New York Local Solar Roadmap:

How Local Solar Can Save New York Money and Create a More Just and Equitable Grid

Summary Results
November 2021

Expert Panel Available to Answer Your Questions

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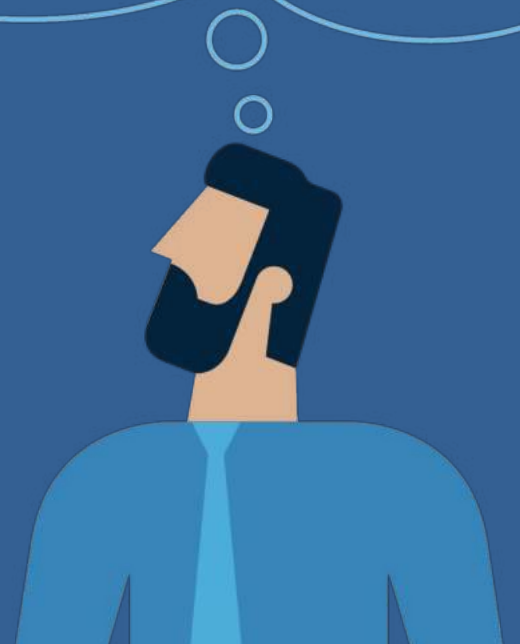
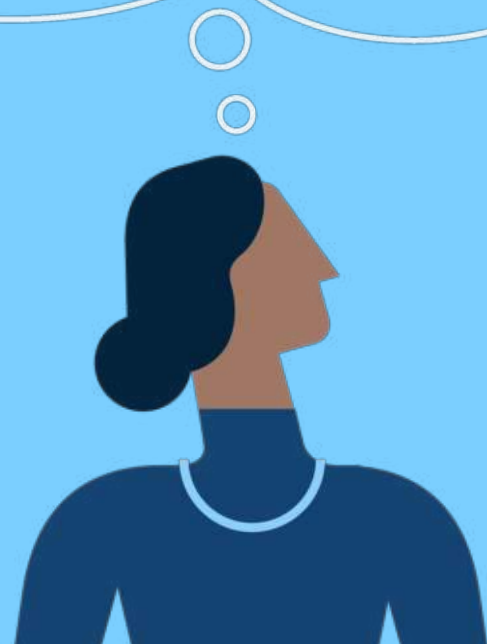
Conventional Thinking

- Large central power plants are the most cost-effective option for New York's energy future due to "economies of plant scale"
- Utility scale is the cheapest, fastest way to meet New York's clean energy goals
- Local solar + storage is too expensive and isn't fair and beneficial to all New Yorkers



Paradigm Shift

- New and better models challenge conventional thinking
- Scaling utility renewables ***AND*** local solar + storage means ratepayer savings
- CLCPA's emphasis on distributed energy was a good start, and new modeling shows that ramping up DER is the best path to complying with the law



Local Solar + WIS:dom-P®

Published Analysis from the Local Solar for All Coalition:

+ Illinois: May 2021
+ California: July 2021
+ National: October 2021

What did we do?

Using one of the most advanced models in the world,
we asked the questions:

How can New York most cost-effectively meet its power decarbonization goals? Would this approach be consistent with the climate justice mandates of CLCPA?

What Did We Find?

The least cost path to meeting its climate and energy justice goals requires New York to outstrip current mandates for distributed solar and storage

11.4 GW of **local solar by 2030** to nearly **22 GW by 2050**

4.8 GW of **distributed paired storage by 2030** to over **17 GW by 2050**

Least cost path deploys resources in **disadvantaged communities**

WIS:dom®-P: Total System Planning Tool

- **WIS:dom-P is a state-of-the-art, fully combined capacity expansion and production cost model**, developed to process vast volumes of data. It was developed by Dr. Christopher Clack and his team at Vibrant Clean Energy. For more information visit: https://www.vibrantcleanenergy.com/.

- **It simultaneously co-optimizes for: (1) Capacity expansion requirements (generation, storage, transmission, and demand-side resources); and (2) Dispatch requirements (production costs, power flow, reserves, ramping and reliability).**

- **WIS:dom-P is a total system planning tool** that provides:

1. 

MORE & BETTER DATA PROCESSING

2. 

TOTAL SYSTEM PLANNING COORDINATION

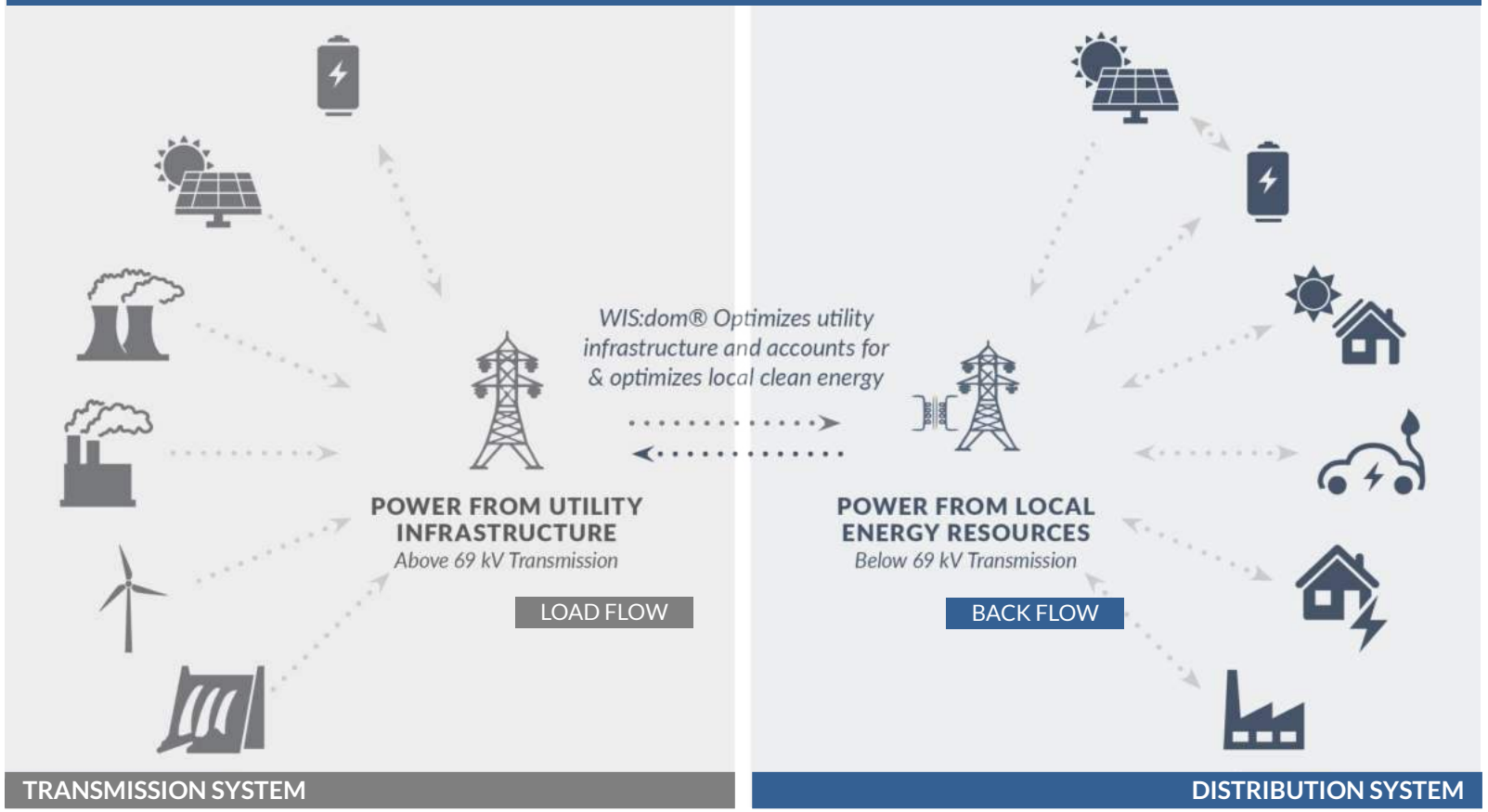
3. 

LOCAL CLEAN ENERGY INTEGRATION & OPTIMIZATION

What Does “Integrate & Optimize” Mean?

- WIS:dom-P co-optimizes and coordinates the utility-scale electricity grid (left) with the distribution grid (right) to find the overall least system cost.
- **Co-optimize and coordinate means** it considers distribution infrastructure requirements and determines when leveraging local solar + storage to serve local load and/or reduce peak load, could lessen the need for some distribution infrastructure and forego additional utility-scale generation and transmission buildout.

WIS:dom optimizes utility infrastructure (left) + integrates all resource options including local energy produced on the distribution grid (right)



What Did We Ask the Model to Assume?

70% renewable electricity by 2030 / 100% zero carbon by 2040

+

Full electrification by 2050

+

Offshore wind capacity floor at 2.4 GW by 2030 and 9 GW by 2035

+

Distributed solar capacity floor at 3 GW by 2023 and 6 GW by 2025

+

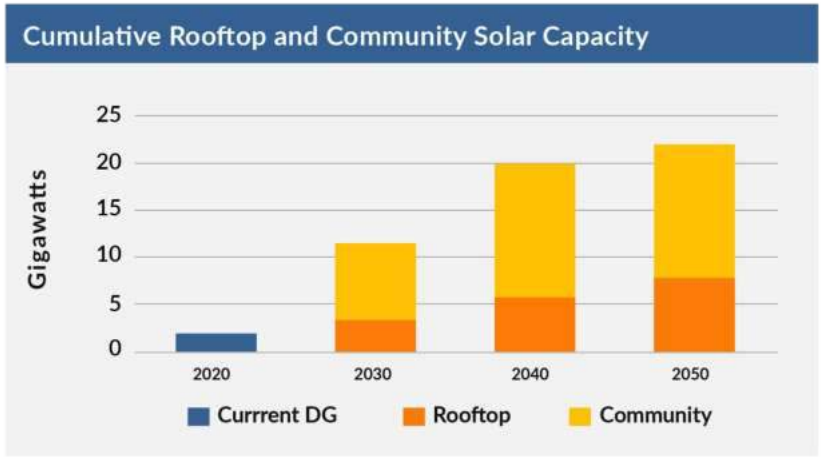
Energy storage capacity floor at 3 GW by 2030

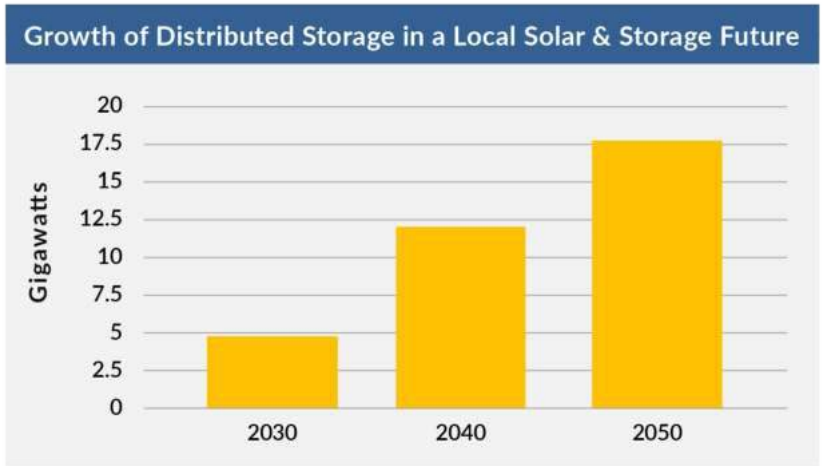
What is Distributed/Local Solar?

- **LOCAL SOLAR + STORAGE** are distributed solar generation and energy storage technologies that provide electric services to the grid. Technologies include rooftop and community solar and distributed battery storage.
- **BENEFITS OF LOCAL SOLAR INCLUDE** direct and indirect benefits such as reduced grid costs (as demonstrated in this report), lower energy bills, local job creation and economic activity, more equitable participation, increased grid resiliency, and more innovation due to competition.

Local Solar + Storage Capacity Key Takeaways

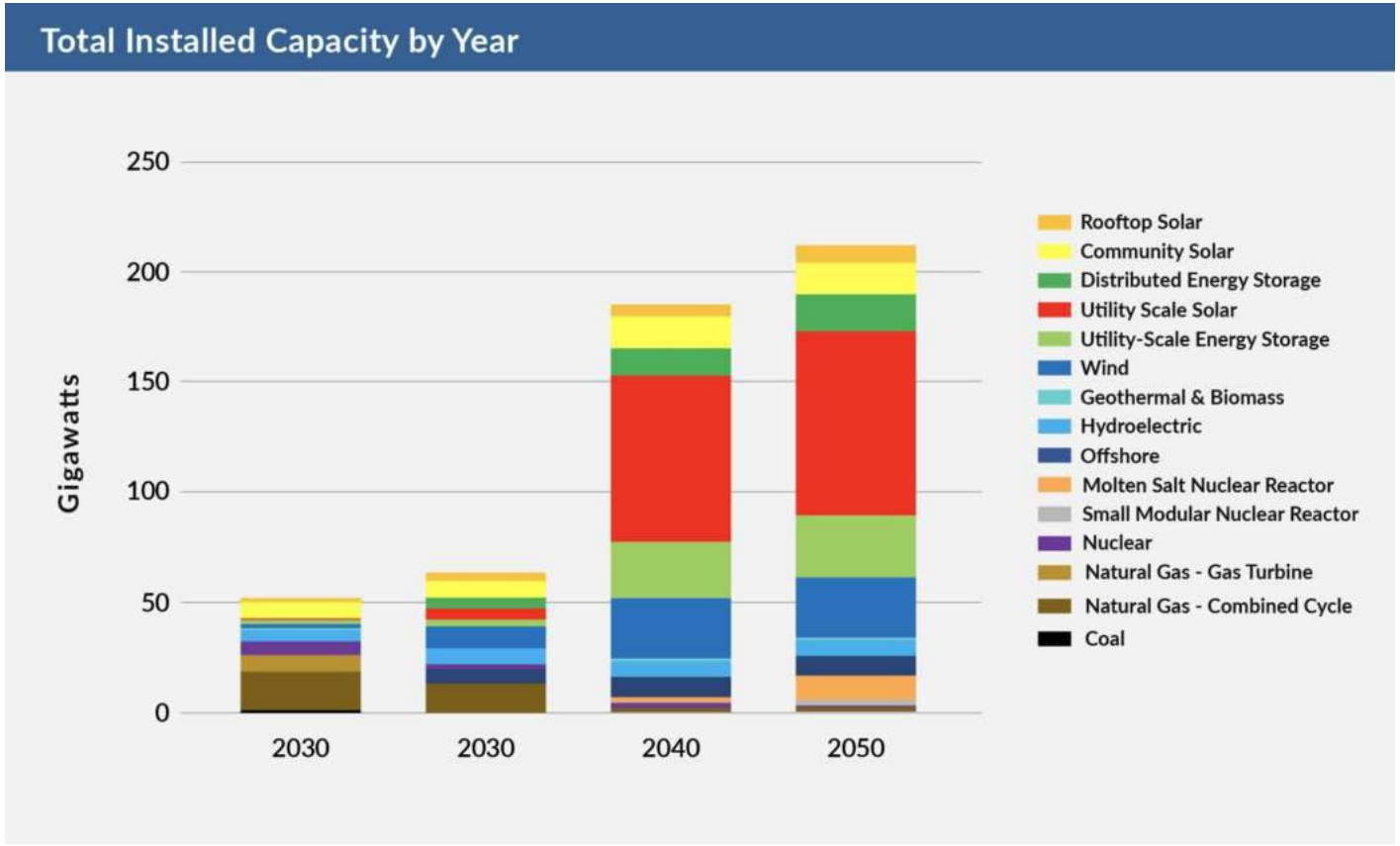
- Although the model was only asked to deploy 3 GW of local solar by 2023 and 6 GW by 2025 (to align with state targets), it independently selected 11.4 GW of local solar by 2030 and 21.9 GW by 2050
- To leverage the benefits of local solar, the model deployed 4.8 GW of distributed storage by 2030, over 12 GW by 2040, and 17.7 GW by 2050
- Together the local solar + storage enable future savings and support the deployment of large-scale renewables.





Total Capacity to 2050

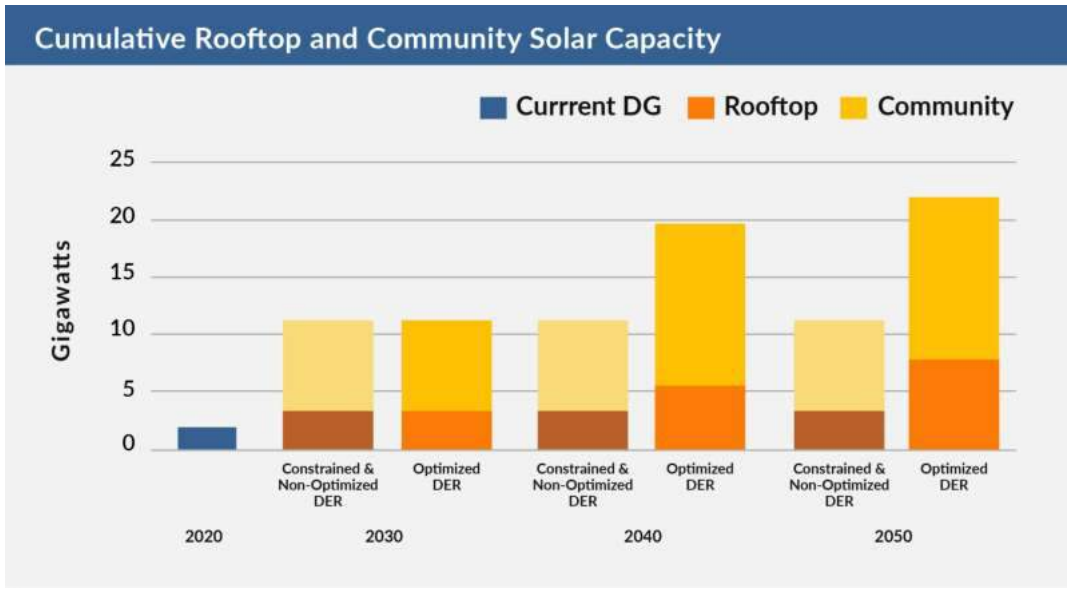
- The shift to an electrified economy drives significant capacity expansion by 2040. In addition to local solar + storage playing a major role, utility-scale solar and onshore and offshore wind account for over 76% of (non-storage) capacity and nearly 62% of generation by 2040. When you retire fossil firming capacity and peaker plants and reshape demand with DER, the truly optimal solution takes advantage of least-cost resources whenever and wherever power is produced.

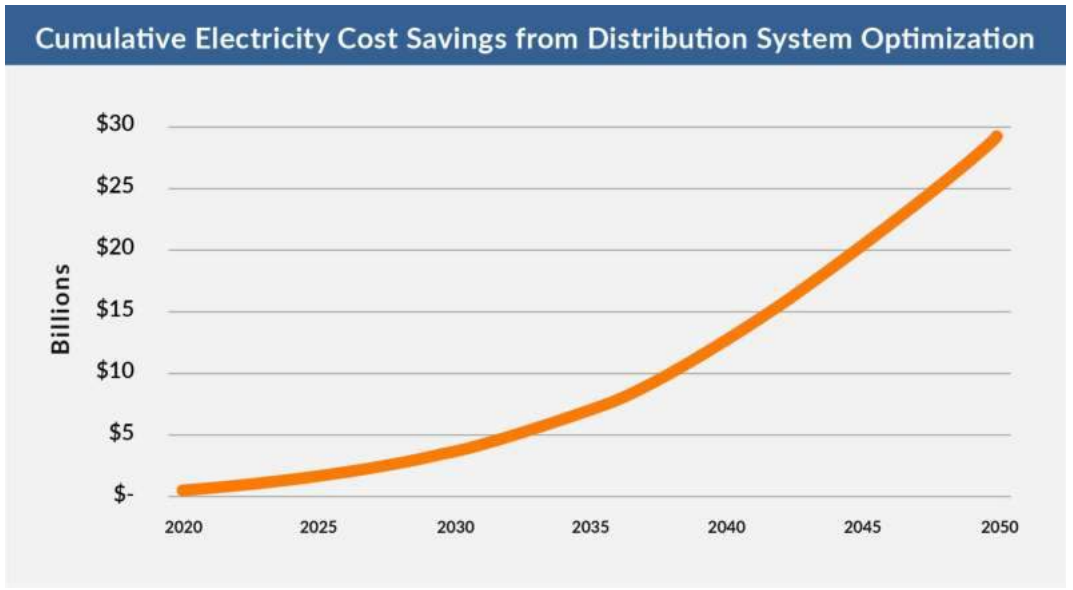


The DER Effect: How does the ability to optimize DERs impact results?

- **It builds more solar long-term**: When not constrained and able to co-optimize the distribution and utility-scale grid infrastructure, the model selects significantly more distributed solar capacity than current state mandates.

- **It saves more money**: When the model optimizes the distribution system, it chooses more distributed solar and distributed storage to achieve a cumulative $28 billion in savings compared to the non-optimized run.

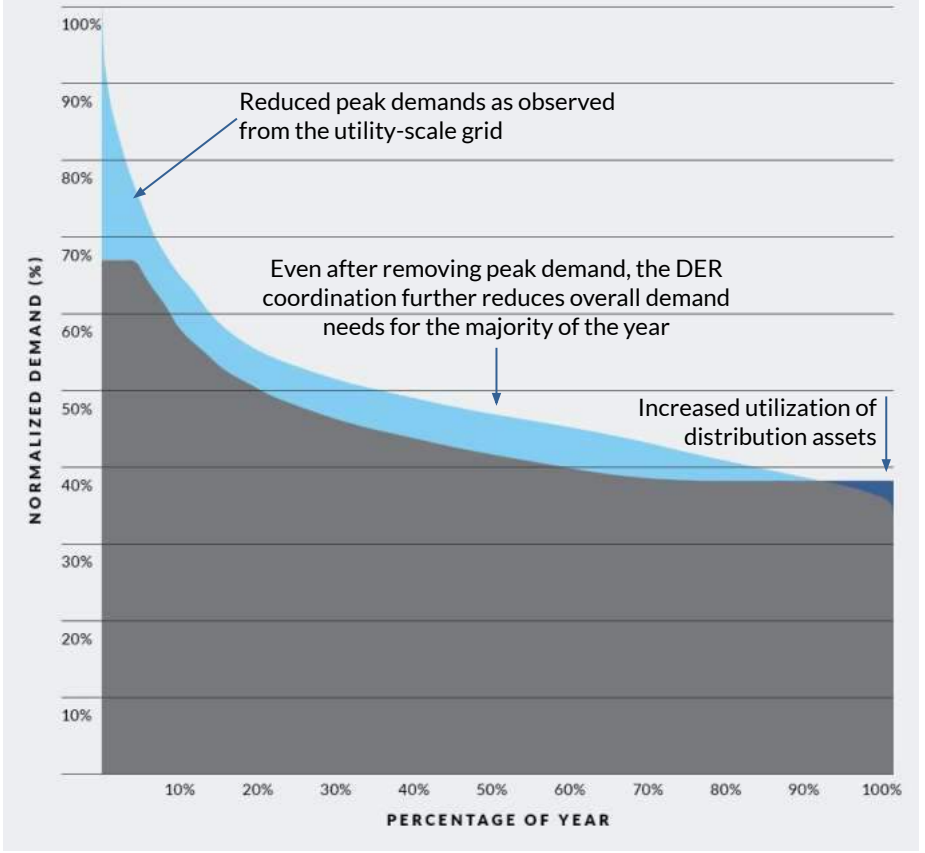




Why Did WIS:dom Find Cost Savings?

- Modeling that ENABLES COMMUNICATION between both sides of the grid (transmission & distribution) with WIS:dom demonstrates an ability for local solar and storage to reshape load, as observed from the utility-scale grid (i.e., above 69 kV).
  - One consequence of this co-optimizing and coordinating utility-scale with distributed-scale is the reduction of volatility in the demand as observed by the utility-scale grid.
  - A second consequence is a dramatic drop in the peak demand requirements as observed by the utility-scale grid — *~16% reduction in peak by 2050 attributed to local solar + storage in national modeling.*
- The result is that more local solar + storage reduces net demand and smooths overall demand to enable access to lowest cost utility-scale generation – more utility wind and solar and less fossil firming capacity.
- By permanently easing stress on system during critical peak hours & reducing how much bulk-scale power is needed to serve the distribution grid, you don't have to overbuild the system with expensive peaker plants and firming capacity.

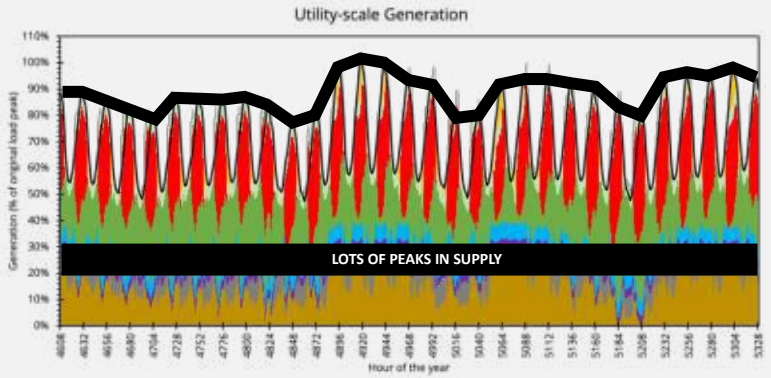
DER Altered Load Duration Curve (example state)

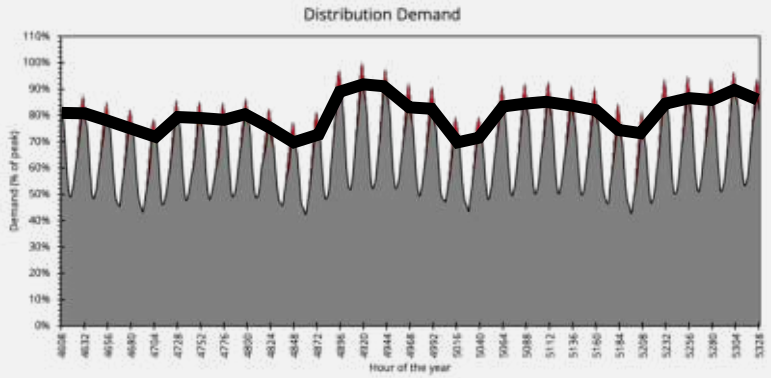


Eases Stress On The Bulk Power System

UTILITY-SCALE GENERATION ⟷ **DISTRIBUTION DEMAND**

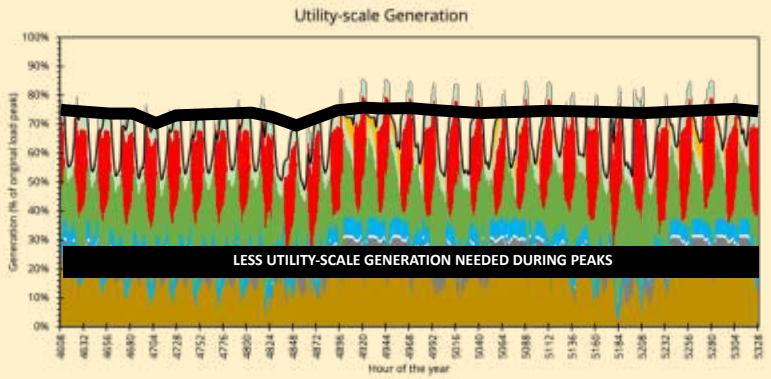
BASE CASE
(summer month in sample state)

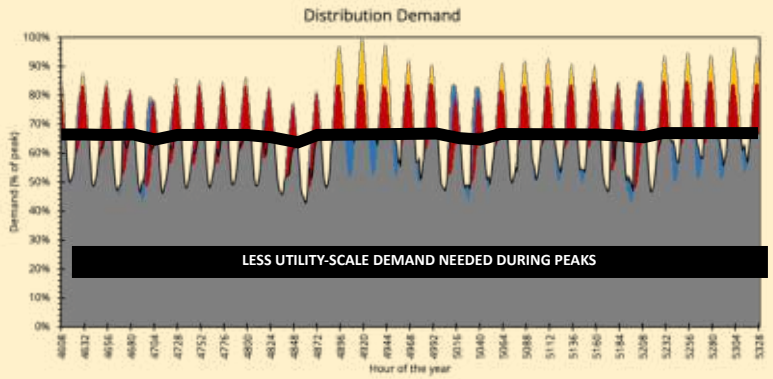




- Demand is sharp and spikey and supply ramps up and down to meet peaks
- More firming capacity and peaker plants are required to meet demand at times of the day when customers are using the most electricity
- Distributed solar + storage have minimal impacts on “shaping load” and meeting system needs

DER
(summer month in sample state)

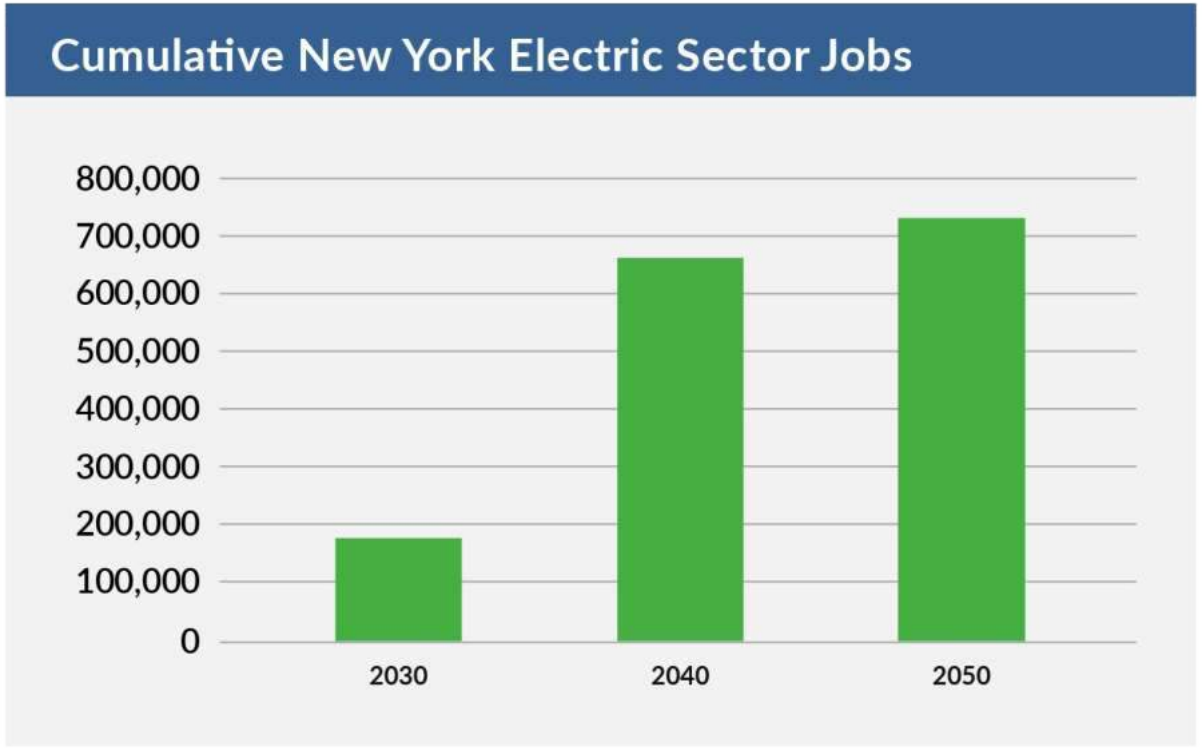




- Demand is smooth because local solar + storage can be deployed at peak times and reshapes load from the perspective of the utility grid (above 69kV)
- Permanently eases stress on system during critical peak hours & reduces how much bulk-scale power is needed to serve the distribution grid
- Less bulk power = less money on expensive peaker plants and firming capacity thus overbuilding the system

Deploying More Local Solar Helps Support 734,000 Electric Sector Jobs by 2050

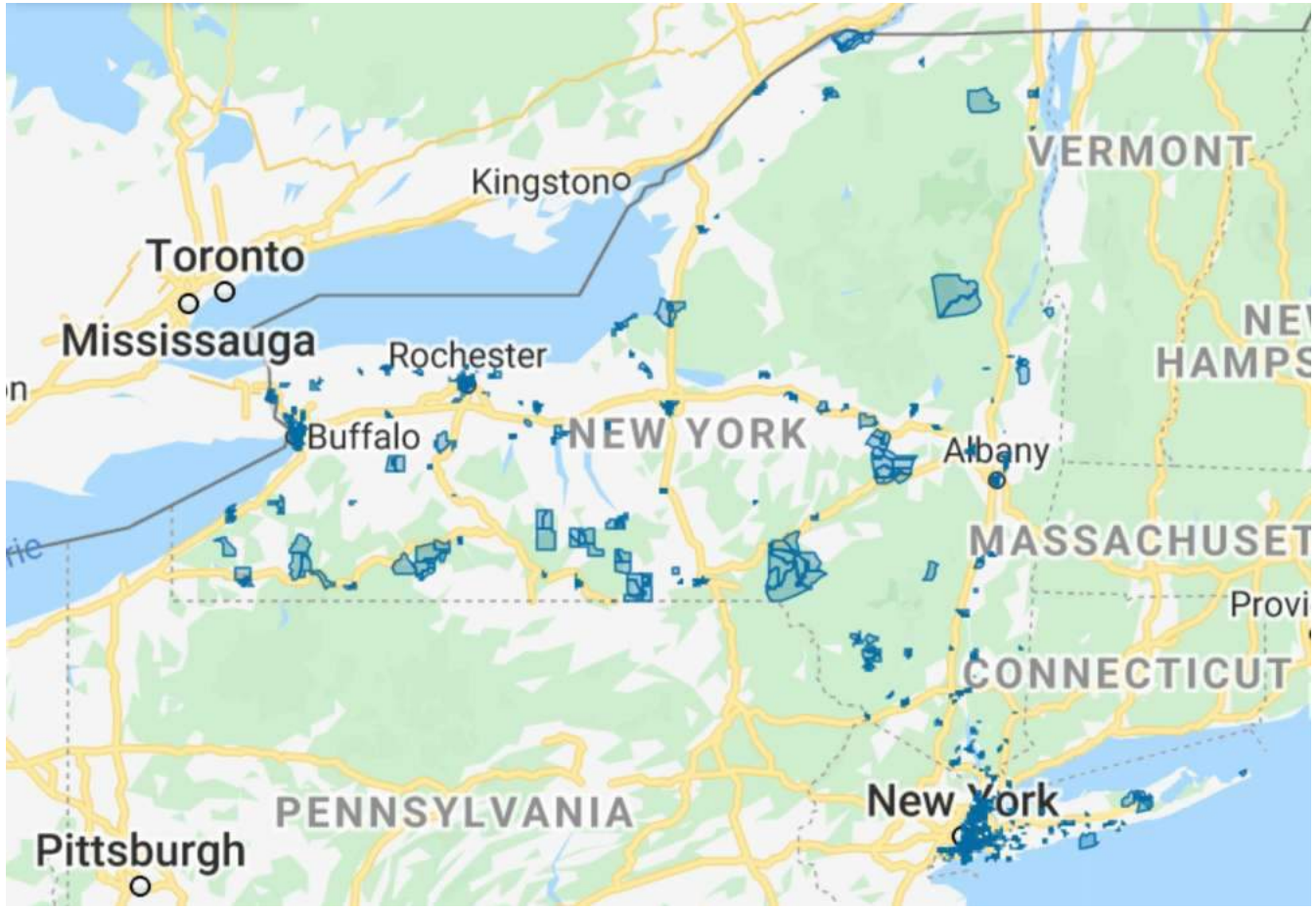
- Integrating, optimizing, and growing local solar + storage results in **more than 160,000 local solar jobs added by 2050**, comprising 22% of all electric sector jobs.
  - This includes direct and indirect jobs but does not include induced jobs (e.g. the ripple effect of direct economic impacts).
- Local solar creates more jobs on a per-MW basis than utility-scale electricity generation.
  - The Optimized DER scenario results in nearly 80,000 more electric sector jobs compared to the Constrained Non-Optimized DER scenario, in large part due to local solar jobs.
  - Distributed PV has an average job/MW ratio of 8.4 compared to utility-scale's job/MW ratio of 3.4*.



*Based on average WIS:dom modeling assumptions for solar. Actual modeled ratios are state and technology specific and are tied to basic assumptions from NREL's JEDI and the IMPLAN modeling tools, adjusted further by actual jobs numbers provided in the Solar Foundation's annual solar jobs report.

The Lowest Cost System Can Deliver on Justice

- Understanding how building the generation system of the future will benefit members of disadvantaged communities (DAC) was central to our inquiry.
- NYSERDA's interim DAC shape was laid over the results to understand the degree to which investments are being made in these areas.
- We found that:
  - A high-DER renewable future is **consistent with** robustly and directly serving DACs
  - Distributed solar, particularly rooftop scale is most cost-effectively deployed within DACs.



Distributed Renewables and Storage are Concentrated in Disadvantaged Communities

- The lowest-cost grid selects for rooftop solar within DACs, with over 60% situated in these geographies by 2030 and almost 70% by 2040.
- This likely due in part to downstate demand and transmission concerns that are more readily met via DG and storage.

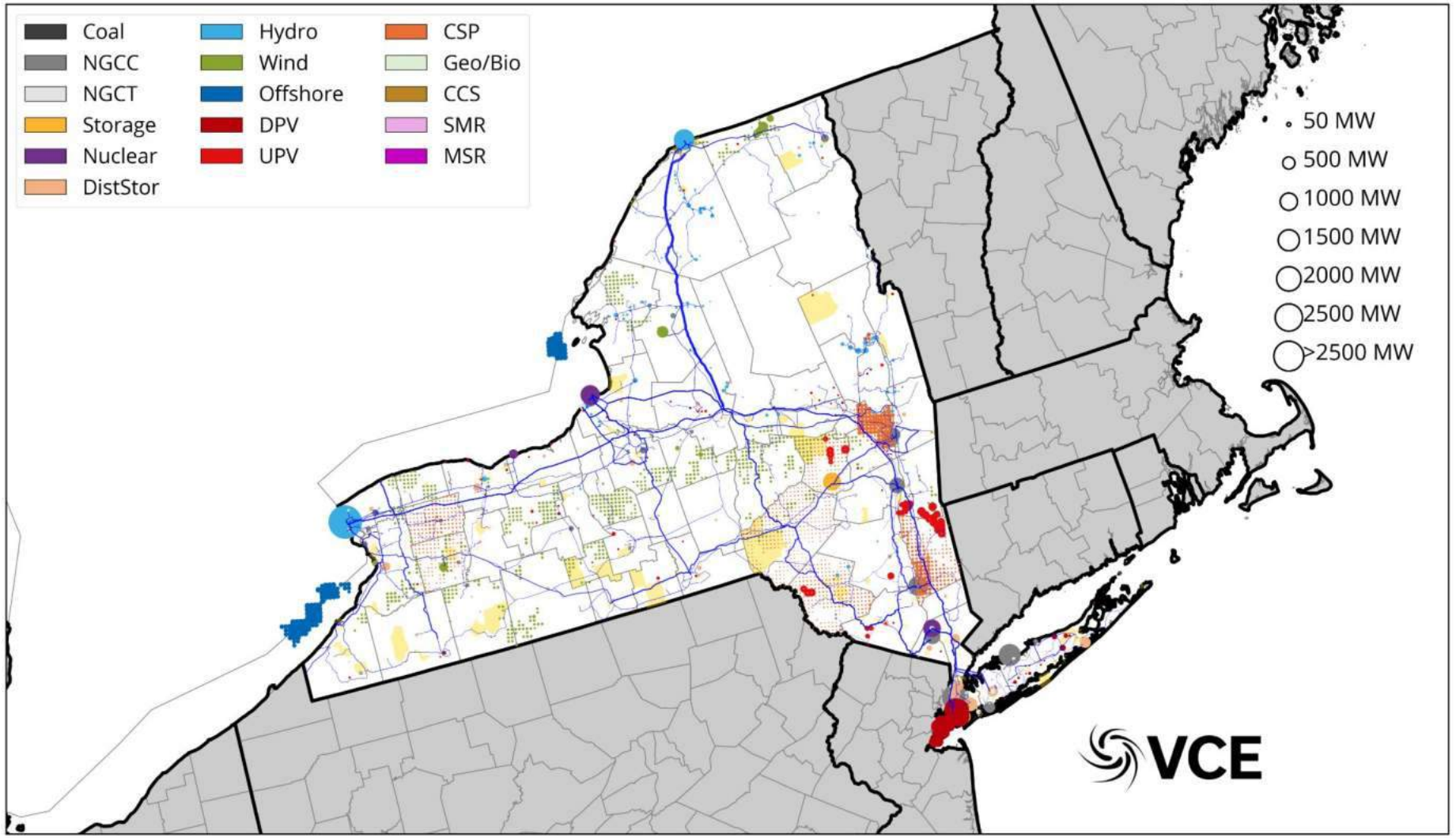
- The model is policy-neutral; so the degree to which disadvantaged communities benefit from local renewables development depends on policy decisions, including the value of tariffs, financial tools, technical assistance, and/ or direct investment for local ownership or control of projects.

RESOURCE (2030)	TOTAL CAPACITY (MW)	% DEPLOYED IN DACs
Rooftop Solar	434,198	62%
Community Solar	10,741,887	12%
Dist. Storage	2,665,057	30%

RESOURCE (2040)	TOTAL CAPACITY (MW)	% DEPLOYED IN DACs
Rooftop Solar	6,005,790	68%
Community Solar	16,292,745	11%
Dist. Storage	12,273,124	30%

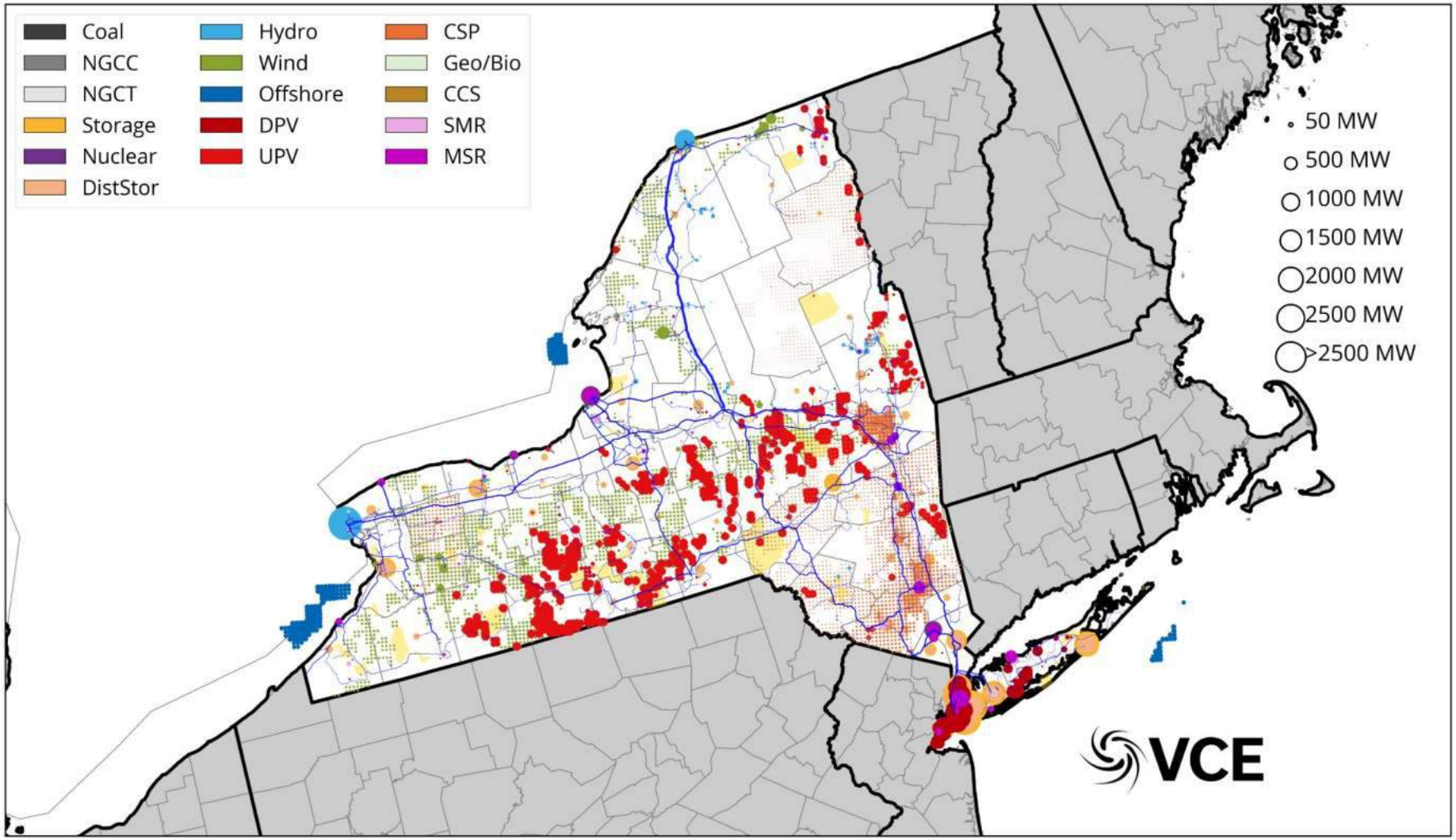
Deployment by 2030

- To meet decarbonization goals in 2030, WIS:dom-P selected a high concentration of distributed solar and storage in and around New York City.
- The model also prioritized community-scale solar in the Hudson Valley, Capital Region, and Western NY.



Deployment by 2040

- By 2040, local solar and storage continue to expand in NYC, while wind, utility-scale, and community solar proliferate in the Southern Tier and Central NY to replace the remaining fossil generation.



Job Creation is Heavily Concentrated in Disadvantaged Communities

- Distributed solar and storage have the potential to be massive job-creators within DACs, with nearly all of the rooftop solar jobs taking place in DACs in 2030 and almost 70% in 2040.
- State intervention is required to ensure that benefits flow to DAC community members:
  - Worker training and placement
  - Worker-led and other non-traditional business models
  - Affirmative, targeted outreach to potential project beneficiaries
  - Direct investment, pre-development grant funding, and and technical assistance

RESOURCE (2030)	TOTAL CAPACITY (MW)	% DEPLOYED IN DACs
Rooftop Solar	25,282.67	99%
Community Solar	58,341.14	75%
All Storage	24,599.56	60%

RESOURCE (2030)	TOTAL CAPACITY (MW)	% DEPLOYED IN DACs
Rooftop Solar	41,459.1	68%
Community Solar	103,415.033	11%
All Storage	213,142.05	29%

What Did We Find?

The least cost path to meeting climate and energy justice goals requires New York to outstrip mandates for distributed solar and storage

11.4 GW of local solar by 2030 to nearly **22 GW by 2050**

4.8 GW of **distributed paired storage by 2030** to over **17 GW by 2050**

Least cost path deploys resources in **DAC communities**

How does it compare with current targets?

Wis:dom-P calls for:

2030	2050
2x more local solar	3.7x more local solar
60% more local storage capacity	6x more local storage capacity

Policymakers & Regulators Should Act Today

- **Establish Clear and Consistent Policies to Scale Local Solar + Storage Today**
  - Set a new 12 GW target for distributed solar
  - Create targeted solar + storage incentives
  - Pair enhanced incentives with training, outreach and pre-development support for DAC member-led projects
- **Integrate and Optimize Local Solar + Storage into State Energy Planning**
  - Create new grid planning processes that require utilities to provide data that will help New York unlock resource optimization
  - Use advanced modeling tools like WIS:dom-P to inform grid planning processes
  - Current pace of local solar + storage deployment is not sufficient to capture $ savings potential

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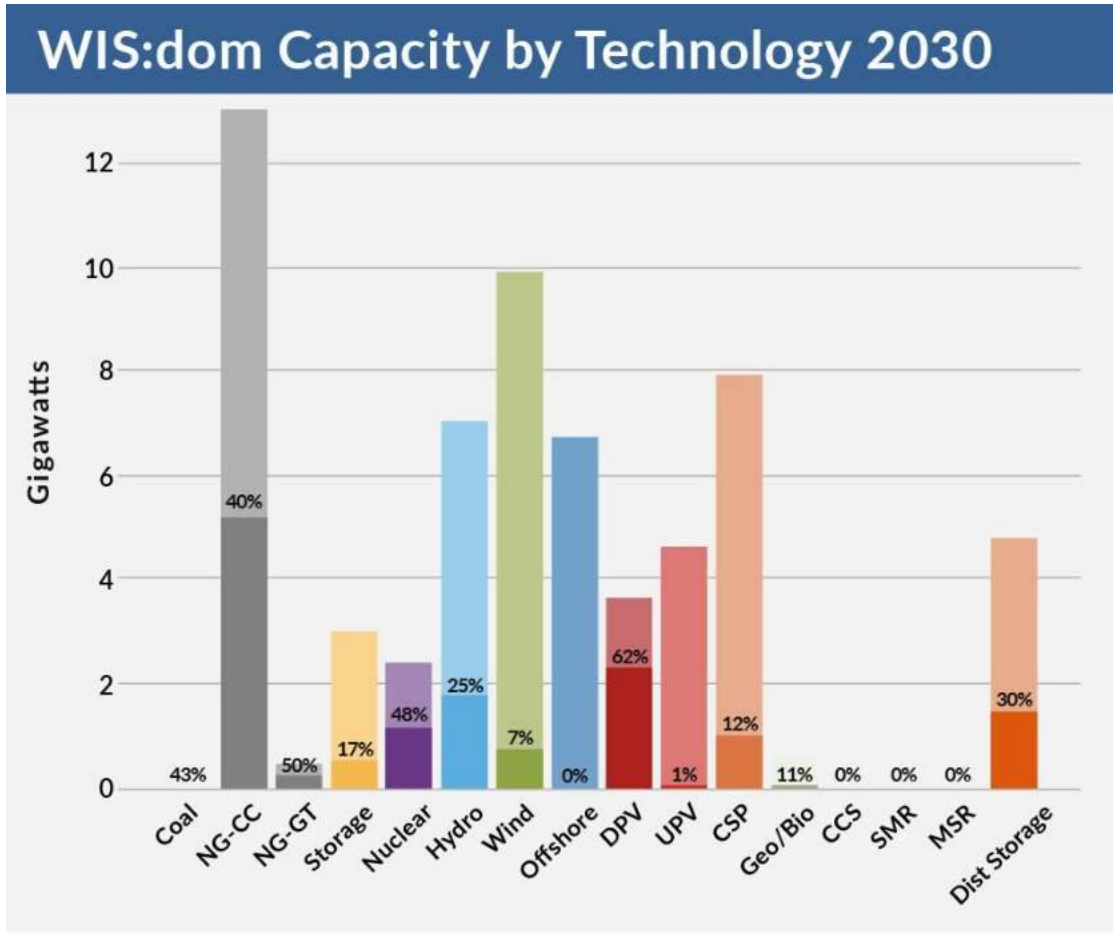
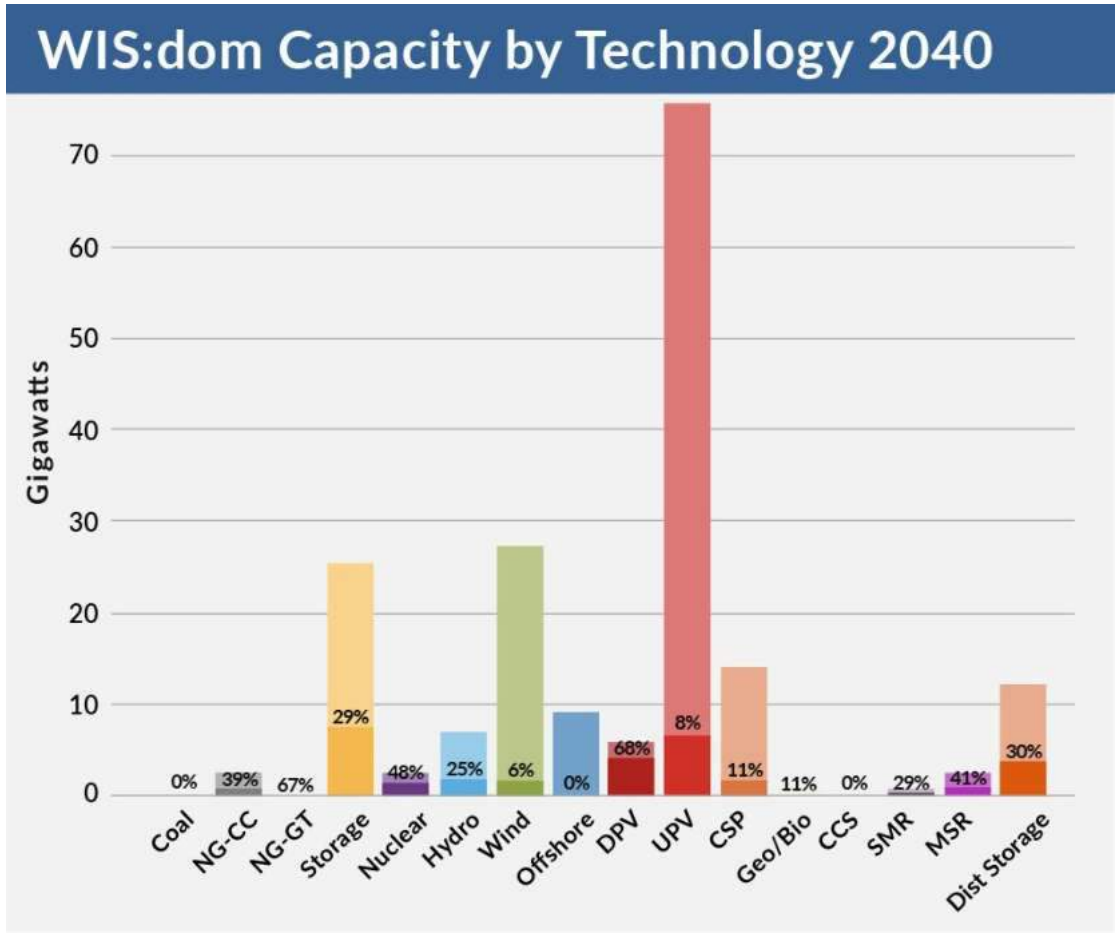
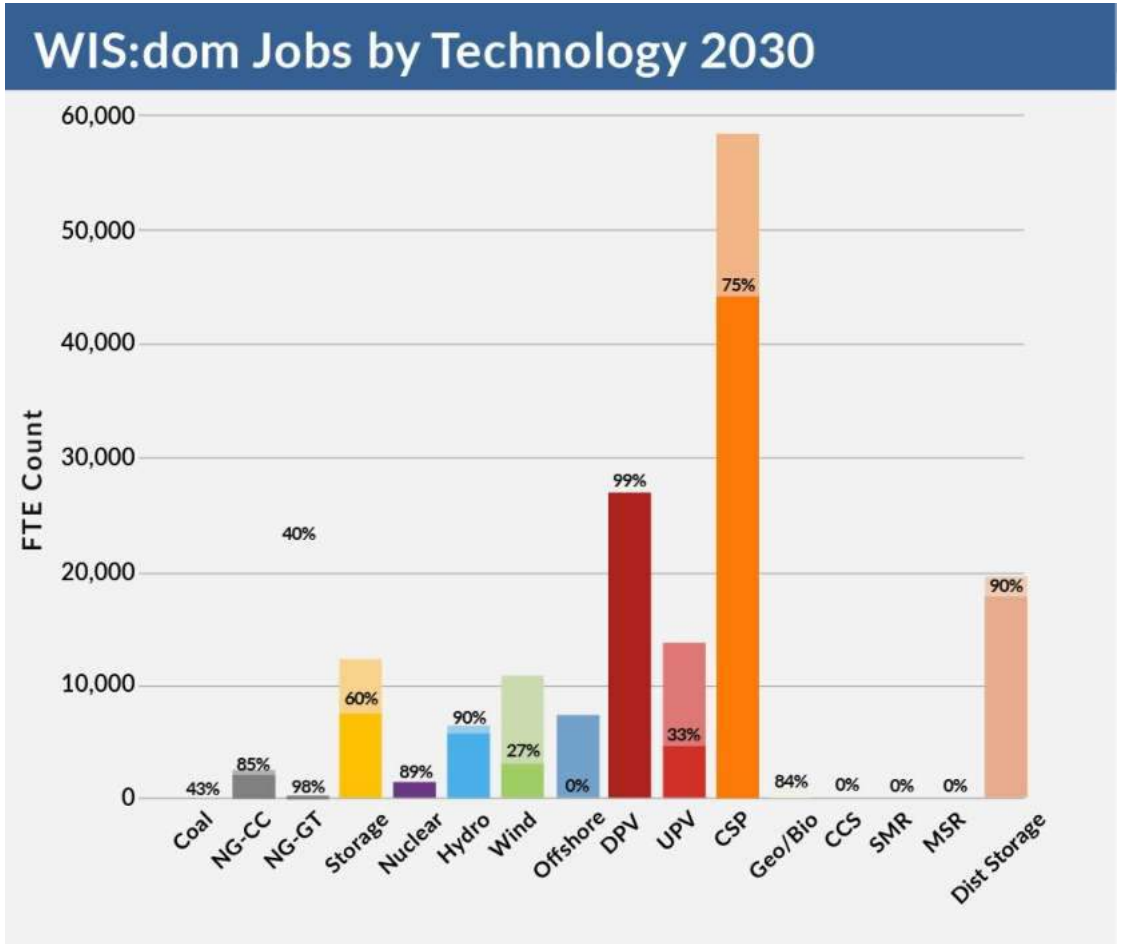
Appendix A: Capacity in DACs

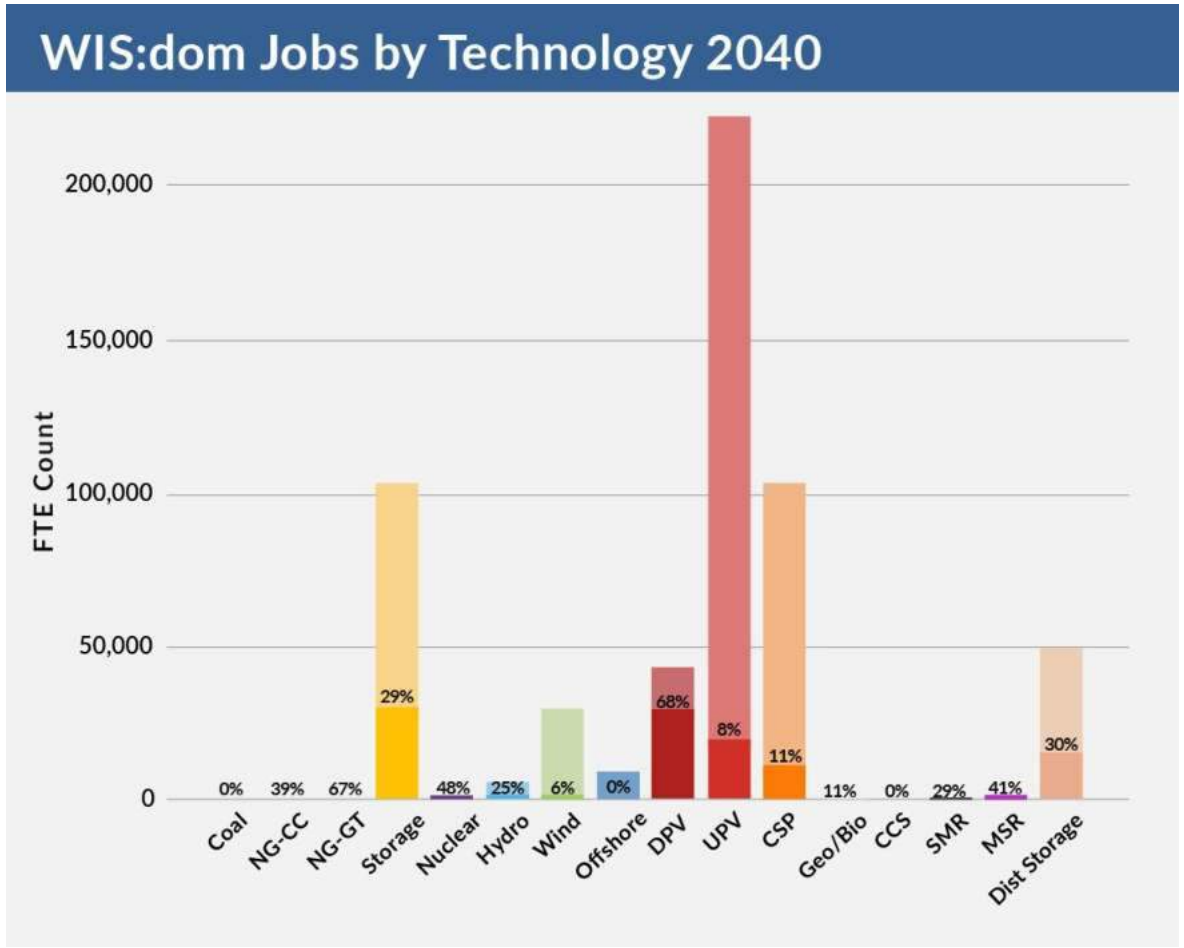




Percentage demarcates projected capacity located in DAC communities

Appendix B: Jobs in DACs





Percentage demarcates projected jobs located in DAC communities