Efficiency delivered.

NBI is responding to increasing urgency to reduce carbon emissions and increased demand for improved energy performance of new and existing buildings.

NBI’s Theory of Market Change:

Our Program Areas

(1) Building & Program Innovation

(2) Zero Energy Leadership & Market Development

(3) Advancing Codes & Policy

VanDusen Botanical Gardens Visitor Centre, Vancouver, BC

Source: Nic Lehoux
Today’s Presenters

Alexi Miller  
Senior Project Manager  
NBI

Sharon Grant  
Founder  
Eco Edge

Alison Waske  
Sustainability & Performance Management Officer  
City of Grand Rapids, MI

Rimas Gulbinas  
CEO  
Maalka

Today’s Agenda

• Introduction and Project Overview
• The Public Buildings Portfolio Management Framework
• Spotlight: The Grand Rapids Experience
• An Integrated Set of Open Source Tools and Free Resources
• Closing: How Cities can Leverage this Project
• Q&A/Discussion
Introduction and Project Overview

Alexi Miller
New Buildings Institute

The Role of Cities in Solving Our Climate Crisis

• **Most people** live in cities (82% US, ~60% globally)¹
• Buildings account for **40%** of total CO₂ emissions² – and **75% in US cities**³!
• About **20% of US floorspace** is owned by state and local governments⁴

1. US Census Bureau, United Nations Development Programme
2. In the US and globally, US Energy Information Administration, Architecture 2030
3. Carbon Neutral Cities Alliance
4. 2012 Commercial Buildings Energy Consumption Survey

Photo: NASA Earth Observatory
Cities are Taking Up the Mantle

<table>
<thead>
<tr>
<th>Pledge, Compact, Commitment, or Initiative</th>
<th>Number of Participating US Local Governments</th>
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<tbody>
<tr>
<td>Climate Mayors</td>
<td>407</td>
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<td>We are Still In</td>
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<td>Under2MOU</td>
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<td>Rockefeller 100 Resilient Cities</td>
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<td>2030 Districts</td>
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<td>DOE Zero Energy Schools Accelerator</td>
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<td>DOE Energy Accelerator</td>
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<td>DOE Zero Energy Districts Accelerator</td>
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</tbody>
</table>

Where is the Opportunity?

Photo: City of Tacoma

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Energy Codes and Forward-Looking Policies

- Local governments are working to advance policies and energy codes – a critical piece of the puzzle
- NBI Webinar Sept 19: An Important Vote for the Climate: 2021 IECC Proposals To Know About

Energy Codes are important, but…

Where is the Opportunity?

New construction & major renovation: 1-2% buildings / year

Existing Buildings are the 99%
Common City Barriers and Challenges

- Staff Capacity
- Institutional Silos and Executive Support
- Institutional Inertia
- Knowledge and Awareness
- Facility & Benchmarking Data
- Data Processing Challenges: Information Overload

- Financial Challenges
- Performance Drift

Five Years, Two Major Projects

- Framework development
- Direct engagement: 3 cities
- Guidance
  - Implementation Guide
  - Case Studies

Municipal Portfolio Performance and Policy Opportunities (DOE, 2016-2019)
- Refine process & framework
- Direct engagement: 4 cities
- Replicability
- Open-source tools
Participating Cities

- **TACOMA**
- **MISSOULA**
- **EUGENE**
- **BOISE**
- **GRAND RAPIDS**
- **PROVIDENCE**

- **NEEA CBR Participating City**
- **DOE MPP Participating City**

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**Key Project Outcomes (Beyond These Cities)**
The Solution for Cities

Each part of the spiral represents a place for stakeholders to interact with data and one another.
Engage the Right Team

• Empower the energy champion
• Ensure cross-departmental representation on an energy team
• View utilities as partners
• Meet regularly
• Present to decision makers, e.g. City Council
• Consider a citizen advisory group
• Share success stories

Understand Decision-Maker Drivers

• Who established carbon emission reduction targets?
• What motivated them?
• Do they understand the significance of buildings?
• How can you create opportunities to educate them?
Define Baseline, Metrics and SMART Goals

Set Interim Targets

Hot off the press! **Zero Energy EUI Targets** (NBI)
Streamline Data Collection and Cleansing

- Ensure there is a master facility list
- If automated, upload to PM, check for building name and address consistency
- If not automated, consider ways to consolidate data streams
- Run data through the free Data Quality Tool (dataquality.maalka.com)

Conduct Virtual Energy Audits (e.g. FirstView®)
EUI

Total Energy Usage

Retrofit Priority

High Heating Load

Further Investigation

Compare Like Buildings
Prioritization Process with Facilities Staff

**Priority level 1** is based on high energy use vs. EUI target and/or high potential energy savings, high proportion of overall City energy use and/or high visibility—*there is a strong reason to invest!*

**Priority level 2** is based on moderate energy use, potential savings or visibility; but *this is a good candidate for upgrades.*

**Priority level 3** is based on minimal reason to upgrade for energy reasons (either new or already very energy efficient or minimal potential to save energy cost effectively).

**Priority level 4** indicates a building in which no or minimal upgrades are worthwhile due to the condition of the building or uncertain future of the building.

Targeted Field Analysis

- Submetering (e.g. flow meters)
- Energy audits (e.g. ASHRAE Level 1, 2 or 3)
- Building operator training
**Implementation**

- Track the impact of energy upgrades
- Establish criteria for upgrading buildings
- Define new construction standards
- Create operational policies
- Explore new funding mechanisms

**Explore New Funding Mechanisms**

- Reinvest savings to create a virtuous circle
- Enable long-term energy planning with a sustainable funding stream
- Help achieve carbon emission reduction targets
- Expedite approval processes for energy upgrades – remove red tape

[https://betterbuildingssolutioncenter.energy.gov/solution-roundup/green-revolving-funds](https://betterbuildingssolutioncenter.energy.gov/solution-roundup/green-revolving-funds)
Show Progress on a Trajectory towards Goals

Municipal Building Energy Use

The Grand Rapids Experience

Alison Waske Sutter
City of Grand Rapids, MI
Energy Team Engagement

- Cross functional team of City staff from many departments
  - Facilities and Fleet, Water, Wastewater, Fire, Mobility and Parking, Libraries, Streetlighting, Office of Sustainability, Purchasing, Engineering
- Monthly 90 minute meetings transitioned to quarterly meetings
- Map all facility and utility locations and accounts, perform quality check on data, discuss department specific and city-wide energy related initiatives, receive and review energy analysis
- Evaluate building prioritization and participate in grant program

Mapping City Operations

- Create a building information master file
  - Location, size, building type, and utility accounts
- Collect energy use data
  - Consumers Energy (Electric)
  - DTE Energy (Gas)
  - Michigan Gas Utilities (Gas)
  - Veolia (Steam)
  - Streetlighting System (Electric)
- Use Energy Star Portfolio Manager
Breadth of City Facility Portfolio

- 200+ buildings
- 335 energy utility accounts
- 3 years of historical data 2015 – 2017
  - Continued annual data tracking
- Framework and process for ongoing tracking and benchmarking

Total GHG and Energy Inventory

- 2018 Cost ($): 7% (Electricity), 2% (Gas), 91% (Steam)
- 2018 Consumption (kBtu): 22% (Electricity), 72% (Gas), 6% (Steam)
- 2018 Carbon (MTCO₂e): 10% (Electricity), 3% (Gas), 87% (Steam)

427 million kBtu generated 56,691 MTCO₂e and cost $9.3 million
Grand Rapids 2018 Energy Consumption by Department

- Fleet: 17%
- Facilites: 11%
- Fire: 2%
- Water: 11%
- Water utilities accounted for 51% of all energy consumption

Grand Rapids Energy Performance Over Time (Weather Normalized)

Baseline is predominantly 2015, but goes back to 2005 for a few facilities. The baseline is calculated from the most historic data available per facility.
Departmental Energy Use Report Cards

• Meet with each department to discuss details of the Energy Use Reports

An Integrated Set of Open Source Tools and Free Resources

Rimas Gulbinas
Maalka
Alexi Miller
New Buildings Institute
State and Local Government Toolkit

**STATE AND LOCAL GOVERNMENT TOOLKIT**

The toolkit for state and local government leaders to reduce energy use in buildings includes strategies and resources available in both their own publicly owned buildings and for their communities. The Toolkit includes resources from city, state, and national partners and allows users to select a variety of topics. This kit provides energy and cost savings for their new buildings as well as a platform to train new buildings. The Toolkit includes resources from city, state, and national partners and allows users to select a variety of topics. This kit provides energy and cost savings for their new buildings as well as a platform to train new buildings.

**LEAD BY EXAMPLE**

**AIM HIGH**

**BRING SUCCESS TO SCALE**

**TELL THE STORY**

**EUGENE CLIMATE RECOVERY ORDINANCE**

The city of Eugeneannounced in 2015 that it will reduce greenhouse gas (GHG) emissions by 2050. The city recognizes the need to reduce carbon emissions but also allows for flexibility in the implementation. The city’s Climate Recovery Ordinance (CRO) includes specific actions to reduce emissions. The city has set a target of 85% reduction in GHG emissions by 2050, with phased reductions over time. By 2021, the city has achieved a 36% reduction in GHG emissions.

**Led by Example**

**AIM High**

**Bring Success to Scale**

**Tell the Story**

**Whole Building Design Guide Tracking Tool**

**Life Cycle Energy Performance Framework For Cities**

**INTRODUCTION**

Cities are increasingly interested in addressing energy use and greenhouse gas (GHG) emissions. In most cases, buildings represent a significant portion — often the largest portion — of energy use or GHG emissions within their borders so jurisdictions recognize that reducing building energy use is critical to achieving their goals.

As cities set actual, measurable goals for reducing overall energy use, it becomes increasingly clear that policies focused only on a small portion of a building’s life-cycle will not deliver the depth of savings identified in policy goals. Strategies are also needed to address the existing building stock in tandem with new construction requirements. Further, a coordinated, methodical approach provides a logical path to incremental improvements towards the final goal, supports the cost-efficient use of city resources, and increases buy-in from industry stakeholders.

By far the most prevalent mechanism nationally for reducing energy use in existing buildings has been utility programs offering financial incentives, mainly in the form of rebates, for the purchase and installation of individual physical building components.


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Whole Building Design Guide Tracking Tool

DATA, ANALYSIS, AND APPLICATION

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<th>High Level Policy</th>
<th>LEADERSHIP: Capacity and Commitment</th>
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<td>Policy Commitment to Collection and Sharing of Building Performance Data</td>
<td>Executive-Level Goals and Commitments to Performance Improvement (Through Action Plan)</td>
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<td>Disclosure Requirements Addressing a Significant Percentage of the Building Stock</td>
<td>Status</td>
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<td>Data Sharing Capabilities at Administrative Level</td>
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<td>Staff and Resources to Implement, Manage and Receive Building Disclosure Requirements and Data</td>
<td>Administration Framework to Adopt and Enforce Policies</td>
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<td>Adjusting Performance Tracking and Management Capabilities for Building Stock</td>
<td>Notes</td>
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<td>City Building Stock Assessment</td>
<td>Notes</td>
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<td>Analyze/Diagnose of Problems: The Issue</td>
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<td>Utility Data Availability</td>
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<tr>
<td>Other Building Data Sources</td>
<td>Other Building Data Sources</td>
</tr>
</tbody>
</table>


© New Buildings Institute 2019

maalka | Public Building Portfolio Management Objectives

OPEN SOURCE TOOLS

SUPPORTED DATA

PLATFORM INTEGRATION

© New Buildings Institute 2019
Open Tools | LEVERAGE POWERFUL PUBLIC TOOLKITS

The following tools were developed over the course of the Department of Energy MPP project period.

**CODES ASSESSMENT**

**PURPOSE:** The Code Assessment Tool enables municipalities to understand how the adoption of various building energy codes and improvement strategies would impact the energy use of buildings across their portfolio.

**LINK:** https://codes.maalka.com

**DATA VALIDATION**

**PURPOSE:** The Data Validation Tool allows users to easily import their EPA Portfolio Manager data and identify data anomalies across their building portfolio. Use the tool as first step to improving data quality before engaging in data analysis.

**LINK:** https://dataquality.maalka.com

**BUILDING LIFECYCLE**

**PURPOSE:** The Building Life Cycle Tool guides users in the collection of the most important building systems and energy efficiency measures information in a standardized format. The data can be used to jumpstart building energy audits.

**LINK:** https://lifecycle.maalka.com/

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Open Tools | Codes Assessment

**PURPOSE:** The Code Assessment Tool enables municipalities to understand how the adoption of various building energy codes and improvement strategies would impact the energy use of buildings across their portfolio.

**Scenario EEM1: Lighting Retrofit**
- Upgrade lighting to LEDs
- Add occupancy sensors to common areas such as corridors, restrooms, mechanical room and lobby

**Scenario EEM2: HVAC Retrofit**
- Match ASHRAE 90.1-2016 HVAC efficiency
- Includes lighting retrofit from 1st scenario

**Scenario EEM3: Green Retrofit**
- Full ASHRAE 90.1 Baseline building (lighting, HVAC, envelope) – uses VAV w/ Reheat system
- Infiltration rate is reduced from 0.3 CFM/ exterior surface to 0.1 CFM/ exterior surface, due to envelope retrofit (WWR not changed)

**Scenario EEM4: Deep Green Retrofit**
- High Performance Envelope: R-40 Roof Insulation and R13 + R15 c.i. Wall Insulation
- High Performance Window: U-0.25/ SHGC-0.38
- Better Cooling Efficiency: 15 EER for package single zone split system; 10 EER for AHU system
- Includes all other ASHRAE 90.1 retrofits

**LINK:** https://codes.maalka.com

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Open Tools | Data Validation

PURPOSE: The Data Validation Tool allows users to easily import their EPA Portfolio Manager data and identify data anomalies across their building portfolio. Use the tool as first step to improving data quality before engaging in data analysis.

[Image of Data Validation Tool]

Open Tools | Building Life Cycle

PURPOSE: The Building Life Cycle Tool guides users in the collection of the most important building systems and energy efficiency measures information in a standardized format. The data can be used to jumpstart building energy audits.

[Image of Building Life Cycle Tool]
Open Tools | Complementary Open Tools

**EUI BENCHMARK**

**PURPOSE:** The Zero Tool was built for Architecture2030 and is used to compare building energy-use intensity with similar building types across the country, based on location and building characteristics.

**LINK:** [https://zerotool.org/zerotool/](https://zerotool.org/zerotool/)

**NET ZERO CALCULATOR**

**PURPOSE:** The Energy Calculator was built for Architecture2030. The Energy Calculator estimates the potential offset of on-site solar and RECs required for your building to achieve zero-net-carbon.

**LINK:** [https://zero-code.org/energy-calculator/](https://zero-code.org/energy-calculator/)

**TEMPERATURE SENSITIVITY**

**PURPOSE:** The Temperature Sensitivity Tool helps users understand how their building energy-use varies with temperature, which can be used to normalize for weather and measure changes to energy-use over time.

**LINK:** [https://sensitivity.maalka.com/](https://sensitivity.maalka.com/)

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**maalka | Platform Integration**

Supporting cohorts of cities to collaborate and share data to facilitate performance comparisons and prioritizations.
Key Recommendations

- Set overall energy-related goals & be aware of the **need to connect** broad goals and day-to-day facility operations through a strategic energy plan
- Consultants, advocates, and other stakeholders should **meet the city where they are**
- Dedicate staff resources and designate an **energy champion**
- **Energy team** meetings can break down internal silos and spark discussion of similar buildings/projects
- Utility can help with **data transfer** (e.g. ESPM APIs)
- **Financial tools** can help bridge operational/capital $$ barrier (e.g. revolving loan funds)
- Leverage free tools & resources!
Take it home with you! Lead by Example!

- This project team ID’d key barriers, spotlighted solutions, and has published free tools & resources
- The Public Buildings Portfolio Management framework can work for your city/county/state/school district
- Make the connection between long-term commitments/goals and day-to-day operations in municipal facilities


Reach out to us!

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Rimas Gulbinas
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Next Webinar: An Important Vote for the Climate
2021 IECC Proposals To Know About

- **Next Thursday!** | Sept. 19 @ 10-11:30am PDT / 1-2:30pm EDT
- International Code Council members and their registered voters can help make a real difference in the 2021 IECC – sparking decades-long improvements in residential/commerical building energy performance.
- Attendees will learn about critical proposals and public comments, steps governmental members must take to register to vote, and deadlines between now and the online voting in November.

[https://newbuildings.org/event/an-important-vote-for-the-climate-2021-iecc-proposals-to-know-about/](https://newbuildings.org/event/an-important-vote-for-the-climate-2021-iecc-proposals-to-know-about/)
Thank you!

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