NUCLEAR ENERGY INSTITUTE

ZERO-EMISSION CREDITS

April 2018

INTRODUCTION

Nuclear energy provides reliable baseload electricity without carbon emissions or other air pollution. The plants that produce this electricity are economic engines for their communities, each one employing hundreds of workers, supporting thousands more job in local communities, and generating hundreds of millions of dollars in economic activity. In spite of these benefits, many nuclear plants have been facing the prospect of early closure, as market forces have challenged their economic viability. Nuclear plants are paid for their electricity, but wholesale power prices have fallen dramatically over the last five years, leaving the plants' future operation in doubt. Unless the plants are compensated for the reliability and clean air that they provide, there will not be an incentive to provide those benefits.

Nuclear plants in New York and Illinois were facing early closure in the face of deteriorating economics. State leaders recognized the benefits that would be lost and developed methods to compensate reactors for the valuable attributes they provide. Each state implemented a zero-emission credit (ZEC) to ensure that the value of generation without air emissions would be factored into decisions about the future of the plant. Because these policies were implemented, five nuclear stations that had been facing doubtful futures have instead been given a new lease on life. Investments are being made to ensure their operation for years to come.

This paper discusses the key features of a zero-emission credit program and identifies some of the differences between the programs in New York and Illinois.

What Are Zero-Emission Credits?

Zero-emission credits are payments that electricity generators receive to compensate them for the valuable attribute of not emitting greenhouse gases in the production of electricity. ZECs are modeled after credit programs in many states that support renewable energy production. Like renewable energy credits (RECs) that are generated by wind and solar generators and sold to utilities, ZECs are credits generated with each megawatt-hour (MWh) of electricity produced by the plants. Just as wind, solar and other non-emitting generators have been compensated through REC programs, ZECs have been established for nuclear energy production, specifically for those plants facing imminent closure.

Each utility is required to purchase a certain number of these credits from the plants that produce zero-emissions electricity. The utility rolls the cost of the credits into the electric customers' bills.

From the point of view of a nuclear plant owner, ZECs provide a source of revenue for an attribute that had previously been provided for free. Before these programs were in place, the markets paid primarily for the electricity that the plants produced, plus a small supplement for the capacity certainty that they provided.[1] (State air regulators and public health advocates did recognize the clean-air benefits, but nobody paid for them directly.) With these credits, each megawatt-hour of generation will receive a ZEC in addition to the price of electricity at that moment.

Setting a ZEC Price

Since the idea of the ZEC is to provide an incentive to preserve non-emitting generation, the price of the ZEC should relate to the value of the avoided emissions. ZEC programs used the 2016 social cost of carbon (SCC) as the starting point for determining credit value. The SCC was estimated by experts[2] across U.S. government agencies using computer models of the economy and environment to estimate the long-term economic impact of emissions so that these costs can be factored into a range of cost-benefit analyses. The central estimate for this cost was $42 per ton emitted.

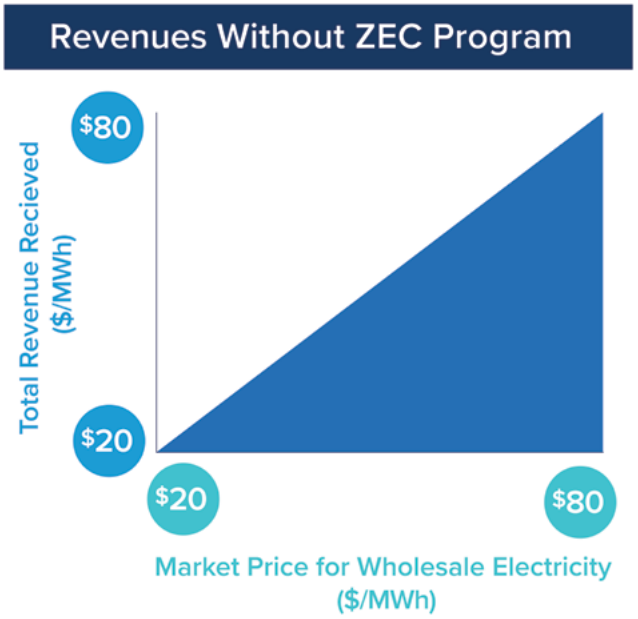
To make the program work, regulators must turn the SCC into a dollars-per-megawatt-hour value. This conversion is done by multiplying the SCC by the average emissions generated by plants running on natural gas or coal. If the fuel is natural gas, the emissions rate will likely be somewhere around 0.5 tons per megawatt-hour. If coal plants are part of the state's mix, then the amount of carbon dioxide emitted per megawatt hour would increase. Multiplying the SCC by an emissions rate will yield a baseline ZEC measured in dollars per megawatt-hour.

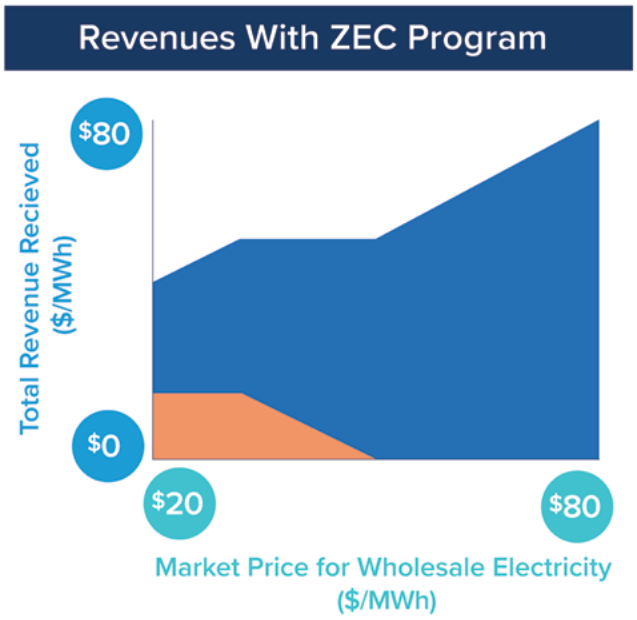
The ZEC programs also include a phaseout provision that can reduce the value of credit payments. The driver for these programs was recognition that low market prices for electricity were creating economic challenges for some nuclear plants. The programs are designed so that the payments will decrease if market prices for electricity rise. The goal is to minimize the impact on consumers.

[1] *Capacity markets are designed to ensure that there will be sufficient generation at times when the electricity system is most stressed. Since nuclear plants run over 90 percent of the time, the vast majority of the revenues for these plants are from wholesale electricity sales. When ZEC prices are calculated, capacity payments are factored in on a per-megawatt-hour basis.*

[2] *U.S. Government Interagency Working Group on Social Cost of Greenhouse Gases, Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis. July 2015.*

The figures below depict the framework. The first chart shows the one-to-one relationship between the market price of electricity on the bottom axis and the final value received by the nuclear generator, in blue, on the vertical axis. The second figure shows the impact of the ZEC and how it phases out as market prices increase. Once the wholesale power price increases to a preset level (notionally depicted at $33 per megawatt-hour in this simplified example) the ZEC, shown in orange, is reduced dollar-for-dollar as market prices exceed this threshold. The total revenues received for the nuclear generation hit a plateau until such a point that market prices greatly exceed recent history and the ZEC has been completely phased out.





Economic Impacts

The zero-emission credit programs enacted in New York and Illinois have enabled the continued operation of five nuclear plants that were otherwise facing early closure.

Notably, though consumers will cover the cost of ZECs through electricity bills, the net impact of these programs will reduce those bills. Studies by The Brattle Group, a respected economic analysis firm, examined the economic impacts of ZEC programs proposed in New York and Illinois and found in both cases that by retaining nuclear generation, more electricity was being provided by low-cost sources than would have been the case if the reactors closed. The reason is that the replacements for the nuclear plants would have been more costly fossil generators.[3] In a relatively small electricity grid such as New York's, this effect was dramatic. Brattle estimated that the ZECs would cost $482 million per year. However, if the plants closed, consumers would avoid paying the $482 million, but their total electricity bill would rise by $1.7 billion per year as more expensive fossil units were put into service.[4]

New York

The New York Clean Energy Standard (CES) includes a zero-emission credit that values the non-emitting attribute of nuclear energy. The Clean Energy Standard will allow Exelon Corp. to continue operation of two plants (Ginna Nuclear Power Plant and Nine Mile Point Nuclear Station) that had been facing early closure. Exelon was also able to buy the FitzPatrick Nuclear Power Plant from Entergy Corp. and continue to operate it. Entergy had planned to close the facility in early 2017.

[3] *In competitive wholesale electricity markets, the price paid to all generators is set by the most expensive unit that is needed to serve the demand at a given time. Since nuclear plants run all the time, they act as "price takers" effectively bidding at zero and allowing fossil fuel plants to set the market price. If the nuclear units were removed from the system, fossil plants that would have been too costly to be called upon would now be used to fill the gap left by the nuclear plants, increasing the market price that would be paid by all customers.*

[4] *The Brattle Group, Preliminary Comment on New York Department of Public Service "Staff's Responsive Proposal for Preserving Zero-Emissions Attributes," July 2016.*

On Dec. 2, 2015, New York Gov. Andrew Cuomo directed the state Public Service Commission to develop a Clean Energy Standard. The CES was to enable the state to meet the ambitious environmental goals in the New York State Energy Plan, including a 40-percent reduction in greenhouse gas emissions from 1990 levels by 2030. This 40-percent reduction is intended to move the state toward a longer-term goal of an 80-percent decrease in carbon emissions by 2050. The state aims to have 50 percent of electricity consumed in New York come from renewable sources.

Cuomo recognized the challenge that New York would face if it were to lose any of its nuclear plants. In his letter directing the Department of Public Service to develop a Clean Energy Standard, he said that the closure of nuclear facilities "would eviscerate the emission reductions achieved through the state's renewable energy programs, diminish fuel diversity, increase price volatility, and financially harm host communities." (In 2015, New York's nuclear power plants produced 44.6 million megawatt-hours of non-emitting electricity, which is 59 percent of the state's clean electricity, and avoided the emission of about 26 million tons of carbon dioxide.)

On Aug. 1, 2016, the Public Service Commission adopted the Clean Energy Standard, including a separate tier that addresses nuclear facilities in the state to complement the tiers for new and existing renewables. Under the plan, at-risk nuclear plants in the state will receive a ZEC for each megawatt-hour they produce. The ZEC program recognizes that nuclear can help the state meet its emission reduction goals, and the credit provides monetary value to encourage continuing investment and operation. The ZEC is structured to parallel the renewable energy credits received by wind and solar under many state policies, like renewable portfolio standards (RPS).

The New York State Energy Research and Development Authority will conduct the transaction. The authority will pay nuclear plant owners for the credits they produce. The load-serving entities in New York are then required to buy the ZECs from the authority. The number of ZECs that each load-serving entity must purchase is determined by its share of the electricity consumed in the state.

The price of a ZEC is set for two years at a time, based on a formula set in the policy. The calculation starts with the social cost of carbon, estimated by the federal government to be $42 per ton of emissions in 2015. Since New York participates in the Regional Greenhouse Gas Initiative (RGGI) carbon pricing system, a small portion of that avoided emission value is already captured by RGGI, so the expected price of a RGGI allowance is subtracted from the ZEC value. The remaining carbon cost is multiplied by the carbon emission rate for New York to calculate the credit in terms of dollars per megawatt-hour. Under current values, the ZEC value would be worth $17.48 per megawatt-hour. The value of the credit is expected to grow in the future as the social cost of carbon increases over time and with inflation. The ZEC concept includes a provision that will limit the value of the credit if electricity market prices rebound in the future. If the market revenues for electricity and capacity payments are forecasted to exceed $39 per megawatt-hour, then the ZEC price will be lowered by the amount above that threshold.

Analysis of the CES has shown that the cost to provide ZECs is more than offset by lower power prices to New York consumers. The Brattle Group found that electricity costs would be $1.7 billion a year lower by preserving the at-risk nuclear units, since they would have been replaced by more costly generation. With the cost of the ZEC program estimated to be less than $500 million a year in the first two years of the program, the net savings to consumers are expected to be more than $1 billion every year.

As soon as the Public Service Commission finalized the CES, Exelon, owner of the Ginna and Nine Mile Point nuclear plants, announced its intention to invest $200 million in those plants to enable their long-term operation. (Exelon had announced that Ginna and Nine Mile Point Unit 1 were facing early closure.) In addition, Exelon and Entergy announced an agreement under which Exelon would purchase the Fitzpatrick plant and continue to operate it. (Before the CES, Entergy had intended to close the plant in January 2017.) The sale was completed in March 2017.

Illinois

On Dec. 1, 2016, the Illinois Legislature passed the Future Energy Jobs Bill. The bill included several changes to the state's electricity system, including changes to the Illinois Renewable Portfolio Standard, increased support for energy efficiency and the creation of zero-emission credits for nuclear plants in the state. The passage of this bill allowed Exelon to reverse its decisions to close the Clinton Power Station in central Illinois and the Quad Cities Generating Station on the Mississippi River. These plants support around 4,200 direct jobs and $1.2 billion in economic activity in the state.

The legislation highlighted the need to retain zero-emission sources of electricity for the state to meet its environmental goals. It also highlighted the findings of a 2015 report[5] issued by four different state government agencies on the potential impacts of nuclear plant closings: increased emissions, higher electricity rates for customers, increased reliability challenges in the region and the loss of jobs. In the face of these risks, the legislature crafted a zero-emission standard that included the establishment of ZECs for nuclear generation.

Each utility must purchase ZECs equivalent to 16 percent of the megawatt-hours it sold in 2014, a level based on the RPS targets already established in the state. The ZECs will be awarded on a 10-year contract that will obligate plants to continue operating during that period, barring an exceptional event such as the imposition of a tax on nuclear facilities in the state or the discovery of the need for a major capital expense. Applicants for ZECs must provide information on their operational and financial outlook to the Illinois Power Agency, which will procure credits based on the long-term environmental impacts for the state, including the preservation of environmental attributes that would be lost through closures.

The legislation sets the value of a ZEC to be $16.50 per megawatt-hour based on the social cost of carbon. This rate increases by $1 per megawatt-hour in 2023 and each subsequent year. As described above, this rate will be reduced if electricity prices exceed a market price index that will be calculated annually based upon projected power prices for the upcoming year. The index averages future electricity prices across the state and includes capacity payments that plants in the state would be expected to receive. The baseline market price index for the initial year is calculated to be $31.40 per megawatt-hour.

As part of the broad package of reforms in the Future Energy Jobs Bill, a second limitation was included to ensure wide support for the legislation. The cost of the zero-emission credits is subject to a cap on the final rate increase for consumers. Should the cost of the ZECs result in a rate increase greater than 1.65 percent, then the number of ZECs to be purchased would be reduced to a level that would comply with this constraint rather than the goal of 16 percent of total electricity sales.

Legal Challenges

Each state program was challenged in federal court early in 2017. The complainants in each included generation companies that competed in the same markets as nuclear plants eligible for ZECs. The plaintiffs argued that ZECs interfered with the wholesale power prices set by competitive markets and the state policies should therefore be invalidated.

Each court dismissed the complaints and allowed the ZEC programs to move forward. In a July 2017 order, Judge Manish Shah held that the policy in Illinois did not impede on the authority of the Federal Energy Regulatory Commission to regulate interstate wholesale electricity markets. Since the value of ZECs is based on the social cost of carbon, "ZEC payments do not…alter the amount of money that is exchanged for wholesale electricity."

On July 25, 2017, Judge Valerie Caproni dismissed the challenge in New York. Caproni drew a clear connection between the establishment of RECs for renewable generation and ZECs for nuclear electricity: "Like RECs, ZECs are credits for the environmental attributes of energy production. Like the sales of RECs, sales of ZECs are unbundled from wholesale sales for energy or capacity. If RECs are not preempted…then the Court fails to see how ZECs are."

Both of these cases are being appealed to the U.S. Court of Appeals.

[5] *Illinois Commerce Commission, Illinois Power Agency, Illinois Environmental Protection Agency, Illinois Department of Commerce and Economic Opportunity, Potential Nuclear Power Plant Closings in Illinois: Impacts and Market-Based Solutions, Response to the Illinois General Assembly Concerning House Resolution 1146, Jan. 5, 2015. Available at: http://www.epa.illinois.gov/topics/air-quality/planning-reporting/nuclear-plant-closings/index.*

NUCLEAR ENERGY INSTITUTE

1201 F Street, NW, Suite 1100
Washington, DC 20004

nei.org