


Energy Storage Roadmap for New York's Electric Grid



**NEW YORK BATTERY
AND ENERGY STORAGE**
TECHNOLOGY CONSORTIUM

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ENERGY STORAGE ROADMAP



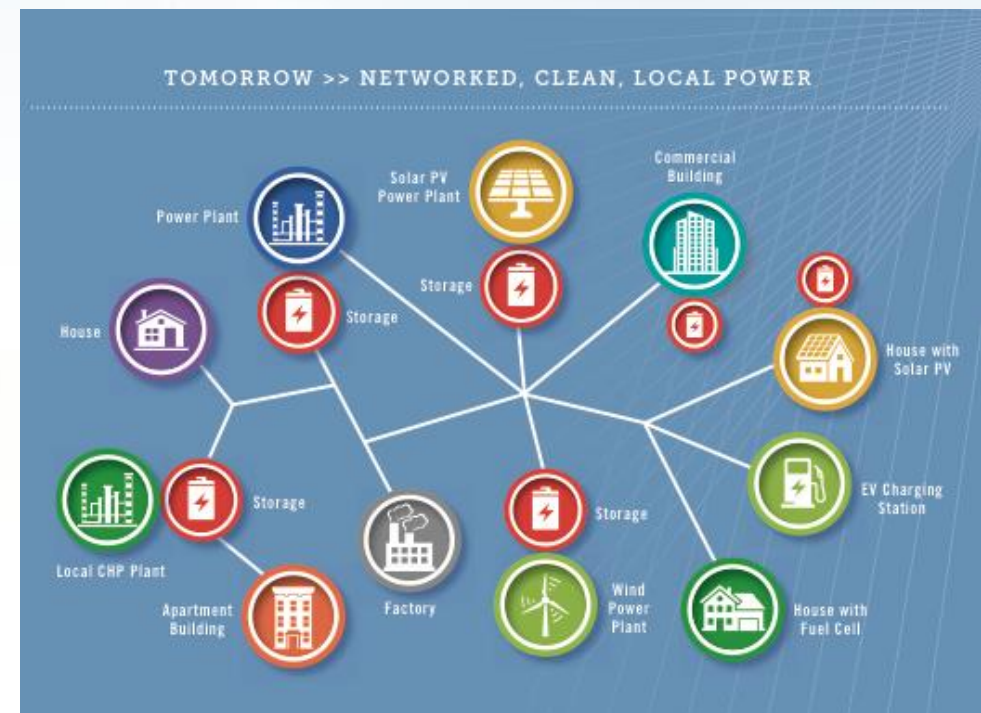
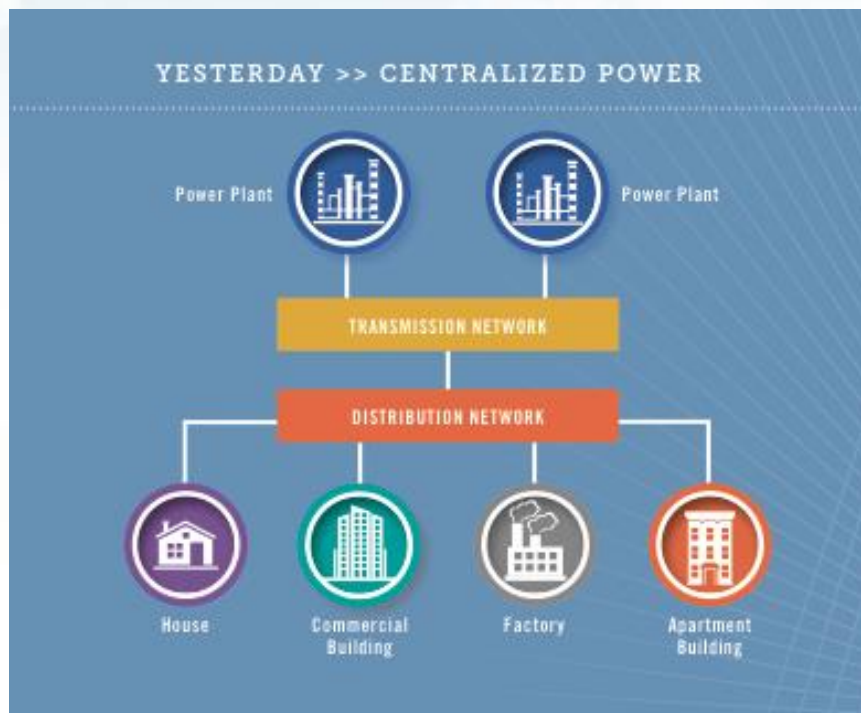
FOR NEW YORK'S
ELECTRIC GRID

Changing Electricity Grid

Key Goals supported by Energy Storage

- ❖ Improving the efficiency and capacity factor (utilization) of the electric grid
- ❖ Integrating an increasing amount of renewable energy
- ❖ Enhancing the reliability and resilience of the electric grid

Electricity Grid Architecture



Energy Storage Applications

DRIVERS	CUSTOMER-SITED (BEHIND THE METER)	DISTRIBUTION SYSTEM	GENERATION AND TRANSMISSION GRID
Capacity and Peak Load Reduction	<ul style="list-style-type: none"> + Demand charge reduction (peak shaving) + Avoiding interconnection upgrades + Permanent load shifting 	<ul style="list-style-type: none"> + Defer system upgrades (local capacity) + Distributed peaker + Circuit load relief/ demand response 	<ul style="list-style-type: none"> + Capacity (peaker plant replacement) + Transmission congestion relief + Transmission upgrade deferral
Renewables Integration	<ul style="list-style-type: none"> + Integrating distributed generation + Microgrid stability + Optimizing energy cost (Time shifting) 	<ul style="list-style-type: none"> + Increase renewable integration (circuit hosting capacity and prevent reverse power flow) + Reduce renewables curtailments and congestion + Circuit flexibility and stability 	<ul style="list-style-type: none"> + Frequency regulation + Renewable firming + Reduce renewables curtailments and congestion + Spinning/non-spinning reserve + Ramp rate reduction (duck curve issue) + Time shift energy
Resilience and Reliability	<ul style="list-style-type: none"> + Uninterruptible Power Supply + Maintaining power quality + Microgrid stability + Building emergency power 	<ul style="list-style-type: none"> + Circuit flexibility and stability + Improve system reliability + Voltage support and power quality (reactive power) 	<ul style="list-style-type: none"> + Spinning/non-spinning reserve + Renewable firming + Black start

Flatten the 100 hour peak

Flatten the peak 100 hours would save \$1.2 - \$1.7 billion annually according to the PSC

1GW/2GWh would eliminate over 30 hours

2GW/10GWh would provide over one-third of the total energy to flatten

Short time allows storage to perform multiple functions

Renewable Integration

50% Renewable energy by 2030 and a need to go further to meet 80x50 greenhouse gas goal

Capacity factors drive high nameplate capacity requirement

Firming and smoothing

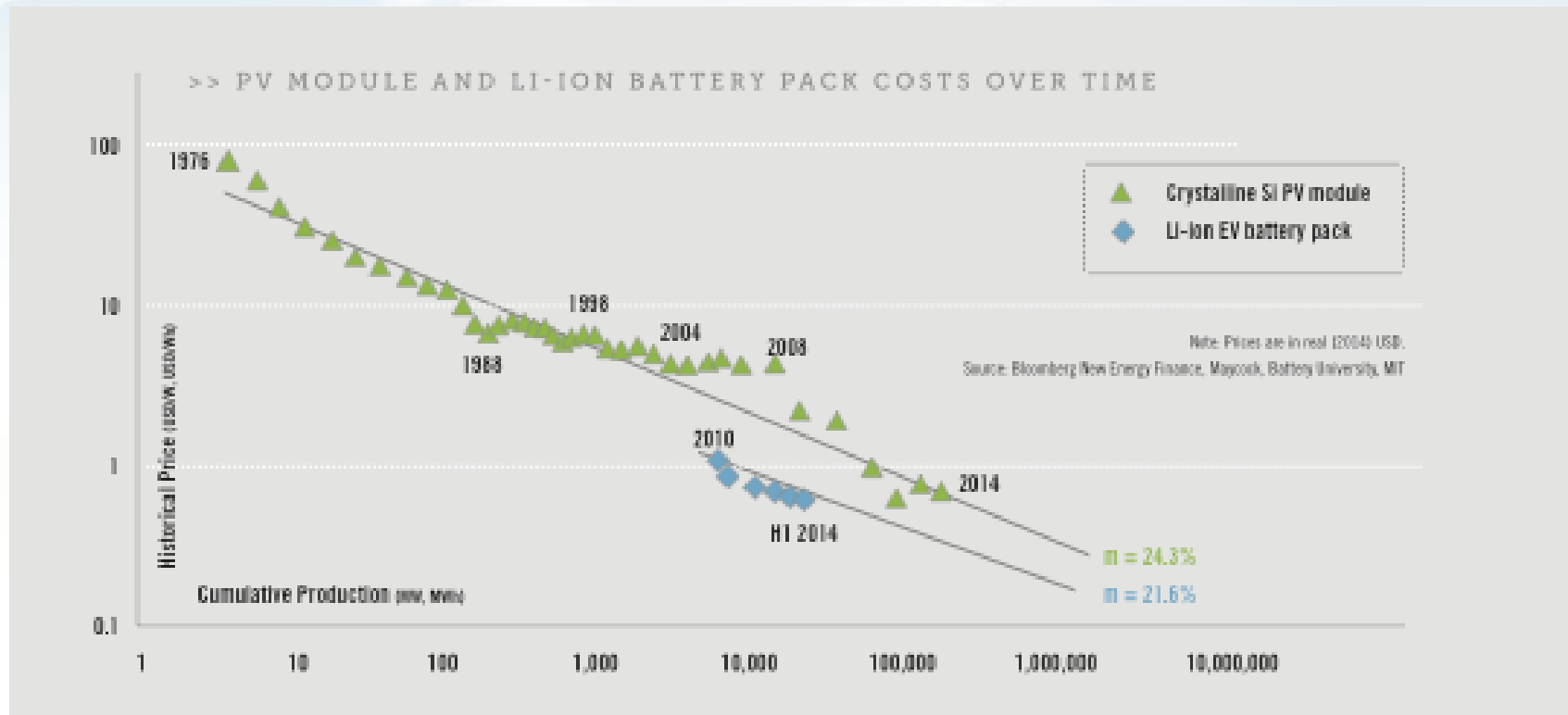
Energy shifting

Project need for at least 4 GW of multi-hour storage and recommend detailed study

Key Challenges

- ❖ Inability to currently monetize full value of storage
- ❖ Inability to participate in existing markets
- ❖ Markets or other monetization mechanisms lacking
- ❖ Confidence in future revenue stream
- ❖ High soft costs
- ❖ Insufficient information availability

Battery Price Reduction

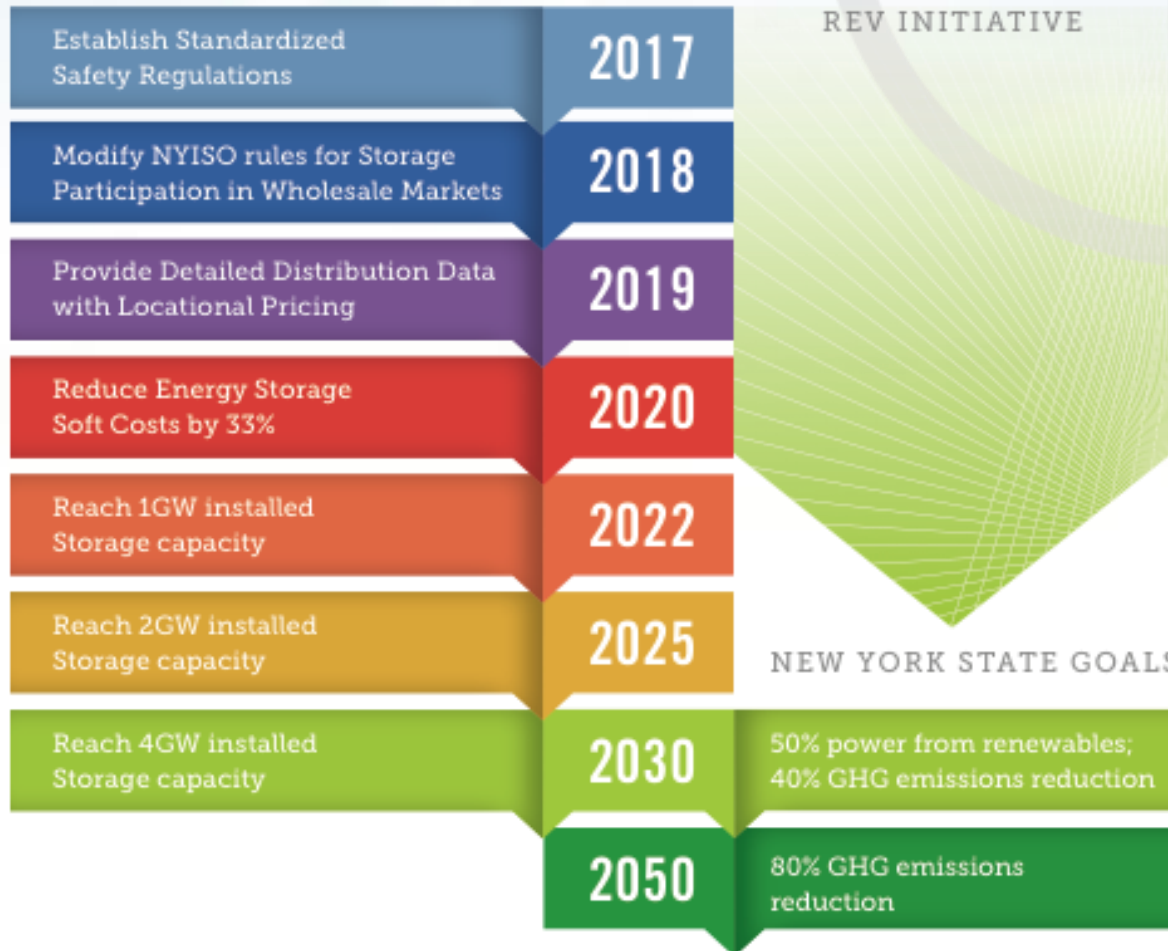


Battery prices decline with similar slope to PV

Roadmap



NY-BEST GOALS AND RECOMMENDATIONS



Storage capacity goals in GW are multi-hour systems with GWh levels discussed in Roadmap

Recommended Actions

LMP+D and peak load:

- Extend existing programs
- Interim programs to realize value – particularly of local capacity/load reduction

Clean Energy Standard:

- Establish Energy Storage goals
- Flexible Energy Credit

Address monetization of value in supporting REV, renewable energy and environmental goals along with revenue confidence

Thank you



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