



*Ohio Conference on Clean/Renewable
Energy and Energy Efficiency*

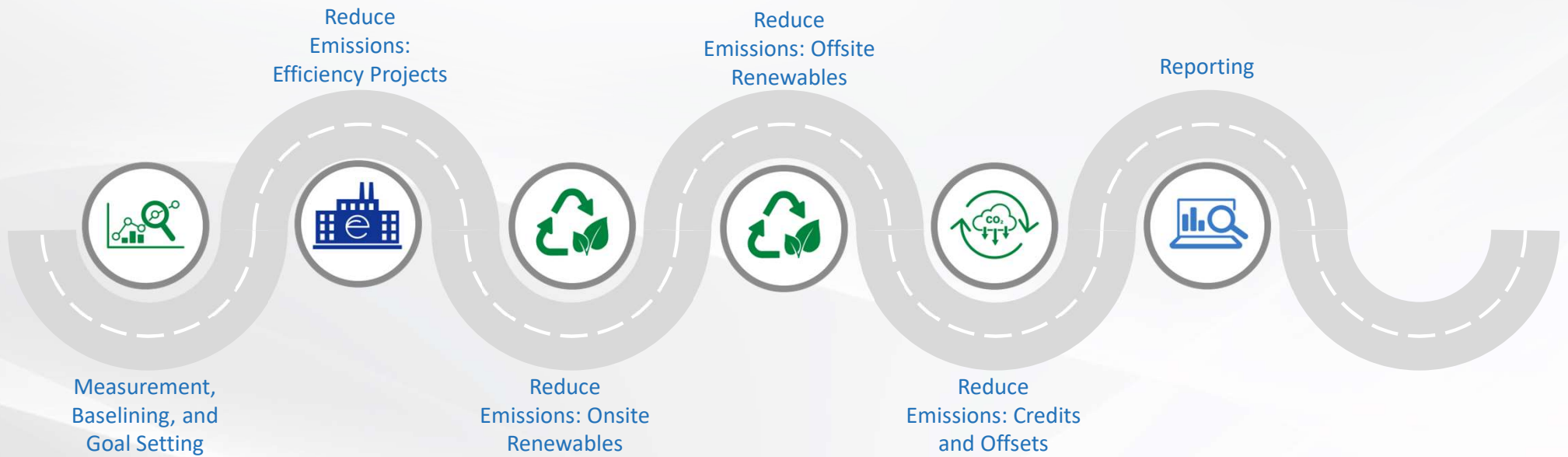
Developing a Customized Sustainability Roadmap

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Roadmap to Reduce Scope 1 and Scope 2 GHG



Measurement, Baselineing, and Goal-Setting



- **First step in a GHG program is to track emissions and establish goals**
 - Scope 1 – *direct emissions* created from sources owned or controlled by company/organization
 - Scope 2 – *indirect emissions* from generation/consumption of purchased electricity
 - Scope 3 – all other emissions, including both up and downstream
- **There are various types of reduction targets**
 - *Absolute* – reduction emissions by a set amount
 - *Intensity* – reduction normalized to units of sales, production, etc.
 - % Renewable or % Carbon-Free
 - Net Zero – reducing emissions to zero
 - Science-Based Target – reduction goal aligns with the latest climate science to limit global temperature rise to 1.5C

Energy Efficiency



- **Energy efficiency is first in the hierarchy of reduction strategies**
 - All forms of energy production have impacts, so strive to use less
 - There are often win-win scenarios that reduce costs and emissions
 - End-of-life equipment upgrades can be significant opportunities with 10% - 50% reductions feasible
 - Utility rebate programs and other incentives are often available
 - Scope 1 efficiency improvements are a first step in strategically reducing carbon footprint
 - While a key strategy, energy efficiency alone may not generate enough savings to meet aggressive GHG targets

Onsite Renewable Energy



- **After energy efficiency, continue to look for behind-the-meter solutions**
 - Dual use of already developed spaces (rooftop arrays, solar carports)
 - Potentially eliminates transmission losses associated with the electric grid
 - Many states and/or local areas have incentives that combined with the existing federal Investment Tax Credit (ITC) help to defray the upfront financial investment
 - Utility companies and other load serving entities (LSEs) have programs that can help to maximize behind the meter solutions so your portfolio of options are broad and adaptable

Offsite Renewable Energy



- **After exhausting onsite initiatives, look to offsite sources of renewables**
 - Allows for larger projects with significant reduction opportunities and creates economies of scale
 - Multiple *offtakers* can be bundled for further impact
 - May not be available in regulated markets
 - Offsite projects allow for opportunities to go beyond the local footprint
 - Contracts could be for longer terms providing more stability
 - Consumers can search for projects that fit their needs, however, size of your load may dictate their ability purchase from such a project

Certificates and Offsets



- **Renewable energy certificates and carbon offsets can be used as the “last mile” bridging the gap between reductions achieved and goals**
 - Include *renewable energy certificates (RECs)*, *emission-free energy certificates (EFECs)*, *renewable natural gas (RNG)*, and *carbon offsets* such as tree plantings
 - Assign a market price for carbon, which can provide a financial incentive for developers to implement more projects
 - Need to review with the various greenhouse gas accounting standards
 - Must be purchased every year to maintain reductions
 - Need to consider concepts such as *additionality*, *locationality*, and *permanence*



Reporting



- **Many stakeholders will be interested in the progress being made**
 - Customers/Consumers
 - Employees
 - Investors
 - Non-Governmental Organizations (NGOs)
 - Government
- **GHG accounting standards establish methods for reporting emissions**
 - How will progress be communicated
 - Dedicated reports
 - Social media/press release
 - Company website



Real-World Examples of Energy Efficiency

For All Buildings

LED Lighting

- High Bay 460W Metal Halide -> 230W T5 Fluorescent -> 100W LED 80% Reduction
- Office – 180W T12 Fluorescent -> 110W T8 Fluorescent -> 40W LED 78% Reduction

HVAC

- Economizers to provide “free cooling” using outside air 100% Reduction
- Higher efficiency heat pumps or rooftop units vs older models 25% Reduction
- Ground source (geothermal) heat pumps 40% Reduction
- Magnetic bearing chilled water systems 40% Reduction

Real-World Examples of Energy Efficiency For Manufacturers

Compressed Air – Demand Side

- 1% savings for every 2-psi pressure reduction 10% Reduction
- Convert pneumatic processes to electric (air cylinder to actuator) 80% Reduction
- Fix leaks – a typical compressed air system has a 20% - 30% leak rate! 10% Reduction

Compressed Air – Supply Side

- Variable Speed Drives
- Heat of Compression Dryer to use waste heat as source of energy for drying 30% Reduction
- Water-cooled vs Air-cooled

Process Chilling

- Similar to HVAC, bypass chiller in winter to provide free cooling 80% Reduction
- Magnetic bearing, water-cooled variable speed chiller vs air cooled 50% Reduction

Steam

- Can steam be converted to hot water? 60% vs 90% efficiency 33% Reduction
- Capture flue (exhaust gas) to preheat incoming water 10% Reduction

Real-World Examples of Energy Efficiency

- **Waste Heat Recovery**

- For water-cooled-compressed air systems, waste heat can be captured to heat water or for space heating
- Other processes, like fryers, ovens, or RTO systems, can potentially be sources of waste heat that can be captured

- **Cogeneration (or Combined Heat & Power)**

- Generate electricity on-site and use waste heat to produce steam, heat water, or chilled water/AC
- Need to have steady outlets for the waste heat to make feasible 30% Reduction

- **Variable Speed Drives**

- Affinity laws -> Energy consumption is proportional to the cube of speed
- Example – slow a motor (for a pump or fan, for example) by 10%, energy consumed is:
 - $90\% \times 90\% \times 90\% = 73\%$ 27% Reduction
- Example – slow a motor by 20%, energy consumed is:
 - $80\% \times 80\% \times 80\% = 51\%$ 49% Reduction

Coming Soon

- **Hydrogen**

- Organizations are finding that Scope 2 (electricity) emissions are easier to reduce because access to carbon-free and renewable electricity supply is more readily available and less expensive than natural gas options that are typically tied to Scope 1 emissions
- Hydrogen will address Scope 1 as an alternative to natural gas

- **Small Modular (Nuclear) Reactors (SMRs)**

- Another area with a lot of research, small modular nuclear reactors may be able to power a small campus with zero carbon emissions
- Prototypes are being built, but are several years away
- Need to address permitting issues and community acceptance

Biographical Information

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Jeff is the Director, Sustainability Management Group at Constellation Energy. In this role, he assists Constellation customers with their sustainability roadmaps, including establishing greenhouse gas baselines and reduction goals, identifying and implementing decarbonization initiatives utilizing energy efficiency and renewables, and tracking progress. Jeff has over 25 years of experience in project engineering and management and over 15 years of experience focusing on sustainability. He has a Bachelor of Science degree in Mechanical Engineering and a Master of Business Administration degree, both from the University of Maryland, College Park.