

A satellite view of Earth at night, showing the illuminated continents of North and South America against the dark background of space. The city lights are visible as a dense network of yellow and white dots across the landmasses.

# Nuclear in the States Toolkit Version 1.0

Policy options for states considering the role of nuclear power in their energy mix

ANS Special Committee on Nuclear in the States  
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## Policy options for states considering the role of nuclear power in their energy mix

### Disclaimer

The American Nuclear Society's Special Committee on Nuclear in the States is proud to present its inaugural publication, Nuclear in the States Toolkit. Meant to provide policy options to states that are considering the role of nuclear power in their energy mix, the toolkit does not advocate for specific policy implementations, nor does the American Nuclear Society (ANS) promote any one solution for nuclear power. This discussion draft is meant to help state decision-makers better understand the range of policy options available, and the ANS welcomes feedback and input from readers on the material included in this report. References to any specific commercial product, process, or service by trade name, trademark, manufacturer or otherwise does not constitute or imply its endorsement or recommendation by the American Nuclear Society.

### About the American Nuclear Society

The Society is a not-for-profit, international, scientific and educational organization. It was established by a group of individuals who recognized the need to unify professional activities within the various fields of nuclear science and technology. December 11, 1954, marks the Society's historic beginning at the National Academy of Sciences in Washington, D.C. ANS has since developed a diverse membership composed of approximately 11,000 engineers, scientists, administrators, and educators representing 1,600 plus corporations, educational institutions, and government agencies. It is governed by four officers and a board of directors elected by the membership.

### About the Special Committee

In 2015, the American Nuclear Society established a Special Committee on Nuclear in the States focused on providing information to state policymakers on the benefits of new and existing nuclear energy facilities.

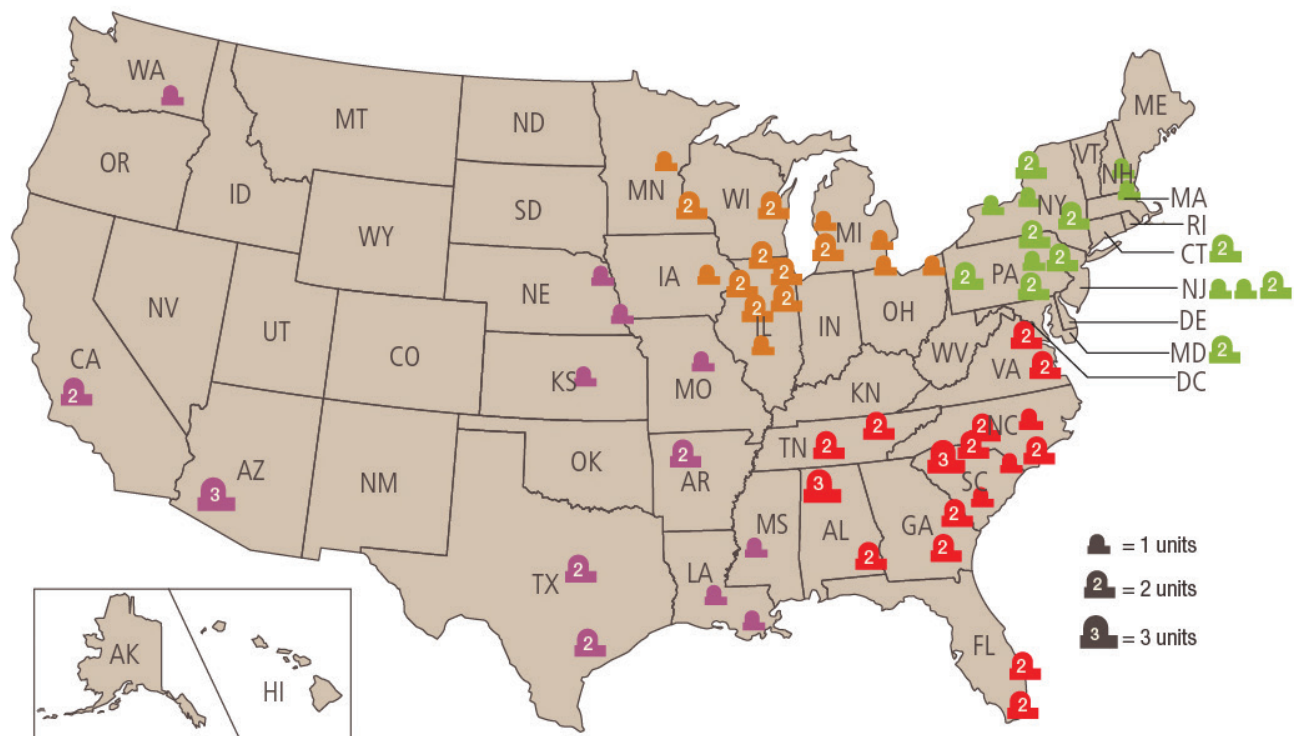
The impetus for the Committee's work was the release of the Environmental Protection Agency's (EPA) Clean Power Plan (CPP), which directs the states to create their own energy plans to meet target emission goals. "We want to give the states every opportunity to realize the benefits of nuclear power and help them understand what tools they have, and how nuclear can be part of that," said ANS President Eugene S. Grecheck.

The Special Committee is led by Dr. Peter B. Lyons, former Department of Energy (DOE) Assistant Secretary, and Donald R. Hoffman, President and CEO of Excel Services Corporation. They organized a team of ANS members in developing potential policy options for states that include nuclear energy in their Clean Power Plan compliance plans. The toolkit includes a range of other ideas to help existing and new nuclear power plants remain economically viable. This is an initial version of the toolkit, and a final version will be an integral part of a larger report on nuclear energy at the state level, due to be released later in 2016.

### Executive Summary

This toolkit outlines a variety of policy pathways to support the current nuclear fleet (Figure 1, page 2) and prevent early retirement. State policymakers should determine which, if any, of these methods are the best fit for their policy, environmental, energy, and economic goals. Each state faces a different set of circumstances regarding nuclear power. The toolkit is a comprehensive overview of a wide range of policy and other options. The ideas in the toolkit range from federal-level initiatives such as federal tax credits, to community-level options like public hearings. Both policy- and market-based tools are included. Where possible, comments and examples for each tool are provided. Input and feedback from readers is welcomed to aid in developing future versions of this toolkit. Please email [nucleartoolkit@ans.org](mailto:nucleartoolkit@ans.org) with any questions or comments.

Figure 1: U.S. Operating Commercial Nuclear Power Reactors



Map courtesy of the U.S. Nuclear Regulatory Commission  
[www.nrc.gov/reactors](http://www.nrc.gov/reactors)

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To prevent the early and permanent closure of U.S. existing nuclear power plants, the ANS Special Committee on Nuclear in the States has identified these potential tools for future use.

## Increase Nuclear Plant Revenue/Revenue Certainty

These are ways a nuclear power plant might increase revenue and revenue certainty to move closer to profitability, including Power Contracts, a Low-Carbon Portfolio Standard, Carbon Taxes, and a Nuclear Portfolio Standard.

While related, the potential positive impacts on nuclear power plant revenue from the Clean Power Plan are covered in a separate major section.

### A. Power Contracts

One proven approach to ensuring the continued financial viability of a nuclear power plant is a power purchase agreement (PPA) with a creditworthy counterparty (e.g., a regulated retail utility) that provides sufficient revenue (and revenue certainty) for the nuclear power plant owner/operator and for bondholders.

Tool/Action
<b>A negotiated power contract (or extension of an existing power contract) between a nuclear plant and an electric utility</b>
Comment
<p>Example/case study is Duane Arnold PPA (power purchase agreement) extension.<sup>1</sup></p> <p>Certain vendors to Duane Arnold supported Duane Arnold in this effort (i.e., Duane Arnold asked their vendors to sharpen their pencils).</p> <p>Some issues:</p> <ul style="list-style-type: none"><li>• Despite efforts by the nuclear power plant owner, no such PPA extensions or replacement PPAs were negotiated for the Kewaunee (Wisconsin) or Vermont Yankee (Vermont) nuclear power plants.</li><li>• The extent to which the nuclear PPA sought will be “out-of-market” is a key issue; buyers of power are not likely to agree to a PPA with prices above market prices and a PPA with prices at market may not help the nuclear plant owner.</li><li>• At the federal level, long-term PPAs are limited by budgetary “scoring” rules, which require appropriations up front for the entire cost of the agreement.<sup>2</sup></li></ul> <p>In regulated regions, state commissions would oversee the contract terms, mindful of not only market prices, but also grid reliability, emissions, and other resource planning issues. Marginal price is the most important factor, but not the only determinant.</p>

<sup>1</sup> September 2014 Order approving PPA extension is at [http://alliantenergy.com/wcm/groups/wcm\\_internet/@int/documents/document/mdaw/mtqy/~edisp/142406.pdf](http://alliantenergy.com/wcm/groups/wcm_internet/@int/documents/document/mdaw/mtqy/~edisp/142406.pdf)

<sup>2</sup> Congressional Research Service, Federal Agency Authority to Contract for Electric Power and Renewable Energy Supply (R41960), August 2011

Tool/Action
<p><b>Special power contract to keep nuclear plant in operation to maintain grid reliability</b></p>
Comment
<p>The Ginna Reliability Support Services Agreement (RSSA) was developed and put in place to avoid the nuclear plant's closure until a transmission system upgrade could be implemented.<sup>3</sup></p> <p>As of December 10, 2015, the NY PSC hearings were still not concluded.</p> <p>See: NY PSC Docket 14-E-0270<sup>4</sup> and FERC Docket ER15-1047-000<sup>5</sup></p> <p>Some issues:</p> <ul style="list-style-type: none"> <li>• NY ISO transmission study showed reliability issues.</li> <li>• Structure of RSSA to both increase level of revenue and increase certainty of revenue.</li> <li>• Intervention of other NY state generators<sup>6</sup> in NY PSC and FERC proceedings related to Ginna RSSA.</li> <li>• A significant amount of time and effort has been required to get this temporary contract approved by state and federal regulators.</li> <li>• Temporary fix – after this RSSA is expired, Ginna will have same financial issues that resulted in earlier decision to close.</li> </ul>
Tool/Action
<p><b>Initiative to ensure viability of the Davis Besse merchant nuclear power plant in Ohio</b></p>
Comment
<p>This is an active and highly contested proceeding in the Ohio PUC<sup>7</sup>. A new hearing began January 14, 2016.</p> <p>Overview:</p> <ul style="list-style-type: none"> <li>• FirstEnergy was separated into two parts by the Ohio approach to electricity reform – a regulated company with the retail electricity companies (e.g., Ohio Edison) and an unregulated market affiliate with the Davis Besse nuclear power plant and other generating stations.</li> <li>• Davis Besse faces low electricity market prices due to a combination of low natural gas prices, low demand growth, renewable penetration, and other factors.</li> <li>• FirstEnergy asked the PUCO to approve a new power contract between its regulated and unregulated affiliates that was intended to keep Davis Besse (and other units, including the Sammis coal plant) financially viable.</li> </ul> <p style="text-align: right;"><i>continued... →</i></p>

<sup>3</sup> FERC was involved in the Ginna RSSA, because the contract involved interstate power and the NY ISO electricity market.

<sup>4</sup> The NY PSC Docket document page is at <http://documents.dps.ny.gov/public/MatterManagement/CaseMaster.aspx?Mattercaseno=14-E-0270>

<sup>5</sup> FERC Docket Sheet at [http://elibrary.ferc.gov/idmws/docket\\_sheet.asp?DOCKET=ER15-1047](http://elibrary.ferc.gov/idmws/docket_sheet.asp?DOCKET=ER15-1047). The FERC Trial Staff filing on November 20, 2015 ([http://elibrary.ferc.gov/idmws/file\\_list.asp?document\\_id=14401160](http://elibrary.ferc.gov/idmws/file_list.asp?document_id=14401160)) suggests the settlement proposed by Ginna on October 21, 2015 will be accepted by FERC.

<sup>6</sup> Including other nuclear generators in New York State

<sup>7</sup> PUCO Docket 14-1297-EL-SSO <http://dis.puc.state.oh.us/CaseRecord.aspx?Caseno=14-1297&link=DIVA>

<b>Comment</b> <i>continued</i> - Initiative to ensure viability of the Davis Besse merchant nuclear power plant in Ohio
<ul style="list-style-type: none"> <li>• The FirstEnergy approach involves a CfD.<sup>8</sup></li> <li>• An earlier application to the PUCO by AEP was rejected, although the PUCO explicitly noted that a new application that met some conditions might be approved.</li> <li>• Some intervenors (e.g., the Environmental Defense Fund<sup>9</sup>) argue that any PUCO deal will not be legal. Some earlier efforts by Maryland and New Jersey to put power contracts in place were rejected by the courts because they were inconsistent with FERC's jurisdiction over interstate power markets.<sup>10</sup></li> <li>• The narrative in this proceeding has been focused on a “bailout” of FirstEnergy and “re-regulation” of the state’s utility sector.</li> </ul>
<b>Tool/Action</b>
<b>Mandate that regulated retail utilities purchase nuclear capacity and/or energy</b>
<b>Comment</b>
Some states require purchase of renewable capacity and/or energy – this may provide a template or precedent for similar requirements for purchase of nuclear capacity/energy.

## B. Low-Carbon Portfolio Standard

This would be similar to the current state renewable mandates. A requirement would be imposed on retail electricity providers that some percentage of the power they purchase for resale to ultimate consumers is sourced from generation that does not emit carbon. This would explicitly include nuclear power, in addition to other generation that does not emit carbon. The importance of this approach is that it moves the standard toward an output-based goal, namely lower carbon emissions, rather than dictating specific technologies.

<sup>8</sup> Contract for Difference. This is a two-way financial hedge contract settled on the electricity market price. The generator sells power into the electricity market and the regulated companies buy bulk power in the same electricity market. The proposed CfD would include a strike price. If electricity market prices are greater than the strike price, the generator pays the regulated company the difference between the market price and the strike price. If the market price is lower than the strike price, the regulated company pays the generator the difference between the strike price and the market price. This is a now-standard approach to power contracts when the parties are also participating in an organized electricity market. [See Appendix on page 35.]

<sup>9</sup> See <http://blogs.edf.org/energyexchange/2015/12/10/firstenergys-bailout-isnt-just-bad-policy-its-illegal/>

<sup>10</sup> A summary of the MD and NJ cases is at <http://statepowerproject.org/states/maryland-and-new-jersey/>



**Tool/Action****Illinois – proposed Low Carbon Portfolio Standard****Comment**

In 2014, Illinois introduced HB3293,<sup>11</sup> a bill that would have established a requirement that retail electric utilities in Illinois procure 70% of their electricity from sources that do not emit carbon dioxide, specifically including nuclear power. Renewables could also participate, but only if they were not already participating in earlier renewable programs in the state.

HB3293 did not get a vote in the 2015 Illinois legislative session, either in the normal summer session or in a special session later in the year. State budget issues were and continue to be pressing.

Some notes:

- The public narrative has been negative and this bill has been publicly described as a “bail-out” or as a “windfall” for Exelon’s nuclear fleet.
- Even with several detailed reports by State Agencies, it is unclear how much money is being lost by the Exelon nuclear units in Illinois – public information on specific power plant financial performance is not available – leading to public concern that these plants were not losing money.
- The recent PJM capacity market changes (i.e., to add performance requirements and penalties after the poor performance of some capacity providers in the Polar Vortex) resulted in higher capacity payments and short-term contracts for some nuclear units that allowed continued operation and stopped immediate shutdowns.

**Tool/Action****Arizona – include nuclear as renewable energy****Comment**

In early 2015, the Arizona State Senate Committee on Water and Energy passed SB1134<sup>12</sup> which would change the definition of renewable energy:

*“Renewable energy” includes solar, wind, hydroelectric, pumped storage, flywheel storage, hydrogen, geothermal, biomass and biomass baseload energy and nuclear energy from sources that are fueled by uranium fuel rods that include eighty percent or more of recycled nuclear fuel and natural thorium reactor resources under development.*

The new definition of renewable energy covers options that do not have carbon emissions and includes nuclear power.

This bill, to become law, would need to be approved by the rules committee, the Senate, and the House of Representatives.

The 2015 bill was not approved by the full Senate. Similar bills in earlier years were also not approved.

While this bill was not approved, the concepts embodied may be useful in other states.

<sup>11</sup> The HB3293 contents and status is at <http://www.ilga.gov/legislation/BillStatus.asp?DocNum=3293&GAID=13&DocTypeID=HB&SessionID=88&GA=99>

<sup>12</sup> <http://www.azleg.gov/legtext/52leg/1r/bills/sb1134p.htm>

Tool/Action
<b>New York State – proposed clean power standard</b>
Comment
<p>In late November 2015, Governor Cuomo announced that he would take actions to include nuclear in New York State renewable programs. According to news stories:</p> <ul style="list-style-type: none"> <li>• New state rules would require utilities to procure 50% or more of electricity from renewable sources (with nuclear included as renewable energy) by 2030.</li> <li>• The NY PSC is expected to start a proceeding in late 2015 or early 2016 to work out the details.</li> </ul> <p>Some observers suggest that this announcement was intended to help prevent the FitzPatrick nuclear plant from retiring early. However, the details of this plan are far from final. Even if agreed, the 2030 deadline is too far in the future to help with merchant nuclear units that have economic issues today.</p>

### C. Carbon Tax

Higher marginal cost (fuel) for fossil-fired power plants would increase electricity market prices.<sup>13</sup> Higher electricity market prices provide an indirect benefit to nuclear (and any other non-carbon-emitting) generators. A carbon tax could help nuclear, but the extent of this help depends on the level (price per ton) of the carbon tax and how the carbon tax is implemented. For example, some versions would tax based on an emission rate so that coal-fired electricity would bear a tax rate roughly twice that of natural-gas fired electricity. Coal with CCS, if in operation, would bear a lower tax rate per MWh than coal without CCS.

Tool/Action
<b>State tax on carbon</b>
Comment
<p>This has been discussed in some states (e.g., Vermont).</p> <p>There is a carbon tax in the Canadian Provinces of British Columbia and Alberta. While there are differences between rights of U.S. states and Canadian provinces, these might provide some useful lessons.</p> <p>A group of states might join to do a regional carbon tax.</p>

<sup>13</sup> Higher fuel prices would also increase costs of electricity from fossil fuel units in regulated states and these costs would be reflected in the overall ratemaking process. Higher fossil fuel prices would increase the relative benefits of nuclear energy for regulated utilities, but would not present the same bottom line profit impact as higher electricity market prices would have for a merchant nuclear plant.

Tool/Action
<b>Federal tax on carbon</b>
Comment
A federal carbon tax would not likely be contemplated as stand-alone legislation. Instead, any such tax would be seen as part of a comprehensive bill that would include an approach to recycle the revenue from the carbon tax (e.g., rebates or lowering individual/corporate income tax rates).

#### D. Nuclear Portfolio Standard

Another approach is a separate portfolio standard, similar to the current state renewable mandates, but focused only on nuclear power. A requirement would be imposed on regulated retail utilities that some percentage of the power they purchase for resale to ultimate consumers is sourced from nuclear generation.

This might allow existing renewable energy mandates and credit schemes to continue without any changes.

Tool/Action
<b>Nuclear generation portfolio mandates</b>
Comment
<p>CPP, if it were more effective, could be a tool for preservation of nuclear through portfolio mandates. Many states now use mandates for wind and solar.</p> <p>Previously, PURPA (1978) had federal mandates requiring purchases of certain types of generation (qualifying cogeneration and small power facilities and renewables) to be implemented by the states.</p> <p>Congress is unlikely to enact a nationwide nuclear portfolio standard.</p>

## Hold Public Hearings or Meetings

Hold hearings on potential early nuclear retirements, in order to:

- Create wider public knowledge of issues
- Discuss adverse economic, environmental, social, and other impacts of early retirement
- Introduce the importance to nuclear power to U.S. “P5” standing in the world and for national security
- Make the point that society (i.e., people; local, state, and federal governments; and the global environment is worse off if these nuclear plants retire early
- Potentially delay closure decisions/actions as a result of hearings or meetings<sup>14</sup>

### Meeting convener

#### White House

#### Comment

Hold a special summit (or similar) that is focused on early nuclear power plant shutdown. Examine and highlight the negative impacts of early nuclear power plant closure on economy, environment, grid reliability, electricity rates (short-term and long-term), and other aspects.

As an example, The White House convened a Summit on Nuclear Energy on November 6, 2015, to highlight importance of nuclear power in curbing carbon emissions.<sup>15</sup>

### Meeting convener

#### Congress/Committees

#### Comment

Hold hearings to examine negative impacts of early nuclear power plant closure on economy, environment, grid reliability, electricity rates (short-term and long-term), and other issues.

Some coordination could be made with major manufacturing associations and states most concerned with reliable power.

<sup>14</sup> These ideas suggests that a nuclear power plant owner might be forced to delay a planned early retirement shutdown (and incur additional losses) while waiting for a hearing. A merchant nuclear plant may have strong claims that such forced delays are not legal. On a related issue, it is important to understand whether any of the entities holding these hearings would have the power/authority to require a delay in shutdown because of a scheduled hearing.

<sup>15</sup> See [http://www.eenews.net/interactive/clean\\_power\\_plan/column\\_posts/LEz6MpBE](http://www.eenews.net/interactive/clean_power_plan/column_posts/LEz6MpBE)



**Meeting convener****Regulatory Agencies****Comment**

Impact of early nuclear retirement:

- FERC – impact on markets (short term and long-term) and on system reliability
- NERC – impact on bulk power reliability/security of supply
- EPA – impact on environment (nuclear electricity replaced by gas or coal electricity) – this may be unlikely
- NRC – environmental impact of early retirement (not seen this before, but might have basis in law) – this may be unlikely
- Other (e.g., Department of Transportation regulates gas pipeline transmission – which would increase as more nuclear is retired)

Hold hearings to examine negative impacts of early nuclear power plant closure on economy, environment, grid reliability, electricity rates (short-term and long-term), and other aspects.

**Meeting convener****Department of Energy****Comment**

Public debate and hearings may not have power of law, but could shed light on negative impacts and focus on protecting the broad public interest.

**Meeting convener****Department of Defense and General Services Administration****Comment**

Hold public hearings on negative impact on grid cost and reliability as an issue for military facilities.

**Meeting convener****State Legislatures****Comment**

Hold hearings to examine negative impacts of early nuclear power plant closure on economy, environment, grid reliability, electricity rates (short-term and long-term), and other aspects.

### Meeting convener

#### State Regulatory/Administrative Authorities

#### Comment

Impact of early nuclear retirements:

- Public Utility Commission
- State Energy Commission (if there is one)
- State Environmental Department/Agency
- Land use planning bodies
- Other

Hold hearings to examine negative impacts of early nuclear power plant closure on economy, environment, grid reliability, electricity rates (short-term and long-term), and other aspects.

### Meeting convener

#### City, county, and other local government entities

#### Comment

Hold meetings on protecting local interest in jobs, tax revenue, and manufacturing.

Emphasize the importance of nuclear power for future expansion of mass transit<sup>16</sup> and electric buses and cars (which will not typically be recharged by wind and solar).

### Meeting convener

#### Various non-governmental entities

#### Comment

The multiple entities that have an interest in this topic could hold meetings or hearings on the general issues related to the negative impact of early nuclear power plant retirement or on specific plants.

These entities might include ANS, NEI, NARUC, or other entities with visibility on mainstream and social media.

<sup>16</sup> High relevance for nuclear power, especially for major urban areas, that should be important for most states. Urban areas are where nuclear can replace or offset fossil fuel use not just in electricity, but also in public/private transportation. This may be more important after 2030, when the focus is on even lower 2050 carbon targets.

## Clean Power Plan

Implementation of a state plan to meet CPP requirements might be done in a manner that helps existing and new nuclear power plants.

Tool/Action
<b>Implement a mass-based plan to comply with requirements of CPP</b>
Comment
<p>A mass-based plan might be structured to provide existing (or new) nuclear power plants with clean power certificates that could be sold.</p> <p>A mass-based approach that an allocation of allowances to all electricity generators, including existing and new nuclear power plants, would potentially provide additional revenue to nuclear power plants.</p> <p>In contrast to rate-based goals, generation from all nuclear capacity, both existing and new, contributes to compliance with mass-based goals by either satisfying new demand with zero-carbon generation or satisfying existing demand that would, in nearly all states, almost certainly be alternatively satisfied by CO<sub>2</sub>-emitting “affected electricity generating units (EGUs)” if the nuclear capacity were not available.</p>
Tool/Action
<b>Implement a rate-based plan to comply with requirements of CPP</b>
Comment
<p>Generation from new nuclear capacity added (through new-build construction or capacity uprates at existing plants) between 2014 and 2030 may earn Emission Reduction Credits (ERCs) during the compliance period from 2022 through 2030. These ERCs may contribute to compliance with the state's rate-based goal.</p> <p>However, generation from existing nuclear capacity cannot make any significant contributions toward compliance with a rate-based goal, since such generation is not eligible for ERCs.</p>

**Tool/Action****EPA Clean Power Plan Evaluation Tool****Comment**

Developed by PhD students at the University of Tennessee.

Allows for exploration through virtually limitless state compliance scenarios using EPA provided data and calculations<sup>17</sup> in addition to a visualization of current generation sources and related carbon emissions.

Shows the effectiveness of new nuclear construction and uprates towards compliance with both mass and intensity based plans.

<https://bccpp.shinyapps.io/mycpp/> [under development]

**Tool/Action****Analysis Group CPP paper****Comment**

In July 2014, The Analysis Group released a report “EPA’s Clean Power Plan: States’ Tools for Reducing Costs and Increasing Benefits to Consumers.” This report<sup>18</sup> is not focused on nuclear power, but has a detailed analysis of the CPP and the impact that various approaches might have on existing and new nuclear power plants.

**Tool/Action****Regional Greenhouse Gas Initiative (RGGI)****Comment**

Other states might consider adopting an approach similar to the Regional Greenhouse Gas Initiative (RGGI), with detailed rules that help nuclear power.

RGGI is the first market-based regulatory program in the United States to reduce greenhouse gas emissions. RGGI is a cooperative effort among the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont to cap and reduce CO<sub>2</sub> emissions from the power sector.

RGGI states sell nearly all emission allowances through auctions and invest proceeds in energy efficiency, renewable energy, and other consumer benefit programs. These programs are spurring innovation in the clean energy economy and creating green jobs in the RGGI states. More information on RGGI is at <http://www.rggi.org/>

<sup>17</sup> <http://www.epa.gov/cleanpowerplan/clean-power-plan-final-rule-technical-documents>

<sup>18</sup> The report can be obtained at [http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis\\_group\\_epa\\_clean\\_power\\_plan\\_report.pdf](http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis_group_epa_clean_power_plan_report.pdf)



Tool/Action
<b>Cap and Trade</b>
Comment
<p>Cap and trade approaches might be another approach to controlling carbon that has the potential to help nuclear power.</p> <p>Cap and trade is an environmental policy tool that delivers results with a mandatory cap on emissions while providing sources flexibility in how they comply. Successful cap and trade programs reward innovation, efficiency, and early action and provide strict environmental accountability without inhibiting economic growth.</p> <p>Examples of successful cap and trade programs include the nationwide Acid Rain Program and the regional NOx Budget Trading Program in the Northeast. Additionally, EPA issued the Clean Air Interstate Rule (CAIR) on March 10, 2005, to build on the success of these programs and achieve significant additional emission reductions. More at <a href="http://www3.epa.gov/captrade/">http://www3.epa.gov/captrade/</a></p>

Mergers or Takeovers

Nuclear power plant owners have indicated that a primary driver of early retirement is financial losses due to low electricity market prices caused by low natural gas prices, low demand growth, subsidized renewable penetration, and other factors. Absent of any other issues, these owners might sell a plant slated for early retirement for as low as zero dollars<sup>19</sup> to a new financially credible (i.e., for purposes of decommissioning fund) owner. The current owner might also provide plant operation services for a fee (e.g., Exelon Nuclear Partners operates Fort Calhoun for OPPD<sup>20</sup>).

The economically threatened nuclear power plants have financial losses caused by low electricity market prices. The primary reason for early retirement is to stop these financial losses and improve corporate profits.

The market value of these economically threatened nuclear power plants, with no changes, is at or below zero. If a bona fide buyer<sup>21</sup> offered to take one of these economically threatened nuclear power plants for nothing, the current owners might accept that offer.

In electricity markets, the early retirement of a nuclear power plant will make the market more profitable for other generators. In some instances, these other generators will include nuclear generators. Any effort to save an economically threatened nuclear power plant will have an adverse economic impact on the other market participants. We should anticipate and address the concerns of these market participants.

There are two broad categories: industry consolidation (i.e., where another nuclear operator is the buyer) and public or government ownership (i.e., where a government entity such as New York Power Authority is the buyer).

A. Industry Consolidation

If an economically-threatened nuclear power plant is a single unit plant, another nuclear operator with other units nearby might be able to take the plant over and achieve lower costs than the original owner. This seems not to have been feasible for Kewaunee (Point Beach is nearby) and FitzPatrick (Nine Mile Point 1 & 2 are nearby).

Tool/Action
Mergers or acquisitions
Comment
Further consolidation – Exelon buying Fitzpatrick from Entergy – synergies with the 2-unit Nine Mile Point plant next door.

<sup>19</sup> Market value may be less than zero. Depending on the details, a seller may even pay a new owner to take the economically threatened merchant nuclear plant.

<sup>20</sup> See [http://www.world-nuclear-news.org/C-Fort\\_Calhoun\\_under\\_new\\_management-2108127.html](http://www.world-nuclear-news.org/C-Fort_Calhoun_under_new_management-2108127.html)

<sup>21</sup> A buyer must have the financial capability to take on the liabilities associated with the plant (e.g., decommissioning and spent fuel) and must have the capability to become the plant operator. Operation might be possible by the former owner with a contract with the new owner.

**Tool/Action****New entity formed****Comment**

A new private entity might be formed that has (a) credentials and credibility to own a nuclear power plant and (b) has support from federal government.

This might be a way to resolve the difficult narrative that helping economically threatened nuclear power plants owned by large companies is somehow “bailing out” profitable companies. By forming a new entity, these narratives would be changed.

Some failing businesses have been saved by an employee buy-out with state or federal government assistance.

**B. Public/Government Ownership**

Some states have entities that own (or formerly owned) nuclear power plants.

**Tool/Action****Purchase or acquisition by government entity****Comment**

State entities could be formed (or used if already formed) to purchase or acquire an economically-threatened nuclear power plant. The New York Power Authority is an example.

Federal entities could also be used for this. TVA and Bonneville Power Authority are existing entities.

A buyer that is not a nuclear operator could retain an experienced operator (perhaps the current operator) under contract.

A new federal entity could be formed specifically to own economically threatened merchant nuclear power plants that might retire early. TARP is an example.

**Tool/Action****Government purchases output under long-term PPA****Comment**

This option may be much easier than an outright purchase. The government entity would buy the output of the economically threatened nuclear power plant at a price and under terms that provide a sufficient and certain amount of revenue and net cash flow needed for the owner to operate the unit profitably.

*continued... →*

**Comment** *continued* - Government purchases output under long-term PPA

A PPA can have a wide range of options and features that can be used to manage the risk to all parties. Utilities may not like loss of government business or competing with the government for retail business. PAYGO requires upfront scoring of PPAs. Such contracts may be prohibitively expensive for GSA. The Congressional Budget Act may need to be modified.<sup>22</sup>

### Tool/Action

#### State eminent domain

#### Comment

If a private merchant nuclear generator plans to close, state governments should consider the public impacts of permitting them to shut down. In order to enable the continuing use of these plants, states have the power to acquire the plant either by purchase or by use of its condemnation/eminent domain power.

Even reactors owned by merchant operators today were built with public funds or by regulated utilities authorized by public utility commissions to provide a needed public service. The public purpose existed when the plants were built and it exists today, so this would be a legitimate use of the state's eminent domain power. In addition, inasmuch as merchant owners claim they are losing money on the plants, they should be willing to transfer all liabilities and assets, including the decommissioning fund and the right to DOE reimbursement for spent nuclear fuel management, to the state taking ownership.

<sup>22</sup> See policy considerations on page 13 in the CRS report at <http://nationalaglawcenter.org/wp-content/uploads/assets/crs/R41960.pdf>



## Government Subsidies

Significant economic benefits are provided by nuclear power plants to local, state, and national governments. Clean air benefits, including carbon-free and emission-free electricity, accrue to the entire country and to the world. Yet a merchant nuclear power plant owner receives no compensation for these benefits to society.

The failure of electricity markets to provide sufficient revenue to operating nuclear power plants to remain in operation is a profound market failure. Only government can step in to address this.

Tool/Action
<b>Grants</b>
Comment
<p>State and/or federal governments would provide grants to economically threatened nuclear power plants to help them cover operating losses.</p> <p>These grants might be supported by the argument that the amount of the grant is much less than the amount of benefits lost in an early retirement and that the grant is intended to correct the failure of electricity markets to provide sufficient revenue to maintain these existing nuclear power plants.</p>
Tool/Action
<b>Federal tax credits</b>
Comment
<p>A new set of federal tax credits for new AND existing nuclear power plants. This might be structured as technology-neutral production tax credits for generation projects that do not have carbon emissions.</p> <p>The Energy Policy Act of 2005 included production tax credits for new nuclear, but this was not a large driver of new nuclear project development.</p>
Tool/Action
<b>State or local tax credits or holidays</b>
Comment
<p>A new set of state tax credits for existing nuclear power plants. This might be structured as production tax credits.</p> <p>A state might also provide relief from state and local income taxes, property taxes, and other taxes on existing nuclear power plants.</p> <p>While state and local taxes (e.g., property taxes) are not a large part of nuclear power plant operating costs, a suspension of these taxes might help an economically-threatened merchant nuclear plant lower losses.</p>

Tool/Action
<b>Federal Feed-In Tariff (FiT) program</b>
Comment
<p>Rather than a PPA, a federal power agency could provide a feed-in-tariff per MWh (rather than a grant), geared to emissions savings.</p> <p>Depending on the details of such a FiT program, the same restrictions and concerns that are present for federal PPAs may be present.</p>

## Lower Costs

In addition to the Government subsidies that were mentioned earlier, there may be ways to lower costs.

Tool/Action
<b>Operating costs</b>
Comment
The recent announcement by the Nuclear Energy Institute (NEI) of an effort to reduce nuclear power plant operating costs may help the existing nuclear fleet limit or stop financial losses.

## Capacity Markets

Merchant nuclear units earn all revenue in the electricity markets, including the short-term electricity market, day-ahead electricity markets, and short-term<sup>23</sup> capacity markets.

All retail utilities have a requirement to maintain enough capacity under ownership or control to meet their peak demand plus an appropriate reserve margin.

NERC develops targets for capacity and reserve margins. The retail utilities can build and operate power plants, enter into bilateral contracts for capacity rights, or participate in the capacity markets organized by some, but not all, electricity market operators in the U.S.

- In MISO, the capacity market is a voluntary side market aimed at helping retail utilities and generators find deals.
- The ISO New England Forward Capacity Market and the New York ISO capacity markets may provide merchant nuclear plants with revenue in addition to electricity spot market revenue.
- The PJM capacity market (i.e., the Reliability Pricing Model or RPM) goes further; RPM assesses the capacity needs of PJM system, runs an auction to buy this capacity, and then apportions the cost to participating utilities.

The Polar Vortex conditions in the winter of 2013-2014 caused a number of power plants in PJM to stop operating, despite having capacity contracts. The reasons included frozen coal piles and curtailed natural gas supplies. The penalties for non-performance were not large and PJM instituted new performance requirements for its capacity market that added stiff penalties for non-performance.

Because of the PJM capacity market changes, the capacity market prices are higher. This was, according to news stories, the reason that multiple Exelon nuclear power plants in Illinois have had a reprieve from early retirement.

Changes to the capacity markets that improve revenue for nuclear power plants would help these nuclear power plants with financial viability.

### Tool/Action

#### Capacity market changes

#### Comment

Changes to other capacity markets could increase the value of capacity provided by nuclear power plants. These changes would need to be developed and implemented by the electricity market operators, with FERC approval.

Changes might include:

- Requiring a higher amount of capacity
- Higher penalties for non-performance (i.e., like the PJM RPM changes)
- Fuel-type requirements (i.e., requiring that some part of the capacity be from nuclear power)

Exelon nuclear power plants in Illinois have had a reprieve from early retirement.

<sup>23</sup> Load Serving Entities may enter into long-term bilateral contracts for capacity that help them meet NERC capacity requirements, but the capacity markets managed by the electricity market operators are short-term markets.



**Tool/Action****Adding mandatory capacity markets****Comment**

ERCOT and MISO do not have mandatory capacity markets, but have considered the potential to add them. Adding capacity markets with features that favor nuclear power would help merchant nuclear in these markets.

## Electricity Markets

Merchant nuclear units earn all revenue in the electricity markets, including the short-term electricity market, day-ahead electricity markets, and short-term capacity markets.

NEI has been supportive of a FERC initiative to change spot price formation and other detailed implementation of electricity market concepts.

Tool/Action
<b>Better spot market price formation</b>
Comment
<p>FERC Docket AD14-14-000 (Price Formation in Energy and Ancillary Services Markets Operated by Regional Transmission Organizations and Independent System Operators) covered these issues.<sup>24</sup></p> <p>While these fixes are not specific to nuclear power plants, nuclear power plants may benefit from the changes.</p>
Tool/Action
<b>Add long-term planning to markets</b>
Comment
<p>Some of the RTO/ISO entities started as regional power pools that were involved in regional multi-state generation planning, in addition to wide area economic dispatch (e.g., PJM, NE ISO, NY ISO).</p> <p>A return to regional generation planning by states and the RTOs has been considered as a response to concerns that reliance on market-based capacity expansion may well result in a less reliable and more volatile electricity system.</p> <p>Adding this function would allow the RTO/ISO entities to consider factors such as current and future environmental requirements (i.e., carbon emissions), refuel and generation type diversity, long-term risk, and long-term price stability.</p> <p>This might provide an opening for existing and new nuclear power plants to play a greater role in these markets.</p>

<sup>24</sup> The EPSA Comments to FERC in Docket AD14-14-000 provide an excellent summary of the issues:  
[https://www.epsa.org/forms/uploadFiles/2F4D700000019.filename.EPSA\\_Comments\\_AD14-14-000\\_2.pdf](https://www.epsa.org/forms/uploadFiles/2F4D700000019.filename.EPSA_Comments_AD14-14-000_2.pdf)

Tool/Action
<p><b>Allowing states to do long-term resource planning and procurement</b></p>
Comment
<p>Several states, including Maryland and New Jersey, have expressed concern that organized electricity markets and market-based new capacity investments were not providing adequate amounts or appropriate types of new generation assets.</p> <p>Both Maryland and New Jersey implemented state programs to determine and procure new generation assets. In both states, these programs were rejected by the courts.<sup>25</sup></p> <p>If states were allowed to put such long-term planning and procurement programs in place, they might be used for nuclear power plants – a state approach to resolving the failure of electricity markets to provide incentives for new nuclear power.</p> <p>If allowed by the courts, states might impose requirements on all companies selling power to retail customers in their state to undertake long-term capacity planning and to procure capacity as needed to meet requirements.</p>

<sup>25</sup> A summary of the MD and NJ cases is at <http://statepowerproject.org/states/maryland-and-new-jersey/>

## Return to Economic Regulation of Electricity Industry

Merchant nuclear plants are an artifact of the electricity industry reform. While low natural gas prices also impact the utilities in non-restructured states, the nuclear power plants are owned by vertically-integrated regulated or government utilities.

It is unclear how a return to regulation in any state could be implemented. Power plants are owned by private parties and would have to be converted into regulated assets. One way would be to require all generating assets and all retail utilities in a state to have long-term power contracts. This might be similar to the Ohio PUC proceeding on the FirstEnergy CfD.

Another way to do this incrementally is to require that any new power plant in a state must be part of a regulated utility.

Tool/Action
<b>Re-regulate utility industry</b>
Comment
<p>In states that restructured/reformed the electricity industry, efforts could be made to re-regulate the industry. This would allow a return to long-term resource planning through Integrated Resource Planning (IRP) processes. The regulatory certainty provided for the resources selected in these IRP process would provide the basis for investment in new nuclear power plants.</p> <p>These IRP processes could also include (implicitly or explicitly) requirements for (or value for) the unique attributes provided by a nuclear power plant, including stable costs, reliable operation, baseload operation, clean air, etc.</p> <p>The procurement of long-term power contracts by state entities in California after 2001 is an example of how re-regulation might be done while maintaining the underlying electricity market.<sup>26</sup></p>
Tool/Action
<b>Re-regulate nuclear power</b>
Comment
<p>Even if all aspects of electricity industry restructuring remain in place, it may be possible to re-regulate nuclear power, putting it into a status that is similar to transmission assets. The specific actions needed to move from merchant nuclear units to regulated nuclear units will be complex and difficult, but the recent Ohio Utility Commission case regarding a new power contract for Davis Besse may offer a relatively simple way to implement this re-regulation.</p>

<sup>26</sup> The California Department of Water Resources (DWR) procured a large amount of capacity; the long-term contracts are now managed by California Energy Resources Scheduling (CERS). More information on DWR and CERS is at [http://www.cers.water.ca.gov/energy\\_contracts.cfm](http://www.cers.water.ca.gov/energy_contracts.cfm)

## New Nuclear Power Plants

These ideas would help new nuclear power plants.

Tool/Action
<b>Siting assistance</b>
Comment
<p>States or Federal Government could establish sites for new nuclear power plants.</p> <p>In addition to providing a suitable site, state or federal governments could also spend time and money in getting environmental approvals and even making an application to the Nuclear Regulatory Commission (NRC) for an Early Site Permit.</p>
Tool/Action
<b>Extension of EAct 2005 benefits</b>
Comment
<p>A new version of the benefits package in EAct of 2005 for a new round of nuclear power plants. This would include:</p> <ul style="list-style-type: none"> <li>• Production or Investment Tax Credits</li> <li>• DOE Loan Guarantees</li> <li>• Standby Insurance (for delays in commercial operation due to regulatory, litigation, or related issues)</li> </ul> <p>A revision of these incentives to make them more appropriate might also be undertaken.</p> <p>The Energy Policy Act of 2005 may not have provided much stimulus for new nuclear power project investment, so a careful study of how effective this will be should be made.</p>
Tool/Action
<b>Nuclear Regulatory Commission (NRC) streamlined ESP/DC/COL processes with lower cost and faster time</b>
Comment
<p>The current implementation of the NRC Part 52 nuclear power licensing process takes too long and costs too much.</p> <p>The NRC could look at the processes and find ways to make them faster and cheaper, without diminishing safety.</p>

Tool/Action
<b>Nuclear Regulatory Commission (NRC) revisit of Part 50 process</b>
Comment
<p>Several new reactor designs have suggested that they might use the earlier Part 50 nuclear power plant licensing process because the Part 52 approach was too long and too expensive.</p> <p>The Nuclear Regulatory Commission (NRC) could revisit the process for a new nuclear power plant licensed using the Part 50 process and strive to make this process faster, more certain (i.e., avoid the concern about a hearing at the end of construction, prior to operating license, that might result in higher costs or even abandonment), and less expensive.</p>
Tool/Action
<b>Tax code provisions</b>
Comment
<p>This would establish favorable federal tax code provisions for new nuclear power plants, including accelerated depreciation.</p> <p>State tax codes would also add similar provisions.</p> <p>Exemption of (or limits on) local property taxes would also be considered.</p>
Tool/Action
<b>Federal government equity</b>
Comment
<p>This would be a federal government injection of preferred equity into a new nuclear power plant – similar to the Troubled Asset Relief Program (TARP) program uses to rescue banks.</p> <p>More than \$600 billion was invested via various financial rescue programs, most of it returned, and so far, the Treasury has booked more than \$60 billion of gain from dividends and interest over losses.<sup>27</sup></p>

<sup>27</sup> See <https://projects.propublica.org/bailout/>

**Tool/Action****Long-term PPA****Comment**

In deregulated/reformed states, a coordinated program to put long-term Power Purchase Agreements (PPAs) in place for a new nuclear power plant could be created.

These PPAs might have a government entity as the buyer, allowing the new nuclear power plant to use the PPA as security for financing.

The PPA might also be tradable, so that the government could sell the PPA rights in the market. Any losses (or gains) from the sale of the PPAs would accrue to the government entity.

PAYGO requires upfront scoring of PPAs. Such contracts may be prohibitively expensive for GSA. The Congressional Budget Act may need to be modified.<sup>28</sup>

**Tool/Action****Favorable state laws and regulation****Comment**

The state laws related to regulated utilities and the regulations implementing those laws could be modified to favor new nuclear power.

The laws and regulatory process in Georgia and South Carolina offer some excellent examples. These states have a system that provides a return on Construction Work in Progress (CWIP), up-front commitment to regulatory treatment, rolling prudence reviews, and other features that are favorable to new nuclear power plants.

Another idea is to review fuel adjustment clause provisions in states with regulated generation. These fuel adjustment clauses may lower the financial exposure of the regulated utility to fuel price risk, but may also provide incentives to invest in generating technologies with high and volatile fuel costs (e.g., gas-fired power plants) rather than investing in generating technologies (e.g., nuclear power) that result in lower total system costs.

<sup>28</sup> See policy considerations on page 13 in the CRS report at <http://nationalaglawcenter.org/wp-content/uploads/assets/crs/R41960.pdf>



## Merchant Nuclear Owner Abandonment Deterrents (Negative Incentives)

These items would put hurdles in place for owners of merchant nuclear plants that suffer financial losses that would prevent them from stopping these losses by undertaking an irreversible early retirement. These items might prevent early retirement, maintaining the plant in operation. However, merchant nuclear plant owners would have to be compensated for any costs they incur. The costs would consist of the losses incurred prior to either finding a new owner or retiring. These measures would potentially have a negative impact on license renewals, as merchant nuclear plant owners may not want to add the risk of these deterrents for an additional 20 years.

Tool/Action
<b>Limits on Decommissioning Fund to restrict early retirement</b>
Comment
<p>If the ability of a nuclear power plant owner to access decommissioning funds were limited, this might cause the owner of an economically-threatened nuclear power plant to re-think a transition to decommissioning.</p> <p>Nuclear Regulatory Commission (NRC) may not have authority to consider or implement this.</p> <p>A legal opinion on the ability to undertake this is necessary.</p>
Tool/Action
<b>Limits on surrender of operating license</b>
Comment
<p>Impose some limits on the ability of an operating nuclear power plant to surrender its operating license. This might make it more difficult for an operating nuclear power plant to retire early.</p> <p>A legal opinion on the ability to undertake this is necessary.</p>
Tool/Action
<b>ISO/RTO restrictions on early retirement</b>
Comment
<p>Already, the RTO/ISO conducts analyses to see if early retirement of a nuclear power plant has adverse impact on grid reliability. In some instances, a retirement may be delayed (e.g., the Ginna situation).</p> <p>If the RTO/ISO analyses were broader, they might also consider other factors such as fuel/generation type diversity and other factors.</p>

**Tool/Action****Enforce duty to serve****Comment**

While there seems to be no duty to serve for merchant nuclear power plants, some provisions in federal law (or RTO/ISO rules, as discussed above) might add this requirement.

This would require that a nuclear power plant needed to obtain permission to retire early.

It is probably not possible to force a merchant owner to operate at a loss, but these requirements might impose an obligation on state or on retail utilities to take action to prevent early retirement.

**Tool/Action****Certificate or Public Convenience and Necessity (CPCN) for early retirement****Comment**

A nuclear power plant must obtain permission to retire early. This might look like the Certificate or Public Convenience and Necessity (CPCN) process for new power plants, but focused on early retirement.

The loss of benefits and higher emissions would make this a difficult process.

**Tool/Action****Environmental Impact Analysis (EIS) for early retirement****Comment**

A nuclear power plant must undertake an Environmental Impact Analysis and file an EIS for early retirement. The higher emissions would make this a difficult process.

## Other Ideas

These ideas would help new nuclear power plants.

Tool/Action
<b><i>State Approaches to Retention of Nuclear Power Plants White Paper</i></b>
Comment
<p>In September 2015, the National Regulatory Research Institute (NRRI) issued a report titled “State Approaches to Retention of Nuclear Power Plants White Paper” for Eastern Interconnection State’s Planning Council (EISPC) and the National Association of Regulatory Commissioners (NARUC). This report was funded by the U.S. Department of Energy.<sup>29</sup></p> <p>This report provides an overview of the factors that create early retirement risks for nuclear power plants, case studies of early retirements and cancelled uprates, a summary of the cost/benefit tradeoffs, and a set of policy tools.</p> <p>A list of policy measures is on pages 15-16; some of these measures are discussed in this ANS toolkit.</p>
Tool/Action
<b>Grants for nuclear training and education</b>
Comment
<p>The federal government, through DOE and NRC, and some states have established programs to support nuclear education and training at the institutional and individual student levels</p> <p>Additional grants may be something to consider.</p>
Tool/Action
<b>Federal government equity</b>
Comment
<p>This would be a federal government injection of preferred equity into an economically-threatened nuclear power plant – similar to the Troubled Asset Relief Program (TARP) program used to rescue banks.</p> <p>It is also possible to do this for new nuclear projects. An example could be a revolving fund for federal construction loans that shifts credit risk during construction to government, then when a nuclear power plant is placed into commercial operation, the owner gets financing secured by operating nuclear plant assets to take out the government construction loan.</p>

<sup>29</sup> This report is available at <http://energy.gov/oe/articles/eispc-white-paper-state-approaches-retention-nuclear-power-plants-now-available> and <http://www.naruc.org/Grants/Documents/NARUC%20NRRI%20Nuclear%20Retention%20White%20Paper%20Sept%202015.pdf>

Tool/Action
<b>End distortionary out-of-market subsidies for renewables</b>
Comment
<p>Revenue to renewable energy projects outside the electricity markets, but linked to physical output, provides incentives for market-distorting behavior.<sup>30</sup></p> <p>These distortionary incentives include Federal Production Tax Credits, state renewable mandates, and credits. The subsidies in another form (e.g., Investment Tax Credits) might provide similar financial incentives for renewable energy, but without the distortions to electricity market prices.</p> <p>It is currently too late to stop the recent legislation approved at end of 2015.</p>
Tool/Action
<b>Decommissioning funds</b>
Comment
<p>Because merchant nuclear generators also have corporate guarantees to fund decommissioning, the existence of the decommissioning fund is an artificial limit on corporate finance.</p> <p>While this presents legal and policy issues, it might be possible to add provisions for an economically -threatened nuclear power plant to draw on decommissioning funds to subsidize current operating losses. If the decommissioning fund were fully- or over-funded, this might be possible with little or no impact on ability to fund decommissioning.</p>
Tool/Action
<b>Spent Nuclear Fuel Fund</b>
Comment
<p>Nuclear power plants have contributed to the spent nuclear power fund for decades, but have no access to the contributions or any expectations of DOE fulfillment of contractual requirement to take spent nuclear fuel.</p> <p>If an economically-threatened merchant nuclear plant could get access now to the past contributions to the spent nuclear fuel fund, this would eliminate the cost and difficulty of the continuing spent nuclear fuel lawsuits and provide the economically-threatened nuclear power plant with a lump of money that could help cover operating losses.</p>

*continued... →*

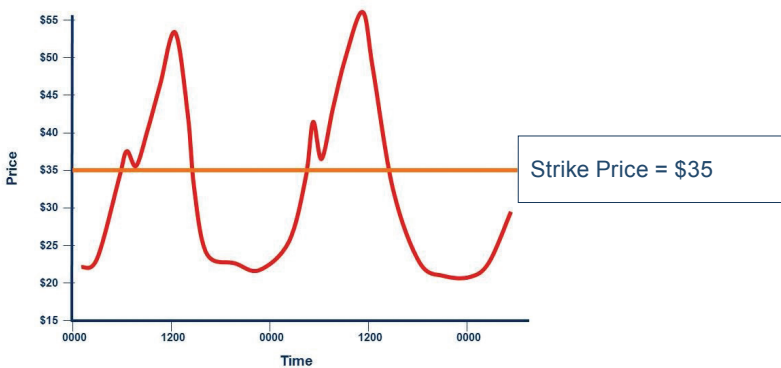
<sup>30</sup> The actual Short Run Marginal Cost (SRMC) of a wind project with a production tax credit is negative. The PTC value is only obtained if the wind project produces energy output. This means that a negative bid is sensible, since the wind project can make profits so long as the negative bid is slightly above the PTC value. The wind project would lose money if a bid of zero (the SRMC absent the PTC) were bid at any time the market cleared at or below zero and the wind unit were curtailed because it did not clear the market.

<b>Comment</b> <i>continued</i> - Spent Nuclear Fuel Fund
<p>This would have to score in the budget process. The Spent Fuel Fund does not even exist as a separate stand-alone account with real dollars. When companies are reimbursed for spent fuel costs (i.e., because of lawsuits against DOE for breach of contract), reimbursements do not come from the Spent Fuel Fund, but from a separate Judgment Fund maintained by Treasury.</p>
<b>Tool/Action</b>
<p><b>Antitrust law enforcement</b></p>
<b>Comment</b>
<p>If there are actions by power generation market participants that appear to be aimed at lowering competition (e.g., by opposing arrangements that might keep an economically-threatened nuclear power plant from retiring early), appropriate investigations into whether this is a violation of the Sherman Act or other antitrust laws may be necessary.</p>

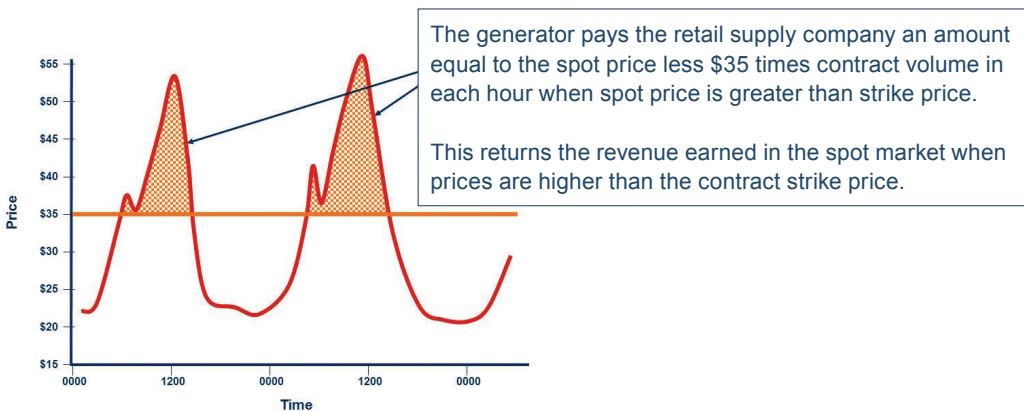
## Appendix

Contract for Difference diagrams from page 6, footnote 8.

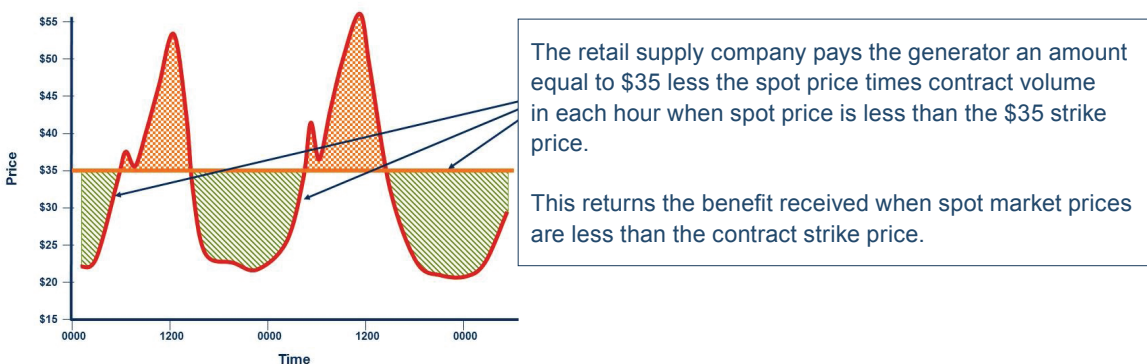
### Swap contract (2-way hedge)



### Swap contract difference payments - Generator



### Swap contract difference payments – Supplier



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