



Energy Efficiency Visualization in Community Planning (S489)

Sunday, April 19, 2015 • 2:30-3:45 p.m.

WSCC—Hall 6E

CM | 1.25

**American Planning Association
2015 National Planning Conference**



Residential Energy Use: Energy and Housing Stock Segmentation to Achieve Community Energy Savings

COOK COUNTY, IL

American Planning Association

April 19th 2015



ELEVATE ENERGY
Smarter energy use for all



Our Mission

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.



Elevate Energy: Smarter Energy Use for All

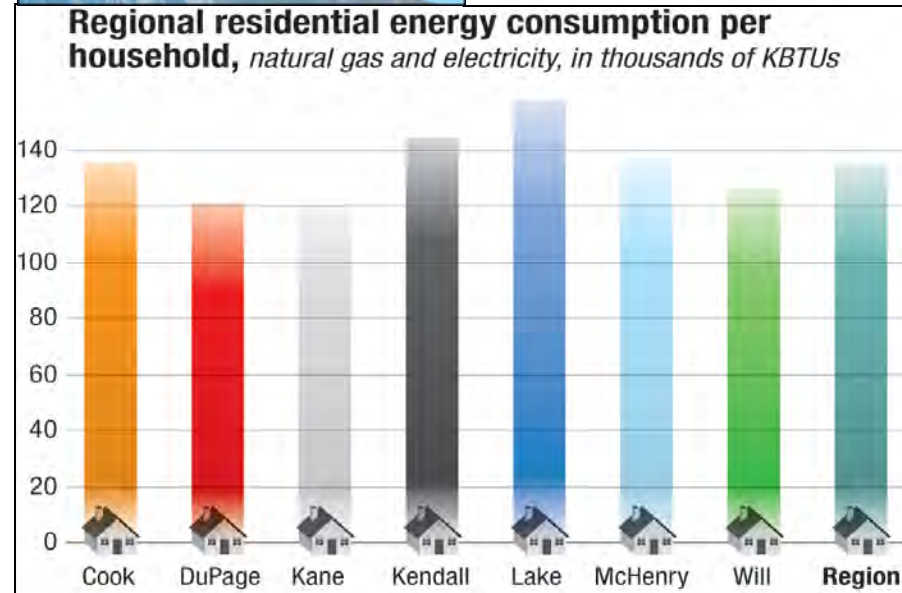
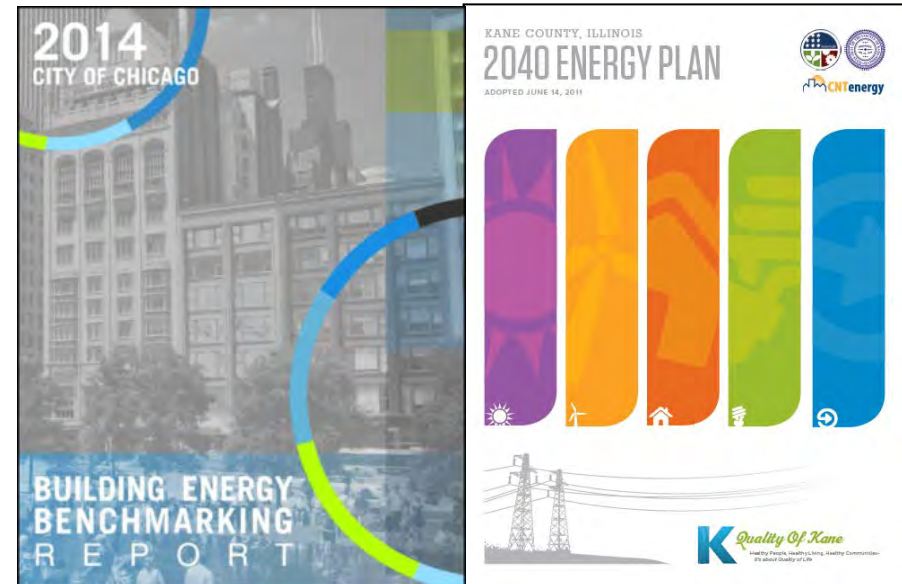
- Smart grid benefits and dynamic electricity pricing in homes
 - 23,000 households enrolled in hourly pricing programs
- Energy efficient buildings
 - 3,600 single family homes retrofitted
 - 18,000 multifamily units retrofitted
- Community-level programs
- Research, policy and innovation





Elevate Energy: Public Sector work

- Energy & Sustainability Planning
 - Municipal
 - County
 - Regional
 - State
- Benchmarking
 - Public Sector building portfolio
 - Rollout/implementation of benchmarking ordinance
- Energy Efficiency at water/wastewater facilities





The Elevate Energy Team



A dedicated and talented team with a broad range of expertise



Agenda

- **Community Sustainability Planning**
- **Context**
- **Single Family Housing
Characterization**
- **Applications**



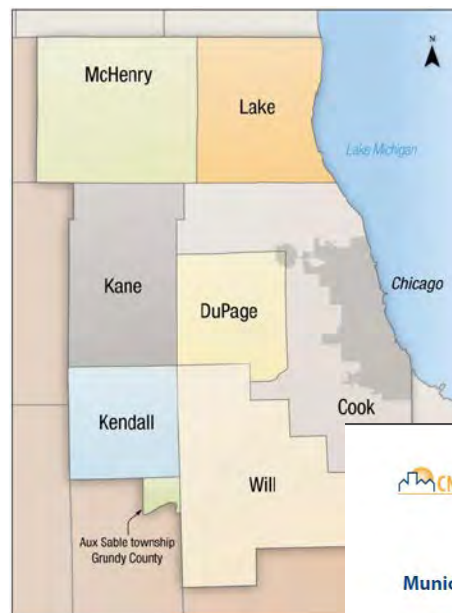
Knowing Where Your Starting From

Community Planning - Baseline Metrics

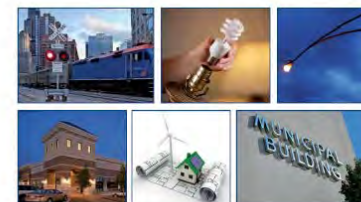
- integral piece to an energy or sustainability strategy or larger scale plan

Municipal Energy Profile Project (MEPP)

- Developed profiles for 270 municipalities in 7 – county region (Chicago metro area)
- Energy and Emissions Data
- Residential, Commercial, Industrial



The Guidebook for the
Municipal Energy Profile Project (MEPP)
February 2011



CNT Energy • Central Integrated Technology, 7171 W. North Ave., Chicago, IL 60647 • (773) 269-8127 • info@cntenergy.org • www.cntenergy.org



Cook County Residential Demographics

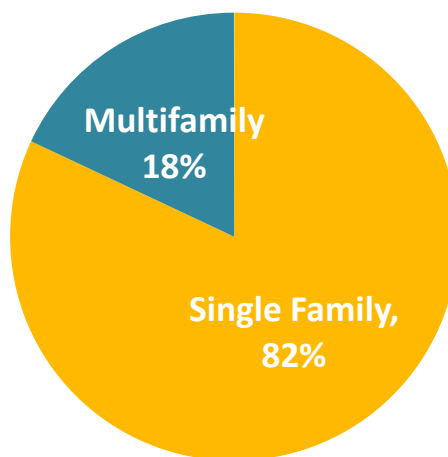
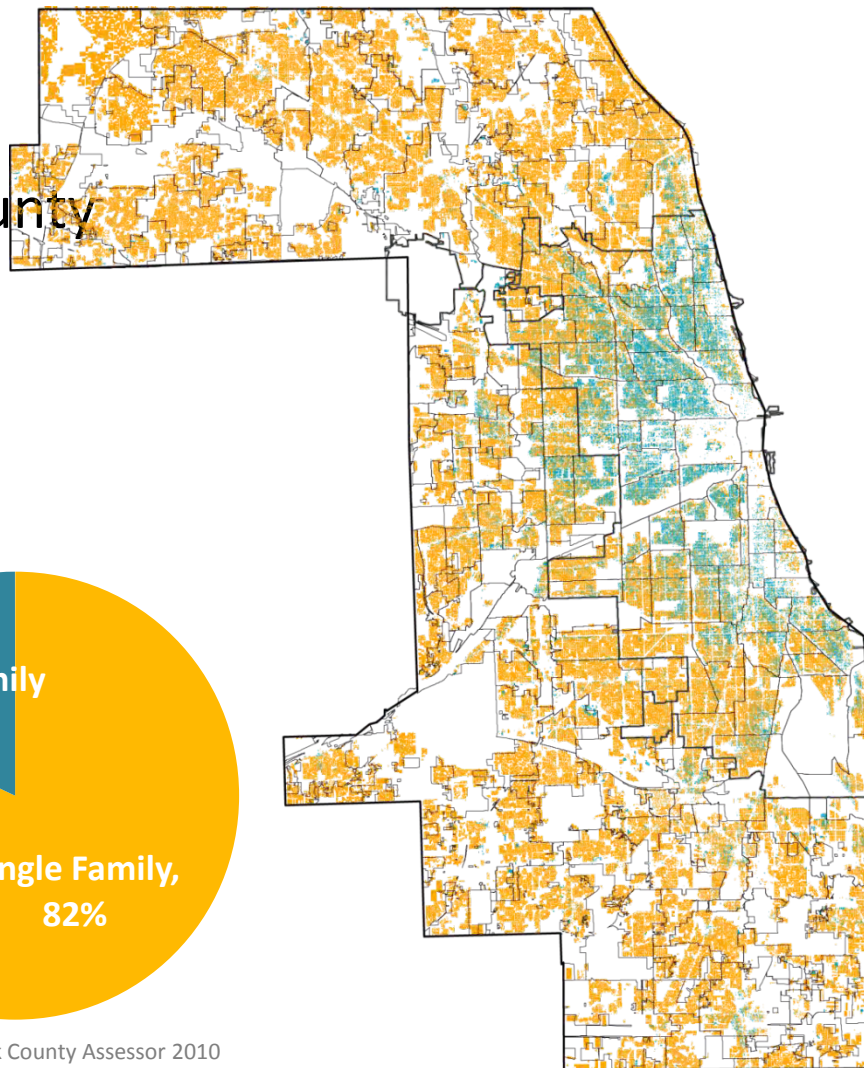
Cook County Single Family Housing & Demographics	
Size	1635 square miles
Households	Nearly 2 million
Single family Homes (n)	Nearly 1.1 million
Size of homes (median)	1,629 square feet
Year built (median)	1956
Construction type	Masonry 38% Frame 58% Other 4%
Household annual income (median)	\$59,903
Heating Systems	85% gas forced air, 15% hot water/steam
Central Air Conditioning penetration	40%



Summary: Housing Stock

Single Family Homes

- 919 K
- *% Housing Units in Cook County





Cook County Home Examples





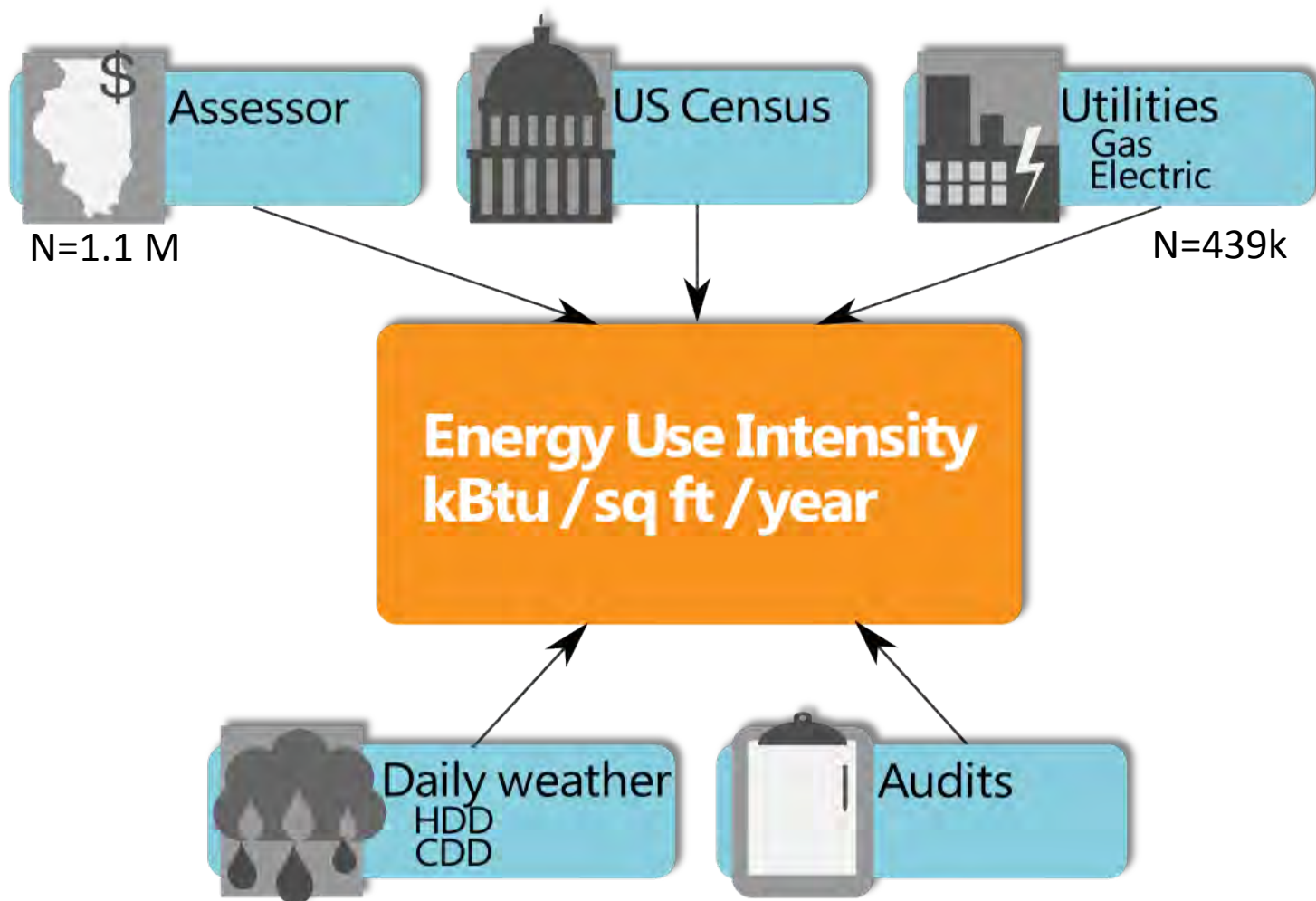
Unique Dataset

Characteristic	2005 RECS, National	2005 RECS, East North Central	Elevate Energy ¹
# Homes	3,102	486	440,204
kWh	10,757	9,685	9,273
therms	706	934	1,306
kBtu - electric	36,703	33,045	31,639
kBtu - gas	70,589	93,353	130,600
Square feet	1,889	2,132	1,254
Year built	Before 1940	Before 1940	1957
EUI	57	59	129

¹ CNT Energy 2011



Housing Characterization Data Collection

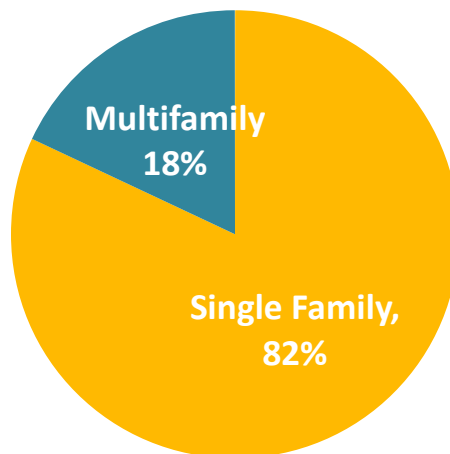
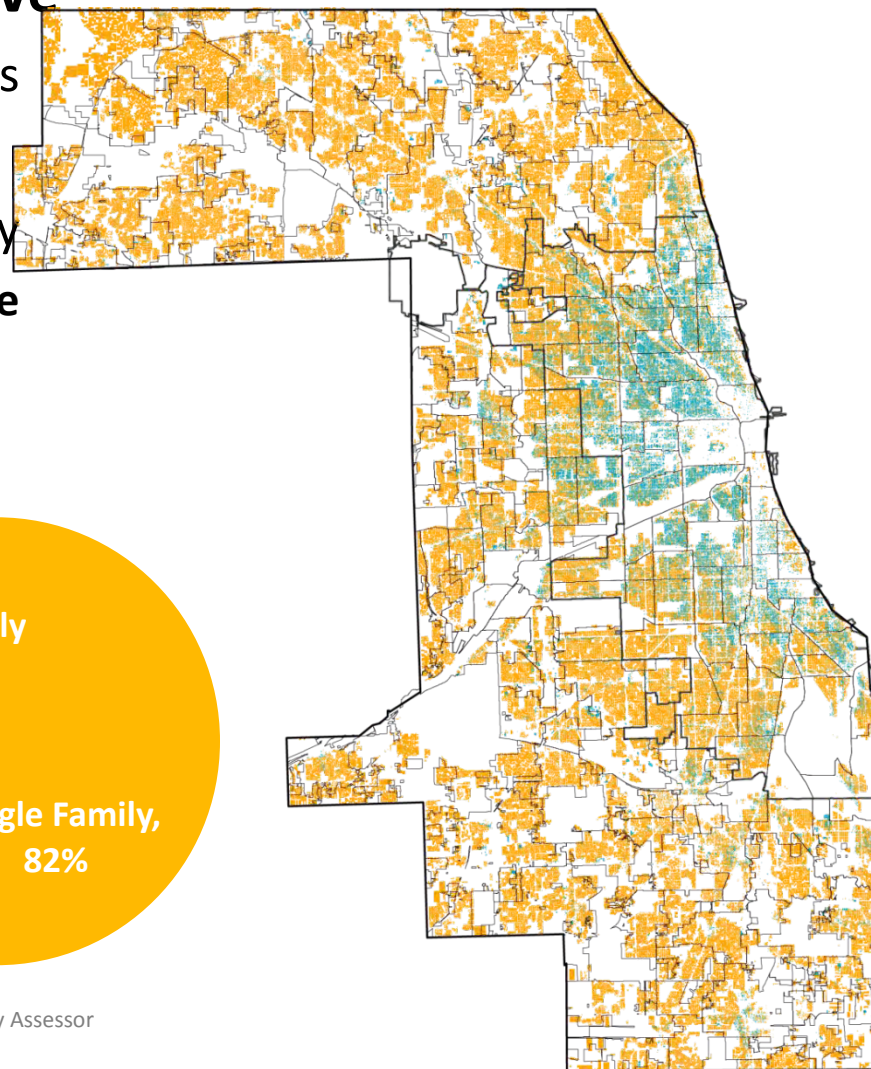




Cook County Single Family Residential Profile

Stock is Old, Small, and Energy Intensive

- 82% of homes built before energy codes
- Median size= 1,313 sf
- Natural Gas Use: 1,329 therms annually
 - **Nearly ~2x intensive as national sample**
- Electricity = 8,697 kWh annually





Housing Characterization Analysis

Segmentation of Housing Stock

- Construction Type (frame or Masonry)
- Year built (Pre-1942, 1942-1978, Post-1978)
- Number of stories

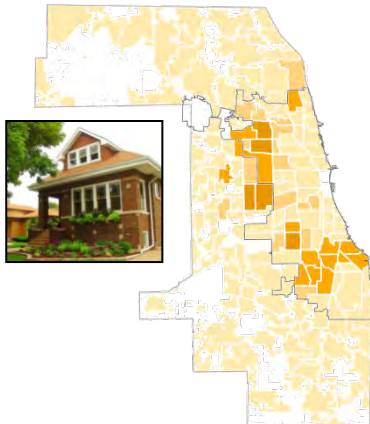
Results

- 15 Housing Groups
- Indicators of deep retrofit and savings opportunities

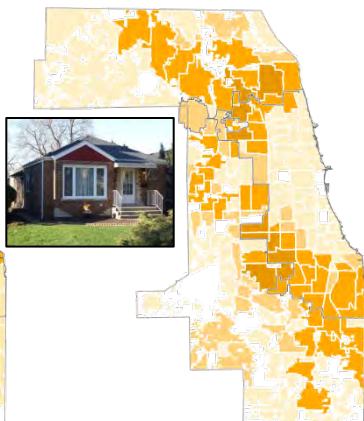


Geographic Concentrations of Housing Types

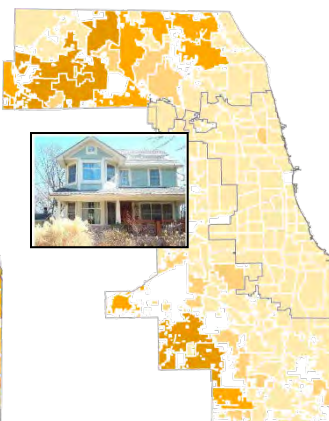
Masonry Pre-1942 Less than 2 stories non split level (Group 6)



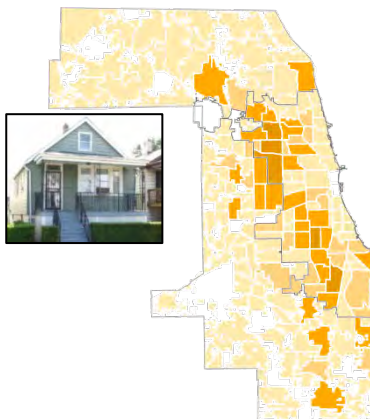
Masonry 1942-1978 Less than 2 Stories no split level (Group 4)



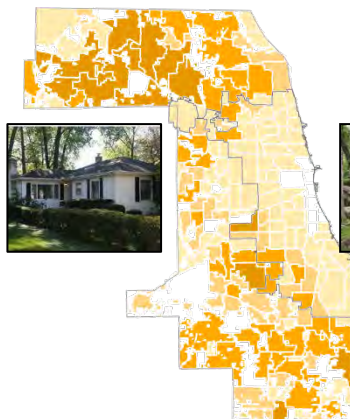
Frame Post-1978 2 or more stories (Group 10)



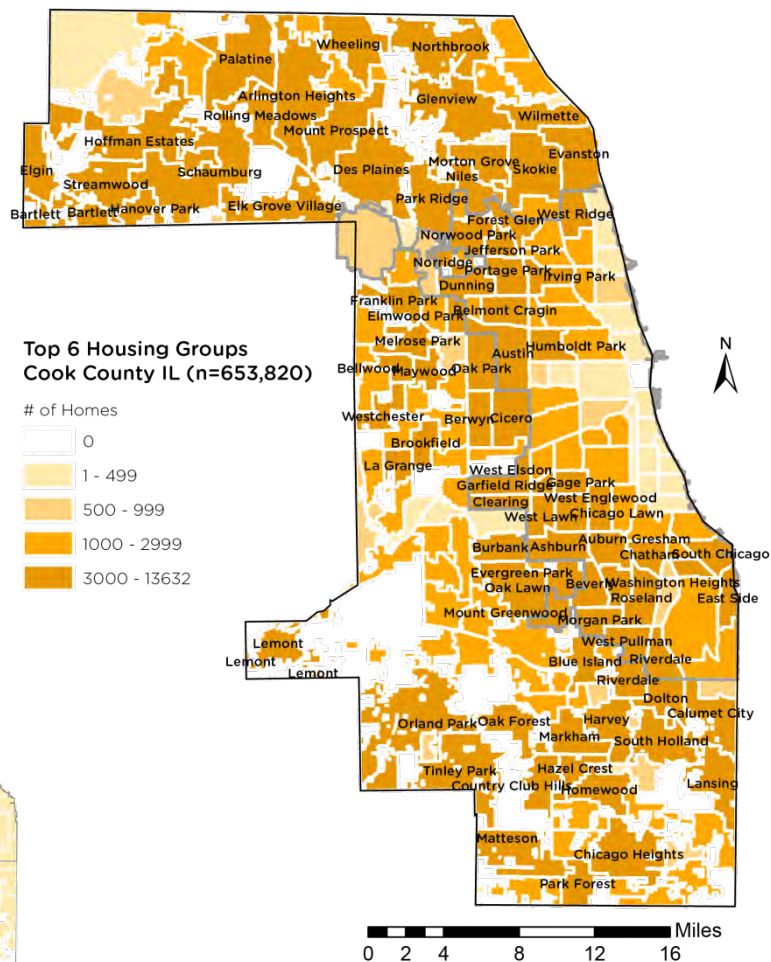
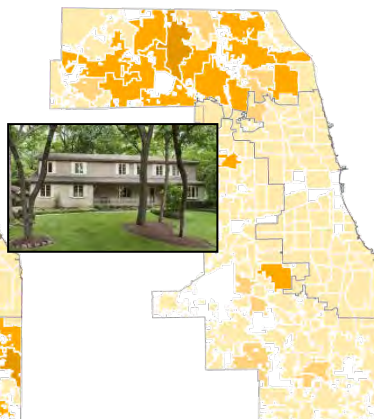
Frame Pre-1942 Less than 2 stories no split level (Group 14)



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



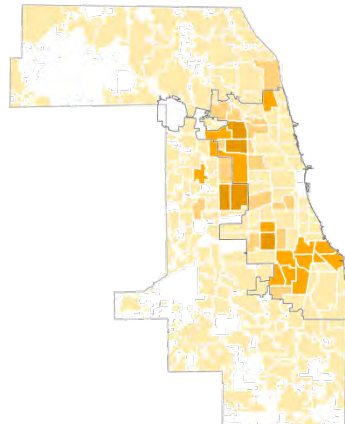
Frame 1942-1978 2 or more stories (Group 13)



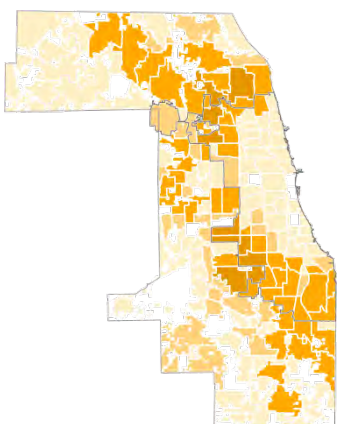


Geographic Concentrations of Housing Types

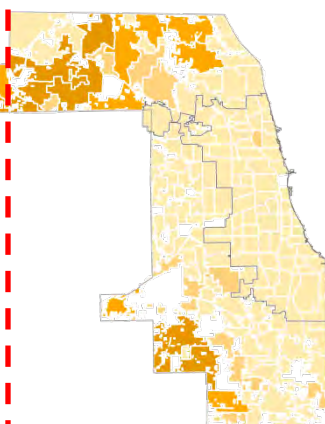
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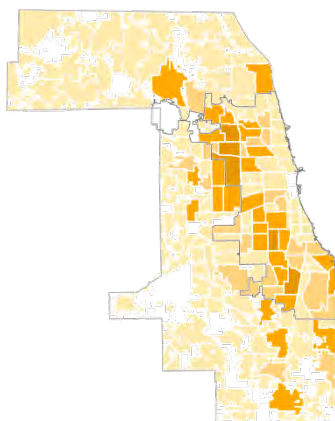
Masonry 1942-1978 Less than 2 Stories no split level (Group 4)



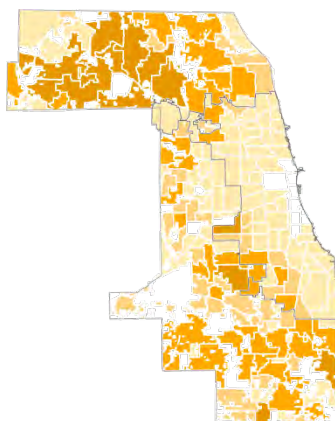
Frame Post-1978 2 or more stories (Group 10)



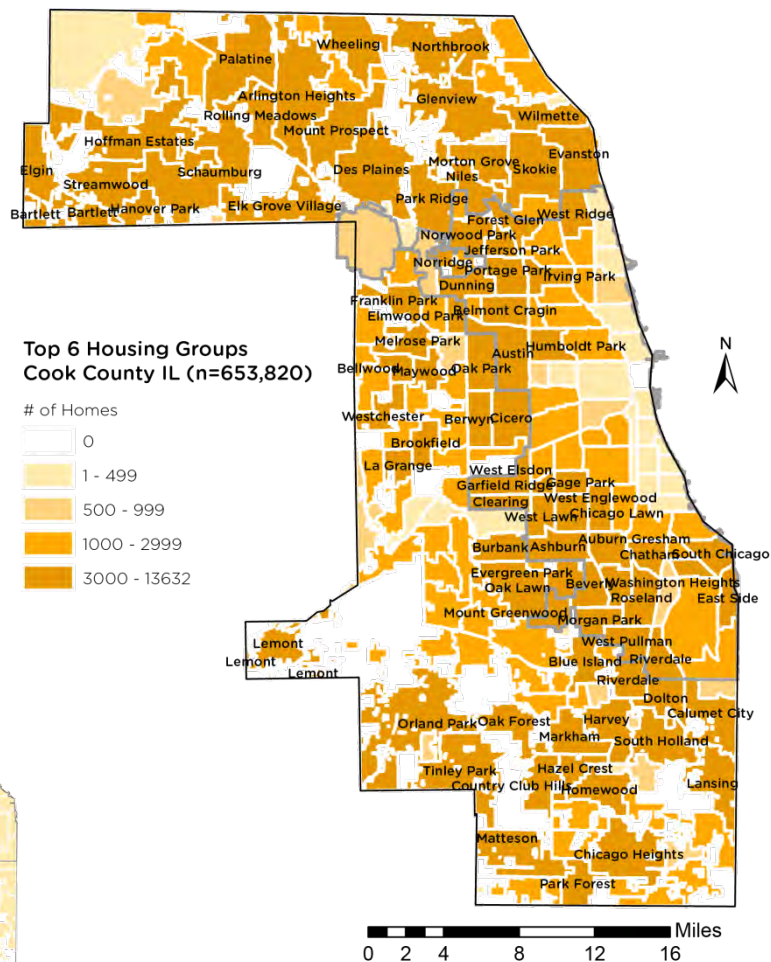
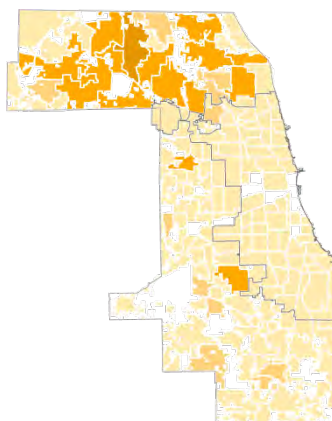
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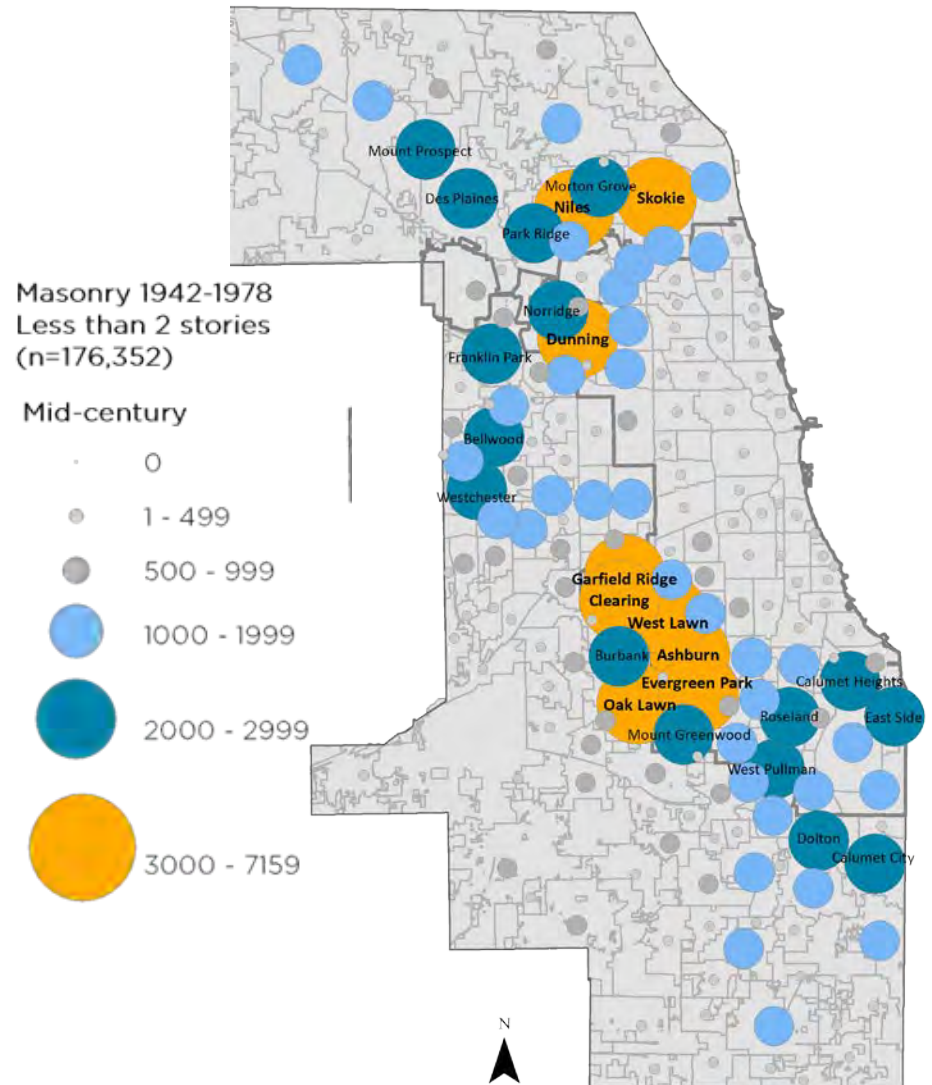
Targeting by Housing Type



- 176,352 of these brick homes in Cook County, representing 19.2% of county's population.

Municipalities/Chicago Community Areas with Largest Concentration of Group 4 (Top 5)

Name	Group 4	Total # of SF Homes	Group 4 % of SF Homes
	N Obs		
Ashburn	7247	11959	61%
Skokie	6663	17129	39%
Garfield Ridge	4763	10405	46%
Norwood Park	4715	11242	42%
Oak Lawn	4245	16695	25%
Total	27,633	67430	41%





County-Wide Savings Potential

Baseline Metrics

- Masonry Pre-1942 Less than 2 stories non split level (Group 6) – 176k Homes
- Median Natural Gas Use – 1,229 Therms Annually
- Median Electricity Use – 7,849 kWh Annually

Potential Program Success (10% Penetration)

- ~17,000 Homes

Annual Savings Potential (10% Therms Savings & 7% kWh Savings)

- ~2 Mil Therms
- ~9 Mil kWh Saved
- ~20,000 metric tons CO₂e reductions



Applications: Align Efficiency w/Community Goals

- Spur economic development
- Preserve affordable housing
- Address high rates of foreclosure, vacancy
- Revitalize historic neighborhoods
- Meet climate change goals



Applications: Real Estate Transaction Process

- These data are also helping to provide energy transparency in **real estate** transactions.
- City of Chicago residential energy costs disclosure when a home is listed for sale via an MLS
- Early results promising




MRED Midwest Real Estate Data
Welcome **Becky R Realtor for Team Becky**

My MLS Search Listings Reports Forms Setup

Search Results - Attached Single

List View Refine Criteria Full - Agent Show Quick Advanced En

showing 1 of 1 listings



Detached Single
Status: **NEW**
Area: **8021**

List Date: **06/26/2013**
List Dt Rec: **06/26/2013**
List Price: **\$399,900**
Orig List Price: **\$399,900**
Sold Price:

Directions: **Diversey West to Rockwell, North to Property**

Sold by:
Closed:
Off Market:
Year Built: **1920**
Dimensions: **37.5X125**
Ownership: **Fee Simple**
Corp Limits: **Chicago**
Coordinates: **N:2900 W:2600**

Contract:
Financing:
Blt Before 78: **Yes**
Subdivision:
Township: **North Chicago**

List. Mkt. Time: **1**
Points:
Contingency:
Curr. Leased: **No**
Model:
County: **Cook**
Fireplaces:






Rooms: **7**
Bedrooms: **4**
Basement: **Full**

Bathrooms **1 / 1**
(full/half):
Master Bath: **None**
Bsmnt. Bath: **No**

Parking: **Garage**
Spaces: **Gar:2**
Parking Incl: **Yes**
In-Price:

Utility Costs: Elec. - **\$770.60/yr,\$64.22/mo**; Gas - **\$1198.00/yr,\$99.83/mo**

Remarks: **CHARMING 4 BED+DEN, 1.1 BATH SINGLE FAMILY HOME ON LOT & A HALF IN DESIRABLE LOGAN SQAURE/AVONDALE LOCATION. REMODELED APPROX 10 YEARS AGO W/ NEWER HVAC, ELECTRIC, PLUMBING, H2O HEATER & ROOF. DIAG HDWD FLRS; LARGE EAT IN KITCHN W/ SS APPLS; HIGH CEILINGS; FULL BASEMENT; HUGE FENCED YARD W/ BLUE STONE PATIO; SECURITY SYS OVERSIZED 2 CAR GARAGE. CLOSE TO 90/94 & ALL LOGAN SQAURE/BUCKTOWN SHOPPING & RESTAURANTS!**

	SUBJECT PROPERTY	COMP#1 adjustment	COMP#2 adjustment
			
Address:	6501 West 182 nd Tinley Park, Illinois	17029 S. Oketo Avenue Tinley Park, Illinois	16333 S. 64 th Court Tinley Park, Illinois
MLS #:	07776697	077730695	07779238
Status:	Active	ACTV	ACTV
List Price:	\$210,000	\$199,900	
Approx Sq. Ft:	1050	1044 (<input type="text" value="1044"/>)	
Energy Rating:			
# Full Baths:	2	\$ <input type="text"/>	\$ <input type="text"/>
Air Conditioning:	Central Air	Central Air \$ <input type="text"/>	Central Air \$ <input type="text"/>
Heat / Fuel:	Gas, Forced Air	Gas, Forced Air \$ <input type="text"/>	Gas, Forced Air \$ <input type="text"/>
Approx Year Built:	1979	1972 \$ <input type="text"/>	1968 \$ <input type="text"/>
		<input type="button" value="Add More Adjustments"/>	<input type="button" value="Calculate Totals"/>
Total Adjustments:		\$ <input type="text" value="\$0"/>	\$ <input type="text" value="\$0"/>
Adjusted Price:		<input type="text" value="\$199,900"/>	<input type="text" value="\$199,900"/>



Application: Approach is Being Replicated

Next Steps and Future Plans

U.S. DEPARTMENT OF
ENERGY | Energy Efficiency & Renewable Energy

Public Records and Census Data



Floor Area,
Bedrooms,
Foundation Type
Year Built

Monthly Bills High-Interval Meter Data



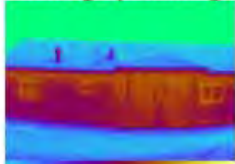
Data for Automated Calibration
and/or Inverse Modeling

Satellite Imagery



Footprint,
Orientation
& Shading

Drive-By Infrared Thermographic Imagery



Thermal
Properties &
Geometry

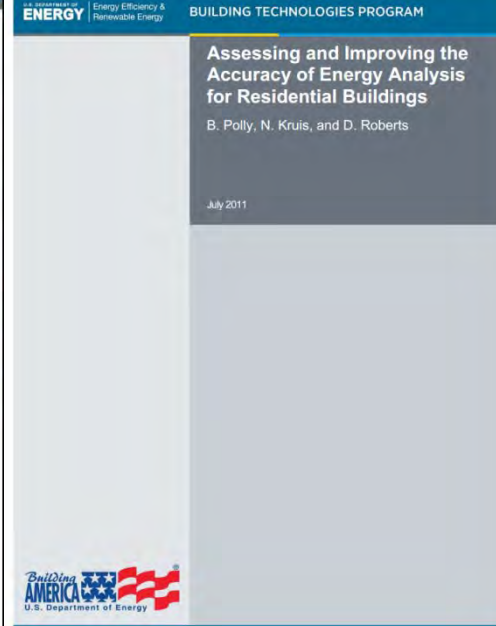
**Data-Driven,
Physics-Based
Simulation and
Optimization
Software**



**Community scale
optimization**

**Community scale
energy savings
potential**

**Targeted deployment at
scale**



[test](#)



Thank You

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