

**Pennsylvania Senate Consumer Protection and Professional Licensure Committee
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Overview of NCSL. We are the only bipartisan organization serving all state legislators and legislative staff in the 50 states, commonwealths and territories. We provide research, analysis, and information on any topic of interest to state legislatures.

NCSL Tracking the issue. We've been tracking these issues since they first came up in states around 2015. It was another year or two before the first states took action and passed measures to provide supplemental revenue to at-risk nuclear plants. We published a web document in 2016, followed by a comprehensive report on the subject in January 2017. The issue was moving so fast at that point that we published a follow-up addendum only a couple of months later.

Nuclear Power in the U.S.

- 98 operating nuclear reactors
- Seven reactors have shut down since 2013: Crystal River (FL), Kewaunee (WI), San Onofre 2&3 (CA), Vermont Yankee (VT), Fort Calhoun (NE), Oyster Creek (NJ)
- Twelve reactors scheduled to shut down over the next decade: TMI (PA), Beaver Valley 1&2 (PA), Pilgrim (MA), Perry (OH), Davis-Besse (OH), Palisades (MI), Indian Point 2&3 (NY), Diablo Canyon 1&2 (CA), Duane Arnold (IA).
- It's worth noting that 82 of the nation's reactors are currently operating on a 20-year license extension. Two power plants have applied for a second 20-year extension—with the Peach Bottom plant in Pennsylvania being one of those. This would extend the operating life for these two plants to up to 80 years and may encourage other plants to do the same. At the moment, more than half the current fleet—52 reactors—would see their 20-year license extensions expire before 2040.

U.S. Energy Mix. This is a time of change for the U.S. energy mix. There are increasingly more coal retirements, while large growth occurs in the renewables sector. Compared to Pennsylvania's energy mix at the end of slide deck, nuclear accounts for about 42 percent of the state's electricity generation so much higher than the national average, and 93 percent of the state's carbon-free electricity. But that also may be because renewables only make up about 5 percent of the state's electricity generation, so much lower than the national average.

Challenges Facing Nuclear Power. Don't want to get too far into it at this point, since everyone is basically aware of the situation facing many nuclear plants in restructured states where many are struggling to cope with lower electricity prices and reduced revenue.

Three main challenges for nuclear power in certain restructured states: The abundance of natural gas with sustained low natural gas prices, along with federal and state incentives for renewable resources, and low growth in electricity demand. It is becoming increasingly challenging for nuclear to compete.

As these issues came to light, and states were faced with the prospect of losing nuclear and coal plants, states began to consider what, if anything, ought to be done.

The Market Issue. On the one hand, electricity markets have functioned as designed. They were designed to deliver reliable electricity at the cheapest possible price. Those were the two parameters: cheapest possible power, so long as reliability wasn't impacted.

However, states have been prioritizing other issues and attributes for years. For example, 29 states and DC have mandatory renewable portfolio standards that have been around in competitive markets for decades.

These are complex issues that not only involve the energy industries impacted, but also obviously the states, market operators like PJM for Pennsylvania and FERC.

Some market operators, like PJM, have questioned this piecemeal state policy approach that we've seen to support nuclear. PJM, in particular, has said you can have market competition or integrated resource planning, but you can't have both and so they've questioned state policies that interfere with the current market and possibly suppress prices.

At the same time, PJM has acknowledged that its market design is no longer really aligned with state goals, with many states interested in valuing attributes like environmental and reliability concerns.

The actual market design may also be flawed, as PJM has said. For example, traditional baseload resources, like nuclear and coal, are not allowed to set prices, even though they're now in a position of being marginal resources—needed to meet reliability. PJM has called this an “unintended bias” against baseload resources that fails to signal the full, true cost of electricity.

I think the biggest point from this slide is there are differing opinions on whether support should be provided specifically for nuclear, but also current market structures may be out of date and flawed, and most importantly, to date, state policies are the only actions we've seen to try to address possible imbalances. These discussions are still dynamic and before FERC.

Legislative Trends. Clean energy has been the biggest trend of 2019. We have seen a variety of bills from state legislatures, but the focus is on clean energy. It is important to note that all of the nuclear support bills passed by states, to date, have also included support and incentives for renewable resources.

State Action on Nuclear Power. Since 2016, four states have adopted policies designed to provide additional revenue for nuclear power plants. New York and Illinois were the first to establish Zero Emissions Credits—commonly known as ZECs. New Jersey took up ZECs in 2018, while Connecticut decided to follow a different path by allowing some nuclear capacity to compete in a separate state-run market for large-scale renewables which tends to return higher prices.

In each case, policymakers were considering a variety of issues: jobs and the economy, clean power and emissions, diversity of the energy mix. Especially as it related to the ZECs programs, the policies were negotiated along with other clean energy initiatives.

In Illinois, for example, the law also expanded energy efficiency and renewables targets, established a low-income solar program, distributed generation rebates and a bill-crediting program for community solar. New York and New Jersey each bolstered their own clean energy programs, as well.

Zero Emissions Credits. ZECs are not, in practice, all that different from Pennsylvania’s Tier 3 Alternative Energy Credits. New Jersey calls its program Nuclear Diversity Certificates, but they are still functionally similar to ZECs.

In practice, ZECs represent a payment for every megawatt-hour of carbon-free electricity generated by qualifying power plants. The underlying assumption is that the majority of lost nuclear capacity would be replaced by gas-fired capacity. And so, ZECs are payments for the avoidance of carbon emissions and other key pollutants that would likely result from these facilities shutting down.

The reality is that the policy is really a compliment to state renewable portfolio standards, and Illinois lawmakers stated this explicitly in passing the Future Energy Jobs Act. RPS programs were initially designed to develop a fledgling renewables industry, not to broadly value carbon-free resources. This has meant that zero-carbon resources, like nuclear, haven’t had a way to receive compensation for the same environmental attributes that renewables receive.

New York initially drew up its ZECs program as a Tier 3 added to the state RPS, much like Pennsylvania is considering in Senate Bill 510. Its current ZECs model is essentially a Tier 3 with a nominal separation.

How it works. This is a very high-level breakdown of how the costs cascade down, ultimately, to ratepayers.

By the numbers. This slide provides a breakdown of the figures involved, comparing the state policies side-by-side. I’ve based Pennsylvania’s figures on Senate Bill 510.

- Bullet 1) Total annual in-state nuclear generating capacity.
- Bullet 2) How much of that capacity is eligible for the state program.
- Bullet 3) The price per megawatt-hour that qualifying plants receive.
- Bullet 4) The annual cost of the program in each state.
- Bullet 5) The number of years that each state’s program runs.
- Bullet 6) The number of reactors that would benefit.

The price I've calculated for Pennsylvania is based on my reading of Senate Bill 510. This Tier 3 price is the mean, between the cap and the floor. The Tier 3 price cap is \$7.29/MWh, which would cost \$605 million per year if 83 million megawatt-hours of nuclear are credited. The Tier 3 price floor is \$6.08 per MWh and would cost \$504 million per year if 83 million megawatt-hours of nuclear are credited.

A couple of points of note:

- 1) Illinois and New York only support a portion of their nuclear fleets—in Illinois it's only about 15 percent of the state's nuclear capacity that qualified under the state's ZECs program. There's now talk of other plants in the state being at-risk and in need of support, which hasn't necessarily sat well with legislators who thought they'd solved the problem back in 2016.
- 2) In addition, you can see that Senate Bill 510 proposes to do much more with around the same amount of money as New York. In fact, New York just raised the price of ZECs so that its program will cost closer to \$540 million over the next two years, while supporting around one-third of the nuclear capacity proposed in Pennsylvania.

Key considerations. Eligibility requirements: what type of facility will qualify? Connecticut, Illinois, New York, New Jersey have all required plants to demonstrate evidence that they're struggling financially. Illinois and New York drew up the policy to specifically include or exclude certain facilities. New Jersey requires plants to show they contribute to the diversity and resiliency of the state's energy mix, but more than in Illinois or New York, left the door open to out-of-state plants.

Price formation: New York and Illinois rely on the Social Cost of Carbon to set the price of ZECs around \$16 to \$18 per megawatt-hour, which puts the price substantially higher than what's proposed in Senate Bill 510.

New Jersey decided to put a small surcharge on ratepayer bills—\$0.004 per kilowatt-hour. The total collected over the year would then be divided between qualifying plants, and based on initial calculations, that should come out to around \$10 per megawatt-hour.

Ratepayer impacts: New Jersey limits ratepayer impacts by adding a known surcharge to ratepayer bills.

Illinois' law doesn't allow ratepayer bills to increase as a result of ZECs by more than 1.65 percent.

Both Illinois and New York established mechanisms that allow the state to reduce the price of ZECs if, for some reason, wholesale prices jump. This would prevent plants from suddenly getting a windfall at the ratepayer expense.

Senate Bill 510 establishes a price cap and floor to limit ratepayer exposure, which puts the Tier 3 price somewhere between \$6.08 per megawatt-hour and \$7.29 per megawatt-hour.

Finally, states have established ways to review the policies to see if they're still needed. In New York, prices are re-set every two years. Illinois requires annual reporting and authorizes the state to reduce prices as it sees fit. New Jersey essentially decides whether to re-up the program every three years.

Illinois' law requires a state agency to publish annual reviews which assess the net benefits to the state and calculate the cost of replacing lost nuclear capacity with other zero carbon resources. In its first (and

so far only) report issued, the Illinois Power Authority calculated that the value of avoided emissions, based on the social cost of carbon, to be just under \$3.6 billion for the first year.

It calculated the cost of replacing the three nuclear reactors that receive ZECs with other zero-carbon resources at between \$2.7 billion and \$10.2 billion, using two different methodologies to calculate the costs.

Where S.B. 510 differs. The legislation would not create a separate structure for nuclear. It's wrapped into the state's Alternative Energy Portfolio Standard. Even the Tier 3 is open to other resources than nuclear. In fact, it limits how much of the Tier 3 credits nuclear can get to 83 percent.

This is almost more in-line with the recent trend we've seen toward a broader definition of clean energy—a move toward a more technology-neutral stance.

The bill also creates penalties for failure to operate. These are unique to this bill and fairly substantial—requiring reimbursement of anywhere from 100 percent to 20 percent of the credits received if a plant shuts down in the middle of a six-year cycle.

The fact that the credits aren't tied to proof of need for financial support is a first in this area. And as we are witnessing in Illinois and elsewhere, the landscape is shifting rapidly. Lawmakers in Illinois started out only wanting to support three reactors at two plants, and now they're having to consider whether other plants that are moving into the at-risk category should also receive support. Senate Bill 510 isn't proposing to treat at-risk facilities differently. It's treating its nuclear fleet, along with additional carbon-free resources, equally across the board.

Senate Bill 510 can also be described as ambitious. It's clearly proposing to support the greatest capacity of all the programs at an annual cost that isn't substantially greater than elsewhere. New York just raised the ZEC price to \$19.59 per megawatt-hour, which goes to four reactors generating 27.6 million megawatt-hours of carbon-free power at a cost of around \$540 million. Senate Bill 510 aims to support nine reactors generating 83 million megawatt-hours of carbon-free power at a cost of around \$550 million.

ZECs in the courts. It's worth noting that the legality of these programs has been upheld so far in the courts. There have been issues with state programs running afoul of FERC jurisdiction in the past, but the ZECs programs in Illinois and New York have been separately upheld in two U.S. Courts of Appeal.

Plaintiffs have argued that the programs are distorting competitive markets under FERC jurisdiction, while states have defended the programs, saying they're functionally similar to long-accepted renewable energy credits programs.

At the moment, all parties are waiting to see if the Supreme Court decides to take up the case.

Thank you for your time today. We look forward to your questions.