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City of Kent Decarbonization Planning

Carbon Footprint Inventory

May 2024

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Agenda

1. Executive summary and glidepath
2. Portfolio analysis
3. Sourcing strategies
4. On site solar
5. Renewable energy credits (RECs)

Decarbonization Planning Approach and Process

Align with Targets, Timing and Priorities

- Understand the stated decarbonization objectives, baseline and expected timeframes, including interim goals
- Ensure adoption with industry frameworks to guide efforts
- Create organizational guidance and boundaries to prioritize the range of sourcing strategies available

Assess Current Condition

- Gather energy and carbon data to understand the “shape” of the portfolio
- Understand expected business changes, and current and planned sourcing strategies, on-site generation and energy efficiency efforts
- Create visualization tools to identify areas of prioritization and hotspots

Evaluate Best-fit Reduction Options

- Research market / policy dynamics impacting sourcing decision-making
- Conduct feasibility assessment for on-site solar
- Investigate renewable sourcing options aligned with prioritization and financial considerations
- Create recommended strategic options per site

Build Decarbonization Glidepath Model

- Create a meaningful and actionable carbon reduction glidepath aligned with targets and timing
- Evaluate the range of available reduction levers, to reduce scope 2 emissions
- Provide site-specific recommendations and quantify the impact of each option
- Frame in context of overall emissions

Creating an actionable decarbonization plan requires organizational alignment, clarity on commitments, resource allocation and alignment with stakeholder expectations

Executive Summary

- City of Kent is committed to taking action to reduce organizational carbon emissions
- The scope of the analysis encompasses 16 Facilities, multiple freestanding electric accounts and diesel and gasoline purchases
  - 57 electric accounts primarily street and traffic lights
  - Diesel and gasoline use across fleet and misc. small engine uses
- The objective of the decarbonization strategy is to develop a meaningful, actionable plan based on a comprehensive energy and carbon analysis.
- Total Carbon Footprint for 2022 is 5,266 Mt CO_2e
  - Scope 1 emissions accounts for 1,527 Mt (Diesel and gasoline are 53% of Scope 1 emissions)
  - Scope 2 emissions accounts for 3,739 Mt (using Market factors)
- Based on the portfolio analysis and option evaluation, the primary levers available to City of Kent are focused on sourcing strategies:
  - 2,558 Mt CO2e of carbon reduction is needed to achieve a 50% reduction from the 2022 baseline, representing 71% of City of Kent's total Scope 2 emissions
- To reach Ney Zero for 2022 through purchase of RECs and offsets would cost approximately $27,175 ($4/MWh RECs and $8/Mt offsets)

Summary and Recommendations

Key Strategic Considerations

- The new City hall is not included in these calculations as it was still under construction
- Total electricity use for the City is over 7,865 MWh in 2022
- Based on utility bills provided, we estimate that total electricity spend was ~$617,000 in 2022
- Liquid fuels (diesel and gasoline) were 53% of scope 1 emissions

Recommendations

- Consider on site solar at two locations.
  - New Safety building (rooftop)
  - Water treatment facility (ground mount)
- Additional renewable energy procurement may be necessary due to limited size of production available
- Electrification of the fleet vehicles as available will make a significant impact on the total scope 1 emissions and can be mitigated through scope 2 options
- Energy efficiency Audits and projects will reduce scope 1 and 2 emissions and utility costs

Summary of Carbon Accounting Principals

Definitions and Reporting Guidance

Methodology	Definition
Location-based Reporting	▪ Quantification based on the average emissions intensity of grids where electricity consumption occurs
Market-based Reporting	▪ Quantification based on emissions emitted by generators from which the reporter has contractual instruments
Residual Mix	▪ The mix of energy generation resources and associated attributes in a defined geographic boundary left after contractual instruments have been claimed, retired, or canceled

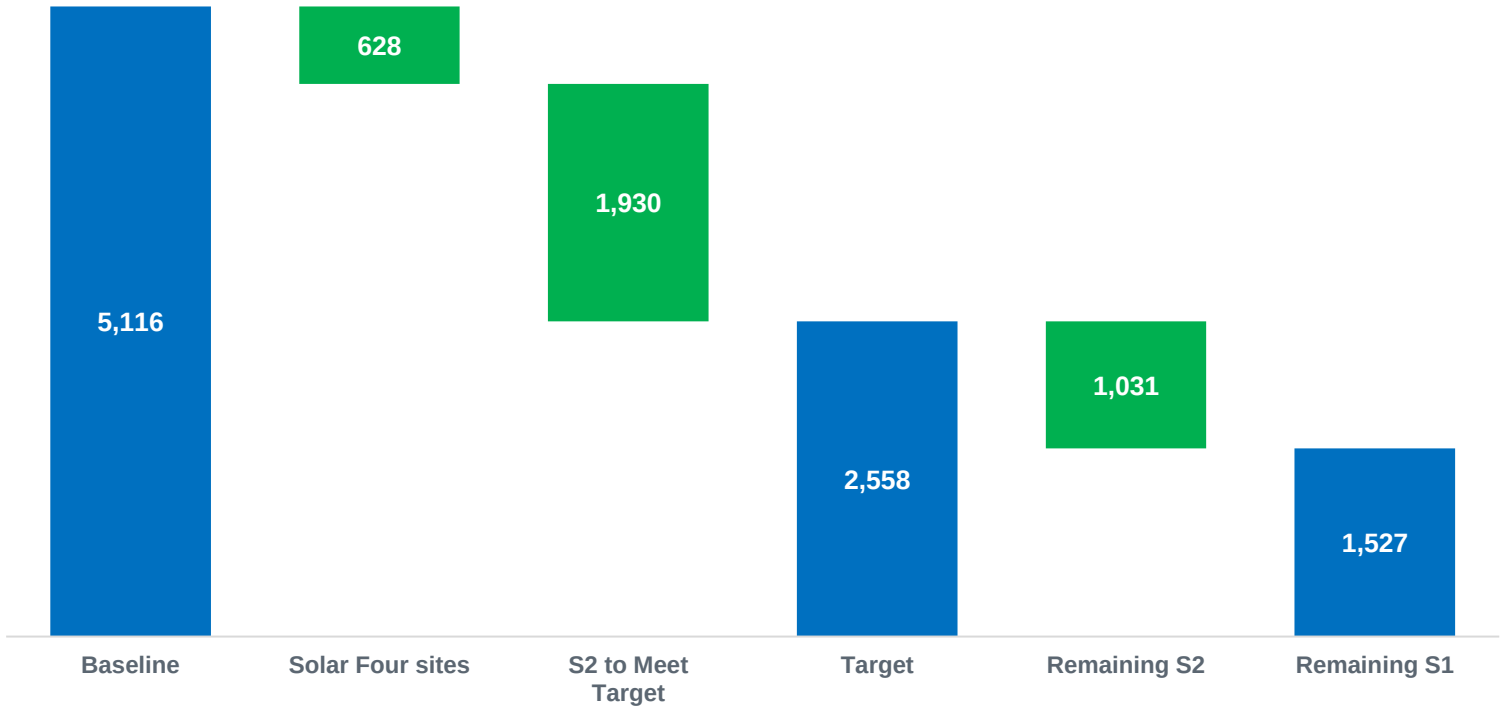
Reporting Guidance

- While emissions factors change, use the most recent published factors available at the time of reporting
- When reporting historical usage align the data year with the reporting period. If the corresponding data year is not available, use the preceding year's factors
- Locations that do not support a market-based method will use the location factors. This will result in location and market numbers being identical
- Organizations should use the most appropriate, accurate, precise and highest quality emissions factor available for each method based on the recommended factor hierarchy

City of Kent Decarbonization Glidepath Model

Emissions Reductions to Meet 50% emissions target

Carbon Reduction Glidepath Model



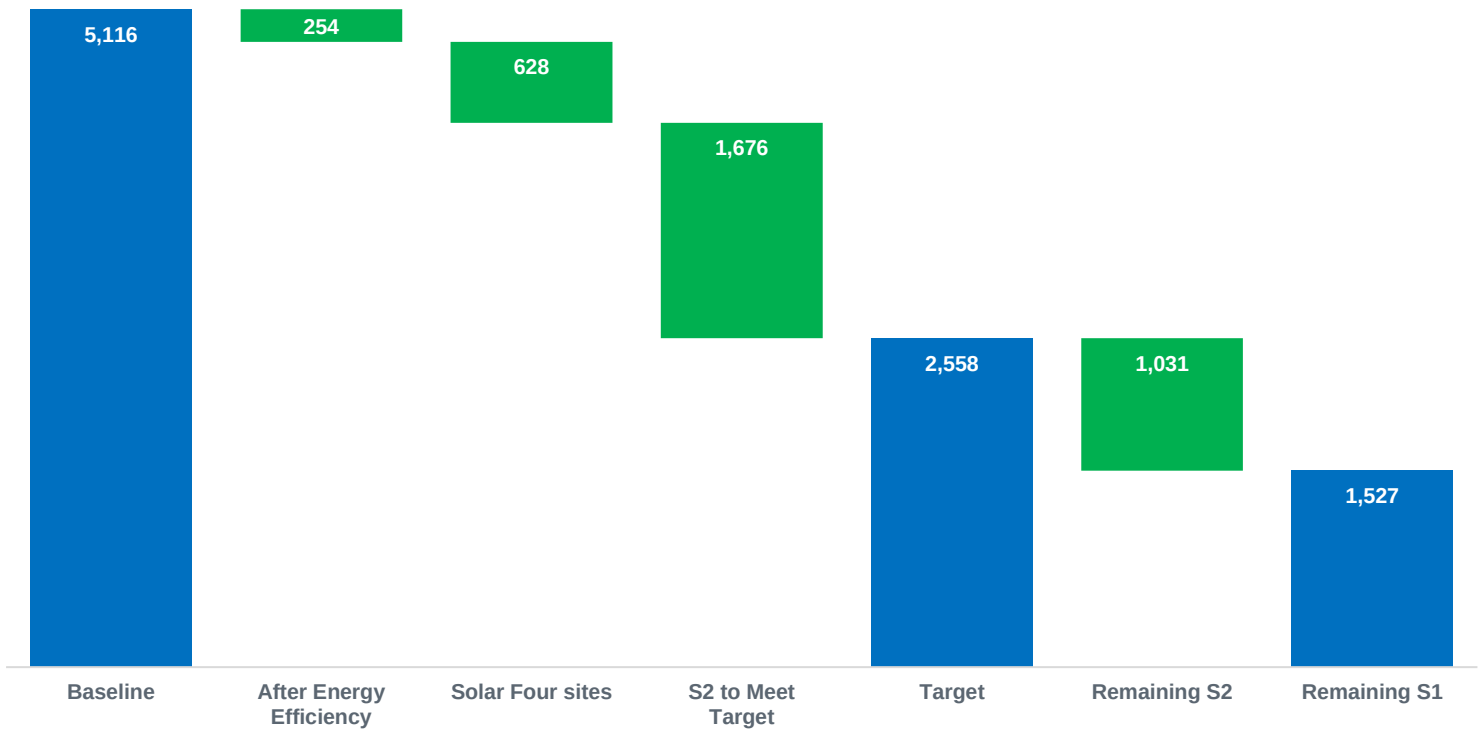
Base Case Model Assumptions

- Baseline for carbon reduction targets is 2022
- 2022 Market factors based on most recent available Green-e Residual Mix factors (2021 data)
- Natural gas gasoline, and diesel (scope 1) and electricity (scope 2) are included in the analysis
  - Additional emissions include HVAC leaks and water treatment plants are not included in this analysis
- Does not incorporate growth or energy efficiency changes
- Solar installations at 4 sites based on projected generation and carbon savings.

City of Kent Decarbonization Glidepath Model

Emissions Reduction with Energy Efficiency

Carbon Reduction Glidepath Model



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- 2022 Market factors based on most recent available Green-e Residual Mix factors (2021 data)
- Natural gas gasoline, and diesel (scope 1) and electricity (scope 2) are included in the analysis
  - Additional emissions include HVAC leaks and water treatment plants are not included in this analysis
- Includes estimated energy efficiency reductions
  - 6% Electricity reduction in each account
  - 4% Natural Gas reduction each building
  - 15% reduction in liquid fuel use (gas and diesel)
- Solar installations at 4 sites based on projected generation and carbon savings.

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Portfolio Energy and Carbon Analysis

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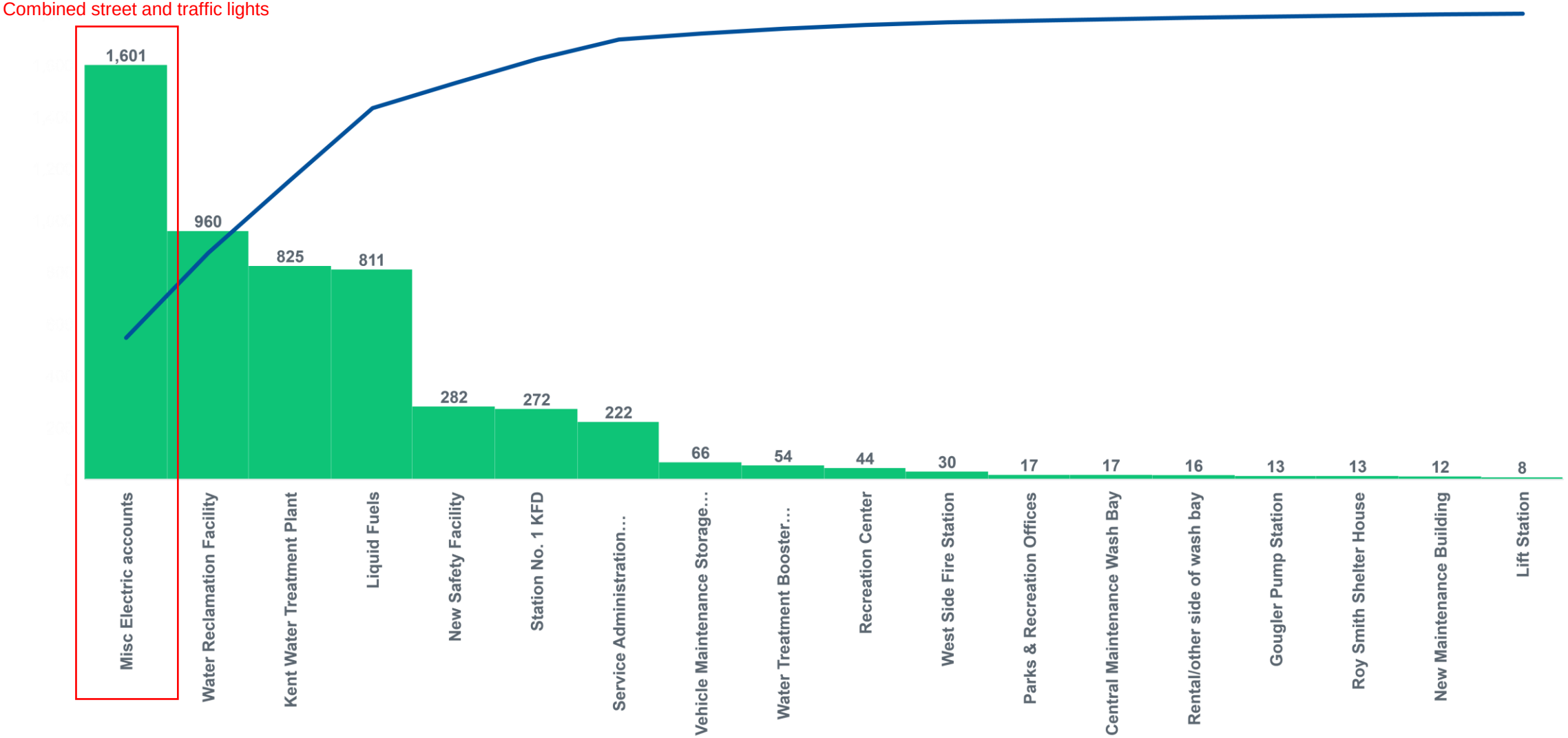
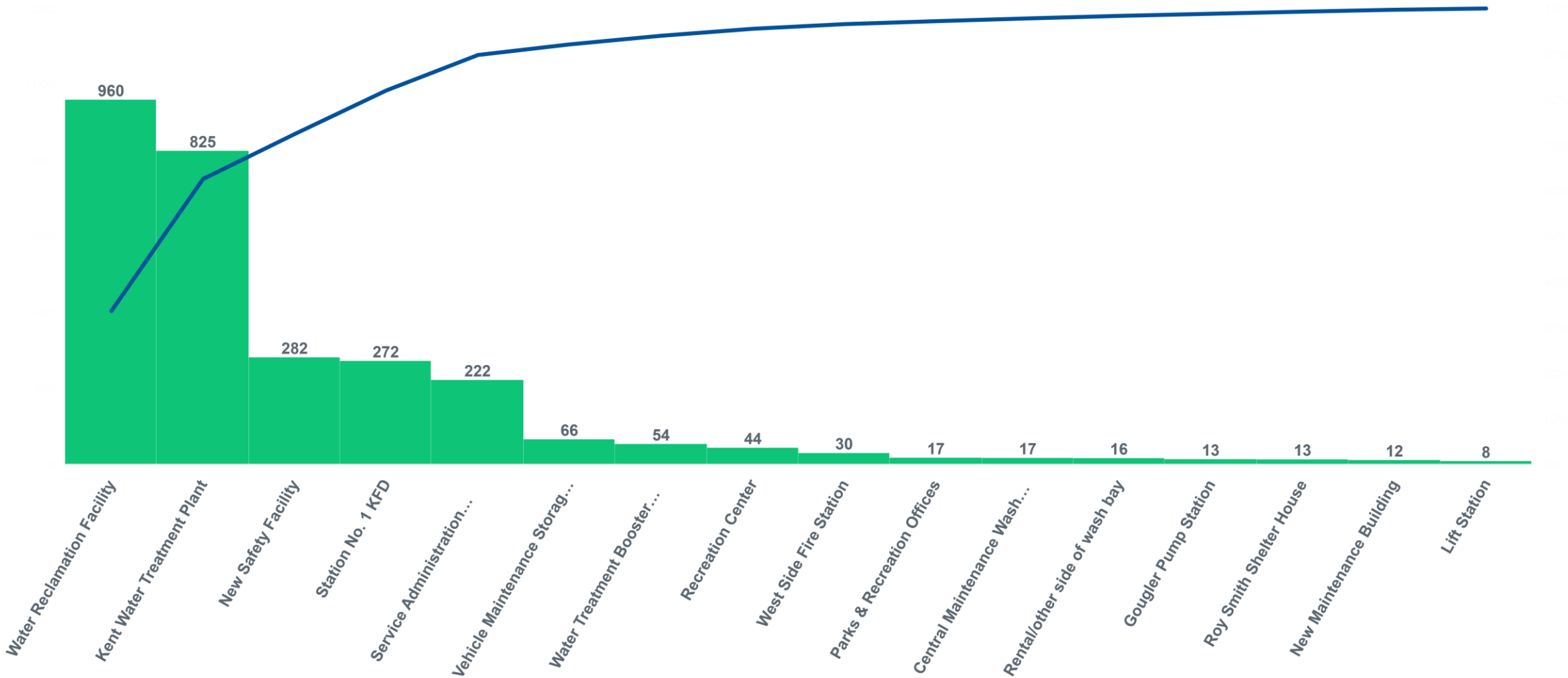
Portfolio Carbon Emissions

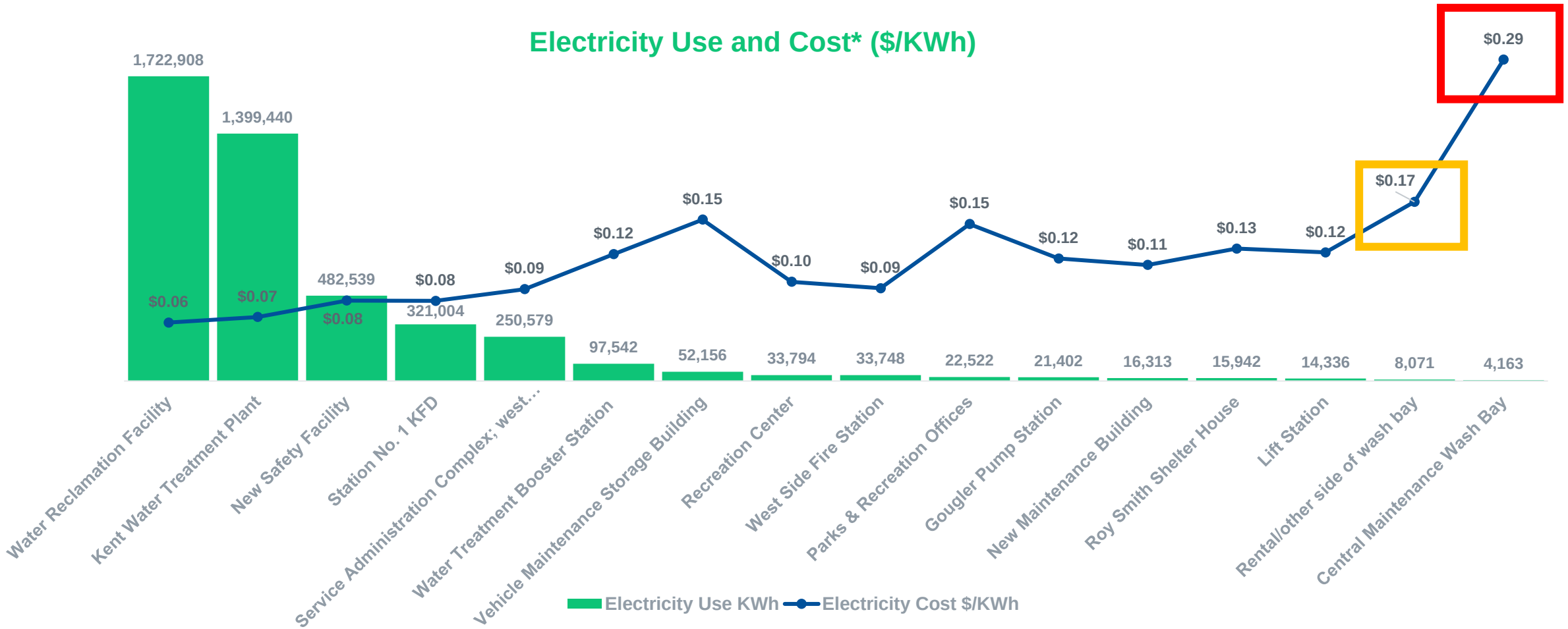
Combined street and traffic lights



Building Carbon Emissions

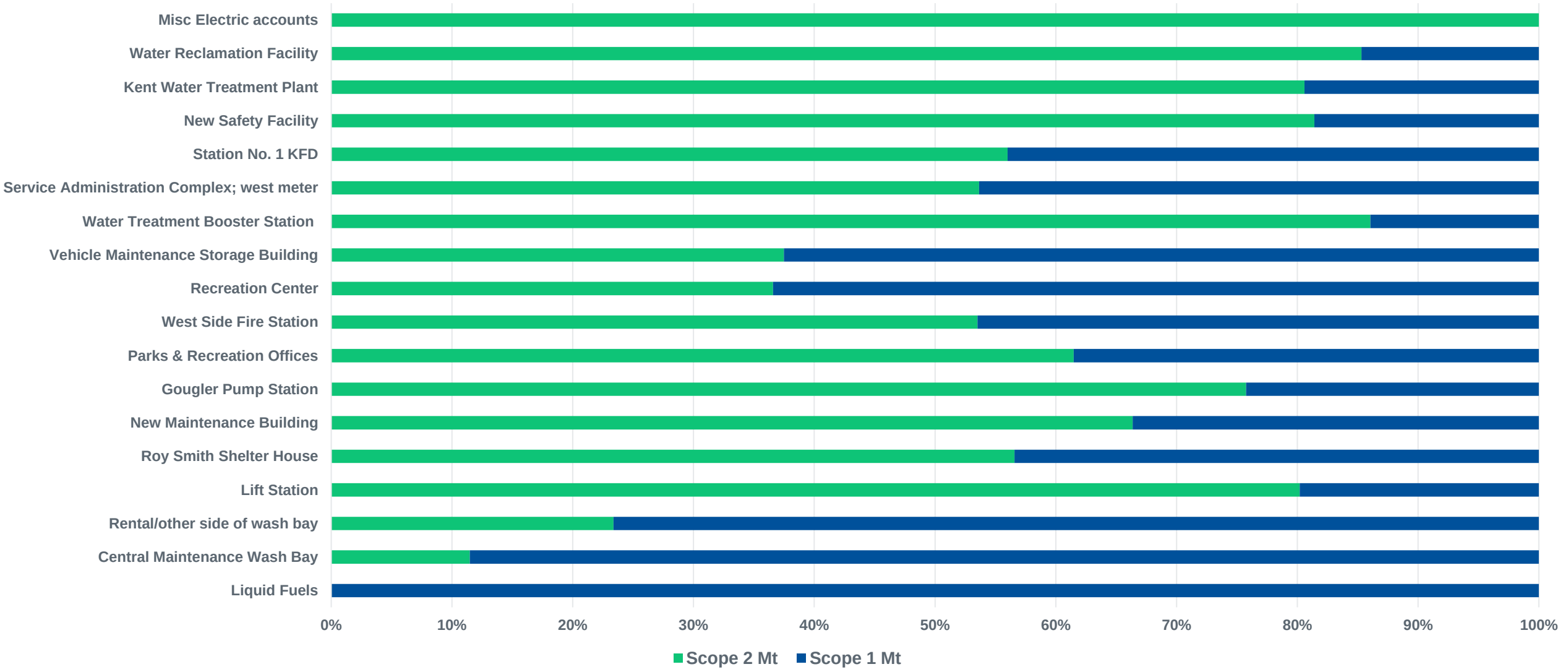


Key Electricity Metrics: 2022



*Total cost on Ohio Edison bills includes distribution and supply charges, riders, and fees.
NOPEC contracted supplier rate is ~$0.04/KWh at all sites

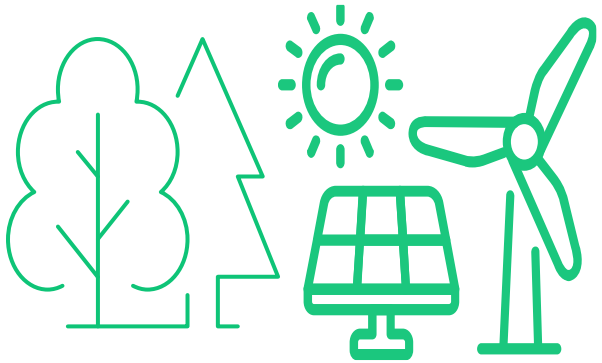
Carbon Emissions by Scope



Carbon Equivalents

Total City Footprint

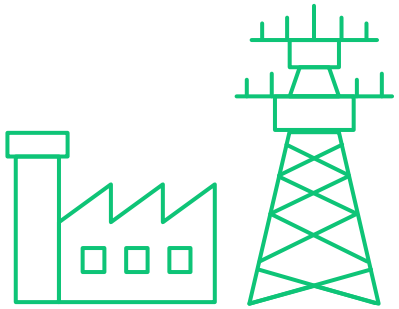
- 5266 Mt CO2e



6,148 Acres of Forest for one year
1.4 Wind Turbines running for one year

Electricity: Scope 2

- 7,865 MWh
- 3739 Mt CO2e

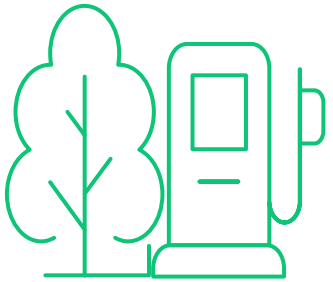


Equal to 2,060 Tons of Coal burned

Liquid Fuels

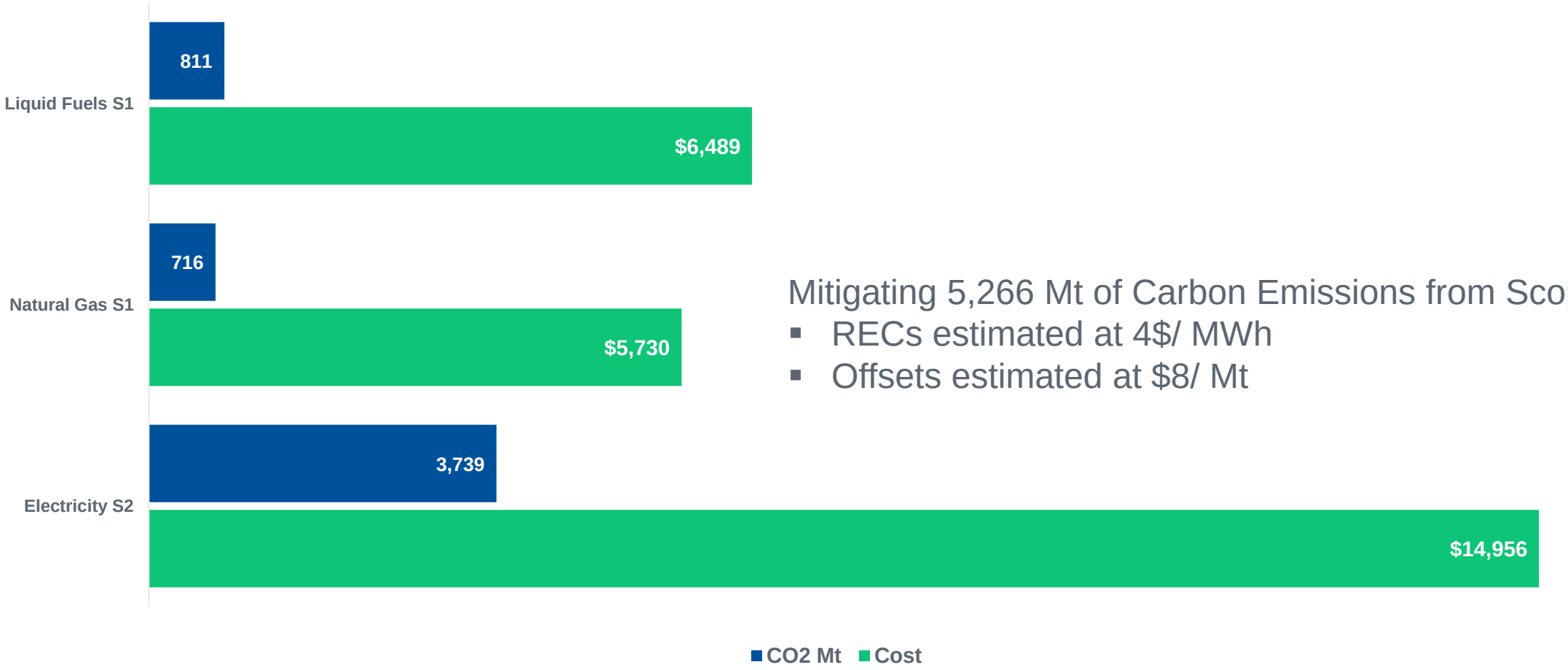
Gasoline and Diesel

- Combine use of 85,723 Gallons
- 811 Mt CO2e



Equivalent of 13,410 Tree seedlings grown for 10 years

Cost to Reach Net Zero Today



Mitigating 5,266 Mt of Carbon Emissions from Scope 1 and 2

- RECs estimated at 4$/ MWh
- Offsets estimated at $8/ Mt

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Sourcing Strategies

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Sourcing Renewable Power

Strategic Options to Reduce Scope 2 Emissions

Generate Additional Certified Renewable Power

Install Renewable Energy Systems

Generate new renewable power on-site

- Market and policy factors that support or inhibit on-site solar
- Viability includes site ownership, physical characteristics, energy profile and rates
- CapEx or PPA financial structures available

Enter into a Power Purchase Agreement

Use renewable power directly from 3rd-party generators

- Suited for larger electricity volumes
- Can be physical (take title to power) or virtual (financial structure)
- Ability to enter long-term contractual arrangements, with contract for differences structure

Purchase Existing Certified Renewable Power

Buy Renewable Energy Certificates (RECs)

Use renewable power backed by certificate

- Simple contracting mechanisms; can be sourced nationally
- Price depends on type of certificate and location; terms typically short to medium-term
- Acceptable strategy within leading industry frameworks

Procure a Renewable Tariff from a Utility or Supplier

Use renewable power backed by certificates

- Contracting directly through provider, invoiced as part of bill
- Type of renewables can vary; can be regional or national (Note: can also include zero-carbon options, such as Nuclear)
- Acceptable strategy within leading industry frameworks
- Typically, short-term contracts

Key Considerations

Strategic Evaluation of Electricity Sourcing Options

Alternative		Description	Scalability	Cost	Transactional Ease	Risk
	On-Site Solar	Project located at the facility; RECs must be retained. Can be CapEx or PPA structure	1	4	3	3
	Financial / Virtual PPA (VPPA)	Financial contract for differences for power bundled with environmental attributes from a specific generating asset	3	4	1	2
	Regulated Utility Green Tariffs or Supplier Program	Utility or supplier developed green power programs bundled with electricity contract	2	2	4	3
	Nuclear “Emissions Free Energy Certificate” (EFEC)	Select retail suppliers offer a carbon free, nuclear power; not considered “renewable”	1	4	4	3
	Unbundled RECs	Title to environmental claims from nonspecific projects	4	3	4	3

Least Favorable 1 — 4 Most Favorable

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On-site Solar

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Solar Assessment

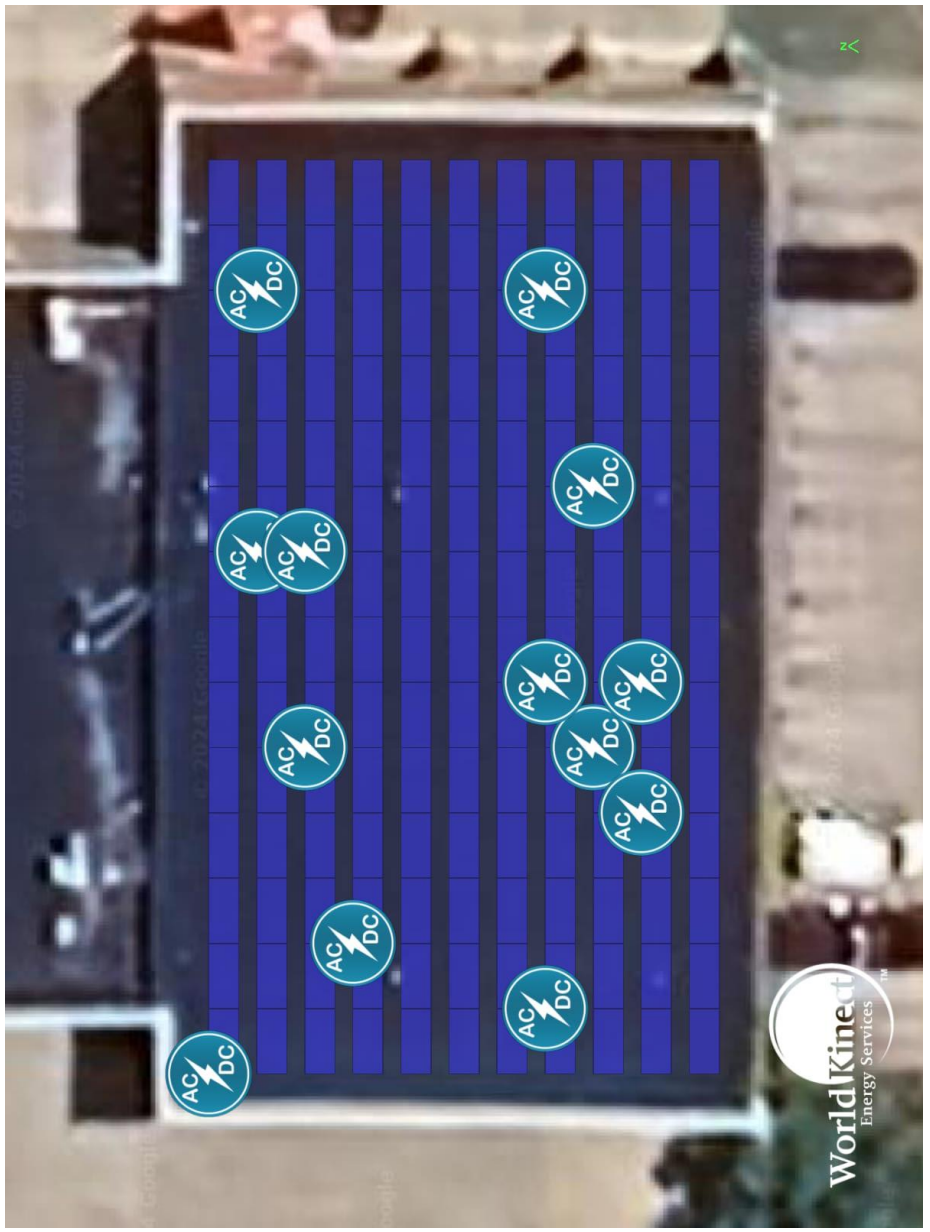
City of Kent: New Safety Facility

301 S. Depeyster St.	
System Size	49.0kW
Solar Production	57,543 kWh
Current Electricity Use	482,539 kWh
% of Total Electricity	11.9%
Carbon Reduction	27 Mt CO_2
REC Cost Avoidance	$82

Solar Assessment

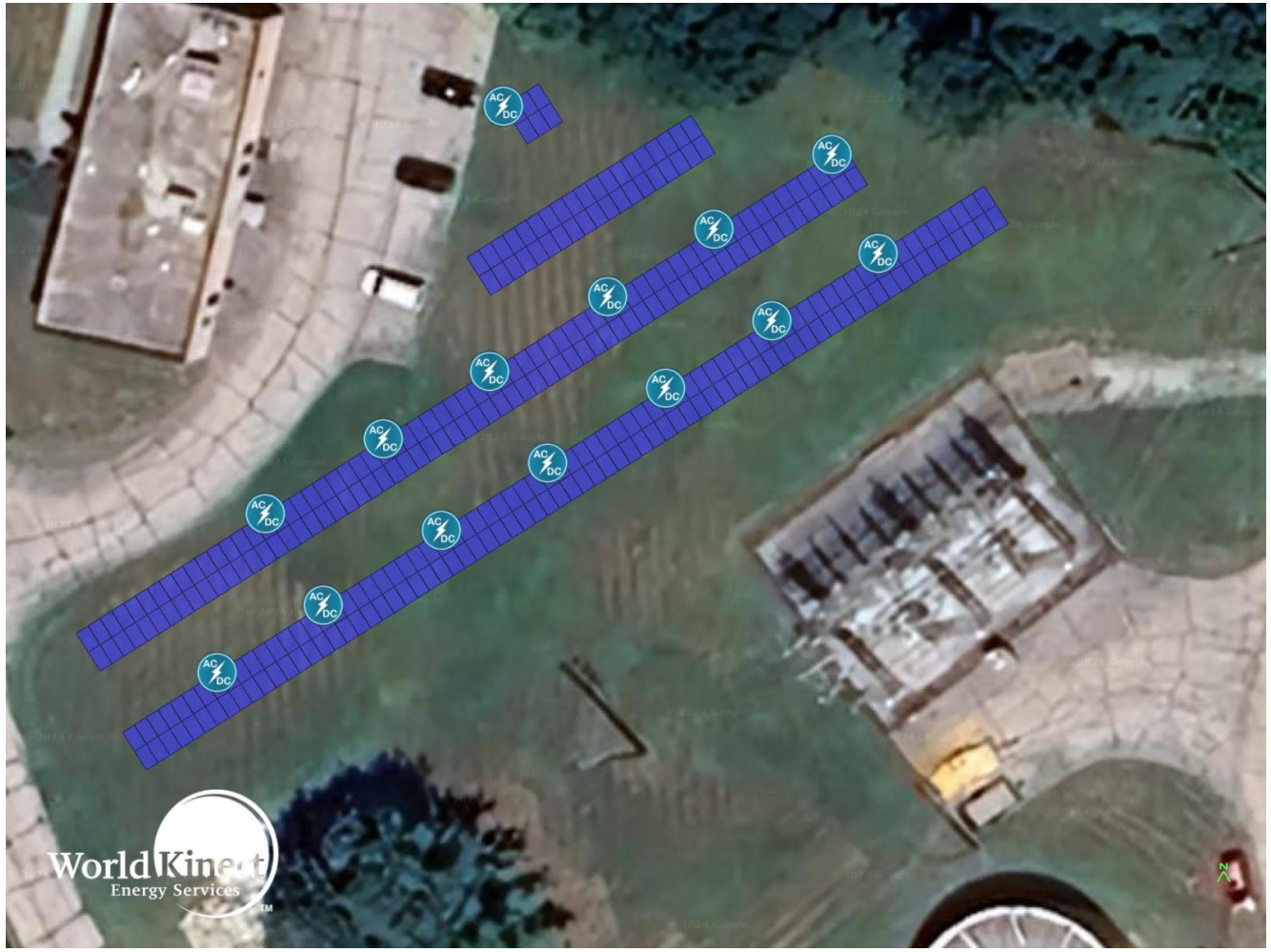
City of Kent: Fire Station #1

320 S. Depeyster St.	
System Size	75.5 kW
Solar Production	91,816 kWh
Current Electricity Use	321,004 kWh
% of Total Electricity	28.6%
Carbon Reduction	44 Mt CO_2
REC Cost Avoidance	$131



Solar Assessment

City of Kent: Water Reclamation Plant



641 Middlebury Rd.	
System Size	102.4 kW
Solar Production	129,051 kWh
Current Electricity Use	1,722,908 kWh
% of Total Electricity	7.5%
Carbon Reduction	61 Mt CO_2
REC Cost Avoidance	$184

Solar Assessment

City of Kent: Water Treatment Plant

5860 Hodgeman Ln	
System Size	802.6 kW
Solar Production	1,043,525 kWh
Current Electricity Use	1,399,440 kWh
% of Total Electricity	74.6%
Carbon Reduction	496 Mt CO_2
REC Cost Avoidance	$1,488

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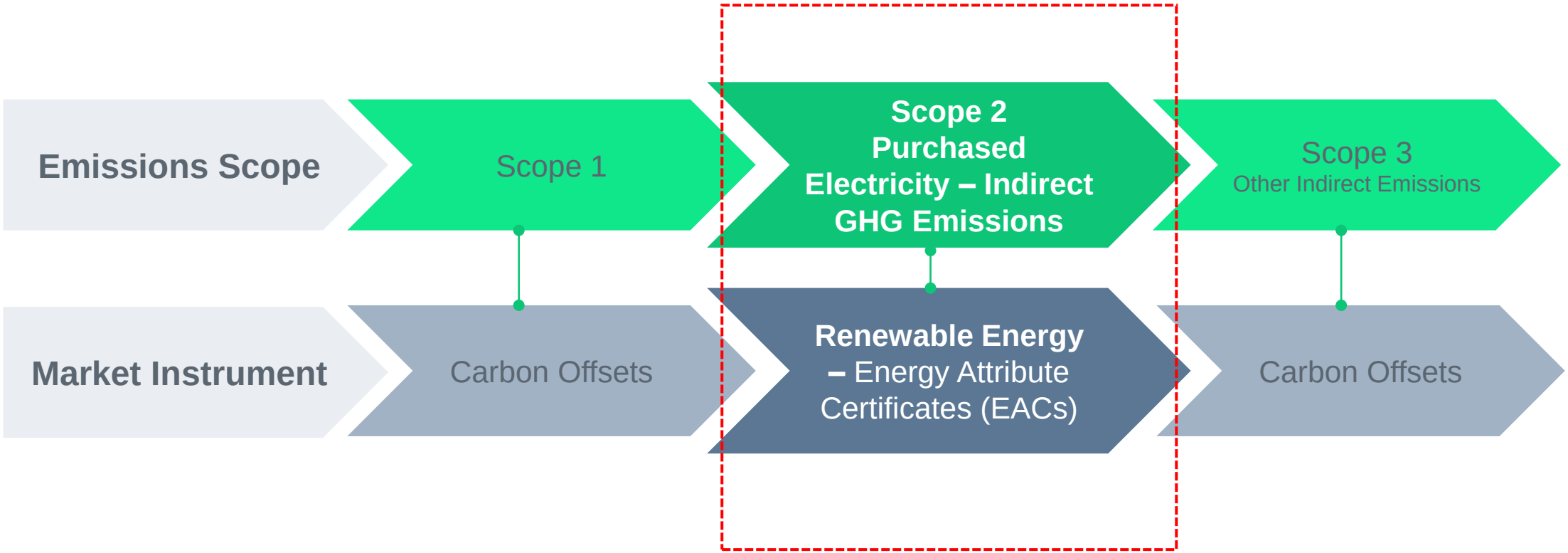
Renewable Energy Credits

Carbon Reduction Strategies

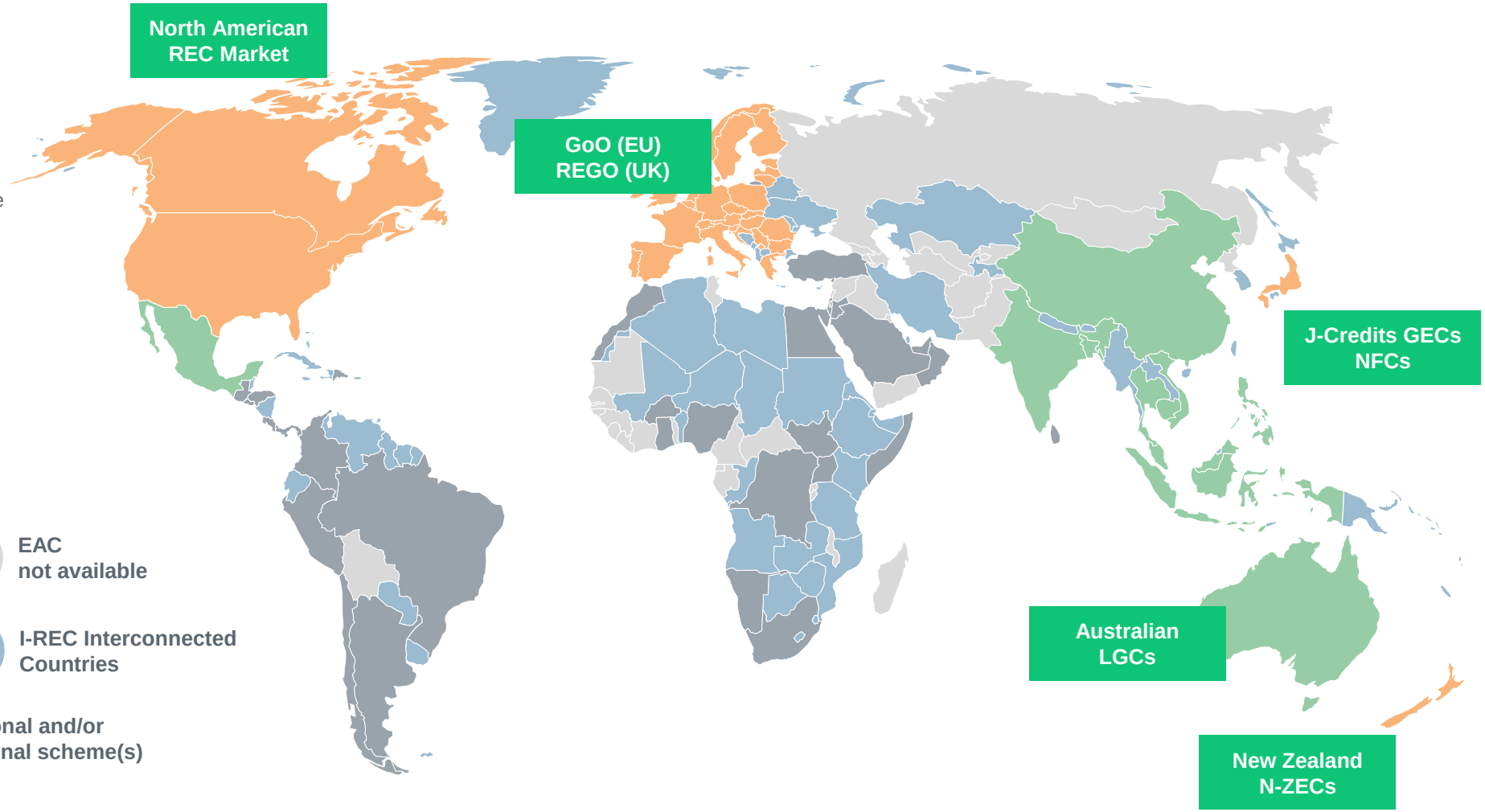
Instruments



EAC Global landscape

Three instruments leading the market

I-REC: International Renewable Energy Certificate
REC: Renewable energy certificates
GoO: Guarantee of Origin
EAC: Energy Attribute certificates



National and/or Regional scheme(s)

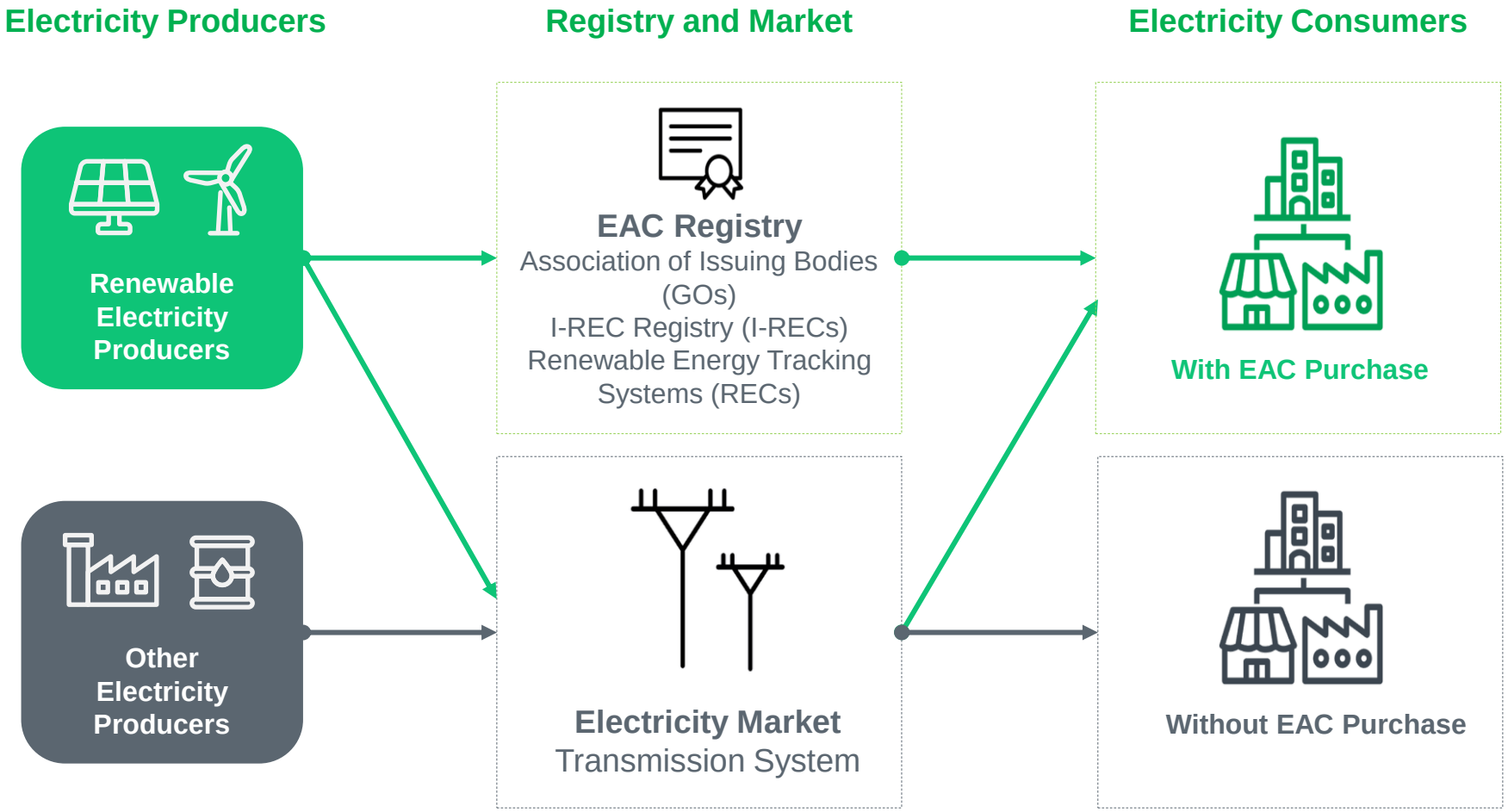
EAC not available

THE INTERNATIONAL REC STANDARD

I-REC Interconnected Countries

THE INTERNATIONAL REC STANDARD & National and/or regional scheme(s)

Energy Attribute Certificates Overview



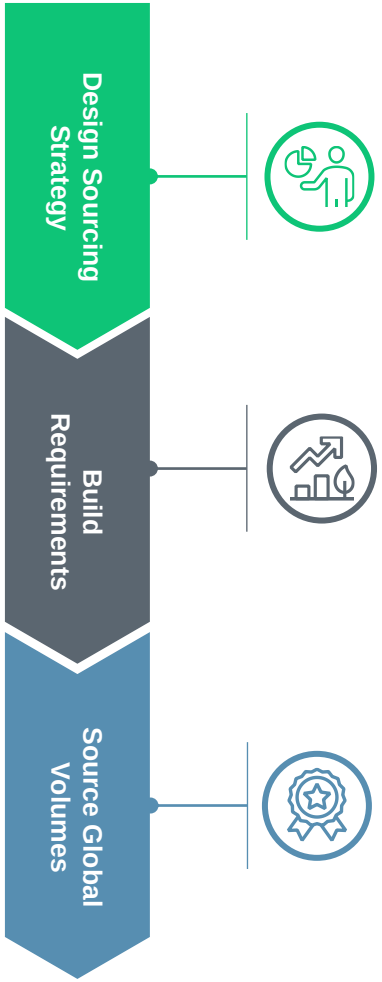
Key Aspects

- An **Energy Attribute Certificate (EAC)** allows all electricity users to make a conscious and evidence-based choice for electricity consumption
- EACs are **Traceable, unique & unduplicable**, ensuring the electricity's origin is from renewable sources

1MWh = 1 EAC

EAC Sourcing Process and Considerations

Sourcing Approach and Process



Review your current energy and sustainability strategies, including corporate guidelines, mandates and decision process and find the best fit with current practices on the EAC markets

Screen your company's commitment to sustainability frameworks and determine what is possible to achieve based on your energy profile and footprint to ensure compliance and meet stakeholder expectations

Source the most relevant product at the best price across the portfolio

Keys to Success

- Have a general understanding of standards and instruments available, in alignment with industry expectations and best practices
- Clearly aligning sourcing with your decarbonization targets, timelines and expectations on marketing claim strength
- Identify potential risks and determine mitigation strategies and practices that should be in place
- Align organization and stakeholders to ensure efficiency, decision-making and cost allocation approach

Other Considerations

- Ramp-up strategies versus sourcing to meet target year
- Determining the best approaches to aggregate demand
- Allocating costs across the organization (site, business unit, etc.)
- Dealing with unpredictability of prices over the long term

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Appendix

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