Carbon Abatement Program (CAP)
Maintaining the Integrity of the RGGI Cap

Summary

The Regional Greenhouse Gas Initiative (RGGI) is an agreement between 10 Northeastern states to limit carbon dioxide (CO_2) emissions through implementing a cap and trade program on power plants within the region (the RGGI Region). The power utilized to supply the electric demands of the Northeastern states flows across state lines and may come from power plants located outside of the RGGI Region. All stakeholders agree that a mechanism must be put in place to maintain the integrity of the RGGI emissions cap by assuring that that increases in electric imports as a result of RGGI do not negate any environmental benefit achieved by RGGI. Or in the worse case, assure that RGGI does not actually *cause* environmental harm, by increasing overall emissions of CO_2 and other pollutants.

Public Service Enterprise Group (PSEG) believes that the integrity of the RGGI cap can be maintained through a Carbon Abatement Program (CAP). As set forth more fully below, a CAP would require Load Serving Entities (LSE's) to purchase a set percentage of "Carbon Abated" certificates from generators that participate in the RGGI program (either through mandatory requirements or opt-in provisions). This will ensure that a set percentage of generation must come from sources that operate under RGGI (mandatory or voluntary) and will provide incentives for the operation of the cleanest units. Without a CAP program, the market will simply favor lower cost generation not subject to RGGI, as the lowest cost compliance solution is simply not to operate units subject to RGGI.

The CAP approach is different from a more traditional emissions portfolio standard (EPS), because the CAP approach doesn't attempt to *directly* regulate the carbon intensity of energy sold in the state. As set forth in more detail under "Additional Discussion" at the end of the document, PSEG does not believe a more traditional EPS approach is workable in PJM. Rather, the CAP approach encourages clean and efficient sources, which will result in lower carbon intensity for the state versus if RGGI is implemented without CAP. CAP can be accomplished within the existing RGGI framework, has real environmental benefits, will not impede interstate commerce and will reflect costs to consumers in line with the expectations for a national program. The CAP mitigates the deleterious effect of "leakage" and maintains the integrity of the RGGI cap.

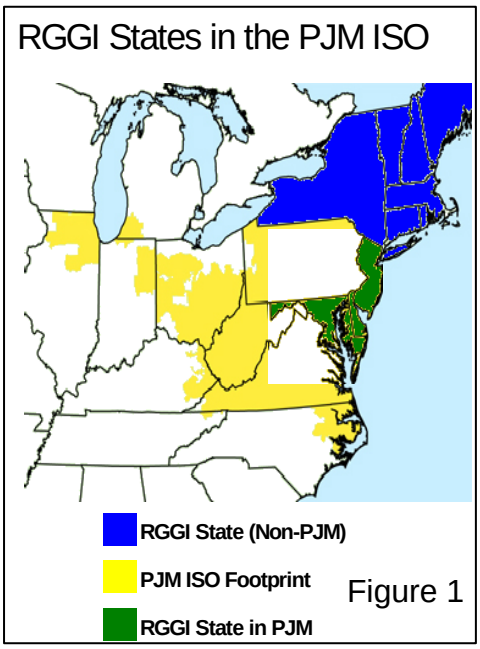

Figure 1

The Leakage Phenomenon

One threat to the success of RGGI is the possibility that CO_2 emissions (as well as emission of other air pollutants) from power plants outside of the RGGI region will increase as a result of reduced operation of plants within the RGGI region, thereby undermining the emissions cap and worsening air quality. Generators within the RGGI region operate within competitive wholesale power markets, the boundaries of which often do not coincide with the boundaries of the RGGI region. Generators operating within competitive wholesale power markets are dispatched based on operating costs. As carbon costs are added to generators within the RGGI region, these generators become more expensive to operate and could experience reduced operations in favor of lower cost generators outside of the RGGI region. Emissions of CO_2 may be reduced within the RGGI region, but total emissions from outside of the RGGI region states increase as out-of-the-region plants increase operations to export lower cost electricity into the RGGI region; a phenomenon known as "leakage".

This leakage phenomenon is especially concerning for New Jersey, Maryland and Delaware. These states have a common Independent System Operator (ISO) known as PJM, which has responsibility for assuring electric reliability throughout the region. PJM determines which electric generating units will dispatch to meet electric demand. Many of the power plants that provide power to the PJM system are not physically located in RGGI states. For example, Pennsylvania power plants are a part of the PJM system and provide a significant amount of power to New Jersey. Yet Pennsylvania power plants are not subject to RGGI and will not have to include carbon costs in their bid price for power. Therefore the benefits of RGGI will be substantially undermined, if not eliminated, in PJM due to the ability of generators in non-RGGI states to produce more electricity than they had previously without any controls on carbon emissions and thereby displacing carbon-controlled plants in the RGGI states because the power prices for non-RGGI generated electricity will be lower.

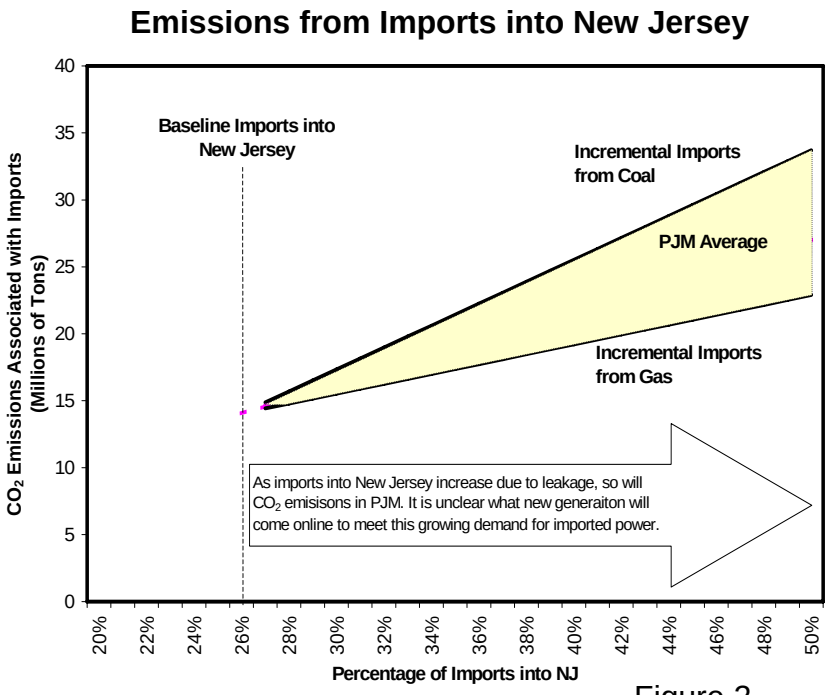

Figure 2

Modeling performed by the RGGI states indicates that New Jersey fossil units, most notably clean natural gas units, would experience reduced output and PJM imports would increase once RGGI is implemented. This is problematic because New Jersey has no control over this shift away from New Jersey fossil generation or over which out-of-RGGI power plants will operate to send additional power to New Jersey. The result could be that overall emissions actually increase due to leakage when RGGI is implemented. Moreover, if left unchecked, it is likely the carbon cap would be compromised and New Jersey's air quality could suffer from higher emissions of criteria pollutants due to the increased operation of "upwind" generation sources.

Proposed Solution

PSEG believes that the potential for leakage can be mitigated through CAP. CAP would require load-serving entities (LSE's) to assure that a percentage of the electricity sold to retail customers comes from electric generating units that "abate" their CO_2 emissions via RGGI allowances or qualified offsets. To assure market flexibility, LSE's may also comply with the standard through the direct purchase and retirement of RGGI allowances (1 allowance per MWH).

The currency used to establish compliance with the CAP program is Carbon Abated Certificates. A "Carbon Abated Certificate" ("CAC") is a tradable certificate created by a CAP affected Source[1] that has generated 1 MWh of electricity and surrendered/used CO_2 allowances equal to the CO_2 emissions associated with that MWh of generation. It is the currency that will be utilized by the LSE to account for CO_2 emissions.

As discussed below, the LSE purchase requirement for CACs can be set at a level to achieve the desired amount of leakage mitigation. RGGI modeling indicates that New Jersey fossil units serve 38% of New Jersey's load under the no-RGGI case, which is reduced to 28% under RGGI. Therefore, an LSE CAC purchase requirement of 38% would provide for full leakage mitigation, while an LSE CAC purchase requirement between 28% and 38% would provide some measure of leakage mitigation.

The CAP program is designed to work either as a stand-alone leakage mitigation program in New Jersey or work in conjunction with other states. States that jointly implement the CAPs program with New Jersey would also require their LSE's to purchase Carbon Abated Certificates (CACs). Ideally, the CAP states would coordinate their required LSE CAC purchase requirements to ensure an appropriate balance between CAC supply and demand in the region. Full leakage mitigation could be accomplished in PJM if Maryland and Delaware were to join the program, however other RGGI states could also implement CAP in their states.

PSEG's proposal would mitigate leakage by sharing compliance costs between generators and LSE's for generating units that are subject to RGGI, thus reducing the imbalances which cause additional imports from PJM.

[1] A CAP affected source is a fossil EGU >25 MW located in a state that serves New Jersey (NJ or a PJM net exporting state)

How CACs certificates are created

Figures 3 – *5* illustrate the certificate creation process. Carbon Abated Certificates can be created by any fossil fuel fired electric generating unit that has a nameplate capacity over 25 MW and is either located in a RGGI State or located in a net exporting PJM state and chooses to opt-in to the program. The diagrams set forth below illustrate the mechanism for an Affected Source to create a CAC:

RGGI State Coal Unit

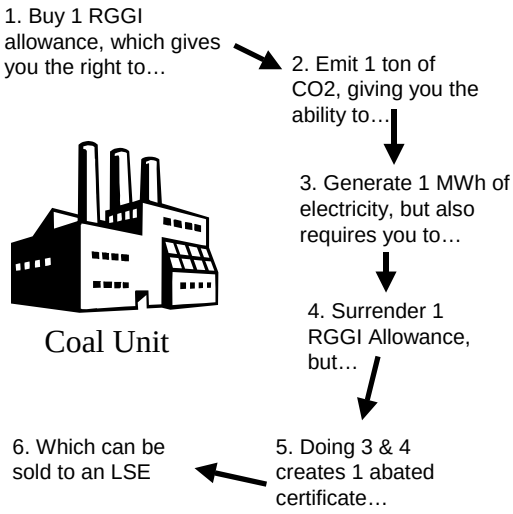

Figure 3

RGGI State Combined Cycle Unit

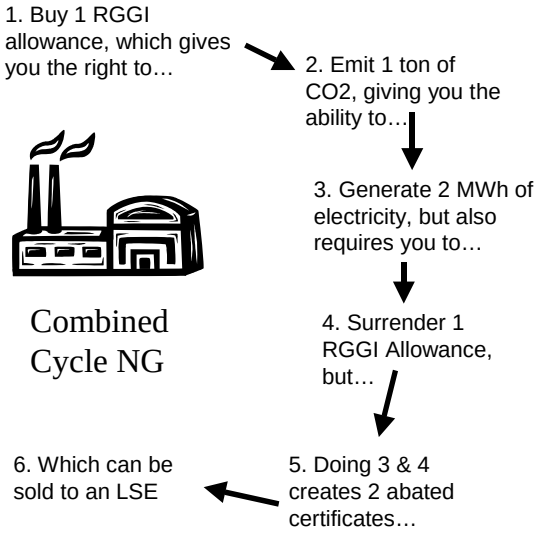

Figure 4

Opt-In : Combined Cycle Unit in a Non-RGGI State

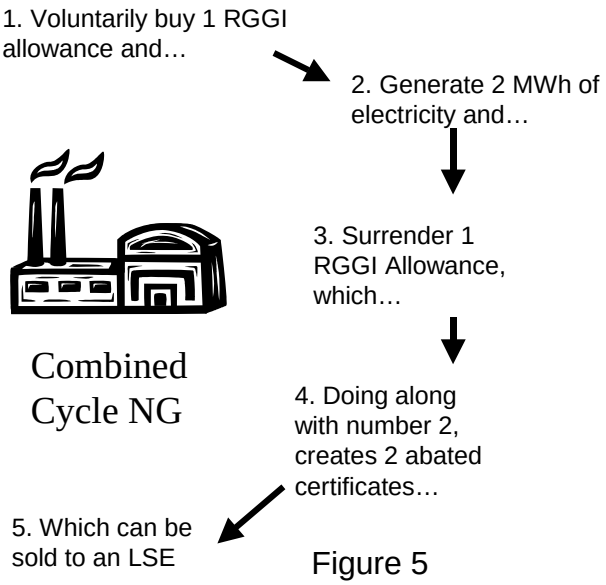

Figure 5

In the 3 examples provided, it is assumed that coal units emit CO_2 at a rate of 1 ton per MWh generated and combined-cycle natural gas units emit CO_2 at a rate of ½ a ton per MWh. So, 1 coal unit would require about 1 RGGI allowance per MWh generated and a combined-cycle natural gas unit would require ½ a RGGI allowance per MWh generated.

This methodology of CAC creation encourages efficiency and the operation of less carbon intensive generating units. Naturally,

generators will want to produce the greatest number of CACs using the fewest number of purchased RGGI allowances. As illustrated in the combined-cycle unit examples, a generator can create 2 CACs for each RGGI allowance surrendered by running a combined-cycle natural gas unit. With a coal unit, it would take 1 RGGI allowance to create 1 CAC. Even within a class of units, generators will be encouraged to operate in an efficient manner to maximize the ratio of CACs created per number RGGI allowances surrendered.

Setting the CAP Target

The LSE purchase requirement for CACs can be set at a level to achieve the desired amount of leakage mitigation. An LSE CAC purchase requirement of 38% would provide for full leakage mitigation, while an LSE CAC purchase requirement between 28% and 38% would provide some measure of leakage mitigation.

PSEG does not envision the target to remain fixed. As the generation mix in New Jersey and PJM changes over time the target would be revised. PSEG proposes that the review and establishment of the target should be overseen by the Board of Public Utilities, who will be able to adjust the target as appropriate. For example, New Jersey RPS is expected to foster the development of renewables in New Jersey. If New Jersey renewable generation grows, the target could be adjusted downward. Retirements, new capacity and progress toward energy efficiency goals will also be factored into the setting the target.

CO_2 Emissions from Leakage at Different CAC Requirements

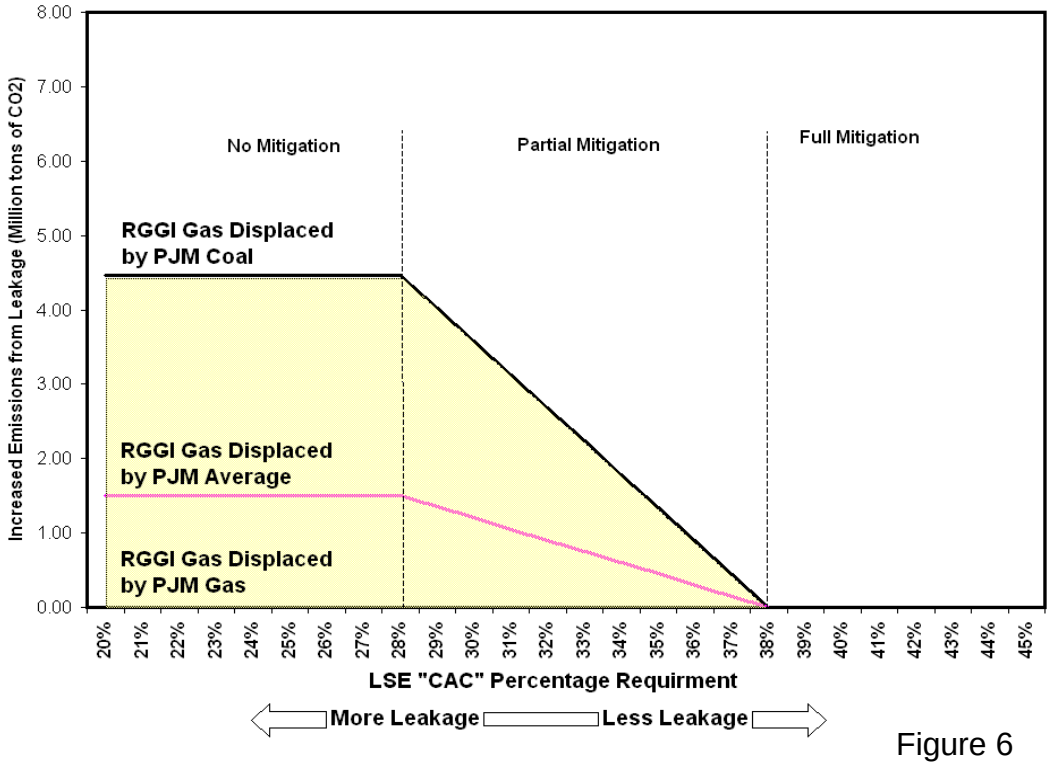

Figure 6

LSE Compliance

The compliance period for the CAP would coincide with the New Jersey "energy year", which runs from June 1st to May 31st of the following year. The CAP compliance filing would operate on the same annual compliance schedule as the New Jersey renewable portfolio standard (RPS), with compliance filings due on September 1st following the close of the energy year. The 3-month period between the close of the energy year and the compliance filing due date would serve as a "true-up" period.

In effect, the CAP would operate very much like an additional tier added to the RPS. In addition to surrendering renewable energy credits (RECs), a BGS supplier would be required to surrender CACs. *Figure 7* below shows the portfolio of RECs and CACs that an LSE serving 1 million MWh of load would be required to surrender on September 1 2010 to demonstrate compliance with both the RPS and CAP.

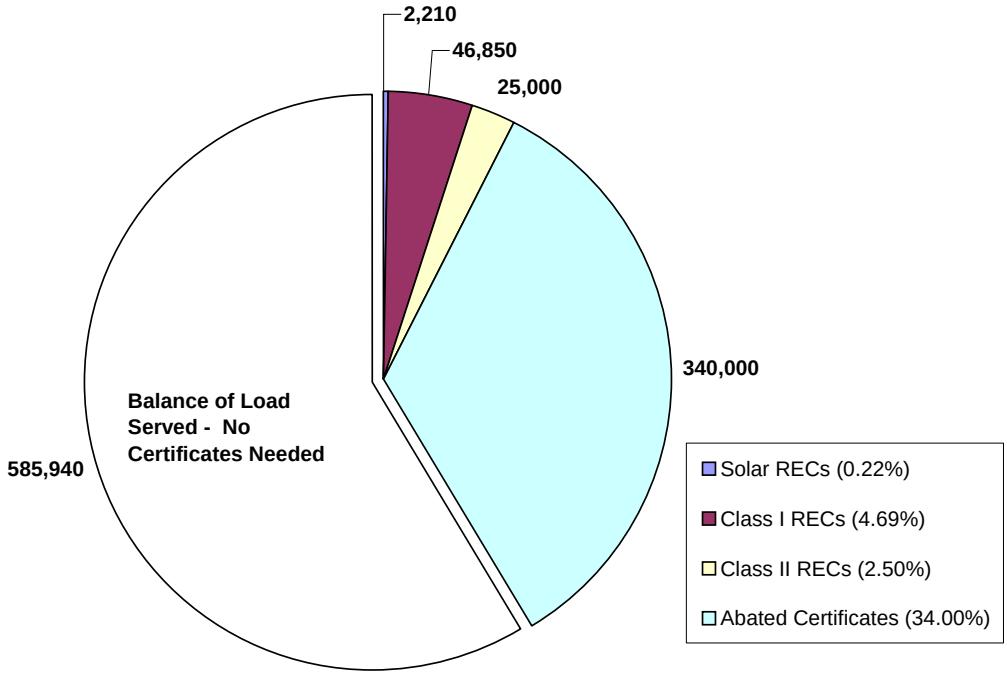

Figure 7

Compliance would be demonstrated by acquiring Abated Certificates from generators in an amount that equals the required percentage of retail sales. The CACs will be generated through the existing PJM Generator Attribute Tracking System (GATS). GATS is a system currently utilized by PJM for tracking the environmental attributes associated with power generation and creating tradable RECs for these attributes. A similar system is utilized in New England so the program is transferable.

An LSE will also have the ability to comply through directly purchasing and retiring RGGI allowances in lieu of using CACs for compliance. This will allow a CAC market to develop, but at the same time, will prevent ratepayers and LSE's from paying excessive compliance costs in excess of the cost of the RGGI program. Since a New Jersey coal unit will need about 1 RGGI allowance to create 1 CAC, under a scenario where CACs are trading at the price of a RGGI allowance, the best a coal unit can do is break even. It is expected, however, the CACs will trade for less than RGGI allowances and that coal units will still see an increased cost from RGGI.

How a CAP Can Mitigate Leakage

Adding a CO_2 allowance cost to generators in the RGGI region, but not outside of the RGGI region, will create additional variable costs for generators subject to the RGGI program. In a market where generating units are dispatched based on their cost, CACs provide generators with a second income stream (in addition to electricity sales) that can be used as a "negative variable cost" to actually lower dispatch cost, similar to generators that aren't required to internalize the cost of carbon emissions. For example, as illustrated in *figure 8*, the ability for a unit to sell a certificate will allow the unit to reduce their dispatch cost by $5.

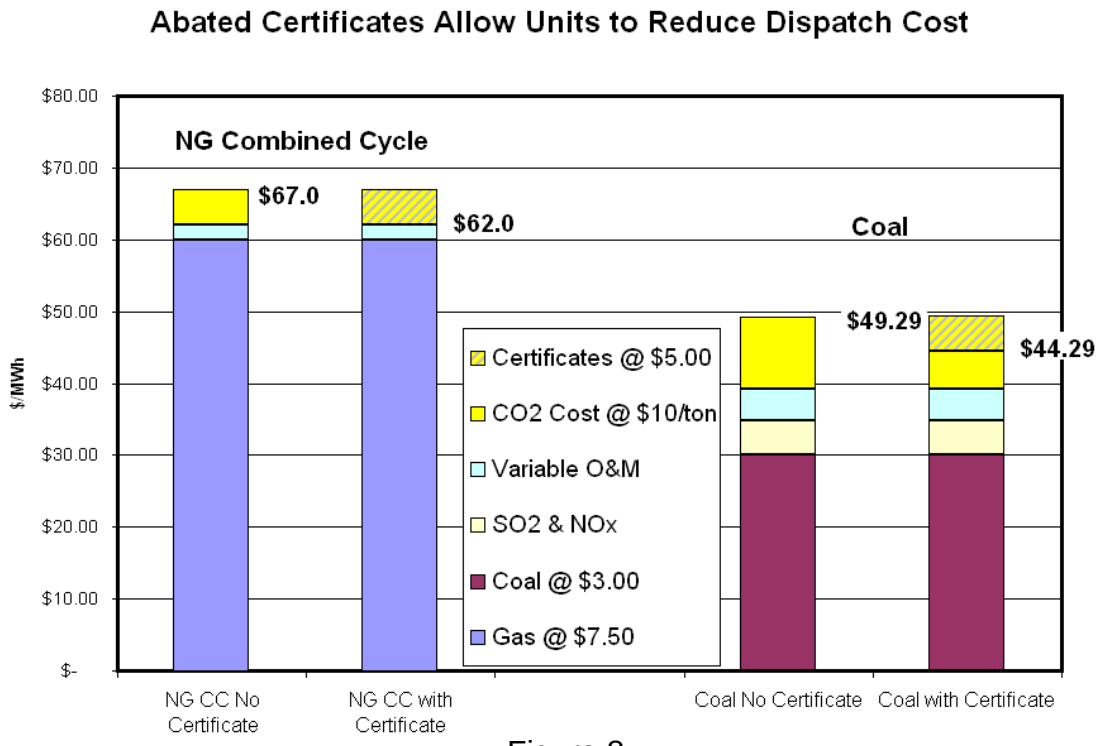

Figure 8

The opt-in provision will help keep CAC prices in-check. In order for an opt-in generator to participate in the CAP CAC trading program, they must purchase and retire RGGI allowances or offsets to abate their CO_2 emissions. The value of the CACs created must exceed the price of the RGGI allowances used; otherwise there would be no incentive to opt-in.

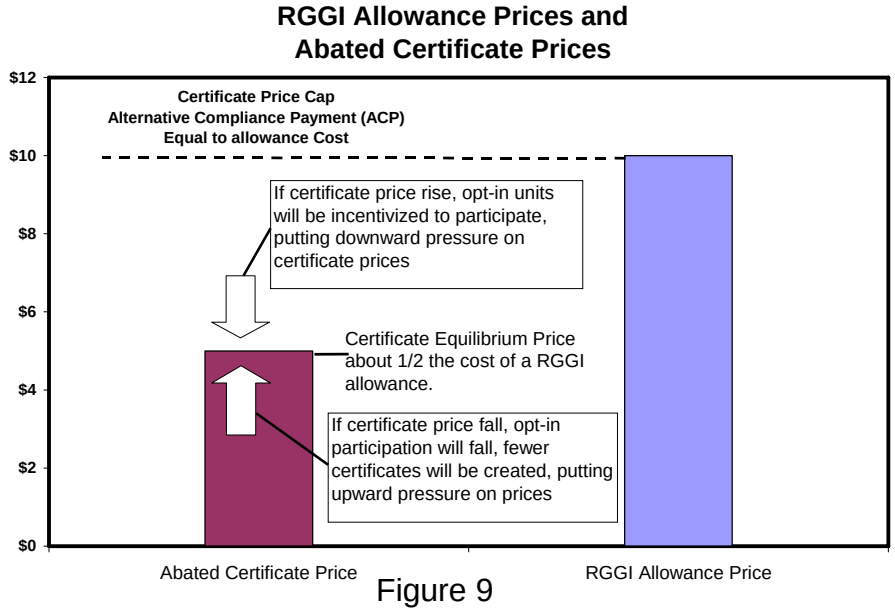

Figure 9

The Economics of a CAP

Under a CAP, the carbon costs associated with capping CO_2 emission in New Jersey would be internalized in New Jersey. Ratepayers would pay the cost of the RGGI program without leakage, but would not "double pay" for both allowances and certificates. The costs are expected to be in line with the expectations for a national program, where leakage doesn't exist. What the CAP really does is allow the cost of RGGI compliance to be shared between the generator and the LSE in a deregulated environment where it may not be possible for a generator to fully embed the cost of RGGI compliance in its dispatch price.

For example, *figure 8* shows that a combined-cycle natural gas unit faced with a $10 RGGI allowance price would need to factor $5 into its dispatch price (combined cycle units emit CO2 at a rate of approximately half a ton per MWh). If this unit were able to sell its certificate for $5, it wouldn't need to factor any RGGI compliance cost into its dispatch price. Consumers would pay for the RGGI compliance cost through the CAP, but would not pay through increased wholesale power costs. This actually benefits consumers, because higher dispatch prices for combined cycle units would mean higher wholesale electricity prices that would be paid to all units operating on the PJM system.

Conclusion

The CAP proposed herein solves the issue of leakage in a workable manner that also:

1) Maintains the integrity of the RGGI cap and results in a real environmental benefit;
2) Assures that any increased cost to ratepayers is reasonable and commensurate with the environmental benefits;
3) Works within the existing RGGI framework; and
4) Works within the existing framework of the wholesale power markets – *for example, it must recognize that bilateral contracts are not commonly used within PJM and electricity can't be tracked from generator to LSE*.

Additional Discussion

The PSEG CAP approach is quite different from other approaches, which focus on attempting to limit electrical imports or require LSE's to account for the emissions associated with the electricity they sell to retail customers. PSEG explored these approaches and found them to be either unworkable or ineffective for states with generators operating in competitive wholesale power markets like PJM.

While the concept of an EPS has been around for quite some time, no state currently has an EPS in place.[2] Designing and implementing an EPS is challenging for a number of reasons. First, portfolio standard (renewable, EPS or CAP) policies are typically state constructs, while wholesale power markets cross state boundaries. For an EPS to achieve its desired results, it must influence the environmental attributes of power flowing into the state. This is critical for a net importer of electricity like New Jersey. The first challenge to overcome is how to influence imports in a regulatory paradigm where a state can't reach beyond its own borders and where the U.S. Constitution (Commerce Clause) prevents states from erecting barriers to interstate commerce.

The first challenge can be addressed by placing the compliance burden on LSEs. Rather than attempting to directly regulate generators, a state can indirectly influence generation by placing standards on the environmental attributes of the electricity sold by LSE's to end use customers within a state's jurisdiction. PSEG's proposal includes this feature.

A second challenge, and one that is specifically problematic for states operating within the PJM ISO, is that bilateral unit contracts are relatively uncommon. Without a contract path in place, it is nearly impossible to even "virtually" track generation from a power plant to any specific LSE. Power plants in PJM generate power, which they deliver into the PJM ISO. LSE's typically buy undifferentiated power from the ISO. PSEG's CAP proposal does not rely on bilateral contracts or attempt to track the physical flows of electricity across the system from generator to LSE.

[2] New Jersey included a provision for an EPS in its 1999 restructuring legislation, however the triggering criteria required by the legislation to actually mandate implementation of the EPS was never realized. California is currently contemplating an EPS to maintain the integrity of its carbon cap and trade program pursuant to the "Global Warming Solutions Act" (AB 32).

This second challenge can be addressed by separating the environmental attributes from the underlying energy and trading the attributes independently of the energy. Clean generators with desirable attributes can sell their clean attributes to an LSE that is required to meet the EPS. Compliance with New Jersey's Renewable Portfolio Standard (RPS) is demonstrated in a similar manner, where renewable energy credits (RECs) are traded separately from the underlying energy.

Evolution of the PSEG EPS Proposal

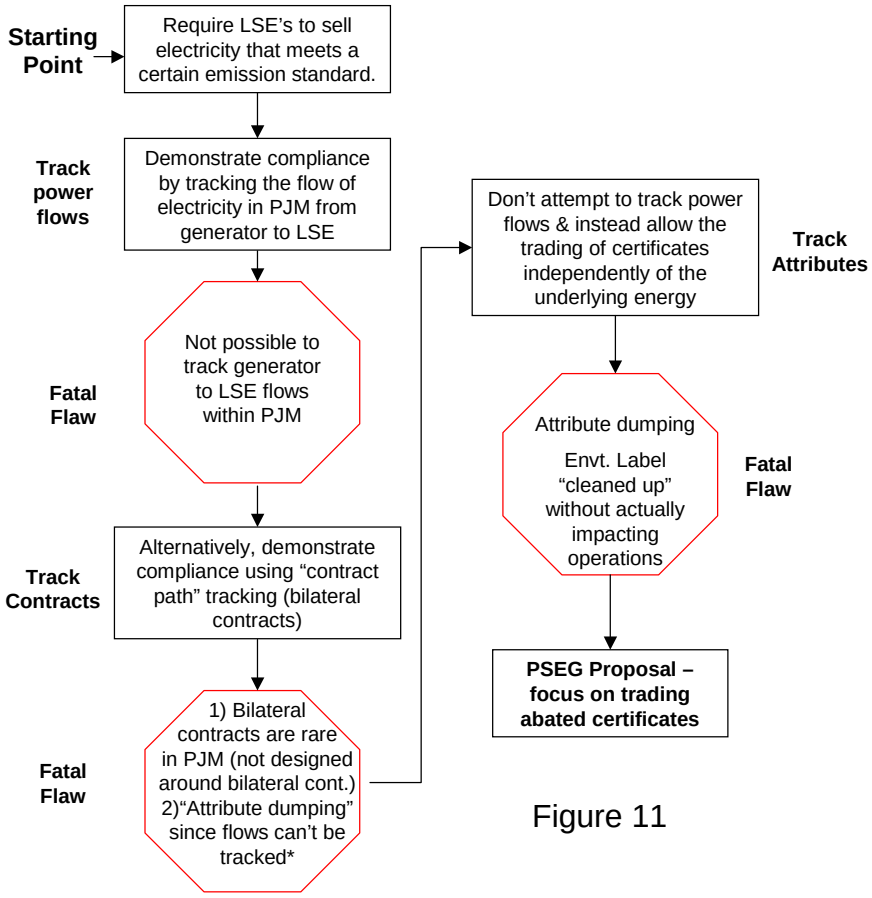

Figure 11

* "Attribute Dumping" occurs when the environmental attributes associated with clean generation freely flow to the state with an EPS requirement. The result is a "clean" environmental label in the state with an EPS, but with no real impact on power plant operations.

Trading environmental attributes separately from the underlying energy, however, leads to a third challenge. If attributes can be traded without restriction, it may be possible to "dump" clean attributes into a state with an EPS without achieving any environmental benefit. Unlike renewable generation, where there are a limited number of renewable energy generators in PJM and therefore "attribute dumping" isn't a concern, PJM has significant quantities of zero emissions nuclear generation. For example, if New Jersey were the only state inside of PJM with an EPS, it might be possible to "dump" all of the attributes associated with PJM's nuclear generation into New Jersey and claim New Jersey is responsible for no carbon emissions from electric power generation. While New Jersey's environmental label would appear "clean", leakage would not be mitigated, the carbon cap would be undermined and air quality would suffer from the increased operation of fossil sources located upwind of New Jersey.

PSEG believes its CAP proposal overcomes these challenges and provides a leakage mitigation strategy that is practical and will provide real environmental benefits to New Jersey.