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U.S. DEPARTMENT OF
ENERGY



Coining a Cleaner Future: Financing Decarbonization Projects

November 28, 2023

11am – 12pm



Christopher Price
Oak Ridge National Laboratory

Agenda

1

Welcome and Polls

2

Topic Introduction

3

Speaker Presentation

4

Q&A and Conclusion

Please go to www.slido.com

using your mobile device, or by opening a new window

Enter Event Code

#DOE

Polls

What sector best describes your organization?

Where are you in your decarbonization journey?

What is your main source of funding for decarbonization projects?

Please go to www.slido.com and enter code **#DOE** to respond



Coining a Cleaner Future: Financing Decarbonization Projects

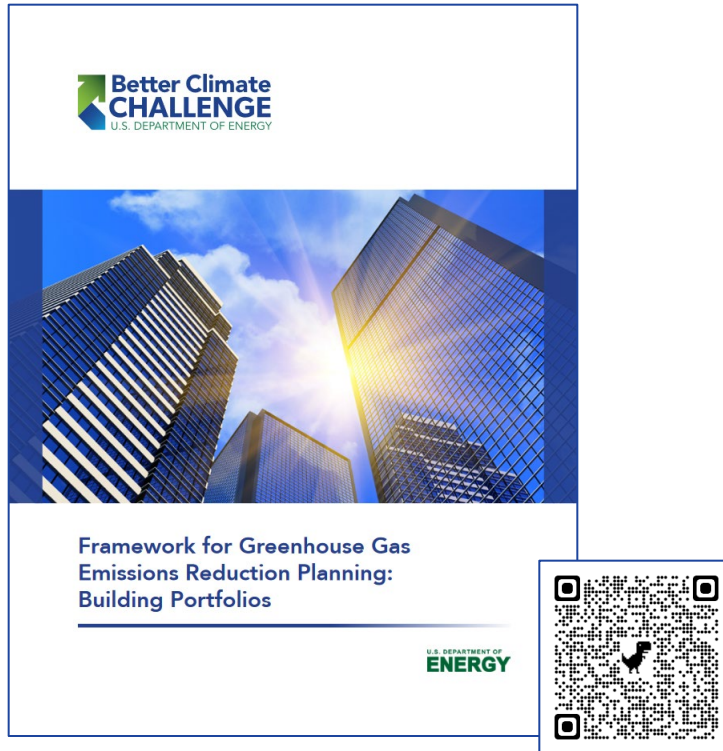
Developing an Emission Reduction Plan

Christopher Price, PhD
Paulomi Nandy



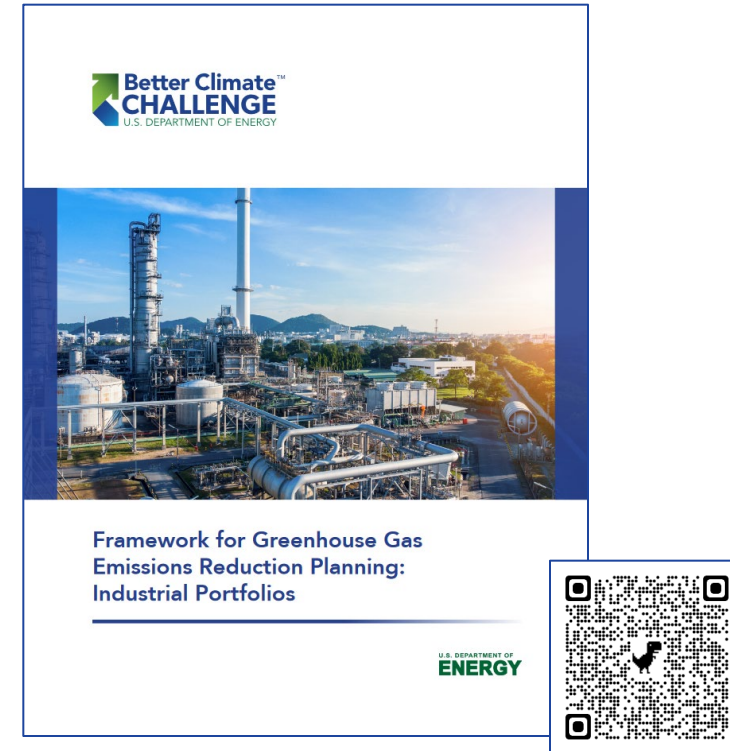
New Resources for Building and Industrial Portfolios!

Building Portfolios











https://betterbuildingsolutioncenter.energy.gov/sites/default/files/attachments/ERP_Framework_Building_Portfolios.pdf

Industrial Portfolios



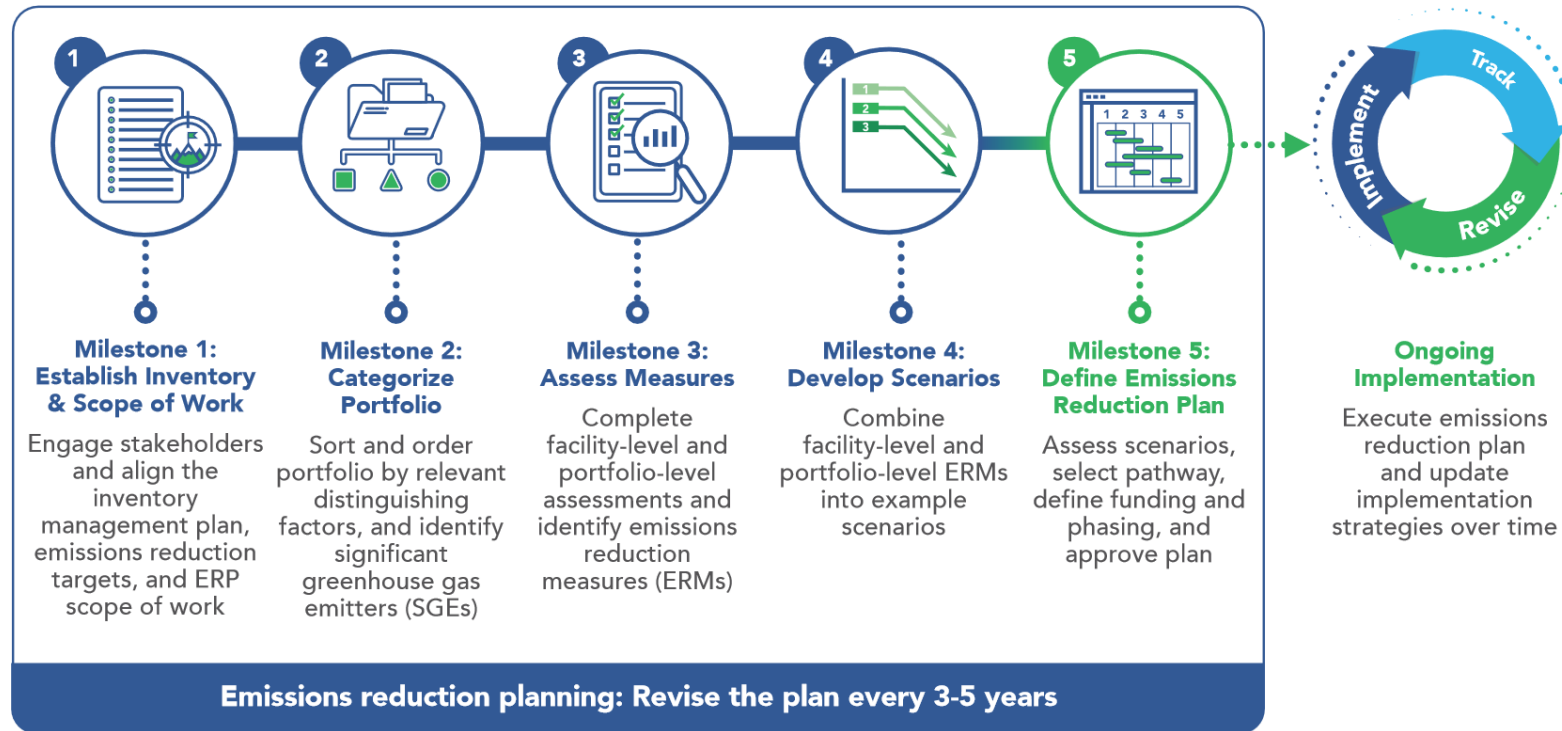
https://betterbuildingsolutioncenter.energy.gov/sites/default/files/attachments/ERP_Framework_Industrial_Portfolios.pdf

Why develop a plan?

-  Stakeholder confidence in organizational sustainability efforts
-  Define steps to meet GHG emission reductions goals
-  Analyze and identify strategies to help decarbonize operations
-  Align operational needs to achieve operational decarbonization
-  Secure financing and personnel needed to accomplish goals
-  Prevent locking into high emissions assets and technologies
-  Stay on track to achieve long term GHG emissions reductions
-  Meet regulatory and reporting requirements

Emissions Reduction Planning: Industrial Portfolios

Framework helps industrial organizations develop a specific and actionable plan to achieve Scope 1 and 2 GHG emission reductions (i.e., an Emissions Reduction Plan)



1: Establish Inventory & Scope of Work



Milestone 1:

Establish Inventory & Scope of Work

Engage stakeholders and align the inventory management plan, emission reduction targets, and ERP scope of work.

- ✓ Identify and engage stakeholders
- ✓ Establish a GHG inventory management plan
- ✓ Set GHG emissions reduction target
- ✓ Define scope of work for ERP
- ✓ Define evaluation criteria

2: Categorize Portfolio



Milestone 2: Categorize Portfolio

Sort and order portfolio by relevant distinguishing factors and identify significant greenhouse gas emitters (SGEs).

- ✓ Select characteristics for the portfolio
- ✓ Identify and quantify GHG emissions for Significant GHG Emitters (SGEs)
- ✓ Benchmark SGEs
- ✓ Select systems for further analysis

3: Assess Measures



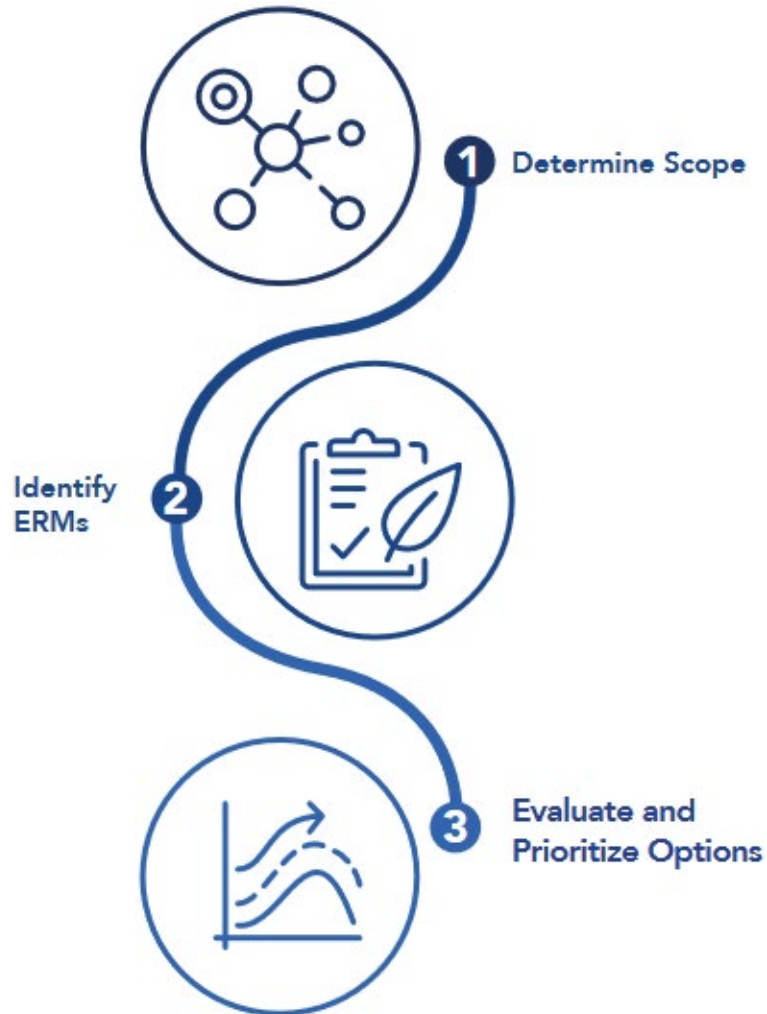
Milestone 3: Assess Measures

Complete facility and portfolio-level assessments and identify emission reduction measures (ERMs).

- ✓ Facility level decarbonization Assessment
- ✓ Portfolio decarbonization Assessment
- ✓ Identify and quantify projects and operational practices that reduce emissions
- ✓ Estimate implementation cost and ROI ← Not a go/no-decision point!

3: Assess Measures





GHG Emissions Reduction Assessments



- ✓ Focus assessments on large GHG emitters that are difficult to decarbonize
- ✓ Based on energy use, operations, and production needs, identify emission reduction measures (ERMs).
- ✓ Prioritize ERMs with additional efficiency, safety, productivity, product quality and waste reduction improvements
- ✓ Prioritize ERMs based on economic analysis

3: Assess Measures

Facility-level Opportunities

Pillar	Benefits
 <p>Energy Efficiency</p>	<ul style="list-style-type: none">✓ Most cost-effective option for near-term emissions reduction potential✓ Efficiency opportunities always exist
 <p>Renewable Energy</p>	<ul style="list-style-type: none">✓ Leverage advancements in low-carbon electricity from both grid and onsite clean generation sources
 <p>Low Carbon Fuels, Feedstock and Energy Sources</p>	<ul style="list-style-type: none">✓ Reduce combustion related emissions from industrial processes
 <p>Carbon Capture and Sequestration</p>	<ul style="list-style-type: none">✓ Capture generated CO₂ at the source and use it to make value added products or store it long-term

3: Assess Measures

Portfolio-level Opportunities



Cross cutting building upgrades such as HVAC, lighting, compressed air, insulation



Purchasing of clean energy for entire portfolio



Switching to low carbon transportation alternatives



Strategies to reduce emissions using demand management and energy storage technologies



Strategies to reduce emissions from material handling and processing

4: Develop Scenarios



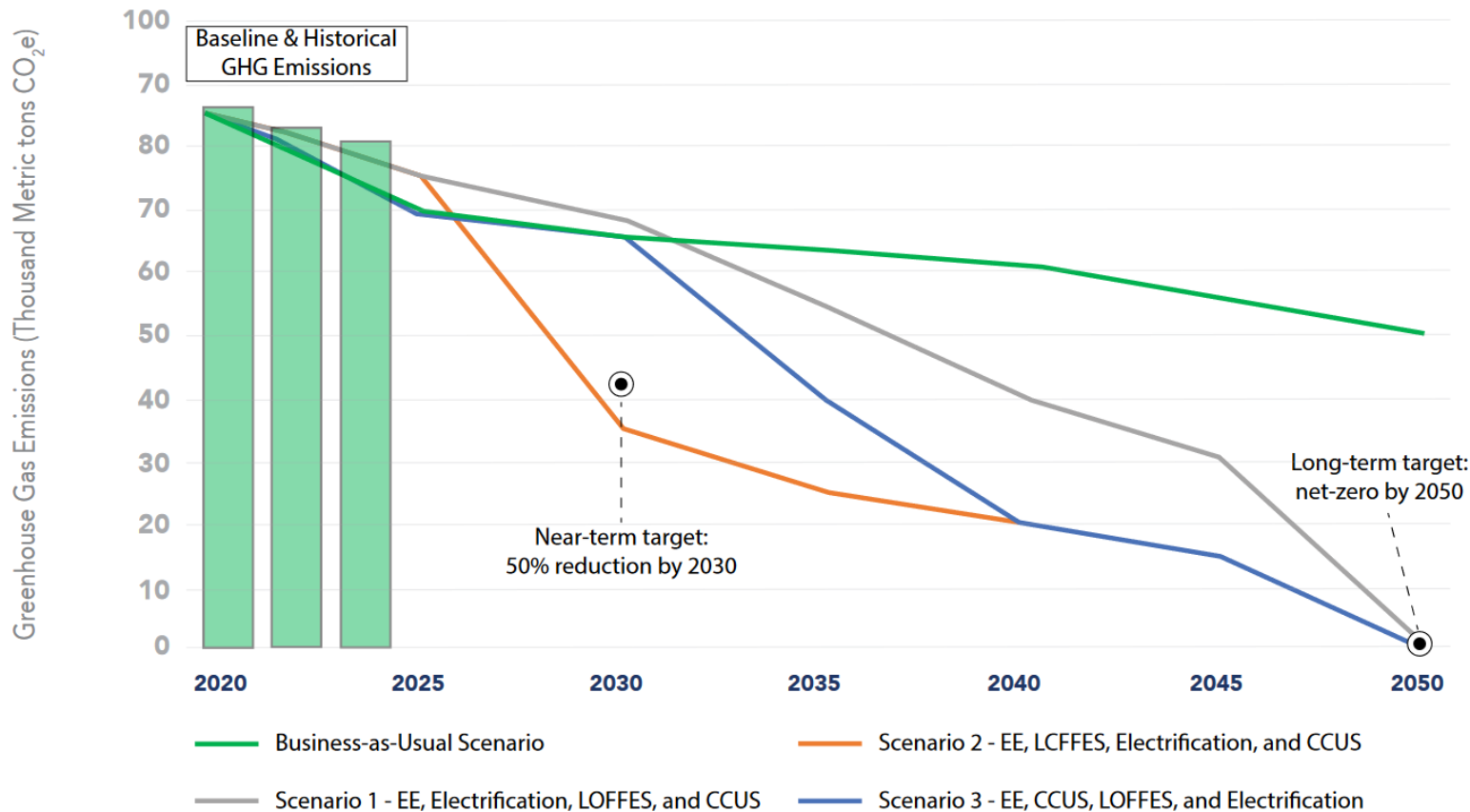
Milestone 4: Develop Scenarios

Combine facility-level and portfolio-level ERMs into example scenarios.

- ✓ Establish scenario parameters
- ✓ Establish future portfolio changes
- ✓ Review emission reduction measures
- ✓ Evaluate and define scenarios
- ✓ Evaluate available financing options ← Not a go/no-decision point!

4: Develop Scenarios

Use Scenarios to Drive Savings



- ERP sets trajectories for savings
- Use identified lists of SGEs to drive projects for significant results
- Use scenarios to help select technologies for the future
- Compare progress against projections as benchmarks

5: Define GHG Emission Reduction Plan



Milestone 5:

Define Emission Reduction Plan

Assess scenarios, select pathway, define funding and phasing, and approve plan.

- ✓ Assess scenario and select pathway
- ✓ Update organizational standards and procedure
- ✓ Secure final buy-in from stakeholder and release plan
- ✓ Secure Financing
- ✓ Set project deployment schedule

Ongoing Implementation



Ongoing Implementation

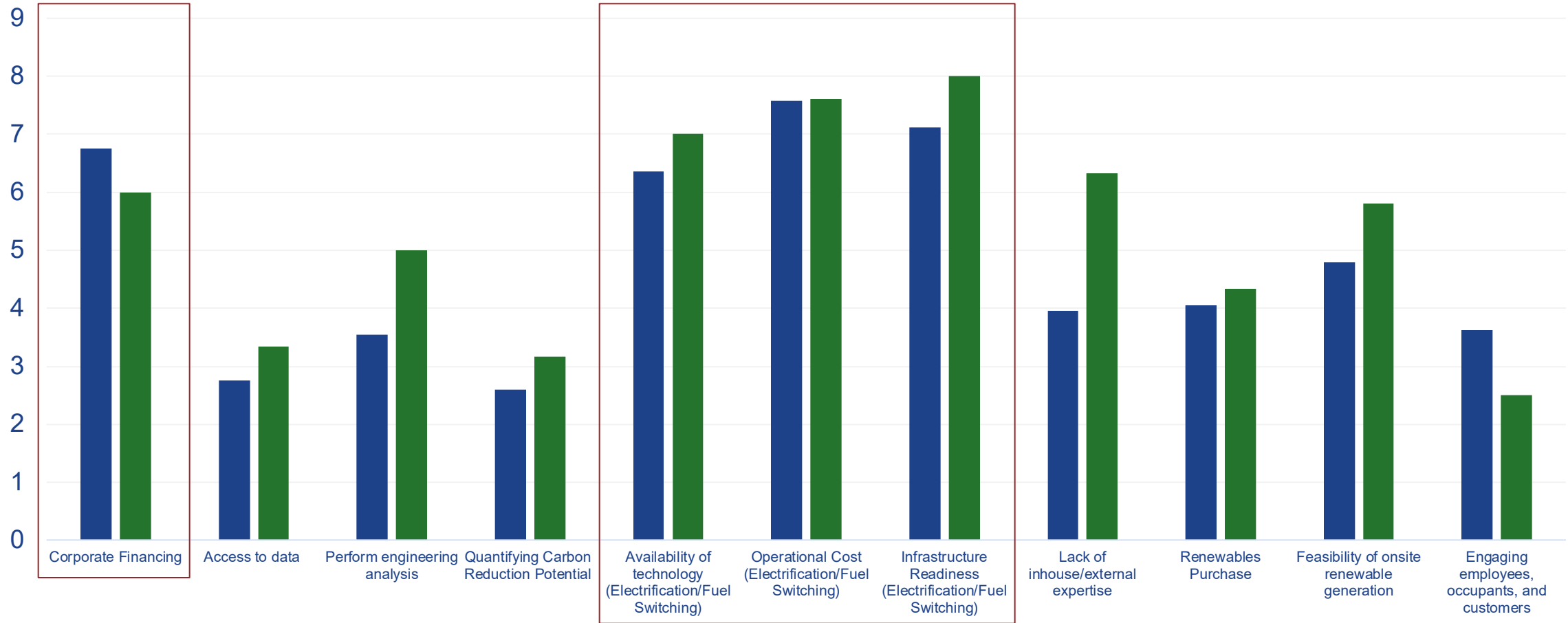
Execute emission reduction plan and update implementation strategies over time.

- ✓ Develop a work plan
- ✓ Measure and verify GHG emission reductions
- ✓ Document and share key learnings from projects
- ✓ Continuous evaluation of conditions and revision of ERP
- ✓ Keep track of available funding and financing options

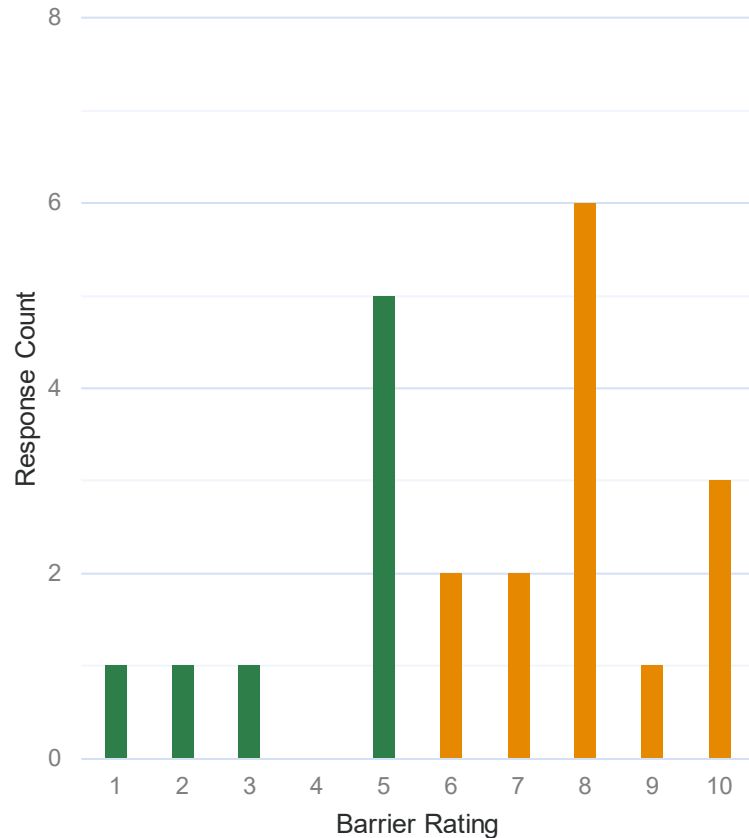
Barriers to Decarbonization

Mean Rating of Barriers
Total (n=26)

■ Non-Energy Intensive (n=20) ■ Energy Intensive (n=6)



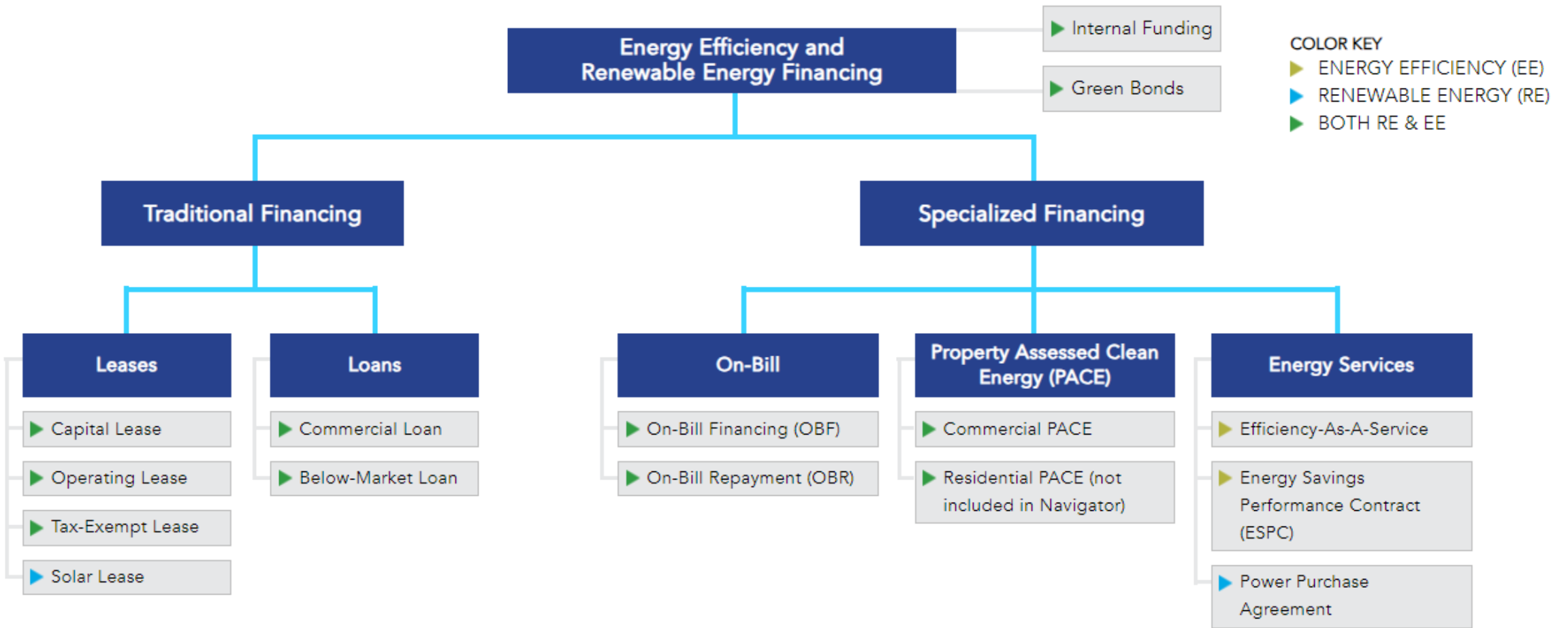
Corporate Financing Barrier



Mean: 6.5
Median: 7.0
Mode: 8.0

- Capital costs to decarbonizing will be substantial (especially through electrification)
- Uncertainty around the cost to decarbonize
- Decarbonization projects have high payback periods and are often out competed for internal funding
- Need to minimize capital expenditures due to recent large capital expenditures
- Focus on growth reduces attractiveness of decarbonization projects
- Renewable financial instrument landscape is changing quickly and drastically

Financing Navigator Tool



Available at: <https://betterbuildingsolutioncenter.energy.gov/financing-navigator>

Questions?

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Laura Jones
Cummins Inc.



Cummins Inc

Laura Jones



**Making people's lives
better by powering a
more prosperous world
requires a healthier planet.**

PLANET 2050

Leveraging our unique skills, experiences, and stakeholder relationships, we are committed to addressing climate change and air emissions, using natural resources in the most sustainable way, and ensuring our communities are better because of our presence in them. We have quantifiable goals for 2030 and visionary longer-term aspirations for 2050.

DESTINATION ZERO

Our strategy to go further, faster to reduce the greenhouse gas and air quality impacts of our products in a way that is best for our customers and all stakeholders.

CUMMINS WATER WORKS

Our initiative to address the global water crisis by strengthening communities through access to sustainable water.

CUMMINS' 2050 ASPIRATIONAL TARGETS

COMMUNITIES ARE BETTER BECAUSE WE ARE THERE

2050 TARGETS:

- Net positive impact in every community where Cummins operates.
- Near zero local site environmental footprint.

DOING OUR PART TO ADDRESS CLIMATE CHANGE AND AIR EMISSIONS

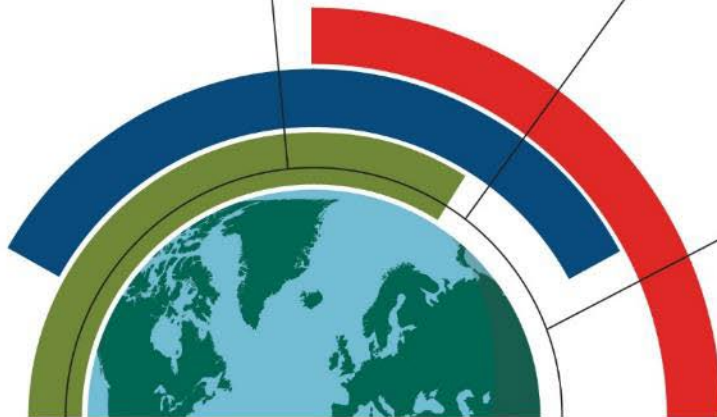
2050 TARGETS:

- Customer success is powered by carbon neutral technologies that address air quality.
- Carbon neutrality and near zero pollution in Cummins' facilities and operations.

USING NATURAL RESOURCES IN THE MOST SUSTAINABLE WAY

2050 TARGETS:

- Design out waste in products and processes
- Use materials again for next life
- Reuse water and return clean to the community



NOTE: Company facilities include all consolidated operations and joint ventures that are part of the Cummins Enterprise Environmental Management System. The company's strategy also includes addressing environmental needs in communities where Cummins employees live and work and where the company does business. Those goals are under development.



NINE 2030 GOALS

SCIENCE-BASED TARGETS

1. Reduce absolute greenhouse gas (GHG) emissions from facilities and operations by 50%.
2. Reduce scope 3 absolute lifetime GHG emissions from newly sold products by 25%.
3. Partner with customers to reduce scope 3 GHG emissions from products in the field by 55 million metric tons.
4. Reduce volatile organic compounds emissions from paint and coating operations by 50%.

CIRCULAR ECONOMY

5. Create a circular life-cycle plan for every part to use less, use better, use again.
6. Generate 25% less waste in facilities and operations as a percent of revenue.
7. Reuse or responsibly recycle 100% of packaging plastics and eliminate single-use plastics in dining facilities, at employee events and as amenities.
8. Reduce absolute water consumption in facilities and operations by 30%.
9. Produce net water benefits that exceed Cummins' annual water use in all Cummins regions.

50%

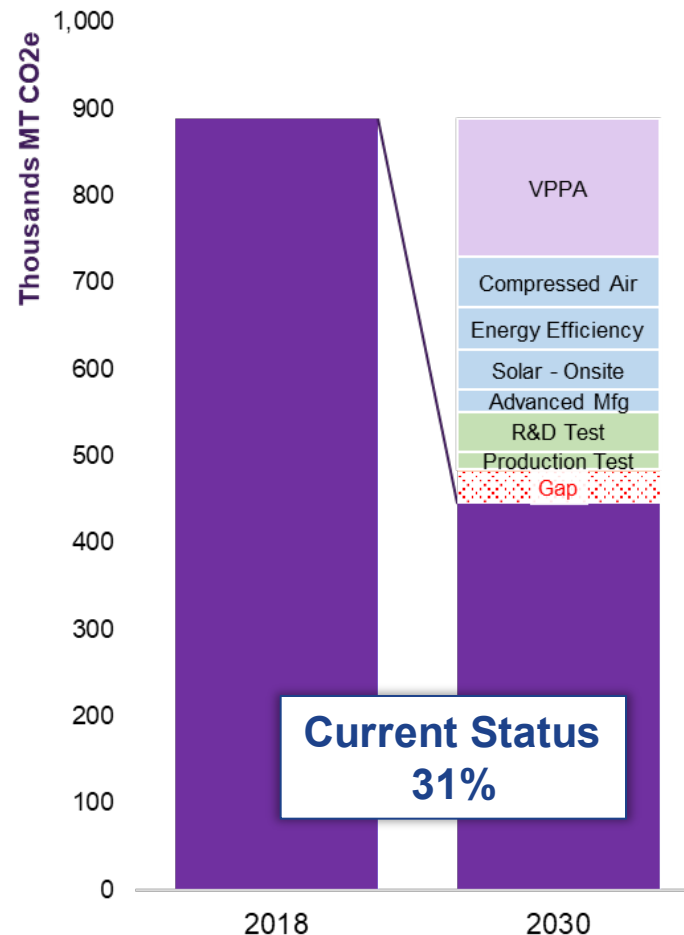
Reduction in absolute GHG emissions from facilities and operations



Facilities and Operations GHG Reduction

GHG Critical X's

- Energy Efficiency
- Compressed Air
- Production EOL and Engineering Testing
- Advanced Manufacturing Technology
- Renewables (onsite, offsite)
- Environmental Monitoring
- Fleet EV



Comprehensive Approach ENV Funding

**ECO Efficiency GHG /
Energy, Water & Waste**

**New Construction
&
Acquisitions**

Returnable Packaging

Paint & Coating VOCs

**P2 - Fluid
Management**

Energy and GHG Project Prioritization Scoring C & E Criteria

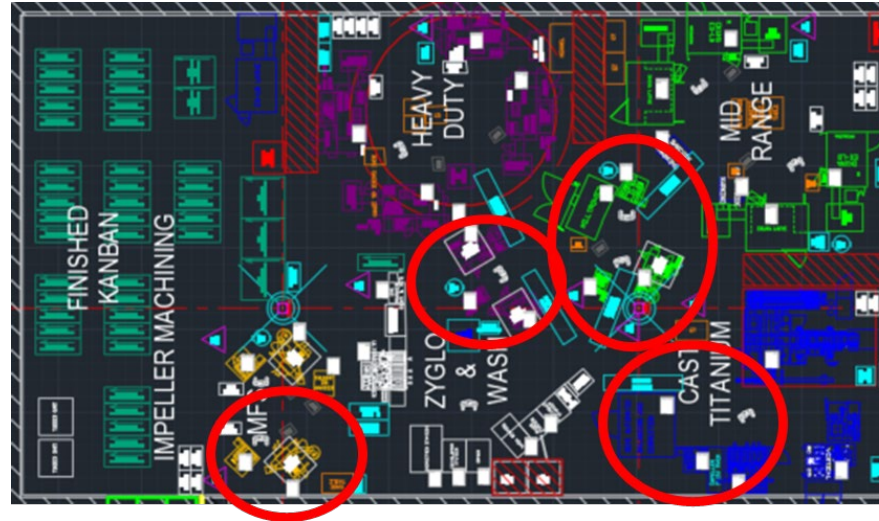
Criteria	Explanation	9		3		1		0	
GHG / Energy Impact	Measure of MMBtu & GHG savings	MMBtu>5,000 or GHG (Mt CO₂e)>300		MMBtu>1,000 or GHG (Mt CO₂e)>200		MMBtu>500 or GHG (Mt CO₂e)>100		MMBtu<500 or GHG (Mt CO₂e)<100	
\$ per enviro benefit	Measure of \$/GHG	Energy	<1000	Energy	1000-2000	Energy	2000-3000	Energy	3000+
Simple Payback	Cost ÷ cost savings	Energy	0-1 years	Energy	1-3 years	Energy	3-5 yrs	Energy	5+ years
Environmental Justice Impact	Env. Harm reduction or benefit to disadvantaged (DA) EJ community according to EJ Screen tool	Direct reduction of env. burden in EJ DA community (exceeds both environmental and socioeconomic threshold)	Direct env. benefit for EJ DA community (exceeds both environmental and socioeconomic threshold)	Indirect reduction of env. burden in EJ DA community	Indirect env. benefit for EJ DA community	Env. burden reduction in non-EJ DA community (exceeds socioeconomic or >env. burden threshold)	Env. Benefit in non-EJ DA community (exceeds socioeconomic or >env. burden threshold)	Env. burden reduction in non-EJ non-DA community	Env. benefit in non-EJ non-DA community

Charleston Turbo Plant Machining Transformation

\$2.025 M

Goals of Projects:

- Reduce operating cost
- Improve machine reliability
- Reduce environmental impact



Capital Investment

**joint funding from Business and Strategic Environmental Fund*

1,053 MT CO₂e

GHG Reduction

5,000 gallons

Avoided Coolant use

\$588,000

Annual Utility Cost Savings

Benefits:

Newer machines with more capability

- 20 machine reduction
- 1,626 square feet of floor space reduced

Reduced energy consumption

- 3,418,000 kwh of electricity saved annually
- Reduction in compressed air demand

Reduced water consumption

- 5,000 gallons of reduced coolant sent to wastewater treatment

USIRR Finance: Environmental Savings

Environmental Finance							
	Mar-21	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27
Assumed environmental costs by year	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Natural Gas, \$ per Therm	0.433	0.446	0.459	0.473	0.487	0.502	0.517
Propane/LPG, \$ per Therm	1.150	1.185	1.220	1.257	1.294	1.333	1.373
Electricity, \$ per kWh	0.150	0.154	0.159	0.164	0.169	0.174	0.179
Diesel, \$ per gallon	3.870	3.986	4.106	4.229	4.356	4.486	4.621
Gasoline, \$ per gallon	3.520	3.626	3.734	3.846	3.962	4.081	4.203
Purchased Water, \$ per US gallon	0.040	0.041	0.042	0.044	0.045	0.046	0.048
Sewer/Discharge/Wastewater, \$ per US gallon	1.000	1.030	1.061	1.093	1.126	1.159	1.194
Waste Recycling / Reuse \$ per Metric Ton	1.100	1.133	1.167	1.202	1.238	1.275	1.313
Waste Disposal, \$ per Metric Ton	10.000	10.300	10.609	10.927	11.255	11.593	11.941
Cummins climate leaders tCO2e valuation	7.000	7.000	7.000	7.000	7.000	7.000	7.000

- Enter the **correct unit prices** for the relevant energy source
- An automatic increase will be factored in for future years.*

GHG Conversion Table		
Energy Source	Emission Factor	Unit
Electricity	0.693	tCO2e per MWh (sensitive to power source)
Natural Gas	0.0050567	tCO2e per Therm
Propane, LPG	0.0163382	tCO2e per Therm (0.0058768 per gallon)
Diesel	0.010098929	tCO2e per gallon fuel
Gasoline	0.00887	tCO2e per gallon fuel

Update GHG Grid Factor for the location

Rocky Mount On Site Solar

The solar PV farm at Cummins' Rocky Mount Engine Plant in North Carolina went on-line in 2022.

3.6MW system is about 6% of the manufacturing facility usage.

Internal target of 10% electrical energy from on site solar.



Renewable Energy Principles

Cummins Renewable Energy Principles

Additional

Generation and purchases must have a net positive effect in the real world, increasing capacity of renewable power that did not previously exist

Tangible

Must be understood and accepted by our many stakeholders

Cost Effective

Must be cost competitive with traditional energy sources over the long term

Transparent

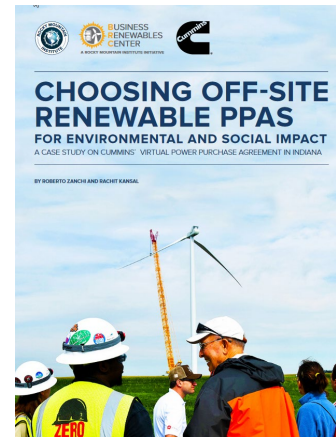
Completely transparent with our renewable energy accounting and in describing facility renewable energy characteristics and attributes

Offsite renewable energy

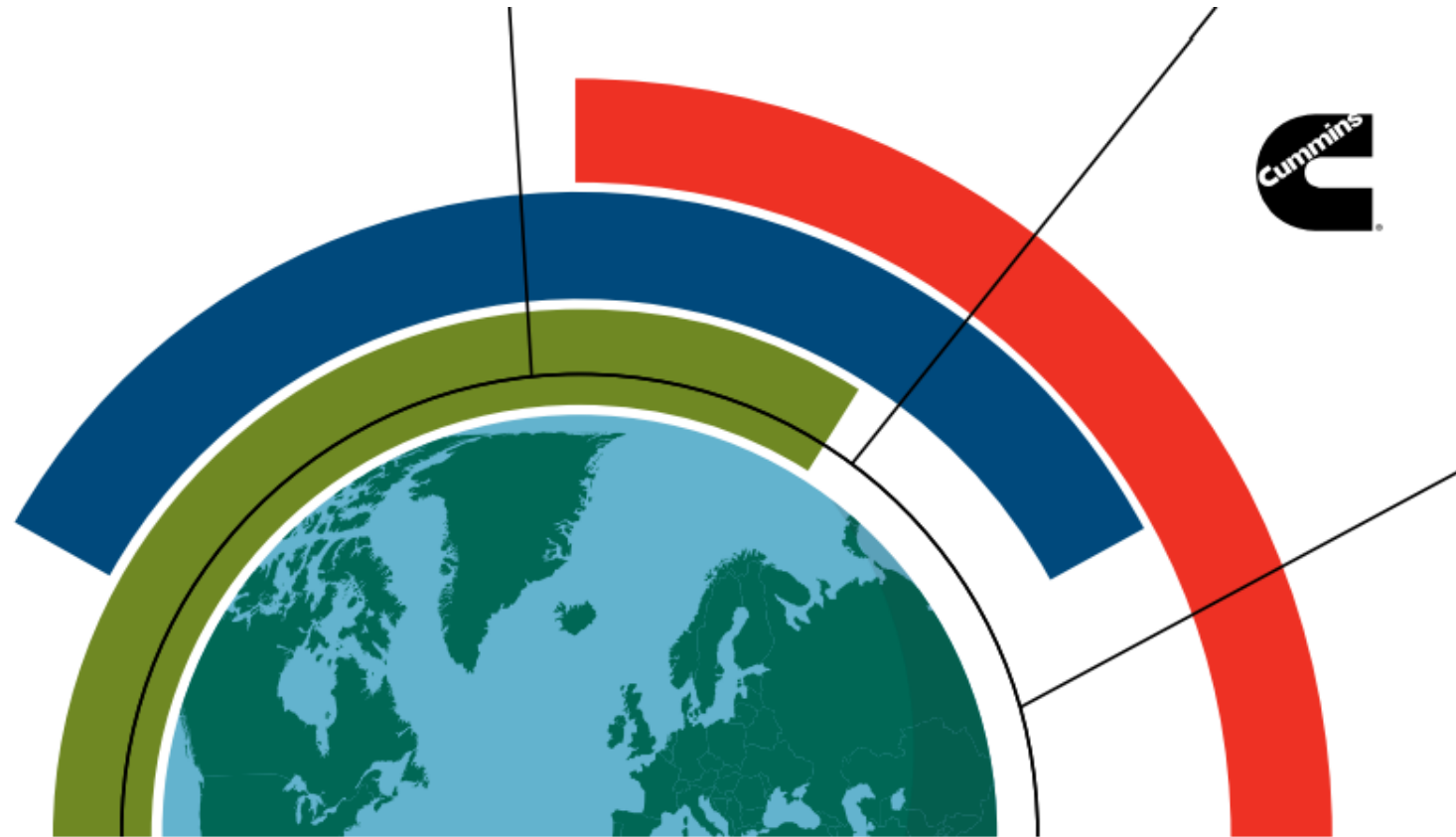


Meadow Lake VI Wind Farm – Indiana

- Virtual power purchase agreement (VPPA)
- 75 MWp capacity
- 235,000 MWh per year generation
- 43% of CMI US consumption
- 125,000 MT CO₂e reduction per year



<https://www.rmi.org/wp-content/uploads/2018/10/Choosing-Off-site-Renewable-PPAs.pdf>



PLANET 2050

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Q & A

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TURNING INSIGHTS INTO ACTION:

BRIDGING BUILDING DATA ANALYTICS AND WORK ORDER SYSTEMS

Tue, December 5, 2023 | 11:00 AM - 12:00 PM ET

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Installing building data analytics software like fault detection and diagnostics (FDD) in commercial buildings reaps significant energy savings. Maximizing FDD benefits is dependent on having a process to translate a high volume of analytic recommendations into effective, corrective actions for HVAC systems. Join this webinar to hear from two leading organizations about their innovative strategies for seamlessly integrating FDD with maintenance work order systems.

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