Smart Grid: NYC Opportunities and Challenges

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NYCEDC
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PlaNYC

Land

1. **Create** enough housing for our growing population
2. **Ensure all New Yorkers have parks** within a 10-minute walk
3. **Clean up all contaminated land** in New York City

Water

4. **Develop water network** back-up systems
5. **Open 90% of our waterways** and protect natural areas

Transportation

6. **Improve travel times** by adding transit capacity for millions
7. **Achieve "State Of Good Repair"** on our transportation system

Energy

8. **Upgrade our energy infrastructure** to provide clean energy

Air

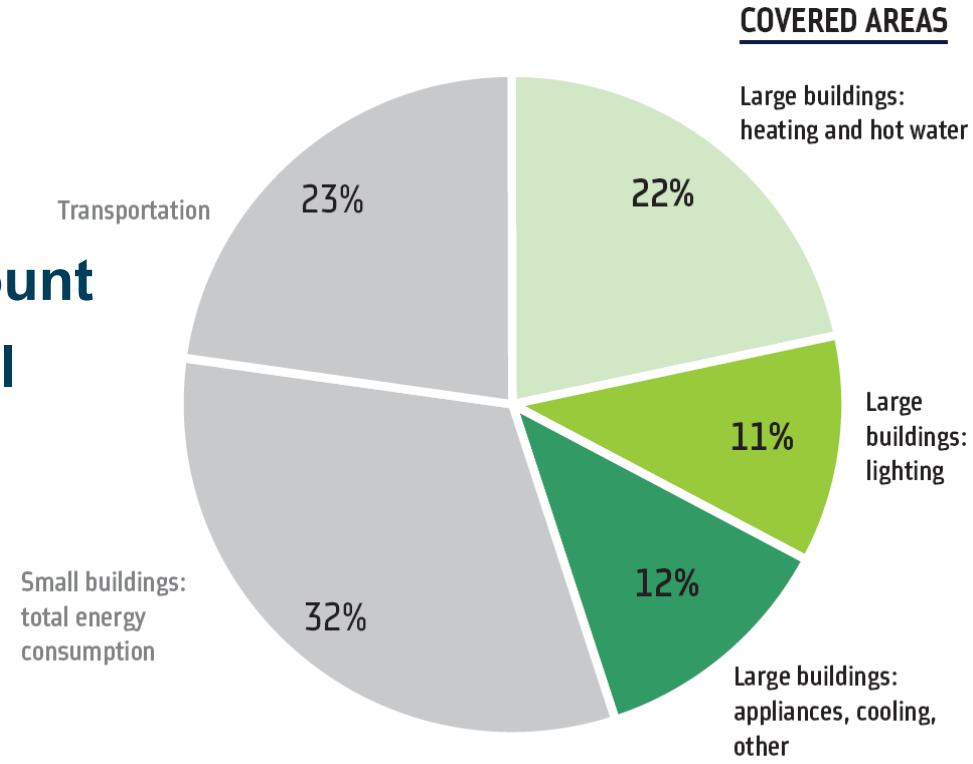
9. **Achieve the cleanest air** of any big city in America

Climate Change

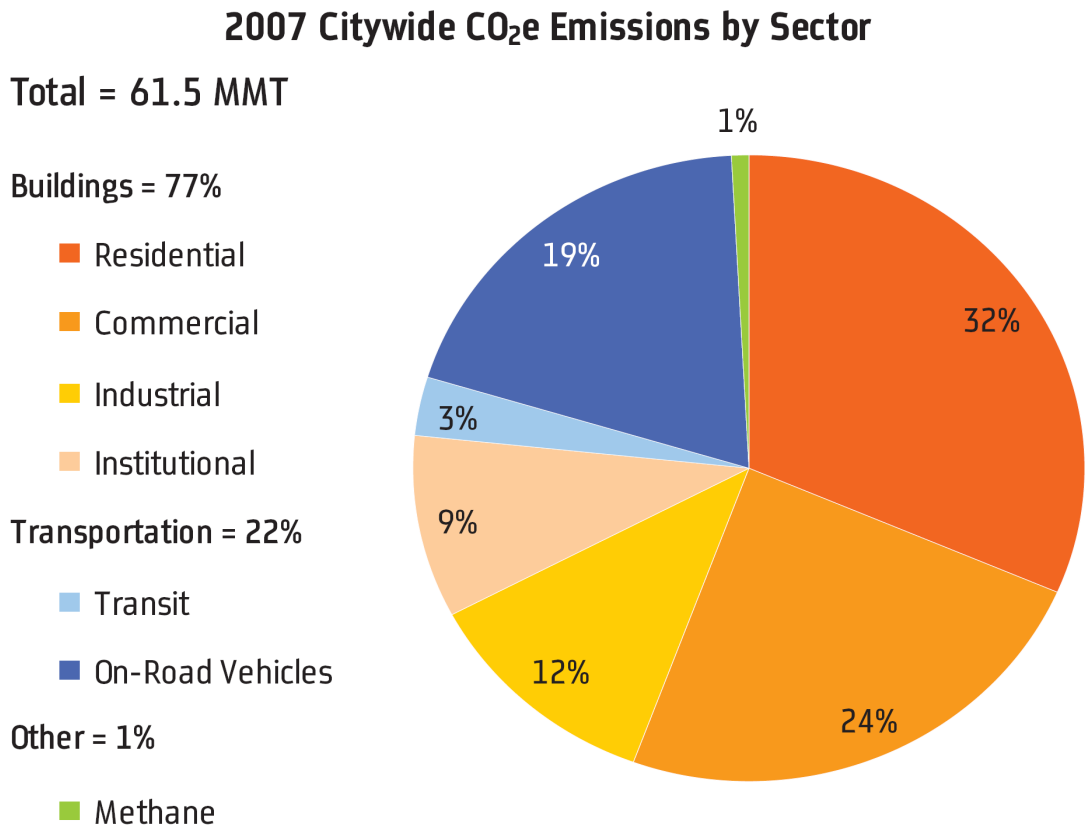
10. **Reduce global warming emissions** by 30%

Buildings: Energy Consumption

NYC's buildings account for 77% of NYC's total energy consumption



Buildings: Nearly 80% of NYC's GHG Emissions

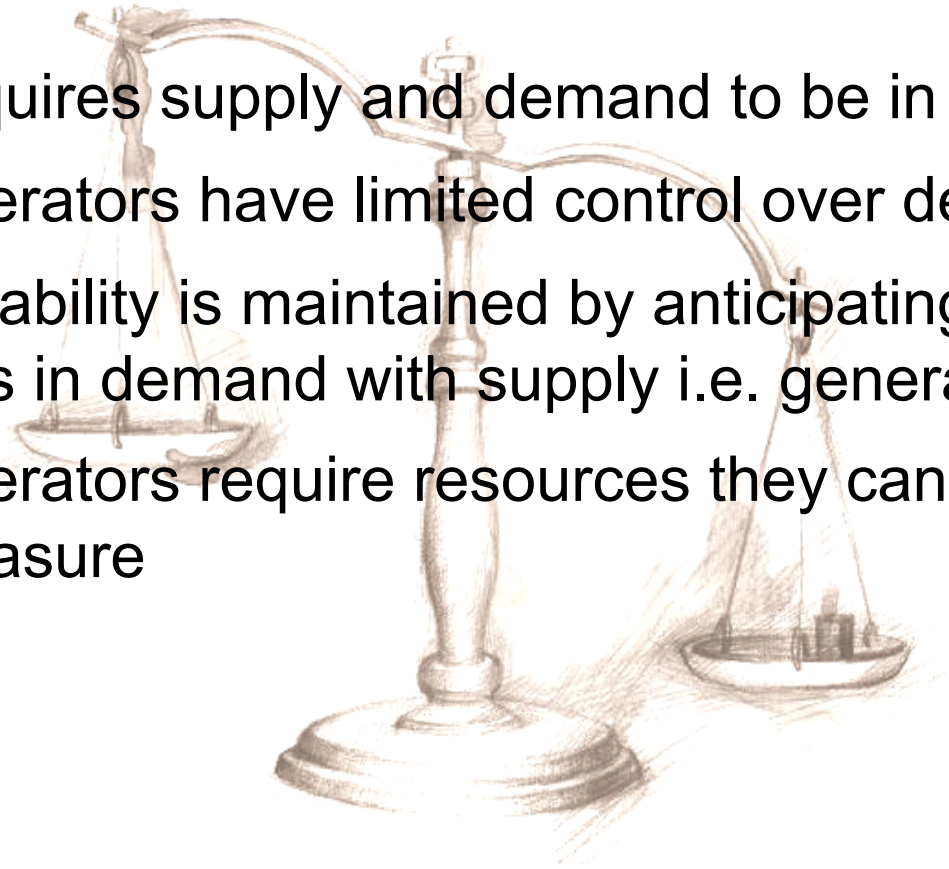


THE NEW YORK CITY

GREENER, GREATER BUILDINGS PLAN

1. New York City Energy Code
2. Lighting Upgrades & Sub-metering
3. Benchmarking
4. Audits & Retro-commissioning
5. Green Workforce Development Training
6. Green Building Financing

Electric Industry Fundamentals



- Grid requires supply and demand to be in balance
- Grid operators have limited control over demand
- Grid reliability is maintained by anticipating and matching changes in demand with supply i.e. generation
- Grid operators require resources they can control, predict and measure

Traditional Demand Response

- Demand Response occurs when customers voluntarily reduce usage in response to high prices or when requested by the utility or the grid operator
- Demand Response programs *today*:
  - Used during system emergencies and high load periods
  - Primary participants are large commercial and industrial customers
  - Response typically comes from emergency generators or equipment shutdowns

Traditional Demand Response is an Underdeveloped Tool

- Does not support grid reliability to the extent possible
- Participation is limited to <100 hours a year
- Difficult for Grid operators to accurately predict, control or measure the amount of deliberate demand reduction from the grid
- Demand reductions are not integrated with clean generation solutions

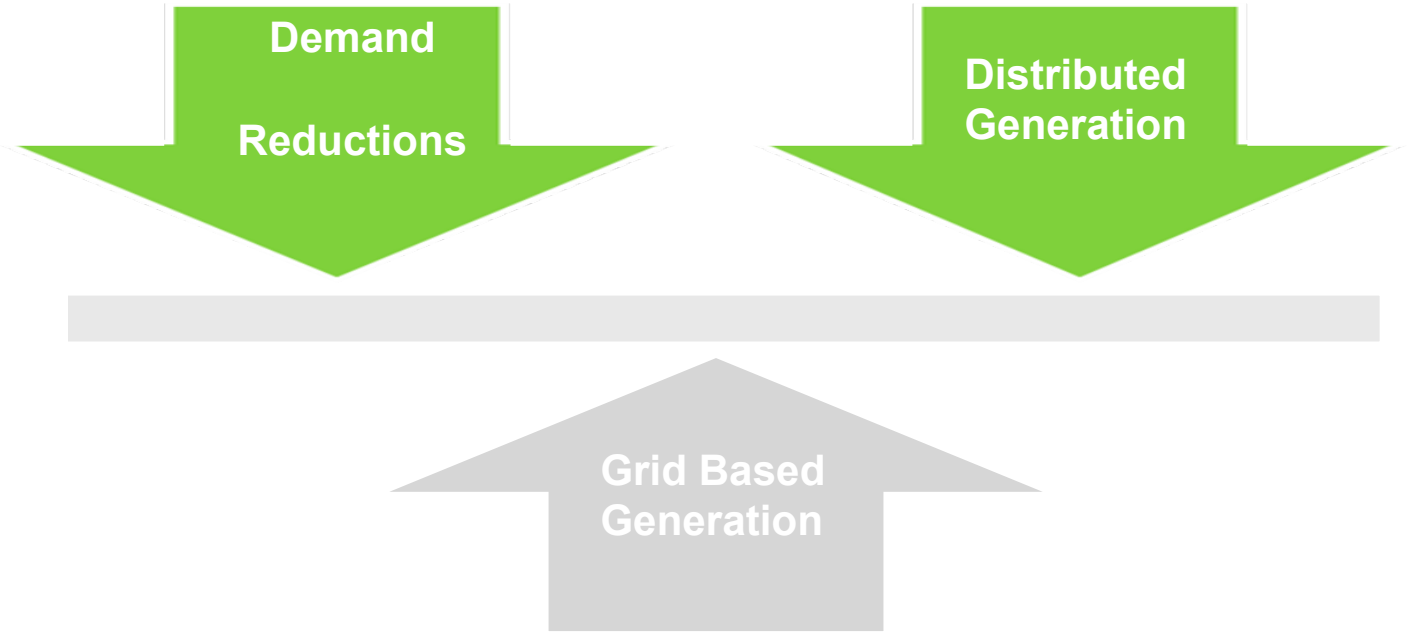
Efficient and Sustainable Markets Require the Integration of Demand Reductions into Real-Time Grid Operations - Virtual Generation

The Nation Needs a Smart Grid

- National electric demand will increase annually by 1-2 percent
- We must reduce dependence on fossil-based generation
- The industry requires $1.3 trillion in infrastructure investment to keep up with demand (EEI)
- Active management of customer demand can reduce energy costs by as much as 20%

Our electric power needs will be met by renewable and traditional generation on the grid and customer controlled demand and distributed generation - The Smart Grid

The Smart Grid is the Game Changer

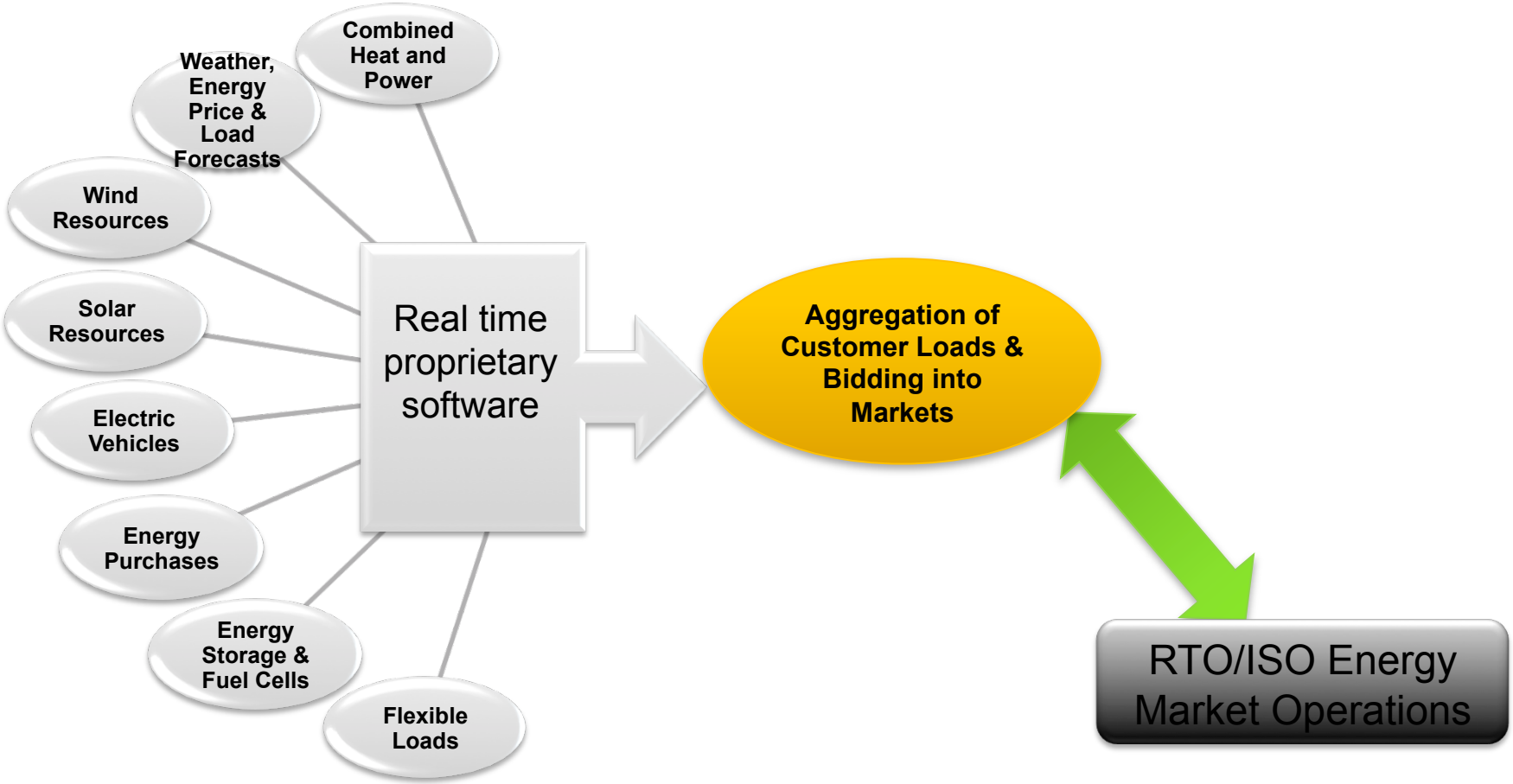


- Two-way communication makes customer-owned distributed generation and demand management available to the grid
- Customers are suppliers to the market
- Grid-based generation is coupled and optimized with customer generation and controllable demand to maintain balance

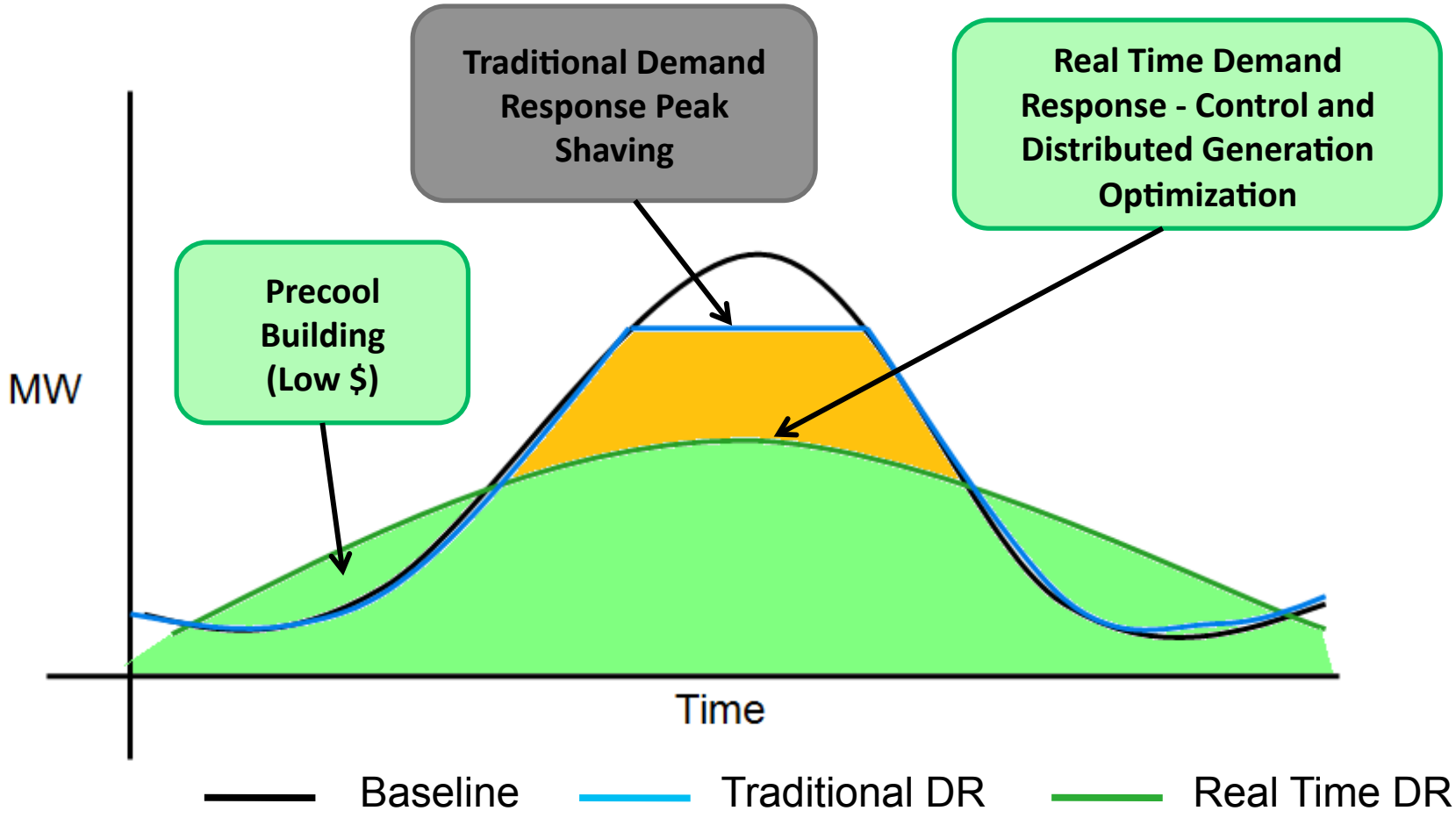
Virtual Generation

- Customer generation and demand management transformed into valuable energy assets
- Optimized load among prices, weather, DG, and supply purchases
- Expanded ability of energy management systems to produce demand reductions
- Predictable, controlled, measured, and auditable resources to be sold into markets

The Technology is Proven and Customer Ready –City is Working with Viridity on Pilot Project



Optimizing Customer Demand



Achieving Smart Grid Benefits Today

Customers	• Increase revenues from market participation • Reduced payback period for energy investments • Reduce supply expense through superior load management • Minimized carbon footprint
RTO/Market Operator/Utility	• Two way information and dispatch of distributed resources • Increased information, flexibility and security at distribution level
Renewable Generation	• Increase system value of renewable resources by integration with controllable demand (use embedded storage in load!) • Achieve environmental objectives through improved utilization of clean energy!

Regulatory and Other Hurdles

- Utility and ISO/RTO programs
  - Price thresholds
  - Real time operation and prices
  - Payment of full market price
  - Measurement and verification
- State: PSC regulatory review
- Federal: Coordination among FERC, DOE, NIST (National Institute of Standards and Technology)
- Need hourly retail rate structures (coming to NYC for all customers over 500 KW in 2011)