

# ***ASSESSMENT OF ENERGY EFFICIENCY GAINS FROM ARRA-FUNDED INVESTMENTS IN THE NATION'S PUBLIC HOUSING***

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USAEE/IAEE North American Conference

September 25, 2018

# BACKGROUND

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- **American Recovery and Reinvestment Act (ARRA) enacted to provide stimulus to US economy**
  - **Intended to generate jobs and incomes at a time of deep economic recession**
- **As part of ARRA, HUD was allocated several \$ billion to invest in energy and water efficiency within the nation's public housing**
  - **\$3 billion allocated by formula**
  - **\$250 million under a competitive green retrofit grant program for multifamily housing**
    - **Public Housing Authorities (PHAs) were required to submit grant applications to achieve additional funds under this program**
- **Congress required HUD to report back on results of the efficiency investments**
- **A team of firms headed by LMI was employed by HUD to compile these results\***



# BACKGROUND (CONT'D)

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- HUD administers a variety of programs affecting the nation's public and subsidized housing stock
  - It supplies resources to local Public Housing Authorities to aid low income residents, and monitors the use of these resources
- There are approximately 3000 Public Housing Authorities within the US
  - These range in size from very small (under 250 housing units) to very large (over 6600 units)
  - They are located in cities and counties throughout the country
- HUD asserts that the nation's public and subsidized housing stock is undercapitalized by about \$25 billion
- ARRA provided HUD several billions in addition to its normal annual budgets



# METHODOLOGY USED IN THE LMI TEAM STUDY

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- Build a model of expected energy savings from Energy Conservation Measures (ECMs)
- Test and refine the model with HUD utility consumption data
- Estimate aggregate energy and water savings from HUD's use of ARRA monies
- Estimate aggregate environmental effects resulting from energy savings
- Report the results to HUD for purposes of informing Congress as to what was accomplished from ARRA monies



# DATA SOURCES

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- **HUD Recovery Act Management and Performance System (RAMPS)**
  - Quarterly reporting system showing Energy (and water) Conservation Measures undertaken by each PHA
  - 37 different ECMs identified
  - Data set complete through 2011
- **Survey by the LMI team of all 201 competitive grant recipients**
  - Achieved an 84% response rate
- **Utility consumption data**
  - Obtained several years annual consumption data for many PHAs
  - Obtained 1 year before and after data for all competitive grant recipients
- **20 site visits to individual PHAs by the LMI team**



# AGGREGATE RESULTS

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- **Energy savings – 315,000,000 kWh/year**
  - Sufficient to power about 29,000 US homes for 1 year
- **Water savings – 1,172,000 ccf/year**
  - Sufficient to supply about 7000 US families for 1 year
- **CO2 reduction – 384,600,000 lb/year**
  - Equivalent to taking 37,400 cars off the road
- **SOx reduction - 1,431,000 lb/year**
- **NOx reduction - 481,000 lb/year**

# OTHER KEY RESULTS

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- On average, competitive grant recipients achieved energy savings of 20.33% from deployment of their awards
- Among the 20 site visits made by the LMI team, energy savings ranged from 2% to 49%
  - Annual unit expense reductions ranged from \$22 to \$818
  - At one PHA, energy consumption and expense actually increased, due to installation of air conditioning where it had not previously existed
- Payback times could be calculated for seven PHAs
  - These ranged from 2.4 to 13.8 years
    - Three were 5 years or less
    - Three were between 5 and 10 years
    - One was over 10 years

# ISSUES CONFRONTED IN EXECUTING THE STUDY

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- **Incomplete or inaccurate data**
  - “Cleaned” data where possible – e.g., converted to proper units, discarded where an extreme outlier
- **Difficult to calculate rates of return on investment**
  - E.g., because monies spent on upgraded assets such as energy efficient refrigerators also provide food cooling services
  - Data showing incremental cost of more energy efficient vs. less efficient equipment not generally available
- **Formula grantees were not informed that rate of return on ARRA investment was an important criterion**
  - These grantees tended to use monies for multiple purposes related to energy but not necessarily intended to achieve high returns on investment
  - For example, increase resident comfort, upgrade buildings and building unit equipment
  - Few formula grantees retained data useful for estimating rates of return on investment
  - Few energy audits done by either formula or competitive grantees




# CONCLUSIONS

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- HUD was able to deploy ARRA monies quickly
  - Notice of Funding Availability issued within a few months of enactment of ARRA
  - Retrofits began shortly thereafter and some were finished later that calendar year
- The ARRA monies spent by HUD achieved largescale aggregate energy and water savings, with consequent environmental improvements
- HUD's competitive grant program achieved significantly higher energy savings per dollar spent than the formula program
  - Program structure matters!
- In future, HUD grant recipients, whether by formula or competitive selection, should be apprised what criteria are important in choosing among investment options and what data should be retained to measure performance
- Independent energy audits procured by the building owner are useful and should be encouraged

# MAKE IT POSSIBLE WITH US



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