City of Louisville
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City Council
Special Meeting Agenda
Tuesday, October 10, 2023
Council Chambers
749 Main Street
6:00 PM

Members of the public are welcome to attend remotely; however, the in-person meeting may continue even if technology issues prevent remote participation.

- *You can call in to +1 408 638 0968 or 833 548 0282 (Toll Free), Webinar ID #876 9127 0986.*
- *You can log in via your computer. Please visit the City's website here to link to the meeting: www.louisvilleco.gov/council*

The Council will accommodate public comments during the meeting. Anyone may also email comments to the Council prior to the meeting at Council@LouisvilleCO.gov.

1. CALL TO ORDER

2. RESOLUTION NO. 48, SERIES 2023 – A RESOLUTION APPROVING AN INTERNAL DECARBONIZATION PLAN FOR THE CITY OF LOUISVILLE ORGANIZATION – *continued from 8/15/23*

- Staff Presentation
- Public Comments (Please limit to three minutes each)
- Council Questions & Comments
- Action

3. EXECUTIVE SESSION

CITY MANAGER ANNUAL EVALUATION
(Louisville Code of Ethics, Section 5-2(b), CRS 24-6-402(4)(f) – Authorized Topics

Mayor is Requesting the City Council Convene An Executive Session for the Purpose of Conducting the Annual Performance Review of the City Manager

Persons planning to attend the meeting who need sign language interpretation, translation services, assisted listening systems, Braille, taped material, or special transportation, should contact the City Clerk's Office (303.335.4536 or 303.335.4574) or ClerksOffice@LouisvilleCO.gov. A forty-eight-hour notice is requested.

Si requiere una copia en español de esta publicación o necesita un intérprete durante la reunión del Consejo, por favor llame a la Ciudad al 303.335.4536 o 303.335.4574 o email ClerksOffice@LouisvilleCO.gov.

- **Requests for Executive Session**
- **City Clerk Statement**
- **City Attorney Statement of Authority**
- **City Council Action on Motion for Executive Session**
- **Council Convenes Executive Session**
- **Council Reconvene in Open Meeting**

4. REPORT – DISCUSSION/DIRECTION/ACTION –CITY MANAGER ANNUAL EVALUATION

5. ADJOURN

SUBJECT: **RESOLUTION NO. 48, SERIES 2023 – A RESOLUTION APPROVING AN INTERNAL DECARBONIZATION PLAN FOR THE CITY OF LOUISVILLE ORGANIZATION**

DATE: **OCTOBER 10, 2023**

PRESENTED BY: **KAYLA BETZOLD, SUSTAINABILITY MANAGER**
JEFF DURBIN, CITY MANAGER
KEVIN FREY, FACILITIES SUPERINTENDENT
KURT KOWAR, DIRECTOR OF PUBLIC WORKS
RYDER BAILEY, FINANCE DIRECTOR
EMILY HOGAN, ASSISTANT CITY MANAGER

SUMMARY:
The 2023 City Council Work Plan includes an item for "City Climate Change/Greenhouse Gas Reduction Initiatives" to "complete and begin implementation of internal strategic decarbonization plan for City facilities and operations".

Staff are presenting the Internal Decarbonization Plan and implementation options for Council consideration and direction.

BACKGROUND:
In November 2022, the City contracted with McKinstry Essention, LCC to complete an engineering, mechanical and financial analysis for each of its municipal facility sites and associated fleet and equipment with the goal of creating a strategic roadmap for cost-effective electrification and decarbonization of all City buildings, fleet, equipment and operations.

Staff and the McKinstry team presented to Council in August which included the Internal Decarbonization Plan Strategic Roadmap's key findings, a 3-phased implementation approach and an analysis of project components, including zero carbon electricity options, financial considerations, decarbonization co-benefits, and funding strategies.

Council directed staff to return with more information about funding, financing and implementation of the Plan's recommendations.

<u>Plan Alignment with Council Priorities</u>
Climate Action Goals
In 2019, City Council advanced its commitment to climate action by unanimously adopting Resolution 25-2019, setting clean energy and carbon emission reduction goals for the municipality and larger community. The municipal climate action goals are as follows:

- Meet all of Louisville's municipal electric needs with 100% carbon-free sources by 2025
- Reduce core municipal greenhouse gas (GHG) emissions annually below the 2016 baseline through 2025 (2016 baseline is 4,016 mtCO2)

As of March 2020, all City facility electricity comes from carbon-free sources, which is supplied as a premium charge added to each premise's monthly electricity consumption through utility billing (Renewable*Connect and Windsource). City facilities also participate in community solar gardens in Boulder and Weld counties and onsite solar at the Water and Wastewater Treatment Plants.

Currently, the City is not meeting the municipal goal to decrease core GHG emissions annually from the 2016 baseline. In 2021, municipal greenhouse gas emissions decreased, but are significantly higher than the baseline year of 2016, likely due to the Recreation Center expansion in 2018.

Sustainability Action Plan
This project supports many internal goals outlined in the adopted Sustainability Action Plan, including the high priority Energy goal to "implement facility audit recommendations…with consideration of resource limitations and other constraints" and "explore expansion of capacity for onsite electricity…generation to decrease energy consumption". The plan also supports transportation goals to "actively promote the adoption of…electric vehicles for Louisville's fleet as appropriate technology develops' and "develop EV charging stations in strategic City locations for future…EV fleet integration".

<u>Internal Decarbonization Plan Strategy</u>
The 2023 Plan outlines near, mid and long term goals for decarbonization of the City's buildings, fleet and equipment. One of the key recommendations from the final report lists "Internal Decarbonization Plan review every 5-7 years". For this reason, staff recommends prioritizing the near term recommendations when considering implementation options.

Near term recommendations include improvements to five City facilities – the Recreation & Senior Center, Public Library, City Hall, Police & Municipal Courts and Sid Copeland Water Treatment Plant. These facilities were selected for near term improvements due to their equipment nearing the end of its useful life.

The near term project scope includes:
- Building hybrid electrification and EV charging installations at five City facilities listed above
- Onsite renewable energy installation at seven sites, for a total of 2.3 MW
- Energy efficiency and load reduction at all ten City facility sites

Staff recommends fleet vehicle electrification be implemented through vehicle replacement schedules and when sufficient EV charging infrastructure is installed at the associated facility. Additionally, Parks, Recreation and Open Space equipment electrification is recommended to be implemented through equipment replacement schedules and as technology allows.

The mid and long term plan recommendations will likely leverage technology advancements and costs for these improvements can likely be built into annual building equipment replacement Capital Improvement Plan (CIP) requests.

Near Term Implementation Options

Colorado Energy Office's Energy Performance Contracting (EPC)

EPC is a state-managed Colorado Energy Office model for financing and implementing energy-related capital improvement upgrades for public buildings. Energy Service Companies (ESCO) are pre-qualified through the State to assist local governments with implementation of decarbonization projects. Through the program's contract, the project's utility savings are guaranteed. If a project does not realize the utility savings, the ESCO is responsible for the shortfall.

EPC allows for flexibility in project funding with the ability for jurisdictions to combine multiple funding avenues such as grants, utility savings, capital and third party financing. Since EPC is a state-led program, many state agencies (CEO, DOLA) prioritize EPC projects for grant funding.

This program has been used for over 200 projects in the state of Colorado with many nearby cities implementing EPC projects such as Lafayette, Erie, Boulder, Westminster, Arvada, Broomfield and Thornton.

Based on Council feedback, staff researched options for near term Plan implementation and the options are outlined below.

1. **Implement the near term recommendations through the City's current budget process.** There is currently $4,822,500 budgeted in the 2023-2027 CIP for building equipment replacements and municipal electrification. This option would allow the City to implement the Plan as funding allows, however the budgeted amount would only allow the City to implement building electrification recommendations at the five facility sites and would not fund EV charging, energy efficiency or onsite renewable energy.
2. **Implement the near term recommendations through EPC without onsite renewable energy.** This option includes an EPC and does not include the additional costs of onsite solar. Although the removal of solar decreases the loan amount, this option does not realize utility cost savings, as a majority of the utility cost savings are due to onsite solar. Additionally, grant funding may not be available if renewable energy is not included in the project's scope.

3. **Implement the near term recommendations through EPC with onsite renewable energy.** This option includes the full near term project scope, including renewable energy. Additionally, this option would provide the best project scope for grant funding and would result in annual utility cost savings.

Comparison of implementation options are outlined in the table below.

Table 1: Comparison of Implementation Options

	Existing CIP	EPC – Near Term w/o Solar	EPC – Near Term with Solar
Payment Method	Cash Flow	Finance	Finance
Building Electrification	X	X	X
Energy Efficiency		X	X
EV Charging		X	X
Solar			X
Grants		(partial)	X
Utility Cost Savings			X
Total Cost	$4,822,500	$14,100,000	$7,600,000
Annual Budget Impacts	Varies by year (CIP driven)	$880,000	$480,000

The table below outlines potential payment options for the implementation of the near term recommendations in the Internal Decarbonization Plan.

Table 2: Cost Comparison of Implementation Options

Year	Option 1: Existing CIP	Option 2: EPC – Near Term w/o Solar	Option 3: EPC – Near Term with Solar
2023	$1,500,000		
2024	$2,585,000	$880,000	$480,000
2025	$287,500	$880,000	$480,000
2026	$450,000	$880,000	$480,000
2027 – 2039	Varies by year – CIP driven	$11,400,000	$6,200,000
Total	$4,822,500 +	$14,100,000	$7,600,000

In the table above, option 1 reflects the current CIP funding for HVAC equipment replacements at the five facilities in the near term recommendations, as well as the municipal electrification CIP funding. Option 1 assumes no additional funding is

budgeted for equipment replacement at these buildings from 2027 – 2039. If a financing option is preferred, the CIP funds can be reallocated towards option 2 or 3.

Option 2 reflects the near term recommendations without the onsite solar scope. Without solar, utility savings are not realized, which increases the annual loan payment annually. Additionally, grant funding is more readily available when projects include resiliency aspects, such as onsite renewable energy. Option 2 assumes $1M CEO Public Building Electrification grant funding is secured, but no other grant funding.

Option 3 includes the near term recommendations with the onsite solar scope at seven facilities. The full loan amount is $14,150,000 and utility cost savings are reallocated towards loan payment through EPC. These savings are guaranteed and result in over $6M in savings during the loan term, which is applied annually to the loan payment, decreasing the annual capital cost to the City. Option 3 assumes the 25% Inflation Reduction Act (IRA) tax credit is applied to the project for reimbursement of onsite solar and also assumes the City receives $5M DOLA Climate Resiliency funding and $1M CEO Public Building Electrification funding. With both of these grant funding opportunities, EPC projects are prioritized for funding.

Both options 2 & 3 assume a 16 year loan term and all numbers are subject to final design, interest rates, lending terms, financing mechanism and savings analysis. Additional costs, including solar operations and maintenance costs, will be evaluated by staff, if given direction to proceed with option 3.

Council may also consider decreasing the scope of an EPC project to one site, such as the Recreation & Senior Center, to decrease overall project costs. With the potential DOLA grant funding and current capital, this project would not require financing but could still be implemented through an EPC due to its robust scope which includes energy efficiency, building electrification, EV charging and onsite solar.

FISCAL IMPACT:

Fiscal impacts related to the Internal Decarbonization Plan have already been incorporated in the 2023 budget. $3 million has been budgeted in the Capital Improvement Plan over 2023 and 2024 for implementation of the Internal Decarbonization Plan. The project identifies longer-term planning for needs related to electrification of City facilities, fleet and equipment. If the Plan is approved, staff will address funding needs through the 2025-2026 budget process, for further discussion.

CITY COUNCIL OPTIONS:

1. Adopt the Internal Decarbonization Plan and explore implementation option 3, near term improvements with solar, through the Colorado Energy Office's Energy Performance Contracting (EPC) program and grant funding.

2. Adopt the Internal Decarbonization Plan and explore the Recreation & Senior Center as a pilot EPC project; explore additional near term improvements through EPC in the future.
3. Do not adopt Internal Decarbonization Plan and direct staff accordingly.

STAFF RECOMMENDATION:
Staff recommends adoption of the Internal Decarbonization Plan and exploring implementation option 3, near term improvements with solar, through the Colorado Energy Office's EPC program and grant funding.

PROGRAM/SUB-PROGRAM IMPACT:
Energy efficiency upgrades both positively impact the Sustainability and Facilities Maintenance sub-programs by reducing energy consumption and realizing cost savings. The objective of the Sustainability sub-program is to use environmental, economic, and human resources to meet present and future needs without compromising the ecosystems on which we depend and to "actively pursue energy efficient upgrades to realize cost savings and reduce environmental impacts." The objective of the Facilities Maintenance sub-program is to "provide and manage facilities that maintain efficient and effective operations and promote environmental and economic sustainability."

Future renewables and electric vehicle planning will further support the Sustainability, Facilities Maintenance, and Fleet Maintenance sub-programs by further conserving resources, increasing operational efficiency, and reducing operational negative environmental impact.

ATTACHMENT(S):
1. Resolution No. 48, Series 2023
2. Implementation option 2 amortization schedule
3. Implementation option 3 amortization schedule
4. Near term implementation utility savings by category
5. McKinstry Final Report
6. Sustainability Advisory Board memo
7. Internal Decarbonization Plan contract (which includes Internal Decarbonization Plan RFP and McKinstry proposal)
8. Public Comments
9. Council Presentation Slides

STRATEGIC PLAN IMPACT:

☒	**Financial Stewardship & Asset Management**	☐	**Reliable Core Services**
☐		☒	**Quality Programs &**

	Vibrant Economic Climate		Amenities
☐	Engaged Community	☐	Healthy Workforce
☒	Supportive Technology	☐	Collaborative Regional Partner

RESOLUTION NO. 48
SERIES 2023

A RESOLUTION APPROVING AN INTERNAL DECARBONIZATION PLAN FOR THE CITY OF LOUISVILLE ORGANIZATION

WHEREAS, the City of Louisville remains committed to its adopted goals to reduce energy consumption, increase clean energy sources, and support the transition to a low-carbon community as outlined in the Sustainability Action Plan and Resolution 25, Series 2019, "A Resolution Setting Clean Energy and Carbon Reduction Goals"; and

WHEREAS, the City previously entered into an Agreement By and Between the City of Louisville and McKinstry Essention, LLC for Consulting Services concerning the development and implementation of a Decarbonization Plan for the City organization ("Internal Decarbonization Plan") which plan has now been completed; and

WHEREAS, the Internal Decarbonization Plan reflects the City's vision in reducing greenhouse gas emissions through facility, fleet, and equipment electrification and renewable energy installation; and

WHEREAS, having reviewed the Internal Decarbonization Plan, the City Council finds its contents acceptable and supportive of the City's vision as outlined in the City's Sustainability Action Plan, and thus desires to approve and adopt the same.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF LOUISVILLE, COLORADO:

Section 1. The Internal Decarbonization Plan, dated October 4, 2023, a copy of which accompanies this Resolution, is hereby approved and adopted.

Section 2. The Internal Decarbonization Plan is intended to serve as a strategic roadmap to guide the City's internal decarbonization efforts, but shall not bind the City to any particular course of action, implementation benchmarks, or timeline.

PASSED AND ADOPTED this 10th day of October, 2023.

_____
Dennis Maloney, Mayor

ATTEST:

_____
Meredyth Muth, City Clerk

Internal Decarbonization Plan

Amortization Schedule – Implementation Option 2

Energy Performance Contract, No Solar

Short Term Recommendations – Energy efficiency (10 facilities), building electrification & EV charging (5 facilities)

PROJECT COSTS (PRESENT VALUE)		
"Near Term" Project Cost (Current Dollars)*		$15,100,000
Other Costs		$0
Transaction Costs		$0
Gross Project Costs		$15,100,000
Grants and Stimulus **		$1,000,000
Project Cost after Rebate/Incentive		$14,100,000
Customer Capital Contribution		$0
Amount Financed		$14,100,000

ANNUAL PROJECT COSTS (PRESENT VALUE)	
Utilities	$38,000

ESCALATORS & RATES		
Electricty Costs		2.50%
Natural Gas Costs		4.38%

	Annual Savings	Cash Flow Analysis		
Year	Total Utility Costs	Loan Balance	Total Payment	Customer Capital Contribution
1	($38,000)	$14,100,000	$881,250	$881,250
2	($38,950)	$13,218,750	$881,250	$881,250
3	($39,924)	$12,337,500	$881,250	$881,250
4	($40,922)	$11,456,250	$881,250	$881,250
5	($41,945)	$10,575,000	$881,250	$881,250
6	($42,994)	$9,693,750	$881,250	$881,250
7	($44,068)	$8,812,500	$881,250	$881,250
8	($45,170)	$7,931,250	$881,250	$881,250
9	($46,299)	$7,050,000	$881,250	$881,250
10	($47,457)	$6,168,750	$881,250	$881,250
11	($48,643)	$5,287,500	$881,250	$881,250
12	($49,859)	$4,406,250	$881,250	$881,250
13	($51,106)	$3,525,000	$881,250	$881,250
14	($52,383)	$2,643,750	$881,250	$881,250
15	($53,693)	$1,762,500	$881,250	$881,250
16	($55,035)	$881,250	$881,250	$881,250
17	($56,411)	$0	$0	$0
18	($57,821)	$0	$0	$0
19	($59,267)	$0	$0	$0
20	($60,749)	$0	$0	$0
21	($62,267)	$0	$0	$0
22	($63,824)	$0	$0	$0
23	($65,420)	$0	$0	$0
24	($67,055)	$0	$0	$0
25	($68,732)	$0	$0	$0
26	($70,450)	$0	$0	$0
27	($72,211)	$0	$0	$0
28	($74,016)	$0	$0	$0
29	($75,867)	$0	$0	$0
30	($77,763)	$0	$0	$0
31	($79,708)	$0	$0	$0
32	($81,700)	$0	$0	$0
33	($83,743)	$0	$0	$0
34	($85,836)	$0	$0	$0
35	($87,982)	$0	$0	$0
36	($90,182)	$0	$0	$0
37	($92,436)	$0	$0	$0
Totals	($2,269,890)	N/A	$14,100,000	$14,100,000

*	Includes HVAC electrification, EV charging and load reduction for all of Near Term. Middle estimate within range used
**	$1M in grants for implementation- $2.8M IRA tax credit from solar was removed.

Internal Decarbonization Plan

Amortization Schedule – Implementation Option 3

Energy Performance Contract, Near Term Recommendations

Near Term Recommendations – Energy efficiency (10 facilities), building electrification & EV charging (5 facilities), onsite solar (7 facilities)

PROJECT COSTS (PRESENT VALUE)		
"Near term" Project Cost*		$22,850,000
Other Costs		$0
Transaction Costs		$0
Gross Project Costs		$22,850,000
Grants and Stimulus **		$8,700,000
Project Cost after Rebate/Incentive		$14,150,000
Customer Capital Contribution		$0
Amount Financed		$14,150,000

ANNUAL PROJECT SAVINGS (PRESENT VALUE)	
Utilities	$362,000

ESCALATORS		
Electricty Costs		2.50%
Natural Gas Costs		4.38%

	Annual Savings	Cash Flow Analysis		
Year	Total Utility Savings	Loan Balance	Total Payment (Utility Savings + Capital)	Customer Capital Contribution
1	$335,000	$14,150,000	$813,602	$478,602
2	$343,375	$13,336,398	$821,977	$478,602
3	$351,959	$12,514,422	$830,561	$478,602
4	$360,758	$11,683,861	$839,360	$478,602
5	$369,777	$10,844,501	$848,379	$478,602
6	$379,022	$9,996,122	$857,623	$478,602
7	$388,497	$9,138,499	$867,099	$478,602
8	$398,210	$8,271,400	$876,811	$478,602
9	$408,165	$7,394,589	$886,767	$478,602
10	$418,369	$6,507,822	$896,971	$478,602
11	$428,828	$5,610,852	$907,430	$478,602
12	$439,549	$4,703,422	$918,151	$478,602
13	$450,538	$3,785,271	$929,139	$478,602
14	$461,801	$2,856,132	$940,403	$478,602
15	$473,346	$1,915,729	$951,948	$478,602
16	$485,180	$963,781	$963,781	$478,602
17	$497,309	$0	$0	$0
18	$509,742	$0	$0	$0
19	$522,486	$0	$0	$0
20	$535,548	$0	$0	$0
21	$548,937	$0	$0	$0
22	$562,660	$0	$0	$0
23	$576,726	$0	$0	$0
24	$591,145	$0	$0	$0
25	$605,923	$0	$0	$0
26	$621,071	$0	$0	$0
27	$636,598	$0	$0	$0
28	$652,513	$0	$0	$0
29	$668,826	$0	$0	$0
30	$685,546	$0	$0	$0
31	$702,685	$0	$0	$0
32	$720,252	$0	$0	$0
33	$738,259	$0	$0	$0
34	$756,715	$0	$0	$0
35	$775,633	$0	$0	$0
36	$795,024	$0	$0	$0
37	$814,899	$0	$0	$0
Totals	$20,010,873	N/A	$14,150,000	$7,657,625

*	Includes HVAC electrification, renewables, EV charging and load reduction for all of near term measures. Middle estimate within range used
**	Assumes resiliency grant ($5M); beneficial electrification grant ($1M) and tax credit for solar is secured

Internal Decarbonization Plan – Utility Savings by Category, Near Term Implementation Option 3

Year	Phase	Annual Electrification Costs*	Annual Efficiency Utility Savings*	Annual PV Utility Savings*	Windsource Savings	Total
1	Near Term	($82,000)	$44,000	$310,000	$25,000	$330,000
2	Near Term	($84,050)	$45,100	$317,750	$25,750	$340,550
3	Near Term	($86,151)	$46,228	$325,694	$26,523	$352,293
4	Near Term	($88,305)	$47,383	$333,836	$27,318	$371,232
5	Near Term	($90,513)	$48,568	$342,182	$28,138	$404,375
6	Near Term	($92,775)	$49,782	$350,737	$28,982	$417,725
7	Near Term	($95,095)	$51,027	$359,505	$29,851	$475,288
8	Near Term	($97,472)	$52,302	$368,493	$30,747	$514,069
9	Near Term	($99,909)	$53,610	$377,705	$31,669	$549,075
10	Near Term	($102,407)	$54,950	$387,148	$32,619	$564,310
11	Near Term	($104,967)	$56,324	$396,826	$33,598	$585,781
12	Near Term	($107,591)	$57,732	$406,747	$34,606	$610,493
13	Near Term	($110,281)	$59,175	$416,916	$35,644	$625,454
14	Near Term	($113,038)	$60,654	$427,338	$36,713	$645,668
15	Near Term	($115,864)	$62,171	$438,022	$37,815	$659,144
16	Near Term	($118,760)	$63,725	$448,972	$38,949	$678,886
17	Near Term	($121,729)	$65,318	$460,197	$40,118	$688,903
Total		**($1,710,908)**	**$918,048**	**$6,468,066**	**$544,040**	**$8,813,246**

*Includes utility escalation of 2.5%

Majority of utility savings are attributed to onsite solar PV. “Electrification Costs” refer to the increased electricity costs as the City transitions from natural gas to electric equipment. Near term Plan measures result in average of $330,000 in utility savings per year. Through Energy Performance Contracting, this annual savings is reallocated towards loan payments.

Internal Decarbonization Plan
Final Report

CITY OF LOUISVILLE

LOUISVILLE, COLORADO
OCTOBER 4, 2023

City of Louisville
COLORADO • SINCE 1878

McKinstry
For The Life Of Your Building

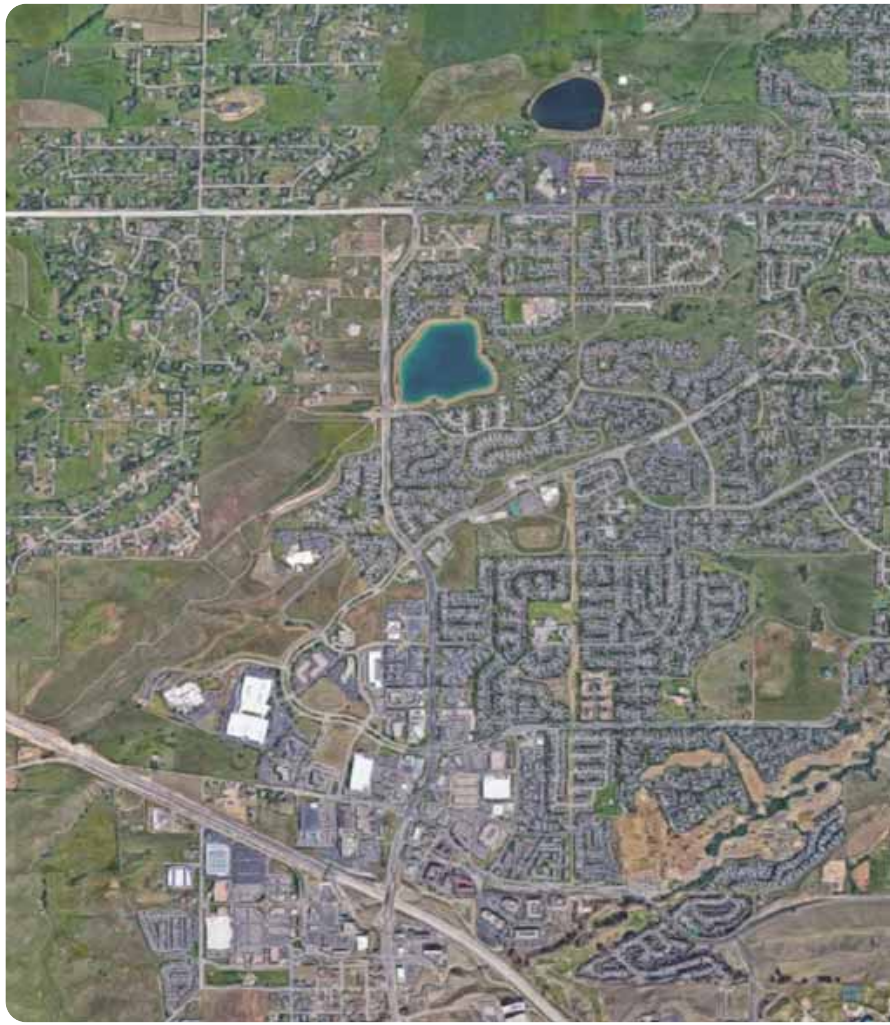
Table of Contents

Date	Version History
8/8/2023	Final Report Issued
9/19/2023	V2 - Revision
10/4/2023	V3 - Revision

Table of Contents Abbreviations

Abbreviation	Definition
AHU	Air Handling Unit
ASHP	Air Source Heat Pump
AWHP	Air to Water Heat Pump
CO2	Carbon Dioxide
CO2e	Carbon Dioxide Equivalent
CHW	Chilled Water
DHW	Domestic Hot Water
dT or DeltaT	Temperature Difference
ERV	Energy Recover Ventilator
EUI	Energy Use Intensity
EV	Electric Vehicle
FCA	Facility Condition Assessment
GC	General Contractor
GSHP	Ground Source Heat Pump
HHW	Heating Hot Water
HPWH	Heat Pump Water Heater
HVAC	Heating Ventilation Air Conditioning
IRA	Inflation Reduction Act
ITC	Investment Tax Credit

Abbreviation	Definition
kVA	Kilovolt-Ampere
kW	Kilowatt
kWh	Kilowatt-Hour
kWp	Kilowatt Peak
LED	Light Emitting Diode
MAU	Makeup Air Unit
MW	Mega Watt
NDHU	Natatorium Dehumidification Unit
PV	Photovoltaic
RCx	Retro Commissioning
ROM	Rough-Order-of-Magnitude
RTU	Rooftop Unit
SCC	Social Cost of Carbon
SHW	Service Hot Water
VAV	Variable Air Volume
VRF	Variable Refrigerant Flow
WWHP	Water to Water Heat Pump



Background

In August of 2019, City Council passed Resolution 25, Series 2019, which set clean energy and carbon emission reduction goals for the municipality and larger community, including:

- **Meeting 100% of Louisville's municipal electric needs with 100% carbon-free sources by 2025**
- **Reducing core municipal greenhouse gas emissions annually below the 2016 baseline through 2025.**

The City of Louisville also adopted Resolution 25-2019 (Setting Clean Energy and Carbon Emission Reduction Goals), and a Sustainability Action Plan (adopted in October 6, 2020). On December 30, 2021, the massive Marshall Fire raged in portions of the Front Range, destroying 550 homes and businesses in Louisville alone. Climate change, which much of the fire is attributed to, became very real to the City, which had already been establishing decarbonization targets. The fire accelerated the City's sense of urgency to act to eliminate its own carbon footprint.

In response to this urgency, in summer and fall 2022, the City contracted for the creation of a study, analysis, and strategic roadmap for electrification and decarbonization of 100% of City buildings, fleet, equipment and operations* by 2030 (as part of this study, an alternative completion target was determined). **This document is the outcome of that effort.**

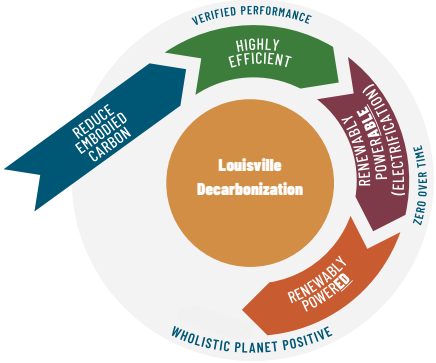
Environmental, Community, and Financial Stewardship and Leadership

Louisville is already aggressively pursuing a path to decarbonization of its own operations through efficiency and renewable electricity. This roadmap establishes a pathway to complete decarbonization, including: additional efficiency measures, renewables, and electrification of buildings, vehicles, and miscellaneous equipment. Louisville will be one of the first jurisdictions in the United States to aggressively embark on decarbonized operations. By taking responsibility for its carbon and climate impacts, Louisville is an exemplar to its own residents as well as the broader world. On a more focused level, the specific efforts Louisville is taking provide a "show and tell" opportunity for decarbonization through communications to City residents and beyond.

**Note this roadmap does not include decarbonization for water and wastewater process loads, purchasing, solid waste/recycling/composting, or street lighting. It also does not include equipment that is used via third-party contracts.*

What is Involved in Decarbonization

What is decarbonization? It is the process of eliminating all activities that generate CO2 and other greenhouse gases (in aggregate, known as CO2e -equivalent). Today, the city's operations (buildings, fleet, miscellaneous equipment) generate 3,400 metric tons of CO2e annually, which is equivalent to the carbon generated by 430 homes in a year.



Eliminating Louisville's carbon footprint requires focus on four main areas:

Embodied Carbon Retrofitting existing buildings, rather than tearing down and building new zero carbon buildings, reduces the carbon inherent in the construction process.

Efficiency & Load Reduction Reducing building energy use, and thereby reducing carbon emissions, reduces the amount of renewable energy needed for total decarbonization.

Renewably Powerable Reducing on-site fossil fuel burning via electrification allows the building to be powered by renewable sources.

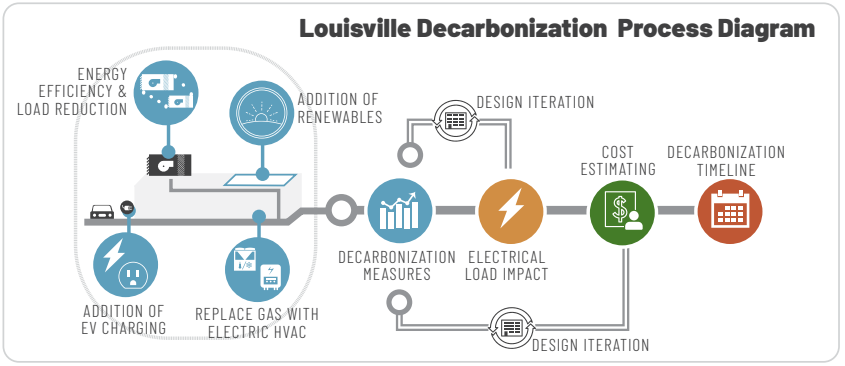
Renewably Powered
Optimizing the mix of available renewable zero-carbon sources leads to decarbonization at the best value for the City of Louisville.

Note that these activities aren't necessarily implemented sequentially – this plan identifies the most cost-effective and high-value phasing plan for implementation .

Core Principles

There are a number of big picture principles and concepts that further illuminate this plan:

- **Be fiscally responsible and avoid replacing equipment before it is worn out.** Allocate the replacement budget to the decarbonized alternative instead, which will typically save 25-50% of the capital cost. Also work within the context of existing equipment and reuse existing systems wherever possible. Completely tearing out and replacing systems has higher embodied carbon, is usually more costly, and always more disruptive.
- **Use proven technologies.** Full zero carbon performance can be achieved via current technologies. Louisville needs results and should not be a guinea pig for untested technologies.
- **Provide the greatest value for least cost.** Full decarbonization, particularly electrification, is expensive. It is critical to pursue the various financial incentives available at the local, state, and federal level. In addition, many decarbonization measures can provide co-benefits, providing value streams that offset costs.
- **Zero carbon power.** Louisville acquires 100% renewable electricity through utility purchase programs, so all electrical uses are assumed to emit zero carbon. However, reducing energy and electrical load has other financial benefits and related co-benefits.



Key Findings

Clear, full, decarbonization pathways exist for all City buildings and its fleet. In most cases these approaches are based on retrofitting the existing HVAC systems, not gutting the building entirely.

Efficiency and load reduction strategies often have lower life-cycle costs than current electricity costs. These are outlined in greater detail in the individual building reports and are recommended for immediate implementation.

Hybrid building electrification is an excellent near and mid-term approach. Hybrid mechanical heating systems, which utilize electricity as the primary heating source and natural gas as a backup, achieve the decarbonization "sweet spot" via substantial carbon reductions (i.e. 75%+) while reducing overall costs up to 50%.

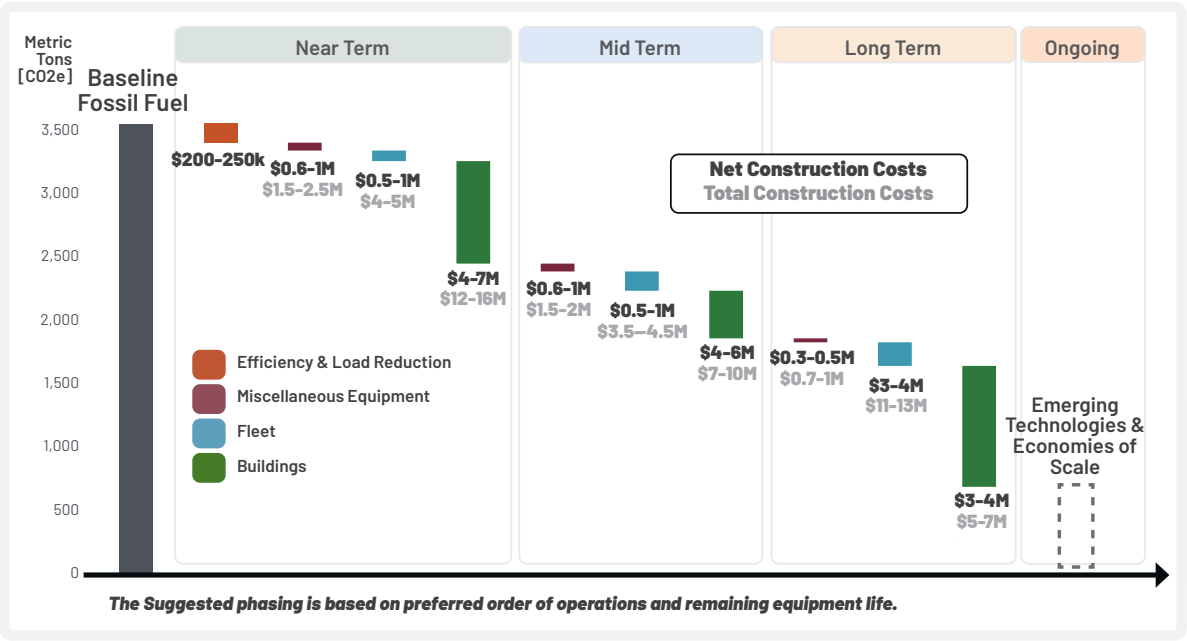
City-owned renewable electricity generation will reduce utility costs and provide greater benefit to the Louisville community. Substantial opportunities exist for on-site renewable electricity. A combination of Inflation Reduction Act and Xcel Energy incentives make this a very attractive option for the City and result in on-site renewable electricity being cheaper than utility-provided electricity. In addition, on-site renewables provide additional resiliency and signal the City's commitment to decarbonization

Key Recommendations

Based on the findings above and detailed findings throughout this report, a formal adoption of the City's decarbonization target is recommended:

- **100% Decarbonization by 2040**
- **Retain 100% Renewable Electricity** (underway)
- **Decarbonization Plan Progress Update Every 5-7 Years**

Fossil Fuel Emissions

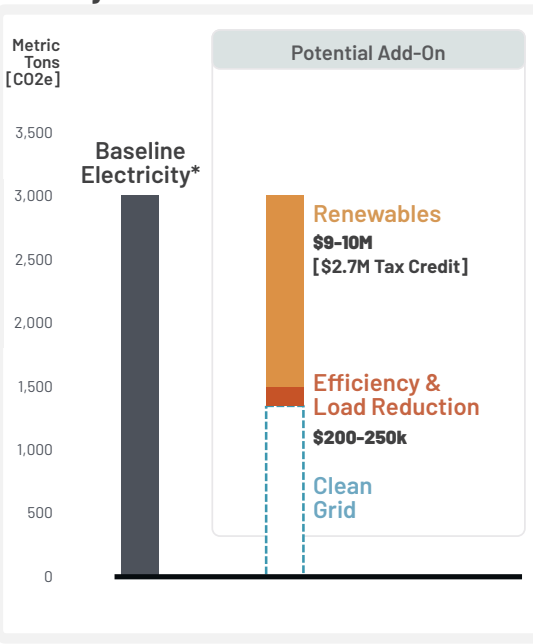


The Suggested phasing is based on preferred order of operations and remaining equipment life.

Efficiency & Load Reduction & Renewables reduce electricity that would need to be offset by nearly **50%**.

Emerging technologies & economies of scale will help bring Louisville to **Zero Carbon** emissions.

Electricity Emissions



Cost Summary Table	
Total Construction Costs	~$51M
Total Like-for-Like Construction Costs (costs that the City would continue to pay)	(~$27M)
Lifecycle Utility Cost Savings (Utility, Fleet, Solar)	($7M)
Total Grants	($3M-13M)
Total Net Cost of Decarbonization (varies based on final grant awards)	**$4M-14M**

Notes:

Total Construction Costs: Total **turnkey** construction costs needed for budgetary purposes. **Costs do not include incentives or grants. The Inflation Reduction Act will potentially offset 30-40% of the cost of renewables and fleet.**

Total Like-for-Like Construction Costs: The **turnkey** "business as usual" costs for replacing existing fossil fuel equipment with similar fossil fuel equipment. Costs were derived from a combination of the City's CIP budget and detailed cost estimating of equipment replacement as the comparison scenario.

Net Construction Costs: (Total Construction Costs) - (Total Like-for-Like Construction Costs)

Total Net Cost of Decarbonization: (Total Construction Costs) - (Total Like-for-Like Construction Costs) - (Total Project Savings + Total Grants)

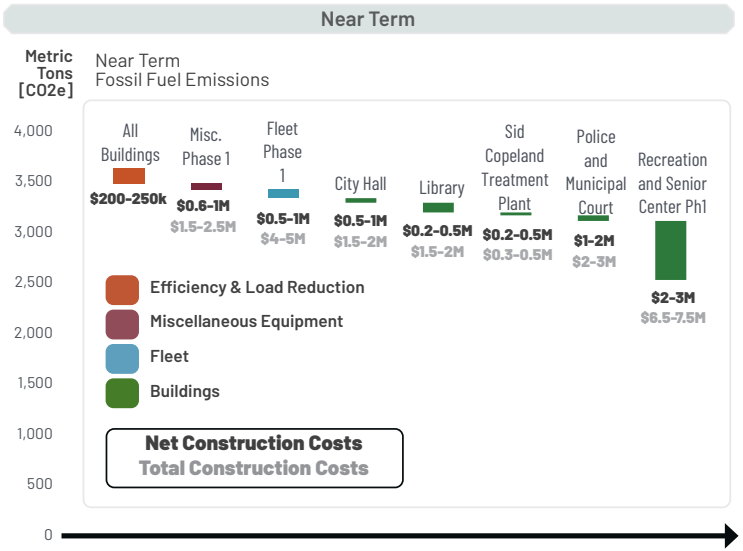
Turnkey Costs: Include design, engineering, construction management, project management, and commissioning.

Building costs include costs associated with EV charging (chargers and electrical infrastructure upgrades)

*Assumes 2023 Xcel Grid Mix

Savings Summary by Measure	Life Cycle Carbon Reduced	Baseline Carbon % Reduction	Baseline Electricity Offset
Building Hybrid Electrification	34,000 tonnes	60%	-
Fleet Electrification	6,500 tonnes	12%	-
Miscellaneous Electrification	2,500 tonnes	4%	-
Efficiency & Load Reduction	2,400 tonnes	4%	5%
Renewables	-	-	45%
Total	**45,400 tonnes**	**82%**	**50%**

Near Term Roadmap



Near Term Projects

Efficiency & Load Reduction

All Buildings

Renewables

(2.5) MW

(8) Sites

Evaluate Xcel renewable purchase needed for 100% offset after installation.

Miscellaneous Electrification

Replace ~40% of remaining gas equipment

Fleet Electrification

(62) Vehicles
(36) ICE - Internal Combustion*
(26) EV - Electric Vehicle

Building Hybrid Electrification & EV Charging

City Hall

(2) Heat Pump RTUs
(17) VAVs
(1) ERV + ASHP
(7) EV Chargers

Library

(3) Heat Pump RTUs
(1) Electric DHW
(9) EV Chargers

Sid Copeland Water Treatment

(1) Heat Pump RTUs
(7) Electric Unit Heaters
(3) EV Chargers

Police & Municipal Court

(3) Heat Pump RTUs
(7) Electric Unit Heaters
(6) EV Chargers

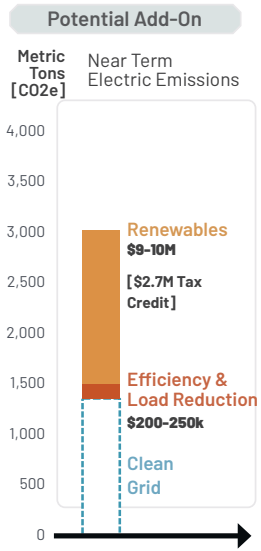
Recreation & Senior Center Ph1

(13) Heat Pump RTUs
(1) Pool NDHU
(5) EV Chargers

**Part of the fleet, including police vehicles, do not currently have a viable EV replacement that will be market-ready before the existing vehicles need replacement. Therefore, some ICE's are still necessary for the initial phases of this plan.*

See the appendices of the building audit reports for detailed descriptions of scope for each decarbonization measure.

Add-On



Near Term Implementation Notes

Renewable Phasing

Renewables are recommended to be implemented right away to take advantage of existing federal and state funding options.

Efficiency & Load Reduction Phasing

Efficiency & load reduction measures are recommended to be implemented right away to realize any potential downsizing for mechanical and electrical systems as buildings are upgraded in the future.

Recreation Center Phasing

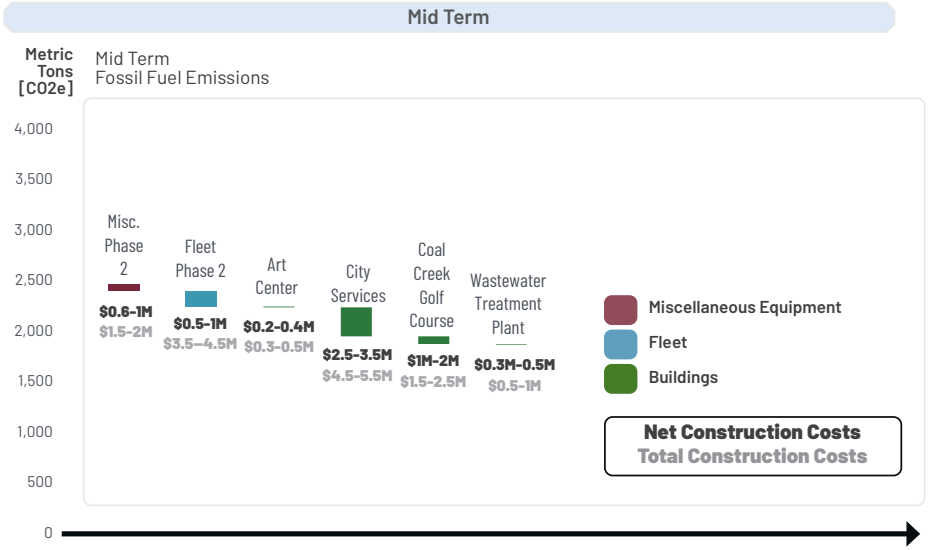
The Recreation & Senior Center measures are split into two phases. The first phase addresses the majority of the RTUs that are near end-of-life and one of the pool natatorium dehumidification units (NDHUs).

Near Term Summary Table

Measures	Life Cycle Carbon Reduced [tonnes]	Total Construction Costs*	Total Like-for-Like Construction Costs*	Net Construction Costs*
Building Hybrid Electrification	13,000	$12-16M	$8.1-9M	$3.9-7M
Fleet Electrification	1,300	$4-5M	$3.5-4M	$0.5-1M
Miscellaneous Electrification	1,000	$1.5-2.5M	$0.9-1.5M	$0.6-1M
Efficiency & Load Reduction	2,400	$0.4-0.5M	-	$0.4-0.5M
Renewables	-	$9-10M	-	$9-10M
Total	**17,700**	**$27-34M**	**$13-15M**	**$14-20M**

*Costs do not include incentives or grants. The Inflation Reduction Act will potentially offset 30-40% of the cost of renewables and fleet.

Mid Term Roadmap



Mid Term Projects

Building Hybrid Electrification & EV Charging

Coal Creek Golf Course

(1) Heat Pump RTUs
(2) ERV + ASHP
Kitchen Electrification
(4) Electric Unit Heaters
(3) EV Chargers

Art Center

(1) ERV + ASHP

Wastewater Treatment Plant

(1) ASHP
(1) Electric Unit Heaters
(1) Electric DHW
(2) EV Chargers

City Services

(1) ERV + WC VRF System
(1) AHU Coil Retrofit
(1) Hydronic AWHP
(1) Electric Hotsy Washer
(~50) Electric Unit Heaters
(1) Electric DHW
(28) EV Chargers

Fleet Electrification

(35) Vehicles
(11) ICE - Internal Combustion
(24) EV - Electric Vehicle

Miscellaneous Electrification

Replace ~40% of remaining gas equipment

See the appendices of the building audit reports for detailed descriptions of scope for each decarbonization measure.

Mid Term Implementation Notes

City Services

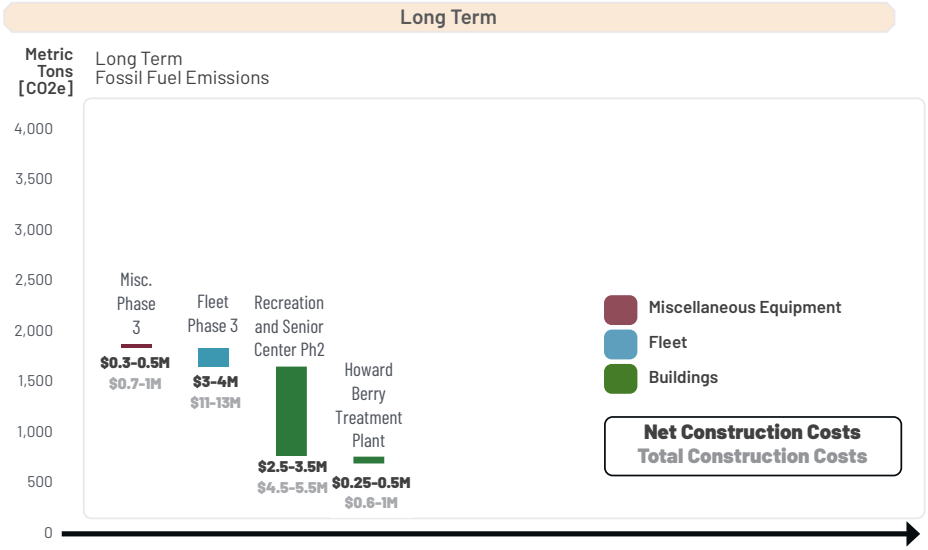
Significant upgrades occur at the City Services building where both major building electrification upgrades and EV Charging upgrades are proposed. EV charging scope at City Services is the largest as it will be the home to the majority of the city's fleet.

Mid Term Summary Table

Measures	Life Cycle Carbon Reduced [tonnes]	Total Construction Costs*	Total Like-for-Like Construction Costs*	Net Construction Costs*
Building Hybrid Electrification	6,000	$6.8-10.1M	$2.8-3.7M	$4-6.4M
Fleet Electrification	2,400	$3.5-4.5M	$3-3.5M	$0.5-1M
Miscellaneous Electrification	1,000	$1.5-2M	$0.9-1M	$0.6-1M
Efficiency & Load Reduction	-	-	-	-
Renewables	-	-	-	-
Total	**9,400**	**$12-17M**	**$7-8M**	**$5-8M**

*Costs do not include incentives or grants. The Inflation Reduction Act will potentially offset 30-40% of the cost of renewables and fleet.

Long Term Roadmap



Long Term Projects

Building Hybrid Electrification & EV Charging

Howard Berry Treatment Plant

(1) Electric MAU
(2) Electric Unit Heaters

Recreation & Senior Center Ph2

(1) Pool NDHU
(6) Pool Heat Pump Water Heaters
(1) DHW Heat Pump

Fleet Electrification

(116) vehicles
(1) ICE - Internal Combustion
(115) EV - Electric Vehicle
(68) 2031-2035
(48) 2036-2040

Miscellaneous Electrification

Replace ~20% of remaining gas equipment

See the appendices of the building audit reports for detailed descriptions of scope for each decarbonization measure.

Long Term Implementation Notes

Recreation & Senior Center

The remaining Recreation & Senior Center upgrades are completed during this phase. Note that the remaining gas RTUs are not electrified due to existing electrical capacity. Re-evaluate existing electrical capacity at the time of this study to see if additional RTUs can be electrified.

Long Term Summary Table

Measures	Life Cycle Carbon Reduced [tonnes]	Total Construction Costs*	Total Like-for-Like Construction Costs*	Net Construction Costs*
Building Hybrid Electrification	15,000	$5-7M	$2.3-3M	$2.8-4M
Fleet Electrification	3,000	$11-13M	$8.5-9M	$2.5-4M
Miscellaneous Electrification	500	$0.7-1M	$0.4-0.5M	$0.3-0.5M
Efficiency & Load Reduction	-	-	-	-
Renewables	-	-	-	-
Total	**18,500**	**$17-21M**	**$11-13M**	**$6-9M**

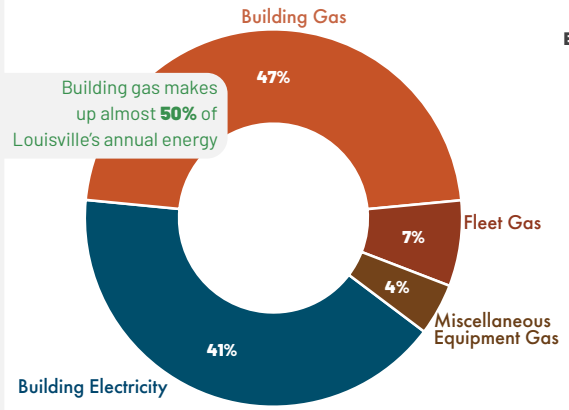
*Costs do not include incentives or grants. The Inflation Reduction Act will potentially offset 30-40% of the cost of renewables and fleet.

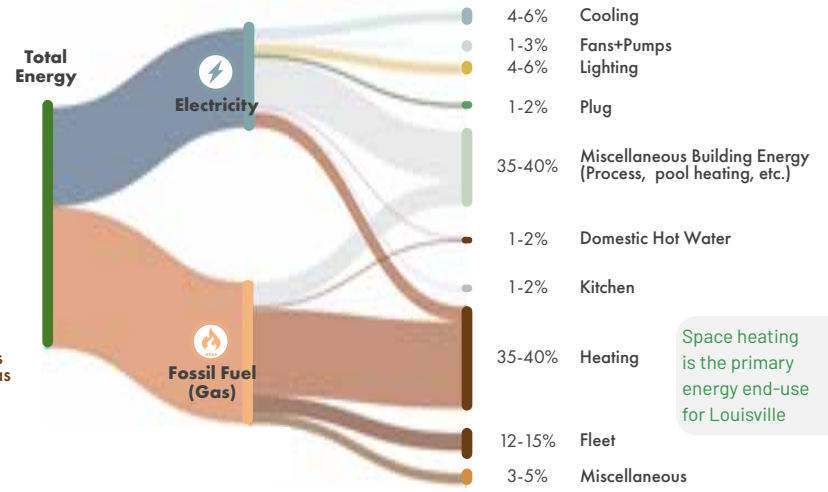
Energy vs Carbon

Energy use and carbon emissions are sometimes used interchangeably, but they are quite different. Carbon emissions come from burning fossil fuels – those burnt fossil fuels provide energy to buildings. Energy can also be provided to buildings via zero-carbon sources, such as renewables.

The City of Louisville participates in programs to offset their existing electrical consumption with renewable sources. **Therefore, for the purposes of this study the total carbon emissions at Louisville will be solely driven by on-site fossil fuel combustion and emissions associated with electric consumption will be zero.**

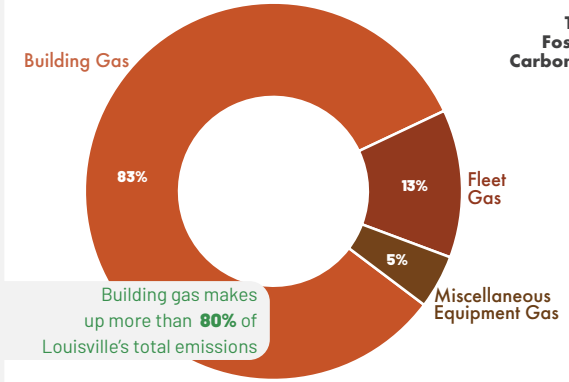
Energy End-Use

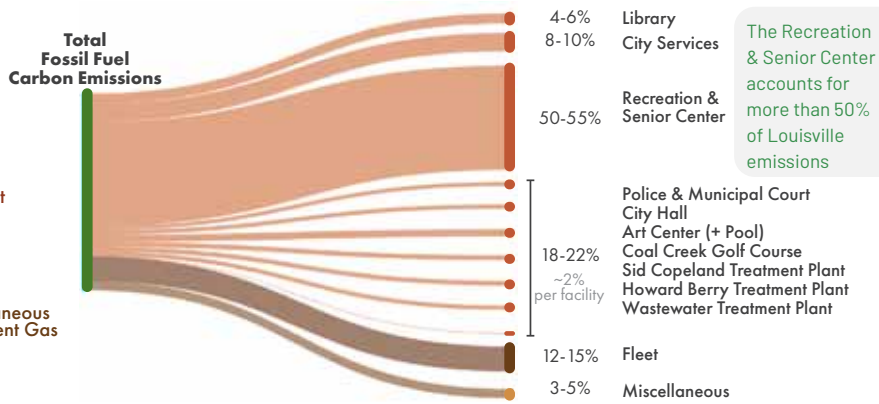




Space heating is the primary energy end-use for Louisville

Fossil Fuel Carbon Emission End-Use





The Recreation & Senior Center accounts for more than 50% of Louisville emissions

Cost of Zero Carbon Electricity

The City's decarbonization approach is predicated on 100% renewable electricity. Given this, the question becomes, **what is the best source of renewable power for the Louisville's operations?**

The table to the right summarizes the cost of zero carbon electricity. **Based on this assessment, acquisition of renewable electricity over time is recommended to follow the following prioritization:**

- **Decrease electrical demand through efficiency & load reduction.**
- **On-site renewables**
- **Renewable percentage inherent in standard Xcel electricity over time**
- **Xcel windsource**

Based on this hierarchy, and given the City's current use of Xcel standard and Windsource electricity, this plan identifies the best opportunities for efficiency and on-site renewables for the City.

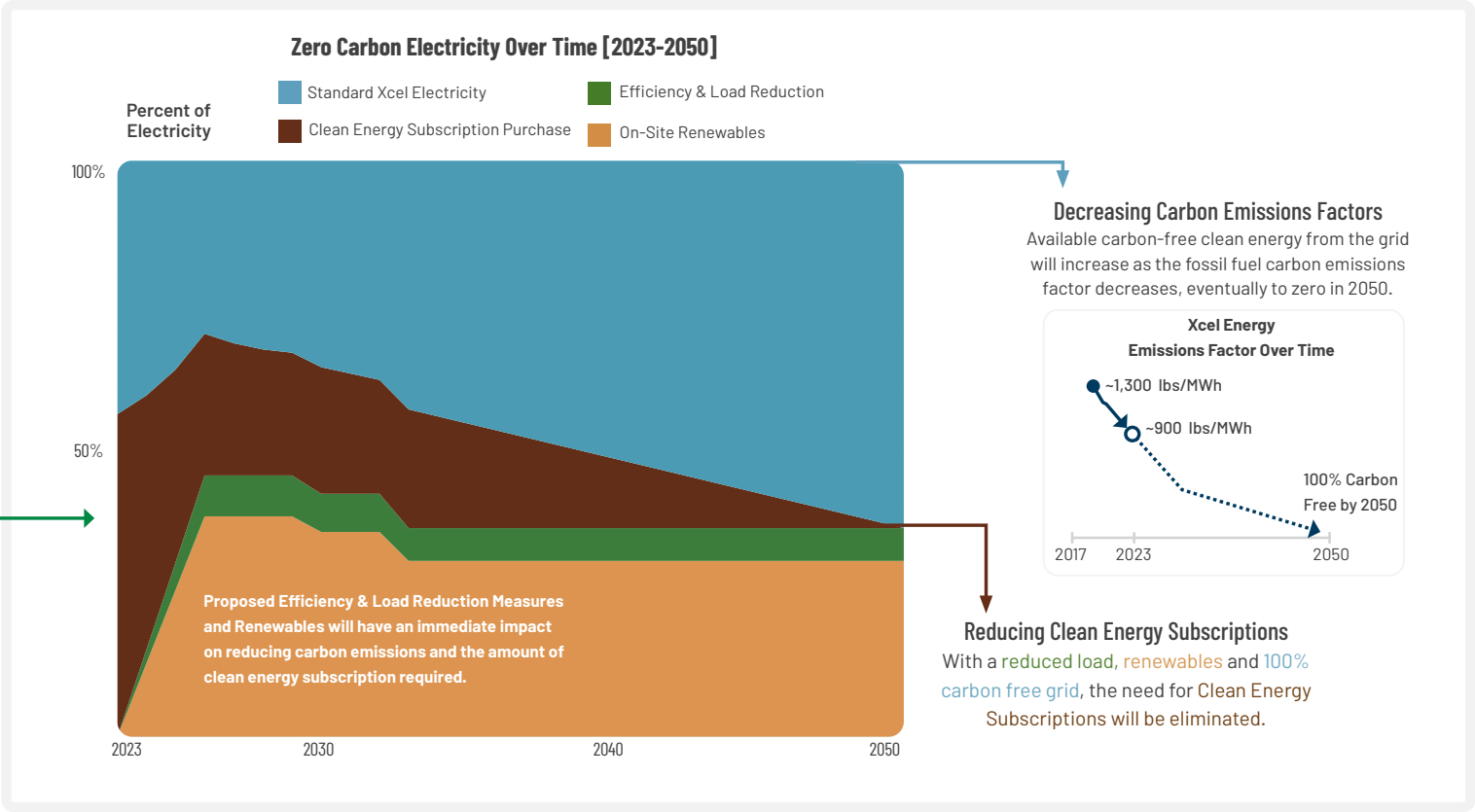
Type	$/kWh	Pros	Cons
Efficiency & Load Reduction	**0.04 $ / kWh**	• Reduces islanded electricity demand during power outages • Sometimes includes co-benefits • Avoids line loss of utility scale solar • Avoids solar/wind impacts of utility scale renewables	• Some facility disruption; contracting time/process
On-site Renewables	**0.065 $ / kWh** (assumes 25.5% IRA direct payment)	• Demonstrate decarbonization to local Louisville community and encourage others to do same • Avoid solar sprawl at scale - avoiding impacts to rural areas • Enable immediate accrual of energy benefits • 25% of cost incentive available through Inflation Reduction Act • Production incentives available from Xcel with REC sale • Avoid electrical energy loss due to transmitting power over long distances • When on-site renewables are a small percentage of the total usage of facility – such as Louisville's on-site opportunities - most solar electricity would be self used and thus not negatively impact grid • Enable future resiliency through addition of batteries and storage	• Requires maintenance (cost included in cost per kwh to left) • Best installed in conjunction with roof replacement, limiting time window • Can only provide portion of needed renewable electricity
Standard Xcel Electricity	**0.065-0.070 $ / kWh**	• Provides some renewable electricity inherent in mix, increasing over time • More expensive than on-site solar per kwh • Ease of implementation, will occur on its own over time –no need for contracting for on-site renewable installation	• Possibility of Xcel not meeting promised renewable target/uncertainty/longer uptake • Solar and wind sprawl/impacts in rural/farming areas • Line loss/less efficient • Doesn't support resiliency
Xcel Windsource	**0.07-0.08 $ / kWh** (base rate + 0.015 $/kWh)	• Enables immediate provision of 100% renewable electricity; not subject to allocation • Ease of implementation –no need for contracting for on-site renewable installation • Contractually guaranteed renewable source	• Most expensive source of renewables • Avian and aesthetic impacts of wind turbines • Line loss/less efficient • Doesn't support islandability
Xcel Renewable Direct*	0.065-0.070 $ / kWh	• Approximate cost parity with standard grid electricity • If can be obtained, enables immediate acquisition of renewable power	• Not currently available • Limited availability, subject to new renewable projects • Solar and wind sprawl/impacts in rural/farming areas • Line loss/less efficient • Doesn't support resiliency

**Renewable Direct is only available occasionally based on subscription. There is a current waiting list to join.*

Zero Carbon Electricity Strategy

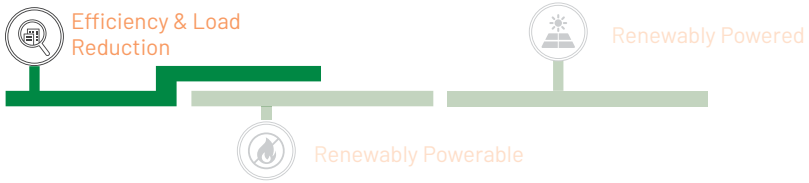
The City of Louisville will utilize a toolbox of strategies to successfully electrify and decarbonize emissions associated with on-site fossil fuel combustion. With an electric utility grid that still has fossil fuel emissions embedded, load reduction and renewables will be key in a quick carbon emissions decrease. Additionally, Xcel's commitment to achieve a 100% carbon free grid by 2050 will play a large role in the decarbonization effects of electrification over time. Combining all these strategies will eliminate the need for Clean Energy Subscriptions over time. The following strategies support the assumption that emissions associated with electric consumption will be zero.

Louisville currently **acquires more than 50% of its clean electricity through a clean energy subscription.** The rest of the city's electricity is from clean grid sources.



Efficiency & Load Reduction

The recent shift towards decarbonization still operates on the core foundation of reducing building's overall energy use. Measures can have two functions: reducing annual energy/carbon consumption and reducing peak building demand load. These measures are often incentivized by Xcel and may have shorter paybacks. Recommended measures throughout the city are summarized in the table below. See the appendices of the building audit reports for detailed descriptions of scope for each measure.



Load	Carbon	Measure	Art Center	City Hall	City Services	Coal Creek Golf Course	Library	Sid Copeland Treatment Plant	Police and Municipal Court	Recreation and Senior Center	Howard Berry Treatment Plant	Wastewater Treatment Plant
■	■	**GLAZING UPGRADES** Upgrade glazing units where failing/single-pane glazing still exists.	●	●						●		
□	■	**HVAC OCCUPANCY SENSORS** Provide occupancy sensors for HVAC setback.							●			
■	■	**POOL COVER** Provide pool cover for reduced evaporation losses.								●		
□	■	**PUMP VFDS** Provide variable speed for pumping systems.					●					
□	■	**CONTROLS OPTIMIZATION / RETRO-COMMISSIONING (RCX)** Optimization of existing controls sequence and operation.	●	●	●		●		●	●		
□	■	**SCHEDULE SAUNA** Provide temperature scheduling of Sauna during unoccupied hours.								●		
■	■	**DUCT AIR SEALING/INSULATION** Provide duct air sealing for leaky duct systems.					●					
■	■	**ENVELOPE AIR SEALING** Provide envelope air sealing for leaky buildings.	●	●	●	●	●	●	●	●		●
□	■	**LIGHTING CONTROLS/VACANCY SENSORS** Upgrade lighting controls for vacancy sensors.		●		●	●	●	●	●	●	●
□	■	**ADVANCED PLUG LOAD REDUCTION** Plug load reduction systems.		●	●	●	●		●	●		
■	■	**LED LIGHTING** Upgrade lighting to LED.		●				●			●	
□	■	**COMPRESSED AIR LEAKS** Provide commissioning to compressed air system to resolve any leaks.			●	●						
■	■	**ENVELOPE INSULATION** Provide envelope insulation upgrades where no-insulation or poor insulation exists.				●						

Why Are We Electrifying?

A powerful tool towards decarbonization is "electrification", which has become a big movement not just in the construction industry, but also in most industries of our society. There are a few driving principles behind this movement:

Electricity is currently produced using a range of sources:
- Carbon emitting fossil fuels – natural gas, coal, oil
- Zero-carbon sources – hydro-power, nuclear, wind, solar, etc.

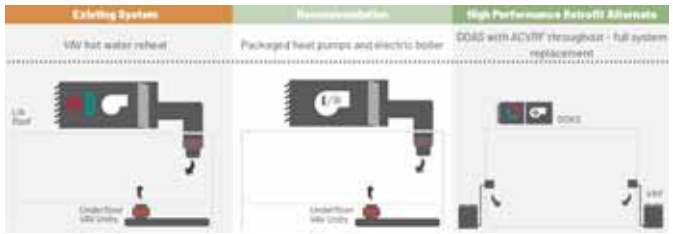
Natural gas inherently emits carbon when burned, meaning gas-based heating sources will always emit carbon

The power grid is shifting away from fossil fuels and towards zero-carbon sources, due to a variety of factors including economic, regulatory, and societal

Electrifying our heating systems means their carbon emissions will drop as the grid continues to add more renewables, eventually dropping to zero

The first step for electrifying space and water heating system was to evaluate various system options. Options were evaluated at each building site, where considerations like energy and carbon savings, incremental cost impact, complexity of design, and additional other factors were all considered when making a recommendation. **Please see the individual building audit reports for additional detail.**

HVAC System Matrix Example



Full Electrification vs Hybrid Electrification: Space & Water Heating Systems

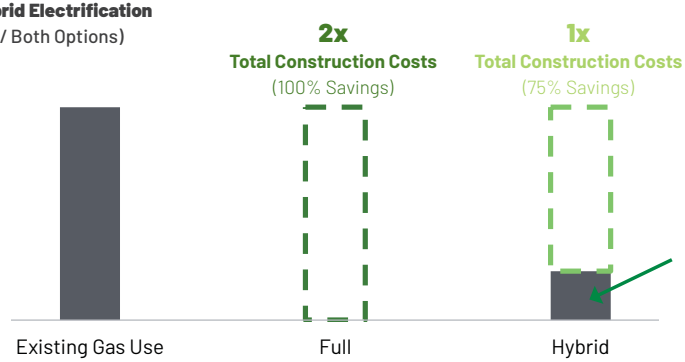
Heating is the single largest source of carbon emissions by Louisville, through burning of natural gas in boilers and furnaces. Heat pumps offer an incredible opportunity to both electrify and save energy, since they run on electricity and are also ~2-3x more efficient than natural gas based heating.

However, while heat pump-based heating is an excellent tool for building electrification, today's technology still requires supplemental heating for the coldest days. In general, it can be expensive to electrify the "last 10%" peak, because the system is sized for the coldest day of the year, which rarely occurs.

Hybrid heat pump/natural gas peaking systems are a useful tool for sensible and cost-effective decarbonization, as they strike a balance between carbon reduction, construction costs, and utility demand costs. For fully electrified heating systems, that supplemental heating would be provided by electric resistance heating, which is capable of low temperature operation. However, in most facilities this approach results in two negative consequences: a costly electrical service upgrade is required, and operating expenses increase due to high peak electrical draw and resulting Xcel demand charges. In many cases, using gas as the peaking fuel source on the coldest day will mitigate need for an electrical upgrade while still achieving significant carbon reductions. The decarbonization "sweet spot" is a heat pump system that meets most of the annual heating demand, supplemented by a gas system to meet the rare coldest days. This results in substantial carbon reductions (i.e. 75%+) while reducing overall costs up to 50%. Retaining the gas supplemental heating until the next replacement cycle in the late 2030s enables:

1. Potential technology evolution, such as 100% heat pump heating even on coldest days, renewable fuel cells, and/or strategic and accessible use of bio-gas for peaking boilers.
2. Developments in demand shifting technology (e.g. batteries), resulting in lower demand charges.
3. Changes in relative cost of natural gas vs. electricity, increasingly favoring electricity.
4. Full utilization of useful life of natural gas equipment.

Full vs Hybrid Electrification
(At Sites w/ Both Options)



Hybrid solutions do not make sense at some sites due to existing electrical capacity and expected future loads. In these cases, **full electrification** is recommended.

The last 25% of gas usage is **~4x more expensive** to electrify than the first 75%.

Additional Considerations

Heating Capacity Oversizing

For the most part, electrified heating system capacities were sized similarly to the existing fossil fuel equipment. As these projects enter the detailed design phase, there is opportunity to minimize electrical impact by identifying equipment that can be downsized. This is particularly impactful in spaces that have freeze protection heating.

Structural Impacts

Some of the proposed measures have an impact on the existing building structural system. These impacts have been included in the construction costs and are detailed in the building audit reports.

Staged Mechanical Electrification

In general, Building Electrical Code requires electrical service to be sized based on nameplate power data for mechanical equipment. Thus, if all mechanical equipment is electrified at the same time, the electrical service upgrade would need to match the total nameplate power. This can lead to oversized electrical systems as mechanical systems are often oversized. For example, the Recreation & Senior Center existing nameplate load is calculated at 2,200 Amps, but utility data shows the actual demand peaking at 550 Amps.

As an alternate approach, Electrical Code also allows for the use of metering data to determine the actual power draw of the equipment; the actual data is then used to determine whether an electrical service upgrade is needed. A staged approach would install a couple electrified units and trend the new electrical load; if the power draw of the mechanical equipment is proven to be less than the nameplate, then additional load could be added to the existing service. This process would be repeated until either the service needs to be upgraded or all units are electrified.

Building Electrical System Considerations

Battery System

Use of battery systems is growing across the building industry, both for resiliency and demand reduction purposes. However, batteries are not suited for every situation. A 250 kW battery system was evaluated for the Recreation and Senior Center, mostly for demand reduction and load shifting purposes. However, the high first cost was unable to offset the annual demand cost reductions, and resulted in a payback longer than the measure life. While this option is currently not included in this plan, it could become a viable option in the future as the technology improves and becomes more cost-effective.

Backup Power

Throughout this study, the impacts to existing backup power systems were evaluated where buildings already had generators. In general, it is recommended to continue using fossil fuel-based generators (e.g. propane) instead of using batteries. Since these units very rarely run, the added cost of batteries is not justifiable. Additional information is available for each building in the building audit reports.

Net Cost of Electrification

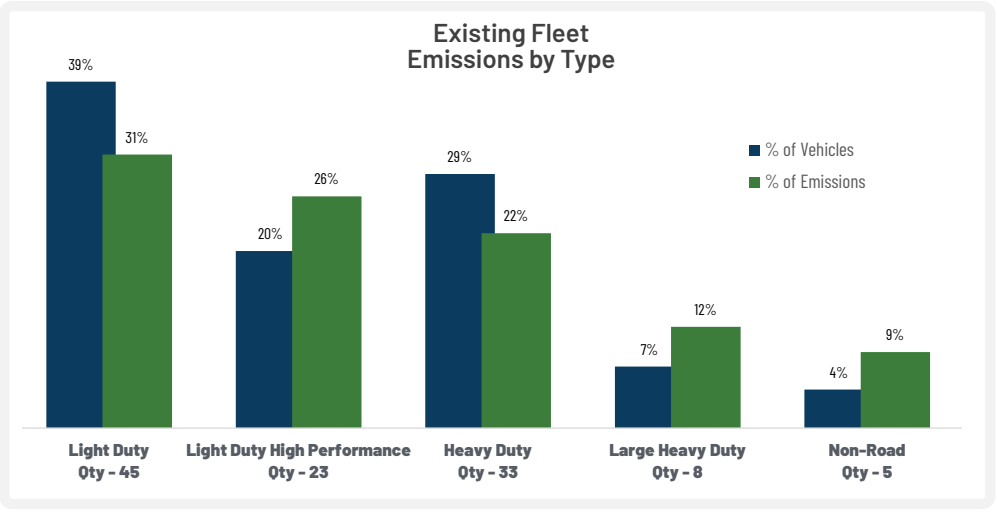
The total cost is the total amount that will need to be allocated for budgetary purposes. The net cost represents the total cost minus the replacement cost that would've been spent to replace the existing units with like-for-like fossil fuel units. Note that there is a significant net cost premium for full electrification due to electrical upgrades.

Existing Fleet

The City of Louisville provided data from 2022 for their fleet vehicles. Vehicles utilized by the city were divided into five categories.

1. **Light duty vehicles –** Light duty vehicles make up the majority of the vehicles the city owns. They typically encompass any normal passenger vehicle such as sedans, SUVs, light pickup trucks, and minivans. This vehicle is mostly used for transporting people and small amounts of cargo.
2. **Light duty high performance vehicles** – This category incorporates mainly police vehicles. These vehicles are similar to the light duty vehicles but have been altered for higher performance due to specific police requirements.
3. **Heavy duty vehicles –** Heavy duty vehicles mostly incorporate large pickup trucks. These vehicles are used for hauling and towing heavy loads.
4. **Large heavy duty vehicles*** – This category is for the large snow plows and street sweepers. These vehicles typically are only used seasonally and have a varying work load that is dependent on the weather.
5. **Non-road vehicles*** – These vehicles are typically construction type vehicles. There usage is usually measured in hours of operation instead of miles.

**There are not currently market-ready EV alternatives for these categories.*



Department	Vehicle Category 1	2	3	4	5	Total
	Light Duty	Light Duty High Performance	Heavy Duty	Large Heavy Duty	Non-Road	[#]
Building Inspection	3					**3**
Code Enforcement	2					**2**
Engineering	4					**4**
Facilities	3		1			**4**
Finance	2					**2**
Parks	10		12			**22**
Police	7	23				**30**
Rec Center	1		2			**3**
Streets			4	5	2	**11**
Utilities	2		10	2	3	**17**
Water Treatment	4		1			**5**
Waste Water Treatment	3		1			**4**
Open Space	4		2	1		**7**
Grand Total	**45**	**23**	**33**	**8**	**5**	**114**

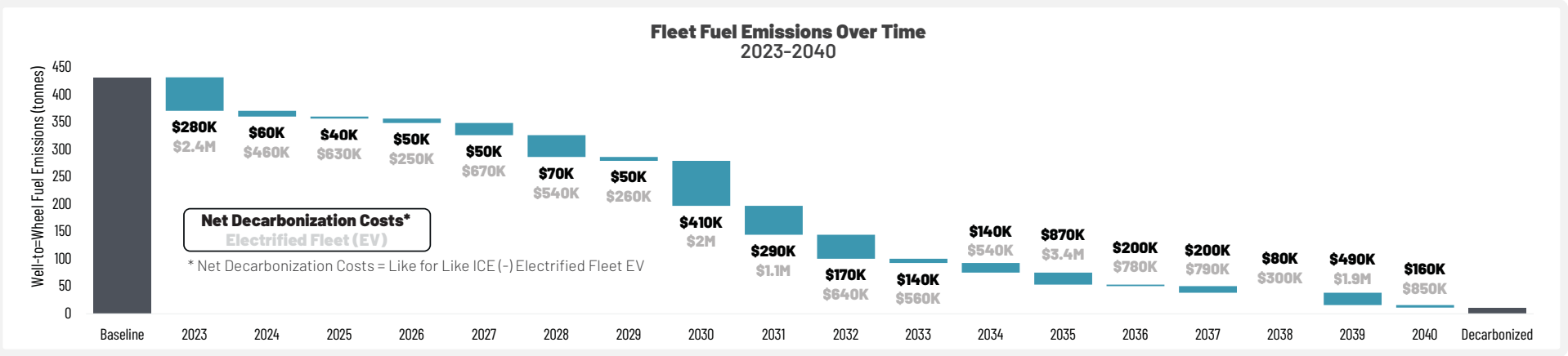
Existing Fleet Emissions

Based on vehicle-specific annual usage, fleet emissions were calculated using publicly-available data from the Environmental Protection Agency. Three key factors contribute to a vehicle's annual CO2 emissions: average miles driven/hours operated, fuel efficiency, and CO2 emissions factor of fuel source. Emissions data is well-to-wheel, meaning it captures to complete life-cycle emissions associated with extraction, production and consumption of fuel.

Please refer to the appendix for additional details on fleet electrification

Fleet Conversion Plan

Transitioning from internal combustion engine (ICE) vehicles to EVs can substantially lower overall carbon emissions. It is recommend that the City replace vehicles with EVs after the current vehicle has met its replacement criteria. Early replacement is not assumed in the analysis – simply a year-over-year swap with an EV once the vehicle reaches the appropriate mileage or service life based on the vehicle type (i.e. 12yr/120,000 for most light duty vehicles).



Vehicle Availability

Not all vehicles in the City's fleet have suitable replacements commercially available. The current EV market is dominated by light duty vehicles, with emerging options in pickup and SUV categories. There currently are no manufactures that outfit an EV for police vehicle use. However, the market is rapidly changing so over the course of the next 5 years new innovation and demand should allow for police patrol vehicles to comes to market. Some vehicles will need to be replaced before there is an EV equivalent on the market, in those cases it is assumed that a new ICE vehicle will be purchased and then will be replaced with an EV in the next cycle. It is assumed all type 2 vehicles (mostly police patrol vehicles) will not have an EV equivalent until 2027 and all type 3, 4, and 5 vehicles until 2030.

Summary of Financial Metrics

EVs have a higher initial capital cost, but lower fuel and maintenance costs than ICE vehicles. Fueling vehicles using electricity is approximately 25% the cost of gasoline. Maintenance costs are 50-75% of gasoline equivalents. Some of the initial cost is offset by federal incentives. Over time, initial costs for EVs are also trending downward as production volumes increase and battery costs decreases.

Over the next 17 years, the Total Cost of Ownership (TCO) of replacing vehicles with EVs would be comparable with ICE vehicles. The amount of CO2 emissions saved would be ~9 million lb. Analysis assumes 2.5% inflation, electric rate inflation of 2.44%, and cost escalation of 2.65%. Initial cost is inclusive of federal incentives for EVs (both passenger and heavy duty).

Fleet Conversion Life-Cycle Cost Analysis (2023-2040)

Scenario	Vehicle [$]	Fuel [$]	Maintenance [$]	Total [$]	2023-2040 Life-cycle Emissions [Tonnes CO^2e]	Decarbonized Reduction from Baseline in 2040 [%]
Like-for-Like (ICE)	$14.5M	$3.9M	$1.6M	$20M	**7,300**	**-**
Electrified Fleet** (EV)	$18.0M	$1.7M	$1.2M	$21M	**3,100****	**97%**

**Costs & Emissions are based on the fleet conversion happening over time and account for both costs and emissions associated with the existing ICE vehicles before they are electrified.

Charging Infrastructure

Overview

Fleet electrification requires infrastructure to charge vehicles to they can be used in daily operations. In addition, there is a desire to provide public charging for electric vehicles to encourage residents to drive EVs themselves. **The costs associated with this infrastructure are included in the building decarbonization costs.** This includes any electrical service upgrades needed to accommodate the new electrical demand. Refer to the Building Audit reports for site specific information on EV Charging infrastructure and it's impacts. Fleet charging should occur almost entirely on-site at City facilities. Charging at publicly accessible stations is much higher cost and adds operational uncertainly.

Charging Power

Charging stations are available in a range of power levels. Level 2 and 3 charging are the most appropriate for fleet use. Level 2 outputs AC power from 7-18kW, adding 15 to 40 miles of range per hour depending on the vehicles type and power level. Level 2 charging requires a 208 volt or 240 volt AC service. Level 3 outputs DC power at 25+ kW and typically requires a 480 volt AC service.

Primarily Level 2 charging for fleet use is recommended, as it provides good value for infrastructure investment when factoring in cost and time required to charge when compared to Level 3 chargers. Level 3 chargers can make sense when high use vehicles need quick recharging, though these chargers will cost more to install and incur a higher charging cost than level 2 chargers.

Public Charging

It is recommended to install a small amount of charging intended to be used by City residents and the general public. These chargers are an important demonstration of the City's decarbonization efforts and provide a valuable city service for residents. These should be located where the intended use of a site aligns with public use.

	# of EV Charging Parkings Spaces			
	Existing	New		Total
	Public Charging	Public Charging	Fleet Charging	Public + Fleet Charging
Facility	[#]	[#]	[#]	[#]
Art Center	0	0	0	0
City Hall	0	8	6	14
City Services	0	4	52	56
Coal Creek Golf Course	2	4	0	6
Library	2	10	8	20
Sid Copeland Water Treatment Plant	0	0	6	6
Police and Municipal Court	0	2	10	12
Recreation and Senior Center	2	6	4	12
Howard Berry Water Treatment Plant	0	0	0	0
Wastewater Treatment Plant	0	0	4	4
Total	**6**	**34**	**90**	**130**

Each EV charger has two charging connections, meaning it provides charging for two parking spaces.

Miscellaneous Equipment Conversion Plan

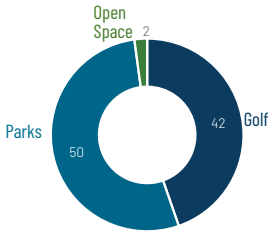
Small gasoline engines, like those in gas powered riding mowers and garden equipment, are fast becoming a significant contributor to smog forming air pollution. These small engines emit hundreds of times more pollutants per hour than automobile engines.

New lithium battery powered riding mowers, park equipment, and leaf blowers compete effectively compared to gasoline powered tools regarding power and performance, and have significantly longer operating run times than older electric models. On top of that, these new tools are quieter and will not produce the lingering gasoline smells that are an unhealthy indicator of the fumes and pollution that gasoline powered equipment produce.

Current Equipment

The city currently has three departments that own the majority of the small engine vehicles and equipment: the golf department, parks and recreation, and open space.

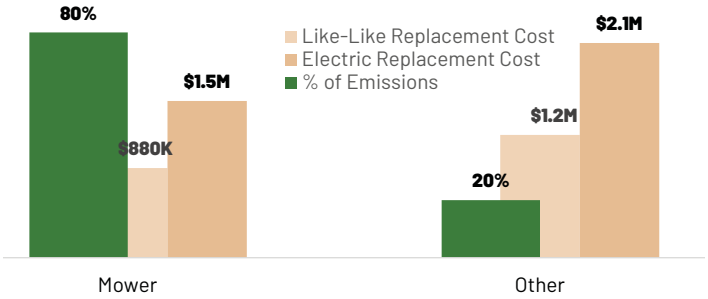
Equipment by Department



Equipment by Type

Equipment	Qty	Equipment	Qty
Aerator	1	Mower	35
ATV	18	Roller	1
Blower	3	Saw	1
Cart	3	Skid	5
Chainsaw	2	Sprayer	1
Chipper	2	Tractor	4
Forklift	1	Trimmer	4
Generator	11	Washer	1
Loader	1		

Lawn mowers account for **80%** of total emissions



Small Engine Electrification

Most the small engine equipment type categories currently have electric equivalents available. The categories that do not or have very limited choices are, tractors, skid, loaders, chippers, and rollers. Some of these types of equipment are actively being developed. Additionally, in the mower category there are some specialty golf course lawn mowers that do not have a good electric choice.

Unfortunately, unlike the fleet electric vehicles, most of the electric lawn care equipment does not have battery warranty that matches the equipment warranty. As this technology matures, the warranties will get better.

Another large hurdle for this equipment is the cost of the electrified version. Most electric versions of the non-handheld equipment is about 1.75 times the cost of the gas version. Maintenance costs are lower, but not enough to offset the initial up front cost.

It is recommended to replace existing equipment that is at the end of its life (most large equipment is replaced by the department every 8 years) with the electric equivalent.

Refueling & Charging

With the newest battery technology available, most of the larger equipment is able to operate during a typical work day. This equipment isn't designed for battery swap out in the field, so if the battery charge got low the operator would need to plug it in somewhere to charge or switch to a different piece of equipment. Typically they would need to switch to a different piece of equipment. The charging time for this equipment isn't fast enough to get a full charge in a reasonable amount of time. For smaller hand-held equipment, spare batteries can be carried along to change out when the charge gets low. Additional training may be required to get operators use to carrying around extra batteries that are fully charged. When the city switches the fleet vehicles to EV's, most work style trucks may have the ability to charge auxiliary devices like batteries for small hand held equipment. For most of this equipment it is recommended that everything be charged overnight as it is unlikely that anything would be able to be charged during the day and used that same day.

Charging

Most small motor equipment will require at least a 120v 15amp circuit to charge. It is recommended that there is one dedicated plug for each piece of equipment. Additional electrical infrastructure will be needed to make charging plugs accessible to all equipment where it is stored.

Battery Life

Battery technology is improving significantly year to year. Most batteries are lithium based and have longer life spans than the equipment. Depending on the manufacturer, the battery warranty may or may not match the typical equipment life. For small hand-held equipment, purchasing extra batteries will allow for longer use and does not add much cost. For larger equipment, the battery can be a significant part of the cost and having a second battery on hand will be cost prohibitive. In addition, the larger equipment isn't always designed for quick battery change outs. Similar to electric vehicles batteries for this type of equipment will eventually have warranty life greater than the cities typical use.

Photovoltaics

Renewable energy plays the important role of offsetting remaining carbon emissions after building load reductions and electrification has been made. This can be handled through a variety of avenues – behind-the-meter systems, Community Solar Gardens, and utility subscriptions. Since City of Louisville already offsets its current electricity with renewable utility subscriptions, the focus was on customer-owned, behind-the-meter systems that would provide more value to the City of Louisville.

On-site Versus Grid Purchase

Some of the benefits of on-site solar vs renewables purchased from the grid are listed below.

- Avoid solar sprawl at scale - avoiding offsetting of impacts to rural areas.
- Avoid electrical energy loss due to transmitting power over long distances.
- Dispersed approach is typically grid beneficial, especially when on-site renewables are a small percentage of the total usage of building - most solar on this bldg would be self used.
- Enable future resiliency through addition of batteries and storage.
- Demonstrate decarbonization to local Louisville community.

High Priority Sites

High priority sites were recommended based on the following considerations:

- Financial and technical feasibility
- Impact & considerations with land development

	Proposed			
	Array Type	Array Size	Array Production	Cost Estimate
Facility	[-]	[kW]	[kWh/year]	[$]
Art Center	None	-	-	-
City Hall	None	-	-	-
City Services	**Ground**	**286**	**315,000**	**$870K**
Coal Creek Golf Course	Ground	202	252,000	$1.2M
Library	Roof	128	174,000	$520K
Sid Copeland Water Treatment Plant	Ground	375	559,000	$1.3M
Police and Municipal Court	Ground	257	397,000	$910K
Recreation and Senior Center	**Ground**	**380**	**569,000**	**$1.2M**
Howard Berry Water Treatment Plant	Ground	200	302,000	$750K
Wastewater Treatment Plant	**Ground**	**690**	**1,026,000**	**$2.1M**
Total			3,593,000	$8.8M

On-Site Design Considerations

Where to create solar arrays: ground, rooftop, or parking canopies?

The first constraint on system size is the available space on the property. Since ground mounted solar arrays are typically the least expensive, this is the first priority, followed by rooftop and then parking canopies. Solar systems benefit from economies of scale – generally, the larger the system, the cheaper it is per kW.

Financial size optimization

In some cases, it is possible to add more solar capacity than can be used by the facility. Typically, based on current regulations, this scenario would mean giving the value of this electricity back to the utility. All recommended on-site solar in this roadmap avoids significant amounts of such value "give back".

Roof age

Roof membranes and solar PV modules have similar lifespans, about 30 years. De-installation/re-installation of a solar system is costly, creating unviable economics in addition to unnecessary hassle for facilities management down the road. The PV array at the Library is the only recommended system that is roof-mounted. This array should be installed at the time of the Library roof replacement.

Assumed useful life of solar

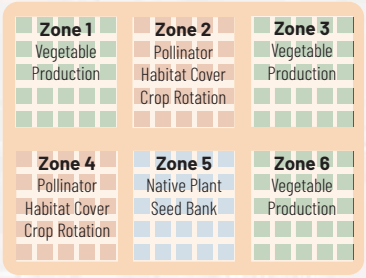
The National Renewable Energy Laboratory estimates the operational lifespan of photovoltaic systems to be 25 to 40 years, and a recent study by the Lawrence Berkeley National Lab found that utility scale solar developers assume an average useful life of ~35 years. The financial pro forma included in this roadmap assumes a useful life of the ground and canopy mounted solar arrays of thirty years, and 25 years for roof mounted arrays (based on typical 25 year roof life). While this is longer than the warranty period, it is expected the arrays will be functional for this period and potentially beyond. A small output degradation is assumed over time, consistent with standard industry practice. Note the pro forma does assume micro-inverter replacement as part of solar operation and maintenance at year 15.

Credit: Jack's Solar Garden

Agrivoltaics

The co-location of ground mounted solar arrays and agriculture (such as community pea patches), or carbon sequestering/pollinator habitat restored native meadows, are a great holistic sustainability solution. All ground mount systems should have some component of agrivoltaics to further mitigate carbon whether it's drought resistant irrigation, pollinator habitats, or wild flowers.

Planting plan for Denver Botanic Gardens Solar Array



Potential future opportunities for larger-scaled Louisville owned renewables

Virtual net metering

The State of Colorado recently adopted virtual net metering legislation, which potentially enables utility customers with multiple site portfolios to transfer the electricity value of solar production from one location to another. The details of this legislation are complex and still being understood, but over time, it may enable Louisville to look at larger scale opportunities, such as undeveloped land, open water, or park areas to be used for solar production .

Water reservoir or sewage processing pond floating solar

A specific opportunity for larger scale solar (which would require net metering to make financially feasible) is floating solar. An initial evaluation suggests that an array ~400kWdc could sit at the Sid Copeland Treatment Plant reservoir. Typically arrays need to be on the scale of 1-2MW or larger to cost-compete with ground mount options.

Financial Considerations

The process of decarbonization doesn't occur in a vacuum, and other financial considerations beyond initial costs or utility savings come into play. Different financial scenarios or considerations impact how the cost of decarbonization might be viewed – these are the **additional avoided costs** discussed below. In addition, the process of electrification, in particular, can yield additional benefits– known as **co-benefits.** Where quantification is possible, it is provided, based on economic modeling derived from best and most recent available science. **All figures assume a value stream of the roadmap horizon of 2023 - 2040.**

Additional Avoided Costs

Estimated Avoided Future Carbon Emissions Penalties

$7,335,000

Avoided future carbon emissions penalties

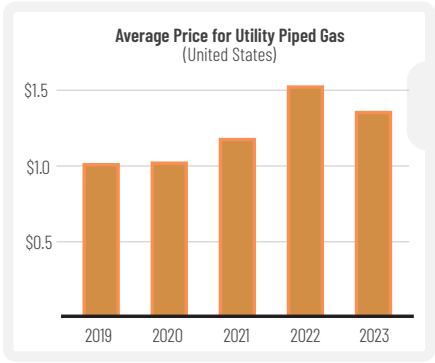
As climate change becomes an increasingly current (rather than future) reality, carbon emissions penalties are starting to be applied by leading organizations to internal operations, and by governing bodies as regulation. Colorado recently adopted HB21-1286, which establishes penalties for high Energy Use Intensity private sector buildings, and the City of Denver created Energize Denver, which has even more aggressive carbon penalties. Leading private sector firms, such as Microsoft, also apply an internal cost of carbon to lower immediate emissions and begin bending decision making to anticipate a more aggressive future carbon penalty regulatory environment. The Canadian Federal government recently adopted an internal decision making price of $261 CDN$/mton, and the EPA has draft rule of $261US. While these have yet to become actual regulatory penalties, they indicate a likely direction over time as climate change worsens. For this roadmap, an initial penalty stream based on the Colorado carbon price of $76/mton is applied from 2023-2027, moving to the draft EPA price for 2028-2040.

Estimated Avoided Cost of Future Natural Gas Price Shock

$732,000

Natural gas price shocks

Historically, natural gas has substantially greater price volatility than electricity, which isn't captured by typical escalation rates. The Russian invasion of Ukraine has put a spotlight on the potential for long term natural gas price instability – during 2022, natural gas prices increased by 50%, making previous natural gas escalation rate assumptions of 3-4% invalid. Many risk forecasters anticipate further natural gas instability based on volatility of many producing nations. This roadmap includes a scenario of a second natural gas price shock in 2030, mirroring the impact of the 2022 shock.



Natural gas prices went up **~50%** in 2022

https://www.bls.gov/regions/west/news-release/averageenergyprices_seattle.

Value of Solar for Future Electric Micro-grid Backup Power

$900,000

Future electric micro-grid backup power

Currently, emergency power is provided by backup fossil fuel powered generators. A decarbonized alternative, with potentially even greater resiliency, is electric batteries fueled by on-site solar. The cost of batteries for such systems is currently cost-prohibitive, but likely to drop in the future. Installing on-site solar as proposed for overall renewable power for the City has a dual benefit of helping enable future electrical islandability. The value of this is assumed at 10% of the overall cost of proposed on-site solar.

Co-benefits

Employee and visitor health and performance:
Air quality and Thermal comfort

The proposed decarbonization program will also enable improvement of ventilation and filtration systems that are part of HVAC systems being electrified. Demand control ventilation can be added and optimized to better filter media. Elimination of natural gas combustion removes any risk of noxious combustion gasses (NOx, SO2, CO) from malfunctioning exhausts, etc. Air sealing the buildings, which retains tempered indoor air, has the added benefit of excluding smog and wildfire smoke, as well as reducing mold – a substantial benefit. Finally, City Hall currently has very poor temperature control, with overheated and colder work areas. The new electrified and rezoned system will enable more comfortable work temperatures there.

Value of Improved Employee and Visitor Health and Performance

$1,027,000

Employee retention – climate leadership

The cost of employee turnover (training, lost knowledge, etc.) is significant in any organization. Employees take pride in working for organizations which have integrity in reflecting their values. This value stream assumes a 2% reduction in employee turnover due to its expressed climate leadership.

Value of Employee Retention Based on Climate Leadership

$714,000

Additional Co-benefits
[Not Quantified]

Community Decarbonization Education & Leadership Decarbonization is a signal to the community about the importance of the climate action goals the City has set. Specific elements such as heat pumps, renewables, and efficiency measures can be used for classes etc. to inform residents about zero carbon living.

Eliminate Gas Explosion Potential Natural gas is flammable gas that has risk of combustion. While the likelihood is statistically low, the potential cost and impact is extreme.

Eliminate Gas Cooking Burns Natural gas is currently used for cooking in the Golf Course Clubhouse. On-site combustion for cooking can lead to burns and injuries. Induction ranges and electric combi-ovens (which use infrared, microwave, steam, and heat together for great efficiency) reduce those risks.

Louisville "Brand" Louisville's decarbonization program is leading edge, and if desired, could be used for publicity and to enhance the City's reputation, with likely economic development benefits.

Job Creation Louisville's decarbonization work will result in local employment that would not otherwise occur in a business-as-usual scenario.

Annual Operating Expense Impacts

Electrification & Building Utility Cost Impact
Electrification can lead to increased annual utility costs due to the existing utility rate structures, where electric demand charges are high and the cost per unit energy of electricity is typically higher than natural gas. Specifically for Xcel energy, electric demand charges ($/kW) are particularly high. This makes demand reduction strategies particularly important. Electric energy ($/kWh) charges for Xcel are lower than most utilities, but are still approximately 50% higher than gas on a $/kBtu basis.

Building Demand Charges
Hybrid gas systems will also provide value by reducing annual demand (kW) costs in comparison to an all-electric alternative. Gas-backup systems have the option to lockout the primary heating (heat pumps) when temperatures are lower to avoid potentially costly demand (kW) charges. This strategy can help alleviate some of the demand penalty associated with the all-electric option, but it will also incur slightly more energy usage and more fossil fuel combustion.

Renewables

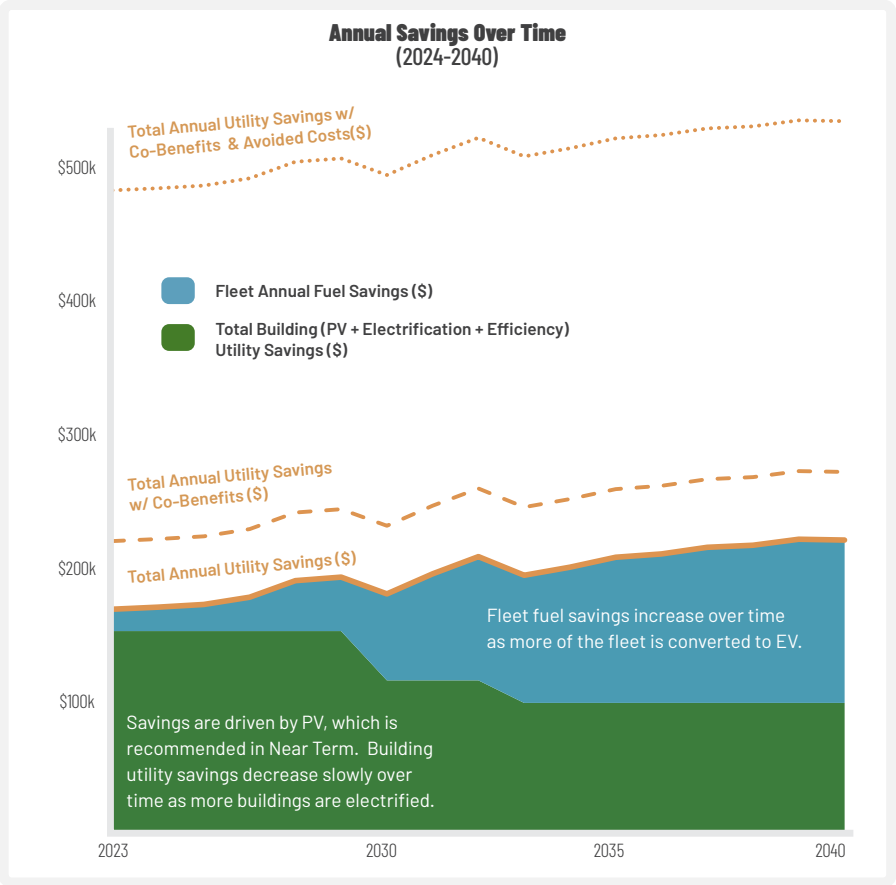
Renewable PV systems account for the majority of the utility cost savings at the building level. Adjusting utility rate schedules based on the recommended PV array was analyzed as part of this study.

Efficiency &Load Reduction

Efficiency & load reduction measures typically have positive utility savings as they do not involve fuel switching.

Co-Benefits & Avoided Costs

Additional benefits realized through the process of electrification. Annualized co-benefits and avoided costs are shown in the figure to the right.



Funding Options

Funding is a critical piece of any decarbonization roadmap to ensure an implementation plan is successfully executed. Over the course of the project, several grant and stimulus funding opportunities were researched and identified along with capital and financing streams that are applicable to the implementation of the City's roadmap. In addition, interviews with the finance team were conducted, and funding workshops were held in March and May of 2023. Below is a list of applicable funding sources identified to help the City fund and implement the recommendations within the Internal Decarbonization Roadmap. All information below is based on research conducted during the year of the study. Grants and stimulus funding is likely to vary in future years.

Grants and Stimulus Funding*

- Colorado Public Building Electrification Grant**
- Colorado High Efficiency Heating & Appliances Program
- Colorado Department of Local Affairs Grants
    - Energy and Mineral Impact Grant
    - Renewable Energy Grant
    - Climate Resiliency Challenge**
- State of Colorado Geothermal Grant
- Congressionally Directed Spending**
- FEMA Building Resilient Infrastructure and Communities (BRIC) grant
- Inflation Reduction Act
    - Investment Tax Credit – Direct Pay for renewable energy systems, battery storage
    - Grant programs for electric vehicles and electric vehicle charging
- US Department of Energy grants for municipalities
- Xcel rebates
- Mow Down Pollution Grant**
- Charge Ahead Colorado Grant**
- Colorado Fleet-Zero Emission Resource Opportunity ("Fleet-Zero")**

*The key to successful grant applications: the full application and submitted project needs to move the needle, be "shovel ready", compelling and create benefits for the community.

** Grants currently being applied for during the 2023-24 fiscal year for project implementation.

Capital and Internal Funding

- Allocate dedicated stream of capital to sustainability during bi-annual budget cycle
- Internal borrowing from enterprise funds with additional capital availability.
    - City has experience with this method of funding projects
    - Some funds are heavily restricted
- Diverted operational/Capital Improvement Plan dollars
- Dedicated sustainability tax – with % earmarked towards municipal & community sustainability projects
    - Investigated in 2023 through Open Space tax extension discussions. Recommend re-investigating in future years.

Financing Options

- **Tax Exempt Lease Purchase** – an installment purchase, conditional sale or lease by a public agency using the installed equipment as collateral and financed by an investor or bank.
- **Bond** - debt obligation issued by a public entity using the loan for public projects, such as constructing buildings, highways, or renovations.
- **Certificates of Participation (COP)** - is a type of financing where an investor purchases a share of lease revenues to secure financing for public sector projects.
- **Energy Performance Contracting** – a contracting and financing tool that leverages multiple sources of funding to construct energy savings projects for public sector agencies.
- **Energy-as-a-service** – a financing tool where a public agencies pays for an energy service without having to make any upfront capital investments and transfers ownership of the capital investment to a third party investor.
- **Infrastructure-as-a-service** - a financing tool where a public agencies pays for infrastructure via an on-going fee or lease payment without having to make any upfront capital investments and transfers ownership of the capital investment to a third party investor.

Financial Analysis

A financial analysis was conducted to determine the true cost of decarbonization. This analysis reviewed the like-for-like costs to continue replacing equipment and fleet with the current gas version and compared it to the cost to electrify and decarbonize operations, mechanical equipment and fleet. All costs within this report are turnkey and include final design, engineering, procurement, construction management, and commissioning costs. The financial impact of the project to the City was calculated from 2024 through 2040. The like-for-like project costs were derived from a combination of the City's CIP budget and detailed cost estimating of turnkey like-for-like equipment replacement as the comparison scenario.

If the City were to continue replacing fleet and mechanical systems with like-for-like gas replacements, the total cost to the City through 2040 would be approximately $27M with no grants or anticipated utility cost savings. If the City were to electrify all fleet, mechanical equipment and operations, the cost would be approximately $51.1M including the recommendations of EV charging, load reduction measures, and renewable energy. Decarbonization would allow for the City to capture $7M in utility and fleet operational savings over the term, secure $3-13M in grants, incentives and stimulus funding, and help to mitigate the impacts of climate change on the community.

Total Net Cost of Decarbonization =

Total Construction Costs - Total Like-for-Like Construction Costs - [Total Project Savings + Total Grants]

The Summary Table to the right shows the net costs of decarbonization as $4.4M to $14.4M depending on the level of grants that the City is able to secure. The co-benefit and avoided costs are not included in this number and would provide an additional $10.6M in benefits to the City through 2040 for a total potential net savings of $6.2M over the business-as-usual or "like-for-like" replacement scenario. This number is calculated by taking the gross cost to decarbonize and subtracting out what the City would be spending anyways and the project savings and grants/stimulus.

Summary Table

Total Construction Costs	**~$51M**
Total Like-for-Like Construction Costs (costs that the City would continue to pay)	**(~$27M)**
Lifecycle Utility Cost Savings (Utility, Fleet, Solar)	**($7M)**
Total Grants	**($3M-13M)**
Total Net Cost of Decarbonization (varies based on final grant awards)	**$4M-14M**

It is recommended that the City do a more in depth financial analysis for each phase to produce a complete and final amortization schedule either internally or with a selected lender. The annual financial model to the right shows annual estimated costs, savings, capital allocation and a summary each year from 2024-2040.

Notes:

Total Construction Costs: Total **turnkey** construction costs needed for budgetary purposes. **Costs do not include incentives or grants. The Inflation Reduction Act will potentially offset 30-40% of the cost of renewables and fleet.**

Total Like-for-Like Construction Costs: The **turnkey** "business as usual" costs for replacing existing fossil fuel equipment with similar fossil fuel equipment. Costs were derived from a combination of the City's CIP budget and detailed cost estimating of equipment replacement as the comparison scenario.

Turnkey Costs: Include design, engineering, construction management, project management, and commissioning.

Annual Financial Model

Year	Total Construction Costs	Solar IRA Direct Pay (30%)	Total Grants	Annual Electrification Utility Cost Savings	Annual Efficiency Utility Cost Savings	Annual Solar Utility Cost Savings	Annual Fleet Utility Cost Savings	Total Like-for-Like Construction Costs	Total Net Cost of Decarbonization
2024	$23,979,948	$0	$8,000,000	($82,000)	$44,000	$335,000	$33,000	$10,185,000	$5,465,000
2025	$629,972	$2,692,000	$100,000	($82,000)	$44,000	$335,000	$36,000	$599,000	($3,094,000)
2026	$244,741	$0	$100,000	($82,000)	$44,000	$335,000	$40,000	$201,000	($393,000)
2027	$661,949	$0	$100,000	($82,000)	$44,000	$335,000	$51,000	$622,000	($408,000)
2028	$538,469	$0	$100,000	($82,000)	$44,000	$335,000	$76,000	$469,000	($404,000)
2029	$255,583	$0	TBD	($82,000)	$44,000	$335,000	$81,000	$213,000	($335,000)
2030	$8,796,674	$0	TBD	($157,000)	$44,000	$335,000	$130,000	$4,253,000	$4,191,000
2031	$1,126,108	$0	TBD	($157,000)	$44,000	$335,000	$160,000	$843,000	($99,000)
2032	$638,869	$0	TBD	($157,000)	$44,000	$335,000	$186,000	$478,000	($247,000)
2033	$5,449,661	$0	TBD	($190,000)	$44,000	$335,000	$192,000	$2,654,000	$2,415,000
2034	$537,051	$0	TBD	($190,000)	$44,000	$335,000	$204,000	$402,000	($258,000)
2035	$3,440,025	$0	TBD	($190,000)	$44,000	$335,000	$219,000	$2,574,000	$458,000
2036	$775,290	$0	TBD	($190,000)	$44,000	$335,000	$224,000	$580,000	($218,000)
2037	$783,153	$0	TBD	($190,000)	$44,000	$335,000	$234,000	$586,000	($226,000)
2038	$297,040	$0	TBD	($190,000)	$44,000	$335,000	$237,000	$222,000	($351,000)
2039	$1,923,560	$0	TBD	($190,000)	$44,000	$335,000	$246,000	$1,439,000	$50,000
2040	$847,035	$0	TBD	($190,000)	$44,000	$335,000	$245,000	$693,000	($280,000)
Total	**$50,925,129**	**$2,692,000**	**$8,400,000**	**($2,483,000)**	**$748,000**	**$5,695,000**	**$2,594,000**	**$27,013,000**	**$6,266,000**

Implementation Options

Delivery and implementation of the decarbonization plan is laid out through 2040. As part of this analysis, it is recommended that full decarbonization is pushed to 2040 due to technology barriers and the recommendation of not replacing fleet and equipment before the end of its useful life. Three primary methods are recommended for the City to consider for implementation of all phases of the roadmap and outlined below. Due to the complexity, uniqueness and scale of the recommendations, three larger phases or mobilizations are recommended for the implementation portion of the project to reduce the burden on staff, consolidate resources and gain cost efficiencies by scaling the project. The methods below are chosen to account for the metrics above and to lower the overall cost to the City through efficiencies and to reduce the amount of resources needed throughout each phase (versus a piecemeal approach).

Energy Performance Contracting

This method utilizes a state-supported program through the Colorado Energy Office that has been used for over 200 projects within public agencies in the state of Colorado. Energy Service Companies are pre-qualified through the State to assist local governments within turnkey implementation of decarbonization projects for fleet and buildings. This approach allows for flexibility in project funding with the ability for the public agency to combine multiple funding avenues such as grants, stimulus, capital and third party financing. This approach is recommended for the larger, complex buildings that require renewable energy, load reduction measures, electrical upgrades, and mechanical electrification as a single project or construction mobilization such as at the City's recreation center. Energy performance contracting enables a jurisdiction, to "surge" a major decarbonization effort and avoid the quick ramp up/ramp down staffing impacts that would otherwise be required to manage such projects.

Further information can be found here: *https://energyoffice.colorado.gov/clean-energy-programs/clean-energy-financing/energy-performance-contracting*

When to Use:

Ph1 Renewables

Ph1 Load Reduction
All Buildings

Ph. 1-3 Mechanical
Larger Systems

***Some* EV Charging**

Design-Build or Design-Bid-Build

Traditional method for construction projects where the City would project management and bid out individual scopes of work for design, construction or both. This is recommended for smaller, less complex buildings and scopes of work that require a simple like-for-like replacement of mechanical systems such as the Art Center.

When to Use:

Smaller HVAC Systems
Mid Term Art Center

Self-Implementation

This method is recommended for scopes of work that the City can conduct internally if staff time and resources allow. This method is recommended for equipment replacements (golf carts, lawn mowers, etc) and EV charging infrastructure.

When to Use:

EV Charging

Fleet Purchase

Misc. Equipment

City of Louisville
COLORADO • SINCE 1878

McKinstry
For The Life Of Your Building

City of Louisville
COLORADO • SINCE 1878

Memorandum

To: **Louisville City Council Members**

From: **Louisville Sustainability Advisory Board**

Date: **October 10, 2023**

Re: **Internal Decarbonization Plan Final Report**

Dear Louisville City Councilors,

The Louisville Sustainability Advisory Board writes you again regarding McKinstry Engineering's plans for decarbonizing the City's buildings and operations. The Board appreciates all of the attention and consideration that City Council has devoted to this planning process. As the Board previously advised, the Board again strongly recommends that City Council adopt and implement these plans for municipal decarbonization.

Previously, the Board specifically voiced its support for McKinstry's recommended solar array installations. According to McKinstry's analysis, these arrays will result in long-term cost-savings for the City. The Board understands that City Council had questions regarding aspects of McKinstry's financial analysis for solar array installations and that City staff and McKinstry will address these questions in the context of financing through the Colorado Energy Office's energy performance contracting program. This program provides not only financing, but also administration for projects like the recommended solar array installations; moreover, the City's work with McKinstry would likely qualify the City as having completed the initial steps in an energy performance contract. The Board hopes that City Council receives satisfactory answers to its questions. If a more thorough financial analysis reveals that installing solar arrays will not result in long-term cost-savings, then the Board still strongly supports McKinstry's recommendations for decarbonizing the City's buildings and operations through timely replacement of

fossil fuel-powered equipment with electrically-powered equipment with electricity supplied from Xcel Energy through its renewable energy subscriptions.

Sincerely,

The Louisville Sustainability Advisory Board

AN AGREEMENT BY AND BETWEEN THE CITY OF LOUISVILLE AND MCKINSTRY ESSENTION, LLC FOR CONSULTING SERVICES

1.0 PARTIES

This AGREEMENT FOR CONSULTING SERVICES (this "Agreement") is made and entered into this 1 day of November 2022 (the "Effective Date"), by and between the **City of Louisville**, a Colorado home rule municipal corporation, hereinafter referred to as the "City", and McKinstry Essention, LLC, a Washington limited liability company, hereinafter referred to as the "Consultant".

2.0 RECITALS AND PURPOSE

2.1 The City desires to engage the Consultant for the purpose of providing energy engineering and consulting services as further set forth in the Consultant's Scope of Services (which services are hereinafter referred to as the "Services").

2.2 The Consultant represents that it has the special expertise, qualifications and background necessary to complete the Services.

3.0 SCOPE OF SERVICES

The Consultant agrees to provide the City with the specific Services and to perform the specific tasks, duties and responsibilities set forth in Scope of Services attached hereto as Exhibit "A" and incorporated herein by reference.

4.0 COMPENSATION

4.1 The City shall pay the Consultant for services under this agreement a total not to exceed the amounts set forth in Exhibit "B" attached hereto and incorporated herein by this reference. The City shall not pay mileage and other reimbursable expenses (such as meals, parking, travel expenses, necessary memberships, etc.), unless such expenses are (1) clearly set forth in Exhibit B and (2) necessary for performance of the Services ("Pre-Approved Expenses"). The foregoing amounts of compensation shall be inclusive of all costs of whatsoever nature associated with the Consultant's efforts, including but not limited to salaries, benefits, overhead, administration, profits, expenses, and outside consultant fees. The Scope of Services and payment therefor shall only be changed by a properly authorized amendment to this Agreement. No City employee has the authority to bind the City with regard to any payment for any services which exceeds the amount payable under the terms of this Agreement.

4.2 The Consultant shall submit monthly an invoice to the City for Services rendered and a detailed expense report for Pre-Approved Expenses incurred during the previous month. The invoice shall document the Services provided during the preceding month, identifying by work category and subcategory the work and tasks performed and such other

information as may be required by the City. The Consultant shall provide such additional backup documentation as may be required by the City. The City shall pay the invoice within thirty (30) days of receipt unless the Services or the documentation therefor are unsatisfactory. Payments made after thirty (30) days may be assessed an interest charge of one percent (1%) per month unless the delay in payment resulted from unsatisfactory work or documentation therefor.

5.0 PROJECT REPRESENTATION

5.1 The City designates Kayla Betzold as the responsible City staff to provide direction to the Consultant during the conduct of the Services. The Consultant shall comply with the directions given by Kayla Betzold and such person's designees.

5.2 The Consultant designates Ashley Brasovan as its project manager and as the principal in charge who shall be providing the Services under this Agreement. Should any of the representatives be replaced, particularly Ashley Brasovan, and such replacement require the City or the Consultant to undertake additional reevaluations, coordination, orientations, etc., the Consultant shall be fully responsible for all such additional costs and services.

6.0 TERM

6.1 The term of this Agreement shall be from the Effective Date to June 30, 2023, unless sooner terminated pursuant to Section 13, below. The Consultant's Services under this Agreement shall commence on November 2, 2022 and Consultant shall proceed with diligence and promptness so that the Services are completed in a timely fashion consistent with the City's requirements.

6.2 Nothing in this Agreement is intended or shall be deemed or construed as creating any multiple-fiscal year direct or indirect debt or financial obligation on the part of the City within the meaning of Colorado Constitution Article X, Section 20 or any other constitutional or statutory provision. All financial obligations of the City under this Agreement are subject to annual budgeting and appropriation by the Louisville City Council, in its sole discretion. Notwithstanding anything in this Agreement to the contrary, in the event of non-appropriation, this Agreement shall terminate effective December 31 of the then-current fiscal year.

6.3 Notwithstanding any other provision(s) of this Agreement, neither party shall be liable, or declared in breach of this Agreement, for any failure or delay in performing an obligation under this Agreement that is due to events beyond such party's reasonable control, including acts of God, armed conflict, war, or pandemic events; including, but not limited to (1) increased illness of such party's workforce and/or unavailability of labor; (2) government quarantines, closures, or other mandates, restrictions, and/or directives; and/or (3) fulfillment of legal health and safety obligations associated with COVID-19 ("Force Majeure"). Force Majeure shall not include (a) financial distress nor the inability of either party to make a profit or avoid a financial loss, (b) changes in market prices or conditions, or (c) a party's financial inability to perform its obligations hereunder.

7.0 INSURANCE

7.1 The Consultant agrees to procure and maintain, at its own cost, the policies of insurance set forth in Subsections 7.1.1 through 7.1.4. The Consultant shall not be relieved of any liability, claims, demands, or other obligations assumed pursuant to this Agreement by reason of its failure to procure or maintain insurance, or by reason of its failure to procure or maintain insurance in sufficient amounts, durations, or types. The coverages required below shall be procured and maintained with forms and insurers acceptable to the City. All coverages shall be continuously maintained from the date of commencement of services hereunder. The required coverages are:

7.1.1 Workers' Compensation insurance as required by the Labor Code of the State of Colorado and Employers Liability Insurance. Evidence of qualified self-insured status may be substituted.

7.1.2 General Liability insurance with minimum combined single limits of ONE MILLION DOLLARS ($1,000,000) each occurrence and TWO MILLION DOLLARS ($2,000,000) aggregate. The policy shall include the City of Louisville, its officers and its employees, as additional insureds, with primary coverage as respects the City of Louisville, its officers and its employees, and shall contain a severability of interests provision.

7.1.3 Comprehensive Automobile Liability insurance with minimum combined single limits for bodily injury and property damage of not less than FOUR HUNDRED THOUSAND DOLLARS ($400,000) per person in any one occurrence and ONE MILLION DOLLARS ($1,000,000) for two or more persons in any one occurrence, and auto property damage insurance of at least FIFTY THOUSAND DOLLARS ($50,000) per occurrence, with respect to each of Consultant's owned, hired or non-owned vehicles assigned to or used in performance of the services. The policy shall contain a severability of interests provision. If the Consultant has no owned automobiles, the requirements of this paragraph shall be met by each employee of the Consultant providing services to the City of Louisville under this Agreement.

7.1.4 Professional Liability coverage with minimum combined single limits of ONE MILLION DOLLARS ($1,000,000) each occurrence and ONE MILLION DOLLARS ($1,000,000) aggregate.

7.2 The Consultant's general liability insurance, automobile liability and physical damage insurance, and professional liability insurance shall be endorsed to include the City, and its elected and appointed officers and employees, as additional insureds, unless the City in its sole discretion waives such requirement. Every policy required above shall be primary insurance, and any insurance carried by the City, its officers, or its employees, shall be excess and not contributory insurance to that provided by the Consultant. Such policies shall contain a severability of interests provision. The Consultant shall be solely responsible for any deductible losses under each of the policies required above.

7.3 Certificates of insurance shall be provided by the Consultant as evidence that policies providing the required coverages, conditions, and minimum limits are in full force and effect, and shall be subject to review and approval by the City. No required coverage shall be cancelled, terminated or materially changed until at least 30 days' prior written notice has been given to the City. The City reserves the right to request and receive a certified copy of any policy and any endorsement thereto.

7.4 Failure on the part of the Consultant to procure or maintain policies providing the required coverages, conditions, and minimum limits shall constitute a material breach of contract upon which the City may immediately terminate this Agreement, or at its discretion may procure or renew any such policy or any extended reporting period thereto and may pay any and all premiums in connection therewith, and all monies so paid by the City shall be repaid by Consultant to the City upon demand, or the City may offset the cost of the premiums against any monies due to Consultant from the City.

7.5 The parties understand and agree that the City is relying on, and does not waive or intend to waive by any provision of this Agreement, the monetary limitations or any other rights, immunities, and protections provided by the Colorado Governmental Immunity Act, § 24-10-101 et seq., C.R.S., as from time to time amended, or otherwise available to the City, its officers, or its employees.

7.6 Neither party shall be liable for any consequential, indirect, special, incidental, or exemplary, or punitive damages, including loss of profits, whether based in contract or tort or any other theory, even if a party has been advised of the possibility of such damages.

8.0 INDEMNIFICATION

To the fullest extent permitted by law, the Consultant agrees to indemnify and hold harmless the City, and its elected and appointed officers and its employees, from and against all liability, claims, and demands, on account of any injury, loss, or damage, which arise out of or are connected with the services hereunder, if and to the extent such injury, loss, or damage is caused by the negligent act, omission, or other fault of the Consultant or any subcontractor of the Consultant, or any officer, employee, or agent of the Consultant or any subcontractor, or any other person for whom Consultant is responsible. The Consultant shall investigate, handle, respond to, and provide defense for and defend against any such liability, claims, and demands. The Consultant shall further bear all other costs and expenses incurred by the City or Consultant and related to any such liability, claims and demands, including but not limited to court costs, expert witness fees and attorneys' fees if the court determines that these incurred costs and expenses are related to such negligent acts, errors, and omissions or other fault of the Consultant. Notwithstanding the foregoing, Consultant's duty to defend, indemnify and hold harmless the City, and its elected and appointed officials and employees as set forth in this section shall only arise upon determination, by adjudication, alternative dispute resolution, or mutual agreement between Consultant and the City, of the Consultant's liability or fault. The City shall be entitled to its costs and attorneys' fees incurred in any action to enforce the provisions of this Section 8.0. The Consultant's

indemnification obligation shall not be construed to extend to any injury, loss, or damage which is caused by the act, omission, or other fault of the City.

9.0 QUALITY OF WORK

Consultant's professional services shall be in accordance with the prevailing standard of practice normally exercised in the performance of services of a similar nature in the Denver metropolitan area.

10.0 INDEPENDENT CONTRACTOR

It is the expressed intent of the parties that the Consultant is an independent contractor and not the agent, employee or servant of the City, and that:

10.1. Consultant shall satisfy all tax and other governmentally imposed responsibilities including but not limited to, payment of state, federal, and social security taxes, unemployment taxes, worker's compensation and self-employment taxes. No state, federal or local taxes of any kind shall be withheld or paid by the City.

10.2. **Consultant is not entitled to worker's compensation benefits except as may be provided by the Consultant nor to unemployment insurance benefits unless unemployment compensation coverage is provided by the Consultant or some entity other than the City.**

10.3. Consultant does not have the authority to act for the City, or to bind the City in any respect whatsoever, or to incur any debts or liabilities in the name of or on behalf of the City.

10.4. Consultant has and retains control of and supervision over the performance of Consultant's obligations hereunder and control over any persons employed by Consultant for performing the Services hereunder.

10.5. The City will not provide training or instruction to Consultant or any of its employees regarding the performance of the Services hereunder.

10.6. Neither the Consultant nor any of its officers or employees will receive benefits of any type from the City.

10.7. Consultant represents that it is engaged in providing similar services to other clients and/or the general public and is not required to work exclusively for the City.

10.8. All Services are to be performed solely at the risk of Consultant and Consultant shall take all precautions necessary for the proper and sole performance thereof.

10.9. Consultant will not combine its business operations in any way with the City's business operations and each party shall maintain their operations as separate and distinct.

11.0 ASSIGNMENT

Except as provided in section 22.0 hereof, Consultant shall not assign or delegate this Agreement or any portion thereof, or any monies due or to become due hereunder without the City's prior written consent.

12.0 DEFAULT

Each and every term and condition hereof shall be deemed to be a material element of this Agreement. In the event either party should fail or refuse to perform according to the terms of this Agreement, such party may be declared in default.

13.0 TERMINATION

13.1 This Agreement may be terminated by either party for material breach or default of this Agreement by the other party not caused by any action or omission of the other party by giving the other party written notice at least thirty (30) days in advance of the termination date. Termination pursuant to this subsection shall not prevent either party from exercising any other legal remedies which may be available to it.

13.2 In addition to the foregoing, this Agreement may be terminated by the City for its convenience and without cause of any nature by giving written notice at least fifteen (15) days in advance of the termination date. In the event of such termination, the Consultant will be paid for the reasonable value of the services rendered to the date of termination, not to exceed a pro-rated daily rate, for the services rendered to the date of termination, and upon such payment, all obligations of the City to the Consultant under this Agreement will cease. Termination pursuant to this subsection shall not prevent either party from exercising any other legal remedies which may be available to it.

14.0 INSPECTION AND AUDIT

The City and its duly authorized representatives shall have access to any books, documents, papers, and records of the Consultant that are related to this Agreement for the purpose of making audits, examinations, excerpts, and transcriptions.

15.0 DOCUMENTS

All computer input and output, analyses, plans, documents photographic images, tests, maps, surveys, electronic files and written material of any kind generated in the performance of this Agreement or developed for the City in performance of the Services are and shall remain the sole and exclusive property of the City. All such materials shall be promptly provided to the City upon request therefor and at the time of termination of this Agreement, without further charge or expense to the City. Consultant shall not provide copies of any such material to any other party without the prior written consent of the City.

16.0 ENFORCEMENT

16.1 In the event that suit is brought upon this Agreement to enforce its terms, the prevailing party shall be entitled to its reasonable attorneys' fees and related court costs.

16.2 This Agreement shall be deemed entered into in Boulder County, Colorado, and shall be governed by and interpreted under the laws of the State of Colorado. Any action arising out of, in connection with, or relating to this Agreement shall be filed in the District Court of Boulder County of the State of Colorado, and in no other court. Consultant hereby waives its right to challenge the personal jurisdiction of the District Court of Boulder County of the State of Colorado over it.

17.0 COMPLIANCE WITH LAWS

17.1 Consultant shall be solely responsible for compliance with all applicable federal, state, and local laws, including the ordinances, resolutions, rules, and regulations of the City; for payment of all applicable taxes; and obtaining and keeping in force all applicable permits and approvals.

17.2 Consultant acknowledges that the City of Louisville Code of Ethics provides that independent contractors who perform official actions on behalf of the City which involve the use of discretionary authority shall not receive any gifts seeking to influence their official actions on behalf of the City, and that City officers and employees similarly shall not receive such gifts. Consultant agrees to abide by the gift restrictions of the City's Code of Ethics.

18.0 INTEGRATION AND AMENDMENT

This Agreement represents the entire Agreement between the parties and there are no oral or collateral agreements or understandings. This Agreement may be amended only by an instrument in writing signed by the parties.

19.0 NOTICES

All notices required or permitted under this Agreement shall be in writing and shall be given by hand delivery, by United States first class mail, postage prepaid, registered or certified, return receipt requested, by national overnight carrier, or by facsimile transmission, addressed to the party for whom it is intended at the following address:

If to the City:

City of Louisville
Attn: City Manager
749 Main Street
Louisville, Colorado 80027
Telephone: (303) 335-4533

Fax: (303) 335-4550

If to the Consultant:

McKinstry Essention, LCC
Attn: Ashley Brasovan
16025 Table Mountain Parkway, Suite 100
Golden, Colorado 80403
Telephone: 303-968-4138

Any such notice or other communication shall be effective when received as indicated on the delivery receipt, if by hand delivery or overnight carrier; on the United States mail return receipt, if by United States mail; or on facsimile transmission receipt. Either party may by similar notice given, change the address to which future notices or other communications shall be sent.

20.0 EQUAL OPPORTUNITY EMPLOYER

20.1 Consultant will not discriminate against any employee or applicant for employment because of race, color, religion, age, sex, disability or national origin. Consultant will take affirmative action to ensure that applicants are employed and that employees are treated during employment without regard to their race, color, religion, age, sex, disability, or national origin. Such action shall include but not be limited to the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Consultant agrees to post in conspicuous places, available to employees and applicants for employment, notice to be provided by an agency of the federal government, setting forth the provisions of the Equal Opportunity Laws.

20.2 Consultant shall be in compliance with the applicable provisions of the American with Disabilities Act of 1990 as enacted and from time to time amended and any other applicable federal, state, or local laws and regulations. A signed, written certificate stating compliance with the Americans with Disabilities Act may be requested at any time during the life of this Agreement or any renewal thereof.

21.0 NO THIRD PARTY BENEFICIARIES

It is expressly understood and agreed that enforcement of the terms and conditions of this Agreement, and all rights of action relating to such enforcement, shall be strictly reserved to City and Consultant, and nothing contained in this Agreement shall give or allow any such claim or right of action by any other third party on such Agreement. It is the express intention of the parties that any person other than City or Consultant receiving services or benefits under this Agreement shall be deemed to be an incidental beneficiary only.

22.0 SUBCONTRACTORS

Consultant may utilize subcontractors identified in its qualifications submittal to assist with non-specialized works as necessary to complete projects. Consultant will submit any proposed subcontractor and the description of its services to the City for approval. The City will not work directly with subcontractors.

23.0 AUTHORITY TO BIND

Each of the persons signing below on behalf of any party hereby represents and warrants that such person is signing with full and complete authority to bind the party on whose behalf of whom such person is signing, to each and every term of this Agreement.

In witness whereof, the parties have executed this Agreement to be effective on the date first above written.

CITY OF LOUISVILLE,
a Colorado Municipal Corporation

By:_____
Ashley Stolzmann, Mayor

Attest:_____
Meredyth Muth, City Clerk

CONSULTANT:

McKinstry Essention, LLC.

By: Bryan Hanson
Digitally signed by Bryan Hanson
DN: C=US, E=bryanh@mckinstry, O=RKY Region, OU="McKinstry Essention, LLC.", CN=Bryan Hanson
Date: 2022.10.20 15:31:23-06'00'

Title: Vice President

Exhibit A – Scope of Services

Request for Proposals

2022 Internal Decarbonization Plan

City of Louisville, City Manager's Office
749 MAIN STREET, LOUISVILLE, CO 80027
PH: (303) 335-4528
www.louisvilleco.gov

Project Number: 101446-540910

PROPOSALS DUE: FRIDAY, AUGUST 26
11:59 A.M.

Table of Contents

PROPOSED PROJECT SCHEDULE

Proposals Due	Aug 26. 2022
Selection Committee – Interviews	Sept. 2022
Final Selection and Contract	Sept. 2022
Kick-off to begin	Oct. 2022
Baseline Review Process	Oct. 2022
Audits 1 - 3 (location TBD)	Nov. 2022
Audits 4 – 6 (location TBD)	Dec. 2022
Audits 7 - 10 (location TBD)	Jan. 2023
Audits 1 - 3 Deliverable	Feb. 2023
Audit 4 – 6 Deliverable	Mar. 2023
Audit 7 – 9 Deliverable	Apr. 2023
Audit 10 Deliverable & Final Report	May. 2023

CITY INFORMATION

Situated between Denver and Boulder, the City of Louisville, Colorado receives national attention for being one of the best places to live in the United States. The City has a population of approx. 21,000 residents and provides a wide range of services and amenities. As a home rule municipality with more than 400 employees to serve its residents, the City delivers core services and operates several public facilities that fall within the scope of work for this project.

In August of 2019, the Louisville City Council passed Resolution 25, Series 2019, which set clean energy and carbon emission reduction goals for the municipality and larger community. This resolution sets goals to meet all of Louisville's municipal electric needs with 100% carbon-free sources by 2025 and to reduce core municipal greenhouse gas emissions annually below the 2016 baseline through 2025.

As a result, the City is seeking a complete engineering, mechanical and financial analysis for each of its municipal facilities (ten facilities in total, some of which consist of multiple buildings) and associated fleet and equipment. The final deliverable for this project will include a strategic roadmap for electrification and decarbonization of all City buildings, fleet, equipment and operations by 2030.

INVITATION

The City of Louisville is inviting proposals from highly qualified firms ("Respondents") exhibiting the following qualifications:

1. Seeking a team of creative and innovative engineers who have a track record of going above and beyond for clients performing tasks such as ASHRAE level 2 and level 3 audits with expertise in identifying strategic opportunities.
2. Seeking a team that has proven and significant realization rates from recommendation reports.
3. Seeking a team experienced in building energy sciences with Heating, Ventilation, and Air Conditioning (HVAC) design engineering expertise.
4. Seeking experience in building electrical system design, specifically regarding the electrification of existing natural gas systems.
5. Seeking heat pump operations expertise (ie, ability to evaluate and recommend specific designs, equipment, identify potential barriers, etc.)
6. Seeking electric vehicle charging, solar photovoltaic and energy storage engineering expertise.
7. Seeking knowledge of fleet vehicles/equipment and landscaping equipment for municipal operations (ie, mowers, leaf blowers, etc.) and electric alternatives
8. Must have knowledge of local, federal, and state funding opportunities and grants and utility programs and incentives.
9. Must have ability to research and analyze financial barriers and supply chain challenges when compiling recommendations report.
10. Requiring Professional Engineering License(s) for the State of Colorado.

The City may contract with multiple firms to obtain all desired services.

Scope of Services

The scope of work will involve an initial review of existing facility mechanical, electrical and plumbing (MEP) drawings, available ASHRAE audit reports, benchmarking data and fleet studies followed by electrification audits of each of the municipal facilities listed below. Each audit may require several experts to be present and these may include electrical engineering experts, HVAC and building mechanical systems experts, building automation and controls experts, building code experts, electric vehicle charging, battery storage design and solar PV expertise as well as others having expertise in the relevant electrification requirements for each of the systems included, but not limited to the following:

HVAC Equipment

1. Rooftop units
2. Heat recovery ventilators
3. Gas furnaces
4. Natural gas boiler systems
5. Commercial kitchen systems
6. Domestic hot water heating systems
7. Gas grills and fireplaces

HVAC Infrastructure

1. Ductwork
2. Piping
3. Electrical service (costs to upgrade to meet new electrical demand)
4. Backup Generators

Distributed Energy Resources

1. On-site solar photovoltaics (PV)
2. Electric energy storage battery systems
3. Demand response controls (hot water heating, batteries, thermal energy storage, lighting, etc.)
4. Vehicle to grid (V2G) planning
5. Innovative future planning (i.e. micro-grid, centralized/district heating and cooling systems (CHP), etc.)

Fleet Equipment

1. Fleet vehicle use evaluation
2. Fleet electric vehicle (EV) charging
3. EV charging infrastructure/electric service design and cost evaluation

Additional Equipment

1. Lawnmowers
2. Trimmers
3. Leaf blowers
4. Golf Carts
5. Snow Blowers
6. Operations equipment

Facilities Included in Scope

The municipal sites that will each require a full electrification audit and subsequent cost evaluation and recommended timeline for implementation will include:

1. Louisville City Services
2. Police and Municipal Court
3. City Hall
4. Louisville Public Library
5. Louisville Golf Course
6. Recreation and Senior Center
7. North Water Treatment Plant
8. South Water Treatment Plant
9. The Louisville Art Center
10. City of Louisville Wastewater Treatment Plant

Each of these municipal facilities have existing Energy Star Portfolio Manager accounts with baseline usage data as well as having completed ASHRAE level 1 audits available for baseline review. As mentioned, the scope of work will involve a thorough review and economic analysis with electrification audit reports delivered for each facility. Sites may contain multiple buildings (white house, golf course maintenance building, old city shops, etc.).

Project and Deliverables Scope

Respondents will be required to attend bi-weekly meetings with the internal working group and will be responsible for conducting staff interviews with representatives from various departments, including but not limited to: City Manager's Office, Public Works and Facilities,

Planning and Building, Parks and Golf Course, Open Space and Trails, and Sustainability to understand department priorities before conducting site visits. Throughout the project, respondents are responsible for regular communication with staff and will be available to answer questions and provide information as needed.

Upon delivery of each electrification audit report, respondents are responsible for department and/or executive management team presentations with results and recommendations to detail findings and answer questions. Respondents are responsible for one City Council presentation during the project, after the site audits are complete and before the audit reports are complete, to communicate audit findings and project progress and direction.

Upon completion of final report, respondent is responsible for three board presentations (Parks and Public Lands Advisory Board, Open Space Advisory Board and Sustainability Advisory Board) and one City Council presentation to detail project steps, findings, and recommendations with a focus on optimal implementation timeline, decarbonization potential and budget impacts.

The ten audit report deliverables shall contain, at minimum, the following sections:

- Executive Summary to include:
    - List of recommendations and alternative options for electrification and decarbonization of buildings and associated fleet and equipment with benefit/drawback analysis
    - Economic summary with options for financing and grants to offset costs
        - Report on GHG cost effectiveness (ie, GHG reduced / dollar spent) intended to help with prioritizing facilities/measures having the greatest GHG reduction cost effectiveness.
    - Total electrical infrastructure capacity upgrade requirement per facility that would allow for the full electrification and EV charging capacity detailed individually throughout the report
    - Availability of materials and supply chain impacts
    - Availability of service providers, electricians, and others as necessary
    - Recommended timeline and action items for implementation of each recommendation, with an emphasis on maximizing financial investments
    - Decarbonization summary (GHG reduced per recommendation and overall potential)
    - Baseline and proposed total facility site energy use intensity (EUI) comparison or Energy Star scores

- Background and introduction with facility descriptions and:
    - Recent (3-year) facility upgrades
    - Review of existing ASHRAE audits
    - Baseline utility data analysis
    - Interview staff to determine and report on knowledge gaps. Deliver on

recommended trainings to fill knowledge gaps (operations and maintenance)

- HVAC Electrification Sections to include:
    - Detailed sections for each HVAC electrification recommendations
        - Description of existing natural gas (or other) system to be upgraded
        - An evaluation of the existing and proposed electrical infrastructure upgrade requirements with cost estimates for the engineering design and implementation specific to each proposed equipment location.
        - An evaluation of each recommended equipment replacement to involve outreach to obtain cost estimates and availability to inform estimated timelines, taking into consideration supply chain barriers.
        - Evaluation of electrification risks (ie. where should building envelope be addressed prior to electrification to avoid future issues operating heat pumps)
        - Evaluation of alternative options (ie. opportunities for combining systems, heat recovery systems, ground-source, or air-source options, etc.)

- Distributed Energy Resources Section(s) to include:
    - Evaluation of electric energy generation, storage and resilience opportunities (necessary infrastructure, availability of equipment, specific equipment recommendations, charging and discharging strategy recommendations, costs, etc.)
        - On-site solar PV
        - Battery storage
        - Demand response
        - Vehicle to grid (V2G)
        - Industrial power-surge technologies that may be applicable
    - Innovative future planning (i.e. micro-grid, centralized heating and cooling, etc.) including necessary infrastructure, availability of equipment and costs.
    - Evaluation into peak demand cost savings potential for each DER system recommended.
    - Evaluation of cost comparison between on-site renewables and Xcel Energy subscription programs, including equipment depreciation costs and replacement schedules.
    - Evaluation of existing and proposed fire codes in locations where batteries are being stored, charged, etc. This should include any potential fire code changes that may result from other electrification measures.

- Fleet Electrification Sections to include:
    - Detailed sections for each fleet recommendation with:
        - Evaluation of existing fleet routes, schedules, and down-time
        - Recommendations with cost analysis and availability to replace the total fleet of vehicles with electric vehicles and necessary charging

infrastructure; including detailed recommendations that are specific to each fleet replacement vehicle, taking into consideration supply chain barriers.
        - Evaluation and recommendations regarding leasing -vs- purchasing fleet EV's
        - Evaluation of the required fleet EV charging infrastructure with recommended schedules and schedule changes (this may involve overlap between each facility so fleet EV's may be shared and optimal charging achieved based on use and overlapping needs) and V2G opportunities.
        - Evaluation of EV charging needs offsite (away from facilities). This may include parks and other locations where our fleet EV's may require charging during the workday to avoid bringing vehicles back to facilities. This may or may not be necessary depending on the findings from evaluations listed previously.
        - Recommended fleet EV battery replacement schedules and costs for annual budgeting purposes.
        - Evaluation of existing and proposed fire codes in locations where batteries are being stored, charged, etc.. This should include any potential fire code changes that may result from other electrification measures.
        - Specific and overall estimates for GHG reductions

- Additional Equipment Electrification Section:
    - Evaluation of operations and lawn care equipment electrification such as lawnmowers, trimmers, leaf blowers, golf carts, snow removal equipment and other operations equipment.
        - Evaluation of existing equipment uses, schedules and down-time
        - Evaluation comparing options to lease our own electric operations equipment -vs- contracting with an all-electric service provider.
        - Recommendations with cost analysis and availability to replace the total number of equipment with electric; including detailed recommendations that are specific to each replacement equipment, taking into consideration supply chain barriers.
        - Evaluation of the required charging infrastructure needed at each facility with recommended charging and use schedules
        - Specific and overall estimates for GHG reductions
        - Evaluation of operations electric equipment charging needs offsite (away from facilities). This may include parks and other locations equipment may require charging during the workday to avoid brining equipment back to facilities. This may or may not be necessary depending on the findings from evaluations listed previously.
        - Recommended operations electric equipment battery replacement schedules, and costs for annual budgeting purposes.

The final report will summarize the ten audit reports and include a strategic roadmap for full decarbonization of City facilities, fleet, equipment and operations by 2030. This roadmap will include a financial and technological feasibility assessment, implementation timeline, greenhouse gas reduction potential and annual budget implications to achieve decarbonization within the allotted timeframe. Project may be completed prior to May 2023 if deemed feasible by Respondent.

Piggyback Contract Award Opportunity
Please indicate your firm's willingness to extend the terms of resulting contracts, inclusive of price, to other Colorado local government entities, including counties and municipalities, should your firm be awarded a contract or contracts pursuant to this RFP. While this clause in no way commits any other local government entity to purchase from the City of Louisville's awarded contractor, nor does it guarantee any additional orders will result, it is intended to allow such local governmental entities, at their discretion, to make use of the City of Louisville's competitive process (provided said process satisfies their own procurement guidelines) and purchase directly from the awarded contractor. All purchases made by other local government entities will be transactions between that entity and the awarded vendor; the City of Louisville will not be responsible for any such purchases. While not dispositive, a response to this section in the negative may affect the City's decision on whether to award your firm a contract pursuant to this RFP.

Submittal Instructions

If you have any questions about the RFP, please contact Kayla Betzold in the City Manager's Office at 303-335-4534 or kbetzold@louisvilleco.gov. Submittals are due at Louisville City Hall (749 Main Street) for time and date recording on or before August 26, 2022 at 11:59 a.m. **Electronic submittals can be emailed to** kbetzold@louisvilleco.gov**.**

All RFPs must be received, and time and date recorded by authorized City staff by the above due date and time. Sole responsibility rests with the Respondents to see that their RFP response is received on time at the stated location. Any responses received after due date and time will be returned to the Respondents.

The City of Louisville reserves the right to reject any and all responses, to waive any informalities or irregularities therein, and to accept the proposal that, in the opinion of the City, is in the best interest of the City of Louisville. Due to the complexity of work required, selection of a firm will not be based solely upon the lowest responsible bid but will also take into account experience gained from work on similar projects and an understanding of the project goals and approach to the project.

Digital copies of the Bidding Documents will be available beginning August 1, 2022 on-line through Rocky Mountain Bid System and linked through the City of Louisville's website at http://www.louisvilleco.gov/business/bidding-opportunities.

Terms and Conditions

1. Each Respondent shall furnish the information required in the proposal.
2. The Contract/Purchase Order will be awarded to the Respondent whose submittal, conforming to the Request for Proposals, will be most advantageous to the City of Louisville, price and other factors considered.
3. The City of Louisville reserves the right to reject any or all proposals and to waive informalities and minor irregularities in proposals received, and to accept any portion of or all items proposed if deemed in the best interest of the City of Louisville to do so.
4. No submittal shall be withdrawn for a period of thirty (30) days subsequent to the opening of RFPs without the consent of the City's delegated representative.
5. A signed purchase order or contract furnished to the selected firm results in a binding contract without further action by either party.
6. Late or unsigned RFPs will not be accepted or considered. It is the responsibility of Respondents to ensure that the RFP arrives at the City of Louisville no later than the time indicated in the "Request for Proposal."
7. The proposed price shall be exclusive of any Federal or State taxes from which the City of Louisville is exempt by law.
8. Any interpretation, correction or change of the RFP documents will be made by Addendum. Interpretations, corrections, and changes of the RFP documents made in any other manner will not be binding, and Respondents shall not rely upon such interpretations, corrections and changes. The City will not be responsible for oral clarification.
9. Confidential/Proprietary Information: RFPs submitted in response to this "Request for Proposal" and any resulting contract are subject to the provisions of the Colorado Public (Open) Records Act, 24-72-201 et.seq., C.R.S., as amended. Any restrictions on the use or inspection of material contained within the proposal and any resulting contract shall be clearly stated in the RFP itself. Confidential/proprietary information must be readily identified, marked and separated/packaged from the rest of the proposal. **Co-mingling of confidential/proprietary and other information is NOT acceptable. Neither a proposal, in its entirety, nor proposed price information will be considered confidential/proprietary. Any information that will be included in any resulting contract cannot be considered confidential.**
10. The City reserves the right to modify the Scope of Services and request revisions to proposals prior to entering into a written contract.

EVALUATION CRITERIA

Please respond to the evaluation criteria with comments that are concise and to the point. The City will evaluate, and finalists will be selected and invited to continue the process by making formal presentations to a selection committee. The best fit will be recommended to City Council authorizing the City to enter into a professional services agreement. The selection committee will evaluate and score the submittals using a weighted average based upon:

A. Statement of Interest (SOI). In up to three (3) pages, express your interest in the project, specifically addressing:
    1. Specialized experience
    2. Analysis/identification of issues – identify constraints as well as opportunities.
    3. Goals – identify how your project goals meet or exceed the City's project goals.

B. Project Approach. In up to five (5) pages, express your project approach, specifically including:
    1. A detailed project schedule highlighting critical path and milestones for completion of the project.
    2. Examples of similar projects – quality finished projects with proven implementation results
    3. Innovative solutions – discuss project alternatives, and/or opportunities to add value to the project.
    4. On-time and budget – accountability for time, budget and firm availability.

C. Project Team Listing
    1. Provide a listing of team members that will be involved in the process, relevant experience and other material that is pertinent and concise.

D. References
    1. Submit three references for similar projects completed within the last three years along with contacts for the project.

E. Cost Proposal
    1. A not-to-exceed amount for all phases of the Scope of Services.

SUBMITTAL

Please submit the following information in the order listed below:

1. Name of your company/organization
2. Type of Organization: (Corporation, Partnership, etc.)
3. Address
4. Names and Address of Project Team or Firm
5. Contact Person(s)
6. Telephone, Fax, E-mail
7. Statement of Interest
8. Project Approach
9. Project Team Listing
10. References
11. Cost Proposal

SIGNATURE PAGE

Failure to complete, sign and return this signature page with your proposal may be cause for rejection.

Contact Information	Response
Company Name	
Name and Title of Primary Contact Person	
Company Address	
Phone Number	
Email Address	
Company Website if applicable	

By signing below, I certify that:
I am authorized to bid on my company's behalf**.**
I am not currently an employee of the City of Louisville.

Signature of Person Authorized to Bid on **Date Firm's Behalf**

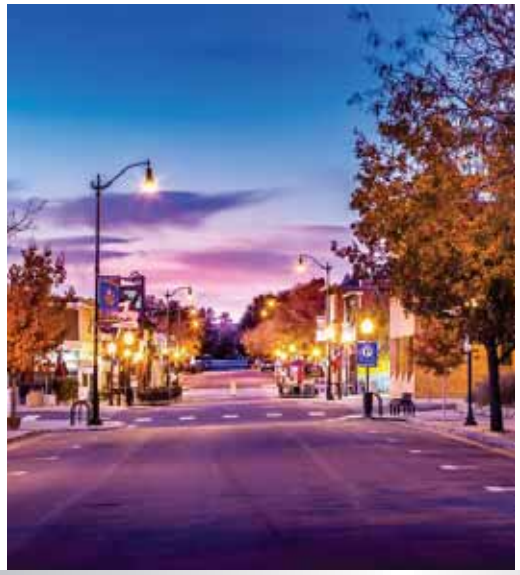
Note: If you cannot certify the above statements, please explain in the space provided below.

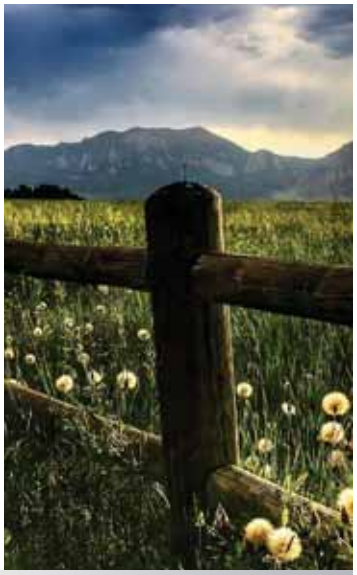
EXHIBIT B

City of Louisville

2022 INTERNAL DECARBONIZATION PLAN

LOUISVILLE, CO
AUGUST 26, 2022





City of Louisville

McKinstry
For The Life Of Your Building

August 26, 2022
Kayla Betzold
City of Louisville, CO
749 Main Street
Louisville, CO 80027
kbetzold@louisvilleco.gov

RE: Request for Proposals 2022 Internal Decarbonization Plan

Dear Ms. Betzold and Evaluation Committee,

On behalf of McKinstry Essention, LLC (McKinstry), we are pleased to submit this response to the City of Louisville's Request for Proposals for an Internal Decarbonization Plan. Our team is excited to partner with the City of Louisville to create a roadmap that drives the City towards electrification and decarbonization by 2030 and prioritizes the economic, environmental, and community goals of Louisville.

A VALUABLE PARTNERSHIP

Given the scope, scale, and complexity of this project, success will require broad expertise in local policies, new technology, project development, project finance, grants, long-term life cycle analysis, and technical engineering/ design. The McKinstry team is the right choice for the City of Louisville project based on the following key proven differentiators:

In House, Experienced Decarbonization & Resiliency Team. Based in Golden, McKinstry's team has a proven track record of engineering, designing, and deploying thousands of projects across the US focused on electrification, energy efficiency, water reduction, distributed energy resources, and electric vehicle fleet conversion. With a team that has **in-house experience in both planning and implementation** for renewables, electrification and decarbonization, your team can be assured that you'll receive an **actionable roadmap.** This breadth of experience enables us to deliver a study with just one trusted partner (Cascade Energy) rather than a number of subconsultants.

Extensive Municipal Experience. McKinstry has completed more than $175 million worth of energy services to the municipal market sector in the last four years implemented across 218+ cities, counties, and government agencies nationwide. We have successfully and safely conducted all this effort around work schedules with little-to-no interruption to customer operations and have the recent and relevant experience – both in planning and implementation - to apply to the City of Louisville project.

Golden, CO-Based Regional Office and Local Commitment. McKinstry's Mountain Region headquarters is located within the City of Golden – just a few minutes down the road from Louisville - and our team is fully committed to serving the local geography. We are excited to continue working in our backyard to further the City's electrification and decarbonization goals by 2030.

Success in Converting Audits to Implementation. With the complexity and uniqueness of this project for the City of Louisville, your team will need to select a firm that not only has experience with roadmaps and studies but also has experience with implementation. McKinstry has General Contracting roots and has experience implementing over $2 Billion in energy, electrification and decarbonization projects nation-wide. Our team is implementing over $100M in decarbonization construction projects in Colorado alone in the next year.

Sincerely,

Ashley Brasovan | Senior Account Executive
303.968.4138 | ashleyb@mckinstry.com

SIGNATURE PAGE

Failure to complete, sign and return this signature page with your proposal may be cause for rejection.

Contact Information	Response
Company Name	McKinstry Essention, LLC
Name and Title of Primary Contact Person	Ashley Brasovan | Senior Account Executive
Company Address	16025 Table Mountain Parkway, Suite 100 Golden, CO 80403
Phone Number	303.968.4138
Email Address	ashleyb@mckinstry.com
Company Website if applicable	www.McKinstry.com

By signing below, I certify that:
I am authorized to bid on my company's behalf.
I am not currently an employee of the City of Louisville.

Ashley Brasovan — 08.26.2022

Signature of Person Authorized to Bid on — **Date Firm's Behalf**

Note: If you cannot certify the above statements, please explain in the space provided below.

> "The experience, professionalism and technical expertise McKinstry has displayed are among the highest in the industry."
> *—Joe Castro PE, Former Facilities and Fleet Manager, City of Boulder*

Statement of Interest

Specialized Experience

MCKINSTRY: LOUISVILLE'S IDEAL PARTNER IN DECARBONIZATION McKinstry is an energy performance company with an unmatched depth and breadth of experience in building planning, design, development, contracting, construction, finance, and operations. Over the last decade, McKinstry has planned, developed and implemented over $2.0 billion in energy projects that reduce our client's carbon footprint through electrification, efficiency and renewable energy. Founded in 1960, with 2,000+ staff, 26 offices coast to coast, and our Rocky Mountain headquarters just down the road in Golden, McKinstry is an ideal partner for Louisville because:

As a company, we believe the climate crisis is an existential threat to humanity. We see our core corporate mission as resolving the climate, equity, and affordability crises as nested concerns in the building sector. This is not just another job for us – we are fully aligned with Louisville's climate values. As shown below, we have taken a national leadership role in eliminating climate harm.

McKinstry made a major commitment to exemplify deep climate solutions and self-developed Catalyst, which will be the largest dual ILFI Zero Energy/Zero Carbon certified building in the United States.

Local strength, national horsepower. Our Golden Rocky Mountain region headquarters, with 100+ employees, is also our corporate center of excellence in existing building decarbonization. Many of our national experts live locally, including in Louisville. As a national company of over 2,000, we also have a deep well of specialized expertise to draw from.

We are passionate innovator/doers, wedding world class design with real world solutions. We love a good study, but don't believe our work is successful if the solution doesn't happen. Our 360 degree perspective on how buildings are designed, estimated, financed, retrofit, and operated over the long haul give our studies a much greater likelihood of action – truly shovel ready.

> "The McKinstry team did a great job of analyzing our operational activities and implementing an effective plan that had the greatest effect on our energy use."
>
> –Justin Anderson, PE, City Engineer, City of Ogden, UT

While we implement solutions, we also specialize in planning and consulting. Our engineering and design consulting studio focuses solely on front-end planning, helping clients make good decisions about their future. This studio is delivery agnostic, ensuring the best value is provided for the customer.

We are privately owned. This seemingly small detail makes a huge difference – we are mission-driven, deeply care about our long term relationships, and are not moved by relentless stock market demands for maximum profitability.

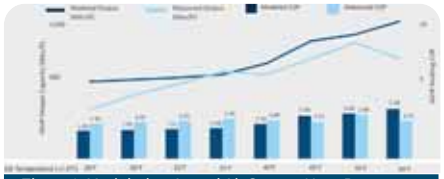


Figure 1. Modeled vs Actual Air Source Heat Pump

Design informed by actual performance. As our industry shifts towards electrification and use of heat pumps, McKinstry tracks actual heat pump performance. We work with our field teams to acquire system operational data and use this to inform our future modeling and designs. The ability to design, build, and operate these heat pump systems sets McKinstry apart.

McKinstry has delivered more than $180 million of decarbonization results for 200+ local governments in the last five years, all of which began with plans and audits. The following are details of our specialized experience:

DECARBONIZATION PLANNING AND ROADMAPPING

FUN FACT: *Brad was launch Director of ILFI's Living Community Challenge*

Led by national decarbonization pioneer **Brad Liljequist**, with technical leadership by **Brian Goldcrump**, McKinstry's decarbonization roadmapping team combines deep innovation with wholistic solutions, ensuring we create an energy endgame for Louisville that provides maximum benefit for minimum cost.

Experience: Decarbonization implementation plans for 200+ local governments, including the City of Boulder, Jefferson County, City of Golden, City and County of Broomfield, City and County of Denver and City of Lakewood; Laird Norton Properties decarbonization plan; Salt Lake City School District decarbonization roadmap; Seattle University decarbonization roadmap.

EXISTING BUILDING ELECTRIFICATION

McKinstry is currently electrifying two schools for Salt Lake City School District.

Very few companies, if any, bring the same level of expertise, rooted in both design and actual retrofitting, to existing building electrification as does McKinstry. Led by Sarah Moore, our national director of engineering for existing buildings, our dedicated retrofit team of nine (out of a larger 110 person engineering group) plans and designs electrification solutions every day.

Experience: Seattle Central College, Uintah Elementary HVAC electrification (full design); Backman Elementary electrification (full design), Unico, Laird Norton, Seattle University.

RENEWABLES/EV INFRASTRUCTURE DESIGN, DEVELOPMENT, AND DELIVERY

McKinstry is pioneering innovative row crop/community solar with Denver Botanic Gardens and Chatfield Farms.

McKinstry's 30+ strong team of solar designers and developers, based in our Golden, CO office are responsible for **35.2 megawatts of solar in the last two years – filling the equivalent of 77 football fields with solar!** With the recent **Inflation Reduction Act inclusion of 30% Direct Payment for onsite solar**, this solution is likely to take a higher profile than previously in the planning effort.

Our EV infrastructure team has designed and developed an array of projects, including the prototype EV fleet delivery van site for a global online retailer.

Experience: City of Boulder, City and County of Denver, Denver Public Schools, City of Lakewood, City of Golden, City and County of Broomfield, Jefferson County, Aurora Public Schools, Colorado School of Mines

Statement of Interest

Specialized Experience

HIGH PERFORMANCE LIGHTING

The International Journal of Industrial Ergonomics—comparing fluorescent and LED lighting—found an 8.3% performance improvement in visual and cognitive tasks.

McKinstry's Lighting Solutions Team, based out of the Golden office, has completed more than 42 million square feet of lighting projects providing more than $7,000,000 in cost savings the last 3 years alone. This team focuses on innovative solutions to ensure the maximum watts are saved while providing quality and comfortable lighting environments.

Local Experience: Denver International Airport, City and County of Denver, City of Phoenix, University of Boulder, City and County of Broomfield, Jeffco School District

ADVANCED BUILDING OPTIMIZATION

McKinstry recently reduced one client's carbon footprint by 18%, just through Advanced Building Optimization!

The bottom line is the majority of buildings are simply operated poorly, wasting huge amounts of energy. McKinstry has an entire 150 person division dedicated to saving energy through retrocommissioning, efficient building operations, and diverse measures that add up to big carbon reductions.

Experience: Decarbonization implementation plans for 200+ local governments, including the City of Boulder, Jefferson County, City of Golden, City and County of Broomfield, City and County of Denver and City of Lakewood; Laird Norton Properties decarbonization plan; Salt Lake City School District decarbonization roadmap; Seattle University decarbonization roadmap.

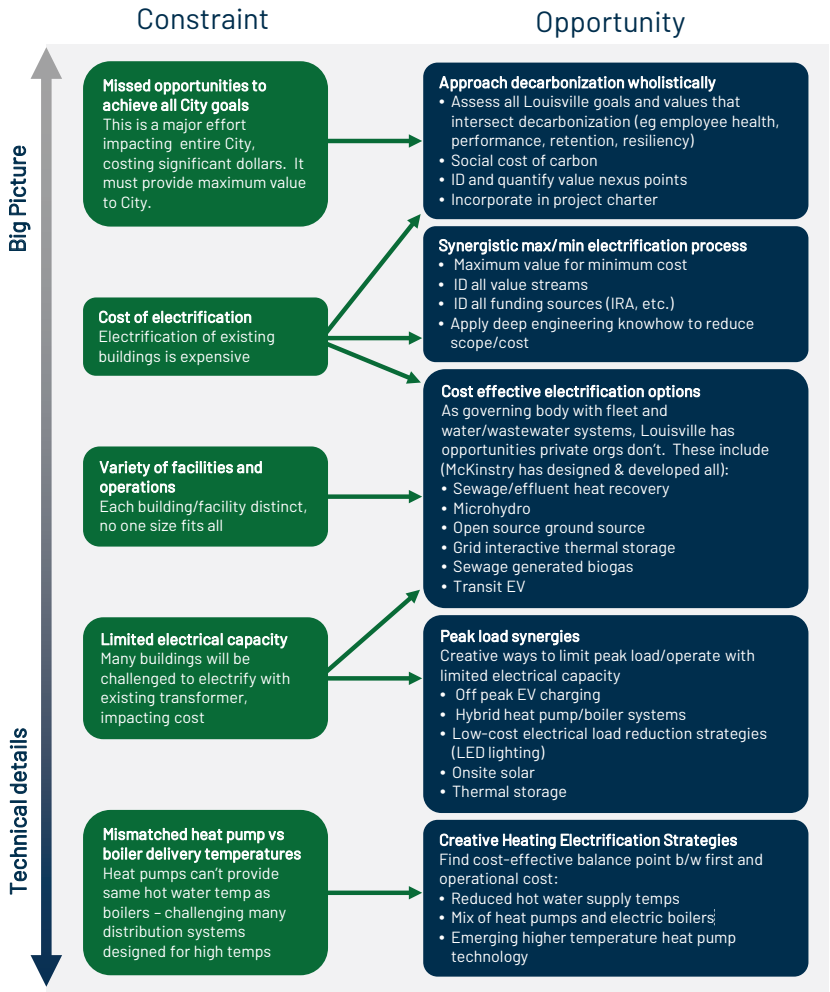
INNOVATIVE ELECTRIFICATION

McKinstry developed the South Landing all electric district heating/cooling system, which is 4x more efficient than a code based system.

McKinstry is an international leader in innovative district and individual building electrification.

Experience: Central Washington University plant gas to electric conversion study; 2nd largest sewage heat recovery/heat pump district in US; all electric South Landing heating/cooling district; regional water main microhydro electricity generation; wastewater treatment plant biogas collection; split distribution temp boiler conversion to heat pump; Two district-scale open loop ground source heat pump system.

Analysis/Identification of Issues



The recent adoption of the Inflation Reduction Act (IRA) throws a very positive wildcard into the mix of renewable electricity decision-making (self-owned vs utility provided). We understand Louisville has a current 100% renewable electricity contract with Xcel Energy. The new IRA 30% Renewables Direct Payment to non-taxed entities (such as Louisville) will upend the math - making it even more cost effective for Louisville to self-own renewables.

Statement of Interest

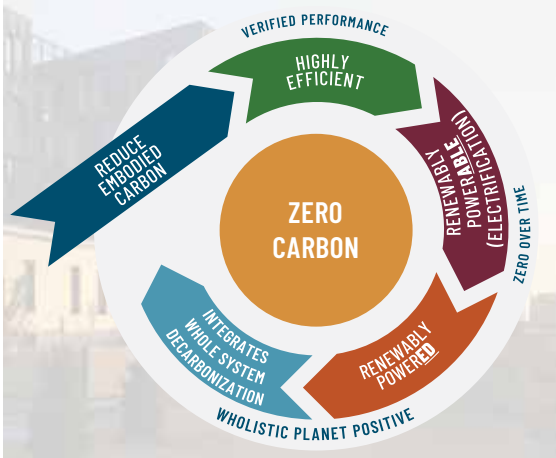
Goals

Our sole initiative is to achieve Louisville's goals for this project – McKinstry's ultimate benchmark of success is a satisfied customer. This is reflected in the longterm partnerships McKinstry has built with municipal and public sector clients in Colorado.

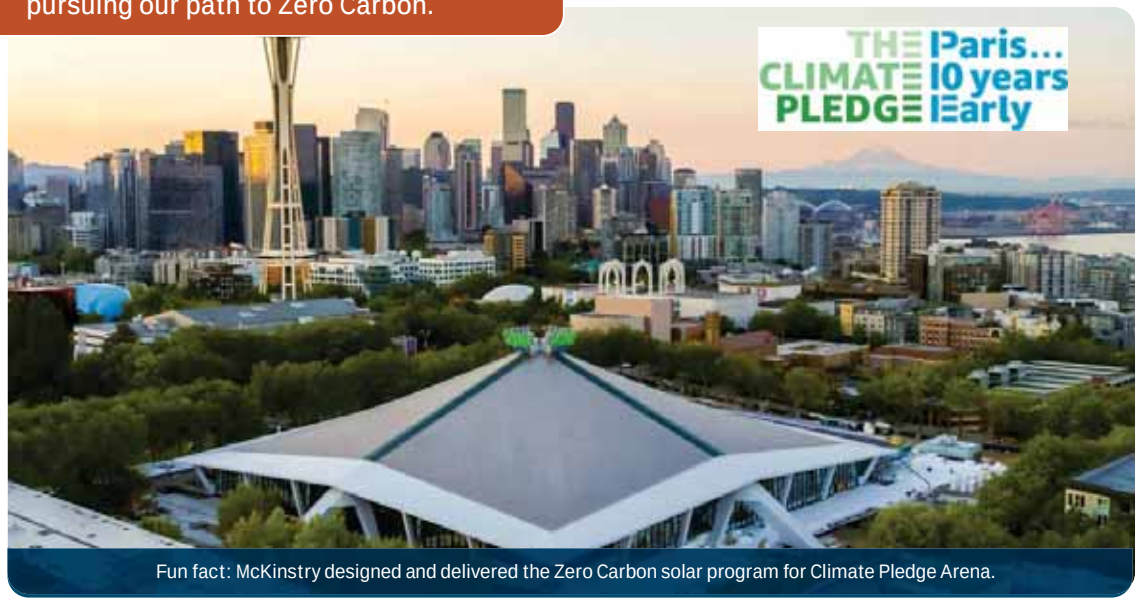
Since establishing our Colorado presence in 2007, McKinstry has implemented more than $200M+ in energy efficiency work with municipal and public sector clients – McKinstry's Client Voice Program surveyed Colorado Municipalities, and the respondents gave McKinstry an average **Net Promoter Score (NPS) of 98%.**

As a starting point, based on Louisville's decarbonization goals, we believe we have 100% climate values alignment between the organizations, facilitating goal achievement. McKinstry's Action for Impact plan establishes us as leading a Zero Carbon future as a core tenet – reflected in being an early adopter of The Climate Pledge, which is focused on organizations committed to doing the hard work of true decarbonization, all the way to full Zero Carbon performance.

McKinstry was the **#10 signatory of The Climate Pledge,** and we are now actively pursuing our path to Zero Carbon.



McKinstry's vision of wholistic decarbonization aligns with Louisville's stated rfp goal of "electrification and decarbonization of all City buildings, fleet, equipment and operations by 2030."



Fun fact: McKinstry designed and delivered the Zero Carbon solar program for Climate Pledge Arena.

From a management standpoint, achieving Louisville's decarbonization goals requires a very deliberate approach throughout the project, including four specific elements:

CLIENT-CENTERED LEADERSHIP

Our study program director, Ashley Brasovan, is unparalleled in excellent client responsiveness and team management. She will ensure the study stays on course, adjusting as needed to meet Louisville's expectations.

Fun Fact: Even though Ashley is a nationally competitive ultra-runner, she is the first into the office in the morning!

INITIAL ORIENTATION & PROJECT CHARTERING

The City's project scope for this RFP is quite clear, so expectations are well defined. We also believe a project kickoff and chartering process as part of the contract establishment process will enable wholistic investigation of aligned topics (such as resiliency, ventilation and health), as well as a clear understanding of the work ahead.

30/60/90 REVIEWS

These reviews are a standard process for McKinstry. In addition to maintaining open communication and alignment, they also allow us to ensure we are on track with Louisville's expectations and to pivot as needed.

DELIVERY AGNOSTIC

As we've expressed elsewhere, McKinstry has a bias for action – we like to see our studies delivered, regardless of who is doing the work! However, we are always 100% focused on identifying the best way for a specific client to be delivered a given project – we don't approach a situation assuming a given path. Because we are skilled in an array of delivery mechanisms, our studies are informed by a realistic and pragmatic implementation approach.

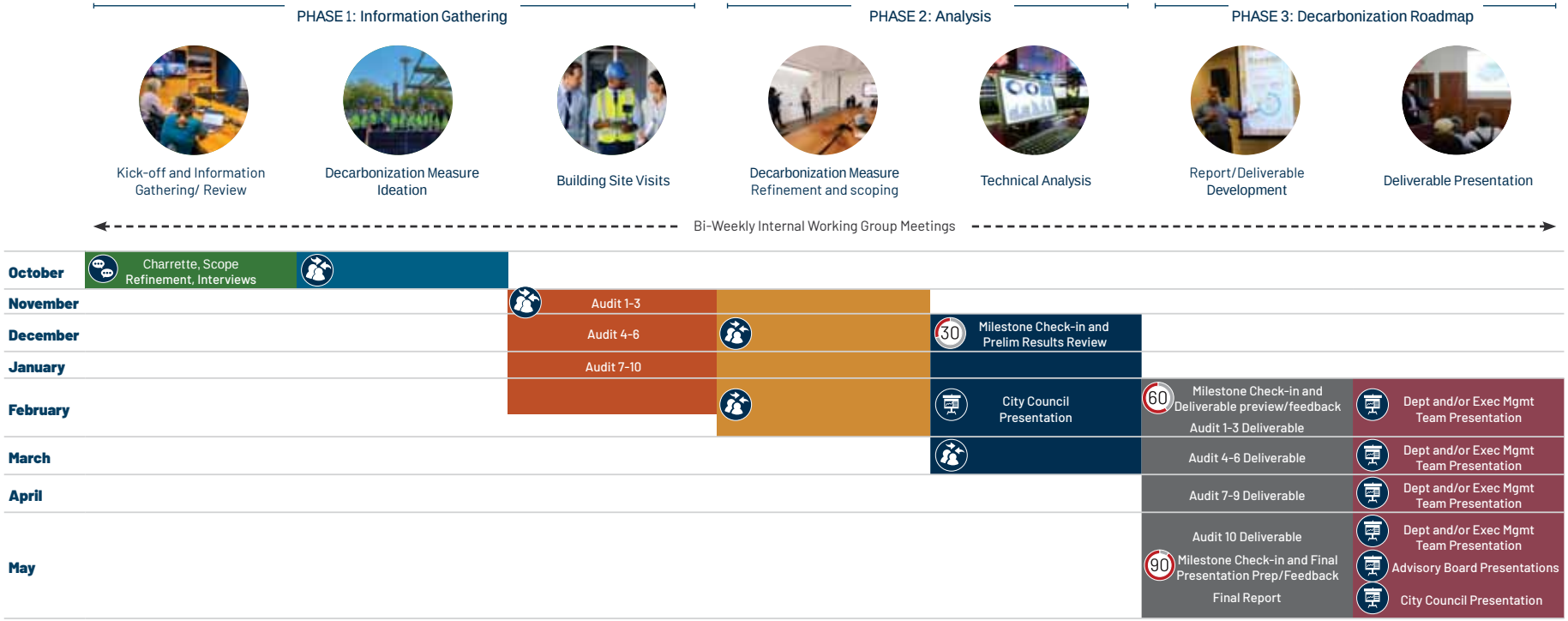
Finally, we know from the RFP that **climate action, rather than study, is Louisville's fundamental goal**. McKinstry's bottom line is delivering verified decarbonization – our entire approach throughout this study will be to ensure Louisville is successful in achieving its climate goals in the real world, not on paper.

Over **90% of McKinstry's efficiency and decarbonization** plans are implemented.

Project Approach

Schedule

The schedule below outlines the timing of the project and highlights the key involvements with Louisville's project team. The 30/60/90 check-ins are critical to the success of the project, and help us recalibrate expectations or direction if needed. The RFP calls for engagement outside of the direct project team, and we plan on coordinating with the project team prior to these engagements. This schedule will be a working document as the project evolves, allowing us to ensure project needs are being met.



- Charrette: Project process, Brainstorming, and Big Ideas
- Grant review
- Interviews: Facilities and department staffs
- Review building audits, benchmarking, and drawings
- Building GHG Inventory
- Review fleet studies
- Establish KPI's and value parameters for benefit/cost analysis
- Project charter development and buy-in

- Establish preferred and no-go measures with facilities staff
- Mechanical capacity analysis
- Load reduction and efficiency measures
- Electrification of buildings, fleet, etc.
- PV, Microgrid, EV Charging
- Commercial kitchen electrification strategies
- Assess condition of key mechanical elements and roofs

- On-site evaluation
- Review constructability of proposed measures

- Narrow alternatives based on feasibility, effectiveness, and cost
- High-level measure scoping for cost estimating
- Qualitative benefit/drawback and non-energy benefit (health, org performance, etc) analysis
- Grant research refinement

- Energy calculations
- Cost estimating
- Supply chain impacts
- Utility coordination (rate schedules, incentives, renewable programs)
- Financial Analysis:
  - Grant analysis
  - Carbon tax and/or Social Cost of Carbon
  - Quantify non-energy benefits
  - Quantify benefit/drawback analysis
- Implementation plan (finance, procurement pathways/options)

- Establish Zero Over Time phasing plan based on anticipated capital replacement of rooftops and critical HVAC components
- System documentation
- Building reports
- Final report
- Reveal interactive tool (optional)

Key

- MILESTONE MEETING
- KEY DELIVERABLE
- LOUISVILLE INPUT / COLLABORATION
- PRESENTATION

Project Approach

The following are four wholistic decarbonization roadmap projects by McKinstry, all of which are being implemented.

CITY AND COUNTY OF DENVER
Decarbonization Plan and Implementation

- ASHRAE Level 2 & 3 audits
- 8,100 MT CO2 annual savings
- 22 buildings
- 1,900,000 square feet
- $17 million efficiency/electrification retrofit
- $25 million community solar garden
- 9.6 megawatt community solar across six sites
- HVAC, envelope, LED, controls upgrades
- Behavior engagement/active efficiency management

CITY OF BOULDER
Decarbonization Plan and Implementation

- ASHRAE Level 2 & 3 audits
- 13,157,000 kwh/8,210 metric tons CO2 annual savings
- Phase One: 20% CO2 reduction
- 66 buildings
- 1.5 million square feet
- $17 million
- Municipal pool solar thermal
- Envelope air sealing
- Electric vehicle charging
- Wastewater treatment plant process improvements
- $4.7 million in incentives
- 1.2 megawatt solar across 12 sites
- HVAC, envelope, LED, controls upgrades
- Behavior engagement/active efficiency management

SALT LAKE CITY SCHOOL DISTRICT
Decarbonization Plan and Implementation

- Includes a comprehensive Zero Over Time roadmap for the District to achieve Zero Carbon performance in their facilities by 2040, including facility electrification over 5 phases
- ASHRAE Level 2 & 3 audits
- Decarbonization goal: 100% renewable electricity by 2030; 100% zero carbon by 2040
- First phase (under construction): 30% CO2 reduction
- 40 buildings
- $29.3 million retrofit
- Electrification of two pilot schools (1 full, 1 hybrid) – 1 ILFI Zero Carbon compliant; integrated maximum CO2 levels = better student performance
- $2 million in incentives
- 1 megawatt solar across 6 schools
- HVAC, envelope, controls upgrades
- Advanced LED lighting system, including daylight variability and vacancy controls

SEATTLE CENTRAL COLLEGE
Electrification Study and Design

- Extremely complex electrification study with multiple buildings, design temperatures, existing steam, and aging facilities
- Incredible 86% reduction in CO2 footprint!
- 1197 metric tons of annual CO2 savings
- 20 buildings, 1.2 million square feet
- Thermal sharing mapping
- Calculated annual carbon savings of 2,640,000 lbs
- Grant awards total roughly $2.3M

"More than just helping the college achieve our greenhouse gas reduction goals and a net zero carbon status, the project is an investment in a living laboratory that will offer faculty and students the opportunity to solve real-world problems *in partnership with McKinstry."*

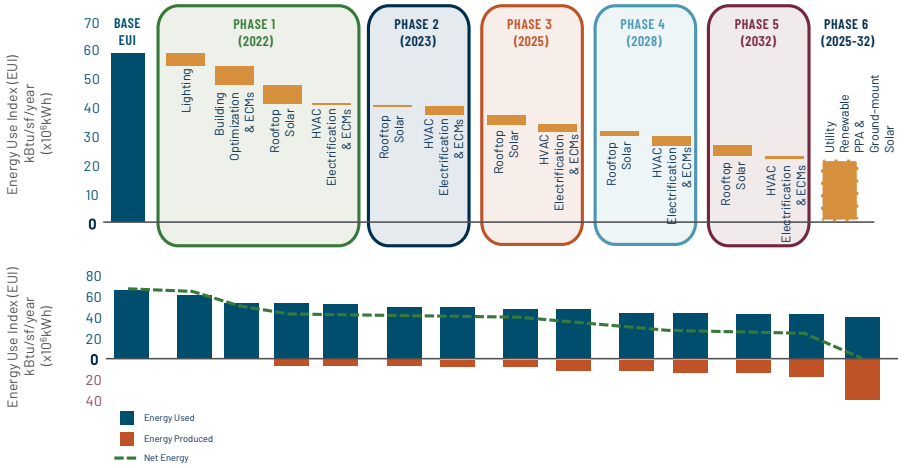
-Lincoln Ferris, Seattle Central College Interim VP of Administrative Svcs

SELECT ADDITIONAL FOCUSED DECARBONIZATION EXPERIENCE INCLUDES:

South Landing Zero Carbon District McKinstry planned, designed, developed, built and operates a next-gen all-electric heating and cooling plant, serving a tech/STEM education campus in Spokane – which is four times more efficient than a traditional natural gas based system.

Seattle University Decarbonization Plan McKinstry is developing a decarbonization roadmap for the campus' 26 buildings. The bulk of the effort consists of building electrification, as the buildings have a wide-array of heating types. McKinstry is working closely with the facilities group to understand their electrification preferences, to ensure the plan not only decarbonizes, but is also operational.

Laird Norton Properties Decarbonization Roadmap McKinstry created a portfolio-wide decarbonization implementation roadmap for this private real estate trust, including eleven sites over the western US, including Denver. The project included an electrification study for US Bank tower, the largest office building in Idaho.



Example of decarbonization summary roadmap created for confidential client. Upper chart reflects appropriate phasing timing based on capital replacement cycle; lower chart shows reduction in energy use and generation of renewable energy use, with the dashed green line showing path to full decarbonization.

Covington Water District Microhydro McKinstry designed and installed a microturbine into the District's inline gravity pressurized water main connection (170 feet of head pressure) from the regional water system. Operating at 1100 gallons per minute, the microturbine produces 32,000 kwh a year at a constant rate, powering the District headquarters.

Wide Scale Solar Delivery McKinstry's 30+ strong team of solar designers and developers, based in our Golden, CO office, are responsible for 35.2 megawatts of solar in the last two years, including:

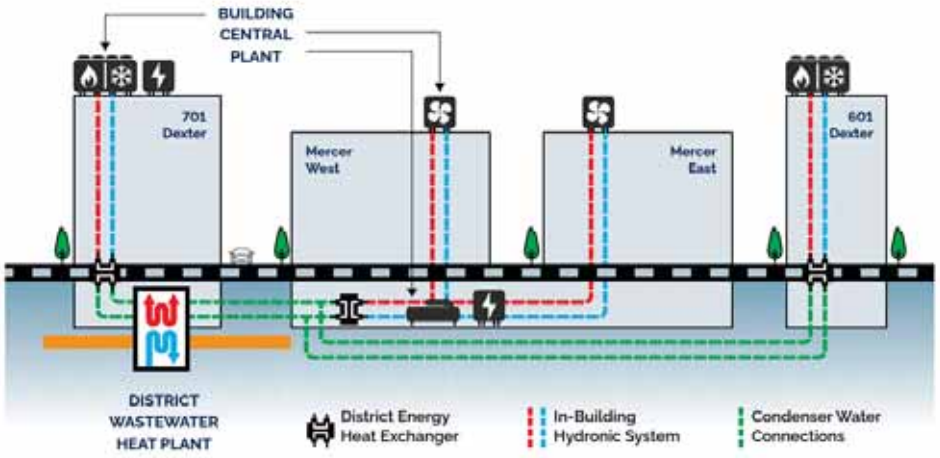
- City and County of Denver's Community Solar Garden (9.6 mw)
- Climate pledge arena (1.2 mw)
- Vestas Pueblo CO wind turbine factory (15 mw)

Project Approach

City Of Tacoma Sewer Biogas Harvesting/Fleet Biogas Power McKinstry delivered a sewage biogas recovery system which reduced the City's carbon footprint by 900 MTe CO2, while generating nearly $2 million in revenue, with a system payback of less than ten years.

King County Bus Electrification Infrastructure McKinstry delivered a $7m electric bus charging system, enabling the County to pilot three different battery/drivetrain/charging systems.

Real Estate Sewage Heat Recovery District McKinstry designed and is delivering one of the two largest sewage heat recovery systems in the United States. Includes tapping an eight foot diameter regional sewage main built in 1908, and diverting its flow into heat recovery processor/wet well. Enables electrified, heat pump based heating and cooling for 1.2 million sf of medical research/labs.



The groundbreaking McKinstry-delivered Real Estate sewage heat recovery system will save an incredible 12,100 metric tons of CO2 per year.

Open Loop Ground Source Systems McKinstry designed and constructed two major open loop ground source systems (more cost effective than traditional closed loop) this year, one for a state public health lab (including steam conversion) and one for a medical school/tech office.

Delivery Fleet Electrification (Confidential) McKinstry conceptualized and designed two major fleet delivery vehicle charging facilities for a major online retailer.

The table to the right is a list of recent Colorado clients McKinstry provided decarbonization study and implementation.

DECARBONIZATION STUDY & IMPLEMENTATION CLIENTS	FACILITY TYPE/ PROJECT TYPE	PROJECT SIZE ($)	SQUARE FEET
Huerfano County	Government	$2-$3M	157,313
City and County of Broomfield	Government	$2-$3M	394,056
City of Boulder Phases 1 - 4	Government	$17M	1,500,000
Denver International Airport	Government	$83M	8,000,000
City of Gunnison	Government	$2-$3M	1,600,000
City of Ogden	Government	In Progress	1,000,000
City of Henderson	Government	$5.1M	(parks & trails)
City and County of Denver	Government	$42M	1,800,000
Foothills Park and Recreation District Phase 2	Government	$8M	358,400
Moffat County	Government	$490,000	50,000
Routt County - Phase 2	Government	$1.3M	200,000
City of Steamboat Springs - Phase 2	Government	$989,000	100,000
Town of Hayden	Government	$1.1M	150,000
Town of Yampa	Government	$68,000	8,000
Town of Oak Creek	Government	$75,000	8,000
Moffat County School District	Government	$560,000	150,000
City of Craig	Government	$1.1M	100,000
City of Durango	Government	In Progress	298,200
City of Clearfield	Government	$2M	153,000
City of St. George	Government	$2M	477,724
City of Lakewood	Government	$2.4M	254,631
Jefferson County Phase 2	Government	$1.6M	533,100
Highlands Ranch Community Association	Government	$2.6M	330,685
City of Golden Phase 2 Solar	Government	$3.2M	solar-only
South Suburban Parks & Recreation	Government	$5.7M	702,062
City of Boulder Recycling Center	Government	$1.6M	27,717
City of Longmont	Government	$3.7M	320,949
GSA Region 8	Government	$10.8M	5,000,000
Adams 12 School District	K-12	$2,097,692	400,949
Cotopaxi School District	K-12	$2.3M	50,161
Fremont RE-2 School District Phase 1-2	K-12	$10.3M	400,000
Aurora Public Schools	K-12	$12M	289,205

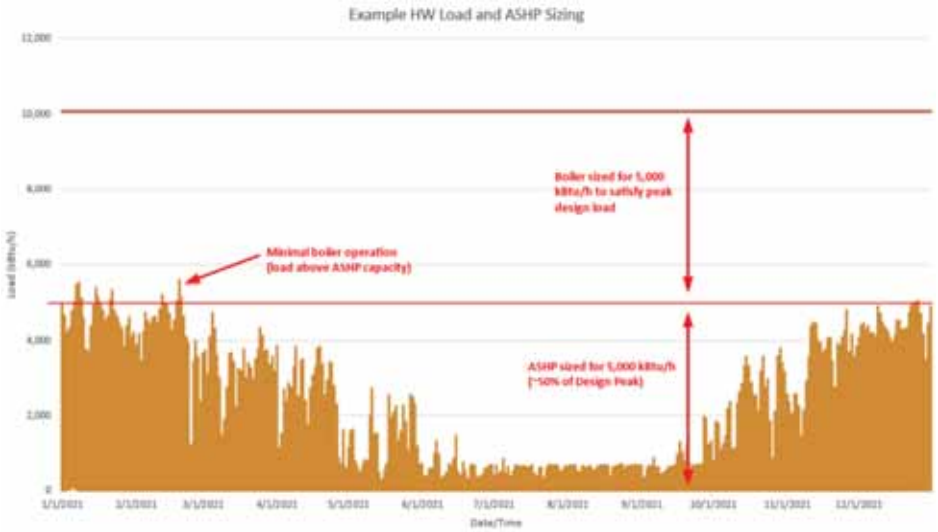
Project Approach

Innovative Solutions

McKinstry believes that innovation isn't done for its own sake – it is done to be effective. We seek to combine practical, low-hanging fruit actions with out-of-the-box, creative, yet real solutions to provide for a unified, high value approach. The following are a number of innovations we think could have merit for Louisville.

RIGHT-SIZED ELECTRIFICATION

In addition to implementing energy efficiency and electrical load reduction measures, it is also important to balance highly efficient (but more expensive) heat pump technology with more cost-effective (but less efficient) electric boiler technology. Using our experience in this climate, we utilize modeling tools to ensure the electrified system strikes the right harmony between first cost and operational cost. Through this analysis, the heat pump can be sized for only 50-60% of the building heating capacity, but still provide heating for 80%+ of the year. This same thought process can be applied to partial electrification if needed, swapping out the electric boiler for a gas boiler.



Balancing Air Source Heat Pump (ASHP) and Electric Boiler Sizing

COMBINING GROUND MOUNT SOLAR AND SOIL CARBON SEQUESTRATION

McKinstry is already pioneering an agrivoltaic approach to community solar with the City and County of Denver at the Denver Botanical Gardens/Chapfield Farms. Even more active carbon sequestration is possible through application of biochar, etc..

SEWAGE HEAT RECOVERY BASED HEAT PUMP HEATING/COOLING

Akin to a ground source heat pump system, but often with lower cost and higher efficiency, this approach uses municipal sewage (often averaging 50-60 degree F even during winter) as a thermal base for efficient water-based heat pumps to operate. Often the greatest barrier to this technology is physical and jurisdictional access to the sewage – which municipalities typically have. These systems may also qualify for a 30% Direct Payment through the Inflation Reduction Act.

PROCESS INNOVATION - MAKING THE RIGHT CHOICE AT THE RIGHT TIME FOR MAXIMUM VALUE.

Decarbonization, especially when it goes as far as electrification and fully renewable power, means a level of organizational engagement and investment that runs deeper than a one-off project. It has to be done right and wholistically – folding in all related organizational goals, such as high performance operations, employee health, retention, satisfaction, and productivity, and resident satisfaction. The right cost-effective balance between energy efficiency, electrification, and renewables must also be found. Then, a multi-year phasing based on the end-of-life for rooftops (to avoid de/reinstall of solar) and key HVAC components should be established. Our Zero+ approach means that we are looking at decarbonization through a broader lens - maximizing the value to all organizational objectives, delivered at the most cost effective time.

WASTEWATER TEAMENT SEWER INFLUENT SMOOTHING AND WATER RESERVOIR LOADING

The sewer treatment process can borrow from the concept of thermal storage by holding sewage for optimized treatment. Similar to thermal storage, this saves money and reduces carbon by allowing treatment to occur during off-peak hours and times of renewable self-generation.

MICROGRID/DISTRIBUTED ENERGY RESOURCE

We will utilize a formal stage-gate process during the DER feasibility assessment. This organizes tasks and deliverables in a chronological way that minimizes project risk and allows for discrete decision points, tracks information, documents and deliverables, engages stakeholders and provides a systematic approach to assessing overall project feasibility. The result is an efficient and thorough assessment of DER opportunities well-integrated into the overall recommended decarbonization plan.

KITCHEN ELECTRIFICATION

One of the often-overlooked aspects of electrification is process and cooking loads. The golf course has a full-service restaurant, so we know a good portion of the site's energy use will be from gas cooking. Our engineering group has evaluated kitchen electrification in existing buildings and knows how this process impacts building electrical infrastructure. McKinstry frequently partners with the Food Service Technology Center to deliver commercial kitchen electrification.

Project Approach

VEHICLE TO GRID (V2G)

Vehicle-to-Grid (V2G) technology is still in its infancy, with limited solutions on the market now. The industry has generally agreed the architecture of these systems will mimic stationary battery installations, and the technology will be more readily available during the implementation period of this decarbonization plan. In this study we will incorporate known information as well as how to integrate future technologies.

McKinstry recently delivered this electric bus charging pilot for King County, WA

NEXT GEN GRID INTEGRATED ELECTRIFICATION

Full decarbonization of existing facilities is highly complex from an electrical capacity and grid interactivity standpoint. Reducing existing electric load through efficiency, increasing load through heating electrification, producing onsite electricity, and then interfacing with a grid which has time variable carbon intensity. While challenging, this presents an opportunity for net decarbonization, taking advantage of offpeak electrical pricing. McKinstry started a new venture called EDO in 2020, which specializes in Grid-Integrated Efficient Buildings. They will coordinate with the utility to determine the long-term plan and viability of this technology. www.edoenergy.com

RADICAL PLUG LOAD REDUCTION

We note that the RFP doesn't speak in detail to the many efficiency measures needed to cost effectively achieve Louisville's decarbonization goals. One critical element is a 360 assessment of things that plug into outlets. McKinstry's Four R approach – **Review, Remove, Replace, and Reduce**– is a proven method for radically reducing what is often the largest single building energy load post-electrification. A core element of this is using IT network enabled computer/monitor auto shutdown functions – typically not done.

COST-EFFECTIVE ENVELOPE IMPROVEMENTS

Based on our substantial previous experience, total envelope overhauls of existing buildings can be quite challenging from a cost-effectiveness standpoint when coupled with heat pumps. However, air sealing, potentially combined with heat recovery ventilation, can be a very effective strategy, as it also improves air quality and thermal comfort. Attention to areas like the roof/parapet junction in particular can yield substantial benefits. Window inserts, such as those provided by the local company Alpen, is another potentially cost-effective solution with additional benefits.

On-time and budget

SINGLE SOURCE OF ACCOUNTABILITY McKinstry believes in the value of streamlining ownership of project outcomes through one single source. We build our teams as a unified system of interoperable components with experience working together. Instead of multiple, self-interested parties, McKinstry offers a single team that shares equal accountability in delivering our project promises. To expedite the flow of information, Brian Goldcrump will lead creation of the study, engaging the right expert at the right time, while Ashley Brasovan will ensure the City is fully informed and happy, every step of the way. We understand Louisville has numerous stakeholders interested in a successful outcome for this project. Ashley will collaborate with you to ensure that we engage all of your constituents in the City, including facilities management, the community, and staff, to deliver a unified decarbonization plan.

SCHEDULE Our team has extensive and successful experience, saving valuable time and budget. As a result, McKinstry is confident in our ability to give Louisville the best chance of completing the project in the most efficient way possible. McKinstry has provided a proposed schedule for the City's decarbonization plan, and we are confident that our team can achieve all project milestones. However, should we need to pivot during the development process, McKinstry's team values strong communication and seeks to resolve potential schedule derailment by providing 30, 60, and 90 review meetings.

MAXIMIZING YOUR BUDGET With numerous municipality's decarbonization projects under our belt, McKinstry understands the pain points. Therefore, we make it our mission to save costs without sacrificing the owner's vision. Our delivery approach will maximize the opportunity to achieve your decarbonization goals within budget.

FIRM AVAILABILITY MCKINSTRY is 100% committed to successfully executing the City's decarbonization efforts. Upon commencement of the contract, McKinstry will prioritize coordination with the City to review each project's life cycle and map a timeline of scope requirements for each building. We've vetted every team member on our organization chart to ensure availability. Additionally, we are backed by over 2000+ energy professionals and will pull resources to support as necessary.

McKinstry's Client Voice Program surveyed Colorado municipalities, and the respondents gave McKinstry a **Net Promoter Score of 98%.**

Project Team

> "McKinstry does a good job of hiring good, strong people to deliver a great service."
>
> *— Stu Reeves, City of Fort Collins*

City of Louisville

Project Team Leads

BRIAN GOLDCRUMP, PE
Whole Systems Technical Study Director, Analysis Lead

ASHLEY BRASOVAN
Team Lead, Louisville Liason, Financial /Grant Specialist

BRAD LILJEQUIST
Director of Zero Carbon Roadmap Innovation & Leadership

Renewables / DERs

DONALD CHUNG
Distributed Energy Resource Expert

MARTIN BEGGS
Renewable Energy Expert

Building Electrification Engineering + District Opportunities

SARAH MOORE, PE
Engineering Director, Building Electrification

DAVID ZILLIS, PE
Electrification Engineer

XIA FANG, PE, CEM, BEMP
Efficiency Strategies And Estimating

PAUL HIGHLEY, LEED, PE
Electrical / Electric Vehicle Engineering

JOHN KEARNS BEMP, EIT, CEM
Energy Analysis

MARLA C COREY-LOIOLA
Cost Estimating

Electrical Integration and EV Fleet/Infrastructure

PAUL HIGHLEY, LEED, PE
Electrical / Electric Vehicle Engineering

NICK EDNEY, CPENG
Electrical Vehicle Infrastructure

Water/Wastewater Decarbonization

PETER SHARP
Strategic Energy Management Coach

Cascade Energy

GIULIA POLLASTRI
Project Engineer

JOHN ROSENBLUM, PHD
Industrial Energy and Water Efficiency Engineer

McKinstry's Water/Wastewater Decarbonization Partner

Cascade Energy offers unique expertise in municipal water and wastewater facilities. We have an in-house team of six experienced engineers focused exclusively on reducing energy consumption improving the sustainability of this customer segment. Our key personnel are industry professionals with hands-on experience in water and wastewater design, construction, and operations coupled with deep energy efficiency, greenhouse gas, and sustainability knowledge. Our team has proven credibility in this conservative industry by demonstrating understanding of operator tasks and priorities, along with the regulatory environment these facilities must navigate. Since 2013, Cascade staff have helped more than 85 wastewater plants and 60 water systems lower their costs, reduce emissions, and become more resilient through operational improvements and system optimization. Along the way, we have identified and analyzed hundreds of capital improvements to further move the needle.

Project Team

EDUCATION

Duke University - M.A.,Energy Management
Duke University - B.A., Earth and Ocean Science

ACCREDITATIONS

Energy Services Coalition Colorado Chapter, Secretary (current)

AFFILIATIONS

ASHRAE member
Associated Builders and Contractors – Seattle Chapter

TENURE

In the industry for 9 years and with McKinstry for 7 years.

ASHLEY BRASOVAN | Project Executive/Grant & Finance Specialist

WHY ASHLEY?

- ✓ Ashley has successfully secured $100M+ financial packages for public sector efficiency projects within Colorado – giving her a hands on understanding of how the Louisville decarbonization roadmap can be implemented.
- ✓ Ashley is laser focused on client satisfaction – she will ensure our team overdelivers for Louisville.

ASHLEY'S ROLE

As Project Executive, Ashley will ensure Louisville's objectives and goals are met, any issues are addressed, and schedule/deliverables are achieved in a coordinated and timely manner. She will also support financial strategies, grant funding, and delivery of the benefit/drawback analysis.

SELECT PROJECT EXPERIENCE

Huerfano County, CO – Project Executive for 33 building decarbonization and energy efficiency project. $2-$3 million construction contract pending.

Denver International Airport, CO –Project Executive for 8.5 million sq. ft. decarbonization and energy efficiency project. $82 million project.

City of Lakewood, CO - Project Executive for energy efficiency program and Solar Feasibility Study

Northwest CO Regional Solar Resiliency Project, CO - 15 sites in Hayden, Yampa, Craig, Steamboat Springs, and Oak Creek; Ground-mount,roof-mount and battery storage

City of Golden, CO - Project Executive for utility dashboarding project

City and County of Denver, CO – 6.6MW rooftop, carport, and ground mount portfolio in development

City and County of Broomfield, CO – 2MW carport and ground mount portfolio in development

Fremont RE-2 School District, CO - 500kw ground mount solar and energy efficiency program Foothills Park and Recreation District Phase II, CO – Project Executive for Phase II audit and energy efficiency program

City of Durango, CO – Project Executive for decarbonization and energy efficiency project.

University of Northern Colorado, Greeley CO – Sustainability Strategist and Program Manager for $8.7 million energy efficiency program

Denver Public Schools, CO – Project Strategist and proposal development resource for $8.5 million decarbonization and energy efficiency project.

EDUCATION

Cal Poly San Luis Obispo, BS, Mechanical Engineering

ACCREDITATIONS

PE Mechanical, OR, CO (pending)
Building Energy Modeling Professional (BEMP), ASHRAE
LEED AP, United States Green Building Council

TENURE

In the industry for 12 years and with McKinstry for 1 years.

BRIAN GOLDCRUMP, PE | Whole Systems Technical Study Director, Energy Analysis Lead

WHY BRIAN?

- ✓ Brian is an experienced mechanical engineer with expertise in decarbonizing buildings, portfolios, and campus systems. Brian's technical mindset enhances the planning process by creating innovative solutions.
- ✓ Brian has a long track record of team empowerment, unifying a wide range of experts and interested parties by proactively communicating and streamlining the project process.

BRIAN'S ROLE

As Technical Study Director and Modeling Lead, Brian oversees the core team of experts developing the City of Louisville Decarbonization Plan. In addition, Brian will Identify and integrate the scientific, engineering, and technical resources necessary to conduct a feasible and effective decarbonization plan.

SELECT PROJECT EXPERIENCE

Seattle University Decarbonization Study, Seattle, WA - Project manager and technical lead for decarbonization "Zero Over Time" roadmap for Seattle University's buildings. The campus includes 26 buildings with various heating configurations and electrification opportunities/challenges. Approach consists of electrical load reduction measures as a first step to cost-effectively implement electrification while minimizing electrical upgrades. The study includes cost estimating and coordination with Seattle U decision-makers.

California State University Decarbonization Study; CA*- Developed framework for decarbonizing all 23 campuses in the CSU system. Focused on campus-wide heating systems, including assessing infrastructure and developing phased carbon reduction strategies. The process will be used by each CSU campus as they determine how to decarbonize their specific campus.

Washington State University Carbon Reduction Planning; WA*- Project manager and technical lead for study to determine how to reduce campus carbon emissions and comply with Clean Buildings legislation most cost-effectively. Study involved detailed Level 2 energy audits of five campus buildings, totaling 550,000 sf. The decision-making metric for the study was EUI reduction per dollar. The study also included coordination with the WA Dept of Commerce, cost estimating, and constructability review. The results were extrapolated across WSU's 10M+ sf of buildings to determine the overall costs of compliance.

***Denotes completed at previous firm.**

Project Team

EDUCATION

University of Washington, Evans School of Public Policy and Governance, Master's, Master of Public Administration, Environmental Policy, 1993

Georgetown University, Bachelor's, History, 1988

ACCREDITATIONS

USGBC LEED Accredited Professional (LEED AP)

Living Future Accredited

TENURE

In the industry for 34 years and with McKinstry for 4 years.

BRAD LILJEQUIST, LFA | Director of Zero Carbon Roadmap Innovation & Leadership

WHY BRAD?

- ✓ Brad's 30+ years of creating Earth-positive buildings and communities give Brad a pragmatic, yet creative approach to delivering deeply sustainable and functional buildings as he contributes key insights and improvements to projects.
- ✓ Brad excels at providing zero energy design leadership and process management, nature-based systems and services design, user load reduction, and zero energy specific integrated design.

BRAD'S ROLE

Brad is a nationally respected leader in decarbonization, well known for both thought leadership and achieving actual results. A serial climate solutions innovator, he is now dedicated to accelerating decarbonization via EPC.

SELECT PROJECT EXPERIENCE

Salt Lake City School District 2027 - Comprehensive Zero Over Time roadmap for the District to achieve full Zero Carbon performance in their facilities by 2040, including facility electrification over five phases., $29.5M, 2025

Seattle Central College Campus District Energy Feasibility Study, Seattle, WA - EcoDistrict to serve over 500,000 sq. ft. of mixed-use developments and existing campus infrastructure. The initial study and assessment included a full-energy analysis, as well as thermal and energy performance modeling of a baseline system and a district energy plant with heat recovery systems. The study and future EcoDistrict will determine strategies to lower electricity cost and potential carbon emissions.

South Landing Catalyst, Spokane, WA - Led Zero Carbon strategy for world's largest dual certified Zero Energy and Zero Carbon building, heated and cooled by an advanced all electric district energy system, $8.3M, 2020

South Lake Union Energy District, Seattle, WA - 1.4M sq. ft. sewage/thermal heat recovery study adding biotech and affordable housing in the heart of Seattle, 2020

zHome 10-unit Townhome Community*

Developer of the first multi-family zero energy project in the United States certified by the International Living Future Institute.

Living Community Challenge, Worldwide, Seattle, WA*

While at the Int'l Living Future Institute, Brad was launch director for the Living Community Challenge, considered to be the most stringent green community standard in the world.

***Denotes completed at previous firm.**

EDUCATION

University of Michigan, MBA
University of California - Berkeley, M.S. Environmental Engineering

Duke University, B.S. Civil and Environmental Engineering

TENURE

In the industry for 16 years and with McKinstry for 2 years.

DONALD CHUNG | Distributed Energy Resource Expert

WHY DONALD?

- ✓ McKinstry's Colorado renewables team leader, Donald is highly successful at achieving his clients' financial and renewable energy goals through negotiating, developing, and managing the execution of solar projects.
- ✓ Donald is a seasoned solar professional, with extensive tenure at NREL as well as utility solar and solar manufacturing – regularly leaning in with key insights.

DONALD'S ROLE

Donald will lead holistic energy strategies for maximizing Louisville's renewables approach, focusing on onsite solar, utility provided renewables, and energy storage.

SELECT PROJECT EXPERIENCE

Array Of DER Projects Including:

Town of Basalt, Basalt CO -Renewables Director for solar and battery energy storage feasibility study identifying and characterizing 530kW of solar projects.

City of Lakewood, Lakewood, CO - Renewables Director for solar feasibility study identifying and characterizing 2MW of solar projects.

Colorado School of Mines, Golden, CO - Renewables Director for solar feasibility study and subsequent 1.4MW solar portfolio.

City and County of Denver, Denver, CO - Renewables Director for 5.8MW distributed community solar garden and EVSE program.

Denver Public Schools, Denver, CO - Renewables Director for 5MW solar portfolio deployed across 17 sites.

Northwest Colorado Regional Solar and Resiliency Project, Craig, Steamboat, Yampa, Hayden, & Oak Creek, CO -Renewables Director for solar and storage feasibility study and subsequent 2MW solar portfolio.

City of Phoenix Water Services Department, Phoenix, AZ* - Development manager for 6.25MW utility-owned, customer-sited microgrid.

US Marine Corps Expeditionary Energy Office, Washington, DC* - Project leader for innovative off-grid DER and demand management technology study.

***Denotes completed at previous firm.**

Project Team

MARTIN BEGGS, PVIP | Renewable Energy Engineer

WHY MARTIN?

- ✓ Martin has over a decade of work experience in the solar industry, installing, managing, designing and developing solar PV and energy storage projects, primarily ranging from 5kW to 5MW.
- ✓ Martin brings a patient, can-do presence to solar design and development that is contagious and calming.

MARTIN'S ROLE

As Senior Energy Engineer with a focus in Renewable Energy, Martin will take the lead on technical development, design and modeling of Solar PV & Energy Storage solutions. He will coordinate and collaborate with project teams, utilities, jurisdictions, technical consultants and product vendors to identify renewable energy applications that are best suited to each project site.

SELECT PROJECT EXPERIENCE

Denver Public Schools, CO - 5MW rooftop solar portfolio at 17 sites

Fremont RE-2 School District, CO - 500kw ground mount solar

Northwest CO Regional Solar Resiliency Project, CO - 15 sites in Hayden, Yampa, Craig, Steamboat Springs, and Oak Creek; Ground-mount,roof-mount and battery storage Town of Basalt, CO - Solar and Storage Project.

Huerfano County, CO - 33 building energy performance contract. $2-$3 million construction contract pending.

Regis Jesuit High School; Aurora, CO - 3 sites, 500 kW-DC solar roof mounted

City of Fort Collins; Fort Collins, CO - 2 sites, 1,100 kW-DC solar ground mounted

City of Durango, CO – Senior Energy Engineer / Renewable Specialist for Phase I EPC

City of Boulder; Boulder, CO - 13 sites, 2.7 MW-DC, roof, ground & canopy mounted

City of Fort Collins; Fort Collins, CO - 1 site, 1.0 MW-DC, single-axis tracker

City of Golden; Golden, CO - 2 sites, 81 kW-DC, roof mounted

Denver Housing Authority Community Solar; Aurora, CO - 1 site, 2.0 MW-DC, single- axis tracker

Hyde Park Electric Department; Hyde Park, VT - 1 site, 1.4 MW-DC, ground mounted

Stowe Electric Department; Stowe, VT - 1 site, 1.3 MW-DC, ground mounted

EDUCATION

University of California, Davis, B.S., Environmental Biology and Management

ACCREDITATIONS

NABCEP Certified PV Installation Professional (#091209-10)

Residential Wireman, State of Colorado (#600076)

TENURE

In the industry for 14 years and with McKinstry for 3 years.

SARAH MOORE, PE | Engineering Director, Building Electrification

WHY SARAH?

- ✓ Sarah is a superb engineer, specializing in existing buildings, including electrification. She leads McKinstry's electrification engineering team, and will bring her deep knowledge and expertise to bear on Louisville's diverse buildings.
- ✓ Sarah is particularly skilled at thoughtful process management, and will help the team ask and answer the right questions in the right sequence.

SARAH'S ROLE

Sarah will provide engineering direction for the building electrification assessments

SELECT PROJECT EXPERIENCE

Salt Lake City School District Electrification Pilot Schools, UT - Sarah managed the initial concept as well as detailed design for converting two 50,000 square foot schools from natural gas based heating and cooking to electric. In an innovative approach, one school will be fully electrified, while the other will retain its gas boiler for limited peaking needs, reducing construction cost. Construction commenced this summer.

Laird Norton Properties Decarbonization Study/Electrification Plan, WA - Sarah managed the development of a portfolio-wide decarbonization roadmap for this private real estate trust. The study included properties in Denver and elsewhere in the Rockies. The study also included an electrification assessment of the US Bank Tower in Boise - the largest office building in Idaho.

Seattle Central College Electrification Study, Seattle, WA - Sarah was the mechanical engineering manager for an electrification study of over 500K sq. ft. of existing campus buildings and infrastructure. The initial study and assessment included a full-energy analysis, as well as thermal and energy performance modeling of a baseline system and a district energy plant with heat recovery systems. This study identified a cost-effective pathway for reducing the College's building carbon footprint by an astounding 92%.

Washington State Public Health Lab Electrification - Sarah directed engineering of this groundbreaking electrification project, which converted this major facility from gas-fired steam based heat to fully electric, open loop ground source heat pump based heating. This project, which starts construction this fall, reduces the Lab's CO2 generation by 87% - saving 550 MT CO2e annually.

McKinstry Electrification Predesign Tool - Sarah is the creator of McKinstry's proprietary electrification predesign tool, which facilitates the assessment of various electrical, mechanical, design temperature, delivery, structural, and financial elements of building electrification.

EDUCATION

Trinity College - Hartford, BS, Mechanical Engineering, 2003

ACCREDITATIONS

Mechanical PE, Colorado and Washington

ASHRAE Building Energy Modeling Professional (BEMP)

LEED Accredited Professional

RESET® Air Accredited Professional

TENURE

In the industry for 18 years and with McKinstry for 5 years.

Project Team

DAVID ZILIS, PE | Electrification Engineer

WHY DAVID?

- ✓ Experienced mechanical design engineer with expertise in building energy use and problem solving with highly complex projects.
- ✓ Ability to develop and implement compound solutions, along with an ability to lead cross-functional teams.

DAVID'S ROLE

As a Mechanical Engineer, David is responsible for the development of detailed mechanical drawings and specifications and designs systems based on existing field conditions, overlaying code requirements as they apply.

SELECT PROJECT EXPERIENCE

Salt Lake City School District 2027 -Comprehensive Zero Over Time roadmap for the District to achieve full Zero Carbon performance in their facilities by 2040, including facility electrification over five phases., $29.5M, 2025

Denver International Airport, CO –Project engineer for 8.5 million sq. ft. decarbonization and energy efficiency project. $82 M project.

Denver City and County, Denver, CO - Project engineer for an Investment Grade Audit (IGA) of 22 facilities across 1.9M square feet within the City.

Colorado School of Mines, Golden, CO - Project engineer for a campus-wide energy audit and to develop a phased approach to decarbonization and energy efficiency. McKinstry performed a complete lighting and water audit and identified many facility improvement measures in three main categories: lighting retrofits, water conservation retrofits, and mechanical retrofits. $8.5 M

John Madden Company - Construction, Greenwood Village, CO - Design Engineer for decarbonization and energy efficiency project consisting of two six-story office buildings totaling 414,000 sq. ft. and is the largest project to be financed through Colorado's PACE program.

University of Utah - Health Science Campus Transformation Design-Build Project, Salt Lake City, UT - Design Engineer for decarbonization and energy efficiency project consisting of the construction of three new buildings (totaling almost 800,000 sq. ft.) to replace three existing buildings. McKinstry completed development and design in over 25 buildings and a central chilled water plant to improve energy efficiency, reduce peak capacity and allow the new buildings to come online using existing infrastructure for less than half the cost of adding new capacity.

EDUCATION

University of Colorado, Bachelor's, Mechanical Engineering/Applied Mathematics, 2015

University of Colorado, Master's, Mechanical Engineering

ACCREDITATIONS

Professional Engineer CO

TENURE

In the industry for 10 years and with McKinstry for 4 years.

XIA FANG, PE, CEM, BEMP | Efficiency Strategies And Estimating

WHY XIA?

- ✓ Xia's expertise has supported many municipalities, schools, universities, and commercial customers by using her experience and knowledge of auditing, energy modeling and HVAC systems to develop high performance projects.
- ✓ Xia has a hands on understanding based on years of experience delivering decarbonization – she regularly provides HVAC estimating for the Golden office.

XIA'S ROLE

Xia will provide two main roles on the project – assessing deep efficiency measures (aside from electrification and renewables) and local estimating expertise.

SELECT PROJECT EXPERIENCE

John Madden Company - Construction, Greenwood Village, CO - Principle Engineer for decarbonization and energy efficiency project consisting of two six-story office buildings totaling 414,000 sq. ft. and is the largest project to be financed through Colorado's PACE program.

City of Broomfield, CO - Principle Engineer for the Development of Investment Grade Audit (IGA) for the City of Broomfield.

Broomfield High School - Broomfield, CO — Principle Engineer for a 240,988 SF existing facility, underwent a major renovation. New HVAC equipment was installed and pneumatic controls were upgraded to direct digital controls. Lighting was also upgraded to LED throughout the facility.

BVSD - Technical Energy Audits, Boulder, CO - Technical Energy Audits (TEA) for Boulder High School, Broomfield Heights Middle School, and Centaurus High School.

Colorado School of Mines, Golden, CO - Xia led this Colorado School of Mines campus-wide energy audit. McKinstry performed a complete lighting and water audit and identified many facility improvement measures in three main categories: lighting retrofits, water conservation retrofits, and mechanical retrofits. $8.5 M

EDUCATION

Colorado State University, Master's, Mechanical Engineering, 2000

University of Shanghai for S&T, Bachelor's, Thermal Energy Engineering, 1997

ACCREDITATIONS

12438, Certified Energy Manager

Building Energy Modeling Professional

0039750, Professional Engineer, Colorado

TENURE

In the industry for 22 years and with McKinstry for 7 years.

Project Team

PAUL HIGHLEY, P.E., LEED AP | Electrical / Electric Vehicle Engineering

EDUCATION

University of Idaho, Bachelor's, Science, Electrical Engineering, 1996

ACCREDITATIONS

Electrical PE in 49 states including CO

LEED Accredited Professional (LEED AP)

TENURE

In the industry for 26 years and with McKinstry for 9 years.

WHY PAUL?

- ✓ Paul is a deeply experienced electrical engineering director, bringing over 25 years of electrical engineering experience in delivering complex electrical solutions.
- ✓ Paul is one of McKinstry's core technical leaders in decarbonization, including complex electrical vehicle infrastructure, distributed energy resources, and electrical capacity of existing building electrification.

PAUL'S ROLE

As electrical engineering manager, Paul will oversee all facets of the electrical scope, with direct involvement on EV and electrical capacity assessments.

SELECT PROJECT EXPERIENCE

Salt Lake City School District Decarbonization Roadmap Paul directly provided a ROM level assessment of the electrical capacity (transformers, panels, utility connections, etc) of 40 facilities to eliminate natural gas (HVAC and cooking), while adding solar and reducing electrical loads through efficiency. This was a very complex scenario, where electrical loads were both increasing and decreasing through various decarbonization activities.

King County, WA Fleet/Employee EV Charging Paul managed the concept and detailed design for fleet electrification – included 64 Level 2 charger at five buildings at three sites. Included directional boring to install underground wiring, evaluation of transformer and service capacity.

King County Bus Electrification Test Pilot Paul managed the concept and detailed design for this groundbreaking EV bus test facility. This project tests three different charger/bus combinations to inform ultimate fleet selection for 1000s of EV buses. Included major electrical feed and transformer, underground duct banks, structural and civil work. McKinstry also installed this system.

Global Online Retailer EV Delivery Fleet Prototype Charging Facility Paul directly led the concept and detailed design for this facility, the first for this major confidential client, which will charge its new electric delivery van fleet. Includes 36 level 2 and two level 3 480v DC fast chargers (Siemens) Evaluated three different approaches: in slab underground conduit and wire, overhead busway, overhead pipe and wires. Landed on overhead busway, suspended chargers. McKinstry then constructed this system. Paul is now working on a second facility for this client.

360 Electric Vehicle Components Assessment Paul has personally created a McKinstry-proprietary analysis tool of all EV infrastructure available, ideal applications, pricing etc. – this will enable us to thoroughly and quickly assess Louisville's ideal systems.

JOHN KEARNS, BEMP, EIT, CEM | Energy Analysis

EDUCATION

Seattle University, B.S, Mechanical Engineering, 2016

University of Washington, M.S, Mechanical Engineering, 2018

ACCREDITATIONS

Building Energy Modeling Professional (BEMP)

Engineer in Training (EIT)

Certified Energy Manager (CEM)

TENURE

In the industry for 6 years and with McKinstry for 5 years.

WHY JOHN?

- ✓ John leverages keen abilities in modeling and knowledge of building systems to evaluate the performance of design solutions.
- ✓ John began his career delivering energy efficiency for existing public sector buildings – he now brings this expertise to his analysis work.

JOHN'S ROLE

John will be responsible for reviewing utility usage, communicating key perfomrance indicators, and supporting energy and financial analysis of ECMs.

SELECT PROJECT EXPERIENCE

Seattle University Campus Decarbonization Roadmap, Seattle, WA – John is providing modeling for a roadmap to zero carbon over time for campus facilities at Seattle University that will consider the decarbonization opportunities and challenges for the campus. Supported campus energy and emissions utility data analysis and benchmarking and decarbonization measure development. High level energy savings and life cycle cost analysis will be performed, and information from the study will be used to generate a long-term Zero-Over-Time strategy.

King County Administration Building, Courthouse, & Correctional Facility, Seattle, WA – Level II ASHRAE Energy Audits for three large (>250,000 sf) King Country buildings in downtown Seattle. Supported energy benchmarking and analysis of the existing sites, energy audit of existing building systems (mechanical, plumbing, envelope, lighting, etc.), and identified all cost-effective ECMs available. Provided compliance documentation for the Seattle Building Tune-Up program across all three buildings.

Unico Financial Center & Puget Sound Plaza, Seattle, WA – John provided modeling for WA and SEA Clean Buildings Performance Standards compliance strategies for two high-rise office towers in downtown Seattle. Both buildings provided unique opportunities for energy savings and required different solutions towards meeting their energy and carbon goals. Supported whole building energy modeling to baseline existing performance and estimate impact of proposed energy efficiency measures. Supported the development of phased implementation strategies and assisted in life cycle cost analysis of recommendations.

Project Team

EDUCATION

University of Melbourne, Bachelor's, Bachelor of Science, Electrical Engineering, 2009

University of Melbourne, Bachelor's, Bachelor of Commerce, Finance, 2009

ACCREDITATIONS

Chartered Professional Engineer, Australia

TENURE

In the industry for 12 years and with McKinstry for 5 years.

NICK EDNEY, CPENG | ELECTRICAL VEHICLE INFRASTRUCTURE

WHY NICK?

- ✓ Whether upgrading the efficiency of a massive mine on the Australian Outback, or reengineering the value chain for utility renewables, Nick brings a yin/yang of deep engineering and financial knowledge to creating deep decarbonization solutions.
- ✓ Nick helps lead McKinstry's vehicle electrification infrastructure efforts and supports the DER assessments.

NICK'S ROLE

Nick will provide the vehicle electrification infrastructure, vehicle selection, and miscellaneous gas equipment electrification parts of the scope, as well as supporting the electrical capacity assessment of the electrification study and DER scope.She will work closely with Xia and David on ground-truthing local labor pricing via Denver area contractors.

PROJECT EXPERIENCE

City and County of Denver Vehicle Electrification Program Included assessment and design of infrastructure, transformers, and charging units in existing settings. Included Chargepoint Level 2 and 3 480v fast chargers.

Miscellaneous EV charging infrastructure Array of chargers in complex existing environments (parking garages, bus stations, etc.) including Sema Connect and Zefnet.

Denver Public Schools Phase 2 Decarbonization program Implementation of facility recommendations, including lighting and misc efficiency upgrades.

Seattle Central College Electrification Study Nick served as the senior electrical engineer, assessing needed electrical upgrades.

Pecan Branch Wastewater Treatment Plant; Georgetown, TX Nick was the electrical engineer overseeing the design of the expansion of the existing treatment plant for the City of Georgetown, Texas.

Avista Smart Cities Micro-Transactive Grid, Spokane, WA Nick served as electrical engineer for an Avista Utilities/McKinstry project to test out a grid on the Washington State University Spokane campus that deploys both solar and battery storage assets in a way that will test reactive components of a Smart Grid within a close proximity of about five buildings on the campus. The grid will leverage SCADA, distribution management systems, spiral optimizer, microgrid controller, and Meter Riva system to optimize the utilization of distribution generation and load assets to achieve the program's goal of a "shared energy economy".

EDUCATION

Associated Builders and Contractors, Estimating Coursework

ACCREDITATIONS

Estimating Classes - Associated Builders and Contractors

AFFILIATIONS

American Society of Professional Estimators, Member

TENURE

In the industry since 1982 and with McKinstry since 2015.

MARLA COREY-LOIOLA | Senior Estimator

WHY MARLA?

- ✓ Marla is a professional estimator with over 35 years of experience. Her only focus at McKinstry is to estimate the cost of materials and labor on the repair and replacement of MEP equipment on existing buildings for McKinstry clients. In one month, she typically provides estimates on 25+ projects—giving our clients the ability to know the true fluctuation in material and equipment cost and product lead time. Given the current volatile supply chain, her expertise will be of great importance in providing accurate cost estimates.

MARLA'S ROLE

Marla is responsible for the management of McKinstry's estimating department and leads the preparation of estimates, budgets and proposals. She will work closely with Xia and David on ground-truthing local labor pricing via Denver area contractors.

PROJECT EXPERIENCE

Salt Lake City School District Electrification Pilot Schools; Salt Lake City, UT - Provided construction estimates for the electrification of two elementary schools, including heat pump, structural, electrical service, and distribution system upgrades.

Seattle Central College Electrification Study; Seattle, WA - Provided ROM estimates for electrical capacity and HVAC electrification.

University of Washington Medical Center; Seattle, WA—Estimator for multiple decarbonization and energy efficiency project; Ongoing

Naval Base Kitsap-Bangor, Puget Sound Energy; Silverdale, WA—Lead estimator for project that included HVAC, lighting, and plumbing upgrades, AMI meter upgrades, pool heat recovery, and HVAC controls optimization across multiple buildings on base; 2022

Green River College OEB Building; Auburn, WA—Estimator for upgrades included a new main service panel, lighting, automatic lighting controls, convenience power, and mechanical equipment connections; 2019

Employment Security Department Solar PV, WA State Department of Enterprise Services; Olympia, WA—Estimator for Solar PV installation at Maple Park Building; 2019

Snohomish County, Phase 5; Everett, WA—Estimator for decarbonization and energy efficiency project including correcting the electrical distribution of the Wall & Oakes Jail, replacing its jail security system and replacing the rooftop HVAC unit on the Medical Examiner building; 2018

Project Team

Peter Sharp CEM

Strategic Energy Management (SEM) Coach

Peter Sharp is an experienced SEM coach who works with industrial customers in Xcel Energy's service territories in Colorado and Minnesota. He has worked with both commercial and industrial customers on energy-saving projects for the past 12 years, including in the refrigerated warehousing, bottle and can manufacturing, and wastewater markets. Peter has a keen understanding of the challenges operations personnel face and understands how to incorporate energy-saving changes that will contribute to a company's success.

Highlights

- Extensive experience leading sector-specific SEM cohorts, including for customers in the indoor agriculture and water/wastewater industries.
- 12 years of experience implementing Xcel Energy's demand-side management (DSM) programs, including both technology-specific programs (lighting, commercial refrigeration), study-based programs (ASHRAE-level audits), and holistic programs (Strategic Energy Management).
- Led energy scans to identify no- and low-cost energy-saving opportunities, analyzing a variety of systems, including compressed air, centrifugal loads, HVAC & process cooling equipment, and lighting systems.
- Helped tailor and deliver SEM training workshops for more than 20 customers. Experience applying and innovating participatory learning techniques to get participants engaged, contributing, and working with each other.
- Helped utilities recruit dozens of ideal participants into SEM cohorts by identifying indicators of SEM success.
- Performed 1,000+ technology-specific assessments and 100+ ASHRAE Level 1 Audits with savings in excess of 5 GWh achieved in some program years.
- Experience promoting energy-efficiency programs via trade partners/contractors, vendors, and direct to end users.
- Led presentations to customers, trade partners, and industry professionals discussing DSM program design and product offerings.

Projects

- Xcel Energy, program management support and SEM coaching for 30 sites
- Kroger, retrofit of cooler case lighting, 30 sites, c90,000 lamps
- Ball Metal Beverage Packaging, installation of 1,250hp air compressor
- Molson Coors, installation of 60+ VFDs on new production line
- Columbia Care, retrofit of c4,500 HID grow lights with LED fixtures
- Amcor, installation of Air Recovery System in blow molding process

WORK HISTORY

2018 – Present
SEM Coach
Cascade Energy

2010 – 2018
Energy Advisor
Franklin Energy Services

2005 – 2010
Owner/Operator
Elite Blasting

EDUCATION

Bachelor of Manufacturing Systems Engineering,
University of the West of England (UK), 1997

CERTIFICATIONS

- Certified Energy Manager (CEM), 2010

AFFILIATIONS

- Association of Energy Engineers (AEE)

www.cascadeenergy.com | info@cascadeenergy.com | 866.321.4573

Giulia Pollastri

Project Engineer

Giulia Pollastri is an experienced chemical and process engineer with a deep understanding of heavy industry and operations. In her current role, Giulia works directly with industrial-sector customers to assess their facilities and operations to identify and quantify opportunities for improving energy efficiency. She provides high quality technical engineering services for multiple utility demand-side management programs, including those of Xcel Energy.

Highlights

- Extensive experience in refinery and wastewater operations through several years of technical support roles at the Livorno Refinery in Italy.
- Led multiple customers through Xcel Energy's Strategic Energy Management (SEM) program, providing treasure hunts, system assessments, data collection, and energy savings calculations.
- Experience working with a variety of industrial-sector customers, including upstream, midstream, and downstream oil and gas; wastewater and drinking water treatment plants; and food manufacturing.
- Experience in providing customers continuous support during project implementation and, once in operation, obtaining available incentives from the utility provider.
- Experience optimizing energy savings for a variety of industrial equipment types, including pumps, compressors, coolers, and heat exchangers.
- Skilled technical communicator, able to communicate effectively across all levels of an organization to resolve complex technical issues.

Skills

- MS Word, Excel, PowerPoint
- FMEA & HAZOP Analysis
- Advanced Process Controls
- Project Management
- Lean Six Sigma Yellow Belt
- Italian (fluent)

Projects

- **Xcel Energy**, Strategic Energy Management (SEM) program delivery
- **Xcel Energy,** project assessments for 10 customers.
- **Xcel Energy,** Wastewater SEM, bottom-up calculations for blower upgrade
- **Xcel Energy,** Upstream VRUs VFD energy study
- **Xcel Energy**, compressed air energy study
- **Rocky Mountain Power, o**il refinery wastewater plant design review for energy efficiency.
- **Energy Smart Industrial**, refrigeration energy study and modeling

WORK HISTORY

2021 – Present
Project Engineer
Cascade Energy

2017 – 2021
Production Engineer and Junior Process Engineer
Eni S.p.A – Livorno Refinery

2017
QC Senior Lab Analyst
Philip Morris International (Bologna)

EDUCATION

Master Thesis, Mixed Culture Syngas Fermentation
Technical University of Denmark

MS, Chemical and Process Engineering
Bologna University, 2016

BS, Chemical and Biochemical Engineering
Bologna University, 2014

PUBLICATIONS

Exploitation of Mixed Cultures in the Fermentation of Syngas for the Production of Biomethane, master thesis, 2016

www.cascadeenergy.com | info@cascadeenergy.com | 866.321.4573

John Rosenblum PhD

Industrial Energy and Water Efficiency Engineer

John Rosenblum brings 30 years of experience and expertise in industrial water and energy efficiency as an independent consultant. His focus is combining analyses of operational data, utility billings, and site-specific conditions to identify the cost-effective benefits of deep water and energy efficiency improvements.

Highlights

- Skilled at working with client engineering teams to identify design improvements that cost-effectively integrate production process requirements with plant utilities infrastructure.
- Experience with a broad range of industries and production processes, including both large and small municipal wastewater treatment plants, semiconductor manufacturing, metal-finishing, laundries, wineries, dairies, canneries, frozen foods, carbonated and natural beverages, meat packing, food bio-gums, petrochemicals, and cruise ships.
- Effectively identifies process-control and equipment improvements to reduce energy costs while improving effluent quality and regulatory compliance for municipal and industrial wastewater treatment plants.
- Experience leading the water/wastewater element of many corporate sustainability evaluations for new facilities and production expansions.
- PhD studies focused on the thermodynamics of energy production and use of solar cogeneration and its cost-effective integration with water and energy efficiency.

Projects

- Identified **savings of 47% in electricity costs** ($960,000/yr from efficiency and $600,000/yr from increasing cogeneration), plus **51% in natural gas costs** ($400,000/yr) for four Southern California wastewater treatment plants (57 MGD).
- Worked with one of the largest municipal water systems in the nation to identify process and contractual issues causing financial losses in biogas production and conversion to renewable natural gas (RNG) and how to overcome them.
- Evaluated cost savings and greenhouse gas reductions in steam and gas operations for a major North American meat manufacturer (estimated **35% reduction in gas use**).
- Completed process water efficiency evaluations and pilot projects at hi-tech facilities in Silicon Valley, CA. Confirmed the technical and economic feasibility of water efficiency in meeting new wastewater-discharge mass limits.

WORK HISTORY

2021 – Present
Industrial Energy/Water Efficiency Engineer
Cascade Energy

1990 – 2021
Industrial Water and Energy Efficiency Consultant
Self-employed

1987 – 1990
Senior Facilities Engineer
National Semiconductor

EDUCATION

PhD, Civil Engineering
Stanford University, 1986

MS, Environmental Engineering
Technion – Israel Institute of Technology, 1978

BS, Civil Engineering
Technion – Israel Institute of Technology, 1976

www.cascadeenergy.com | info@cascadeenergy.com | 866.321.4573

References

CITY AND COUNTY OF DENVER

Contact: Johnathan Rogers | Renewable Energy Specialist

Phone Number: 203.912.4664

Email: johnathan.rogers@denvergov.org

RELEVANCE TO LOUISVILLE

McKinstry has a long-term partnership with the City and County of Denver that has included an Energy Master Plan, 100% Renewable Energy Roadmap, full decarbonization audit of 2M square ft and a current on-call Distributed Energy Resources contract. Our team will leverage this local experience and lessons learned to directly apply to this City of Louisville project.

> "Willingness to be flexible to help create a complex, but highly impactful project for the Denver community."
>
> *—Jonathan Rogers, Renewable Energy Specialist, City and County of Denver*

DENVER PUBLIC SCHOOLS

Contact: Trena Marsal | Executive Director

Address: 900 Grant St., Denver, CO 80203

Phone Number: 720.423.4011

Email: trena_marsal@dpsk12.net

RELEVANCE TO LOUISVILLE

McKinstry has a long-term partnership with Denver Public Schools that has a comprehensive decarbonization audit and implementation across several million square feet of downtown buildings. In addition, the McKinstry team has assisted in installing over 8MW of solar PV to offset load across the District. Our team will leverage this local experience and lessons learned to directly apply to this City of Louisville project.

> "I am so thankful for our partnership with McKinstry!"
>
> —Trena Marsal, Executive Director of Facility Management, Denver Public Schools

SALT LAKE CITY SCHOOL DISTRICT

Contact: Paul Schulte | Executive Director of Auxiliary Services

Phone Number: 801.874.8367

Email: paul.schulte@slcschools.org

RELEVANCE TO LOUISVILLE

Salt Lake City School District has similar aggressive decarbonization targets as City of Louisville. McKinstry provided the district with an initial decarbonization phase resulting in a 30% CO2 reduction.

> "McKinstry has been a great wholistic partner in achieving the District's decarbonization goals."
>
> —Paul Schulte Executive Director of Auxiliary ServicesManagement
> Salt Lake City School District

Cost Proposal

The proposed fee for this project is **$ 265,840.** The fee covers the Project and Deliverables Scope as described in the RFP. The summary breakdown of fees is provided below, broken up by Phase as defined in our Project Approach section. The level of detail represented by this fee assumes this project is the step prior to project implementation. Our scope includes energy/utility cost impacts, as we believe financial analysis used for decision-making should include this component.

We are very happy to decrease or increase scope and effort of work desired based on Louisville's evolving perspectives on the project. McKinstry and the City of Louisville could collaborate during the interview, contracting, and/or stakeholder engagement process to refine the scope and cost of work deliverables as needed, to ensure we ultimately provide the most pertinent level of detail that results in an actionable and realistic roadmap to project implementation.

As a local design-build firm with extensive experience in decarbonization delivery, McKinstry is also happy to investigate the option of crediting the cost of this decarbonization study within a future construction project, should the City choose to contract with McKinstry for the implementation of the recommended measures.

Task	Description	Task Total Price
Phase 1	Information Gathering	$35,100
Phase 2	Analysis	$139,140
Phase 3	Decarbonization Roadmap (Includes all meetings and presentations)	$76,600
Add-On 2	Electrical load reduction and efficiency measures 2	$15,000
TOTAL PROJECT COST		$265,840
Add-On 1	Detailed water and wastewater treatment analysis 1	$55,000

ADD-ON SERVICE NOTES

1. Our base scope includes electrification of the space heating and domestic water heating systems in the three water/wastewater plants. This additional scope includes our partners Cascade Energy, who have recently completed the SEM audit for these buildings. It includes Cascade's expertise related to the process loads of the water/wastewater plants, and analysis for electrification and load reduction of those loads. The level of detail in Cascade's scope is negotiable.

REIMBURSABLES

All reimbursables for the outlined scope are included. Any additional scope items added via change order may require additional reimbursable expenses.

ASSUMPTIONS AND EXCLUSIONS

1. [redacted]
2. Design is not included. Neither concept narratives nor detailed design drawings are included.
3. Diagrammatic markups and equipment specification details for recommended equipment will be included.
4. Detailed energy modeling is not included. Energy calculations will be done via spreadsheet calculations.
5. Cost estimating is being done at a Rough Order of Magnitude (ROM) level.
6. One (1) person performing building walk throughs for six (6) days total.
7. Operations and Maintenance (O&M) scope is not included.
8. All meetings and presentations will be conducted virtually, unless indicated otherwise in the Scope of Work.
9. Costs assume all bi-weekly meetings, staff interviews, department and/or executive management team presentations, and final Board presentations will be conducted virtually.
10. Costs assume there will be an in-person kick-off with key City stakeholders and (2) in-person City Council presentations.

PIGGYBACKING

McKinstry would be delighted to extend these contract terms to other local government entities, with the understanding that scope and cost refinements would be required based on the specific buildings and needs of the jurisdiction.

MCKINSTRY & CASCADE HOURLY RATES

The Rate table represents the work set forth in the City of Louisville Decarbonization RFP, the proposal received in response, and the Contract Documents.

The hourly service rate shall be inclusive of all costs, including mileage and/or per diem.

Employee Title McKinstry	Hourly Rate*
Director of Engineering	$223
Engineering Manager	$162
Sr Design Engineer	$162
Lead Design Engineer	$128
Building Performance/Design Project Engineer	$104
Sr Acct Exec - Energy	$127
Sr Energy Engineer	$130
Employee Title Cascade Energy	**Hourly Rate**
Senior Engineer III	$216
Engineer III	$210
SEM Coach II	$190
Engineer II	$175
Program Specialist	$130

**Valid until 12/31/2022*

Cost Proposal

Hours for Project

Decarbonization Task or Milestone	Total Proposed Hours
Phase 1: Audit	**308**
Data Gathering	0
Utility Data Review	6
Compile all data	4
Carbon savings potential	10
Drawing Review & Existing System Documentation	52
Previous Study Review	25
Electrical capacity matrix	10
Understand and document recent upgrades	6
City / McKinstry team value workshop and prep	32
Measure Ideation	0
Mechanical measures	39
DER/Microgrid/district	24
PV	32
Misc Equipment	12
Fleet	18
Site Visits	0
Onsite assessments	26
Debrief/Info Organization	12

Decarbonization Task or Milestone	Total Proposed Hours
Phase 2: Analysis	**873**
Measure Refinement / Scoping	0
Mechanical/electrification measures	254
DER/Microgrid/district	72
PV	49
V2G	28
Demand Response/Load shedding	20
Misc Equipment	24
Fleet	72
Technical Analysis - Energy Calcs	0
Load reduction measures	0
Mechanical measures	32
DER/Microgrid/district	12
PV	6
Demand Response/Load shedding	12
Misc Equipment	12
Fleet	8
Utility Coordination	0
Rate Schedules	5
Peak demand reduction savings	5
Renewable programs	4
Financial Assessment	0
Cost Estimating	122
Supply chain impacts	8
Measure operating expense benefit	24
GHG cost effectiveness (GHG reduc/$)	8
Non-energy cost savings	48
Social cost of carbon/Carbon tax implications	8
Grant analysis	40

Decarbonization Task or Milestone	Total Proposed Hours
Phase 3: Roadmap and Documentation	**256**
System Documentation	0
Mechanical measures	54
DER/Microgrid	16
PV	18
Demand Response/Load shedding	14
Misc Equipment	12
Fleet	12
Building reports	62
Final report	22
Develop timeline for implementation	28
Final presentation prep	18
Major Meetings	**107**
Dept/Exec Mgmt Presentations	12
City Council Presentations	12
Board Presentations	12
Bi-weekly City team meetings	44
Staff Interviews	12
Facilities Interviews	15
Add Scope: Load Reduction Measures	**105**
Phase 1	31
Phase 2	56
Phase 3	18
Total	105
Total	**1,649**

Meredyth Muth

From: Eliza Fry
Sent: Tuesday, October 3, 2023 9:03 PM
To: jdurn@louisvilleco.gov; Tiffany Boyd; City Council

Dear Louisville City Council Members,

My name is Eliza Fry. I am currently a sophomore at Fairview High School and a member of the Net Zero club. Even though I go to school in Boulder, I am a Lousiville resident. I'm writing to you today to support the internal decarbonization plan that the council will be issuing a decision on on October 10th. A vote in support of this plan is a vote in support of the future of Louisville - and the future of young people like me.

On behalf of my generation, I urge you to consider the following when making your decision:

-
-
- To
- decarbonize, we must remove fossil fuels from our buildings and vehicles. As shown in the final report, building gas use makes up 47% of Louisville's energy use and more than 80% of total emissions. Passing the plan would make significant steps into lowering
- that percentage; a necessary action.
-
-
-
- Louisville is currently not meeting our Climate Action Goals. Specifically, we are not meeting
- our goal to "reduce core municipal GHG emissions annually below the 2016 baseline through 2025". Our building emissions today are higher than they were in 2016; an increase we cannot afford under any circumstances.
-
-
-
- The
- plan includes on-site solar generation, which is much more cost-effective than Xcel Energy grid-purchased electricity and Windsource credits. By increasing the amount of local, on-site solar, we will be able to reduce our dependence on external, privatized
- energy sources.
-
- The plan also includes the addition of electric vehicle charging stations in popular locations such as Coal Creek Golf Course. This addition would not only make the facility closer to net zero, but it would encourage more residents to participate in the facility due to accommodations for residents with electrical vehicles.

I strongly encourage you to pass the Internal Decarbonization Plan, and show the youth of Louisville and the broader community that you care about our future and understand the severity of the climate crisis.

Thank you for your time.

Sincerely,
Eliza Fry
15, Sophmore
Louisville resident

From: Katie Doyle Myers
To: City Council
Subject: Public comment on the internal decarbonization plan
Date: Tuesday, October 3, 2023 8:39:36 AM

Hello City Council:
First and foremost, thanks to you all for your tireless support for our city. I know you all care deeply about our community, and that you are doing all you can to ensure it is vibrant, sustainable, and healthy for all. Today I am writing to urge you to approve the internal decarbonization plan that I know you are carefully reviewing.

From the last city council meeting, I recognize there's a solid understanding that removing fossil fuels from our buildings and vehicles is a must to reach our city's climate action goals. I also recognize that it comes at a cost, and that the financial element is of paramount concern. I applaud you all for taking some extra time to carefully review the budget to ensure maximum fiscal responsibility. At the same time, I am urging you to approve the plan, with the understanding that the city staff will find the financial mechanisms necessary to cover the investment that is needed to kick this off. While the price tag may seem daunting at first, the report does indicate that the measures and recommendations in the plan have been vetted and that they are in essence ***the most cost effective way to achieve the greatest amount of emission reduction and decarbonization potential*** (page 5 of the final report). By bundling pieces of the project together, we will continue to implement the plan in the most cost effective way.

As a citizen, I feel confident that, by the city council adopting the internal decarbonization plan, we are showcasing our leadership for the community and commitment to a healthy, sustainable present and future. I know that we can seek support - especially fiscally - from the county, state, and federal government budgets and other sources to ensure that the City of Louisville remains fiscally responsible. I know that Jeff and Kayla - and other city staff members - are working to uncover grants and other funding mechanisms to ensure that we can move forward into a clean energy future AND ensure the financial stability of our town. These opportunities exist with the IRA climate action grant opportunities, from national funders like The Funders Network, from our state Department of Public Health and the Environment, from Boulder County's Environmental Sustainability Matching Grant Program, and more. Many of these COL is tapped into already, and many remain as opportunities. The funding *is* available, the staff to draw down the funds needed is prepared, the plan is sound. We just need your adaptation. We CAN do this!

With gratitude,
Katie Doyle Myers
425 Grouse Court
Louisville, CO 80027

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katie doyle myers
::fon:: 303.919.4486
::fam:: k + b + finn + leo

From: Evelyn Ray
To: City Council
Subject: Letter of Support for Decarbonization Plan
Date: Monday, October 2, 2023 7:24:49 PM

Dear Louisville City Council Members,

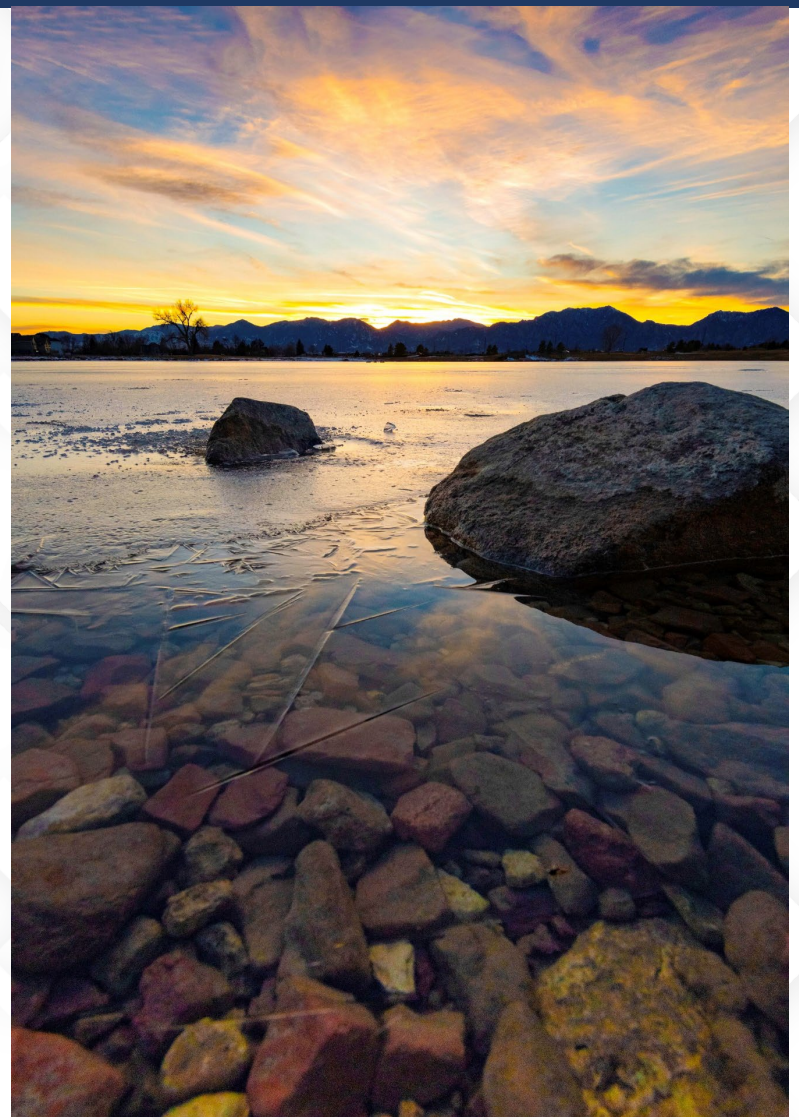
Hi! I encourage you to vote yes on the Internal Decarbonization Plan. I'm Evelyn Ray and I am a senior this year at Centaurus High School and a member of the Eco Warriors club. I think this plan is a great step in the right direction regarding the future of us young citizens along with the health of the environment in general.

This item has been a high priority on the 2022 and 2023 City Council Work Plans and this year's work plan calls out "Complete and begin implementation of internal strategic decarbonization plan for City facilities and operations". Removing fossil fuels from our buildings, vehicles, etc. is necessary for taking steps toward decarbonization, and building gas use makes up 47% of Louisville's energy use and more than 80% of total emissions.

A pass on the Internal Decarbonization Plan will make it clear to the youth that you care about my generation's future and intend to take steps to ensure our safety.

Thank you for your time and consideration.

Sincerely,
Evelyn "Evy" Ray
17, graduating class of 2024 at Centaurus High School



City of Louisville

Internal Decarbonization Plan

City Council

October 10, 2023

Plan Alignment with Council Priorities

- High priority City Council work plan item in 2022 and 2023
- Supports municipal climate action goals
- Supports Sustainability Action Plan goals

Goal of Plan: Roadmap towards decarbonization of City buildings, fleet and equipment

Plan Strategy

- The Internal Decarbonization Plan outlines Near, Mid and Long term goals for the City.
- Recommended Internal Decarbonization Plan review every 5 years due to technology advancements

Implementation – The Near Term Plan

- Near term improvements to City facilities (5 buildings)
  - Through City budget or implementation mechanisms

Mid to Long Term Strategy – technology advancements leveraged

- Buildings – Costs built into annual building equipment replacements CIPs

Fleet – Implement through vehicle replacement schedules

Near Term Implementation Options

Energy Performance Contracting (EPC)

- Colorado Energy Office managed model for financing and implementing capital improvement upgrades
- Utility savings are guaranteed through the contract – if project does not realize utility savings, the Energy Service Company (ESCO) is responsible for the shortfall
- Framework supports grant funding through state agencies (DOLA, CEO, CDPHE, etc.)
- Nearby cities with current EPC projects: Lafayette, Erie, Boulder, Westminster, Arvada, Broomfield, Thornton

Implementation Options

1. Implement near term improvements through current budget (cash flow)
2. Implement near term improvements through EPC financing mechanism (without solar)
3. Implement near term improvements through EPC financing mechanism (with solar)

Near Term Implementation Options

	Option 1: Existing CIP	Option 2: EPC – Near Term w/o Solar	Option 3: EPC – Near Term with Solar
Payment Method	Cash Flow	Finance	Finance
Building Electrification	✓	✓	✓
Energy Efficiency		✓	✓
EV Charging		✓	✓
Solar			✓
Grants		partial	✓
Utility Cost Savings			✓
Total Cost	$4,822,500	$14,100,000	$7,600,000
Annual Budget Impacts	Varies by year (CIP driven)	$880,000	$480,000

City of Louisville

Near Term Implementation Options

Year	Option 1: Existing CIP	Option 2: EPC – Near Term w/o Solar	Option 3: EPC – Near Term w/ Solar
2023	$1,500,000		
2024	$2,585,000	$880,000	$480,000
2025	$287,500	$880,000	$480,000
2026	$450,000	$880,000	$480,000
2027 – 2039	Varies by year – CIP driven	$11,400,000	$6,200,000
Total	$4,822,500+	$14,100,000	$7,600,000

- Option 1 includes current CIP equipment replacements for 5 facilities in Plan's near term recommendations. This assumes no additional funding is budgeted for equipment replacement 2027 – 2039.
- Option 2 & 3 assume a 16 year loan term.
- EPC annual payments are all inclusive – additional funding for equipment upgrades would be eliminated from CIP.
- Option 3 achieves 42% renewable electricity and 30% decarbonization.

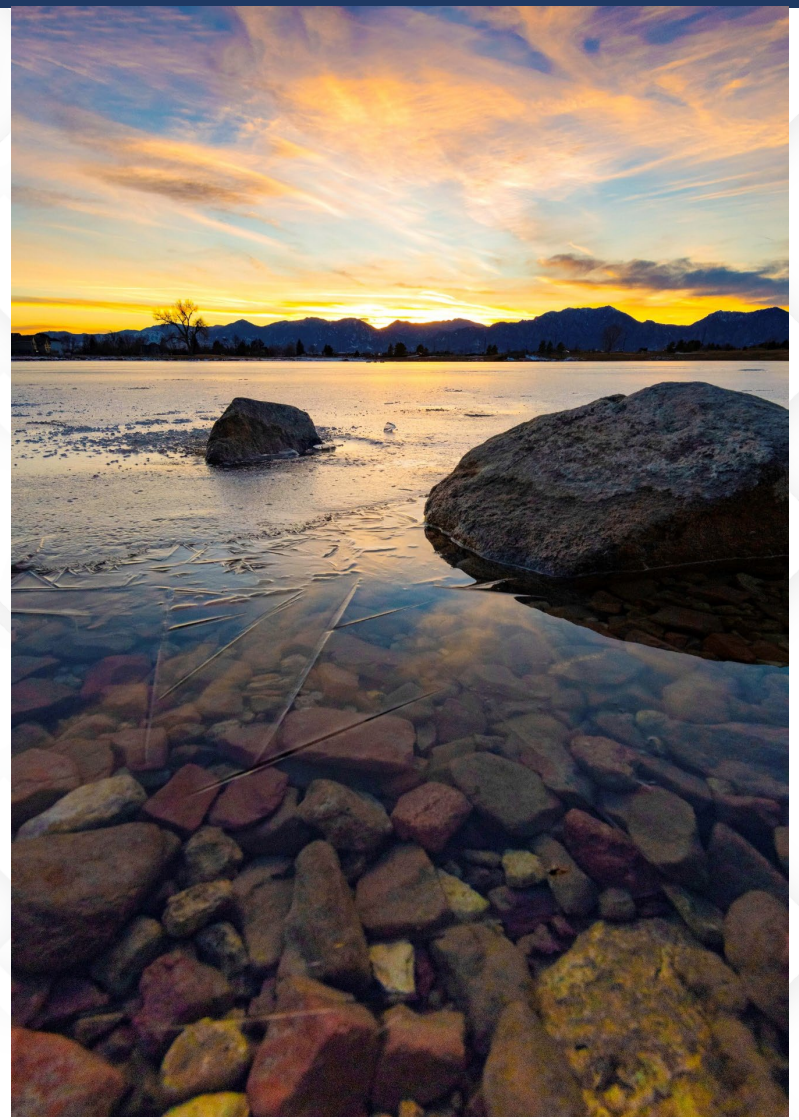
City of Louisville

Plan Strategy

The Internal Decarbonization Plan outlines Near, Mid and Long term goals for the City.

Near Term Implementation Recommendation

Staff recommends adoption of Internal Decarbonization Plan and exploring implementation option 3, near term improvements with solar, through the Colorado Energy Office's Energy Performance Contracting (EPC) program and grant funding.



City of Louisville

Thank You

Questions?