



NREL Support to Louisville Metro Government

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Purpose of Slide Deck

- This slide deck was developed to summarize key insights and results yielded from Phase I of the Louisville-NREL Partnership.
- It was presented in various public venues in Louisville throughout Q3/Q4 of 2021.

NREL At-A-Glance

3,056 Workforce, including:

- 2,188 regular/limited term
- 454 contingent workers
- 193 postdoctoral researchers
- 132 graduate students
- 89 undergraduate students

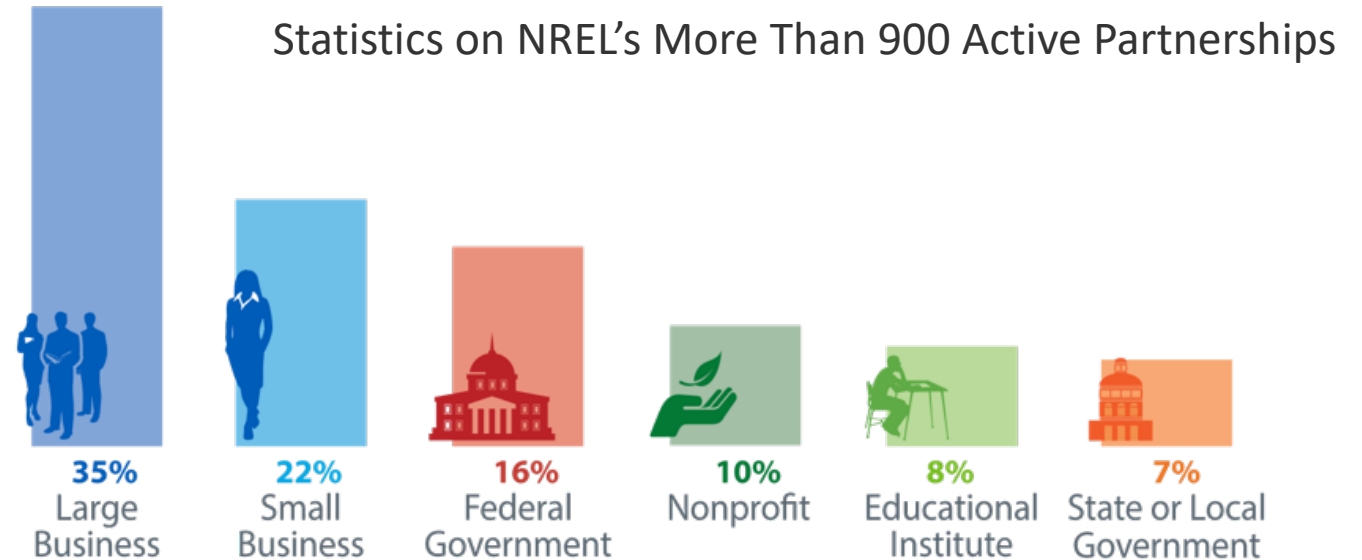
World-Class research expertise in:

- Renewable Power
- Energy Efficiency
- Sustainable Transportation
- Energy Systems Integration

Partnerships with

- Industry
- Academia
- Government

3 Campuses operate as living laboratories



Recent Local Government Partnerships



Los Angeles, California

With the Los Angeles Department of Water and Power (LADWP) and the local community, NREL analyzed more than 100 million simulations to uncover the various pathways available for the LADWP to meet ambitious clean energy targets and continue providing reliable power.



Photo from the City of Kingston

Kingston, New York

NREL partnered with the City of Kingston to evaluate various technical and policy measures to achieve 2050 clean energy goals in a socially equitable manner, helping to inform immediate next steps for the city government.



Photo by Warren Gretz, NREL 25967

Orlando, Florida

NREL partnered with the Orlando Utilities Commission to understand the potential for customer-owned rooftop solar to contribute to Orlando's 2050 100% clean energy goal. The analysis also examined the potential technical and financial implications of increased rooftop solar deployment for the city.



Photo by Kendall Septon, NREL 42887

Kansas City, Missouri

NREL partnered with Kansas City (Missouri) and various public, private and community partners to identify an equitable geographic distribution of streetlight-based electric vehicle charging infrastructure to support local electric vehicle adoption.



LA100

The Los Angeles 100% Renewable Energy Study

LA100 offers detailed, ultrahigh-resolution analysis to equip Los Angeles decision-makers to answer these questions:



What are the **pathways and costs to achieve a 100% renewable electricity supply** while electrifying key end uses and maintaining the current high degree of reliability?



What are the potential benefits to **the environment and health**?



How might **local jobs and the economy** change?



How can **environmental justice communities** benefit from and be part of the solution?

Louisville-NREL Partnership: Project Focus

- **Phase I Project Focus**

- NREL will support the Louisville Metro Government (LMG) in identifying avenues for achieving a goal of 100% clean renewable electricity for LMG operations by 2030 based on current institutional and legal context in Kentucky.
- NREL will conduct detailed planning of Phase II activities and will develop a statement of work for the project.

- **Phase II Project Focus**

- NREL will evaluate the technical, economic, legal, and practical feasibility of specific to-be-determined avenues for achieving the goal of 100% clean renewable electricity for LMG operations by 2030.
- The evaluation, or analysis, can be used by LMG leadership to inform and prioritize actions.

How NREL Will Work With Louisville Metro Government

Provide Planning and Implementation Support

Inform Prioritization of Actions

Evaluate Feasibility of Options

Identify Avenues for Goal Achievement

Photo by Werner Slocum , NREL 62957

What is NREL's Role?

- NREL is an independent technical institution that does not provide policy recommendations, nor is it involved in any policy or political advocacy work of any kind.
- NREL will provide LMG with decision-supportive analysis and data on the costs and benefits of various identified avenues for achieving the 2030 goal for renewable electricity for municipal operations.

Ongoing Activities

- NREL has conducted an extensive set of interviews with LMG staff to develop a greater understanding of the local energy situation, institutional constraints and priorities, and past and current activities relevant to community energy goals
- NREL has also conducted desk-based research focused on:
 - LMG's legal and institutional constraints in the electricity space
 - Louisville Gas and Electric (LG&E) portfolio of assets, regulatory paradigm, and other key aspects
 - Legal relationship of LMG and LG&E.

Environmental Justice and Equity Considerations

- **Procedural Justice:** Are members of the public—and specifically members of frontline communities that will be impacted (either positively or negatively) by LMG’s pursuit of its 2030 goal—able to be meaningfully involved in decision-making processes? What efforts will decision makers make to seek out and facilitate involvement of those potentially impacted?
- **Recognition Justice:** What are the causes of historical and present inequities in the energy system that can be acknowledged and accounted for within the process to plan LMG’s achievement of its 2030 goal? How are communities in the Louisville area currently being impacted by the energy system?
- **Distributional Justice:** What are various community definitions of a fair and equitable spread of benefits and costs across the community as LMG achieves its 2030 goal? From this perspective, what are the pros and cons of various avenues for achieving the LMG 2030 goal?

Adapted from *The Energy Justice Workbook* (Initiative for Energy Justice) available at:

<https://iejusa.org/wp-content/uploads/2019/12/The-Energy-Justice-Workbook-2019-web.pdf>

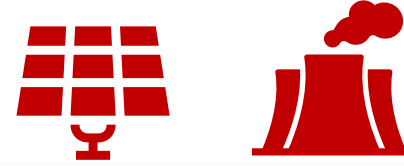
Avenues for 2030 Goal Achievement: Electricity Supply and Demand

*Can LMG reduce its
demand for electricity?*



Electricity Demand

*Can LMG decarbonize its
electricity supply?*

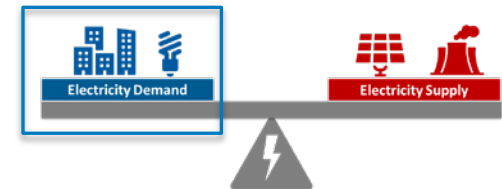


Electricity Supply



Background: Demand-Side Measures

- How are demand-side measures defined?
- How can demand-side measures help meet the 2030 100% clean electricity goal for LMG?
- Most demand-side measures can be pursued without utility involvement
- There are *many* options to improve municipal energy efficiency—some are more cost-effective than others.

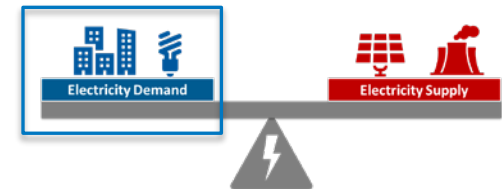


Background: Financing Demand-Side Measures

In cases where new infrastructure is needed, energy efficiency is characterized by upfront capital expenditures followed by operational cost savings.

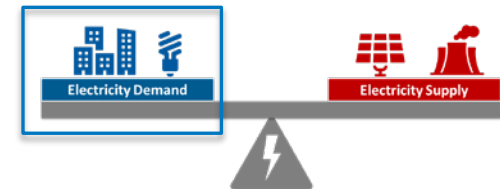
Example of Financing Mechanisms

	Capital Expenditure Required?	Operational Expenditure Savings?	Energy Savings?
Budget financing	Yes	Yes	Yes
Public bond	Yes	Yes, less the bond interest	Yes
Bank loan	No	Depends on loan terms	Yes
Energy savings performance contract	No	Depends on contract but likely marginal if any	Yes
Municipal savings reinvestment funds	Yes/No	Yes	Yes



Demand-Side Measures

- **Use Less Energy via Energy Efficiency Measures**
 - Energy benchmarking*
 - Changes in operational patterns for buildings with controls
 - Investment in control systems for buildings without controls
 - Energy efficient retrofits for municipal public lighting
 - Energy efficient retrofits for municipal buildings (e.g., insulation and air sealing, lighting replacement, and space/water heating appliance replacement)
 - Construction of new municipal buildings in highly energy efficient manner
- **Use On-Site Renewable Energy via Distributed Energy Resources**
 - Rooftop (or otherwise on-site) solar located “behind the meter”
 - Geothermal water source heat pumps for heating and cooling

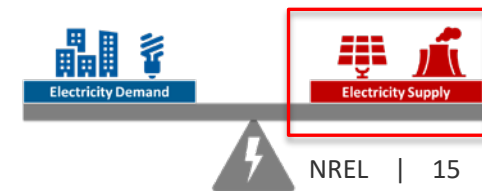


* Foundational activity; no direct reduction in energy use

Background: Supply-Side Measures

- LMG currently purchases electricity and receives public lighting service from LG&E.
- LG&E is a regulated monopoly utility that currently generates 80-90% of its energy from coal and 9%–19% from natural gas.^a

a Source: “What are the challenges of renewables in Kentucky?” LG&E, Available at: https://lge-ku.com/environment/expanding-renewable-energy/expanding-our-renewables/expanding-our-renewables-help#c-tabs-vertical-5786_collapse_target-5796



Supply Side Avenues

What options can LMG consider to decarbonize the electricity supply?

Utility highly involved



Utility not involved

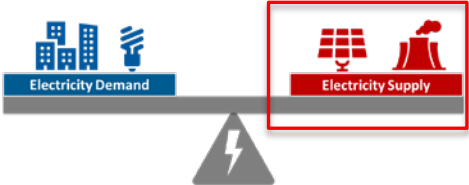
LG&E Green
Tariff and Solar
Share programs

Virtual power
purchase
agreement

Utility and policy
advocacy activities
**[outside of
project scope]**

Municipalization
(LMG facilities
only)

Municipalization
(entire community)



Thank You!

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