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MID-ATLANTIC SOLAR & STORAGE INDUSTRIES ASSOCIATION

**Mid-Atlantic Solar & Storage Industries Association**

*Rutgers Eco-Complex, Suite 208-8*
*1200 Florence-Columbus Road, Bordentown, NJ 08505 | info@mseia.net*

## MSSIA Special Event:

# GRID MODERNIZATION: Powering Tomorrow: Advancing Grid Modernization in NJ, PA, and DE

## January 23, 2024

**Lyle Rawlings, P.E.**
**President, MSSIA**
**President & CEO, Advanced Solar Products**

# Topics:

1. Interconnect denials are accelerating

1. The "Low-Hanging Fruit" solutions

1. High-penetration renewables in NJ: sooner than you think.

2. How should we finance Grid Modernization?

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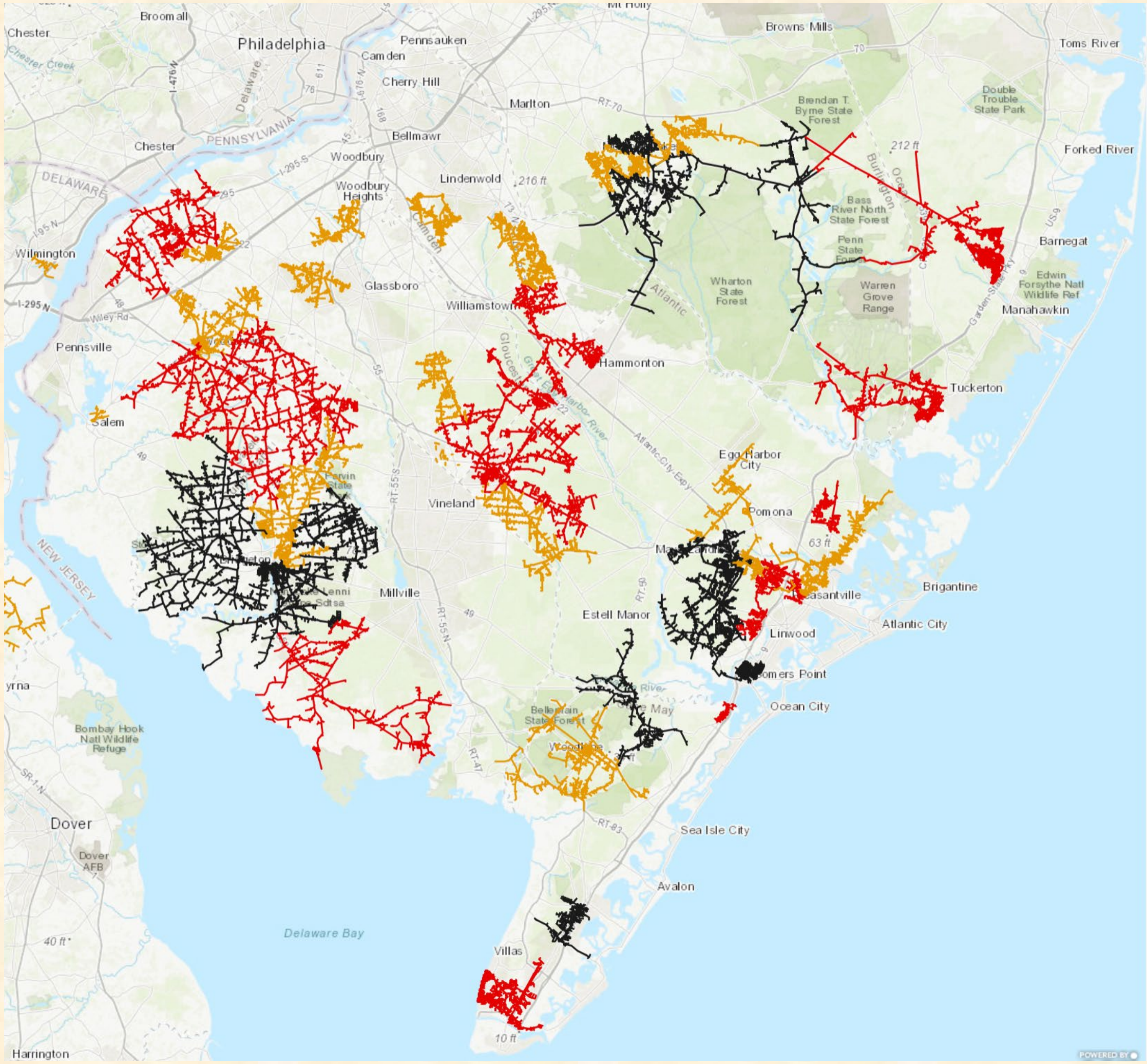
# Circuits Closing to Further Solar Development




## Restricted circuits map, Atlantic City Electric Co.

**A large proportion of circuits in ACE territory are restricted or closed to *any* further development of solar power.**

**Denial of interconnection is becoming more common in the rest of the state too.**

**Antiquated standards for circuit closure, disallowance of available enabling technology, and disallowance of reverse flow through substations are problems that need to be addressed.**

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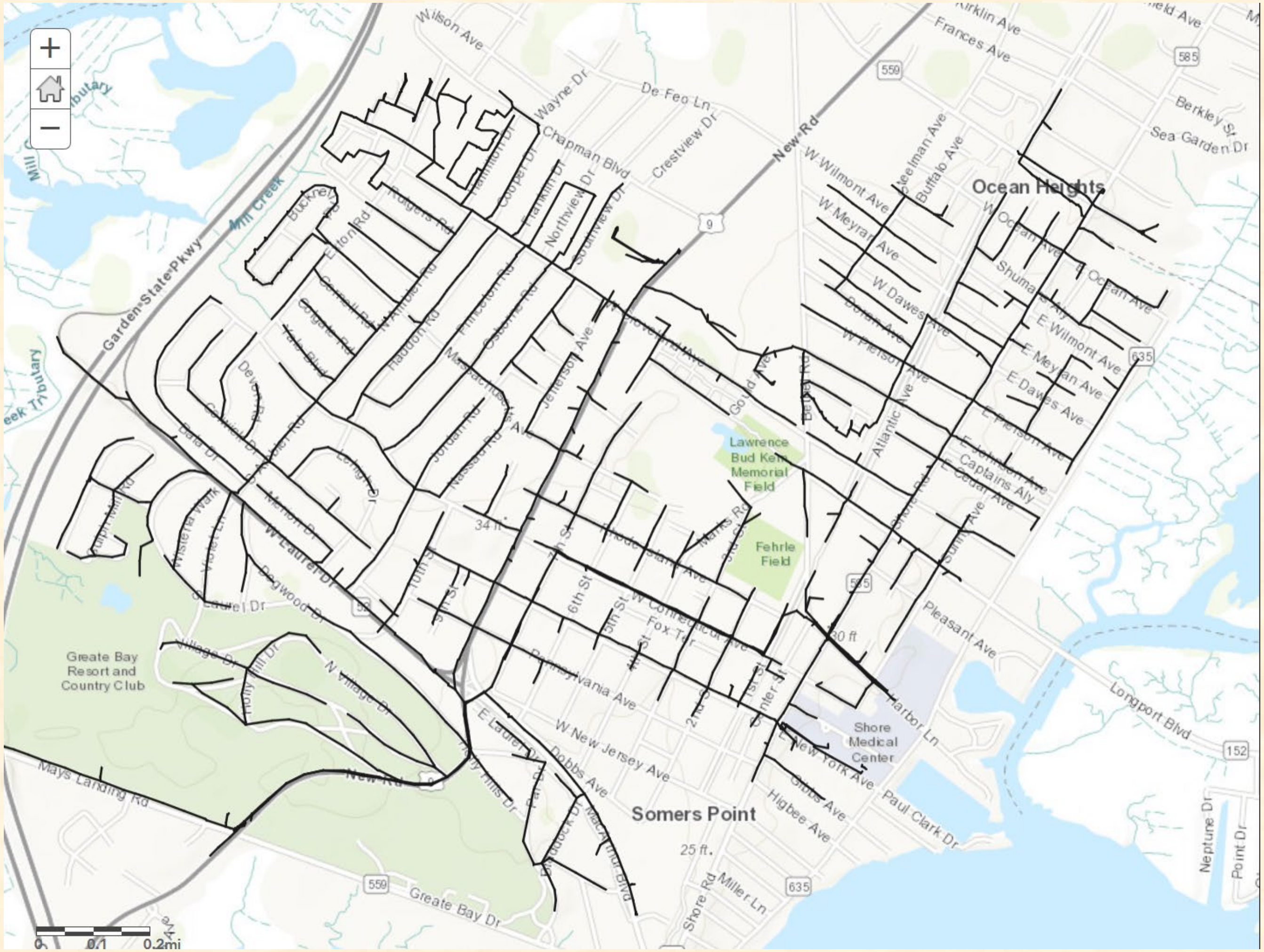


## Restricted circuits map Closeup of Somers Point

**Entire towns are being closed to further solar development.**

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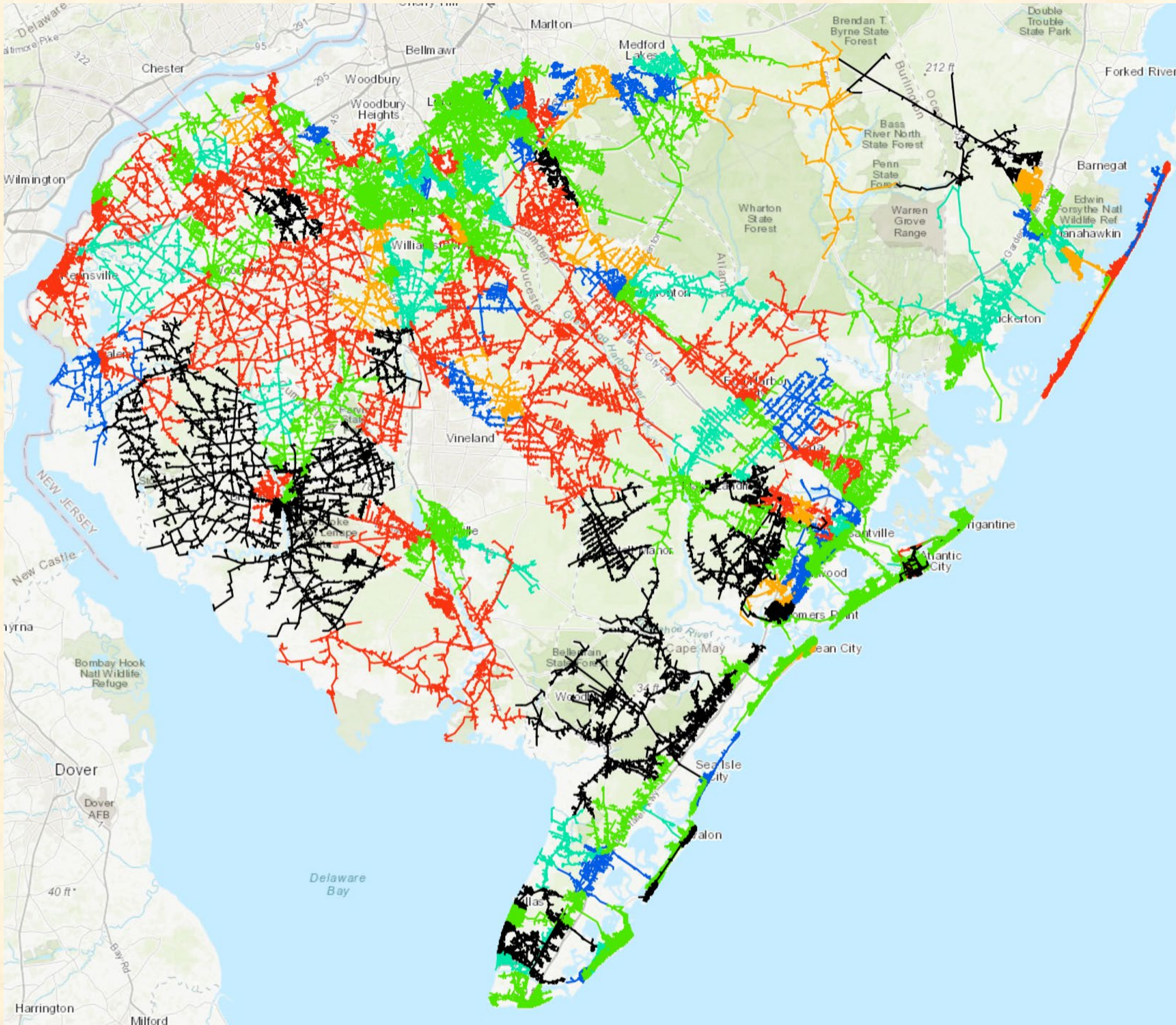
# Circuits closing or severely restricted – ACE

## (black is closed, red is restricted to <250 KW)



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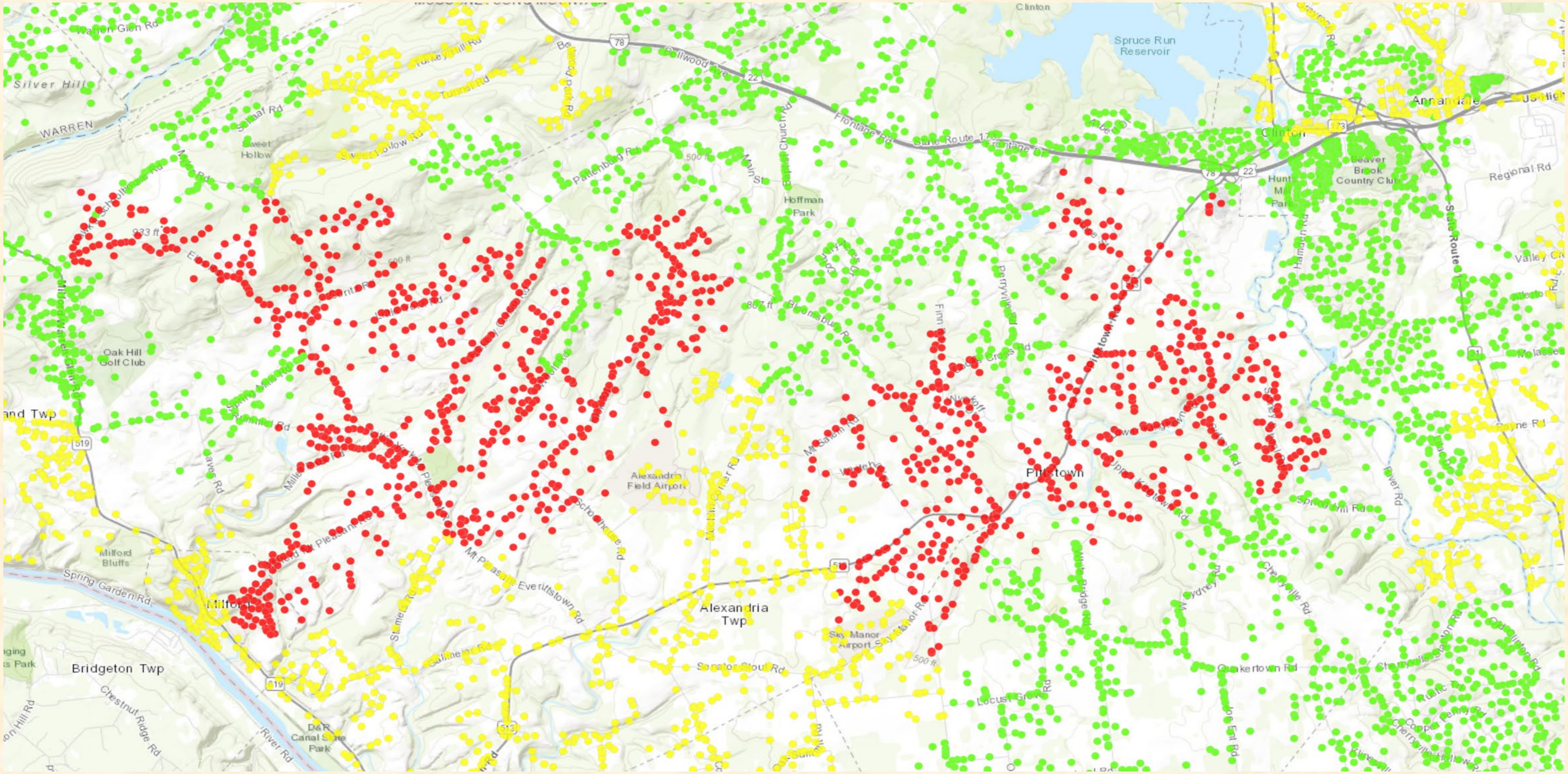
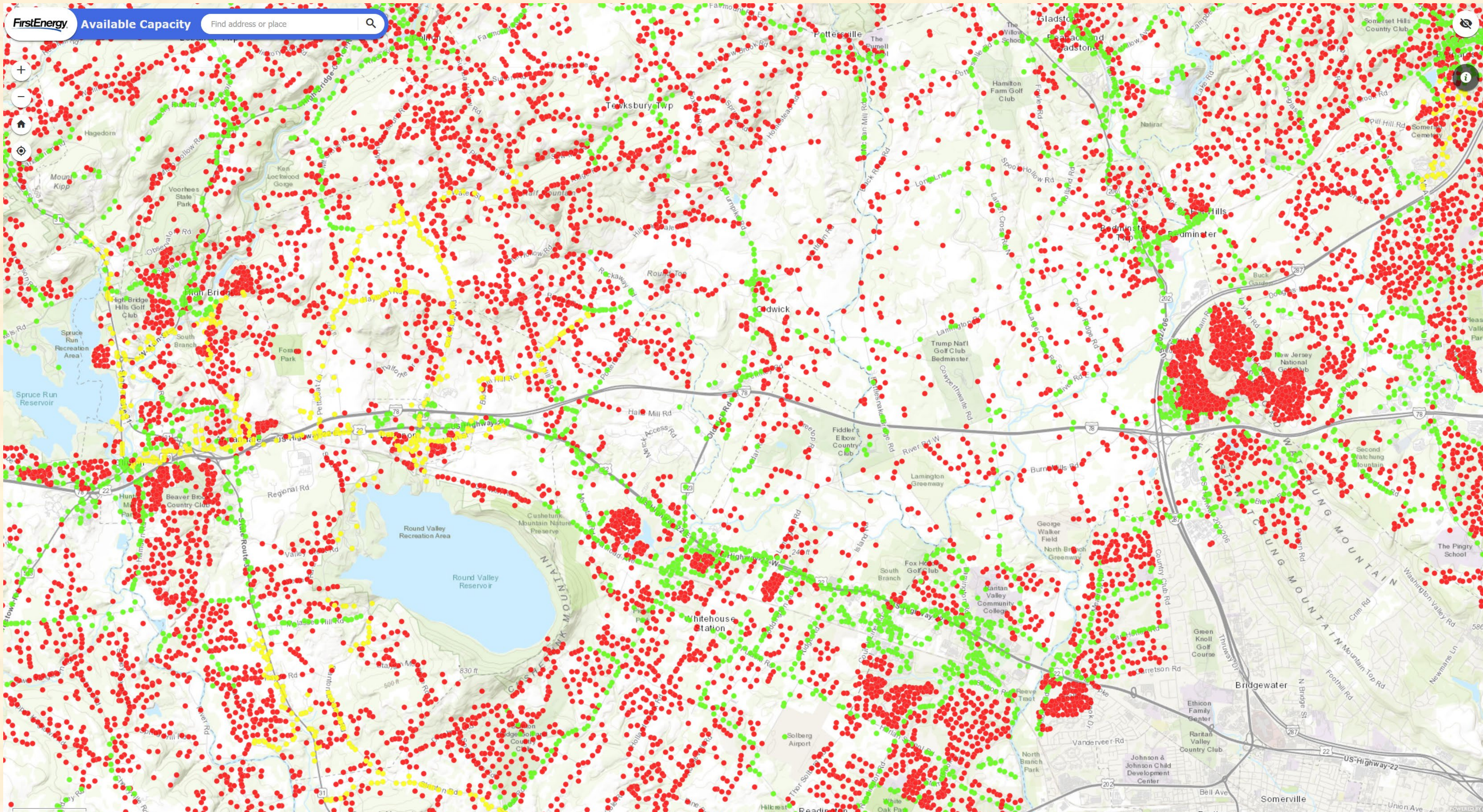
# Circuits severely restricted – JCP&L (red is restricted to <100 KW)

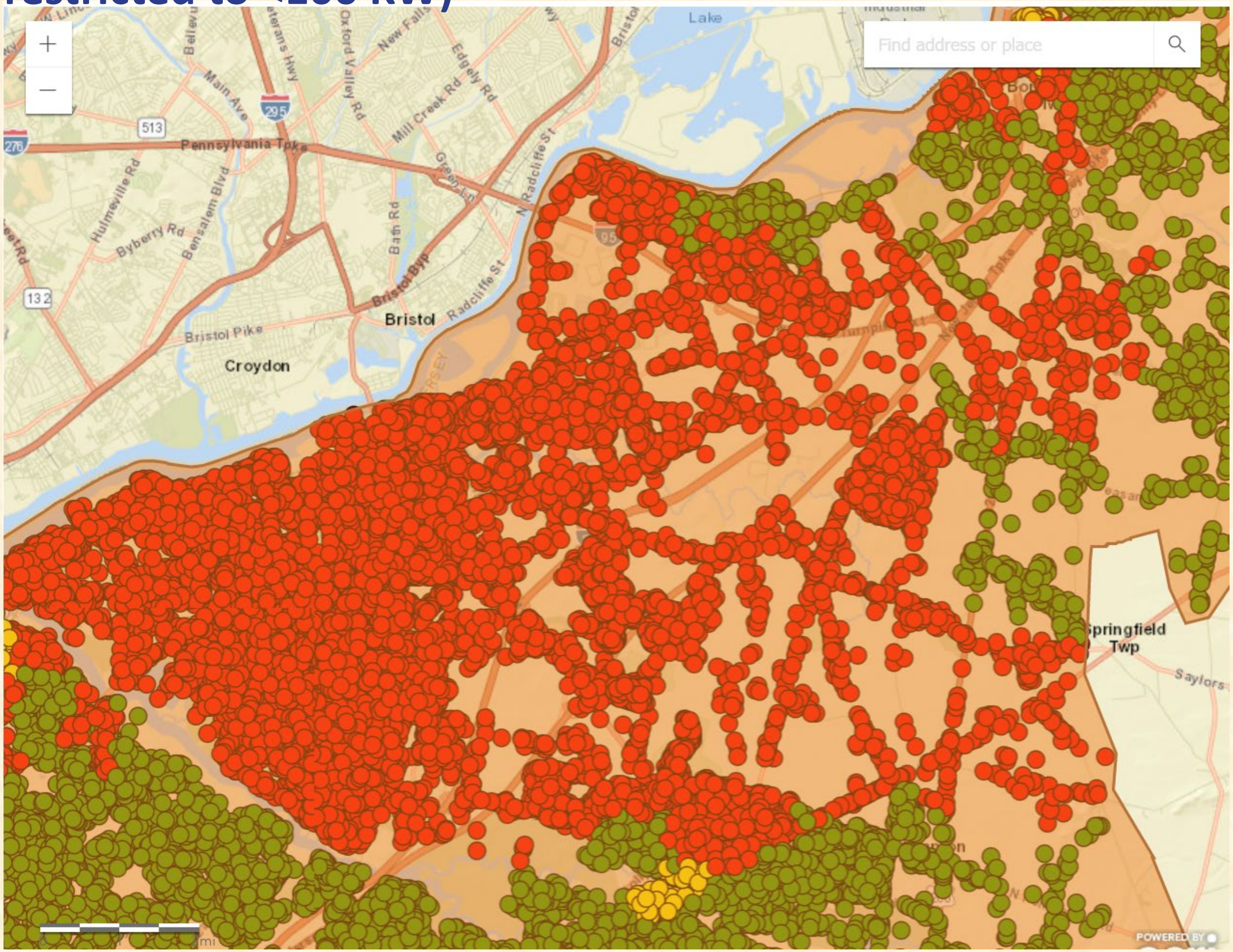
## Feb. 2020:



# Circuits severely restricted – JCP&L (red is restricted to <100 KW)



# Circuits severely restricted – PSE&G (black is closed, red is restricted to <100 KW)



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# MSSIA "LOW-HANGING FRUIT" MEASURES FOR OPENING CIRCUITS TO GREATER PV HOSTING

## 1. Allow reverse flow through substations

Substations can handle reverse flow (solar power input momentarily exceeding the load on the substation and flowing back into the sub-transmission or transmission system). Usually minor changes to the substation's control system are all that is necessary to allow this, greatly increasing the amount of solar power that can be connected to the substation compared to the current restrictions.

## 2. Use the reactive power capabilities of solar inverters

All solar inverters already have a built-in capability that is extremely potent – the ability to provide controllable reactive power services. When reactive power can be deployed in a controllable fashion in a circuit, it can be used to stabilize voltage (it's called volt-VAr control).

These capabilities can also be used to solve distribution system issues that are unrelated to solar power. For years now, New England ISO has required every PV project over 5 MW to activate its ability to provide this service.

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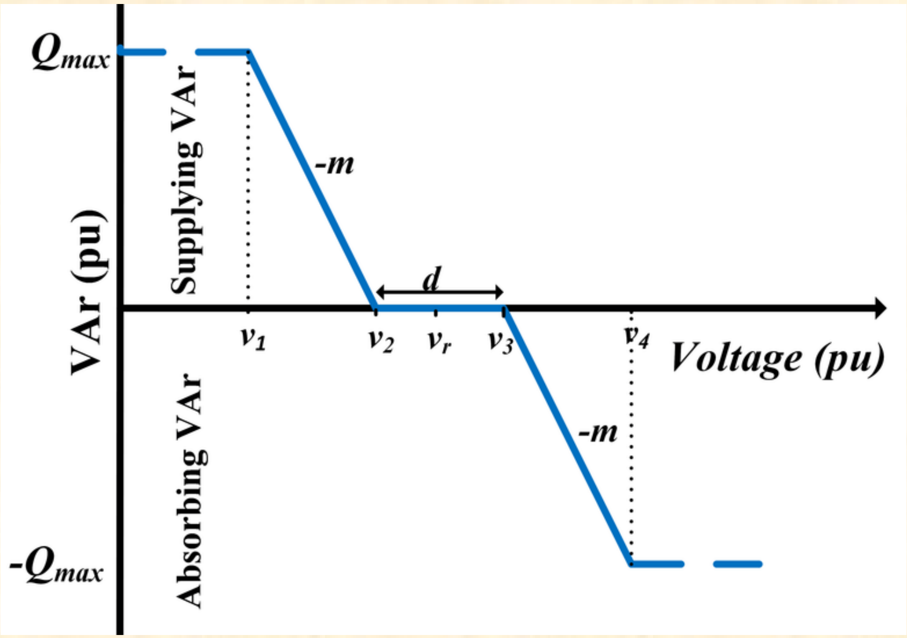
# CASE STUDY: THE ELIZABETH MINES PROJECT, VT

- A 5 MWac solar project on a brownfied in Strafford, VT with ASP as engineer.
- Green Mountain Power reviewed the interconnect application, concluding that the circuit serving the site could only handle about 2.2 MW
- ASP engaged with GMP first to demonstrate the natural limits to ramp rate. When that wasn’t enough, ASP engaged with GMP’s engineering dept. cooperatively to assess the use of inverter reactive power.




- The cooperative engineering effort reached the conclusion that a simple algorithm for Volt-VAr control for a maximum PF range of .975 leading or lagging would increase GMP’s approved capacity of the circuit to 5 MW.
- Compensation is needed for reactive power providers for the losses of real power when volt-VAr is activated.

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# MSSIA "LOW-HANGING FRUIT" MEASURES FOR OPENING CIRCUITS TO GREATER PV HOSTING

## 3. Utilize batteries connected to PV systems

Batteries can provide several different types of power smoothing services that can help preserve a stable and resilient grid. With the current interconnect regulations, however, batteries currently are <u>not allowed</u> to be used to increase the hosting capacity of distribution circuits. The Clean Energy Act required the development of large amounts of grid-connected battery power in order to enable the transition to renewable energy. They should be allowed to perform that function.

## 4. Utilize predictive services to control ramp-down of PV systems

Today highly granular satellite weather data is available. This data is already used widely in many parts of the country, and elsewhere around the globe, for very accurate, short-term forecasting of changes in PV power systems' output. These services are used routinely to ensure gradual ramp-down of PV systems so that no harmful voltage fluctuations are caused. Ramp-up control can be accomplished simply by programming it into inverters.

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# MSSIA "LOW-HANGING FRUIT" MEASURES FOR OPENING CIRCUITS TO GREATER PV HOSTING:
# THE NEW REALITY

## 5. Curtailment

MSSIA has previously thought of curtailment as a future necessity, but not as a short-term necessity.

The sudden increase in interconnection denials that occurred in and around November's application window for community solar showed that strong measures are need sooner than expected.

In order to keep circuits open and re-open closed ones, it may be necessary to bring curtailment (with compensation) into the picture now.

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# The current status of in-state solar energy:

- Current installed capacity plus approved projects in the pipeline (5.35 GW) are enough to generate about 8.5% of the state's annual electric needs.

- That capacity, on cloudless days in spring or fall, will generate over 37% of the state's load between 10 AM and 3 PM.

- The state's Energy Master Plan "Least Cost Scenario" calls for 17.2 GW of solar by 2035, and 32.2 GW by 2050.

  It also states that solar energy should be remunerated according to the "full value stack" of services that it provides.

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# The Good News:

**Staying on course with existing nuclear, successful wind development, and solar development according to the EMP Least Cost Scenario will get us very close to 100% by 2035:**

1. Load growth - EVs grow load by 16.8% by 2035[1] (ave. 1.4%/year)
- Assume building electrification adds 1.0%/year through 2035
- Assume energy conservation subtracts 1.4%/year per the EMP

Then net growth is 1.0%/year. 2035 total load = 88.4 million MWH/year

| | |
|---|---|
| 2. Nuclear generation at 3,452 MW = 27.8 million MWH/year = | 34.8% |
| 3. Wind at 7,500 MW = 27.9 million MWH/year = | 36.1% |
| 4. In-State Class 1 at 400 MW = 2.8 million MWH/year = | 3.5% |
| 5. Solar per EMP LCS[2] = 19.8 million MWH/year = | 24.7% |

In sum, 2035 nuclear + wind + NJ Class 1 + solar (per EMP) = 94.0% of total load.

[1] Based on year by year new car sales assumptions, e.g. EVs at 25% of new car sales by 2027, 50% by 2030, and 100% by 2035, on total sales of 500,000 new cars/year

[2] Based on Energy Master Plan Least Cost Scenario - 17.2 GW of in-state solar by 2035 (the EMP LCS also specifies 32.2 GW by 2050)

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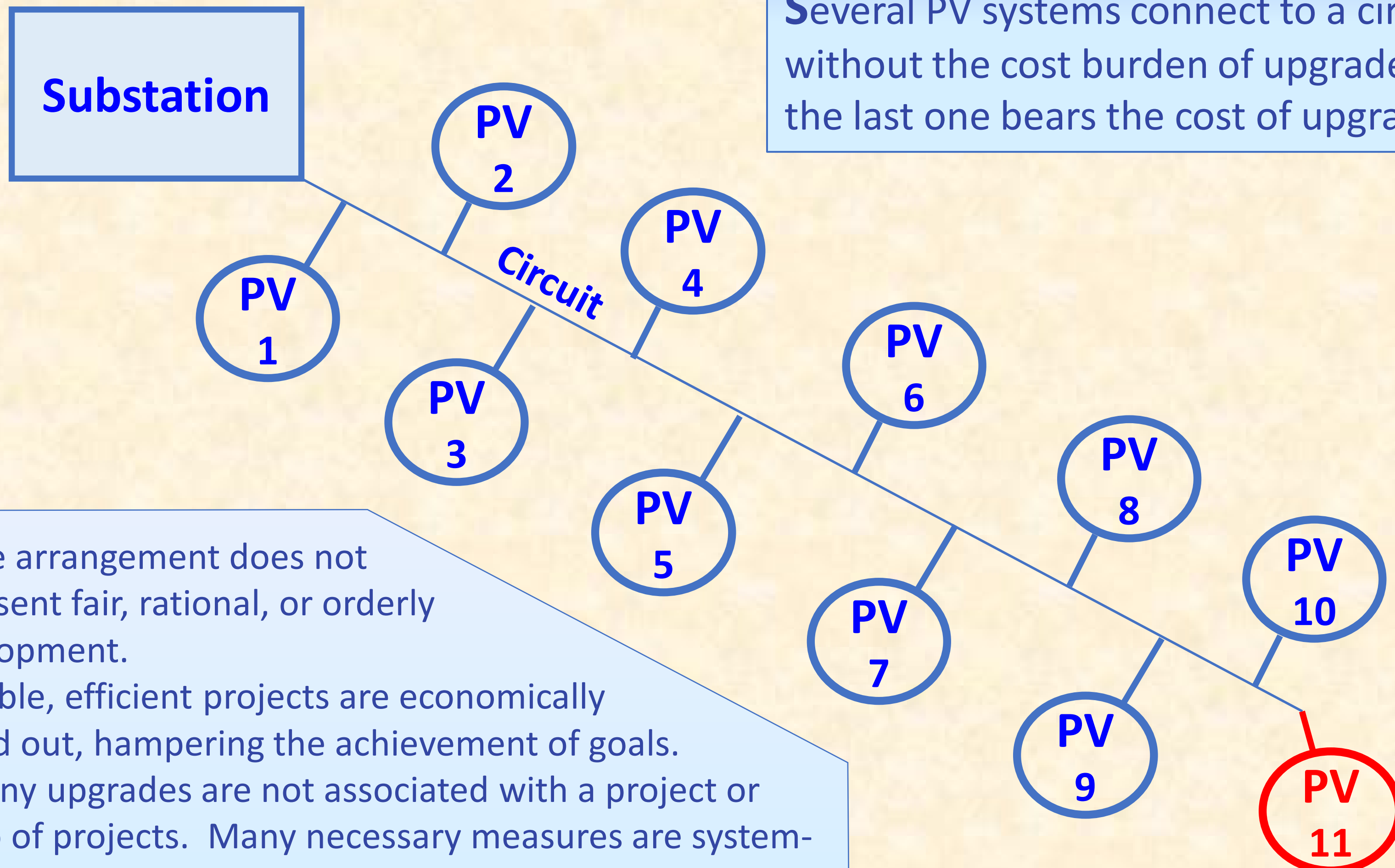
# Currently: Musical Chairs?

Several PV systems connect to a circuit without the cost burden of upgrades, then the last one bears the cost of upgrades.




1. The arrangement does not represent fair, rational, or orderly development.
2. Viable, efficient projects are economically locked out, hampering the achievement of goals.
3. Many upgrades are not associated with a project or group of projects. Many necessary measures are system-wide or state-wide

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# HOW WILL INFRASTRUCTURE BE FINANCED FOR OTHER CLEAN ENERGY RESOURCES?

## Examples:

- **Development of electric vehicle charging infrastructure will require a large-scale program of distribution system enhancement.**

  **The state, in its first action to encourage electric vehicles, made utilities responsible for making needed upgrades for charge stations, and they will recover the amortized costs through the rate base. There was essentially no debate over that.**

- **Building electrification will require a large-scale program of distribution system enhancement.**

  **It is assumed that utilities will responsible for making the grid upgrades that are required, and will recover the amortized costs through the rate base (who else? Building owners?).**

# HOW WILL INFRASTRUCTURE BE FINANCED FOR OTHER CLEAN ENERGY RESOURCES?

## Examples (cont'd):

- Offshore wind will require transmission-level and distribution-level upgrades on land to transmit and distribute the power from the point of interconnection.

  BPU awarded $1.1 billion to utility-led teams to build onshore infrastructure to accommodate offshore wind power, with the cost added to the ratebase. A second award is expected early this year. More infrastructure further downstream is likely to be needed.

# SO, WHAT ABOUT SOLAR?

**For 24 years, solar energy has been delivering regional pollution mitigation, greenhouse gas mitigation, jobs, federal funds, economic growth, reduced wholesale peak power costs, "profit to the people", and increasingly, resiliency.**

**In order for solar energy to continue growing in New Jersey; in order for these benefits to continue,**

**The state must commit to both the execution and the financing of the necessary infrastructure, in a fashion similar to the way it has committed to other clean energy initiatives.**