



# Retroficiency

NESEA

Analytics to Scale Building Efficiency

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# Retroficiency Overview

## Problem

- Buildings spend billions on energy use
- Process to reduce is expensive, time-consuming, and unscalable

## Solution

- Rapid energy models for targeting, engagement, conversion, and tracking
- Faster and more comprehensive and consistent

## Team

- Energy, software and data experts
- As many energy engineers as software developers

## Highlighted Customers



Connecticut  
Light & Power

A Northeast Utilities Company



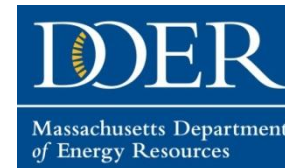
COUNCIL OF SMALLER ENTERPRISE



CLEARResult



Conservation  
Services Group



Massachusetts Department  
of Energy Resources

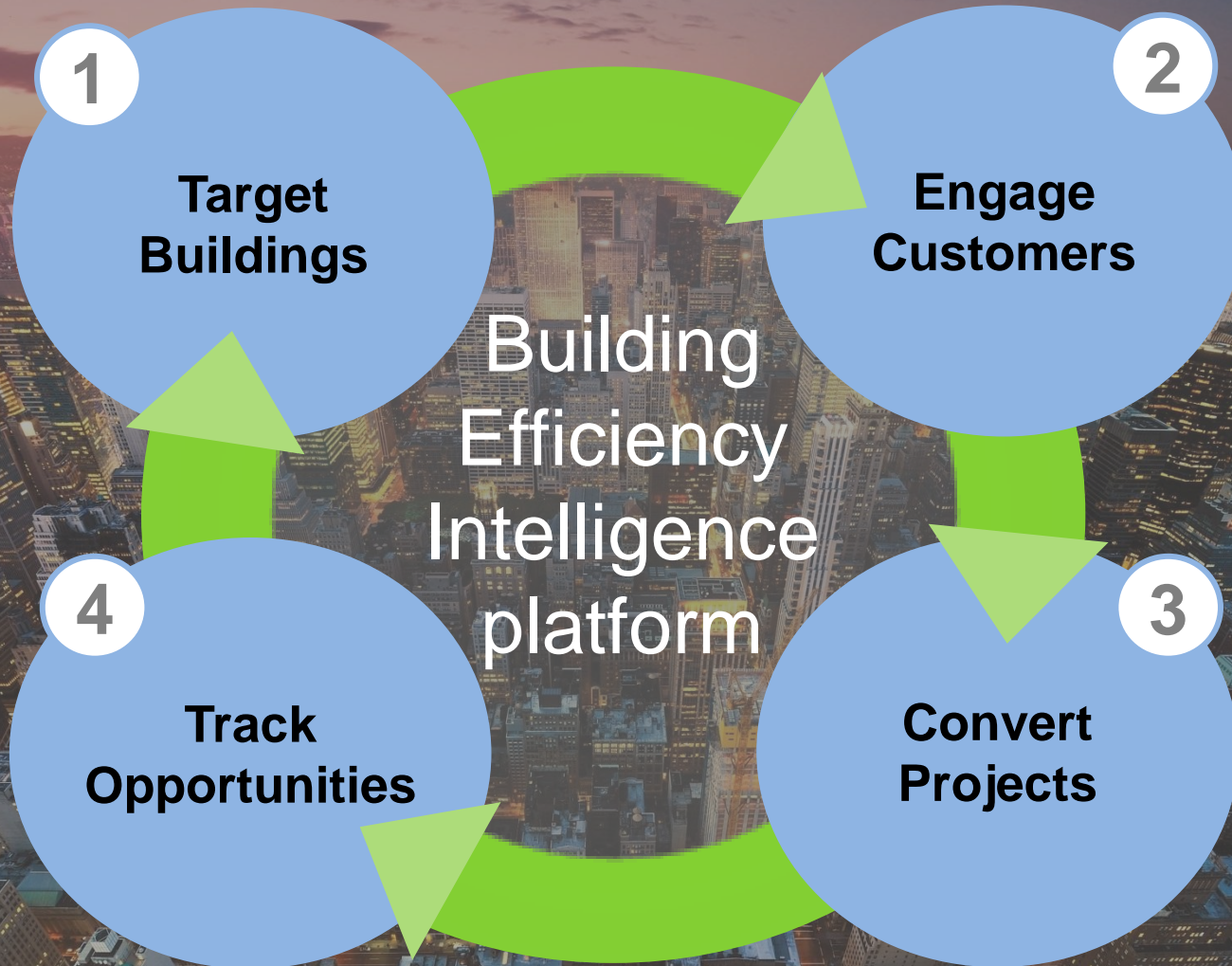


peci

Energy for Change

Evaluated more than 1.7B square feet since March 2011

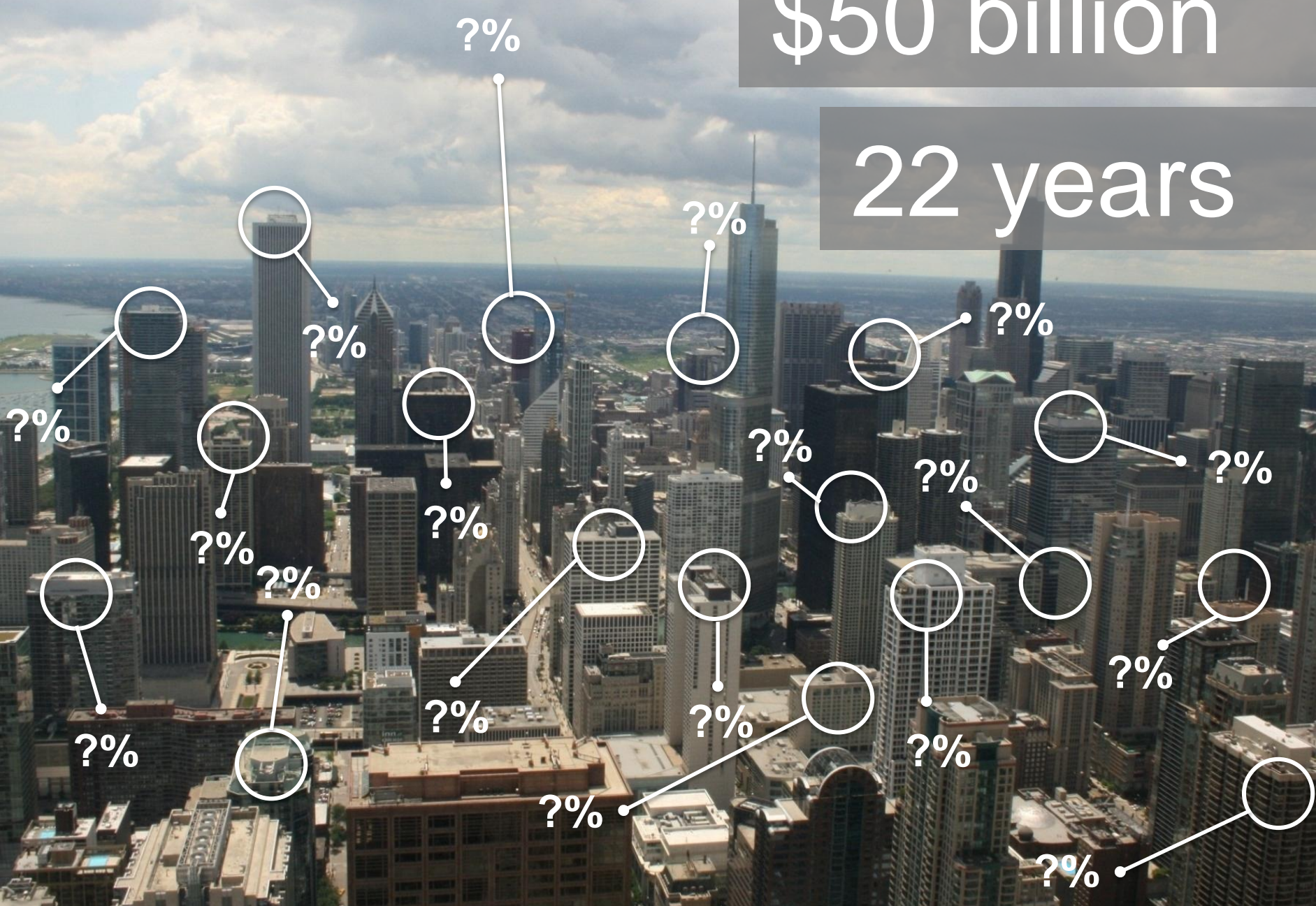
# Rapid energy models to drive deep savings at a fraction of the time and cost





\$50 billion

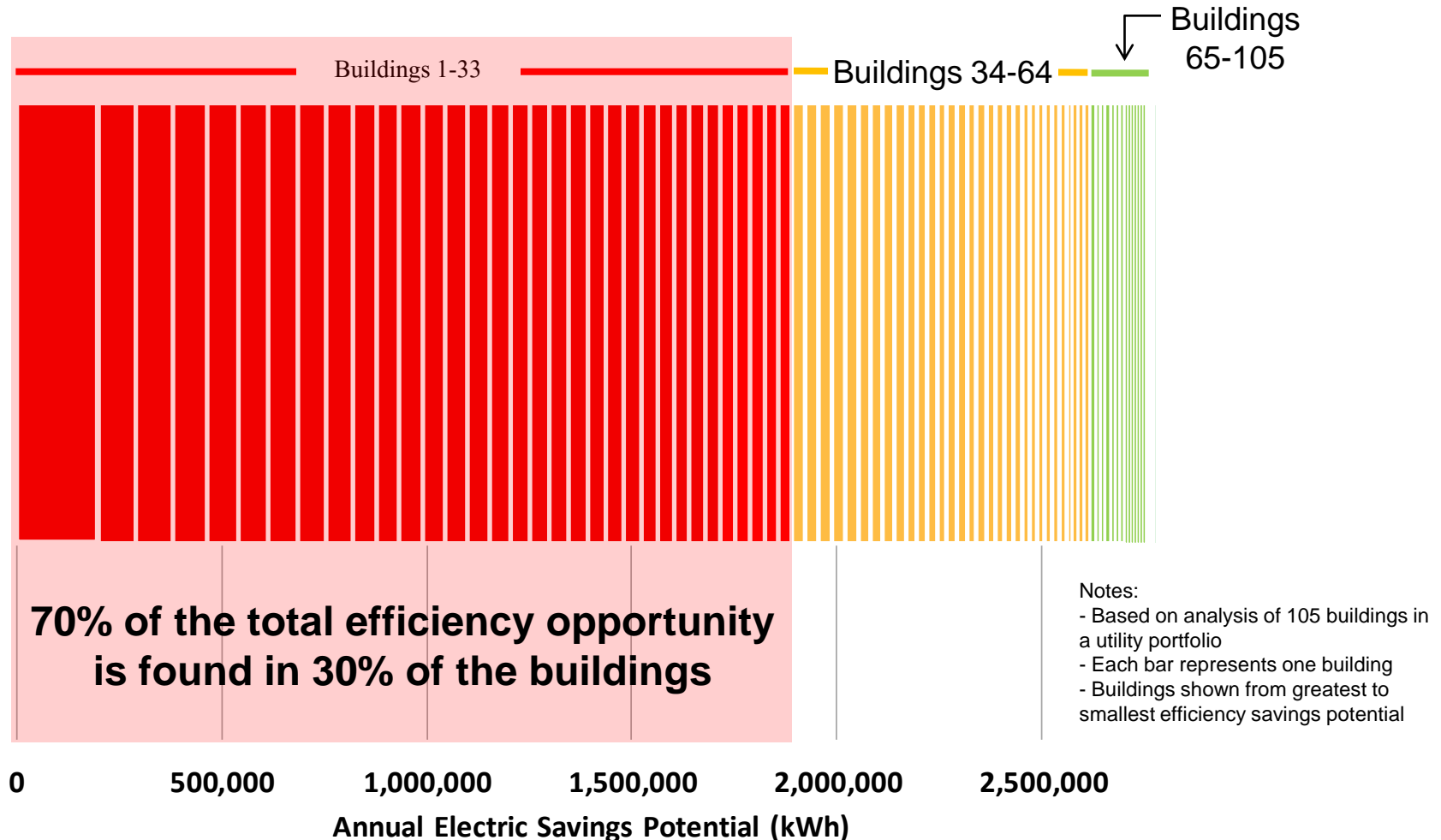
22 years








# Focus on the Buildings that Matter

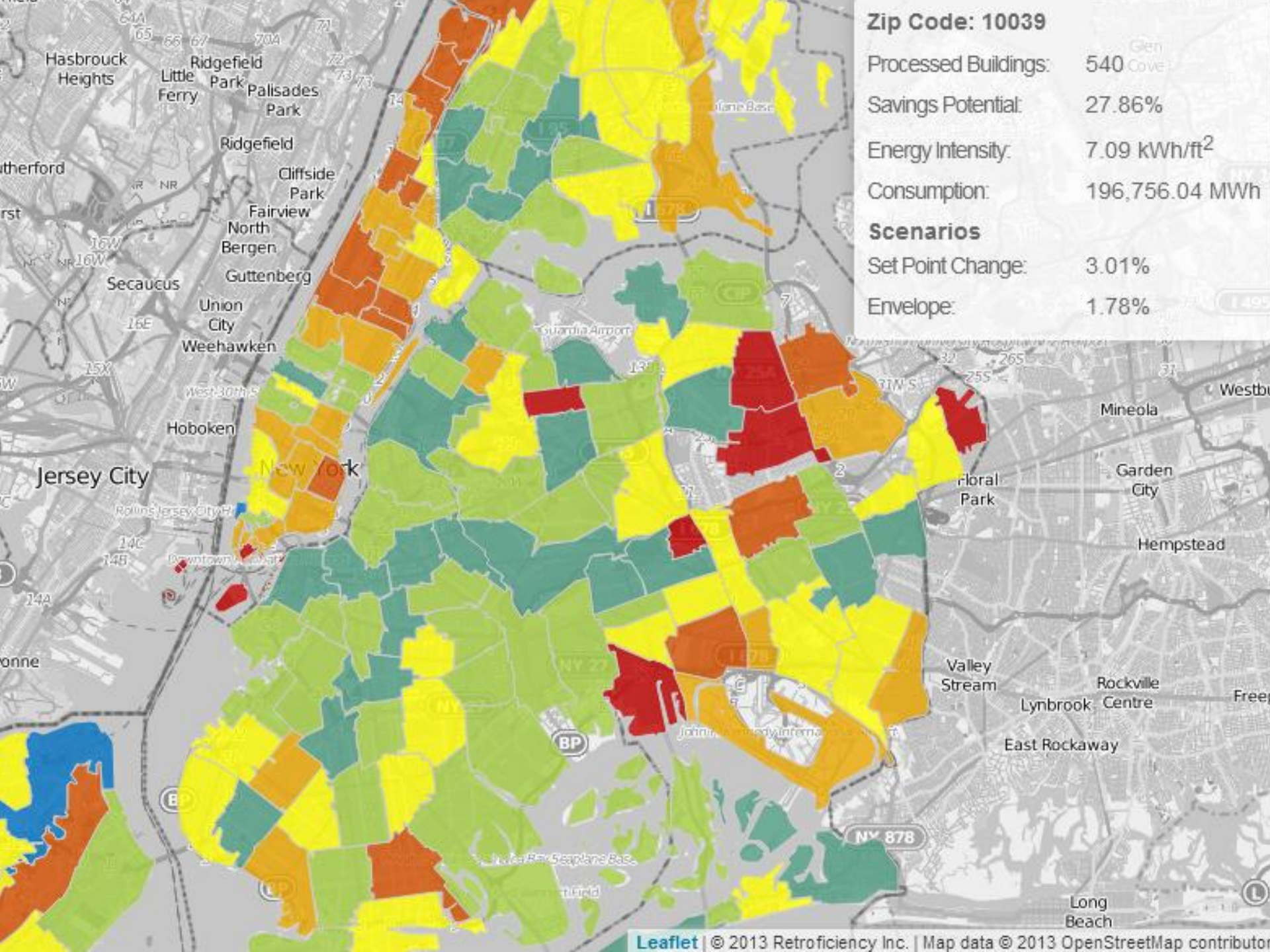
## Contribution of High Potential Buildings to Total Energy Savings Potential



# Rapid Energy Models for All Types of Data

<b>Available Data Type</b>	<p><b>Limited Information</b></p> <p>Public/private sources Monthly consumption</p>	<p><b>Interval Consumption</b></p> <p>Smart meters or Interval meters</p>	<p><b>Detailed Asset Data</b></p> <p>Walkthrough/survey Monthly consumption</p>
<b>Our Modeling Approach</b>	 <p>Physics-Based Simulation      Inference Algorithms</p>	<p>Advanced Statistics</p>  <p>Inverse Modeling      Forward Modeling</p>	 <p>Physics-Based Simulation      Inference Algorithms</p>
<b>Results You Receive</b>	<p><b>Target Buildings</b></p>	<p><b>Target Buildings</b></p>	<p><b>Target Buildings</b></p>
	<p><b>Engage Customers</b></p>	<p><b>Engage Customers</b></p>	<p><b>Engage Customers</b></p>
		<p><b>Convert Operational Opportunities</b></p>	<p><b>Convert Operational Opportunities</b></p>
			<p><b>Convert Capital Measures</b></p>





Zip Code: 10039

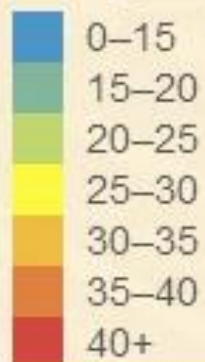
Processed Buildings: 540  
Savings Potential: 27.86%  
Energy Intensity: 7.09 kWh/ft<sup>2</sup>  
Consumption: 196,756.04 MWh

**Scenarios**

Set Point Change: 3.01%  
Envelope: 1.78%



# Energy Savings %



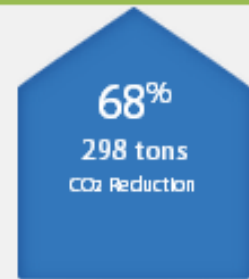
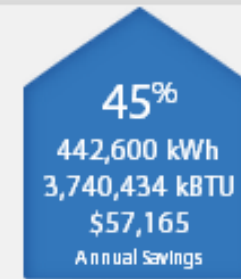
Savings Potential

Current Snapshot

Recommendations

# HVAC

space conditioning systems, pumps, fans, & controls



Issues Found: 7

## 1. Building is both heating and cooling at same time



High  
Savings Potential



Short  
Payback Period

### Details

Analysis indicates that there are extended periods of simultaneous heating and cooling occurring within the building.

Simultaneous heating and cooling in this building occurs between -- 36.6 °F and 41.6 °F

### Solution: Minimize Simultaneous Heating and Cooling

Based on shoulder season variability in electric consumption alone, it appears that this building simultaneously heats and cools. While certain conditions do exist when the building must operate both its heating and cooling systems to maintain occupant comfort, drastic energy savings can be achieved when systems are optimized to reduce these circumstances. Measures or improvements that should be evaluated further include:



#### Implement/Adjust Disable or Cut-out Temperature for Heating Systems

Heating plant cut-out controls allow for automatically shutting off or disabling heating equipment at set outdoor air conditions. For example, cut-out controls can prevent heating equipment from coming on above 50°F/10°C, reducing the likelihood of concurrent heating and cooling and limiting the heating systems standby losses.



## Package Comparison

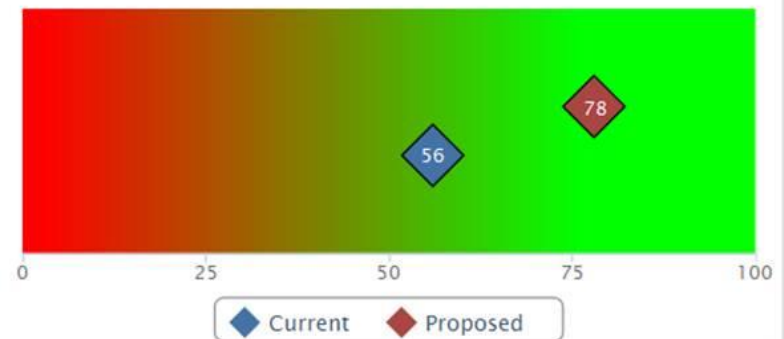
	Total Annual Savings*	Installed Cost	Simple Payback Period	CO2E Reduction	Annual Energy Savings
Short Term	\$225,840	\$421,096	1.9	18%	21%
<b>Mid Term</b>	<b>\$371,824</b>	<b>\$1,824,864</b>	<b>4.9</b>	<b>26%</b>	<b>29%</b>
Long Term	\$443,216	\$5,815,092	13.1	30%	32%
Additional ECMs**	\$73,958	\$273,097	3.7	1%	1%

\*Total savings also includes annual and non-annual O&M.

\*\*Totals represent sum that could be overstated as interactive effects not considered.

## Performance Metrics

Energy Intensity Cost **Energy Star** CO2



This is the current and proposed ENERGY STAR ratings for the building. The number shows the % of buildings that it outperforms for energy.

## Package ECMs & Performance Summary

Office: Upgrade to new Super T8 fluorescent lighting with electronic ballasts  

Decrease heating set points to 70 degrees when occupied and to 62 when unoccupied in accordance with ASHRAE standards

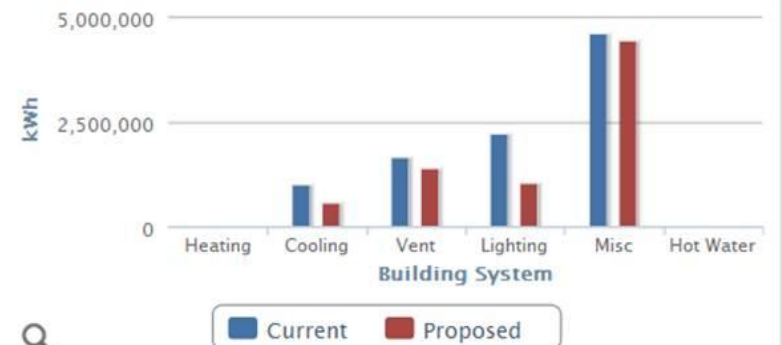
Install occupancy sensors to control lighting in Office

Install air side economizer control with dry bulb changeover control

	CO2 Reduction:	1,520 tons	kW Reduction:	15%
	Energy Star Increase:	22 points	kWh Reduction:	2,046,166
	Cost Reduction:	24%	Therm Reduction:	62,053

## Consumption By System

% of Total Units

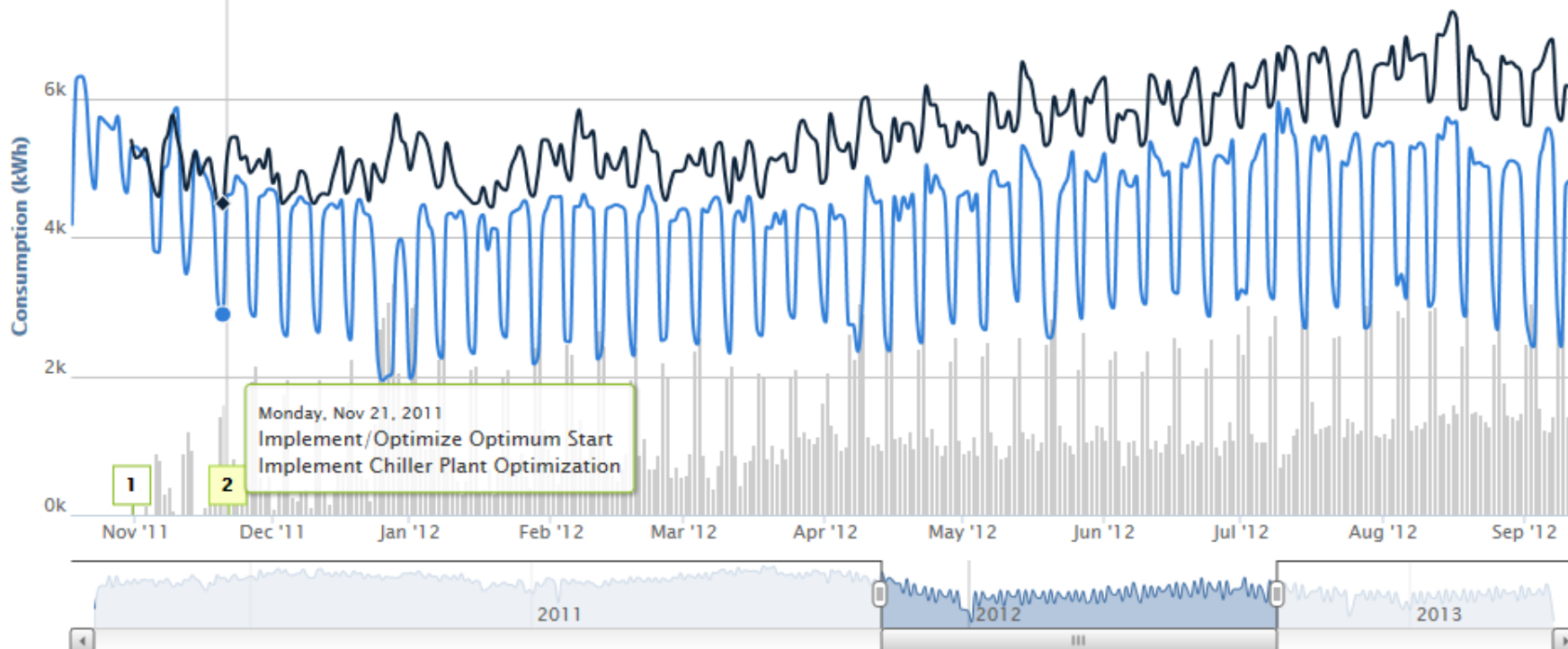


The chart shows the current and proposed energy consumed by the various building systems on an annual basis.



Zoom 1m 3m 6m YTD 1y All

From Oct 18, 2011 To Sep 12, 2012



Monday, Nov 21, 2011  
Implement/Optimize Optimum Start  
Implement Chiller Plant Optimization

— Actual — Baseline █ Savings █ Implemented Projects

**1,753,852kWh**  
Total Consumption

**▲ 438,820kWh**  
Total Reduction

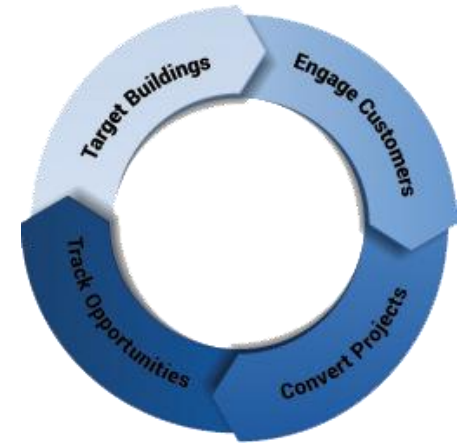
**20%**  
Percent Reduction

**▲ 58kW**  
Average Reduction

# Case Study: Deep Savings at Scale

## Pilot Overview

- Commercial efficiency program for large IOU
- A challenge to drive energy efficiency savings amongst SMB customers
- Pilot to demonstrate efficacy of Retroficiency's platform for targeting, engagement, and project conversion



## Pilot Results

- ✓ Focused on high potential buildings with targeting
- ✓ Improved customer engagement and participation

Realized Savings/Building      ↑ 3x

Expected \$/MWh Saved            ↓ 50%

# Thank You



One of America's  
Most Promising  
Companies for 2014



One of America's Most  
Promising Social  
Entrepreneurs



Utility Technology  
Challenge 2013 Winner



“Analogous to giving a  
miner a GPS and the  
coordinates of a gold vein”



Best Green  
Invention for 2013

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Smart Grid Startup  
to Watch



“Represents an innovative  
new entrant in the energy  
efficiency space”



Utility Technology  
Challenge 2012 – Pilot  
Program Winner



MassTLC Innovative  
Energy Product of the Year



American Technology  
Awards - Clean Tech /  
Green Tech Product of  
the Year

