Attachment 8.1
Return to Agenda

De-Carbonization / DER Report for NYSRC Executive Committee Meeting 4/11/2025

Contact: Matt Koenig (koenigm@coned.com)

The April 2025 edition of the De-Carbonization / Distributed Energy Resources (DER) Report includes the following items:

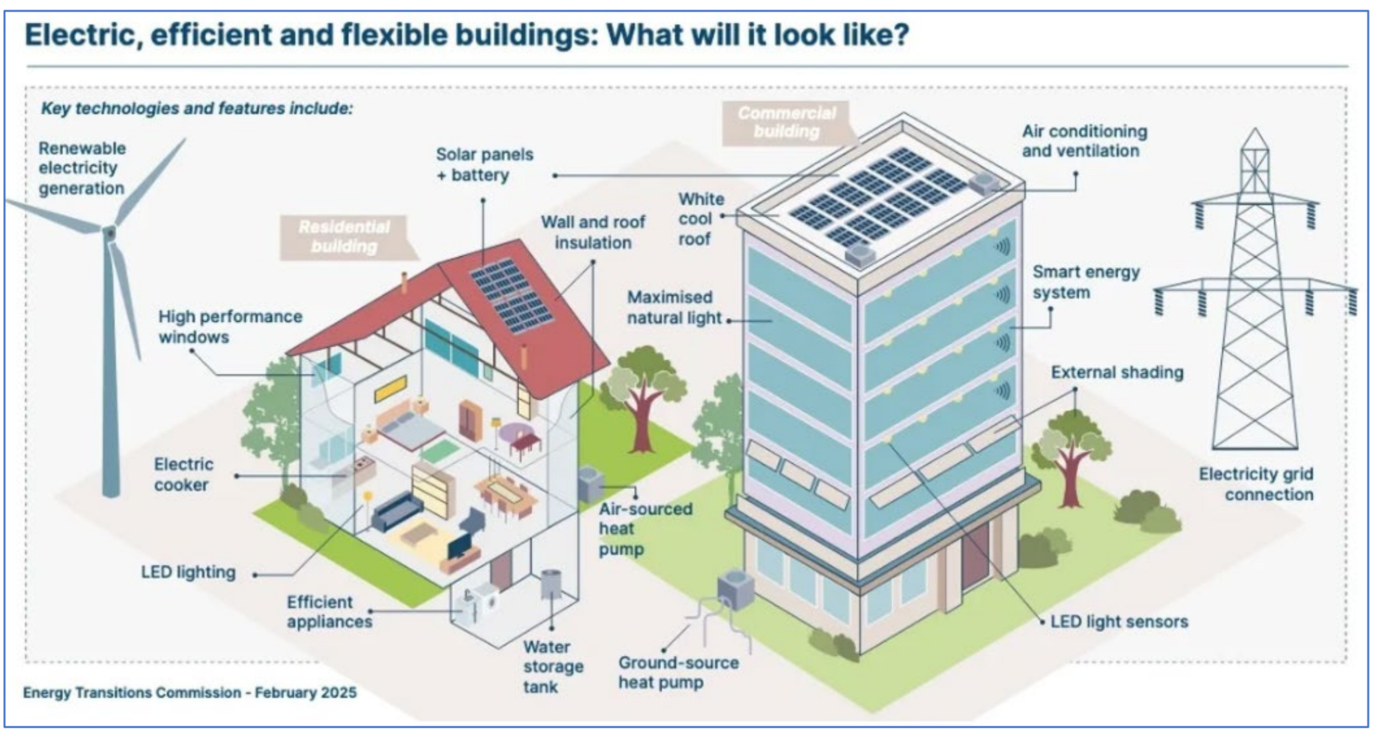
- Canary Media: How to Decarbonize Every Building Everywhere – Just Not All at Once
- NY Times: The Vicious Cycle of Extreme Heat Leading to More Fossil Fuel Use
- NY Times: The Climate Fix - Nuclear Waste Finds Its Forever Home
- Snapshots of the NYISO Interconnection Queue and Cluster Queue: Storage / Solar / Wind / Co-located

Canary Media: How to Decarbonize Every Building Everywhere – Just Not All at Once

This Article highlights concepts for reducing carbon emissions from buildings and their construction. From their structural bones to the energy they constantly consume, buildings account for a staggering one-third of global carbon pollution: 12.3 gigatons of CO^2 in 2022. Most of these emissions come from their operations — the fuel burned on-site for heating and cooking and off-site to produce their electricity. But 2.6 gigatons of CO^2 annually, or 7% of global emissions, stems from the carbon baked into the physical structures themselves, including the methods and materials to build them, otherwise known as embodied carbon.

A February report lays out a blueprint for tackling each of these sources of CO^2 and cleaning up buildings globally by 2050. The challenge is massive: It depends on the actions of millions of building owners. But the policy and technology tools already exist to meet it, according to report publisher Energy Transitions Commission, an international think tank encompassing dozens of companies and nonprofits, including energy producers, energy-intensive industries, technology providers, finance firms, and environmental organizations.

The report identifies several key levers that must all be pulled in order to deal with the climate problems from buildings: energy efficiency, electrification, flexible power use, and design that minimizes materials and uses cleaner ones. Each is showing varying degrees of progress around the world.



How to make buildings more energy efficient

Building developers and owners can pursue a variety of strategies to make their buildings less energy-intensive and cheaper to operate without sacrificing the comfort of their residents, according to the report. They can seal air leaks; insulate attics, walls, and floors; and install double- or triple-pane windows to make buildings snug like beer cozies. Weatherization strategies that take a medium level of effort would cut 10% to 30% of energy use, according to the report; deeper changes could slash up to 60%.

For retrofits, online tools and in-person energy audits can help owners decide which changes make the biggest difference for the climate, their comfort, and their energy bills. Other simple techniques can combat growing demand for cooling, which globally is set to more than double by 2050 due to rising temperatures and incomes, the report notes. Passive approaches that deflect the sun's rays, from painting roofs white to planting shade-giving trees, can slash cooling needs by 25% to 40% on average.

Efficiency measures "deliver a clear return to households over time," said Hannah Audino, building decarbonization lead at the commission. But because the payoffs can be slow to materialize, governments should provide targeted financing to lower-income households that might not otherwise be able to afford these upgrades, she added.

There's also the challenge of convincing landlords to invest in efficiency measures even though tenants often pay for utility bills themselves. To ensure broad uptake, the authors recommend policymakers implement building performance standards, an approach adopted by U.S. cities like New York and St. Louis to penalize building owners who fail to meet certain emissions or energy-use benchmarks.

For new builds, energy codes and other regulated standards can set a performance floor. They differ widely worldwide, but the Passive House approach is "the gold standard," per the report. Buildings that meet its benchmarks typically slash energy use by a whopping 50% to 70% compared to conventional constructions. What's more, new buildings that use 20% less energy than those built merely to code usually have a "very manageable" premium of 1% to 5%, the authors write, which can be recouped in a higher sale price for developers or lower bills for owners.

Connecting buildings via underground thermal energy networks in which they share heat can also unlock big efficiency gains — and do it faster and at bigger scales than individual action might. The report notes that they "should be deployed where possible."

To decarbonize buildings, electrify everything

Buildings will need to be fully electrified to become climate friendly. That means swapping fossil-fuel–fired equipment for über-efficient heat pumps (including the geothermal kind), heat-pump water heaters, heat-pump clothes dryers, and induction stoves.

Heat pumps are essential to decarbonize heating, which is the biggest source of operational emissions and currently only 15% electrified worldwide, according to the report. The appliances are routinely two to three times as efficient as gas equipment, and they lower emissions even when powered by grids not yet 100% clean.

Heat pumps can come at a premium, though the authors expect prices to fall as sales grow and installers gain experience. In countries with mature markets, heat pumps can even be cheaper than gas heating systems, according to the report: Take Denmark, Japan, Poland, and Sweden. For most homes in the U.S. and many in Europe, per the report, heat pumps are cheaper to run than gas equipment and have lower total lifetime costs. Heat pumps make even more economic sense when consumers are considering installing an AC and a gas furnace; heat pumps are both in one.

These appliances also keep getting better. Manufacturers learn how to improve technologies with experience, as they have done with solar panels and wind turbines. The result is that heat pumps are becoming more efficient; getting smaller; and reaching higher temperatures as they transition to natural refrigerants (which also have lower global warming potentials), the authors write.

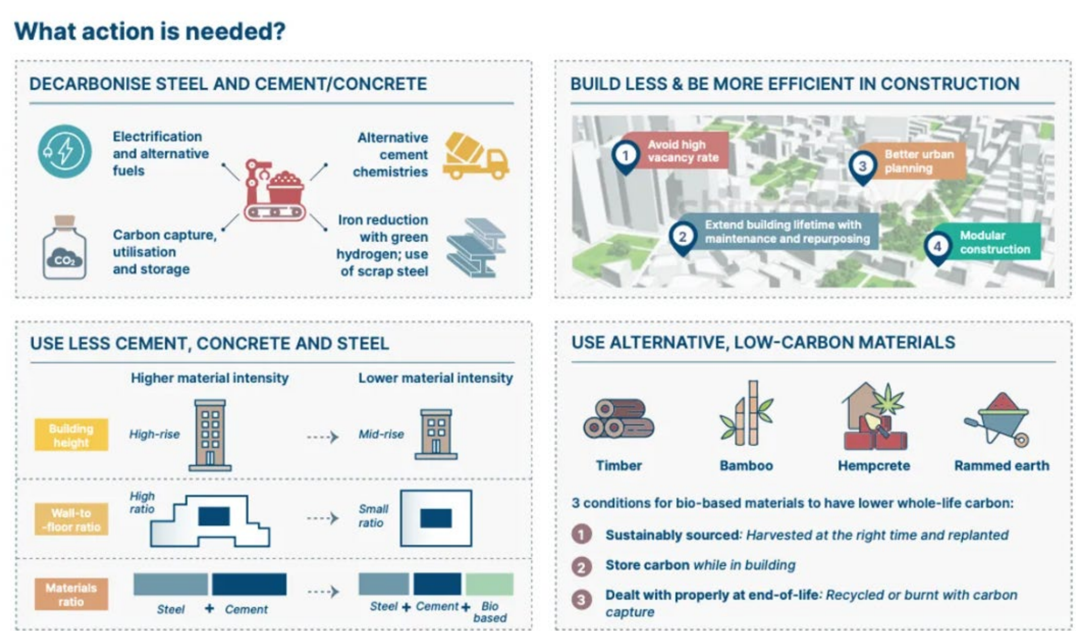
But policymakers need to address energy costs to encourage widespread electrification, according to the report. Countries with high electricity prices relative to those of gas lag in heat pump adoption. Fixes include shifting environmental levies that are currently disproportionately piled onto electricity bills to gas costs, offering lower electricity rates for customers with electric heating, and putting a price on carbon, the report says. Banning gas equipment would be the most direct move, but "only a handful of countries, such as the Netherlands, have successfully outlined plans" to do so.

Make demand for grid power flexible

Buildings will need more power when they're all-electric, potentially straining grids. Unchecked, global electricity demand for buildings by 2050 could grow 2.5 times what it is today, per the report. But with efficiency improvements, the commission expects electricity requirements to grow a more modest 45%.That's still massive. So, to decarbonize buildings without breaking the grid, we'll need to make them flexible in their electricity demand, the authors note. By using power when it's cheap, clean, and abundant, these edifices will also be more affordable than they'd be otherwise.

Low-cost smart thermostats and sensors can reduce demand by 15% to 30% and shift energy use automatically when prices drop. In some places, commercial building owners can already reap tens of thousands of dollars in annual savings by dialing down energy use when grid demand is highest.

The report recommends that all buildings aim to have the ability to shift when they actively heat or cool by two to four hours without compromising comfort. That's doable with existing solutions that provide thermal inertia, including insulation and tank water heaters that store hot water for when it's needed. Utilities and regulators can spur more flexible demand by implementing electricity rates or utility tariffs that reward customers for using power outside of peak periods.



(Energy Transitions Commission)

How to clean up embodied carbon

Building floor area globally is expected to grow by over 50% by 2050, according to the report. If structures are built with the same techniques as today, cumulative embodied carbon emissions could soar an additional 75 gigatons of CO^2 between now and midcentury. But that amount could be reduced to about 30 gigatons of CO^2 by maximizing the utility of buildings that already exist, decarbonizing building materials, and designing new ones differently. Using existing structures is "the biggest opportunity" for reducing embodied carbon, per the report: The strategy avoids adding any new embodied emissions at all. But it's harder to implement this tactic than it is to change building techniques, the authors add.

Producing materials drives up-front emissions, and the biggest contributors are cement, concrete, and steel, the report notes: They account for 95% of the embodied carbon from materials in buildings. Low- and zero-carbon cement, concrete, and steel can be made using electricity, alternative fuels, exotic chemistries (including ones inspired by corals), and carbon capture with storage. But developers need incentives to buy these clean materials, which aren't yet widely available or competitive on cost alone.

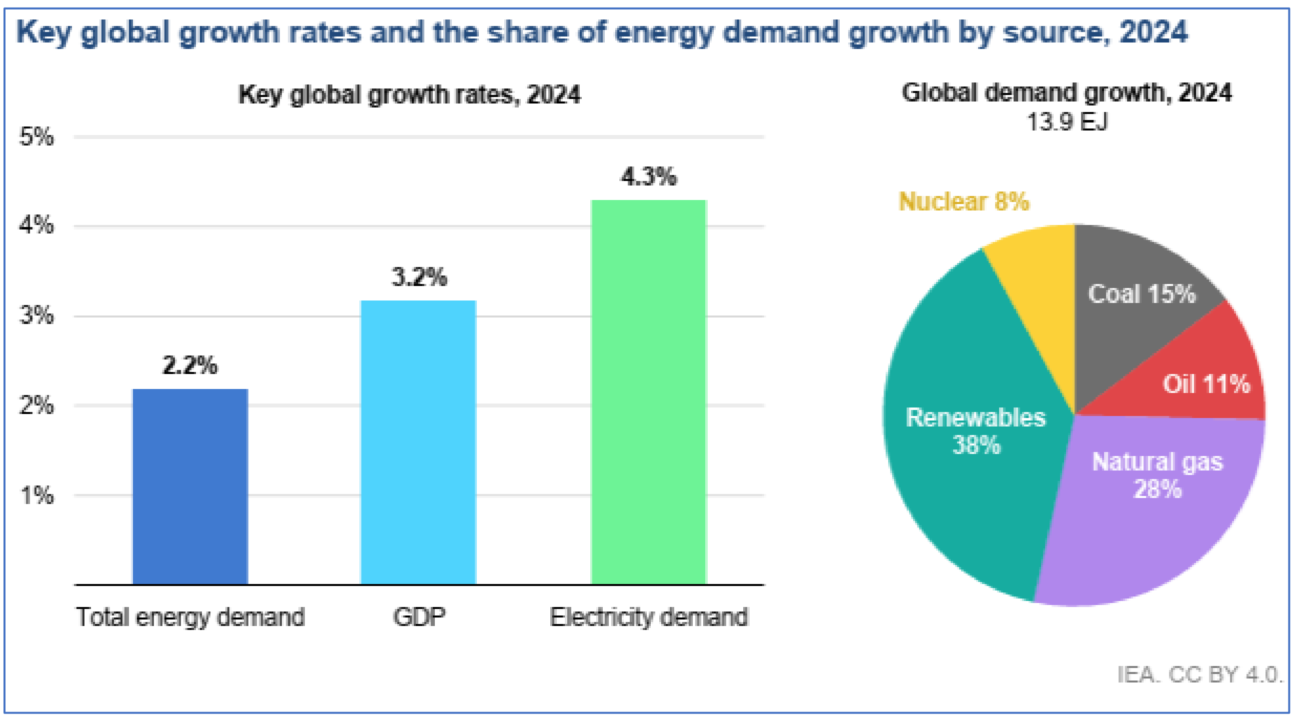
A complementary approach is to design buildings with less of the emitting stuff. For the same floor space, a mid-rise structure uses less material than a high-rise, which needs a larger foundation and bigger columns. A boxy building is more efficient than an irregular one. Developers can moreover supplement construction with alternative, lower-carbon materials, per the report. These include recycled materials, sustainably sourced timber, bamboo, rammed earth, and "hempcrete" — a low-strength, lightweight mixture of hemp, lime, and water that actually absorbs carbon.

Embodied carbon has been particularly challenging to curb because it's largely invisible. In 2021, London regulators decided to change that, requiring major developers to tally all the carbon emissions, operational and embodied, over the building's lifetime while still in the planning stage, the authors write. Developers weren't required to stay below any carbon-intensity threshold; they just had to report expected emissions, said Stephen Hill, associate director in the buildings sustainability team at firm Arup, a member of the Energy Transitions Commission. "But it triggered a kind of race downwards in terms of embodied-carbon intensity for developers, all of whom wanted to have the lowest-carbon developments," he added. "It's a fascinating example of what transparency will do and how the market behaves."

NY Times: The Vicious Cycle of Extreme Heat Leading to More Fossil Fuel Use
This Article highlights key findings from a new Report / Summary from the International Energy Agency (IEA). Last year was the hottest on record, and global average temperatures passed the benchmark of 1.5 degrees Celsius above preindustrial times for the first time. Simultaneously, the growth rate of the world's energy demand rose sharply, nearly doubling over the previous 10-year average. As it turns out, the record heat and rapidly rising energy demand were closely connected.

That's because hotter weather led to increased use of cooling technologies like air-conditioning. Electricity-hungry appliances put a strain on the grid, and many utilities met the added demand by burning coal and natural gas. All of this had the makings of a troubling feedback loop: A hotter world required more energy to cool down homes and offices, and what was readily available was fossil-fuel energy, which led to more planet-warming emissions. This dynamic is exactly what many countries are hoping to halt through development of renewable energy and the construction of nuclear power plants. Put another way, the I.E.A. estimated that if 2024's extreme weather hadn't happened — that is, if weather were exactly the same in 2024 as in 2023 — then the global increase in carbon emissions for the year would have been cut in half.

It's not all bad news: Increasingly, the global economy is growing faster than carbon emissions. "If we want to find the silver lining, we see that there is a continuous decoupling of economic growth from emissions growth," said Fatih Birol, the executive director of the agency.



Extreme heat helped drive global demand
A major factor that raised global electricity demand last year was extreme heat, particularly heat waves in the U.S., China and India, the report found. Last spring, temperatures in New Delhi hit 126 degrees Fahrenheit, and temperatures in northern China broke records. All that added load had consequences, the I.E.A. found. These temperature effects drove about a fifth of the overall increase in demand for electricity and natural gas. Other electricity-intensive sectors grew in 2024. For example, data-center capacity grew by about 20 percent, mostly in the U.S. and China.

High temperatures led to burning more coal

Renewables, like solar and wind, are not that good at handling large, sudden upticks in electricity demand during heat waves. And they're still not being deployed fast enough to meet global goals to triple renewable capacity by 2030. To meet urgent demand for electricity and help people avoid heat stress, some countries burned coal to help power air-conditioners and other cooling technologies. That led overall coal demand to increase by 1 percent last year to reach a record. The agency's report found that the entire increase in coal demand could be explained by extreme temperatures. China remained the world's biggest global coal consumer, burning 40 percent more coal than the rest of the world combined.

Global electricity demand jumped

In 2024, global energy demand grew by a little over 2 percent, almost twice as much as the average annual increase over the previous 10 years. This trend held across the board: Oil, natural gas, coal, renewables and nuclear all had an uptick in demand. Most of the global growth was concentrated in nations with emerging and developing economies, led by China and India. The numbers were even up in the European Union, where energy demand has largely not grown since 2017, with a post-Covid rebound year being the exception.

The result of all this growth? Once again, energy-related carbon emissions reached a record in 2024. The I.E.A. estimated last fall that global carbon-dioxide emissions will peak in the next few years, then fall by 3 percent by 2030 under current national policy commitments. Global emissions would need to fall by 43 percent by 2030 in order to keep global warming below the 1.5-degree Celsius threshold established in the 2015 Paris Agreement, according to the U.N. The temperature goal is seen as Increasingly unattainable by scientists and policymakers.

Renewables and nuclear are growing

About 80 percent of new electricity generation came from renewables and nuclear least year, and renewables accounted for almost a third of total electricity generation. Solar installations led the charge. In the United States, solar and wind electricity overtook coal for the first time. Global carbon emissions would have been seven percent higher last year without clean technologies like solar, wind, nuclear, electric cars and heat pumps, the report found.

For the first time, oil dipped below 30% of global energy demand

Growth in oil demand continued to slow last year, with factors including consumers' buying electric vehicles and ditching gas-powered cars. Last year, just two categories accounted for virtually all of the growth in oil demand: Aviation and shipping, and plastics. Plastics have become an increasingly important part of oil companies' growth plans as cars and trucks go electric and other sectors use less oil. Oil is a key material in plastics manufacturing.

E.P.A. investigations of severe pollution look increasingly at risk

Under the Biden administration, the E.P.A. took a tough approach on environmental enforcement by investigating companies over pollution, hazardous waste, and other violations. The Trump administration, on the other hand, has said it wants to shift the E.P.A.'s mission from protecting air, water, and land quality to one that seeks to "lower the cost of buying a car, heating a home and running a business." As a result, the future of several long-running investigations suddenly looks precarious.

A new E.P.A. memo lays out the latest changes. E.P.A. enforcement actions will no longer "shut down any stage of energy production," the memo, from March 12, says, unless there's an imminent health threat. It also curtails a drive Biden started to address the disproportionately high levels of pollution facing poor communities. A New York Times article covering the E.P.A. mem can be found here.

NY Times: The Climate Fix - Nuclear Waste Finds Its Forever Home

This Article describes how Finland is establishing the worlds first permanent storage site for nuclear waste. Additional material in this report appears in this NY Times article from June 9th, 2017.

For decades, the U.S. government has been staring down a growing problem: It doesn't have a permanent site to dispose of used nuclear fuel. Finland, however, is about to be the first country that does. Posiva Oy, a joint venture owned by two Finnish nuclear power companies, is on the cusp of officially starting operations at what is set to be the world's first permanent underground disposal site for spent nuclear fuel. Posiva has been working on the site, located on the country's western coast, since 2004, and it hopes to begin permanent disposal in less than a year.

Excavating equipment at the site of the Onkalo repository project, the world's first permanent spent-nuclear-fuel storage facility, deep in granite bedrock in Finland, in 2017.

A copper capsule for spent nuclear fuel during a test in the Onkalo spent nuclear fuel repository in Eurajoki, Finland, in 2018

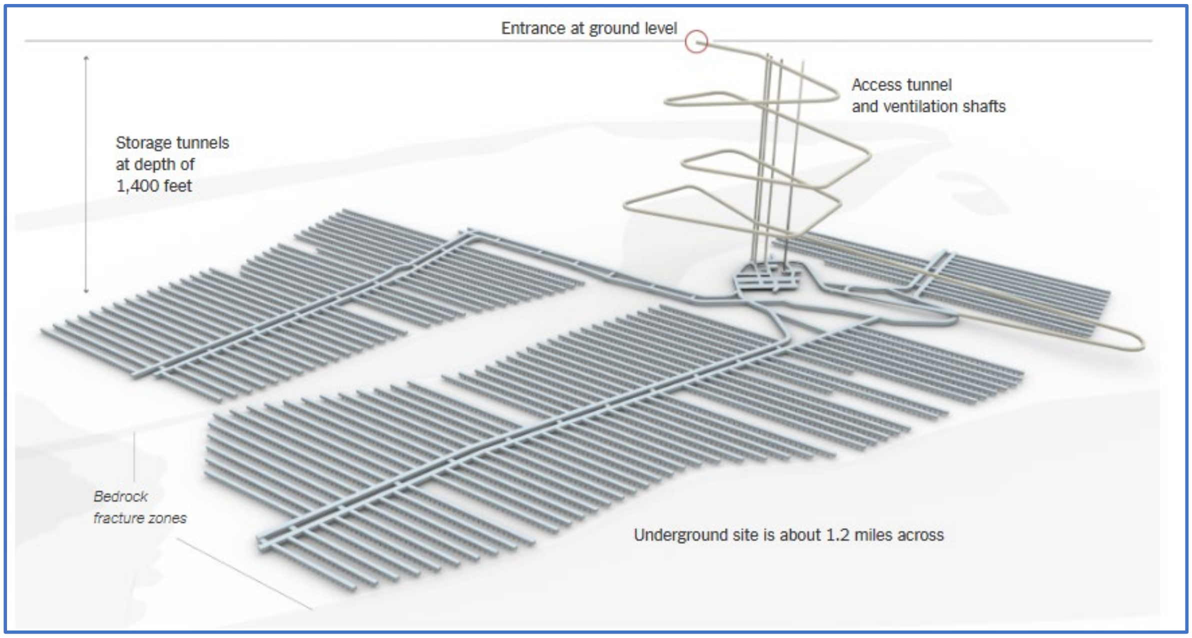
"We have a solution," said Pasi Tuohimaa, Posiva's communications manager. "Final disposal of the spent fuel, it has been the missing part of sustainable use of nuclear energy." Earlier this month, the United States Supreme Court heard arguments in a lawsuit over the federal government's decision to approve a temporary storage facility for spent nuclear fuel in Texas. The lawsuit underscored a touchy subject — plans to store nuclear waste deep under Yucca Mountain in Nevada, the only permanent storage site in the United States allowed by federal law, have been stalled for years.

The World Nuclear Association estimates the amount of spent nuclear fuel in the U.S. at the moment would fill up only half of a football field. But, as demand for electricity has risen, the nuclear industry is going through something of a renaissance, with companies investing billions and planning to reopen shuttered plants in the U.S.

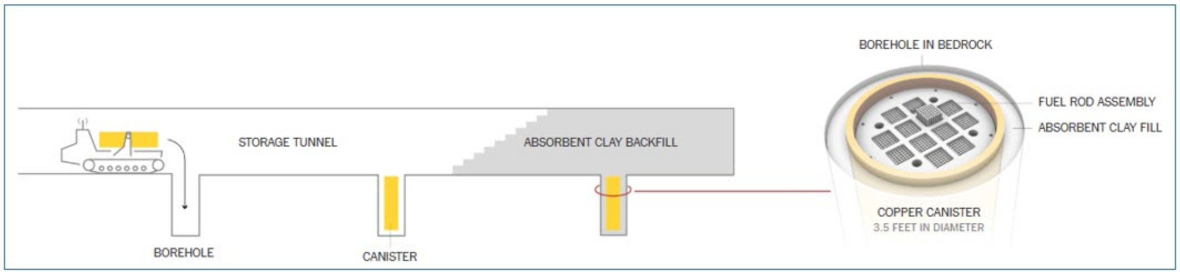
How Posiva's storage plan works

The barriers to permanently storing nuclear waste aren't as much technical as about planning and politics. Permanent nuclear waste storage facilities can take decades to study and build. At its disposal site, Posiva has drilled an array of tunnels spanning a collective 10 kilometers, Tuohimaa said. The company's plan is to insert the used fuel pellets into rods that are contained in iron and copper canisters. The containers are then stored hundreds of meters underground and surrounded by compressed bentonite, a type of clay that swells when it comes into contact with moisture and essentially tightens the area around the containers. The tunnels are then backfilled.

Long-Term Parking for Radioactive Waste
Granite bedrock in Western Finland will be the final resting place for the country's spent nuclear reactor fuel. A spiraling vehicle tunnel as well as access and ventilation shafts lead 1,400 feet underground, where the fuel will be stored in about 20 miles of tunnels for thousands of years.



Storing the Fuel
Because of radiation hazards, copper fuel canisters will be handled remotely and placed in vertical boreholes every 30 feet. Holes are located away from rock fractures that could expose canisters to water and lead to corrosion. If water did intrude, absorbent clay packed in the holes and tunnels should keep it away.



Right now, spent nuclear fuel in the U.S. can be temporarily stored in special pools or in dry casks at nuclear-reactor sites, according to the Nuclear Regulatory Commission. It can also be stored at independent storage sites if authorized by the commission, which is one of the issues at the heart of the case that has made its way to the Supreme Court. Storing it temporarily, however, has a hefty price tag. The federal government currently pays hundreds of millions of dollars per year for the spent fuel's temporary storage.

Where permanent storage goes from here
In Finland, which gets more than 40 percent of its power from nuclear energy, Posiva is currently doing a trial run using fill-in elements. Other countries are following in Finland's footsteps. France, Sweden, and Switzerland have selected sites for planned projects, and other projects have been proposed in China, Canada, Germany, Hungary, Britain, and Japan, according to the World Nuclear Association. And in the U.S., there has been talk of revisiting plans for the Yucca Mountain site. Last year, lawmakers from both sides of the aisle toyed with reconsidering the idea.

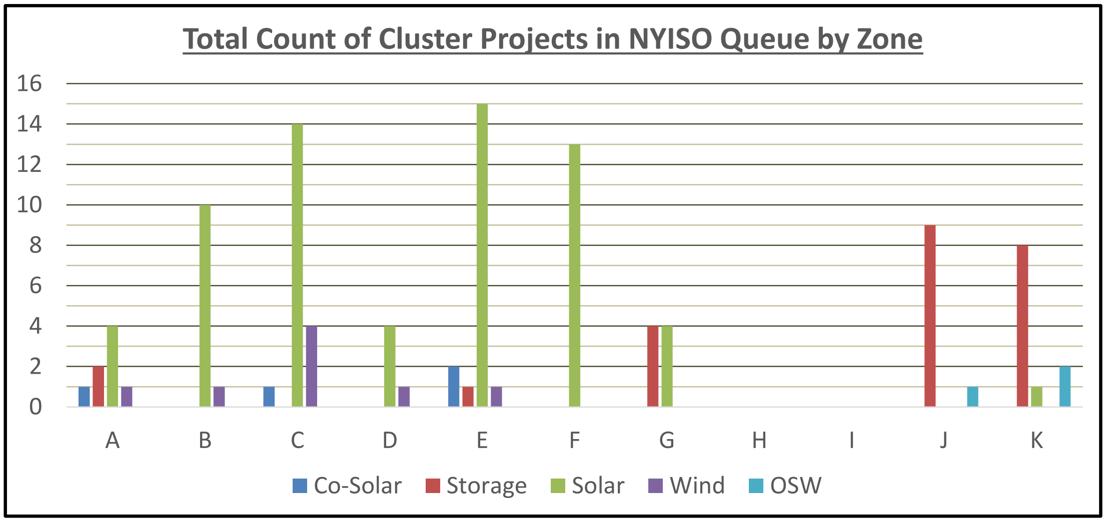
Interconnection Queue: Monthly Snapshot – Storage / Solar / Wind / CSRs (Co-located Storage)

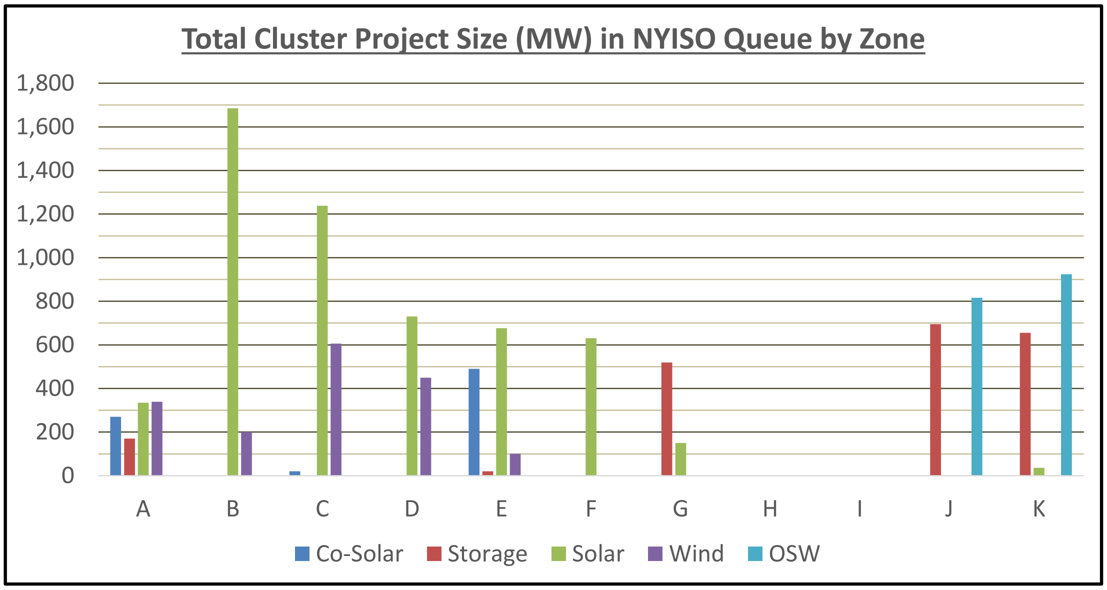
The intent is to track the growth of Co-Located Solar / Storage, Energy Storage, Solar, Wind, and Offshore Wind (OSW) projects in the NYISO Interconnection Queue, looking to identify trends and patterns by zone and in total for the state. The information was obtained from the NYISO Interconnection Website, based on information published on March 17th, and representing the Interconnection Queue as of February 28th. Note that only four projects were added, and 65 were withdrawn during the month of February.

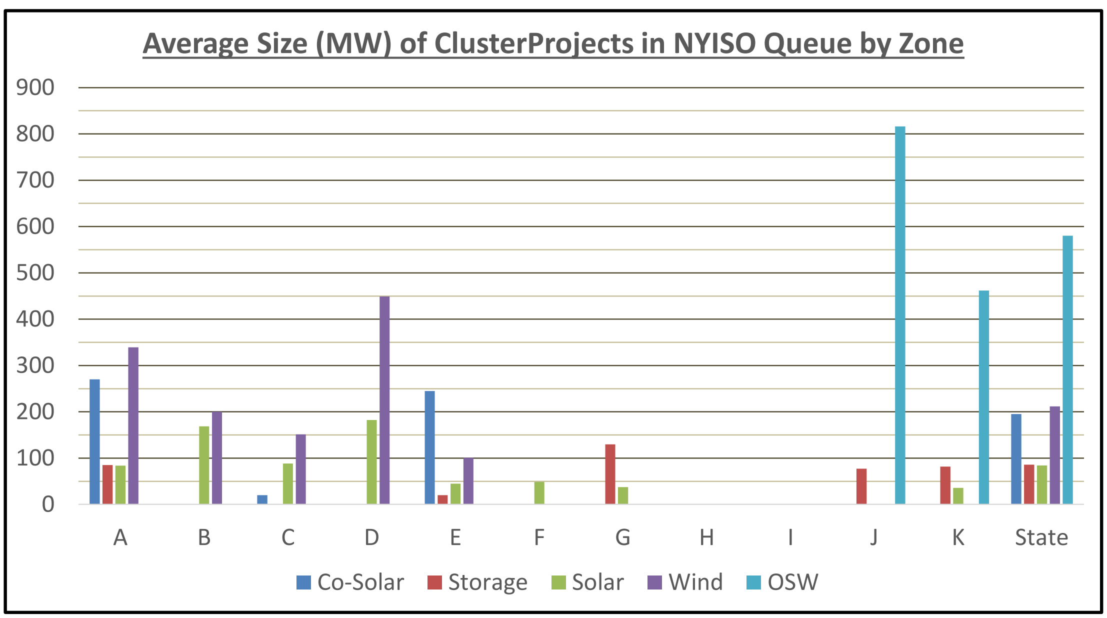
Total Count of Projects in NYISO Queue by Zone					
Zone	Co-Solar	Storage	Solar	Wind	OSW
A	1	2	4	1	
B			10	1	
C	1		14	4	
D			4	1	
E	2	1	15	1	
F			13		
G		4	4		
H					
I					
J		9			1
K		8	1		2
State	4	24	65	8	3

Total Project Size (MW) in NYISO Queue by Zone					
Zone	Co-Solar	Storage	Solar	Wind	OSW
A	270	170	335	339	
B			1,685	200	
C	20		1,238	606	
D			730	449	
E	490	20	676	101	
F			631		
G		519	150		
H					
I					
J		695			816
K		655	36		924
State	780	2,059	5,481	1,695	1,740

Average Size (MW) of Projects in NYISO Queue by Zone					
Zone	Co-Solar	Storage	Solar	Wind	OSW
A	270	85	84	339	
B			169	200	
C	20		88	151	
D			183	449	
E	245	20	45	101	
F			49		
G		130	38		
H					
I					
J		77			816
K		82	36		462
State	195	86	84	212	580


Total Count of Cluster Projects in NYISO Queue by Zone
16
14
12
10
8
6
4
2
0
A
B
C
D
E
F
G
H
I
J
K
Co-Solar
Storage
Solar
Wind
OSW


Total Cluster Project Size (MW) in NYISO Queue by Zone
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
A
B
C
D
E
F
G
H
I
J
K
Co-Solar
Storage
Solar
Wind
OSW


Average Size (MW) of ClusterProjects in NYISO Queue by Zone
900
800
700
600
500
400
300
200
100
0
A
B
C
D
E
F
G
H
I
J
K
State
Co-Solar
Storage
Solar
Wind
OSW

Cluster Interconnection Queue: Monthly Snapshot – Storage / Solar / Wind / CSRs (Co-located Storage)

The intent is to track the growth of the Cluster-based projects, including Co-Located Solar and Wind / Storage, Energy Storage, Solar, Wind, and Offshore Wind (OSW) projects in the NYISO Interconnection Queue, looking to identify trends and patterns by zone and in total for the state. The information was obtained from the [NYISO Interconnection Website], based on information published on March 17th.

Note that within the Cluster Queue, there are currently 243 projects totaling 37,243 MW. This represents a drop of 54 projects, totaling 23,640 MW from the previous month, corresponding to the transition through the Phase 1 Entry Decision Period into the Cluster Study Part 1. A total of 133 projects representing 38,240 MW are listed as having been withdrawn to date.

Cluster Project Totals as of February 28th, 2025

Total Count of Projects in NYISO Queue by Zone						
Zone	Co-Solar	Co-Wind	Storage	Solar	Wind	OSW
A	6		22	4	6	
B	3		2	1		
C	5		23	16	5	
D			5	3	2	
E	9		9	9	4	
F	3		13	8		
G	1		30	1		
H			3			
I			1			
J			15			1
K			28			2
State	27		151	42	17	3

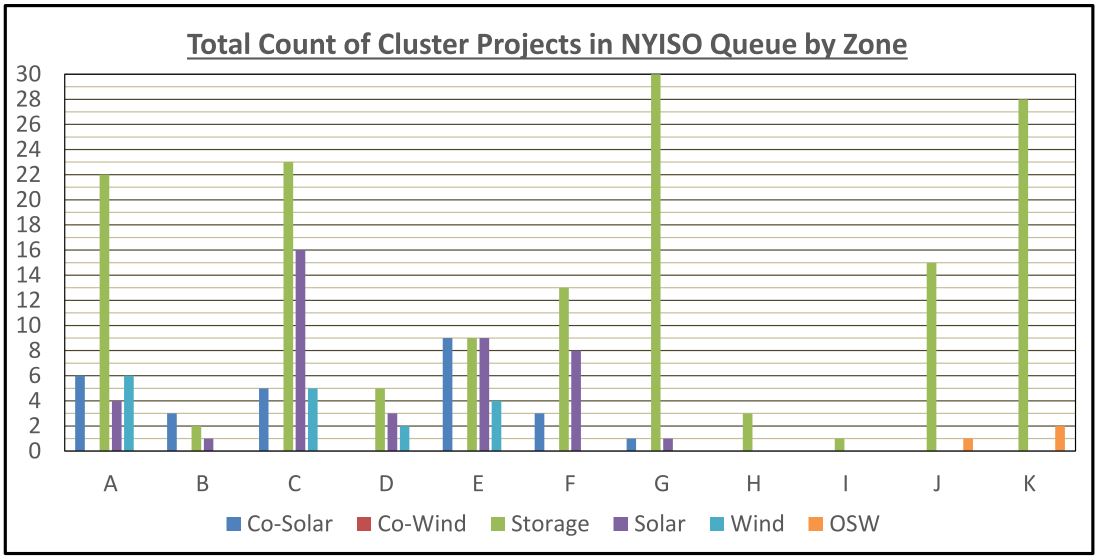
Total Project Size (MW) in NYISO Queue by Zone						
Zone	Co-Solar	Co-Wind	Storage	Solar	Wind	OSW
A	947		3,808	780	746	
B	920		400	83		
C	690		3,245	1,621	442	
D			615	440	760	
E	1,378		1,469	893	380	
F	405		2,009	747		
G	40		5,166	30		
H			524			
I			130			
J			2,309			1,310
K			2,328			2,631
State	4,379		22,002	4,593	2,328	3,941

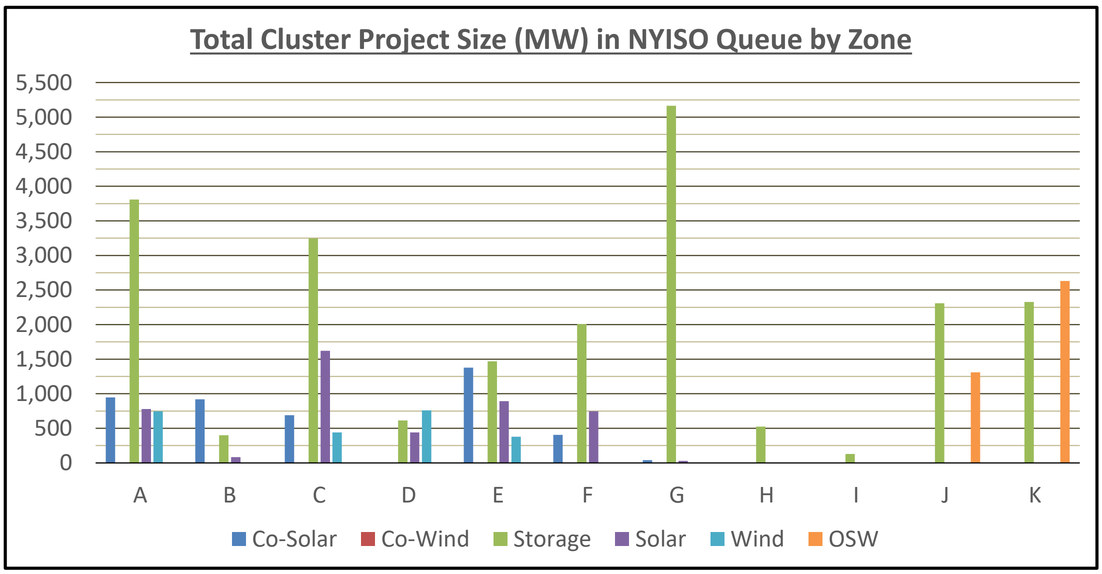
Month over Month Changes (Jan to Feb, 2025)

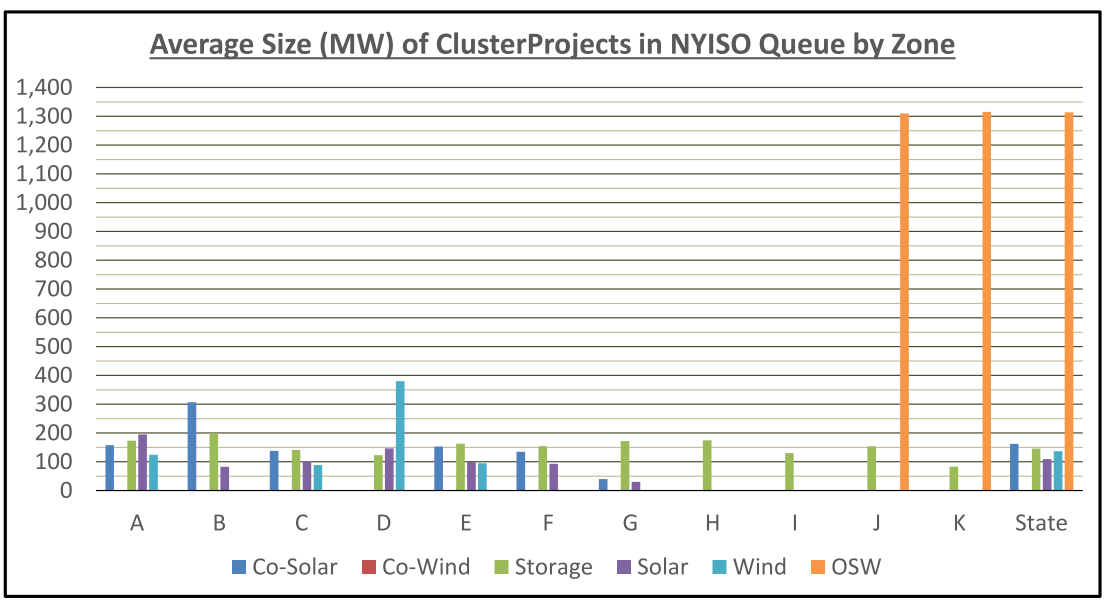
Change in Total Count of Projects in NYISO Queue by Zone						
Zone	Co-Solar	Co-Wind	Storage	Solar	Wind	OSW
A	0	0	-2	-1	0	0
B	0	0	-1	-2	0	0
C	0	0	-4	-3	-1	0
D	0	0	-2	-2	0	0
E	0	-1	-4	-3	0	0
F	0	0	-3	-2	0	0
G	-1	0	-4	0	0	0
H	0	0	0	0	0	0
I	0	0	0	0	0	0
J	0	0	-2	0	0	-4
K	0	0	-6	0	0	-6
State	-1	-1	-28	-13	-1	-10

Change in Total Project Size (MW) in NYISO Queue by Zone						
Zone	Co-Solar	Co-Wind	Storage	Solar	Wind	OSW
A	0	0	-260	-85	0	0
B	0	0	-100	-250	0	0
C	0	0	-1,652	-240	-119	0
D	0	0	-90	-200	0	0
E	0	-350	-1,100	-540	0	0
F	0	0	-1,600	-175	0	0
G	-59	0	-429	0	0	0
H	0	0	0	0	0	0
I	0	0	0	0	0	0
J	0	0	-1,000	0	0	-5,410
K	0	0	-1,089	0	0	-7,599
State	-59	-350	-7,320	-1,490	-119	-13,009

Average Size (MW) of Projects in NYISO Queue by Zone						
Zone	Co-Solar	Co-Wind	Storage	Solar	Wind	OSW
A	158		173	195	124	
B	307		200	83		
C	138		141	101	88	
D			123	147	380	
E	153		163	99	95	
F	135		155	93		
G	40		172	30		
H			175			
I			130			
J			154			1,310
K			83			1,316
State	162		146	109	137	1,314


Total Count of Cluster Projects in NYISO Queue by Zone
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
A
B
C
D
E
F
G
H
I
J
K
Co-Solar
Co-Wind
Storage
Solar
Wind
OSW


Total Cluster Project Size (MW) in NYISO Queue by Zone
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
A
B
C
D
E
F
G
H
I
J
K
Co-Solar
Co-Wind
Storage
Solar
Wind
OSW


Average Size (MW) of ClusterProjects in NYISO Queue by Zone
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
A
B
C
D
E
F
G
H
I
J
K
State
Co-Solar
Co-Wind
Storage
Solar
Wind
OSW