

# Applying GIS to Characterize Neighborhoods by Housing Stock and Energy Efficiency Potential

#### American Association of Geographers

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**ELEVATE** ENERGY Smarter energy use for all



# We promote smarter energy use for all.



We give people the resources they need to make informed energy choices.



We design and implement efficiency programs that lower costs, and protect the environment.



We ensure the benefits of energy efficiency reach those who need them most.



- Based in Chicago but extending our reach nationally
- Researching and implementing smarter energy programs that include those traditionally left out by other energy services





- Smart grid benefits and dynamic electricity pricing in homes
- Energy efficient **buildings**
- Community-level programs
- Research, policy and innovation





- Mapping Energy Use
- Research
- Context
- Application of GIS





- Increases local transparency
- Enhances coordination
- Amplify energy efficiency program scale
- Untapped resource in the energy efficiency industry





# **Comprehensive Community Scale Approach**

- Chicagoland Single Family Housing Characterization
- Energy and Housing Stock
  Segmentation to Achieve
  Community Energy Savings
- Single Family Energy Efficiency Webmap



## **Housing Characterization Data Collection**





- Segmentation of housing stock
- 15 Groups
- Homes most likely to achieve deep energy savings

ENERGY Renewable Energy	
	Chicagoland Single-Family Housing Characterization
	J. Spanier, R. Scheu, L. Brand, and J. Yang Partnership for Advanced Residential Retrofit (PARR)
	June 2012
	Energy and Housing Stock Segmentation to Achieve Community Energy Savings
	Rachel Schen, Emily Robinson, and Dr. Anne Evenz, Elevan Energy Published and Presented at ACEEE Summer Study in Buildings Parific Grove, CA August 17, 2014
	ABSTRACT
	Municipalities require cobust energy and building data in order to meet energy efficiency and emission reduction goals, but these data can also be used to inform and achieve broader community goals such as those related to affordable housing or economic development. These data exect to be tallored to east community using broading provides more affectively help policymalates prioritine any structures in a suggest and structures. Despite increasing demand for and access to beguing and energy data at the aggregate and building level, there is tall no broad understanding of how gardicular houses types use energy differently.
	housing stock and energy use. The analysis combines the measured energy commutation in over 400,000 homes and the property assessor data of one million homes in Cook County, Illinois. Then the space presents results from an analysis of measured energy use performance and housing characteristics argumented by construction type, age and size. The analysis provides durinct energy outcomes and provides a method to prioritize homes for maximum aggregate energy arvings.
	The payer that describes how moving segmentation has been appund on the Unicago region in residential energy records programs, adding genergatian and contra level in both income analysis. Last, the paper discusses results and presents recommendations for how measured energy use across populations of how the summine freeds that cannot be observed in single home comparisons, provide clarity in red entate transactions, and have a demanti impact to how community-scale programs are developed and implemented.
	Introduction
	In order for municipalities to meet climate and energy efficiency goals it is important to more toward more targend straingin, addensing the housing note that is most able to pervide deep savings and strategies that scale quickly and efficiently. Policymaker must address the housing stock in geographic clusters, not as individual homes. This paper presents an analysis and a methodology that matrix energy use and building characteristics to identify building and community assess and opportunities. Maniforgianties and energy efficiency portunes could busing stock to employ a comprehensive community-based approach toward energy and housing. Policymakers can use this approach to identify key housing types and gographies to develop outerach and efficiency program more effectively. These methods can be used to inform.community investment statemets.





#### **Geographic Concentrations of Housing Groups**





- Describe building and energy use
- Target homes most likely to achieve deep energy savings
- Tailor energy efficiency packages to unique building stock
- How can data be employed as part of a comprehensive community-scale approach?





# **Application: Chicago Strategy**

 66.9% of Chicago's single family housing falls in 4 building types



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Masonry 1942-1978 Less than 2 Stories (Group 4)



Masonry Pre-1942 Less than 2 stories (Group 6)



Frame 1942-1978 Less than 2 stories (Group 11)



Frame Pre-1942 Less than 2 stories (Group 14)



## **Neighborhood Building Characterization**

- Portage Park
- 9,864 single family homes
- 86% homes top 4 building types (8,483)
- 51% frame; 49% brick
- 96% built before energy codes







#### **Neighborhood Energy Use**

- Portage Park
- 1,399 therms annually
- 8,248 kWh annually





### **Recommended Energy Efficiency Measures**

- Upgrade Packages
  - Attic and air insulation
  - Wall and basement insulation
- Savings
  - 10% 20% therm savings
  - 7% kWh savings



#### **Neighborhood Savings Potential**

- Portage Park: 8,483 top 4 building types
- 10% Penetration = 843 homes
- Annual Savings Potential (10% therm; 7% kWh)
  - ~125,000 therm savings
  - ~487,000 kWh savings
  - ~1,100 CO2e metric tons







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