

## Zero Emission Certificate Application

### I. Global Warming Reduction Act Mandates – Salem 2

**Conclusion:** Retirement of the Salem and Hope Creek nuclear plants or even the retirement of Hope Creek alone or any one of the three plants “would significantly and negatively impact New Jersey’s ability to comply with” the GWRA goals. The GWRA has aggressive greenhouse gas (GHG) emission reduction goals. As indicated in the NJBPU’s Energy Master Plan (EMP), the cornerstone of the GWRA’s goal to reduce economy-wide state GHG emissions 80% below 2006 levels by 2050 is an 100% clean energy target established in Governor Phil Murphy’s Executive Order 28. Regarding the clean energy goal, the current EMP acknowledges that “New Jersey’s current trajectory and efforts will be insufficient to reach the goals . . .”<sup>1</sup> Therefore, the state should take actions that prevents any increase in GHG emissions from the electricity generation sector. As stated in the ERM Report:

These GHG emission increases would significantly impact and jeopardize the State’s ability to achieve its 2050 GHG reduction goals. Also, the Intergovernmental Panel on Climate Change (IPCC) stresses the urgency for transformative policy efforts to reduce GHG emissions in the short term. The retirement of clean, existing nuclear resources runs counter to these efforts. The continued operation of the Hope Creek and Salem units is needed to prevent backsliding in the efforts to combat climate change.<sup>2</sup>

Accordingly, the ERM Report clearly shows compliance with the ZEC Act eligibility standard as applied to the GWRA.

**Results:** The revised ZEC application order requires a study of the avoided GHG emissions ten (10) years prior to and projected (5) years beyond the application date. The ten-year lookback covers calendar years 2010 through 2019. A range of estimated avoided emissions using three emission rates: PJM marginal emission rate, PJM system average emission rate and an average NGCC emission rate. Table 3-2 represents the Full Retirement Case. Avoided GHG emissions, based on PJM marginal emission rates, range from 13.5 to 19.6 million metric tons (MMT) per year. Avoided GHG emissions based on PJM system average emission rates range from 9.4 to 13.7 MMT per year. Avoided GHG emissions based on the average emission rate for a NGCC facility range from 9.4 to 10.6 MMT per year.

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<sup>1</sup> NJBPU, “2019 Energy Master Plan Pathways to 2050”, pg. 10.

<sup>2</sup> ERM, “Impact of PSEG Nuclear Unit Shutdowns on Greenhouse Gas Emissions”, pg. 30.

**Table 3-2. Estimated Range of Avoided GHG Emissions, 2010-2019: Full Retirement Case<sup>3</sup>**

Year	Nuclear Generation (MWh) Hope Creek, Salem 1 and 2	Avoided GHG Emissions Based on PJM Marginal Emission Rate (MMT)	Avoided GHG Emissions Based on PJM System Average Emission Rate (MMT)	Avoided GHG Emissions Based on Average NGCC Rate (MMT)
2010	28,169,910	18.3	13.7	10.4
2011	28,308,000	18.0	13.5	10.5
2012	28,395,547	17.1	12.8	10.5
2013	28,278,134	19.6	13.0	10.5
2014	26,656,214	18.5	12.2	9.9
2015	28,002,931	18.5	11.8	10.4
2016	25,300,096	16.7	10.4	9.4
2017	28,602,507	16.3	11.2	10.6
2018	28,441,791	15.3	10.5	10.5
2019	26,637,324	13.5	9.4	9.9

Table 3-3 represents the Hope Creek Retirement Case (proxy for Salem 2). Avoided GHG emissions from the Hope Creek facility using PJM marginal emission rates range from 4.4 to 7.2 MMT per year. Avoided GHG emissions based on PJM system average emission rates range from 3.1 to 5.0 MMT per year. Avoided GHG emissions based on the average emission rate for a NGCC facility range from 3.2 to 3.9 MMT per year.

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<sup>3</sup> Id., pg. 18.

**Table 3-3. Estimated Range of Avoided GHG Emissions, 2010-2019: Hope Creek Retirement Case (proxy for Salem 2)<sup>4</sup>**

Year	Nuclear Generation (MWh) Hope Creek only	Avoided Emissions Estimate Based on PJM Marginal Emission Rate (MMT)	Avoided Emissions Estimate Based on PJM System Average Emission Rate (MMT)	Avoided Emissions Estimate Based on Average NGCC Rate (MMT)
2010	9,438,542	6.1	4.6	3.5
2011	10,474,891	6.7	5.0	3.9
2012	9,551,241	5.8	4.3	3.5
2013	9,070,386	6.3	4.2	3.4
2014	10,373,816	7.2	4.8	3.8
2015	9,409,357	6.2	4.0	3.5
2016	9,603,443	6.4	3.9	3.6
2017	10,627,333	6.0	4.2	3.9
2018	9,546,684	5.1	3.5	3.5
2019	8,726,946	4.4	3.1	3.2

GHG emissions from all electric generators in New Jersey have averaged about 18 MMT per year from 2010 to 2019. The avoided GHG emissions from the Hope Creek Retirement Case (proxy for Salem 2) represent about a 15-40% higher level of New Jersey electric sector GHG emissions. The avoided GHG emissions from the Full Retirement Case reflect what would otherwise have been a 50-100% higher level of New Jersey electric sector GHG emissions.

The five-year projected emissions cover the period from 2020 through 2025. Table 3-4 includes the projected In-State GHG emission increase from New Jersey generators for the Hope Creek Retirement Case (proxy for Salem 2) ranges from 0.4 to 1.0 MMT and 1.6 to 3.2 MMT for the Full Retirement Case. These values represent the In-State Electric GHG emissions component as it would be calculated for 2020 through 2025 under the GWRA.

<sup>4</sup> Id., pg. 19.

**Table 3-4. Avoided In State Electric GHG Emissions, 2020-2025 (MMT)<sup>5</sup>**

Retirement Case	2020	2021	2022	2023	2024	2025
Hope Creek	0.7	0.4	0.7	0.8	0.9	1.0
Full	2.2	1.6	2.3	2.8	2.7	3.2

ERM estimated imported electric generation using EIA data in conjunction with the PA Consulting model output date. ERM estimated annual total electric sales using a five-year average of 74,822,955 MWh from 2014 to 2018 EIA data. The annual total electric sales projection was adjusted to 80,454,790 MWh to account for T&D losses similar to New Jersey Department of Environmental Protection's (NJDEP) analysis. Imported Electric was calculated by subtracting in-state generation from total adjusted electric sales for each year 2020 through 2025.

ERM calculated CO<sub>2</sub> emissions using a projected PJM system average annual CO<sub>2</sub> emission factor based on EIA's 2020 Annual Energy Outlook (AEO). ERM calculated total GHG emissions by applying an adjustment factor of 1.006304 to represent the additional GHG emissions contribution of combustion-related CH<sub>4</sub> and N<sub>2</sub>O.

The Table below includes avoided GHG emissions from Imported Electric from Tables 3-8 (Hope Creek Retirement Case (proxy for Salem 2)) and 3-9 (Full Retirement Case) in ERM's report.

**Table. Avoided Imported Electric GHG Emissions, 2020-2025 (MMT)<sup>6</sup>**

Retirement Case	2020	2021	2022	2023	2024	2025
Hope Creek	5.4	5.8	4.3	3.4	3.7	2.9
Full	10.0	10.3	9.6	8.5	8.8	7.6

Table 3-10 summarizes the total avoided GHG emissions (In-State Electric + Imported Electric) for both the Hope Creek Retirement Case (proxy for Salem 2) and the Full Retirement Case.

<sup>5</sup> Id., pg. 21.

<sup>6</sup> Id., pgs. 25 and 26.

**Table 3-10. Total Avoided GHG Emissions, 2020-2025 (MMT)<sup>7</sup>**

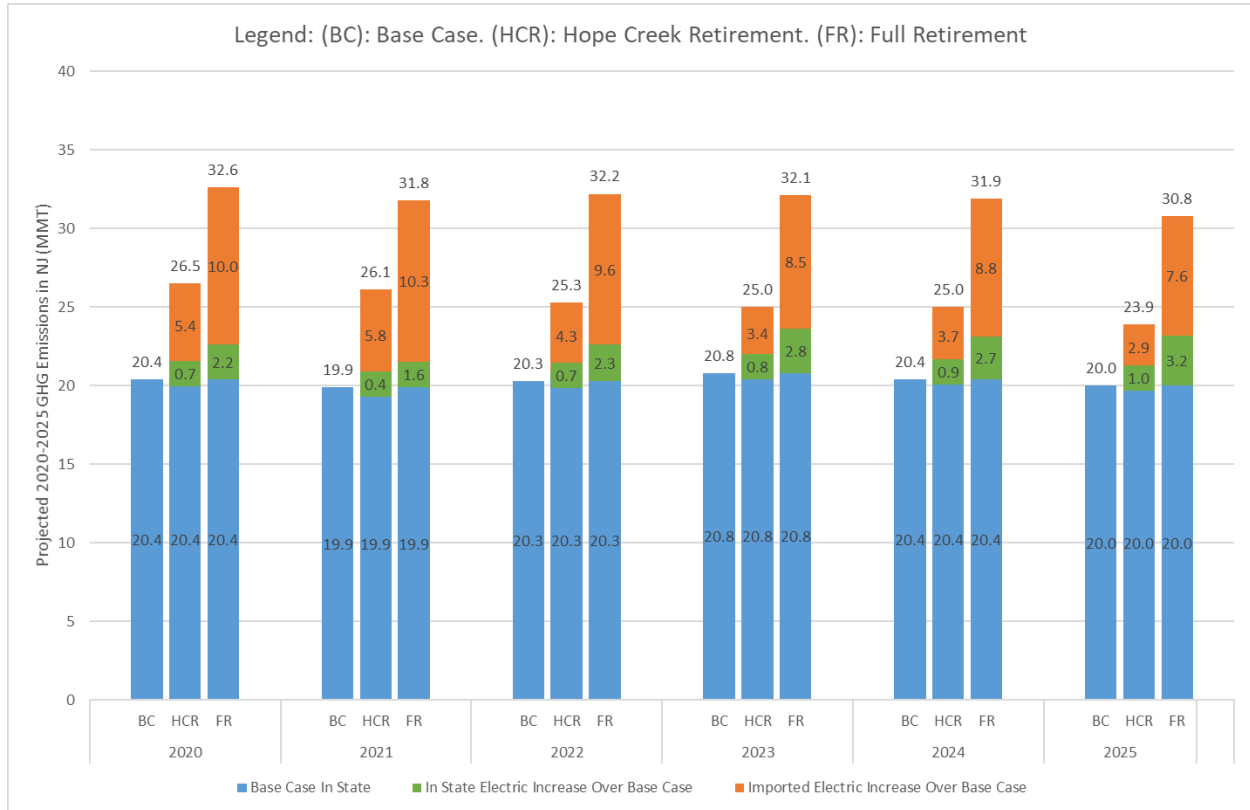
Year	Hope Creek Retirement			Full Retirement		
	Avoided In-State GHG	Avoided Imported GHG	Total Avoided GHG	Avoided In-State GHG	Avoided Imported GHG	Total Avoided GHG
2020	0.7	5.4	6.1	2.2	10.0	12.2
2021	0.4	5.8	6.1	1.6	10.3	11.9
2022	0.7	4.3	5.0	2.3	9.6	11.8
2023	0.8	3.4	4.3	2.8	8.5	11.2
2024	0.9	3.7	4.5	2.7	8.8	11.5
2025	1.0	2.9	3.9	3.2	7.6	10.9

Figure 3-9 represents the sizeable increases from the Hope Creek Retirement Case (proxy for Salem 2) and the Full Retirement Case over the projected 2020-2025 Base Case GHG emissions.

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<sup>7</sup> Id., pg. 28.

**Figure 3-9. Projected 2020-2025 GHG Emissions in NJ (MMT)<sup>8</sup>**



**Methodology Used:** The GWRA establishes the rules and regulations for the NJDEP to follow regarding the monitoring and reporting of GHG. The ERM study calculates the impact of the retirement of Salem and Hope Creek on New Jersey’s ability to meet the GWRA standards based upon the described methodology.

N.J.S.A 26:2C-41(5)(c)(2) sets forth the methodology for the monitoring and reporting of GHG emissions in the Electricity Generation Sector as follows:

c. Pursuant to the rules and regulations adopted pursuant to subsection a. of this section, the department shall require reporting of the greenhouse gas emissions:

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(2) from any entity generating electricity in the State and from any entity that generates electricity outside the State that is delivered for end use in the State. With respect to electricity generated outside the State and imported into the State,

<sup>8</sup> Id., pg. 29.

the department shall determine the emissions from that generation by subtracting the kilowatt-hours of electricity generated in the State from the kilowatt-hours of electricity consumed in the State, and multiplying the difference by a default emissions rate determined by the department;

NJDEP breaks down the types of generators covered in the phrase “from any entity generating electricity in the State” into two inventory components: “In-State Electric” and “MSW Incineration” (municipal solid waste incineration). NJDEP interprets the phrase “and from any entity that generates electricity outside the State that is delivered for end use in the State as “Imported Electric”. The GHG contribution for the “Electricity Generation Sector” inventory thus consists of the sum of three components: In-State Electric, Imported Electric, and MSW Incineration.

Under the GWRA, accordingly, In-State Electric refers to GHG emissions from entities that generate electricity in the State.<sup>9</sup> Imported Electric refers to GHG emissions from entities that generate electricity outside the State that is assumed to be delivered for end use into the State. The GWRA specifies that with respect to Imported Electric, NJDEP shall determine the emissions from that generation by subtracting the kilowatt-hours (kWh) of electricity generated in the State from the kWh of electricity consumed in the State, and multiplying the difference by a default emissions rate determined by NJDEP.

To calculate expected In-State Electric emissions, ERM relied mainly on PA Consulting’s analysis, focused on the modeled CO<sub>2</sub> emissions. To determine the MWh quantity of electricity imports/exports across state lines, ERM estimated net import generation amounts (and associated GHG emissions) using EIA data in conjunction with the PA Consulting model output data. Consistent with NJDEP’s original GHG inventory published in 2008, ERM assumed Transmission and Distribution losses of 7%. ERM also used historical EIA data to project In-State and Imported Energy which took account of energy type. The Full Retirement Case and the Hope Creek Retirement Case (proxy for Salem 2) were both considered. Consistent with NJDEP’s previously used methodology, ERM applied projected PJM system average annual CO<sub>2</sub> emission factors in its GHG inventories to calculate Imported Electric emissions. Annual PJM system average annual CO<sub>2</sub> emission factors were developed using projections from EIA’s 2020 AEO. Consistent with NJDEP’s previously used methodology, ERM also applied an adjustment factor of 1.006304 to account for emissions of CH<sub>4</sub> and N<sub>2</sub>O which were not explicitly modeled by PA Consulting.

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<sup>9</sup> The modeling analyses performed by PA Consulting included MSW incinerators in New Jersey within the modeling domain. The GHG emission contributions from MSW Incineration therefore are assumed to be included in the totals for In-State Electric.