THE ENERGY EFFICIENT FACTORY TOOLKIT

ENERGY & MANUFACTURING® in Appalachia

THE ENERGY EFFICIENT FACTORY TOOLKIT

Table of Contents

ENERGY & MANUFACTURING in Appalachia

Energy Efficiency Strategies

Today, energy costs are a significant portion of manufacturing operations. Energy Efficiency Strategies help manufacturing companies to implement efficient energy practices, practical emissions reduction strategies, and tools to reduce operational costs. These practices are fundamental to business performance and there is a clear business opportunity to implementing them.

No matter where an organization is on their journey towards energy efficiency, the opportunity for continuing education is essential. The Energy & Manufacturing in Appalachia (EMA) program is available to support you. The information in this toolkit is a good first step to gaining organizational alignment, creating a baseline, identifying opportunities, and becoming a more efficient operation.

The toolkit is divided into four easy-to-follow phases, each with key questions and associated tools.

PHASES	KEY QUESTIONS
PHASE 1: Leadership Alignment	☐ Are leaders aligned to begin the Energy Efficient Factory journey? ☐ Do you have a facility champion? ☐ Have you created a team and assigned responsibilities?
PHASE 2: Baseline Understanding	☐ Do you understand the context of the industry and your operations? ☐ Do you understand the regulatory changes impacting your operations regarding emissions? ☐ Do you have customer driven requirements to report emissions? ☐ Do you have a baseline for utility usage and waste generation? ☐ Do you have GHG emissions baseline for scope 1 and scope 2?
PHASE 3: Opportunities for Improvement	☐ Do you have a system for collecting opportunities? ☐ Do you have a system for tracking opportunities? ☐ Do you know the ROI for opportunities to compare value?
PHASE 4: Goals, Action Plan, and Measurement	☐ Have you set facility and corporate goals for utilities, waste, emissions, efficiency gains? ☐ Do you have a management system for building action plans and measuring progress for goals? ☐ Do you have a Communications Plan?
ADDITIONAL ITEMS	☐ Do you need to calculate scope 3 emissions? ☐ Are customers and supply chain members asking you to fill out questionnaires regarding your carbon footprint?

For more information on implementing the toolkit or for support on any of the phases, please contact: Tom Reed, EMA Program Manager, (412) 918-4269, Tom@WeMakeItHere.org

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Introduction

With the tremendous advances in energy efficiency technology, as well as the changing regulatory environment, it is difficult for organizations to know what to do or how to plug themselves into this changing dynamic.

Amidst all this change, three things are clear:

1 – The direction of the energy industry is toward greater demand.
2 – Management of energy consumption and energy efficiency is fundamental to business performance.
3 – There is a business opportunity to reduce usage and costs.

The Energy Efficient Factory Toolkit was built with the three statements above in mind with the goal to help organizations take practical actions – wherever they are on their journey to manage energy and emissions – that realize the value that energy efficiency provides. This toolkit uses a step-by-step approach to outline the fundamentals of energy and emissions management in a way that provides actionable guidance and resources for organizations to continue making progress. It is important to consider the Communication Plan at each step of this process.

While this toolkit is designed to be followed sequentially through the phases and steps, organizations can tailor the content and their approach to meet the needs of their unique operations and context. Then, with a constant focus on sustainable value, manufacturers can ride the wave of the energy efficiency revolution to unlock new paths to growth. The EMA program team can walk you through the steps of this toolkit. This is a free service for manufacturing companies in Appalachia. Email EMA@WeMakeItHere.org to get started.

The Business Case for Energy Efficiency

The reasons that a company may begin a journey toward energy efficiency can vary. Common reasons may include:

- Key customers require their suppliers demonstrate progress as part of their own commitments
- Investors, Board of Directors, and other senior executives see this topic as a priority
- Competitors are differentiating themselves in this area and taking your market share
- Reduced energy costs for your current or future operations
- New or future regulatory compliance standards at the federal, state, or local level
- Employees expectations that the company they work for is efficiency focused

Regardless of the reasons that start a company down this path, business leaders are justified in assessing whether those activities provide a real value proposition to invest time and resources into clean energy efficient activities. Companies – particularly manufacturers like you – who do manage their energy consumption and emissions can expect to realize business value in one or more of four primary categories:

- Cost Savings and Efficiency
- Revenue Protection and Growth
- Risk Reduction
- Brand and Reputational Value

The degree of each of these four impacts will vary depending on an organization's unique operating context, but a comprehensive approach to energy and emissions management can realize all of them.

COST SAVINGS AND EFFICIENCY

This is often the most straightforward value case to make – more efficient energy consumption drives a reduction in energy costs through lower utility bills. A Lean approach results in greater efficiency and translates into less waste, higher productivity, and lower costs.

These efficiencies can range from small activities like shutting off equipment or changing the layout of a process to be more streamlined, up to capital improvements to add automated systems that regulate power consumption or on-site power generation systems. The table below shows some examples and the potential return on the investment:

TYPE OF EFFICIENCY	EXAMPLE(S)	TYPICAL ROI (~5 YRS)
Simple	"Turn Stuff Off" protocol	> 1,000% (no / very low cost)
Intermediate	Replace lighting with LEDs	100 – 300%
Advanced	Smart meters or more efficient equipment	50-500%

These efforts also help reduce other hidden costs. For example, employees broadly prefer to work at companies that show awareness and responsibility towards energy conservation. Demonstrating action around energy and emissions management and efficiency gains can help increase employee loyalty and thereby increase productivity and lower hiring and attrition costs. Additionally, there is evidence that management and integration of these topics into business operations are correlated with a lower cost of capital.

REVENUE PROTECTION AND GROWTH

Customers are increasing their focus on their suppliers' progress toward energy efficiency and emissions reduction. This may take the form of supply chain questionnaires such as EcoVadis, CDP, or other customer information requests, either as part of new business RFPs or as part of on-going supplier evaluations.

Purchasing departments use this information more frequently as a component of their supplier selection process. A recent survey cited 69% of procurement executives consider environmental performance when selecting new suppliers and renewing contracts. Organizations who are prepared to answer and score well will have a competitive advantage to protect revenue from their largest contracts and accounts.

Additionally, the advantage of managing energy and emissions may allow engaged manufacturers to take business from disengaged competitors and reach new customers. Leading manufacturers may even be able to command a price premium for goods produced with higher standards of environmental responsibility.[1]

RISK REDUCTION

While less tangible than cost savings or revenue growth, risk reduction is another area of business value where a proactive management approach to energy and emissions can avoid negative surprises and business impacts.

Regulatory risk is an area that is rapidly evolving for energy and emissions, particularly for manufacturers who have customers or operations in places where new legislation on these topics is already in place and beginning to take effect. Other areas of risk will be specific to a company's operating context and may include volatility in energy prices, stricter building codes, emissions controls, and mandated disclosures, among others, with risks of fines or lost business.

Regardless of the type of risk, companies who proactively assess risk with a lens on energy and emissions management will be better positioned to manage them and address any issues that do materialize with minimal business impact.

BRAND AND REPUTATIONAL VALUE

Evidence continues to emerge that employees, customers, and investors increasingly prefer products from companies that take action on their non-financial impacts, such as energy and emissions management.[2] While more difficult to quantify, these activities can lead to greater customer loyalty and repeat sales. Leading organizations may be recognized on different rankings, lists, or indices that can boost company pride internally and credibility externally. Some factories may already have on-going engagement with the communities in which they operate, and energy and emissions management is another way a company can be seen as a good corporate citizen.

To realize the value of this area, companies must strike a balance between promoting the good things they are doing and acknowledging the progress that is still to be made.

1 pwc 2021 Consumer Intelligence Survey
2 https://www.mckinsey.com/industries/consumer-packaged-goods/our-insights/consumers-care-about-sustainability-and-back-it-up-with-their-wallets

The Energy Efficient Factory Journey

The journey toward an Energy Efficient Factory has several phases and will take focus and constant support from leadership.

Phase 1
Leadership Alignment

Phase 2
Baseline Understanding

Phase 3
Opportunities for Improvement

Phase 4
Goals, Action Plan and Measurement

Additional Items

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PHASE 1

Leadership Alignment

The journey to an Energy Efficient Factory is one that requires buy-in throughout the organization, starting with company leadership alignment and direction. The first step is for leadership to agree that the journey will be investigated and, if it makes sense, undertaken. As with all changes the purpose of the change must be stated and clearly shared throughout the organization.

The next step in implementing energy management is to identify a champion and energy management team to own the initiatives at each facility. This team will be responsible for understanding the facility's energy use.

The champion will likey require access to all energy invoices to identify trends in usage and any potential issues that need to be addressed. Ideally, this person should be directly familiar with the manufacturing processes on the production floor as they will be best positioned to understand the avenues for efficiency improvement, recognize when the invoices are reflecting excessively high or low usage, and drive the necessary changes to protocols and processes by engaging other team members along the way, and the energy management team that will begin the early phases. Typically, the technicians and operators have a deep understanding of operation, while the office workers have knowledge of utility usage and customer requirements. Both groups are key members of the team and should be involved to gain full organizational buy-in.

Some energy efficiency and cost reduction projects can be long-term, over many months or even years. Delineating stakeholder roles for the project's tasks and phases ahead of time via a RACI matrix or other project management approach helps energy management team members and those affected to plan for future work and/or future changes to their work. It also fosters a sense of accountability across the team and helps ensure the right amount of information gets to the right people.
See Appendix A for a RACI Matrix Worksheet.

PHASE 1 QUESTIONS:

- ☐ Are leaders aligned to begin the Energy Efficient Factory journey?
- ☐ Do you have a facility champion?
- ☐ Have you created a team and assigned responsibilities?

Once the energy management champion and team are set, together with responsibilities, the team is ready for phase 2.

PHASE 2

Baseline Understanding

Phase 2.1: Context of your industry and your operations

CONTEXT OF YOUR INDUSTRY

The drivers for the business case for energy and emissions management will vary from company to company and from industry to industry. These may include customers, investors, regulators, and others. Before taking any action, it is important to understand where the opportunities and pressure points are likely to exist for your company and to prioritize action along those lines. One way to do this is to look to see what leading companies in your industry or what the leaders in your customers' industries are doing. What goals are they setting? Are they committing to implementing actions into their supply chains?

These questions will help put your own activities in context for where you may need to focus now or in the short-term future.

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CONTEXT OF YOUR OPERATIONS

Once the bigger picture around the industry is understood, the process can zoom in to the organization level to begin to assess the possible scope of initiatives related to energy and emissions management.

The questions below will help provide a broader picture of the organization and where initiatives may begin:

QUESTION	WHY IT MATTERS
How many facilities/ assets do you have?	These are main sources of energy usage, and a complete list will give a picture of the scale of the organization.
Where are all facilities/assets located?	Location determines different emission factors (EF) for GHG calculations; accessibility of energy sources will vary by region.
What property type are these facilities (e.g., manufacturing, warehouse, office, etc.)?	Different types of facilities will have energy intensities, and it may help to segment them this way when comparing performance data.
Are those facilities owned or leased?	Owned facilities often have greater visibility to utility data and more control of decisions to make changes compared to leased facilities. Data collection with owned facilities likely will be easier.
Do you have any large equipment that is nearing end of life, or considered for replacement?	Large equipment is replaced infrequently and is typically a large contributor to energy consumption and associated emissions.
Are you planning any expansions or new facilities?	Any new investments are key times to look for new sources of energy, more efficient equipment, layout, or processes, and in general, are the best time to make energy efficiency decisions.

Appendix B contains a Facility Inventory Worksheet that allows you to answer the questions above for your own organization.

PHASE 2.1 QUESTIONS:

- ☐ Do you understand the context of the industry and your operations?
- ☐ Do you understand the regulatory changes impacting your operations regarding emissions?
- ☐ Do you have customer-driven requirements for reporting emissions?

Phase 2.2: Gather Utility Usage

You cannot improve what you do not measure. Ongoing management of energy usage and emissions is impossible without access to the relevant data. A comprehensive greenhouse gas (GHG) emissions inventory considers all aspects of the organizational footprint, and the following questions are intended to fill any gaps that may not be apparent. Direct emissions from internal operations as well as indirect emissions from purchased energy sources are all considered in a thorough inventory, so keeping these questions in mind while starting to explore the intricacies of GHG emissions can help set the stage for what information may be required in a full inventory, with the caveat that not all questions will apply to all organizations.

- Do you have any GHG Emission Equipment (e.g., vehicles, forklifts, generators, etc.)?
- Do you have any production processes that produce additional emissions? This should not be confused with equipment that uses fuel as an input for power.

Appendix C contains a Greenhouse Gas Emission Equipment Inventory Worksheet that allows you to answer the questions above for your own organization.

The following actions help to facilitate the ongoing tracking and collection of this data:

- Using the energy management team and local representatives that was created in Phase 1 begin collecting and managing the facility data.
- Set regular data collection periods. Start with annual data and then move to quarterly or monthly collection to enable faster identification of trends and more real-time process changes.

Establish a single location to store the data (e.g., Microsoft Excel spreadsheet, Energy Star Portfolio Manager, or any other data entry location).

DATA COLLECTION TIPS:

- Electricity from renewable sources that is generated on-site or purchased should be recorded separately in order to enable accurate quantification of emissions associated with different electricity generation sources.
- If utility usage is sub-metered, record the sub-metered data rather than aggregating it.
- Pay close attention to the consumption units indicated on the bill (e.g., kWh or MWh for electricity; therms, scf, or ccf for natural gas; etc.) and record them accurately.
- If possible, record any potential variables that may affect energy consumption in the facility – heating and cooling degree days (HDD and CDD), dew point temperature, production output, operating hours adjustments, upsets that result in higher utility consumed or more waste created, etc.
- Continually assess for any missing data points and endeavor to fill these gaps.

PHASE 2.2 QUESTION:

☐ Do you have a baseline for utility usage?

Phase 2.3: Convert to Greenhouse Gas (GHG) Emissions

Calculating greenhouse gas (GHG) emissions and establishing a baseline is an important step for organizations who are responding to requests for energy and emissions information or for those who are managing their emissions proactively.

Similar to financial accounting standards (such as GAAP), there is a common accounting standard for calculating GHG emissions as well. Developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD), the **Greenhouse Gas (GHG) Protocol** is the world's most used standard for GHG emissions accounting.

To provide standardization across emission types, the GHG Protocol divides an organization's emissions into three categories – Scope 1, Scope 2, and Scope 3 – based on the degree of control that the organization has over the different sources of emissions. The three scopes are defined as follows:

- **SCOPE 1** – Emissions that occur from sources that are on–site or from the direct operations of an organization. This includes stationary combustion, mobile combustion, fugitive, and process emissions, as defined in the glossary.
- **SCOPE 2** – Emissions that occur from the direct operation of an organization, but from indirect sources. This includes the purchase of electricity, steam, heat, or cooling.
- **SCOPE 3** – Emissions that are the result of activities from assets not owned or controlled by the reporting organization but indirectly impacts its value chain. A company's scope 3 emissions do not include any emissions already accounted for in Scope 1 or Scope 2. Examples are emissions from employee commuting, transportation tied to suppliers, or the use of the product by the consumer.

The graphic below illustrates the breakdown of emissions sources by scope, as defined by the GHG Protocol. [3]

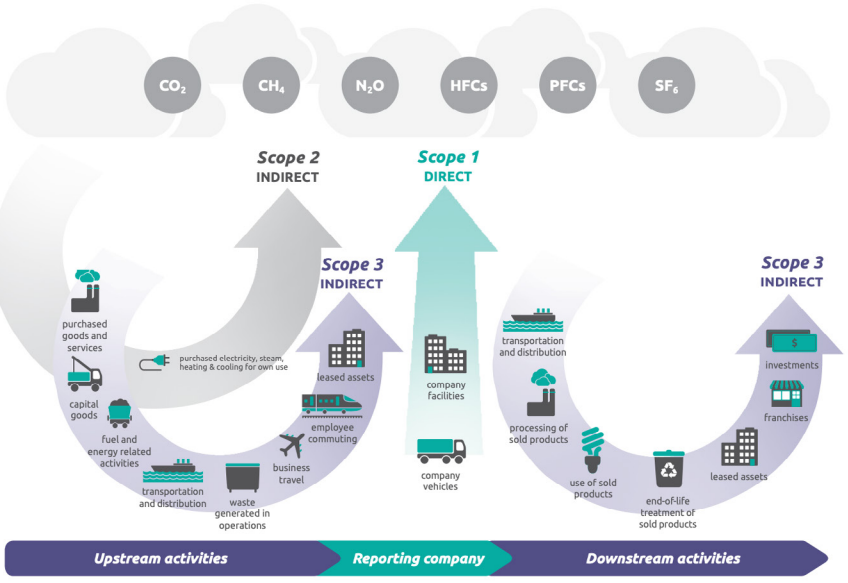

Figure 2: Scope 1, 2, and 3 greenhouse gas emissions visual from the GHG Protocol detailing direct and indirect emissions and the types of greenhouse gases.
3 https://ghgprotocol.org/corporate-standard

Calculating scope 1 and 2 emissions is more straightforward than scope 3 as there is generally greater access to primary data sources. Therefore, this section focuses on calculating scope 1 and 2 GHG emissions, and scope 3 emissions are covered in Additional Information.

Calculating GHG emissions is a simple equation that involves two factors:

Activity Level*CO2e Emissions Factor=CO2e Emissions

Activity level refers to the quantity of activity from an emissions source, such as kWh of purchased electricity or gallons of fuel consumed.

CO2e emissions factor is a reference value that denotes the quantity of greenhouse gas emissions (measured in mass of CO2e, or carbon dioxide equivalent) released per unit of activity. To ensure that the emissions are calculated correctly, the unit in the denominator of the CO2e emissions factor must match the activity level units.

PHASE 2.3 QUESTION:

☐ Do you have GHG emissions for scope 1 and scope 2?

For more information on calculating GHG see the resources below.

Resources

Arcadia: Automated Utility Data
Energy Star Portfolio Manager
Greenhouse Gas Protocol
EPA GHG Inventory Development Process and Guidance
Scope 1 and 2 GHG Inventory Guidance
EPA Simplified GHG Emissions Calculator
GHG Protocol Emissions Calculation Tool
GHG Emission Factors 2023_EPA

PHASE 3

Identify Opportunities for Improvement

Step 3.1: Identify Opportunity Areas

Once baseline measurement data are in hand, organizations are a big step closer to realizing business value. The next step is to identify where there are efficiency and cost-reduction opportunities.

A logical way to do this is through a facility assessment. Armed with the data from the baseline you and your energy management team can walk through the facility identifying large energy users or inefficiencies. An important part of this facility assessment is to utilize the knowledge of the employees who work on the facility floor. They have deep experience of how the equipment works and what opportunities make sense to begin to work on.

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In tandem, another good option is to bring in a third party to review the baseline information and then walk through the facility with you offering a cold set of eyes. In addition, there are other tools that can be used regularly to identify and track opportunities. Below are some ideas to trigger thoughts:

LEAN MANUFACTURING & OPERATIONAL EXCELLENCE TOOLS

- ☐ Regular facility tours
- ☐ Visual management
- ☐ 5S or other LEAN tools
- ☐ Continuous Improvement processes
- ☐ Project Management Office (PMO)
- ☐ Daily, Weekly, Monthly progress reviews
- ☐ Employee suggestions or Energy Treasure Hunts
- ☐ Process for completing quick wins

EFFICIENCY FOCUSED TOOLS

- ☐ Materiality Assessment
- ☐ Risk Register
- ☐ Business Continuity Plan

CORPORATE RESPONSIBILITY REPORT

Each of these tools can offer different ways to reduce consumption of utilities, reduce waste creation, mitigate risk, or make the operation consistently more efficient. Utilize the ones that work well for your business and seek additional help for ones that you are not familiar with using.

QUICK WINS

In addition, proactively and preventatively addressing facility maintenance also mitigates electricity, natural gas, and product waste. Leaks of air, chilled water, or steam can lead to excess energy usage, wasted money, and sometimes pose safety and quality risks. Properly maintaining facility equipment requires a culture of accountability and improvement in the organization; procedures for equipment usage and maintenance must be in place and individual employees must feel empowered to use established reporting mechanisms to disclose leaks and equipment malfunctions.

Other quick wins include lighting updates and HVAC system optimization, which often have fast payback periods. Regarding lighting, switching to high efficiency LED lights not only reduces electricity consumption (and the associated utility cost), but it also reduces cooling loads due to the lower heat output of LEDs compared to incandescent and CFL bulbs. Further, due to the longer product life of LEDs, maintenance requirements due to lighting are also reduced. In managing a transition to LED lights, taking an intentional approach to lighting and de-lamping if there are areas that are over-lamped can help drive further reductions.

PHASE 3.1 QUESTION:

- ☐ Do you have a system for collecting opportunities?

Step 3.2: Use Data to Prioritize Opportunities

One of the ways data can be most powerful is the ability to provide quantitative comparisons. Particularly when visualized in charts, the data can show obvious outliers that may be worth investigating, either for inefficiencies or for being highly optimized.

It may be helpful when comparing facilities for efficiency to use a "normalized" metric – rather than just energy consumption – that accounts for factors that may influence overall energy use, such as floor space (e.g., measured in square feet or meters) or production capacity (e.g., measured in units produced). For example, rather than comparing just megawatt-hours between facilities, you might use megawatt-hours per square foot.

Data at the facility and month levels likely will require additional digging to understand what is behind any large variations. However, technology solutions can provide more timely and insightful analysis. Sub-meters can track energy of certain equipment or areas within a facility and allow for measurements at the minute level. This can provide near-real time feedback and faster identification of issues.

When assessing improvements that involve large capital investments, planning and prioritizing these major upgrades based on both the financial and energy/emissions implications is important. There are a variety of ways that these opportunities can be prioritized, but a common method is to calculate the potential return on investment (ROI), which is calculated according to the following formula.

$$\textbf{ROI} = \frac{\textbf{Total Savings} - \textbf{Total Costs}}{\textbf{Total Costs}} * 100\%$$

Where "Total Savings" = the total savings due to the efficiency improvement (often concentrated in reduced utility costs) over the lifetime of the upgrade and "Total Costs" = the initial upfront capital investment plus any ongoing maintenance costs over the lifetime of the upgrade. A positive ROI indicates a profitable investment while a negative ROI indicates a loss.[4] Additional resources are also available from the US EPA's ENERGY STAR program for evaluating the economics of energy efficiency projects and financing them: ENERGY STAR Cash Flow Opportunity Calculator and Financial Value Calculator and ENERGY STAR Financing Resources.

4 https://utilitiesone.com/how-to-calculate-return-on-investment-roi-for-energy-efficient-lighting

In some situations, the ROI may be negative when simply looking at the local level. You may need to understand the impact of reputational damage or loss of customers due to not meeting emissions targets and take this into account when making an investment decision.

PHASE 3.2 CHECKLIST:

- ☐ Do you have a system for tracking opportunities?
- ☐ Do you know the ROI for opportunities to compare value?

PHASE 3 RECAP

Once baseline data has been collected and an understanding of GHG emissions at the facility has been calculated, trends in overall utility and energy use will become clearer. The flows of energy throughout the facility can begin to highlight opportunities for efficiency improvements and reductions in the form of quick wins.

- Identify opportunity areas and prioritize 'quick win' energy reduction tactics.
- Calculate project savings to determine prioritization.
- Transition efforts into ongoing management systems (rather than one-off initiatives).

Resources

Go on an Energy Saving Treasure Hunt
  - Treasure Hunt Checklist: Manufacturing Plants
  - Treasure Hunt Checklist: Commercial Buildings

Evaluate the Economics of Energy Efficiency Projects

ISO 50001: Energy Management

PHASE 4

Goals, Action Plan, and Measurement

The steps outlined through Phase 3 help to baseline and identify opportunities within your operations targeting greater efficiency, lower energy usage, and lower costs. However, it is possible to make more transformational gains with energy and emissions management by introducing goals and targets into a proactive, systems-based approach. That process often involves multiple departments within an organization, sometimes even looking beyond the organization's four walls to its entire ecosystem of customers and suppliers.

Utilizing the governance established at the onset of the journey, and with the knowledge of your baseline and opportunities, the next step is to create goals.

Phase 4.1: Develop Goals

To define what goal(s) to create, the energy management team should begin collecting inputs to inform the goal development process, which may include the following:

- Trends of past data / results (using results from Phase 2)
- Future company plans (e.g., new markets or products, facility expansion, etc)
- Senior leadership vision for the company (e.g., reducing energy costs by 40%)
- Customer expectations and opinions on energy or emissions goals

At this point, the energy management team should consider the different types of goals that are common to energy and emissions management:

- **Absolute vs Intensity**
  - Absolute goals limit or reduce the **total** energy consumed or emissions released.
  - Intensity goals reduce the **per unit** energy consumed or emissions released.
- **Fixed vs Relative**
  - Relative goals use a baseline year as a reference for the goal.
  - Fixed goals have a set value (often 0 or 100%) and do not use a baseline year.

Goals should follow the SMART philosophy, meaning Specific, Measurable, Achievable, Relevant, and Time-bound. SMART goals create an atmosphere where the goals can be more easily understood and those responsible for achieving the goal are more motivated. **See Appendix D for a Draft Goals Worksheet.**

Below are some examples of these types of SMART goals:

- "By the end of 2026, we will reduce our energy consumption per square meter by 25% compared to our 2020 baseline." **(Intensity, Relative)**
- "By the end of 2030, we will reduce our Scope 1 and 2 emissions by 50% compared to our 2016 baseline." **(Absolute, Relative)**
- "We will send zero waste to landfill by 2035." **(Absolute, Fixed)**

PHASE 4.1 QUESTION:

☐ Have you set facility and corporate goals for utilities, waste, emissions, efficiency gains?

Phase 4.2: Develop Action Plan

After establishing a goal or as part of the finalization process, the goal owner should put in place a high-level plan for the initiatives that will help achieve a goal. Each action in the plan should have a rough timeframe associated with it and align with the values of the goal projection. Additionally, each action should also have financial estimates that show which actions are generating returns and which would be new costs to produce a total financial picture of the goal. In some cases, the financial savings from efficiency actions may be used to pay for or offset actions that are a cost without a return.

Phase 4.3: Management System to Monitor Results

In order to monitor progress for each goal a management system is required. These systems can be simple, like an excel spreadsheet, or complex, utilizing ISO standards.

This step is the connection point that creates feedback loops toward continuous improvement. All goals should have interim milestones at least every year, and preferably more frequently. If data and results are only being tracked and analyzed once per year, it is difficult to get a handle on what is really happening in the day-to-day work that influences overall performance toward a goal.

In addition to finding the right frequency for data collection, the energy management team should also look to include leading indicators as part of the ongoing results analysis. With energy and emissions data, lagging indicators (such as energy consumed) are the most common but they don't predict future performance as well. A leading indicator would be something that is closely correlated to emissions producing activities and looks into the future. One example could be financial projections of customer orders or sales figures. These may help predict future spikes or drops in energy and/or emissions.

PHASE 4.3 QUESTION:

- ☐ Do you have a management system for building action plans and measuring progress for goals?

Phase 4.4: Communicate with Stakeholders

One of the last steps in a management system cycle can be easy to skip but is important not to miss: communicating results to stakeholders. Communication is a critical component because it keeps people engaged with the topic and reminds them that this is an on-going initiative that is producing results. Sharing the results can achieve greater buy-in and support for the initiative in the future, particularly if there are financial savings attached to it.

In preparing for this step, it is useful to document which stakeholder groups are the intended audiences for communication. These may be internal or external audiences, with some examples below:

INTERNAL STAKEHOLDER EXAMPLES	EXTERNAL STAKEHOLDER EXAMPLES
Executive Leadership Teams	Customers
All staff	Suppliers
Teams helping with energy mgmt. initiatives	Investors
Marketing team	Communities of operation

Once the audience is identified, there are three elements that should guide the communication approach:

- The goal: Why are you sending the communication? What should it accomplish? Sometimes it should simply inform or leave a positive perception. Other times, it should help secure additional funding.
- The message: What are the few key things the specific audience should learn or know? And why does that matter to them?
- The medium: How should the message be delivered? This could be a report, an email, a video clip, a social media post, etc.

Each of these three elements should be tailored to the specific audience and how they best receive, absorb, and use information. For example, Executive Leadership Teams may prefer a presentation with PowerPoint slides they can reference. Investors may prefer a formalized report. Staff members may be most likely to watch a short video clip or read a social media post.

Regardless of the audience, two things are important to remember with communications:

1 – View the output through the eyes of the audience and how they may react to it; adjust accordingly.
2 – Be prepared for responses of all types and how to respond in a constructive way.

If a communication effort ends with no feedback, that most likely means it was not effective. If it was effective, it likely will turn into dialogue, and imagining different types of dialogue helps to prepare effective responses that keep stakeholders engaged. **See Appendix E for a Communication Plan Worksheet.**

PHASE 4.4 QUESTION:

☐ Do you have a Communication Plan?

Additional Items

SCOPE 3 EMISSIONS

Once an action plan is fully implemented for the organization and energy/emissions reductions are beginning to be realized, the efforts can then reach beyond the scope of the organization's own direct operations. An organization's impact is not solely limited to what occurs within its facilities' walls. Upstream and downstream impacts from materials extraction to product use and end-of-life all contribute to the overall impact of a product or service. These impacts are harder to quantify and more difficult to manage due to lack of direct control but managing them is something that many manufacturing customers are beginning to require.

Not all Scope 3 categories are relevant for every organization and obtaining the data to calculate the categories may be difficult. Therefore, when reporting Scope 3 emissions, clearly defining and communicating the boundary – e.g., which categories are relevant and/or included in the inventory, which are not, and why – is critical to provide transparency and aid comparability from year-to-year reporting as additional data may become availability or the relevance of some categories may change.

For categories that are relevant but for which data is unavailable, emissions can be estimated using a variety of approaches, including secondary or proxy data from life cycle databases. These are particularly useful for approximating Scope 3 emissions in cases where primary data from suppliers may be unavailable. For examples of life cycle databases, see GHG Protocol Life Cycle Databases.

For detailed definitions and explanations of how to calculate Scope 3, see GHG Protocol - Corporate Standard.

SUPPLIER INFORMATION

In some cases, you may need to engage your suppliers for required data. Similar to the reporting burden companies may feel from their customers, organizations should consider balancing the need for information compared to the effort required of their suppliers to comply. Best practices are to prioritize the information you need and then to communicate that clearly with suppliers so that they understand which areas are most important and can be more efficient with their responses.

Supplier engagement can also take a variety of forms, from informal supplier questionnaires to clauses in supplier contracts necessitating certain actions or disclosure. For example, the following questions could comprise a baseline questionnaire to be sent to an organization's supply chain:

1 – Do you track: water usage, energy usage, chemical usage?
2 – Do you calculate and track your greenhouse gas (GHG) emissions?
3 – Do you have a plan to reduce your energy consumption and/or emissions?
4 – Do you publish an annual sustainability report?

There are tools and platforms for manufacturing organizations to obtain emissions data from their suppliers, some of which a company may already be using as a supplier to its own customers.

- **EcoVadis** is a technology platform that captures an annual assessment from suppliers, covering energy, emissions, and other social and governance topics. Companies can request that their supplier complete an EcoVadis assessment, which will then be shared with them to review, with results driving potential corrective actions.
- **CDP** – formerly known as the Carbon Disclosure Project – is a global environmental reporting system that supports annual disclosure of companies' risks and opportunities related to energy emissions through three distinct questionnaires. These questionnaires and their respective scores can then be used by customers to make informed decisions regarding their suppliers and track their supply chain's progress to ultimately improve performance.

Additionally, allow space for suppliers to be at different points in their own journey and give them time to make progress. This toolkit may be a good resource for them as well.

ADDITIONAL INFORMATION QUESTIONS:

- ☐ Do you need to calculate Scope 3 emissions?
- ☐ Are members of the supply chain asking you to fill out emissions questionnaires?

Resource Summary

Manufacturing Energy Consumption Survey (MECS)
https://www.eia.gov/consumption/manufacturing/

GHG Inventory Guidance and Calculation Tools:

- GHG Protocol
- EPA GHG Inventory Development Process and Guidance
- Scope 1 and 2 GHG Inventory Guidance
- EPA Simplified GHG Emissions Calculator
- GHG Protocol Emissions Calculation Tool
- GHG Protocol: Scope 3 Calculation Guidance

EPA Emission Factors:

- https://www.epa.gov/system/files/documents/2023-03/ghg_emission_factors_hub.pdf
- https://www.epa.gov/egrid
- https://www.epa.gov/egrid/data-explorer

Energy Star resources:

- Treasure Hunt Guide: https://www.energystar.gov/sites/default/files/buildings/tools/Energy_Treasure_Hunt_Guide_Jan2014.pdf
- Energy Management Guide: https://www.energystar.gov/sites/default/files/buildings/tools/Guidelines%20for%20Energy%20Management%206_2013.pdf
- ENERGY STAR Cash Flow Opportunity Calculator and Financial Value Calculator
- ENERGY STAR Financing Resources
- Energy Star Portfolio Manager
- Evaluate the Economics of Energy Efficiency Projects

ISO Management System Standards:

- https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100400.pdf
- https://www.iso.org/management-system-standards.html
- https://www.iso.org/iso-50001-energy-management.html

Platforms and Assessments:

- Arcadia: Automated Utility Data
- EcoVadis
- CDP

Appendix A: RACI Matrix Worksheet

RACI matrix is a tool that may help this person be successful with engaging others by mapping and defining the roles and responsibilities of other team members of stakeholders related to these projects. "RACI" is an acronym that defines categories of responsibility for each involved stakeholder:

- **R = RESPONSIBLE:** This designation identifies team member(s) who are directly tasked with undertaking the work to accomplish a given assignment.
- **A = ACCOUNTABLE:** This identifies the person who ensures that all personnel involved in the project understand their delegated assignments, reviews final deliverables, and in the case of ongoing initiatives, continually monitors the results. This role will likely be filled by the facility energy champion as defined above.
- **C = CONSULTED:** This identifies individuals who do not actively work on the project but are critically impacted by the project's outcomes. Their needs are important to consider throughout the project and they likely have contributions that can aid in the project's success. Strive to gain their necessary input without overwhelming them (or the project team) with an inundation of information or information requests.
- **I = INFORMED:** This identifies stakeholders that may be impacted by the project's outcomes, but they have a smaller direct stake in the work than those who need to be consulted. Often comprising leaders of affected teams or a company's senior leadership, these individuals need to be regularly informed of the project's progress but do not need all the details of each task.

As shown in the example below, a RACI matrix is created by listing all project tasks down the leftmost column and all relevant stakeholders along the top row. Then, in each cell, the stakeholder's RACI designation for that particular task is identified with the corresponding letter. [5]

	MACHINE OPERATOR	PROCUREMENT LEAD	PLANT MANAGER	COO	MARKETING LEAD	CFO
Record utility data	-	R	A	I	-	I
Analyze Smart Meter data	C	-	R	A	-	-
Calculate Emissions	-	-	R	A	I	I
Compile success stories	I	I	C	A	R	I

Table 1: An example RACI matrix for a manufacturing facility detailing the roles for each relevant job title.

Now, enter all project tasks down the leftmost column and all relevant stakeholders along the top row for your company in the blank table below. Then, in each cell, the stakeholder's RACI designation for that particular task is identified with the corresponding letter.

5 https://www.forbes.com/advisor/business/raci-chart/

Appendix B: Facility Inventory Worksheet

	PROPERTY TYPE (list all that apply) Operations, Office, Retail, Warehouse, Transportation, Parking, Other	**ADDRESS**	**SQUARE FOOTAGE**	**OWNERSHIP** Own and Use, Lease/Rent From Owner, Own and Lease/Rent to other company(ies)	**HVAC** (list all that apply) Heating for entire facility, Heating for part of facility, Cooling for entire facility, Cooling for part of the facility	**ENERGY SOURCES** (list all that apply) Electric Grid, Natural Gas, Solar, Wind, Other
1						
2						
3						
4						
5						

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Appendix C: Greenhouse Gas Emission Equipment Inventory Worksheet

	EQUIPMENT TYPE (List each type on a separate line) Semi-Trucks, Box Trucks, Pickup Trucks, Vans, Cars, Forklifts, Landscape Equipment, Backup Generators, Other	**NUMBER OF THESE**	**ENERGY SOURCES** (check all that apply) Electric Grid, Natural Gas, Solar, Wind, Other
1			
2			
3			
4			
5			

	PRODUCTION PROCESSES THAT PRODUCE ADDITIONAL EMISSIONS (List each type on a separate line) Smelting, Circuit Breaker, Other	**NUMBER OF THESE**	**ENERGY SOURCES** (check all that apply) Electric Grid, Natural Gas, Solar, Wind, Other
1			
2			
3			
4			
5			

Appendix D: Draft Goal Worksheet

Use this table to capture goal assumptions. Goals should follow the SMART philosophy, meaning Specific, Measurable, Achievable, Relevant, and Time-bound.

SPECIFIC – What do you want to accomplish?
MEASURABLE – How will you measure progress?
ACHIEVABLE – Do you have the skills and resources available to complete the goal?
RELEVANT – Is the goal aligned with the overall objective?
TIME-BOUND – When will the goal be completed?

DESCRIPTION OF GOAL	METRICS	DATE FOR COMPLETION	RESPONSIBLE

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Appendix E: Communication Plan Worksheet

[One sentence summary description of topic for communication]

1 – Audiences:

- Who will we engage in our communications, in order of priority?

2 – Key Messages:

- Maximum of 3 or 4 short, focused messages which form the basis of the communications

3 – Action Plan:

- Bullet form summary of the steps we plan to take

4 – Measurement:

- How will we measure our success? What does success look like?

5 – Resources:

- Summary of costs (internal and external), and who will be responsible for them – for example web designers, printers etc. are potential external resources

6 – Tactical Plan

TOOL Examples: event, announcement, web site, brochure, training documents, meeting etc.	**WHEN** Timing for production, delivery	**ACCOUNTABILITY** Who is accountable and responsible

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Glossary

CDP: Formerly known as the Carbon Disclosure Project, an organization that encourages companies to disclose their environmental impacts and strategies to manage them.

CFLs: Acronym for "compact fluorescent lamps" which are energy-efficient light bulbs that use fluorescent technology.

CO2e: Acronym for "Carbon Dioxide Equivalent", a normalized unit for measuring various greenhouse gases in terms of their global warming potential.

Decarbonization: The process of reducing carbon emissions, aiming to lower the carbon intensity of energy sources and industrial processes.

Direct Emissions: Greenhouse gas emissions released from sources directly owned or controlled by an organization, such as exhaust from manufacturing plants or company-owned vehicles.

Emission Factor: A coefficient used to estimate the quantity of emissions produced per unit of activity.

Emission Factors Hub: A resource center providing information on emission factors for various industries and activities through the United States Environmental Protection Agency (U.S. EPA).

EcoVadis: A platform that assesses and rates companies' sustainability performance and practices within their supply chain.

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EnergyStar: A certification identifying energy-efficient products, and a platform to help an organization track and improve energy efficiency across the entire portfolio of properties.

Energy Treasure Hunt: A systematic approach to identifying energy-saving opportunities within an organization.

eGRID: Acronym for "Emissions & Generation Resource Integrated Database" which is a comprehensive data set of environmental attributes of power generation from the U.S. EPA.

Fugitive Emissions: Emissions that are not physically controlled but result from the intentional or unintentional releases of GHGs. They commonly arise from the production, processing transmission storage and use of fuels and other chemicals, often through joints, seals, packing, gaskets, etc.

GAAP: Acronym for "Generally Accepted Accounting Principles" which are standard guidelines for financial accounting.

GHG: Acronym for "Greenhouse Gas", usually used in the context of gas emissions – including carbon dioxide, methane, and nitrous oxide – released from burning fossil fuels and other processes that contribute to climate change.

GHG Protocol: Guidelines for quantifying and managing greenhouse gas emissions developed by the World Resources Institute and World Business Council for Sustainable Development.

Indirect Emissions: Greenhouse gas emissions that are not directly owned or controlled but associated with an organization's activities, like purchased electricity or employee commuting.

ISO: Acronym for "International Organization for Standardization" which develops and publishes international standards for various industries.

LEDs: Acronym for "Light-emitting diodes" which are energy-efficient and long-lasting sources of lighting.

Life Cycle Databases: Databases containing information on the environmental impact of products or processes from creation to disposal.

Management System: A structured framework used by organizations to manage processes and achieve objectives.

Mobile Combustion: Burning of fuels by all vehicles owned or leased by an organization such as cars, trucks, trains, etc.

Process Emissions: Emissions released into the atmosphere generated from industrial and manufacturing processes.

RACI Matrix: A management tool outlining responsibilities in a project: Responsible, Accountable, Consulted, and Informed.

Return on Investment (ROI): A financial metric used to evaluate the profitability of an investment relative to its cost.

Scope 1: Emissions that occur from sources that are on–site or from the direct operations of an organization. This includes stationary combustion, mobile combustion, fugitive, and process emissions.

Scope 2: Emissions that occur from the direct operation of an organization but from indirect sources. This includes the purchase of electricity, steam, heat, or cooling.

Scope 3: Emissions that are the result of activities from assets not owned or controlled by the reporting organization but indirectly impact its value chain. A company's scope 3 emissions do not include any emissions already accounted for in Scope 1 or Scope 2.

SBT / Science-Based Target: Emission reduction targets aligned with scientific findings to limit global warming, as determined and governed by the Science-Based Target initiative (SBTi).

Smart Meters: Advanced meters that monitor and manage energy consumption in real-time, providing detailed insights for users and utility companies.

Stationary Combustion: Burning of fuels to generate electricity, steam, heat, or power in stationary equipment such as boilers for heating buildings, gas furnaces and gas-fired combined heat and power (CHP) plants.

Sub-meter: Additional meters used to measure energy consumption in specific areas or systems within a building.

Supplier Engagement: Collaborative efforts to involve and work closely with suppliers on sustainability and ethical practices.

Sustainability: The practice of meeting the needs of the present without compromising the ability of future generations to meet their own needs, considering economic, social, and environmental aspects.

TSO Protocol: Acronym for "Turn-Stuff-Off" Protocol, an energy-saving practice encouraging individuals or organizations to power down or switch off non-essential equipment, appliances, or lights to reduce energy consumption when not in use.

US EPA: Acronym for "United States Environmental Protection Agency" which is a federal agency overseeing environmental protection regulations in the United States.

WBCSD: Acronym for "World Business Council for Sustainable Development" which is a coalition of businesses committed to sustainability.

WRI: Acronym for "World Resources Institute" which is a global research organization focusing on environmental and sustainability issues.

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