# Comprehensive Implementation Plan to 100% Renewable Energy

Renewable Energy Alliance of Louisville (!00%REAL), A Non-profit Citizen Led Organization

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## Introduction

REAL applauds the steps the Louisville Metro Government has taken towards implementing Louisville's commitments to clean, renewable energy, adopted in 2020, including:

1- the commitment of the Mayor's Office in Executive Order 2021-005 to transition to electric vehicles and to require contractors and suppliers doing in excess of $1 million in business with Louisville annually to provide a written commitment to reduce their carbon footprint;

2- hiring Zachary Tyler as Louisville's first energy manager and implementing his recommendations, leading to savings of more than $700,000 in his first year and additional savings every following year; and now hiring two assistants to create further efficiencies in the city's energy usage;

3 – beginning the Energy Innovation Fund with 80% of the savings accumulated from efficiency efforts to fund more efficiency and clean energy projects, and all of the positive steps made possible by that fund; these include reducing electricity usage by 16% and natural gas use by 18%;

4 – growing the Office of Sustainability in 2023 "to elevate sustainability within Louisville Metro Government and integrate it across Metro's agencies and programs," and all of the studies and actions taken by that office, including adding solar energy generation to seven city buildings and the Solar Over Louisville program.

## The Need for Continued Progress

The pre-industrial concentration of carbon dioxide in the Earth's atmosphere was 280 parts per million for 10,000 years. In 2020, when the Louisville Metro Council passed the resolution for 100% renewable energy, the concentration had grown to 412 ppm. In April of 2025, the concentration was 430 ppm. There is now **52% more carbon dioxide** throughout the entire atmosphere. We feel the effects of this increase on a regular basis in the frequency and intensity of severe weather, pollution, and higher pollen count.

Metro Government must look beyond Louisville Gas & Electric's planned changes in its electricity generation profile. Currently, only about 2% of LG&E's electricity comes from renewable sources, and PPL, LG&E's parent corporation, does not project reaching net zero emissions until 2050, therefore Metro Louisville will need to take substantial, yearly action on its own to achieve its goals.

Achieving higher degrees of energy efficiency should continue to be part of the overall effort, but efficiency alone will never address the need for clean energy. Efficiency does have a good return on investment and good stewards should take advantage of that reality. This document lays out a plan to achieve the Council's clean energy goals.

**A Plan to Reach our Goals**

## The Three Resolutions:

By **2030**: 100% renewable electricity for city operations

By **2035**: 100% renewable, all forms of energy for city operations

By **2040**: 100% renewable, all forms of energy, community wide

## The Three Initiatives: Rooftop Solar, Utility-Scale Solar, and Deep Geo-Thermal Energy

**Rooftop Solar** is currently being installed on city-owned buildings. As nearly every building can produce its own energy, this is the best long-term solution for renewable energy, but it is too gradual and incremental a process to meet the 2030 goal. It should be continually funded by the city every year for the foreseeable future, and the city should issue **Solar Ready** certificates to builders and developers.

**Utility-Scale Solar.** Ground-mounted solar can be installed much more rapidly than rooftop, costs about half as much and will be necessary to meet the 2030 and 2035 goals. The downside is that it covers a lot of land. It is used by some as a temporary land preservation measure if the installation is decommissioned and the land returned to other uses.

**Geo-thermal** is an upcoming utility-scale technology. Shafts take up very little space and can be drilled nearly anywhere, especially on existing coal and gas fired generating facilities. They can also connect to existing on-site transmission and distribution infrastructure. As the 2040 goal requires approximately 100 times the generating capacity of the 2030 goal, deep geo-thermal or some other innovative technology will be needed to for non-solar renewable energy production.

## Timing the Initiatives with the Goals

| | By 2030 | By 2035 | By 2040 |
|---|---|---|---|
| **Goals** | Metro Buildings<br>100% clean electricity<br>(no use of coal or gas) | Metro Government<br>100% clean energy (no use of coal, gas and gasoline) | Metro Louisville<br>100% clean energy |
| **Rooftop solar** | City owned buildings<br>Initiate solar certificates | More new construction on Metro and community buildings is solar ready | |
| **Utility scale solar** | | Solar field, electric vehicles, HVAC upgrades from gas to elctricity | |
| **Geothermal or other new technology to meet community wide demand** | | | Install shafts near distribution infrastructure (former coal mines and gas plants) |

## Implementation

### The 2030 Goal: **Rooftop** and **Utility Scale Solar**

Rooftop solar requires no special arrangement with LG&E (net metering) and most buildings (especially one- and two-story) with good solar exposure can produce all of their own energy. It is the best use of land for long-range renewable energy generation and should be an on-going transitional process for the foreseeable future. The process, however, is incremental and slow. The city owns only a small percentage of the roof space needed to generate its full electrical usage.

Funding possibilities for **Rooftop Solar**:

Annual appropriations: The City should budget $1,000,000 annually ($500,000 in 2025) specifically for rooftop solar on city-owned buildings. The Energy Innovation Fund largely cannot be used for this purpose. It requires a six-year return on investment for 80% of the fund, which systematically excludes solar development. There is currently no other source of funds from the City for rooftop solar. $1,000,000 will buy approximately 500,000 kw of solar and save the city $72,000 annually. The payback period on a General Service Account, at $0.12/kwh, is approximately 13.8 years. **After the payback period, the city will receive virtually free electricity for an additional 15-25 years, saving at least $10-12M annually in today's dollars.**

**Bond Issue**: The same $1,000,000 a year could be financed through a bond issue. Many Louisville citizens would feel more involved in their city through buying "**Sun Bonds**."

**Green Bank:** Bank loans for renewable energy are springing up for commercial and residential installations. Some may become available for local government.

**Utility-Scale Solar** will be required to meet the 2030 goal. It is the best way to develop renewable generating capacity relatively quickly and cheaply, but will require connection to the existing distribution infrastructure and cooperation with LG&E. LG&E has shown some interest in solar in its 2023 Integrated Resource Plan, and its parent company, PPL, has pledged to be 70% renewable by 2035. In practice, however, LG&E continues to plan more fossil fuel development and ignores the Louisville Resolution for 100% renewable energy.

Utility-scale solar is likely to conflict with LG&E's monopoly of both generation and distribution of electricity in Louisville. **This is the greatest barrier to the 100% resolution.** The monopoly makes sense for distribution, in that we do not want more than one set of wires coming into each building, but not for generation. The monopoly was granted by the state of Kentucky at a time (1896) when electrical generation was produced by centralized power plants. We are now in an age of distributed generation in which the generation monopoly is no longer needed. The grid should be open to decentralized renewable generation through entrepreneurial competition.

A 60-megawatt ground-mounted solar power installation to meet the 2030 goal would cover about 300 acres. It would have to be near transmission lines but need not be in Jefferson County. This solar farm would generate the city government's entire electrical usage of 85,000,000 kwh per year. **Cost: about $70,000,000** (plus land cost,) about half the per-watt cost of rooftop solar.

**Payback period: 6-8 years**. This type of installation usually includes a decommissioning bond that provides for facility removal at the end of the contract period, usually 25-30 years, so the land can be returned to other uses. Some have used solar farms as a means of preserving farmland for future generations.

Funding possibilities for **utility scale solar**:

**Bond Issue:** Because the installation costs about half, the payback period will be about half (excluding land cost), making Sun Bonds much more attractive. But the city would have to own and operate the facility.

**Power Purchase Agreement:** This is a more practical arrangement requiring little or no upfront costs. The city would contract with a solar developer to build, finance, own, and maintain the facility in exchange for a steady income stream for the electricity produced. The city would pay per month as it does now. (It now pays about $10-12,000,000 per year for electricity.) Prices for utility-scale solar fluctuate but are considerably lower than the city now pays for coal or gas fired electricity.

## The 2035 Goal: Continue **Rooftop** and **Utility-Scale-Solar** development.

Convert city usage of petroleum and natural gas to electricity by the following:

1. Electrify all city owned vehicles.

2. Electrify and upgrade heating and cooling systems in city buildings.

3. Increase solar facilities, both rooftop and utility-scale, to meet new demand from electrification of former coal and gas usage.

4. Continue the energy efficiency program and city rooftop appropriations.

## The 2040 Goal: Continue **Rooftop Solar**, **Utility-Scale Solar**, Install deep **Geothermal** or other innovative technology.

Louisville will need about 100 times as much renewable energy community wide in 2040 as it does for city operations in 2030. Solar, wind, and hydro-electricity are unlikely to provide enough for 100% renewable energy. Adaptations will include electric heating, water heating, and transportation for all vehicles and buildings in the Louisville area.

**Deep geothermal energy** may be the best option available before 2040. The Earth's temperature a mile or so below the surface is measured in thousands of degrees, and is virtually unlimited. It is estimated that using 0.1% of the Earth's heat would power human civilization for the next 20,000,000 years. Current deep boring technology is limited because metals used for drill heads and well casing melt at such high temperatures. A new drilling technology developed by Quaise solves both problems. It uses "Millimeter length energy waves" rather than a rotary drill to break and melt rock as it descends into the Earth a method that also vitrifies and seals the sides of the hole to make metal casing unnecessary. It is still in the experimental stage but likely to be proven for commercial scale installations before the 2040 goal. This system, or some similar technology, could be installed by LG&E directly or through a Power Purchase Agreement similar to that for utility solar.

## General Implementation Tools

We need a series of **metrics** to measure implementation progress. REAL would like to cooperate with the Office of Sustainability to create a percent figure for quantifying progress toward each of the three 100% goals. We would then be able to report to Metro Council annually. Progress toward each of the goals should be measured from 2019, before the goals were set, in terms of:

1) Renewable energy production from LG&E's hydro plant, and from residential, commercial, and government roof top and utility scale solar arrays.

2) Energy efficiency realized by the city.

3) LG&E data on increases/decreases in Metro energy consumption: electrical and natural gas.

**Solar-Ready Certification** We would also like to see the city develop a program through the Office of Sustainability for builders and developers who design and build with full solar production in mind. Solar readiness is not solar installation—it is design and construction of good rooftop exposure to enable prospective buyers to take full advantage of the sunlight falling on their roofs. Solar-ready standards are already written as an appendix to the International Building Code and can be easily adapted for local use. Buildings capable of producing their own energy will become more valuable than those that are not, making these certificates valuable to potential buyers.

**The Renewable Energy Alliance of Louisville is asking the Metro Council to allocate $500,000 for rooftop solar on city buildings in the 2025-2026 fiscal year.** Please make this a separate budget line, designated for solar energy, within the Office of Sustainability and to commit to making annual additions to this fund. This allocation is the continuation of a plan to meet Metro Council's clean energy goals over the next 15 years.

For a more detailed discussion see the 2020 report: LOUISVILLE'S ENERGY FUTURE A Path to 100% Renewable Energy by 2040
https://renewableenergylouisville.org/assets/Louisville_Energy_Future.pdf