



2023 Better Buildings SUMMER WEBINAR SERIES

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U.S. DEPARTMENT OF
ENERGY



In Case You Missed It: 2023 Better Buildings Summit Sampler

June 6, 2023

11:00AM –12:00PM ET

Nate Allen

U.S. Department of Energy

Agenda

- 1 Welcome
- 2 Centering Equity and Community Engagement in Climate and Clean Energy Planning
- 3 Multifamily Financial Roundtable: Financing Energy Efficiency and Electrification
- 4 Planning for the Future: Climate Risk Assessments & Resilience
- 5 We Conduit: Lessons Learned from the Industrial Electrification Working Group
- 6 Closing and Q&A

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#DOE

About the Better Buildings, Better Plants Summit

- Annual event for Better Buildings, Better Plants partners and other key stakeholders
- Provides opportunity to explore emerging technologies and share innovative strategies in decarbonization, energy efficiency, and more
- Attendees take part in interactive sessions with industry experts and market leaders as well as network with their peers

Stayed tuned for more information on the 2024 Summit in the coming months!



Today's Presenters

- **Sumedha Rao, Executive Director for the Mayor's Office of Sustainability**
 - City of Louisville, KY
- **Sadie McKeown, President**
 - The Community Preservation Corporation
- **Giuls Kunkel, Associate, ESG**
 - MetLife Investment Management
- **Bert Hill, Health, Safety, Environmental and Energy Manager**
 - Volvo Group North America

Centering Equity and Community Engagement in Climate and Clean Energy Planning

Sumedha Rao

City of Louisville, KY

Louisville Metro Government
Mayor's Office of Sustainability

Planning Louisville's Equitable Clean Energy Transition Through C-LEAP

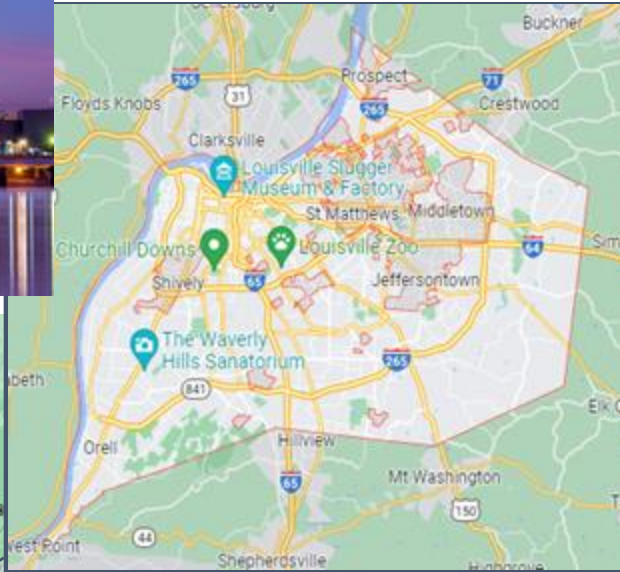


OFFICE OF
SUSTAINABILITY

Sumedha Rao, LEED AP
Executive Director

Overview of Louisville's Sustainability Efforts

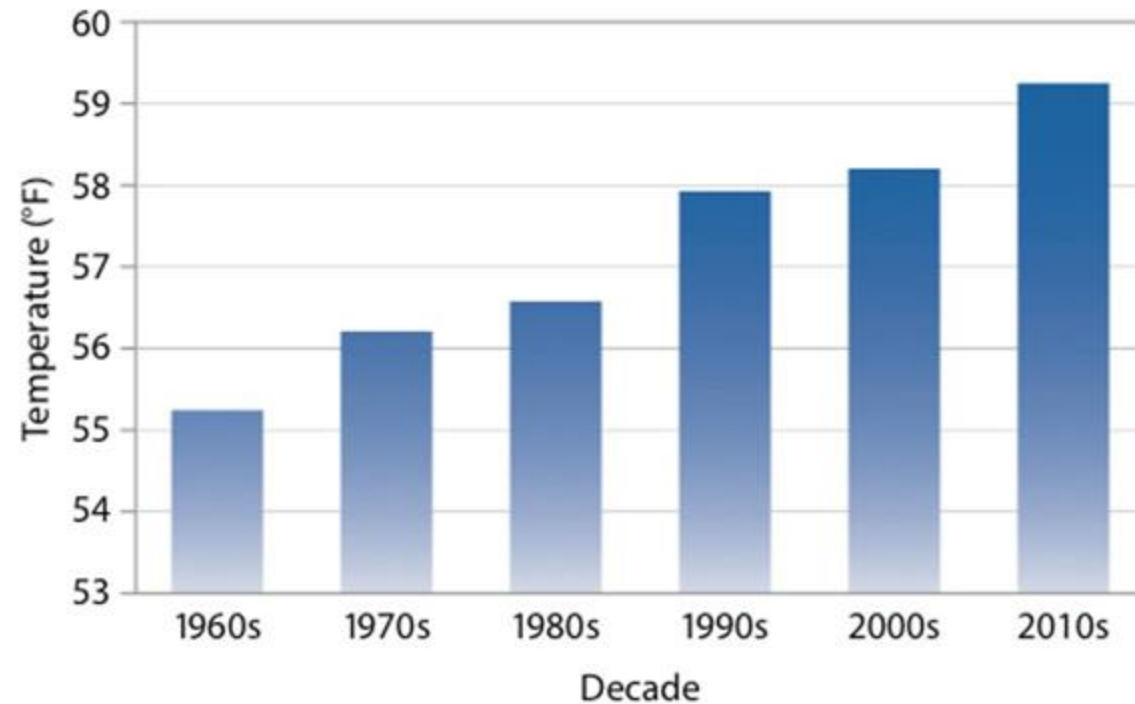
Hello from Louisville!



Louisville, KY
Population: ~750,000
MSA: ~1.3million
Merged city-county government

Louisville's Climate is Changing

Average Temperature in Louisville



Higher Temperatures

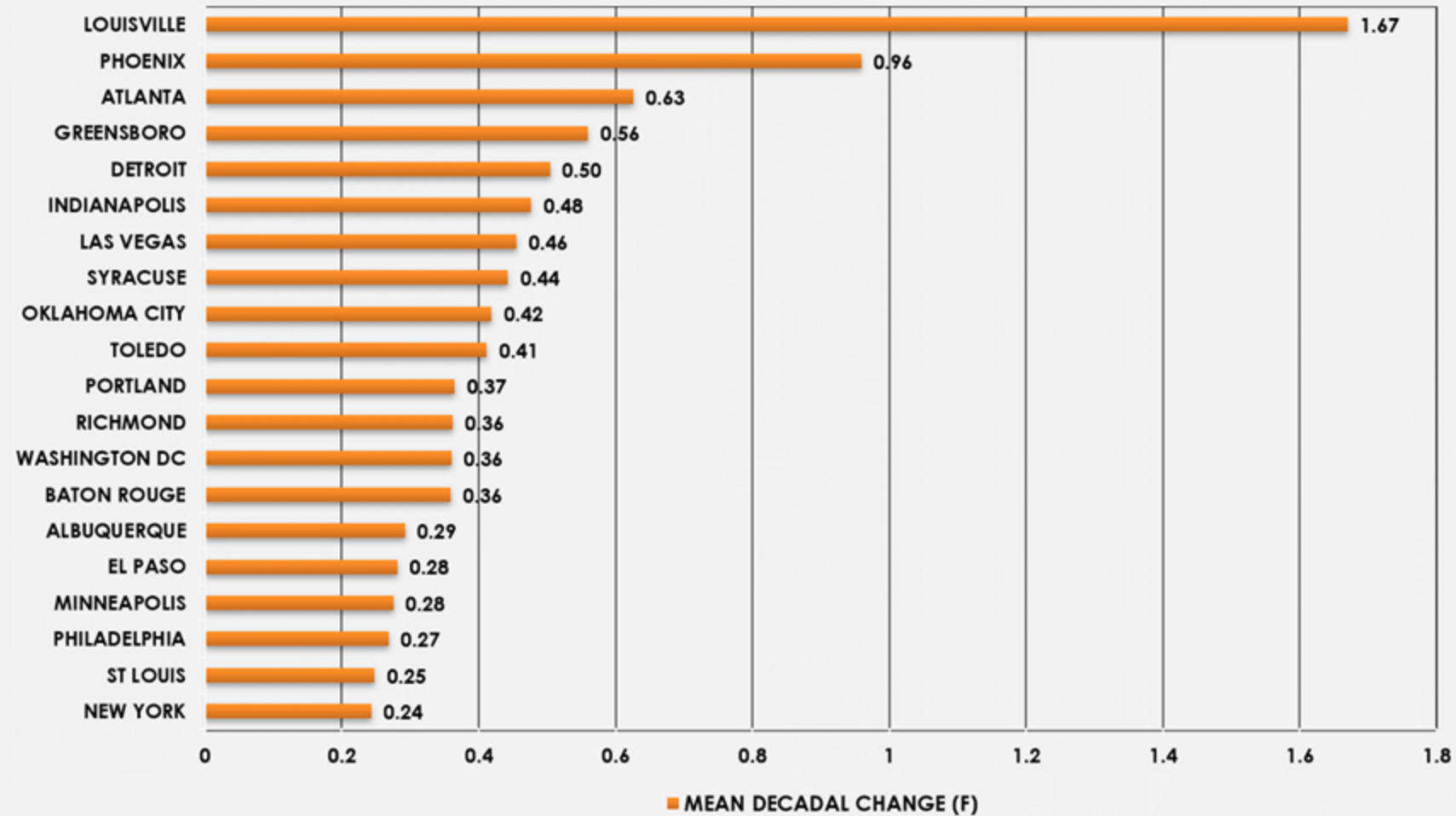
The average number of days per year above 90°F has increased by 12 days since 1960

Heavier Rain Events

The 3 largest rain events in Louisville happened in the last decade

**Louisville
is the
Nation's
Fastest
Warming
Urban Heat
Island**

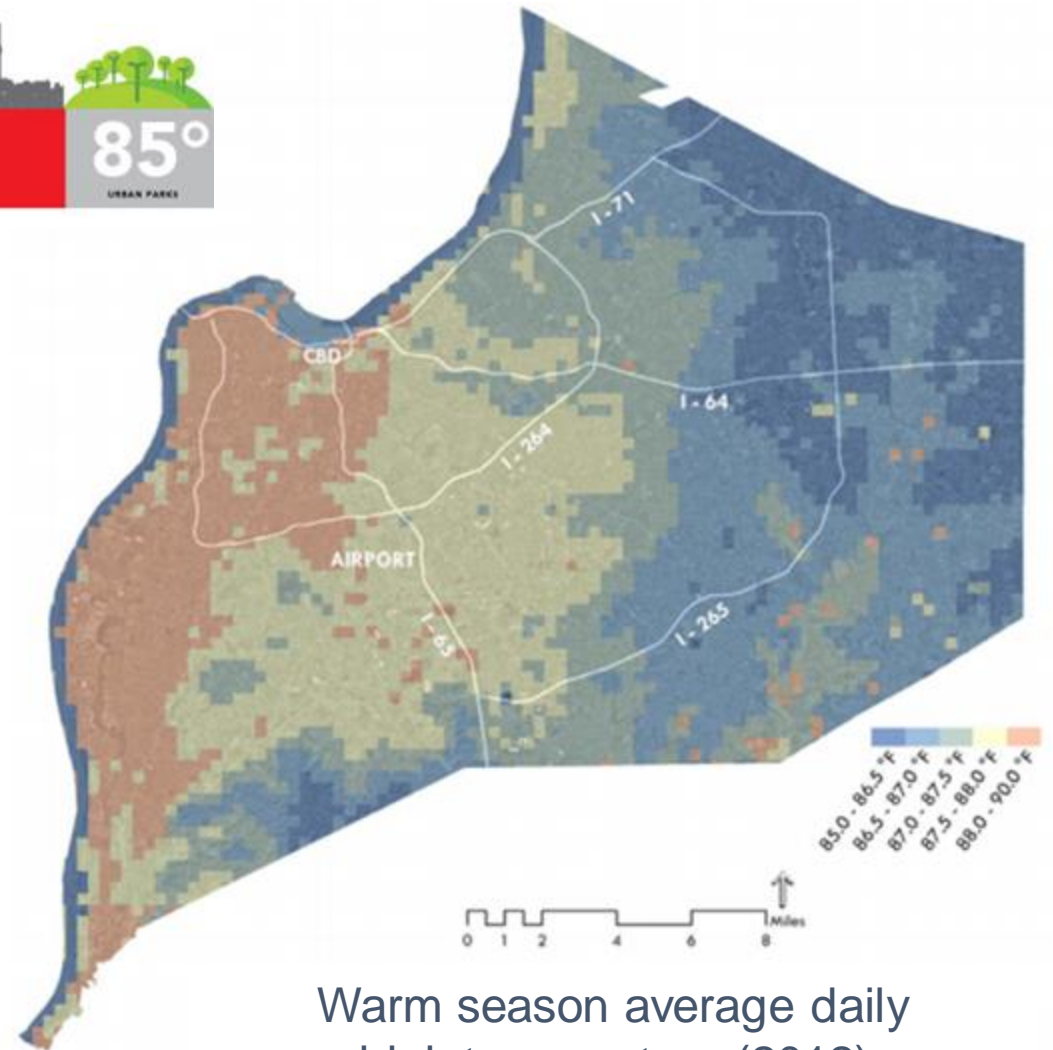
Top 20 Cities: Most Rapidly Warming Urban Heat Islands 1961-2010



SOURCE: URBAN CLIMATE LAB, GEORGIA INSTITUTE OF TECHNOLOGY

Climate Change Impacts Louisvilleans Unequally

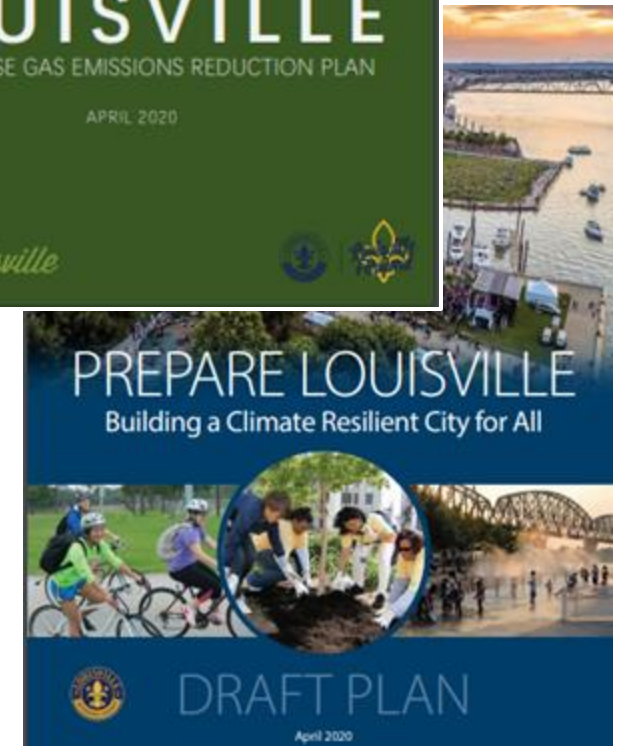
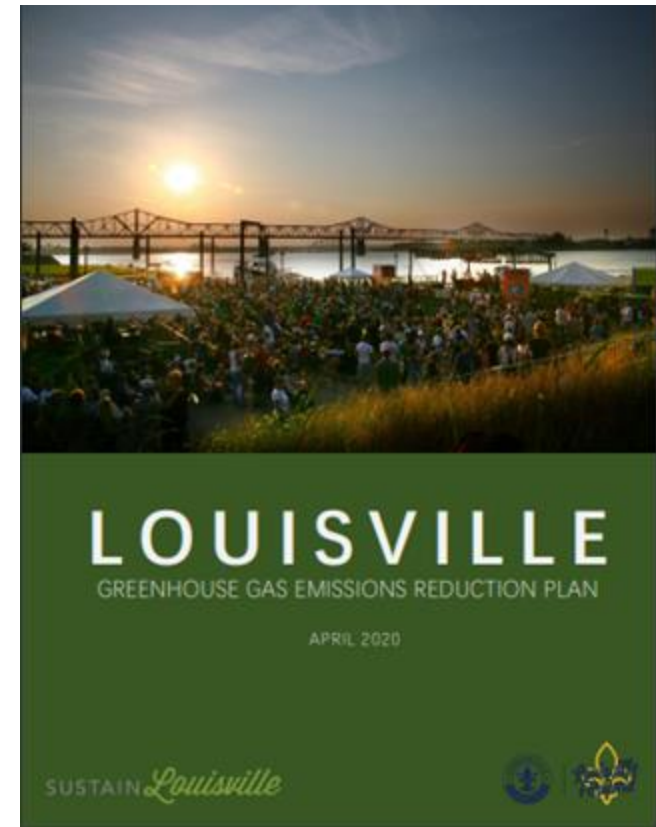
What the Urban Heat Island Effect means for Louisville



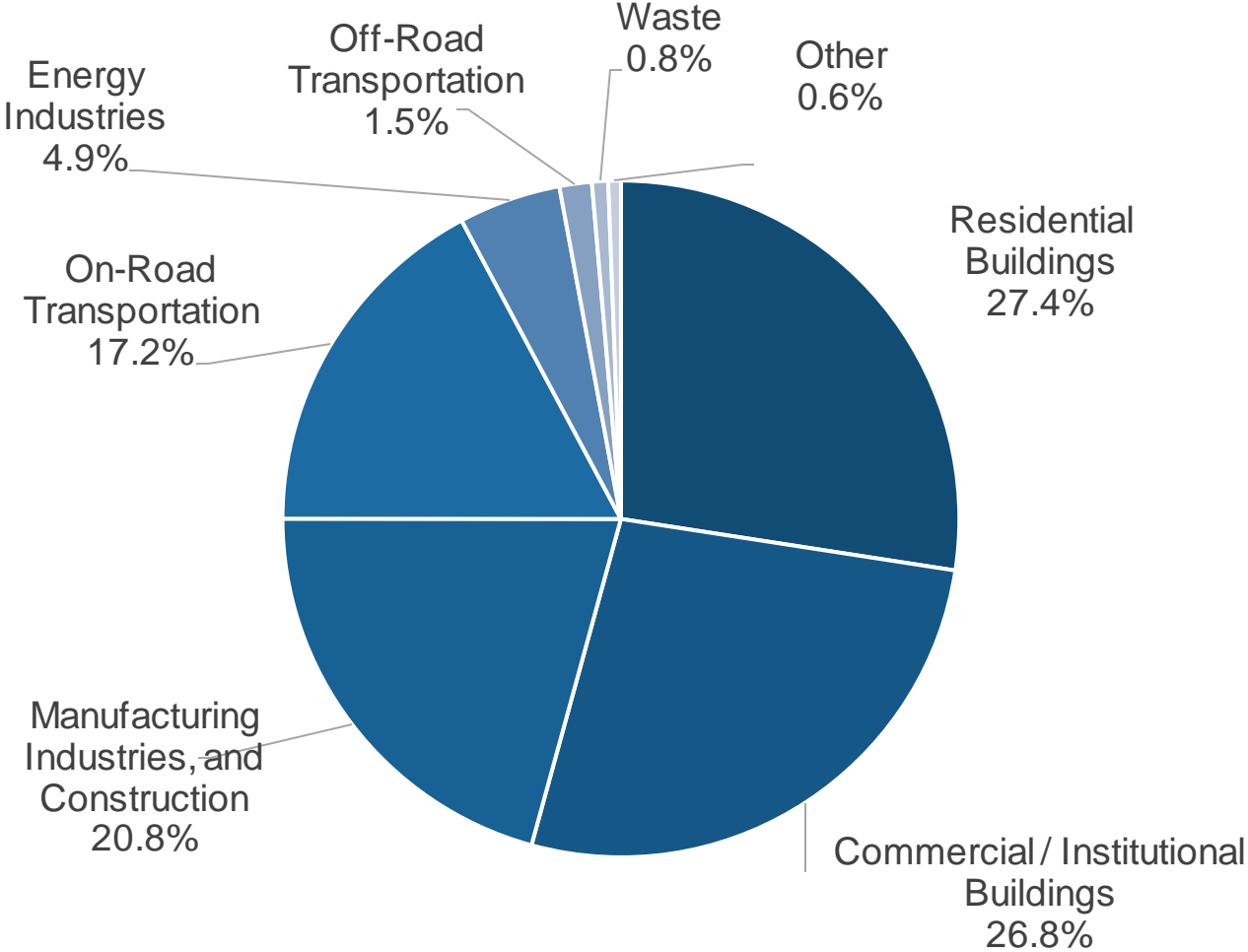
Warm season average daily high temperature (2012)

LMG's Climate Plans and Studies

- ✓ Sustain Louisville (2013)
- ✓ Greenhouse Gas (GHG) Inventory (2016)
- ✓ Plan 2040 (CHASE Principles) (2019)
- ✓ Resilient Louisville (2019)
- ✓ GHG Emissions Reduction Plan (2020)
- ✓ Climate Change Vulnerability Assessment (2020)
- ✓ Prepare Louisville (2020)



2016 Louisville Greenhouse Gas Inventory



16,000,537 tCO₂e

City	Per Capita GHG Emissions
Columbus, OH	13.2 tCO ₂ e
Austin, TX	15.5 tCO ₂ e
US National Average	16.5 tCO₂e
Nashville, TN	20.1 tCO ₂ e
Louisville, KY	20.9 tCO₂e
Knoxville, TN	21.7 tCO ₂ e
Memphis, TN	22.0 tCO ₂ e
St. Louis, MO	22.9 tCO ₂ e

Louisville's Guiding Sustainability Policies

R-102-19: Resolution for 100% Clean Energy

- 100% clean electricity for LMG operations by 2030
- 100% clean energy for LMG operations by 2035
- **100% clean energy community-wide by 2040**

R-157-22: Resolution Establishing a Science-based Greenhouse Gas Emissions Reduction Target

- Reduce emissions by half by 2030
- **Net zero emissions by 2040**

*Can we reduce demand
for energy?*



Energy Demand

*Can we clean up the
energy supply?*



Energy Supply



**How Do We
Achieve 100%
Clean Energy
and Net Zero
Emissions?**

Image: National Renewable Energy Laboratory (NREL)

Louisville's Participation in C-LEAP

In 2022, Louisville was 1 of 23 C-LEAP Pilots



Clean Energy Community-wide

Louisville was selected for the Communities LEAP Pilot

Communities LEAP Priorities:

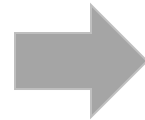
1. **100% clean energy community-wide by 2040**
2. Rapid deployment of distributed energy efficiency and renewable energy solutions for the **residential sector**
3. Accessibility and direct benefits for **low-income renters** and residential property owners
4. **Enhanced utilization of existing programs** such as the Energy Property Assessment District (local PACE program), Cool Roof Incentive Program, Solar Over Louisville (local solarize campaign), and Community Development Block Grant funds
5. Development of new programs to fill gaps as needed
6. **Built in financial sustainability** for long term success
7. **Viable** within our regulated utility environment



Louisville's Communities LEAP Scope

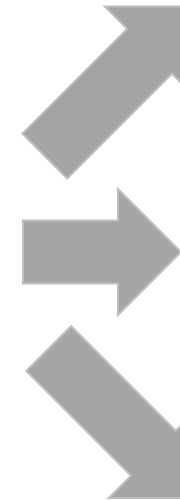
Context and Challenges

- 31.63% of population is low-income
- High energy burden
- Exposure to environmental health hazards
- High fossil fuel usage from utility vs. ambitious clean energy goals



Application priorities

- 100% clean energy community wide by 2040
- DER/EE for residential sector
- Benefits/access for low-income renters/owners
- Improvement to existing programs, develop new ones
- Financial sustainability, viable within context



Identify Low-hanging Fruit for Requirements in Affordable Housing

Community Benchmarking Support

Gap/Policy Analysis for DER/EE Programs

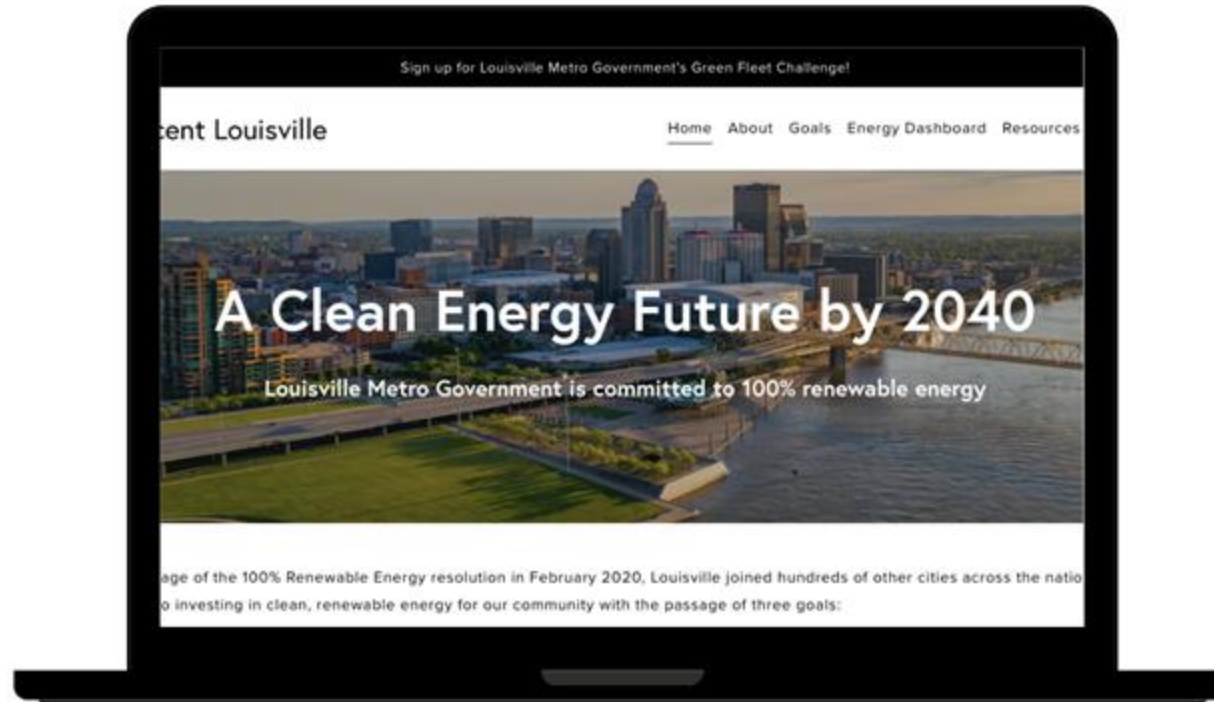
Workforce Development

Equitable Financing Solutions Identification

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🔍 LouisvilleKY.gov/sustainability ✕

🔍 100PercentLou.com ✕



Socials:
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[@SustainLou](https://twitter.com/SustainLou)



Contact: Sumedha Rao | sumedha.rao@louisvilleky.gov

Multifamily Financial Roundtable: Financing Energy Efficiency and Electrification

Sadie McKeown

Community Preservation Corporation

Planning for the Future: Climate Risk Assessments & Resilience

Giuls Kunkel

MetLife Investment Management

MetLife Investment Management
Better Buildings Summit, 2023

Planning for the Future: Climate Risk Assessments & Resilience

June 6, 2023

About MIM

- The institutional asset management business of MetLife, Inc.
- Provides investment solutions to institutional investors worldwide
- \$669 Bn¹ of total assets under management
\$109.8 Bn² Commercial Real Estate AUM
- Real Estate portfolio includes equity, real estate debt and agricultural debt
- ESG Integration is a part of our business
 - Commitment to achieve 50% reduction in Scope 1 and 2 GHG emissions by 2030
 - PRI signatory
 - GRESB
 - EPA ENERGY STAR® Partner of the Year- Sustained Excellence
 - DOE Better Buildings Challenge
 - DOE Better Climate Challenge
 - ULI Greenprint Member
 - Fitwel Champions



1. As of December 31, 2021. At estimated fair value. Includes all MetLife general account and separate account assets and unaffiliated/third-party assets managed by MIM

2. As of December 31, 2021. At estimated fair value. Represents the value of all commercial mortgage loans and real estate equity managed by MIM, presented on the basis of gross market value (inclusive of encumbering debt).

A Look at Risk

Climate Risk

Physical risks from climate change including:

- **Damage to properties**
- **Potential increases to operating costs**
- **Increases in insurance premiums**

Acute Risks:

- Tropical cyclone, flooding, wildfires

Chronic Risks:

- Sea level rise, drought, heat stress

Transition Risk

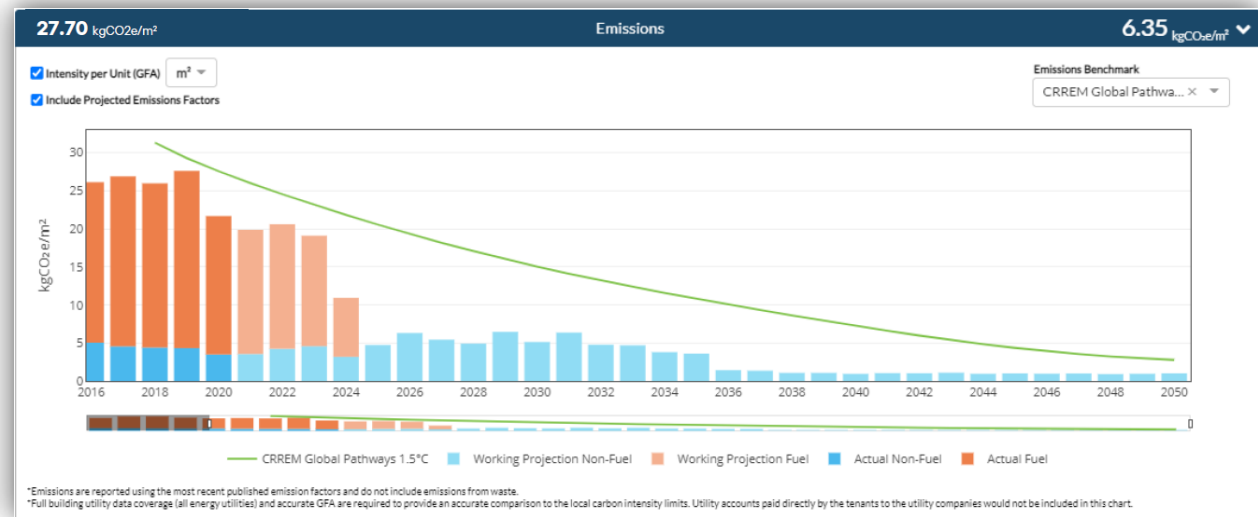
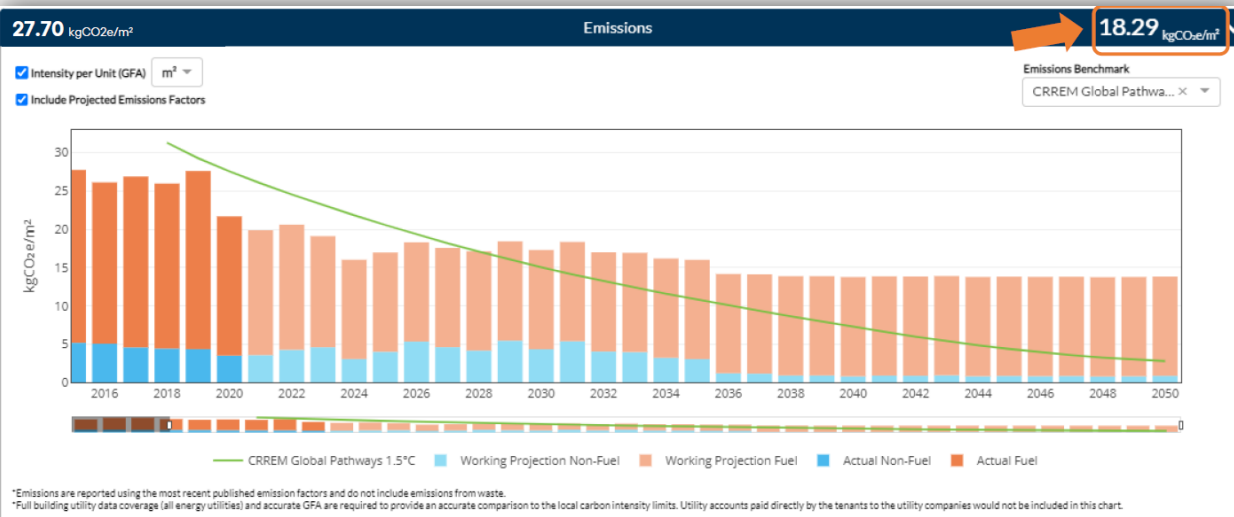
Risks and costs associated with transitioning to an energy-efficient and low-carbon building.

- **Policy and Legal Risk**
 - Carbon pricing and reporting, BPS laws
- **Technology Risk**
 - Substitution of existing products and services
- **Market Risk**
 - Changing consumer behavior. Uncertainty through market signals
- **Reputation Risk**
 - Increased stakeholder concerns, stigmatization of sector



Approaching Transition Risk

Using Tools to Manage Transition Risk





Approaching Climate Risk

Climate Physical Risk Assessments

Munich RE Climate Risk Analysis

- Location Risk Intelligence (LRI) tool

Required for Due Diligence

- All potential new acquisitions and loans
- Completed annually for equity and debt portfolios
- Analyze for risks posed by:
 - Tropical Cyclone
 - Flooding
 - Sea Level Rise
 - Heat Stress
 - Precipitation Stress
 - Wildfire
 - Drought

Location Risk Intelligence



Location Risk Intelligence Single Risk Assessment Report

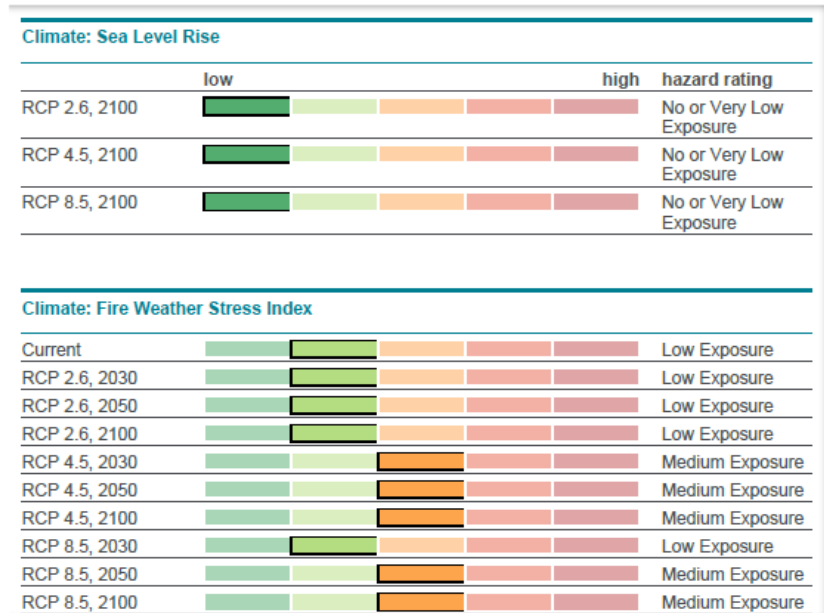
03/09/2023

Single Risk Assessment Report

Risk Location	6215 Beesley Dr, 89115 Las Vegas, USA
Longitude/Latitude	-115.0387, 36.2736
Munich Re Risk Location Quality	Coordinates (100)
Elevation	614m
Distance to Coast	> 50 km
Distance to Fault	6379m

MIM Internal Analysis

- Results of Munich RE Analysis run through MIM Climate Change Assessment Tool
- Properties with high scores evaluated by MIM Risk team and regional architects
- Deep dive analysis on high-risk properties by MIM ESG team



MetLife Investment Management

Climate Change Assessment Tool

Property Name: Cons Square III **Assessment Date:** 09/22/22

Location: Washington, DC **Property Type:** Office

Climate Scores RCP 4.5, 2050

Hazard Category	Hazard Rating
Tropical Cyclone	Medium Exposure
River Flood Undefended	Medium Exposure
Sea Level Rise*	No or Very Low Exposure
Fire Weather Index	Low Exposure
Drought Stress Index	No or Very Low Exposure
Heat Stress Index	Low Exposure
Precipitation Stress Index	Medium Exposure

*Use the 2100 projection for the Sea Level Rise hazard.

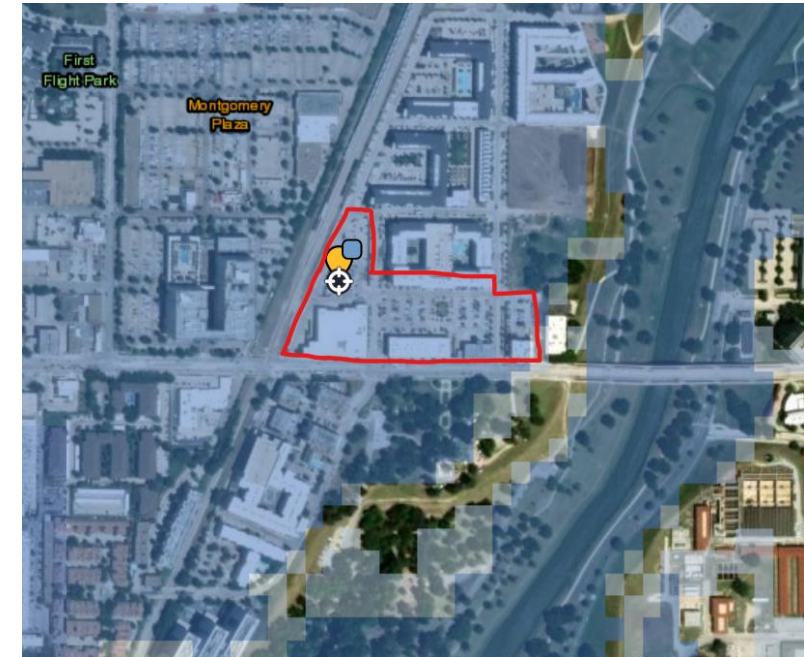
Results

Total MIM-Adjusted Risk Score	4-5
MIM-Adjusted Risk Category	Low

Conclusion
 Cons Square III was run through the Munich Re climate change assessment model. The report indicates the asset has a low potential risk from climate change.

Example Analysis: Retail Site in Fort Worth, TX

- Existing Asset
- Score of “High” on MIM Climate Change Assessment tool due to flood risk
- MIM ESG Analyst Completed Deep Dive to Evaluate Risk Posed to property
- Previous Flooding:
 - Flood event in Fort Worth, TX on August 22nd, 2022, no flooding experienced on-site.



▼ River Flood Undefended ⓘ

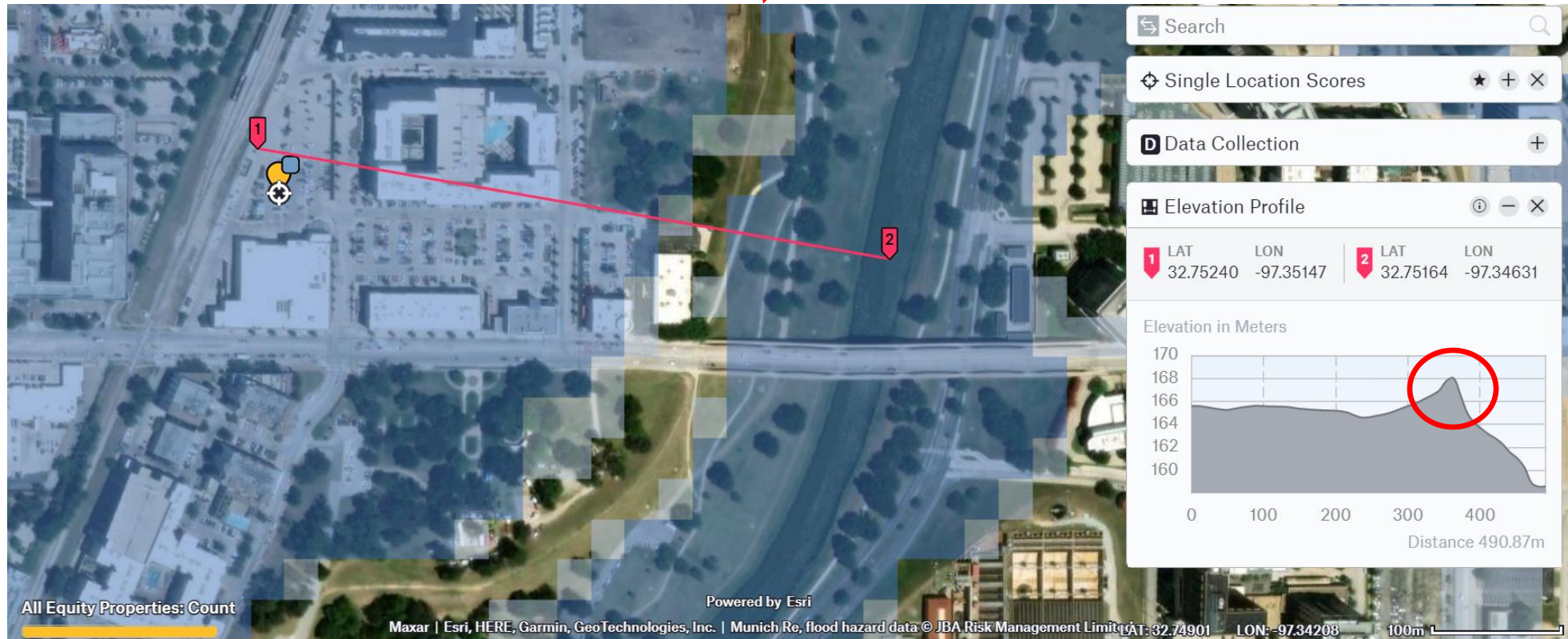
LOW HIGH

RCP 4.5, 2050

Tropical Cyclone	River Flood Undefended	River Flood DEFENDED	Sea Level Rise	Fire Weather Index	Drought Stress Index	Heat Stress Index	Precipitation Stress Index	Total MIM Adjusted Risk Score (SUM) with Undefended Score	MIM-Adjusted Risk Category with Undefended Score	Total MIM Adjusted Risk Score (SUM) with DEFENDED Score	MIM-Adjusted Risk Category with DEFENDED Score
0	10	2	0	1	1	1	1	14.00	High	6.00	Medium

Property Flood Risk

Levee



Flood Defenses



1.2098 W 7th St - Google Maps

Disclosures

This material is intended solely for Institutional Investors, Qualified Investors and Professional Investors. This analysis is not intended for distribution with Retail Investors.

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Thank you!

We Conduit: Lessons Learned from the Industrial Electrification Working Group

Bert Hill

Volvo Group North America

V O L V O

Electrification case studies

2023 Better Buildings, Better Plants Summit Sampler

Volvo Group

Bert Hill

Boiler Replacement

- **Current Boiler Supports**
 - Building heat
 - Process equipment
- **Recommendation for replacement**
 - Increasing maintenance cost
 - Exceeded the useful life
 - Needed repairs due to compliance related issues



Proposed Alternative

Electric Boiler –Upgraded primary service

- PPL provides new outside transformer and new lines into the main gear inside the building – no cost
- New indoor 4000 amp switchboard and 3200 amp main circuit breaker
- New 1200 amp circuit breaker for new boiler
- Lead time for materials 10-12 months
- Time for install – 1 week (100% plant closure) – power outage required
- Downtime for office heating and production related process equipment – Wash Bay
- Boiler - \$153,940
- Upgraded Electrical Service – \$482,712



Environment

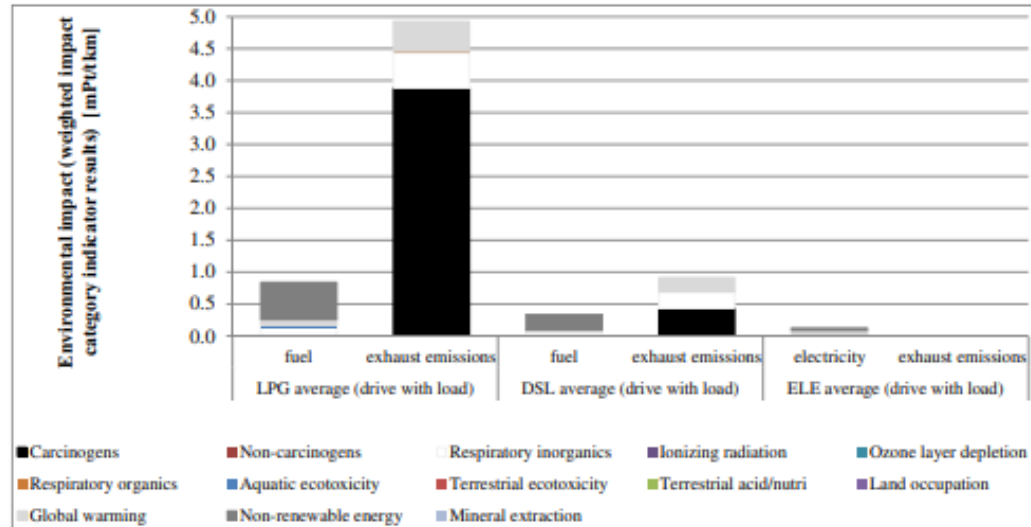
Boiler Replacement

CLIMATE AND RESOURCES			
<u>CO2 Emissions</u>	<u>Increase or Decrease</u>	<u>What is the % impact compare with current set-up</u>	
	Decrease	Reduction of 387 metric tons per year (-76% of plant total)	
<u>Energy Consumption</u>	<u>Increase or Decrease</u>	<u>What is the impact on renewable energy?</u>	
	Increase	Favorable impact on renewable energy	
<u>Chemical</u>	<u>Increase/Decrease</u>	<u>Any chemicals from Black or Grey-list to be used</u>	
	None	NA	
<u>Waste</u>	<u>Increase/Decrease</u>	<u>New type or waste?</u>	<u>Waste to landfill?</u>
	None	NA	NA
<u>Water</u>	<u>Increase or Decrease</u>		
	None	NA	
<u>Other Environmental Impacts</u>	<u>Is this best available technic?</u>	<u>Do we increase circularity?</u>	
	Yes	Reduce fossil fuel consumption, reduce CO2 emissions and increase renewable energy consumption	

Forklift replacement

	Fuel cell	Lithium	Lead acid	LPG
Pro's	<ul style="list-style-type: none"> Emission-free Fast refuel More energy-efficient than LPG 	<ul style="list-style-type: none"> Emission-free Higher capacity than lead acid Shorter charging time Longer life than lead acid 	<ul style="list-style-type: none"> Emission-free Well established 	<ul style="list-style-type: none"> Established technology Fast refuel
Con's	<ul style="list-style-type: none"> Lower overall efficiency than batteries More infrastructure needed New technology Not available for all models on all markets 	<ul style="list-style-type: none"> New technology Not available for all models on all markets 	<ul style="list-style-type: none"> Long charging time Space needed for charging and battery change Shorter expected life than than Lithium 	<ul style="list-style-type: none"> Some emission Fossil fuel Noise from combustion

Forklift replacement



Truck Type	kg CO2
Electric (lead acid)	4,600
Diesel	13,980
LPG	17,640

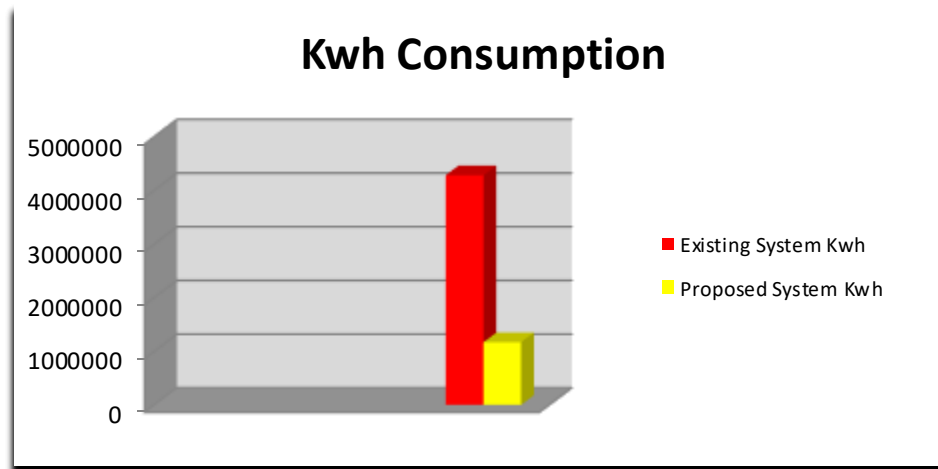
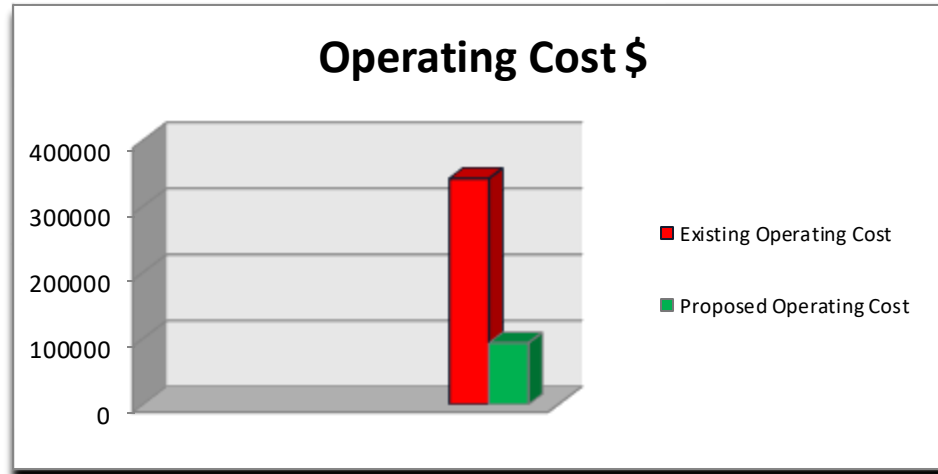
Standard 2000 kg counterbalanced truck working 2000 hrs per year. UK electricity grid.

An environmental life cycle assessment of forklift operation: a well-to-wheel analysis. International Journal of Lifecycle Analysis. (2016) 21:1438–1451

Benefits of a Lithium-Battery Fleet

- **Higher efficiency** – lithium battery forklifts are more efficient than lead-acid, they can provide power for lifting heavy loads while requiring less electricity to do so
 - Less electricity usage → saves roughly \$60K per year
- **Lasts Longer = Less Downtime** – lithium batteries have a lifespan of 5-7 years, which is double that of lead-acid ones
 - Less equipment needed due to longer runtimes and quicker charging (8 units)
- **HSE Impact** – plant level EH&S benefits
 - Remove lead, sulfuric acid and potential Hydrogen gas from the workplace
- **Lower Maintenance Costs** – lithium batteries require less maintenance
 - Remove filling and washing tasks

Forklift replacement



Seeing the Big Picture

- **Combined Energy Treasure Hunt and Electrification Assessment**
 - Pilot event supported by the DOE, ORNL, WVU, and EPRI
 - Covers the first two pillars in the DOE Industrial Decarbonization Roadmap
 - Energy Treasure Hunt
 - Low and No-cost energy savings opportunities
 - Focused on operational and behavioral aspects
 - Identified energy savings opportunities equal to 7% of energy spend
 - HVAC control, furnace insulation, compressed air improvements
 - Electrification Assessment
 - Focused on reducing carbon emissions via electrification
 - Followed the model developed in the DOE Low Carbon Pilot Program
 - Identified opportunities that can be prioritized and evaluated in more detail



DOE Electrification Assessment Framework

1. Inventory and Portfolio Management	2. Assessing Facility's Electrification Readiness	3. Identifying Strategies for Electrification	4. Evaluating and Implementing Projects
<ul style="list-style-type: none"> •Identify Significant Energy Users (SEU) and KPI •Estimating baseline energy use and emissions breakdown by system 	<ul style="list-style-type: none"> •Estimating electric power threshold •Assessing facility and utility side infrastructure •Assessing utility rates 	<ul style="list-style-type: none"> •Technologies for process heating, HVAC and Forklifts •Guidance on project identification 	<ul style="list-style-type: none"> •Guidance on technology selection •Building holistic cost comparison models •Quantifying non-energy benefits •Project Prioritization

V O L V O

Thank you!

Q & A

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PAYING THE PRICE:

HOW INTERNAL CARBON PRICING SUPPORTS
EMISSIONS REDUCTION

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Additional Questions?

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