Operationalizing Emissions Reduction and GHG Accounting Requirements: Tools and Technical Assistance for North Carolina Businesses

by

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Executive Summary

North Carolina's Waste Reduction Partners (WRP) is a public-private technical assistance program affiliated with the North Carolina Department of Environmental Quality. WRP provides no-cost energy and waste audits to businesses and organizations across the state along with specific reduction plans to help these entities lower costs and environmental impact.

WRP has identified a growing convergence between traditional energy and environmental management functions and more recent greenhouse gas emissions (GHG) reduction and reporting requirements, particularly among its industrial manufacturing clients in the automotive, food and beverage, and textile sectors. While energy and environmental management are viewed as core function both ensuring operations and requisite permit compliance, GHG or carbon emissions accounting and reduction requirements are viewed as non-core and ancillary despite emanating from specific corporation, customer, and regulatory pressures. WRP clients are often resource constrained, ill-equipped to detail with the complexities of comprehensive GHG emissions accounting. Typically, points-of-contact are single individuals or small teams without deep GHG-centric, sustainability expertise and with minimal budgets for training and external support or emissions abatement projects.

This project created an accessible, user-friendly and living knowledge bank for WRP. They intend to use this content to help bridge the gap for clients dealing with near-term, practical implementation and reporting deadlines versus lengthy, technical, and complicated GHG accounting standards that can feel inaccessible to an operational-focused manager. To do so, I reviewed and synthesized thousands of pages of technical documentation from primary sources (GHG Protocol's Corporate and Scope 3 Standards), secondary sources (e.g., EPA, UN/IPCC, NGOs), and industry learnings from past WRP client engagements.

The result was over fifty pages of approachable guidance and management considerations organized by emissions scope, and presented in an actionable, "how to" format including resource and tool links while maintaining GHG Protocol and EPA alignment. This helps WRP to simplify compliance and reduction processes for their client and better enable plant leaders to connect energy efficiency and cost savings with emissions reduction.

To-date, WRP has identified $502,000 in annual savings and 2,423 metric tons CO_2e reduction potential across client companies. WRP now intends to deploy this guidance during on-site engagements in the clients preferred formats, through industry meetings and conferences to help educate and facilitate future client engagements, and to enhance its internal capabilities.

Recommended implementation steps for WRP include near-term actions (e.g., integrating emissions accounting into established energy audits, developing sector-specific guidance), mid-term expansion (e.g., creating an online resource, exploring third-party hosting platforms for calculations), and long-term sustainability (preparing for GHG Protocol updates, measuring impact through client follow-up). This phased approach ensures the guidance remains relevant while expanding its reach and effectiveness across North Carolina's industrial sector.

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Project Context and Need

North Carolina Waste Reduction Partners (WRP) is a public-private, technical assistance program that is affiliated with the North Carolina Department of Environment Quality that offers no cost, energy and waste audits and efficiency assessments to North Carolina businesses leveraging in-house staff and a network of senior engineers and scientists from industry and academia. WRP has witnessed a growing overlap among its industrial manufacturing clients, particularly those across automotive, food and beverage, and textile sectors, as energy goals increasingly overlap or extend to new greenhouse gas (GHG) emissions accounting and reduction requirements.

This has also exposed an important gap: that state manufacturing businesses often lack expertise, resources, and time to effectively address emergent emissions requirements. Whereas ensuring plant operations, permit compliance, and adherence to established environmental management and energy management systems (e.g., ISO 14001, 50001) are recognized as core daily functions and processes, new GHG accounting and reduction requirements are viewed as additive and non-core despite strategic drivers coming from corporate parent, customer, and/or regulatory sources.

WRP client points-of-contact are typically single individuals or small teams representing operations or environmental and energy management leads who may be casually aware and even supportive but lack specific GHG experience and mandate to become internal leaders versus "check the box." These managers have little budget to access fee-based training, certification, or external support that large firms regularly access. They also face idiosyncratic challenges attempting to define project boundaries, comply with varying reporting requirements and formats (e.g., corporate versus customer survey versus regulatory).

Other economic or operational constraints also make it difficult for these colleagues to meaningfully address new emissions requirements, including Scopes 1, 2, and 3 emissions accounting. Moreover, energy and emissions reduction and abatement projects must compete head-on projects on return-on-investment and payback period basis against higher priority and production-centric capital projects, further inhibiting internal promotion and likelihood absent an urgent need. I observed these challenges during previous on-site work projects for WRP with Bridgestone America Tire Operations and Uchiyama Manufacturing Americas.

Objective

This Masters Project builds on these past client experiences, other WRP client engagements, and growing demand for WRP emissions-centric services to create a knowledge bank of "evergreen" insights, management considerations, and practical "how to" guidance for Scope 1, 2, and 3 emissions accounting. This was done by synthesizing current, highly technical primary source materials, government and non-governmental organization literature, and industry best practices. WRP intends to maintain and update this information as a living document. And, translate relevant content into various forms as part of ongoing efforts to train, assist, and execute emissions reduction initiatives alongside existing energy reduction programs with clients and NC business.

Methodology

This project reviewed and extrapolated from thousands of pages of technical documents and guidance to develop this practical knowledge bank for WRP and its clients. This process included:

1. Reviewing primary source (i.e., GHG Protocol's Corporate and Scope 3 Standards)
2. Analyze secondary sources including, but not limited to:
    a. Governmental agencies, particularly the US Environmental Protection Agency but also notable international (e.g., European Union) and state-level (e.g., California) regulations, or emissions factor sources (e.g., United Kingdom's Department for Environment Food and Rural Affairs)
    b. International organizations (e.g., United Nation and its Intergovernmental Panel on Climate Change).
    c. Non-Governmental Organizations (e.g., Science-based Targets Initiative, CDP, Center for Resource Solutions/Green-E, Sustainability Accounting Standards Board, Edison Electric Institute).
    d. Private industry, particularly utilities serving the North Carolina market and large multinationals corporate parents or customers whose public emissions reduction and sustainability commitments are driving new accounting and reduction requirements on WRP clients.
3. WRP client engagement learnings– WRP has identified \$502,000 and 2,423 metric tons CO_2 equivalent emissions of annual savings and reductions for its clients including BRP, Bridgestone Americas Tire Operations, Culp Home Fashions, Oiles, Wicked Weed Brewing, and Uchiyama Manufacturing America. These have elucidated common abatement opportunity areas (e.g., compressed air leaks and system optimization, peak load shifting).
4. Synthesize and translate this content into over fifty pages of practical guidance organized into short guides and planning consideration documents, including tool and resource links, and step-by-step instructions for WRP and its clients. This content library covers each emission scope while maintaining alignment with GHG Protocol and EPA guidance.

Product and Significance

The significance of this project lies in its ability to assist WRP and, in turn, its clients to bridge the gap between practically implementing a near-term requirement and highly technical and evolving GHG accounting standards, processes, and theoretical guidance that can be perceived by plant managers as overwhelming and inaccessible.

The objective of the project for WRP is to build an accessible, user-friendly, and "evergreen" knowledge bank and management considerations that effectively synthesizes these primary and secondary GHG accounting sources. This also includes linking WRP and its client points-of-contact directly to specific resources, emissions factors, global warming potential values, and other calculation tools needed for execution; and, sample emissions calculations for most common Scope

1 direct emissions sources (e.g., gasoline, diesel, propane, and refrigerants), and Scope 2 indirect, purchased emissions sources (e.g., electricity, steam, and heating/cooling).

For clients, WRP intends to deploy this content during on-site engagements as approachable and practical guidance in a format that works for the client. Fundamentally, WRP's client point-of-contact needs to be able to deal with their GHG emissions requirement in context of daily operations, otherwise it becomes a barrier or imposition to them. Giving them the right questions to ask, relatable and easily digested calculations and step through building an emissions inventory or good practice for data collection makes their accounting and reporting task accessible.

This helps to simply and shorten compliance and enables plant leaders to make clear connections among energy, emissions reduction, and cost savings. WRP also expects to deploy aspects of this knowledge bank publicly through its regular participation at industry meetings and conferences raising awareness and education level for GHG emissions accounting and reduction measures, and "marketing" WRP's on-site client support services.

Internally, WRP also expects this content library to help "train the trainer", better equipping its core staff and energy and waste experts to think in GHG emission-centric terms more expressly, deepening a mission-aligned competency and capability to serve North Carolina business and organizations. It also helps ensure consistent guidance aligned with its established energy assessment work.

Recommendations and Next Steps

Recommended actions for WRP over the near-, mid-, and long-term include:

- Near-term (<12 months) – Integrate emissions accounting into WRP's core energy audit process; develop sector-specific guidance supplements for key North Carolina industries; Utilize ongoing client follow-up to assess evolving emissions need.
- Mid-Term (12-24 months) – Transform content into online and interactive resources and training materials; Incorporate WRP client learnings to improve offering; and pursue third-party hosting platforms for emissions calculations and abatement ideas.
- Long-term (>24 months) –Prepare for planned updates to GHG Protocol standards and revisit former clients to measure GHG accounting and reduction 'stickiness' as a matter of business process and operations, and reduction impact and over time.

At the time of completion, it is my understanding that WRP has plans to implement on many of these recommendations. Taking a phased approach also helps to ensure flexibility for WRP to pull forward or push back planned and potential implementation activities to best reflect the needs of its clients and expand WRP's reach and effectiveness for North Carolina businesses and organizations.

Appendix – WRP Document Example

Example: Calculating Scope 1 Emissions for the Plant's Diesel Consumption

1) **Identify Methodology**
    a. Corporate parent or Customer has made decision to follow GHG Protocol Corporate Standard.
        i. Ex) An automotive manufacturer is required to follow OEM's M2030 supplier survey which is underpinned by the GHG Protocol Corporate Standard.
    b. Monitoring period is for calendar year 2024 (Jan 1-Dec 31)

2. **Data Collection**

    a. Plant EHS Manager or Facilities/Maintenance Department monthly fuel purchase and consumption logs from meter and/or monthly receipts/invoices.

    b. Gather all relevant 2024 data.

    c. Total Diesel Consumed = 27,273.50 gallons

Meter: Diesel						
Property: Sample North Carolina Company						
Report Date: January 18, 2025						
	Delivery Date	**Quantity (gal)**	**Cost**	**Estimated Value**	**Last Modified Date**	**Last Modified By**
	1/18/2024	2,391.70	$5,934.12	No	2/18/2024	EHS Manager
	2/18/2024	2,043.00	$6,455.10	No	3/18/2024	EHS Manager
	3/18/2024	2,068.70	$7,546.50	No	4/18/2024	EHS Manager
	4/18/2024	2,493.00	$10,619.82	No	5/18/2024	EHS Manager
	5/18/2024	2,426.70	$10,213.98	No	6/18/2024	EHS Manager
	6/18/2024	2,051.10	$10,376.51	No	7/18/2024	EHS Manager
	7/18/2024	2,049.00	$10,858.18	No	8/18/2024	EHS Manager
	8/18/2024	2,400.00	$11,640.99	No	9/18/2024	EHS Manager
	9/18/2024	2,459.00	$10,720.96	No	10/18/2024	EHS Manager
	10/18/2024	2,423.90	$10,202.20	No	11/18/2024	EHS Manager
	11/18/2024	2,474.40	$9,301.27	No	12/18/2024	EHS Manager
	12/18/2024	1,993.00	$8,966.96	No	1/18/2025	EHS Manager
	2024 Totals	**27,273.50**	**112,836.59**	No	1/18/2025	EHS Manager

3. **Apply Relevant Emissions Factor**
    a. Using EPA emissions factors for diesel fuel (Distillate Fuel Oil No. 2):
        1. Diesel fuel emission factor = 10.21 kg CO_2 per gallon
        2. Must also account for small amounts of CH_4 and N_2O emissions, which have different global warming potentials (GWPs)
            1. CH_4: 0.41 grams or 0.00041 kg/gallon (GWP = 28)
            2. N_2O: 0.08 grams/gal or 0.00026 kg/gallon (GWP = 265)
    b. Always check the latest EPA Emission Factors Hub document directly from the EPA website.
    c. It is good practice to obtain and verify Global Warming Potential Values from the IPCC or Intergovernmental Panel on Climate Change.

1. Parties to the Paris Agreement agreed to begin using IPCC's 5th Assessment Report (AR5) vales. Standard practice, including the GHG Protocol, utilize this version.
    1. Note that IPCC will issue periodic updates with new GWP values. This is problematic for companies and countries that made commitments based on previous IPCC GWP values. This is why the AR5 version is used most commonly and ensures a consistent baseline.
    2. The 100-year GWP value is most common in corporate carbon accounting.

d. Obtain clarification internally or document assumptions taken to ensure internal alignment and ongoing consistency.

4. Calculate Scope 1 Emissions

a. Basic calculation: Fuel Used × Emission Factor

1. CO_2 emissions = 27,273.50 gallons × 10.21 kg CO_2/gallon = 278,462.435 kg CO_2

2. CH_4 emissions = 27,273.50 gallons × 0.00045 kg/gallon x 28 GWP = 343.646 kg CO_2e

3. NO_2 emissions = 27,273.50 gallons × 0.00026 kg/gallon x 265 GWP = 1,879.144 kg CO_2e

b. Sum of Diesel CO_2 and CO_2e Scope 1 Emissions

1. 278,462.435 + 343.646 + 1,879.144 = 280,685.225 kg CO_2e

c. Convert to metric tons (or whichever end-value required)

1. 280,685.225 kg CO_2e / 1000 kg/mt = 280.685 mt

5. Document Assumptions/Methodology. Simple document or Appendix showing:

1. Data source (e.g., Monthly fuel purchase logs)

2. Emission factors and GWP sources (e.g., EPA, IPCC documentation)

3. Assumptions (e.g., All fuel purchased is consumed during same period)

4. Calculation Methodology (e.g., Direct multiplication of activity data by emission factor; Source of Calculating – GHG Corporate Protocol)

5. Anything atypical