative externality, as the costs of pollution are borne by society as a whole, not just energy producers and consumers. Because producers and consumers of polluting energy resources do not bear the full cost of their production (or consumption) choices, too much energy is produced (or consumed), resulting in a market outcome that is economically inefficient.[29] Tax subsidies for clean energy resources are one policy option for

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[23] U.S. Congress, Joint Committee on Taxation, *General Explanation of Tax Legislation Enacted in the 106th Congress*, committee print, April 19, 2001, JCS-2-01, p. 25.

[24] U.S. Congress, Joint Committee on Taxation, *General Explanation of Tax Legislation Enacted in the 112th Congress*, committee print, February 2013, JCS-2-13, pp. 212-213.

[25] Several empirical studies estimate the effects of the PTC on wind investment and development. See Travis Roach, "The effect of the production tax credit on wind energy in deregulated electricity markets," *Economics Letters*, vol. 127 (2015), pp. 86-88; Gireesh Shrimali, Melissa Lynes, and Joe Indvik, "Wind energy deployment in the U.S.: An empirical analysis of the role of federal and state policies," *Renewable and Sustainable Energy Reviews*, vol. 43 (March 2015), pp. 796-806; Claudia Hitaj, "Wind Power Development in the United States," *Journal of Environmental Economics and Management*, vol. 65 (2013), pp. 394-410; Xi Lu, Jeremy Tchou, Michael B. McElroy, and Chris P. Nielsen, "The Impact of Production Tax Credits on the Profitable Production of Electricity from Wind in the U.S.," *Energy Policy*, vol. 39 (2011), pp. 4207-4214; Gilbert E. Metcalf, "Investment in Energy Infrastructure and the Tax Code," in *Tax Policy and the Economy*, ed. Jeffery R. Brown, vol. 24 (National Bureau of Economic Research, 2010), pp. 1-33.

[26] William D. Nordhaus, editor, Stephen A. Merrill, editor, and Paul T. Beaton, editor, *Effects of U.S. Tax Policy on Greenhouse Gas Emissions*, National Academy of Sciences, Washington, DC, 2013, p. 68.

[27] Trieu Mai, Wesley Cole, and Eric Lantz, et al., *Impacts of Federal Tax Credit Extensions on Renewable Deployment and Power Sector Emissions*, National Renewable Energy Laboratory, NREL/TP-6A20-65571, February 2016, http://www.nrel.gov/docs/fy16osti/65571.pdf.

[28] For a more detailed discussion of the economic rationale for intervention in energy markets, see U.S. Congress, Joint Committee on Taxation, *Present Law and Analysis of Energy-Related Tax Expenditures*, committee print, 112th Cong., March 23, 2012, JCX-28-12.

[29] Knowledge spillovers may exist in research, development, and deployment, providing a potential economic rationale for subsidization. Because firms benefit from research, development, and deployment activities of others, profit-maximizing firms will invest less in these activities than what is socially optimal. However, since knowledge spillovers can affect a broad range of industries, direct support for these activities generally may be more efficient. Further,

addressing the inefficiencies and market failures in the energy sector.[30] Here, the subsidies approach is not the most efficient way to achieve the policy objective.[31] Subsidies reduce the average cost of energy, encouraging energy consumption, countering energy conservation initiatives, and offsetting emissions reductions.[32] Additionally, tax subsidies do not necessarily provide a comparable incentive for all emissions reduction alternatives, and may favor more costly reductions over less costly ones. Finally, tax subsidies also reduce tax revenues. To the extent that these subsidies are financed by distortionary taxes on other economic activities, they reduce economic efficiency.[33]

A more direct and economically efficient approach to addressing pollution and environmental concerns in the energy sector would be a direct tax on pollution or emissions, such as a carbon tax.[34] This option would generate revenues that could be used to offset other distortionary taxes, achieve distributional goals, or reduce the deficit. A carbon tax approach would also be "technology neutral," not requiring Congress to select which technologies to subsidize.[35]

Tax incentives are also not the most efficient mechanism for delivering federal financial support directly to renewable energy developers and investors. Stand-alone projects often have limited tax liability. Thus, project developers often seek outside investors to "monetize" tax benefits using "tax-equity" financing arrangements.[36] The use of tax equity investors, often major financial institutions, reduces the amount of federal financial support for renewable energy that is delivered directly to the renewable energy sector.[37] Tax incentives that reward production, as opposed to investment, are likely to lead to more renewable electricity per dollar of federal subsidy.[38]

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production-based subsidies will become increasingly inefficient at targeting such externalities as renewable energy technology matures.

[30] There are also nontax options, such as regulations and mandates, which are beyond the scope of this report.

[31] Metcalf, Gilbert E. 2008. "Using Tax Expenditures to Achieve Energy Policy Goals." *American Economic Review*, 98(2): 90-94.

[32] The 2013 National Academy of Sciences report notes how tax credits for renewable electricity increase overall electricity demand.

[33] Gilbert E. Metcalf, "Federal Tax Policy towards Energy," Tax Policy and the Economy, vol. 21 (2007), pp. 145-184.

[34] For general background on the carbon tax option, see CRS Report R42731, *Carbon Tax: Deficit Reduction and Other Considerations*, by Jonathan L. Ramseur, Jane A. Leggett, and Molly F. Sherlock; and Donald Marron, Eric Toder, and Lydia Austin, *Taxing Carbon: What, Why, and How*, Tax Policy Center, Washington, DC, June 2015, http://www.taxpolicycenter.org/UploadedPDF/2000274-Taxing-Carbon-What-Why-and-How.pdf.

[35] For a discussion of the challenges associated with achieving technology neutrality using the subsidies approach, see testimony of Gilbert E. Metcalf before the Senate Committee on Finance, *Technology Neutrality in Energy Tax: Issues and Options*, April 23, 2009, available at http://www.finance.senate.gov/imo/media/doc/042309gmtest.pdf; and testimony of Gilbert E. Metcalf before the Senate Committee on Finance, *Reforming America's Outdated Energy Tax Code*, September 17, 2014, available at http://www.finance.senate.gov/imo/media/doc/Testimony%20-%20Gilbert%20Metcalf.pdf.

[36] For more on the use of tax-equity financing in the renewable energy sector, see Bloomberg New Energy Finance, *The Return - and Returns - of Tax Equity for US Renewable Projects*, November 21, 2011, http://about.bnef.com/white-papers/the-return-and-returns-of-tax-equity-for-us-renewable-projects/.

[37] Low-income housing tax credit (LIHTC) recipients have relied on "syndicators" to facilitate tax-equity partnerships since the credit was enacted in 1986. Carlson and Metcalf (2008) found that firms taking the PTC also tended to claim substantial amounts of LIHTCs, providing early evidence of the use of tax equity in the renewable energy sector as well. Equity provided for LIHTCs tends to fluctuate between the mid-$0.80s to low-$0.90s per $1.00 tax credit. See CRS Report RS22389, *An Introduction to the Low-Income Housing Tax Credit*, by Mark P. Keightley.

[38] Joseph E. Aldy, Todd D. Gerarden, and Richard L. Sweeney, *Investment Versus Output Subsidies: Implications of Alternatives for Wind Energy*, National Bureau of Economic Research, Working Paper 24378, March 2018.

Another consideration is the interaction of the PTC with other policies designed to support the development of renewable electricity resources.[39] More than half of U.S. states currently have renewable portfolio standards (RPS) policies in place.[40] Subsidies for renewable energy at the federal level, including the PTC, reduce the cost of complying with state-level RPS mandates.

Policy Options and Proposals

Without legislative action, the PTC is not available to nonwind projects that began construction after December 31, 2017, or wind projects that begin construction after December 31, 2019. One option is to allow the PTC to expire as scheduled. Under this option, projects that meet specified construction start dates would receive the PTC for the first 10 years of qualified production.

Another option would be to provide a temporary extension of the PTC. With this option, the construction start date deadline could be extended by a set number of years. With the enactment of P.L. 114-113, the expiration date for the PTC for wind is different than the expiration date for the PTC for other technologies. Thus, Congress may choose to extend the PTC for nonwind technologies. The extension could be made retroactive for 2018. If the PTC for nonwind technologies were extended, the phaseout that currently applies to wind could be applied to other technologies. Another alternative would be to extend the PTC for nonwind technologies, and remove the phaseout for wind, such that all PTC-eligible technologies qualified for the PTC at the same rate.

In 2014, House Ways and Means Committee Chairman Dave Camp proposed a form of PTC phaseout as part his tax reform proposal introduced in the 113th Congress, the Tax Reform Act of 2014 (H.R. 1). Under this proposal, the PTC inflation adjustment factor would have been eliminated. This would reduce the value of the PTC for renewable electricity to 1.5 cents per kWh, for all PTC-eligible properties still within the 10-year eligibility window. Thus, facilities that had received a 2.3 cent per kWh PTC in 2014, and were still within their 10-year PTC window in 2015, would have seen the value of the PTC fall to 1.5 cents per kWh for 2015 and beyond. Under Chairman Camp's proposal, the PTC would have been fully repealed after 2024. Because the value of the PTC would be reduced for existing facilities, the JCT estimates that this proposal would have raised $9.6 billion in additional federal revenues between 2014 and 2023, relative to current law at the time. A similar proposal was introduced in the 114th Congress as the PTC Elimination Act (H.R. 1901).

President Obama's FY2017 budget proposed a permanent extension of the PTC.[41] Additionally, under President Obama's proposal, the PTC would be made refundable, solar facilities would be added as qualifying property, and the credit would be modified such that renewable electricity consumed by the producer could qualify for tax credits. Solar property that currently qualifies for the residential energy efficient property credit would also be eligible for the PTC. Additionally, the investment tax credit (ITC) for renewable energy would be made permanent. In analysis of

[39] In addition to other policies, market factors, such as natural gas prices affect wind development. See CRS Report R42576, *U.S. Renewable Electricity: How Does the Production Tax Credit (PTC) Impact Wind Markets?*, by Phillip Brown.

[40] For a map summarizing October 2018 standards across states, see the U.S. Department of Energy, Energy Efficiency & Renewable Energy's map, "Renewable Portfolio Standard Policies," available at http://www.dsireusa.org/resources/detailed-summary-maps/.

[41] For more information, see Department of the Treasury, *General Explanations of the Administration's Fiscal Year 2017 Revenue Proposals*, Washington, DC, February 2016, available at https://www.treasury.gov/resource-center/tax-policy/Documents/General-Explanations-FY2017.pdf.

President Obama's FY2017 budget, the JCT estimated that making permanent the PTC and ITC, along with these other changes, would cost $19.8 billion between 2016 and 2026.[42]

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[42] Joint Committee on Taxation, *Estimated Budget Effects of the Revenue Provisions Contained in the President's FY2017 Budget Proposal*, March 24, 2016, JCX-15-16, available at https://www.jct.gov/publications.html?func=startdown&id=4902.