# New Jersey Energy Choice: Solar and Battery or Nuclear and Natural Gas Generation

**by**

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## Executive Summary

In November 2025 the New Jersey Board of Public Utilities (BPU) issued an update of the NJ Energy Master Plan (EMP) which continues the call for 100% carbon free electricity by 2035 as required by Governor Murphy's executive order of February 2023. Upon assuming office in January, the new Governor Mikie Sherrill issued executive orders declaring an electricity affordability crisis (EO1) and directing the development of new renewable and distributed sources of generation, excluding wind, to meet the energy needs of the state (EO2).

In aggregate these policies call for reliance on solar and battery storage together with existing nuclear generation to fulfill the state's energy needs in 2035 while keeping the cost of that energy affordable for NJ ratepayers. It is the purpose of this report to assess the feasibility of that strategy to meet those objectives and, if not, to propose an alternative approach using nuclear and natural gas generation.

### New Jersey Power Requirements

In 2025 NJ consumed 80,000 GWH of electricity. Due to increased electrification and EV usage, this is expected to reach 100,000 GWH by 2035. Summer peak usage will grow by 10% from 19.4 GW in 2025 to 21.2 GW by 2035. However, over the same period, winter peak demand is forecast to grow by 45% from 13.2 GW to 19.1 GW, almost as high as the summer peak.

### Current Generating Capacity

Currently NJ has about 13.4 GW of instate generating capacity, a mix of generation resources including 3.5 GW of nuclear, 9.2 GW of natural gas and less than 1 GW of renewable and other capacity.

Since 2017 there has been a total elimination of coal units (2000 MW) and 650 MW of nuclear capacity at Oyster Creek so that NJ is increasingly reliant on imports from PJM to meet summer peak demand which is currently more than 19.4 GW so there is an in-state shortfall of about 28% in capacity needed during peak summer demand conditions.

Meeting the 100% carbon free power mandate by 2035 would require replacing the 9200 MW of current in state fossil resources as well as PJM imports as they emit carbon dioxide from gas and coal units, with in state solar generation and battery storage by 2035.

## Solar/Battery System Capacity Requirements

In combination with existing nuclear units supplying 3.5 GW (3500 MW) of baseload capacity, to meet the 2035 summer peak load of 21 GW (21,000 MW) and supply the total annual demand of 100,000 GWH, a total installed solar capacity of **50 GW** (50,000 MW) would be required. This is well in excess of that envisioned in the EMP (2000 MW by 2030) or as called for in EO2.

In addition, a total of **100 GW** (100,000 MW) of 4-hour battery capacity would be needed to supply power during the night and when solar power is not being produced to meet instantaneous demand. This is well beyond that called for in current energy policy (2000 MW by 2030) or the EMP.

## Cost and Ratepayer Impact

The capital cost of a 50 GW solar PV cell system would be **$50 billion**. A utility level 100 GW 4-hour lithium battery BESS installation also has an estimated capital cost of **$50 billion** for a combined cost of **$100 billion**.

This level of capital cost plus operating and maintenance expense results in a Levelized Cost of Energy (LCOE) of $290/MWH over 20 years for the combined solar/battery system. This price is more than three times the expected PJM wholesale market price of $86/MWH. Another $19/MWH would be required for necessary transmission interconnection costs so that the total cost to ratepayers would be **$309/MWH**.

Together with other imbedded costs for existing nuclear generation, transmission and distribution and other bill adders, the total residential bill in 2035 would reach **46 cents/kwhr**, more than twice the current rate and almost double the inflation adjusted current cost (24 cents/kwhr). Rates for commercial and industrial customers would see similar increases.

## Feasibility Analysis

The analysis of a solar/battery system to satisfy a carbon free mandate by 2035 clearly demonstrates that such an approach is not feasible for both technical and cost reasons. The amount of area needed for 50,000 MW of solar cells would require 250,000 acres or **390 square miles of solar cells** through the state. This would involve over 1 million warehouse-sized rooftops or the equivalent, a prospect clearly not remotely achievable.

Similarly, locating 100,000 MW of BESS facilities of 50 MW each would require siting **2000 such installations** throughout the state. Attempting to place that many high fire risk facilities in or near populated areas would not be acceptable and would receive major local resistance and additional cost for lithium fire-fighting infrastructure. The disposal of toxic and hazardous lithium battery cells throughout and at the end of life of these facilities would be prohibitive from an environmental and cost perspective.

The cost analysis presented clearly demonstrates that meeting the goal of 100% carbon free power by 2035 is unaffordable with solar and batteries. A similar finding would apply to a wind/battery approach. Thus, the goal itself is unattainable. A more realistic alternative to meeting the state's energy needs in 2035 using nuclear and natural gas is proposed herein.

**Alternative Energy Plan**

The proposed alternative program would add **2000 MW of new nuclear** capacity at an existing nuclear site at Salem/Hope Creek or Oyster Creek as has been proposed by the site owners, together with **8000 MW of new natural gas** baseload or dispatchable units at existing or formerly used gas or coal sites. This approach has the important schedule and cost advantage of requiring minimal time and cost to connect these new facilities with the grid.

The capital cost of the 2000 MW nuclear units is estimated at $16 billion while the 8000 MW of gas capacity can be built at a cost of $12 billion for a total combined cost of **$28 billion**, a fraction of the **$100 billion** needed for the solar/battery program.

The total cost of the nuclear/gas program can be undertaken with little or no ratepayer subsidy required. The combined LCOE of the 10 GW of new generation is **$83/MWH**, below the wholesale market price of $86/MWH. This compares with the **$309/MWH** cost of the solar/battery approach. An offshore wind/battery system would be even more costly at **$365/MWH.**

Under the solar/battery program, the residential cost of electricity will more than double from 20 cents/kwhr today to **46 cents/kwhr** in 2035. By contrast the nuclear/gas program would see rates reach only **23 cents/kwhr**, a 10 year annual increase of 1.5%/yr, less than general inflation.

In addition, currently gas generation is subject to additional payments to the Regional Greenhouse Gas Initiative **(RGGI) which would add another $10/MWH** to generation cost which increases ratepayer bills To keep rates affordable, as part of the proposed nuclear/gas program, NJ should withdraw from RGGI as other states have done.

While nuclear and natural gas are the main elements of the proposed alternative plan, this is not to say solar generation has no role in meeting the state's energy needs in 2035. If the 2 GW of utility solar generation is built as currently proposed, it can serve to stabilize grid voltage if properly located. With sufficient gas peaking capacity, however, there is no need for additional battery storage as the peakers can be dispatched as needed to serve as backup power whenever needed.

If the proposed nuclear/gas program were implemented the following would be the breakdown of NJ generating capacity in 2035:

| | Capacity (MW) |
|---|---|
| Solar | 2,000 |
| Nuclear | 5,500 |
| Gas Dispatchable Units | 14.300 |
| Gas Peaking Units | 3.000 |
| Hydro | 400 |
| total | 25,200 |

Thus, NJ would have sufficient in-state resources to satisfy its peak demand (21,000 MW) without reliance on imports from PJM and would have a 20% margin in line with PJM guidelines to ensure reliability of electric supply in 2035 and beyond.

**Conclusion**

The forgoing analysis demonstrates that attempting to build an electric power system that relies on solar and battery resources without sufficient baseload or dispatchable generation is neither technically or economically feasible. The fact that **solar energy** is only available during daylight hours and then only to the extent the sun is at favorable seasonal and daily conditions, means that it **must generate all required energy for satisfying instantaneous demand while at the same time charging batteries** for supplying stored energy during the night or whenever the solar output is insufficient to meet demand.

This means that installed **solar capacity must be overbuilt by a factor of three** or more over peak demand and that batteries must have even greater capacity to store sufficient energy to meet demand over a day or more without solar output. The physical requirements of such a system would far outstrip available space in NJ to site such facilities or for the supply chain to supply the required components. Economically, it has been shown that such a solar/battery system would involve enormous capital cost and raise rates to unaffordable levels. The same conclusions would apply to other renewable resources such as wind/battery combinations.

The clear result of this analysis is that **the EMP goal of 100% carbon free electricity by 2035 or any other date is unachievable** due to these technical and economic realities. Without that as a constraint, the proposed alternative plan of retaining existing baseload and dispatchable nuclear and natural gas resources while adding 10 GW of new capacity for satisfying peak load and bulk power needs as well as 2 GW of solar capacity for grid stabilization and voltage control would be reliable and affordable and would allow NJ to satisfy its own needs by 2035 and beyond without undue reliance on PJM imports as is currently the case.

Accordingly, it is recommended that:

- The current mandate to achieve 100% carbon free electricity by 2035 be revoked.
- The state should withdraw from the Regional Greenhouse Gas Initiative (RGGI).
- The Legislature should enact laws as necessary to support the development of 10 GW of new nuclear and natural gas and 2 GW of solar capacity by 2035.
- The Governor should direct BPU and other agencies to take all steps necessary to support that energy plan.

These steps are vital to ensure electric power in NJ is reliable, affordable and cleaner for all of the state's residents and businesses while supporting economic development and providing numerous good paying jobs.

**New Jersey Energy Choice:**
**Solar and Battery or**
**Nuclear and Natural Gas Generation**

## 1.0 Introduction

In November 2025 the New Jersey Board of Public Utilities (BPU) issued an update of the NJ Energy Master Plan (EMP)[1] which continues the call for 100% carbon free electricity by 2035 as required by Governor Murphy's executive order of February 2023[2]. Upon assuming office in January, the new Governor Mikie Sherrill issued executive orders declaring an electricity affordability crisis (EO1)[3] and directing the development of new sources of generation to meet the energy needs of the state (EO2)[4].

EO2 calls for accelerated development of solar and battery storage facilities but makes no mention of wind, in recognition that onshore wind has very limited potential in the state and that offshore wind is no longer viable due to cost and Federal policy that opposes such projects. And while it directs that existing gas fired generation be retained and the feasibility of new nuclear generations studied, it provides no support for building new gas or nuclear generation in the near term and it also does not remove the existing goal of achieving 100% carbon free electricity by 2035 which would require removing existing natural gas sources by then.

In aggregate then, the policy calls for reliance on solar and battery storage together with existing nuclear generation to fulfill the state's energy needs in 2035 while keeping the cost of that energy affordable for NJ ratepayers. It is the purpose of this report to assess the feasibility of that strategy to meet those objectives and, if not, to propose a practical alternative approach.

## 2.0 New Jersey Power Requirements

In 2025 NJ consumed 80,000 GWH of electricity. Due to increased electrification and EV usage, this is expected to reach 100,000 GWH by 2035 as shown below[5].

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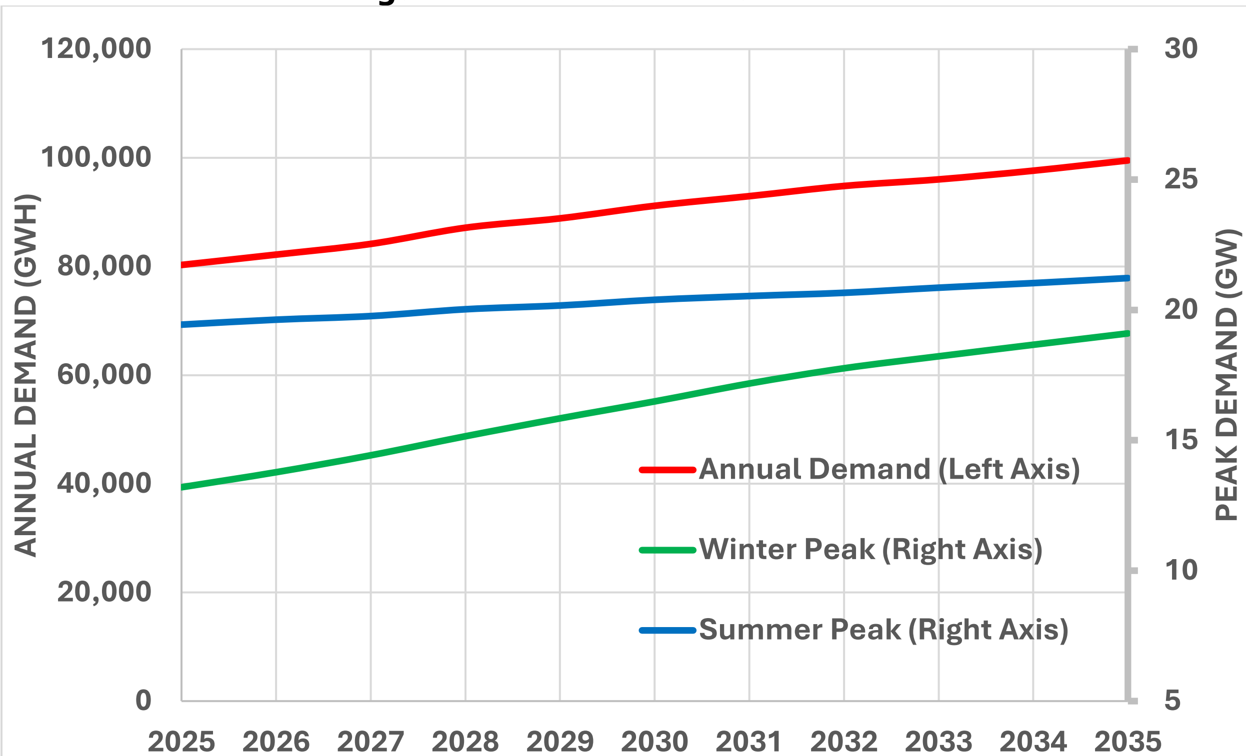
[1] New Jersey Energy Master Plan 2024, November 2025.
[2] Executive Order No.315, Governor Phil Murphy, February 13, 2023.
[3] Executive Order No.1, Governor Mikie Sherrill, January 26, 2026.
[4] Executive Order No.2, Governor Mikie Sherrill, January 26, 2026.
[5] PJM Load Report, 2025

**Figure 2-1 NJ POWER FORECASTS**




Summer peak usage will grow by 10% from 19.4 GW in 2025 to 21.2 GW by 2035. However, over the same period winter peak demand is forecast to grow by 45% from 13.2 GW to 19.1 GW, almost as high as the summer peak. This is also due to increased electrification for building heating, cooking and EV charging. The higher winter demand poses particular challenges for a solar dominant generating infrastructure because of the reduced daylight hours and unfavorable solar angle in the winter months.

Currently NJ imports 25% of power from the regional PJM[6] grid to meet summer peak demand and 20% to satisfy total annual usage. These percentages are expected to grow to 50% and 42% respectively by 2035 if the plan to eliminate fossil generation were achieved[7].

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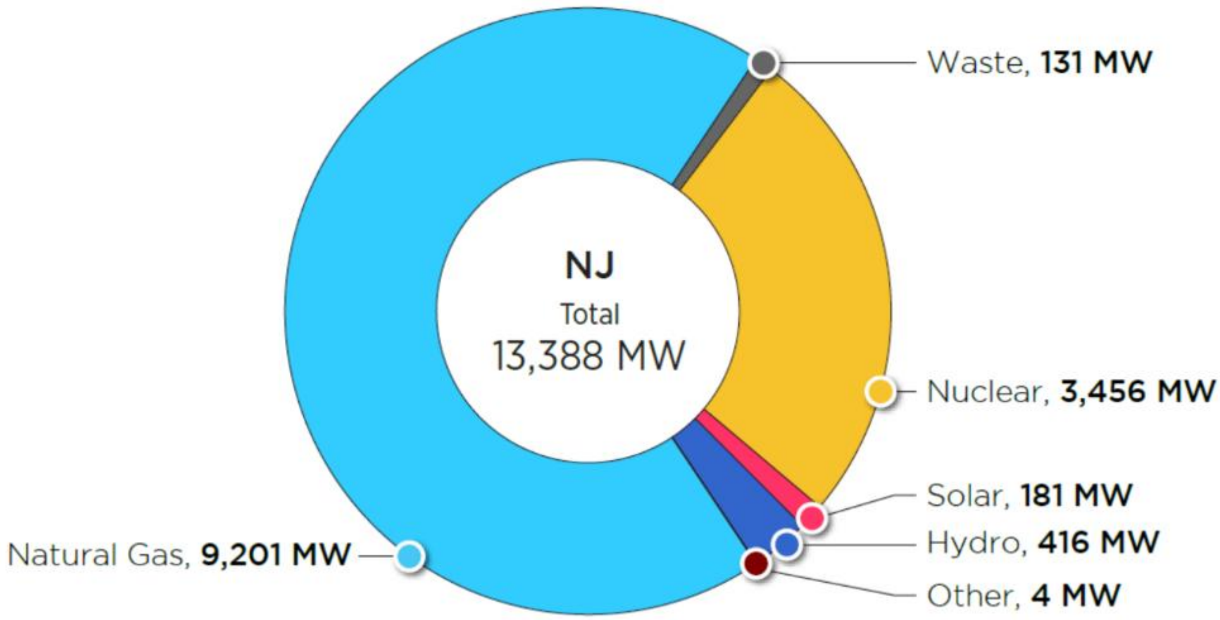
[6] PJM is the regional transmission organization (RTO) that coordinates the movement of wholesale electricity in New Jersey and all of parts of 12 other states and the District of Columbia

[7] Analysis of the New Jersey Energy Master Plan, Whitestrand Consulting, May 2025.

## 3.0 Current Generating Capacity

Currently NJ has a mix of generation resources as shown below.

**Figure 3-1 – NJ Electric Generating Capacity**[8]




From this chart one can readily see the challenge posed by the objective of eliminating all fossil fuel generation by 2035 while ensuring reliability of supply. As indicated, the state is heavily reliant on natural gas plants which comprise almost 70% of in-state capacity made up of about 7200 MW of baseload/load following and 2000 MW of peaking capacity. Nuclear provides an additional 25%. Renewables make up less than 5% of capacity.

Since 2017 there has been a total elimination of coal units (2000 MW) and 650 MW of nuclear capacity at Oyster Creek so that NJ is increasingly reliant on imports from PJM to meet summer peak demand which is currently more than 19,000 MW so there is an in-state shortfall of about 25% in capacity needed during peak summer demand conditions.

Meeting the 100% carbon free power mandate by 2035 would require replacing the 9200 MW of current in state fossil resources as well as PJM imports as they emit 724 lbs/MWH of carbon dioxide from gas and coal units, with in state solar generation and battery storage by 2035.

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[8] NJ State Infrastructure Report, PJM June 2025.

## 4.0 Solar/Battery System Capacity Requirements

A generating system composed almost entirely of solar and battery storage cells must serve the load demand at all times of the year, including meeting summer and winter peak loads. **Batteries do not *generate* power**, they merely discharge stored electricity that has been generated by another source which has previously charged the battery. This means that the solar component of the system must generate all the power required to satisfy demand, except for the power supplied by existing NJ nuclear plants.

Although NJ currently has 5 GW of installed solar, virtually all of this is behind the meter capacity from panels on homes and other structures. There is only 110 MW of utility scale battery storage in the state. The EO2 calls for increasing these sources through Community Solar and other distributed energy and storage programs. Because these solar sources are mainly rooftop installations that are not situated for optimal solar angle and are not maintained for maximum efficiency (by cleaning, snow removal, etc.) their capacity factor is well below that expected for utility grade installations. The same applies to battery storage capacity with distributed behind the meter batteries (such as home and EV batteries). This analysis assumes that the required solar or battery capacity will be supplied by equivalent utility grade installations.

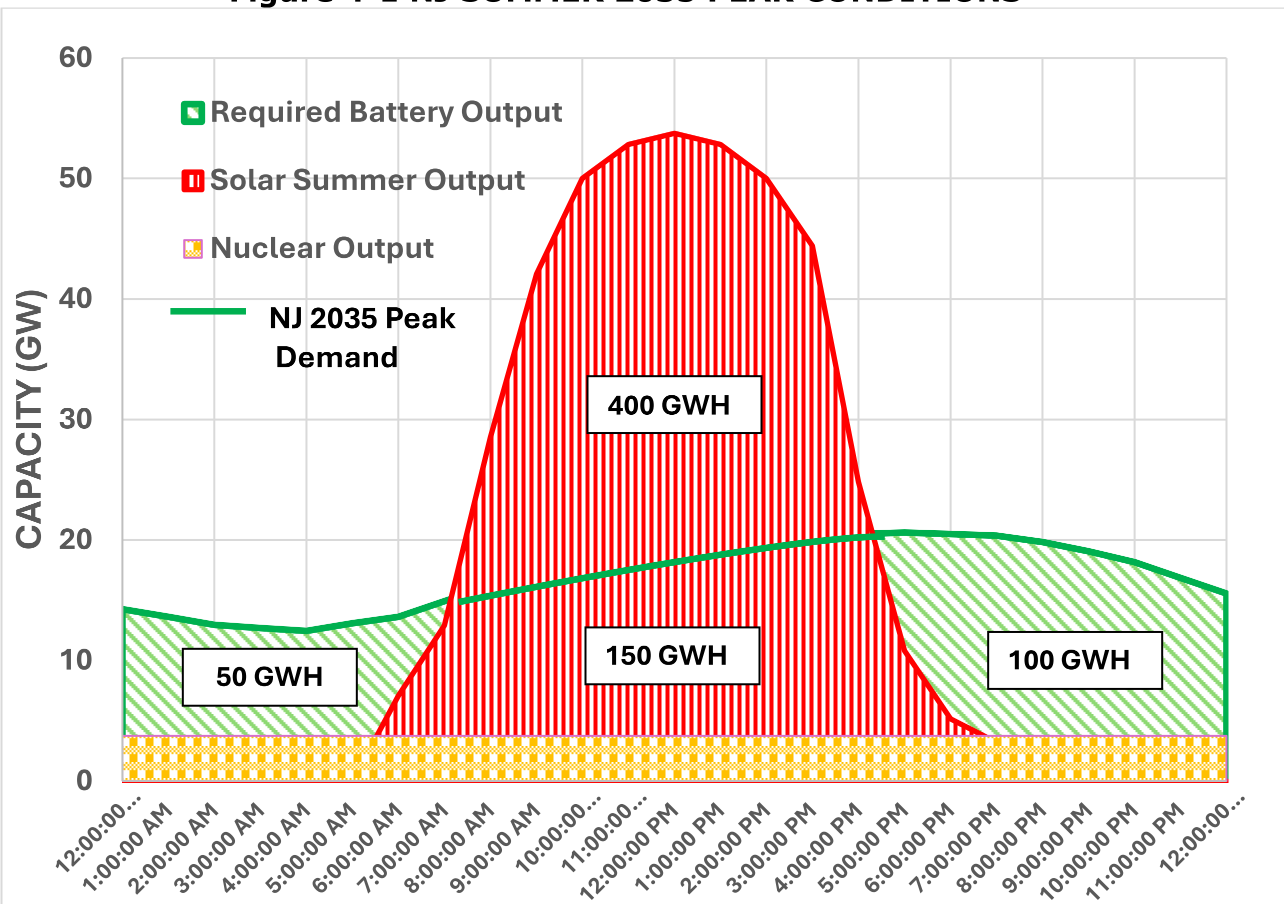
As noted, the 2035 annual demand forecast is for 100,000 GWH. If the existing 3.5 GW of nuclear capacity is retained, at an expected 95% year-round capacity factor, it will generate about 30,000 GWH of power. This means the solar cells must provide the additional 70,000 GWH of generation required in 2035, or an average of 8 GW throughout the year.

Solar generation on the PJM grid has an average capacity factor of 16%, so in order to provide that level of power, the solar cells would need a nameplate capacity of **50 GW** (50,000 MW). This is well in excess of that envisioned in the EMP (2000 MW by 2030) or as called for in EO2.

With that installed solar capacity (50 GW) the following chart displays how the demand would be served on a peak summer day in 2035 when a peak demand of 21 GW is reached and persists from about 4-6 PM. Average demand is about 16 GW requiring a total of 384 GWH of power over the day. Existing nuclear units with a capacity of 3.5 GW will serve the load throughout the 24 hour period, supplying 84 GWH. Therefore, the solar/battery capacity must supply the remaining 300 GWH of power. This is indicated by the red and green areas under the demand curve.

From midnight to 6 AM stored battery energy is discharged to meet the demand until 6 AM when solar energy becomes available with the rising sun which is available until sundown around 7 PM. From then until midnight battery discharge must be available to meet the demand

**Figure 4-1 NJ SUMMER 2035 PEAK CONDITIONS**

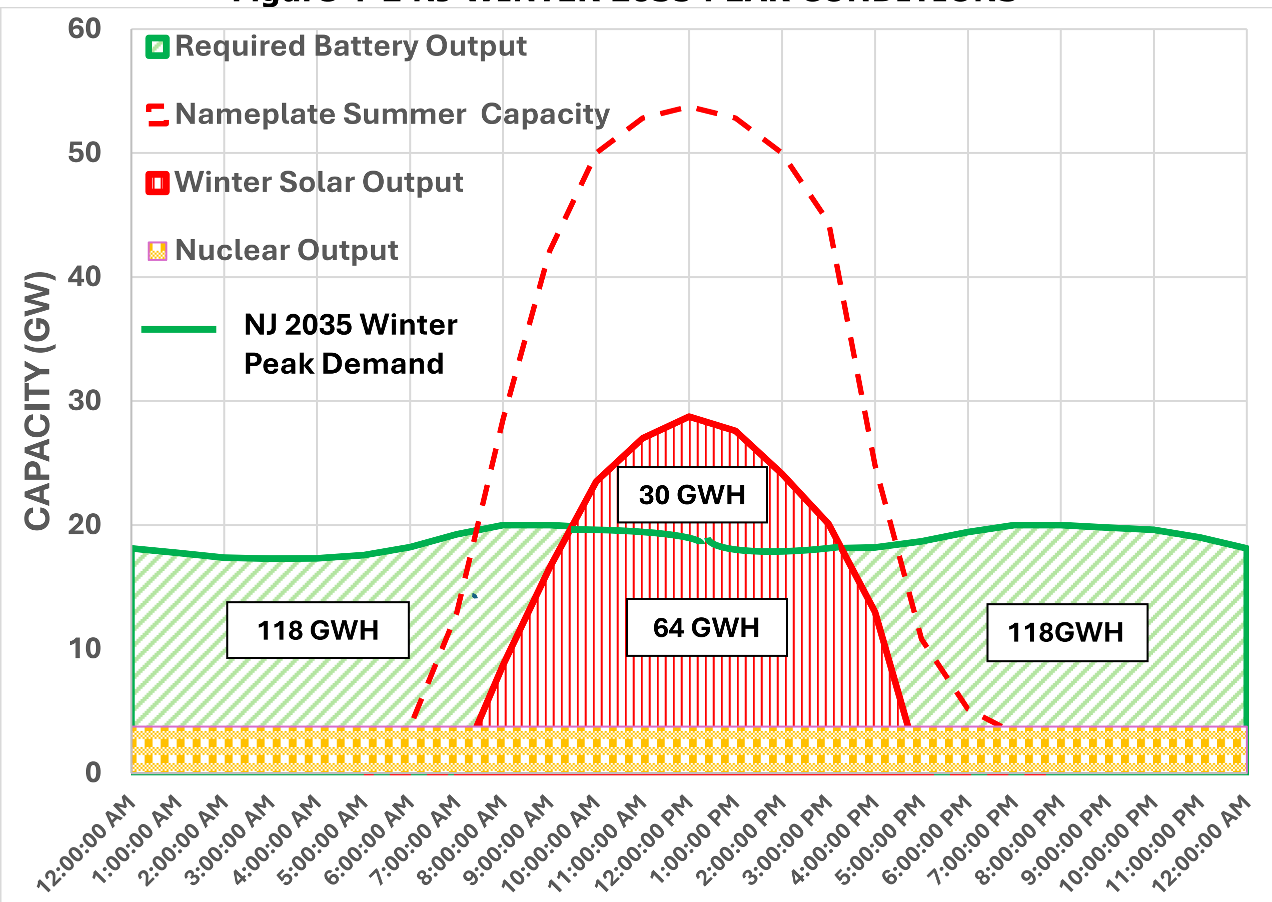



Over the course of the day, solar and batteries each supply about half the 300 GWH needed. The 50 GW of solar capacity also supplies almost 400 GWH of excess power for battery charging (the red area above the demand curve), more than sufficient for the required battery supply for the following day and for storing energy for future use.

It should be noted that the chart depicted in Figure 4-1 is for a sunny summer day with maximum solar output. Cloudy or overcast conditions will reduce solar output and require additional battery output. That factor and the increased demand for battery power during the winter determine the required battery storage capacity.

The chart below shows the equivalent conditions expected at the winter peak in 2035. As indicated, the winter peak is reached twice during the day, reflecting the increased demand associated with residential heating and cooking as people arise and later return from work. The first peak of 20 GWH is reached at about 7 AM and, after a midday reduction, again appears at about 7 PM.

**Figure 4-2 NJ WINTER 2035 PEAK CONDITIONS**




Average demand is about 16 GW requiring a total of 384 GWH of power over the day. As in summer, existing nuclear units with a capacity of 3.5 GW will serve the load throughout the 24 hour period, supplying 84 GWH. Therefore, the solar/battery capacity must again supply the remaining 300 GWH of power. This is indicated by the red and green areas under the demand curve.

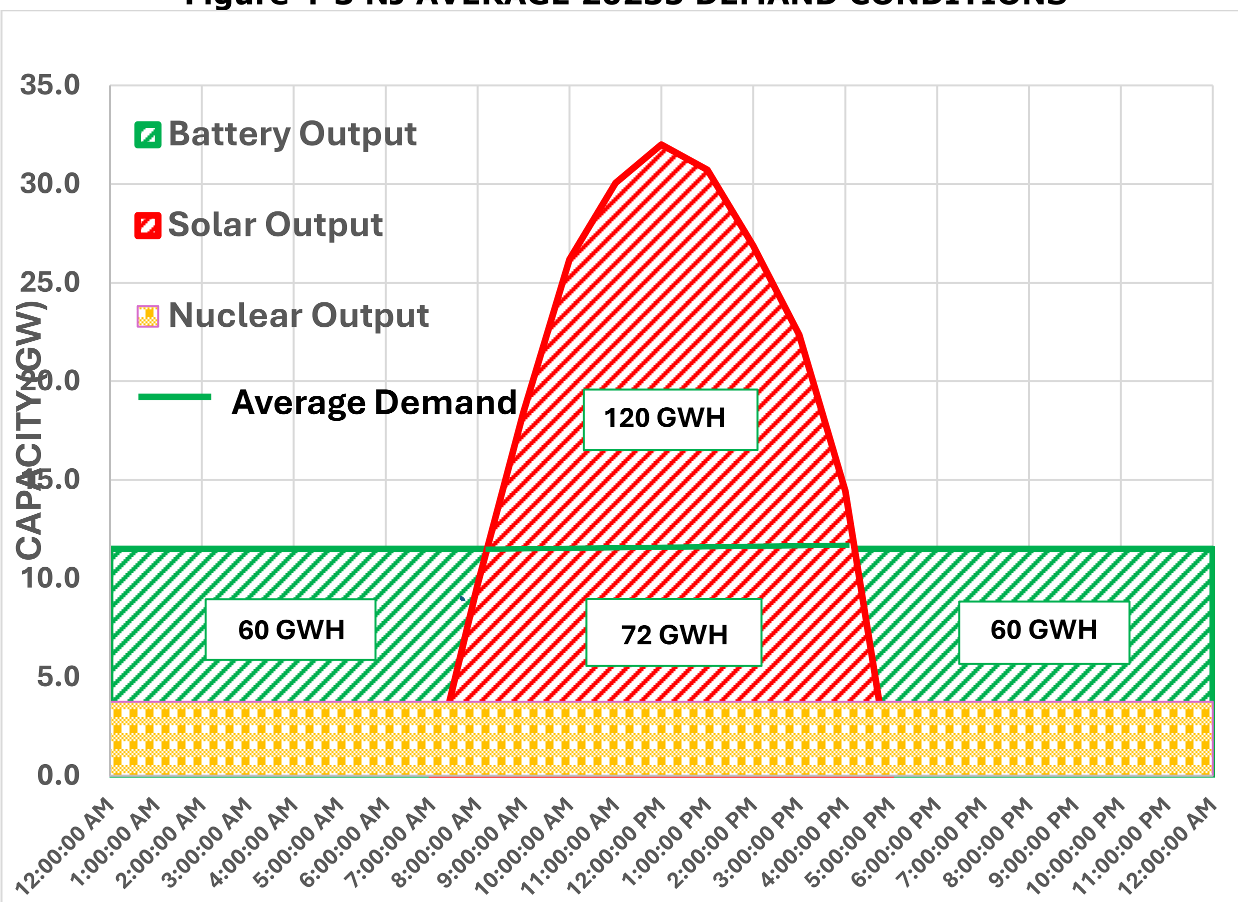
Due to the less favorable solar angle and shorter period of daylight in the winter, the solar output is about half of the summer peak capacity and production as indicated by the dotted curve in the chart.

As a result, over the course of the day, solar provides only 64 GWH for demand while batteries supply the remaining 236 GWH needed. The solar cells also deliver only about 30 GWH of excess power for battery charging (the red area above the demand curve). Thus, the batteries are drawing on excess stored energy that has been charged in prior periods.

In order to have sufficient capacity for winter conditions, or for days when there is little or no solar output, and to fully absorb the excess solar peak output, the battery component of the system must be sized to supply at least 400 GWH of discharge capacity. The GW rating of the battery system is a function of the discharge duration of the cells. Currently a 4 hour rating is the maximum commercially available. That would require a system rated at **100 GW**.

Based on the foregoing analysis, for purposes of cost analysis it is assumed the system required to deliver 100% carbon fee electricity by 2035 would be composed of 50 GW of solar cells and 100 GW of 4-hour discharge capacity batteries.

**Figure 4-3 NJ AVERAGE 20235 DEMAND CONDITIONS**



As shown in Figure 4-3 above, this combination of solar and battery capacity will serve the average demand of 192 GWH, with the solar cells providing 72 GWH and the batteries 120 GWH. During the day, the solar cells will also generate the 120 GWH of excess energy needed to charge the batteries for service during the night.

It is recognized that for some hours during the year, supplemental power from the PJM grid may be required to charge batteries or serve demand. It is expected also that for some hours the NJ system may have excess capacity which would be exported to PJM. Given that the annual solar output (70,000 GWH) matches the required NJ annual demand, these conditions would result in a net zero carbon emissions balance from PJM imports and exports, satisfying the goal of 100% carbon free electricity by 2035 generated and used in NJ.

## 5.0 Cost and Ratepayer Impact

The cost of the required solar/battery system would be substantial. The capital cost of utility grade PV solar facilities is estimated to be $1 million/MW[9] so the cost of a 50 GW system (50,000 MW) would be $50 billion. A utility level 4 hour lithium battery BESS installation has a estimated capital cost of $500,000/MW[10] so 100 GW (100,000 MW) of capacity would also cost $50 billion for a combined cost of **$100 billion**.

It should be noted that the required solar and battery components are primarily of foreign origin and these cost indices do not reflects the impact of recent tariffs which will significantly increase unit costs per MW.

In addition, the power output of solar cells and lithium batteries degrades at 2% and 3% per year respectively, requiring replacement on an ongoing basis to maintain required power ratings. The cost of this replacement is estimated at $1 billion/yr and $1.5 billion/yr for the solar and battery installations, respectively.

In order to attract that much capital investment, a ratepayer subsidized revenue stream would have to be approved providing guaranteed pricing similar to that approved by the BPU for offshore wind projects in OREC contracts under the Offshore Wind Economic Development Act (OWEDA). A detailed investment analysis (see Appendix A for assumptions) indicates that the guaranteed price of power would have to be set at a Levelized Cost of Energy (LCOE) of $290/MWH or higher over 20 years. This price is more than three times the expected PJM wholesale market price of

[9] USDOE Solar System Benchmarking, 2024.
[10] SRNE Solar Company, December 2025.

$86/MWH[11] over the same period. Another $19/MWH[12] would be required for necessary transmission interconnection costs so that the total ratepayer cost would be **$309/MWH**.

Together with other imbedded costs for existing nuclear generation, transmission and distribution and other bill adders, the total residential ratepayer bill in 2035 would reach **46 cents/kwhr**, almost twice the 2035 inflation adjusted cost of 24 cents/kwhr. Rates for commercial and industrial customers would see similar increases.

Assuming offshore wind was available to replace solar by 2035, at a higher capacity factor of 47% it would require 17 GW in combination with 50 GW of 4 hour battery capacity but have an LCOE of $340/MWH and require an additional $25/MWH for transmission interconnection for a total cost of **$365/MWH**, 36% higher than the proposed solar/battery system and so clearly not a viable alternative.

## 6.0 Feasibility Analysis

The forgoing analysis of a solar/battery system to satisfy a carbon free mandate by 2035 clearly demonstrates that such an approach is not feasible for both technical and cost reasons. Given its relatively small area and high latitude, NJ is not well suited for reliance on solar energy. At 5 acres/MW[13], to site 50,000 MW of solar cells would require 250,000 acres or 390 square miles of solar cells through the state. This would involve over 1 million warehouse sized rooftops or the equivalent, a prospect clearly not remotely achievable.

Similarly, locating 100,000 MW of BESS facilities of 50 MW each would require locating 2000 such installations throughout the state, each needing 10 acres for safety reasons. Attempting to place that many high fire risk facilities in or near populated areas would not be acceptable and would receive major local resistance and additional cost for lithium firefighting infrastructure. The disposal of toxic and hazardous lithium battery cells throughout and at the end of life of these facilities would be prohibitive from an environmental and cost perspective.

The cost analysis presented clearly demonstrates that meeting the goal of 100% carbon free power by 2035 is unaffordable with solar and battery power and even

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[11] Cost of New Nuclear Generation in New Jersey. Whitestrand Consulting, December 2025.
[12] A Comparison of the Levelized Cost of Energy (LCOE) of Various Generating Source, Whitestrand Consulting, December 2025.
[13] Solar Land Lease. 2017.

less so for offshore wind with battery backup. Thus, the goal itself is unattainable. A more realistic alternative to meeting the state's energy needs in 2035 is discussed in the following section.

## 7.0 Alternative Energy Plan

The concept of replacing firm baseload or dispatchable generating resources, such as natural gas and nuclear power with intermittent, weather dependent sources backed up by battery storage has been shown to be impractical on both technical and economic grounds. If the goal is to ensure a reliable, affordable electric power infrastructure that will minimize (but not totally eliminate) carbon emissions, we have previously proposed such an alternative system that would rely on existing natural gas and nuclear plants while building 10 GW of new generation by 2035[14].

The proposed program would add 2000 MW of new nuclear capacity at an existing nuclear site at Salem/Hope Creek or Oyster Creek as has been proposed by the site owners, together with 8000 MW of new natural gas including 7000 MW of baseload or dispatchable units and 1000 MW of gas peaking units at existing or formerly used gas or coal sites. This approach has the important schedule and cost advantage of requiring minimal time and cost to connect these new facilities with the grid.

The capital cost of the 2000 MW of nuclear units is estimated at $16 billion while the 8000 MW of gas capacity can be built at a cost of $1.5 million/MW for a total combined cost of **$28 billion**, about a quarter of the **$100 billion** needed for the solar/battery program.

The total cost of the nuclear/gas program can be undertaken with little or no ratepayer subsidy required. The 2000 MW new nuclear units can be built by 2035 at a LCOE of $85/MWH, at or slightly below the PJM wholesale market price of $86/MWH[15]. The LCOE is $78/MWH for new combined cycle gas units and $200/MWH for gas turbine peaking units[12], so the combined LCOE of the 10 GW of new generation is **$83/MWH** including an additional $1/MWH of interconnection cost. This compares with the **$309/MWH** cost of the solar/battery approach.

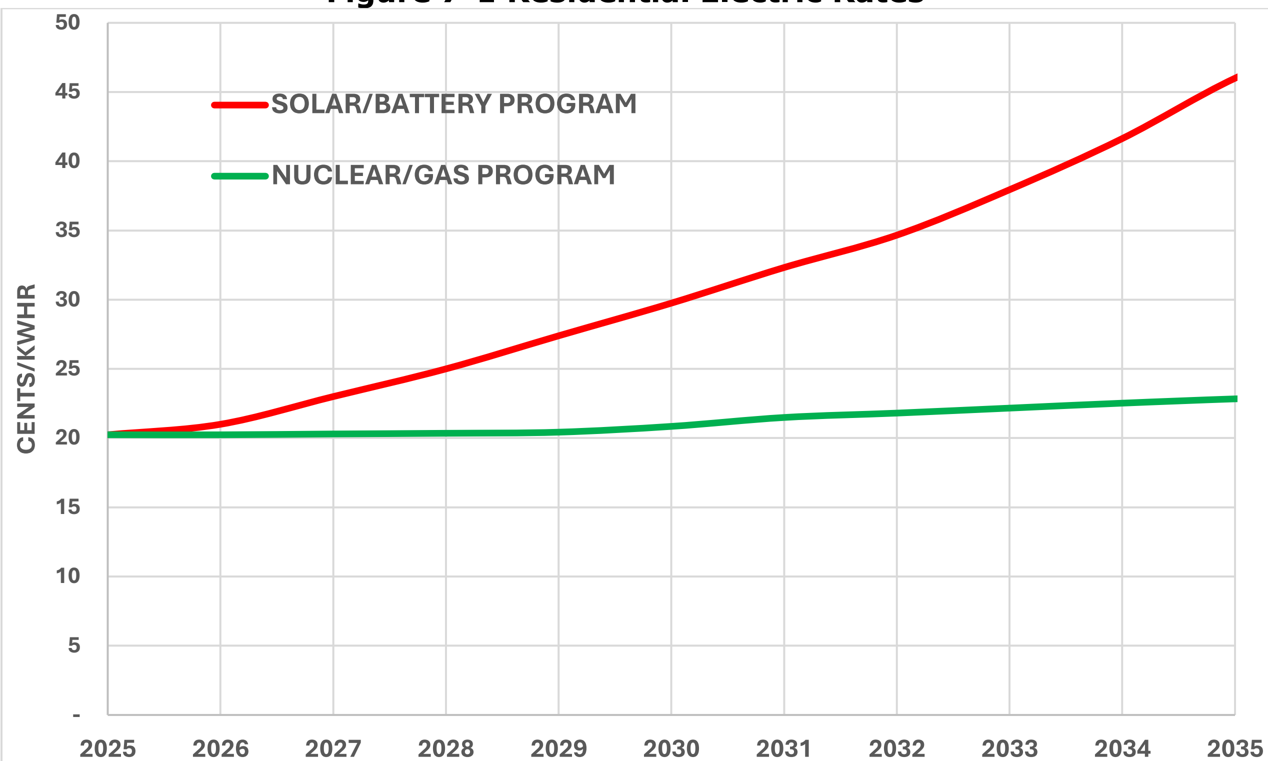
It should be noted that currently gas generation is subject to additional payments to the Regional Greenhouse Gas Initiative (RGGI) which would add another $10/MWH to generation cost which increases ratepayer bills and makes NJ gas generation less competitive with gas generation in non-RGGI states such as WV. To maintain

[14] Wanted: A New Jersy Energy Policy that Works and is Affordable, Whitestrand Consulting, August 2025.
[15] Cost of New Nuclear Generation in New Jersey, Whitestrand Consulting, December 2025

ratepayer affordability, as part of the proposed nuclear/gas program, NJ should withdraw from RGGI as other states have done.

The following chart shows how residential bills will grow over the next ten years under the two approaches.

**Figure 7-1 Residential Electric Rates**




As indicated, under the solar/battery program, the residential cost of electricity will more than double from 20 cents/kwhr today to **46 cents/kwhr** in 2035. By contrast the nuclear/gas program will see rates only grow to **23 cents/kwhr**, a 10 year annual increase of 1.5%, less than general inflation.

While nuclear and natural gas are the main elements of the proposed plan, this is not to say solar generation has no role in meeting the state's energy needs in 2035. If the 2 GW of utility solar generation is built as proposed, it can serve to stabilize grid voltage if properly located. With sufficient gas peaking capacity, however, there is no need for additional battery storage as the peaking units can be dispatched to serve as backup power whenever needed.

If the proposed nuclear/gas program were implemented the following would be the breakdown of NJ generating capacity in 2035:

**Table 7-1 Planned 2035 NJ Generating Assets**

| | Capacity (MW) |
|---|---|
| Solar | 2,000 |
| Nuclear | 5,500 |
| Gas Dispatchable | 14,200 |
| Gas Peakers | 3.000 |
| Hydro & Other | 1,000 |
| Total | 25,700 |

Thus, NJ would have sufficient in-state resources to satisfy its peak demand (21,000 MW) without reliance on imports from PJM and would have a 22% margin in line with PJM guidelines to ensure reliability of electric supply in 2035 and beyond.

## 8.0 Conclusion

The forgoing analysis demonstrates that attempting to build an electric power system that relies on solar and battery resources without sufficient baseload or dispatchable generation is neither technically or economically feasible. The fact that **solar energy** is only available during daylight hours and then only to the extent the sun is at favorable seasonal and daily conditions, means that it **must generate all required energy for satisfying instantaneous demand while at the same time charging batteries** for supplying stored energy during the night or whenever the solar output is insufficient to meet demand.

This means that installed **solar capacity must be overbuilt by a factor of three** or more over peak demand and that batteries must have even greater capacity to store sufficient energy to meet demand over a day or more without solar output. The physical requirements of such a system would far outstrip available space in NJ to site such facilities or for the supply chain to supply the required components. Economically, it has been shown that such a solar/battery system would involve enormous capital cost and raise rates to unaffordable levels. The same conclusions would apply to other renewable resources such as wind/battery combinations.

The clear result of this analysis is that **the EMP goal of 100% carbon free electricity by 2035 or any other date is unachievable** due to these technical and economic realities. Without that as a constraint, the proposed alternative plan of retaining existing baseload and dispatchable nuclear and natural gas resources while adding 10 GW of new capacity for satisfying peak load and bulk power needs as well as 2 GW of solar capacity for grid stabilization and voltage control would be reliable and affordable and would allow NJ to satisfy its own needs by 2035 and beyond without undue reliance on PJM imports as is currently the case.

Accordingly, it is recommended that:

- The current mandate to achieve 100% carbon free electricity by 2035 be revoked.
- The state should withdraw from the Regional Greenhouse Gas Initiative (RGGI).
- The Legislature should enact laws as necessary to support the development of 10 GW of new nuclear and natural gas and 2 GW of solar capacity by 2035.
- The Governor should direct BPU and other agencies to take all steps necessary to support that energy plan.

These steps are vital to ensure electric power in NJ is reliable, affordable and cleaner for all of the state's residents and businesses while supporting economic development and providing numerous good paying jobs.

## APPENDIX A

## Solar/Battery Generation System
## Financial Analysis Assumptions

| | |
|---|---|
| Solar Cell Capacity | 50,000 MW |
| Battery Capacity (4 hr) | 100,000 MW |
| Solar Capacity Factor | 16% |
| Solar Capital Cost | $1 million/MW |
| Battery Capital Cost | $0.5 million/MW |
| Solar Replacement Cost | $1 billion/yr |
| Battery Replacement Cost | $1.5 billion/yr |
| Solar O&M Cost | $48,000/MW-yr |
| Battery O&M Cost | $25,000/MW-yr |
| Decommissioning Cost | $50 billion |
| Equity Share | 40% |
| Debt Share | 60% |
| Finance Interest Rate | 6% |
| Battery Investment Tax Credit (ITC) | 30% |
| Tax Rate | 21% |
| Target Internal Rate of Return (IRR) | 12% |
| Weighted average Cost pf Capital (WACC) | 6.64% |

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**The Author**

*Edward P. O'Donnell is a principal in Whitestrand Consulting LLC. He has spent 35 years in the nuclear power industry as an engineer, manager and executive with responsibilities for design and licensing of numerous plants in the US and abroad. He was also responsible for engineering, corporate planning and rate matters for a NJ nuclear utility and has testified in utility rate proceedings before the NJ BPU.*

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