



**Trends in Multifamily Building Energy Efficiency:
Challenges and Opportunities for Upgrades
LIFE 2014 Statewide Conference
Albany, NY – May 29, 2014**

David Hepinstall, Executive Director, AEA



Diverse Opportunities in Multifamily Buildings Based on Various Factors

- Building Vintage (1900-present day, changes in construction)
- Low-rise, Mid-rise, and High-Rise Buildings
- Regional Building Stock and Climate Variations
- Central Systems (heating, cooling, hot water and/or ventilation utilities paid by owner but provided to tenants)
- In-Unit Systems (often including heating, hot water and cooling, as well as other utility bills paid for by tenants)
 - Results in split incentive when equipment and appliances are property of the owner but utility bills paid by resident
- Master metered buildings where all utilities are paid by owner



Impact of Variations in End User Characteristics

- Example: New York City apartment buildings
 - Condominium vs. co-op vs. rental apartments
 - Central heat and hot-water paid for by the owner
 - Common area (lobby, hallways, basement, exterior) lighting on one or more central meters
 - “Master metered” building-wide electric meter
 - “Sub-metered” vs. direct metered apartments



Impact of Variations in Investment Decision-Making Authority

- Wide variety in building ownership structure
- Property management firm's roles
- Single building vs. a project with multiple buildings vs. a “portfolio” of buildings
 - In close proximity or spread over multiple locations
- Regulated properties (e.g., HUD, State, City programs with rules and regulations governing approval process for upgrades)
- Firms acquiring existing buildings to upgrade and sell or hold (with varying time horizons)



Cost Effective Upgrade Opportunities – Central Systems

- Repairs and retro-commissioning of existing equipment (including controls adjustment, pipe insulation)
- New controls on existing equipment to minimize waste and maximize efficiency (such as Energy Management Systems, central heating boiler controls based on indoor and outdoor temperatures, and remote monitoring of performance)
- Distribution system controls (Thermostatic Radiator Valves to reduce apartment overheating and assist in system balancing)
- Replacement with high efficiency equipment (cost effective when existing equipment is at end of useful life)
- Underutilized but potential increase in adoption:
 - Central Domestic Hot Water Recirculation Controls
 - Variable Speed Drive Circulators and ECMs for Heating Systems



Cost Effective Upgrade Opportunities – In-Unit Systems

- In-Unit Heating and Cooling Systems tend to be less cost effective due to less use and load per equipment. However, when equipment is at end of useful life, recommended options are:
 - High Efficiency Direct Vent Furnaces
 - High Efficiency Air Conditioning
- Programmable Thermostats savings can be minimal. Tenant education is key to success.
- Underutilized but potential increase in adoption:
 - Heat Pumps
 - Mini-Split Systems, provide very high efficiency cooling and heating and allow for room specific control



Cost Effective Upgrade Opportunities – In-Unit Direct Install

- Free Installation of up to 2 Smart Strips per apartment can be an effective way to address the expanding plug load and provide large tenant benefit in cost savings
- Direct install programs that include free CFLs and low-flow showerheads and faucet aerators can provide both owner and tenant benefits, when the owner pays the central DHW cost and the tenant pays for the electric use



Cost Effective Upgrade Opportunities – Lighting and Appliances

- Lighting systems can be in common areas (lobbies, stairwells, common corridors) and on exterior of building
 - Typically owner paid utilities
 - Highest paybacks because of 12-24 hour operation, even with small wattage reductions
- In-unit residential lighting upgrades often need to focus on improved aesthetic quality and tenant satisfaction, in addition to energy savings
 - Often needs to be free or highly competitive incentives to entice owner investment
- Underutilized but potential increase in adoption:
 - LEDs: Better light quality, long life, “cool” early adopter factor



Overcoming the Split Incentive

- When the purchaser of the equipment does not pay the energy costs of its use, the owner and resident have “split incentives,” their self-interests collide both in what to purchase and how their behavior may create energy waste
- Although savings from some in-unit measures paid for by the owner may accrue to tenants, such actions lead to other benefits to both owner and residents, including improved living experience, marketability and tenant retention.
 - Comfort (steadier heating and cooling) and
 - Improved air quality for residents and building staff
 - Reduced recurring maintenance costs and
 - Early adopter – cutting edge image for the owner.



Collaborative Program Design Options

- Tenant measures at low or no cost to owner or as requirement for owner access to program incentives for common area measures
- Comprehensive set of cost effective energy upgrade measures that can be completed concurrently or staged in phases over time and in multiple buildings in a portfolio
- Completion of related measures maximizing energy use reduction, e.g., EMS, TRVs, master venting and low-flow DHW devices



The “Whole Building” Program Model

- States throughout the country are experimenting with variations on the Whole Building Program theme
- In California alone:
 - PG&E
 - Southern California Edison and Gas Company
 - Bay Area Regional Energy Network
 - Southern California Regional Energy Network Rater
 - Marin Clean Energy
 - San Diego Gas & Electric
 - Sacramento Municipal Utility District
 - Rate Payer On-bill Re-payment Pilot



The “Whole Building” Program Model

- By coupling a minimum % savings requirement with strong rebates, and in some cases, streamlined access to EE financing, owners are driven to engage in comprehensive common area *and* in-unit work.
- Programs leverage trigger events such as window or water heater replacements to go deeper.



Multifamily Weatherization Model

- Energy audit driven scope of work requires completion of measures with higher Savings to Investment Ratio (SIR) before those with lower SIR's.
- Ban on re-weatherization stimulates completion of comprehensive scope of work in a building during a single program year
- Tenant benefit requirement stimulates whole building scope of work and collaboration.



Cost-Effectiveness Testing: Project vs. Single Measure

- WAP requires energy audit calculation of overall project SIR with measure interactivity
- NYSERDA's Multifamily Performance Program initially focused on total project TRC.
- Energy Efficiency Portfolio Standard programs promulgated by Public Utility Commissions often base incentives on single measure cost-effectiveness



Sample Upgrade Scope 1

Building Type	Garden-style	Climate Zone	3	Year Built	1965
Floor Area	35,412	Units	40	Stories	2
				Savings	
Windows – Replace windows with double pane (U-Factor = 0.350 SHGC = 0.4)				1.5%	
Upgrade Existing Attic Insulation to R-38				1.9%	
Install Low-Flow Showerheads and Aerators				6.8%	
Replace Halogen and Incandescent Lighting with CFL's and LED's				2.3%	
Total for All Improvements				12.5%	



Sample Upgrade Scope 2

Building Type	Garden-style	Climate Zone	12	Year Built	1970
Floor Area	5,775	Units	5	Stories	2
Improvements				Estimated % Savings	
Windows – Replace windows with double pane (U-Factor = 0.340 SHGC = 0.31)				5.8%	
Appliances – Replace Washing Machines with CEE Tier III				7.3%	
Install Low Flow Showerheads and Aerators				.4%	
Add Sensors to Exterior Lighting and Laundry Room				.2%	
Total for All Improvements				13.7%	



Work Quality Standards

- Energy efficiency upgrades that are supported by program incentives also are affected by program rules, cost-effectiveness standards and quality assurance/quality control processes required to draw down these incentives.
- Work Quality standards and a trained work force are key ingredients to successful energy efficiency upgrades in multifamily housing



Changing Utility Roles

- Traditional “demand side management” programs
- Utility restructuring leading to “public benefit” programs, e.g., NY’s System Benefits Charge (SBC) funding and then Energy Efficiency Portfolio Standard (EEPS) supporting efficiency upgrades
- “Resource acquisition” vs. Market Transformation approaches
- Impact of the “Green Bank” and New York’s “Reforming the Energy Vision” initiatives?



Assuring EE in Affordable Housing

- AEA's Mission: Energy Affordability through Energy Efficiency
- Market-based solutions alone unlikely to reduce the extent of energy “waste” in multifamily housing where many low and moderate-income households in NY live.
- Need for a well informed consideration of impacts on this sector in taking steps to reform the “Energy Vision.”

