



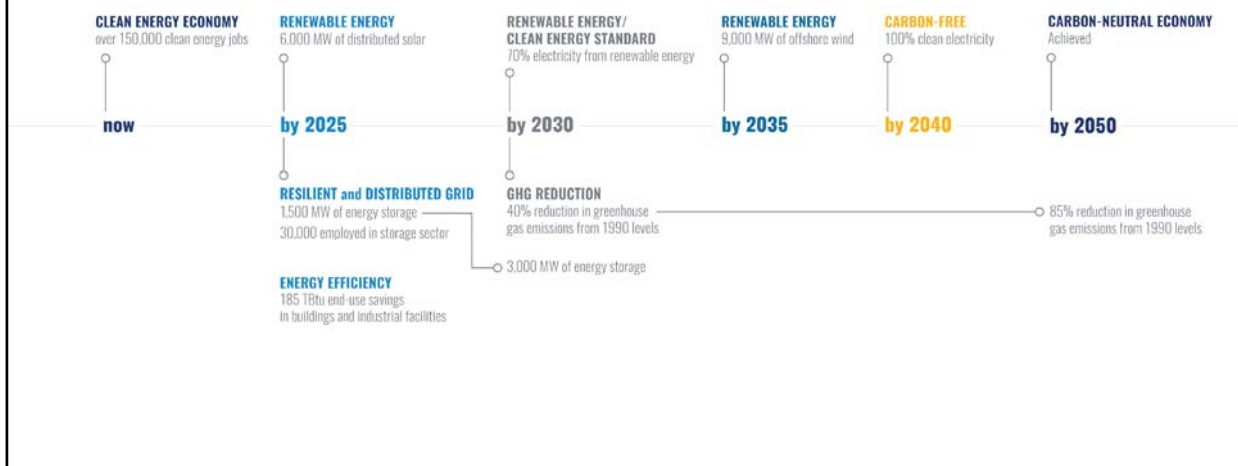
Driving Innovation and Reducing Costs

Lessons from NY's Investment in Carbon Neutral Multi-family Housing

Patrick O'Shei, Director of Market Development, NYSERDA

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New York State Clean Energy Goals



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Greenhouse Gas Emissions Reduction Target

85

by

50

New York's 85x50 emissions reduction target will require a carbon neutral statewide building stock



2019-2021: Programs & Initiatives

RetrofitNY	Buildings of Excellence	Codes to Zero	Lead by Example
Net Zero Energy for Economic Development		Clean Heating & Cooling	
Net Zero New Construction & Portfolio Support		Net Zero Manufactured Housing	



Desired Outcomes

- Achieve New York State energy & carbon goals
- Better resident health, comfort, and quality of life
- Improved building and community resiliency
- Improve housing affordability
- Improved construction productivity
- Economic development opportunity
- New York as a model for others.



Multi-Family New Construction Market

- 40 Million SF per year
- 80% within NYC
- 1/3 units market rate and 2/3 affordable
- Upstate: Low and Mid-rise
- NYC Mid-rise and High-rise
- Trending toward mixed-use buildings



Building Upon Fundamentals

- Understanding cost curves and sharing experience
- Knowing where the incremental costs are
- Using third party standards

netZero Village – in Rotterdam, NY. This is a Market Rate development, which was the first gen net zero development completed by developer David Bruns, who has now added a new net zero development Solara, to his portfolio. The project includes a highly efficient exterior, onsite PV, onsite solar thermal, and electric vehicle charging. David Bruns has indicated that he will never build a non-net zero site again because the economics are so good.



New Construction – Pathways Forward

- Partnership with Affordable Housing Agencies
- Working with Manufacturers
- Long-term Commitment

Sendero Verde – Jonathon Rose Development with Handel Architects. This project is in late stage design and will be the largest Passive House and Enterprise Green Communities certified project in NY when complete. It will also be getting HPD funding (affordable housing). The building will have VRF, ERV, have a small PV system on site. Located in NYC.



Lessons Learned: Net Zero New Construction

General Learning

- For low rise affordable multifamily housing – costs are +0 to 3%
- Most use panelized exteriors with VRFs
- Starting to see modular projects
- Launching a new modular program for net zero urban infill

BOE 2019 Competition

- Several projects with CO2 based refrigerants & Low embodied carbon
- 12 Net Zero, 15 All electric projects, 4 with geo-thermal
- Up to 36 stories
- 2 Gut rehabs, 36% mixed use
- 80% of units are affordable



Retrofits: Need for Industrialization

General Issues

- Custom Net Zero Retrofits too expensive
- Building stock often in poor condition and needs remediation
- Wide variety of existing HVAC & domestic water systems
- Inability of building electric system to accept renewables
- Cost over-runs due to existing conditions

Potential Solutions

- Manufactured components and supply chain for economies of scale
- Exterior panelization
- Unitized HVAC & domestic water system that fit existing space
- Design-Build & Construction Management





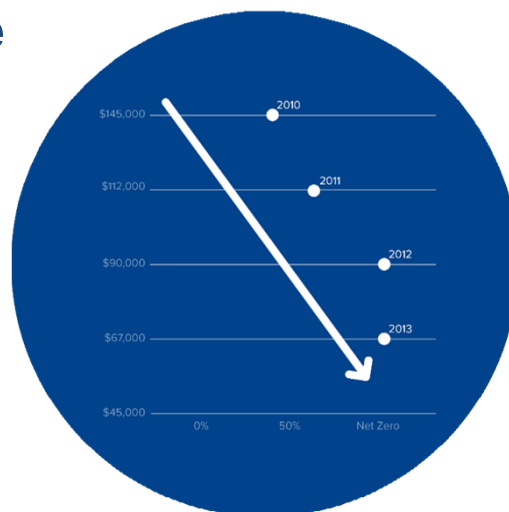
Adapting the Successful Energiesprong Model to New York State

RetrofitNY



Key Achievements of the Energiesprong program

- Net zero energy buildings at 40% of the cost of initial pilots
- The market is scaling up
 - ✓ 4,500 retrofits completed
 - ✓ 4,000 n/c projects completed
 - ✓ 20,000 projects in the pipeline



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Key components of net zero solution



Elements

- Highly insulated building envelope
- Downsized mechanical works
- [On-site] distributed generation
- Grid interactivity



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Conventional Process



Prefabricated High Performance Components



RetrofitNY Round 1 Design Pilots

Location: Troy, NY
Project: Two-stories (18 Units)
Owner: Beacon Communities
Team: ICAST



Location: Phoenix, NY
Project: Two-stories (40 units)
Owner: Rock Property
Team: King + King Architects

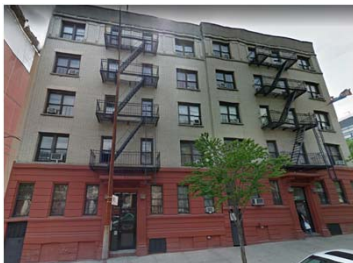


Location: Portville, NY
Project: Two-stories (24 units)
Owner: Conifer Reality
Team: SWBR



RetrofitNY Round 1 Design Pilots

Location: Bronx, NY
Project: Five-stories (42 Units)
Owner: Volmar
Team: Bright Power



Location: New York, NY
Project: Six-stories (21 units)
Owner: Joe NYC
Team: Levy Partnership



Location: Brooklyn, NY
Project: Four-stories (46 units)
Owner: RiseBoro
Team: Chris Benedict RA



Partnerships

**Demonstrating
Demand to the
Manufacturing
Sector**

