Section: Planning

Task 10: We identify and prioritize energy performance improvement opportunities, and have processes in place to update them.

Getting It Done

1. Develop and document a methodology and criteria for how your organization will identify, prioritize, and update energy performance improvement opportunities.
2. Apply the methodology and criteria you developed to identify, prioritize, and update energy performance improvement opportunities.
3. Update the list of prioritized improvement opportunities at specific intervals and when major changes in sites, equipment, systems, or energy-using processes take place.

Task Overview

Opportunities for energy performance improvement are a key component of the energy review. Energy performance improvement opportunities are identified by examining current practice and determining how it can be improved. This process can bring to light the potential for improved operating practices, equipment and system improvements, and advanced technologies that would benefit your organization.

Opportunities are prioritized in accordance with your organization's criteria to optimize the use of resources.

This guidance is relevant to Section 6.3 d) of the ISO 50001:2018 standard.

Associated Resources Short Description

no resources for this questions

Full Description

Identify energy performance improvement opportunities.

Identification of energy performance improvement opportunities is the responsibility of the energy team. Input from all employees, as well as from external resources, should be solicited and considered as appropriate.

Learn More: **Benefits from implementing energy performance improvement opportunities**

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- Reduced energy consumption
- Decreased operating and energy costs
- Improved operating efficiency
- Environmental improvements

One common method for identifying opportunities is an energy assessment. Energy assessments are an excellent method for collecting data for the energy review (see Task 8 Energy Data Collection and Analysis) and provide a vital source of information for energy management planning, including identification of energy improvement opportunities. Assessments yield a "snapshot" of your organization's current energy performance and offer a list of quantified improvement measures. Assessments can be conducted by the energy manager, members of the energy team or continual improvement teams (e.g., Kaizen teams), corporate energy specialists, external consultants, utility personnel, or university experts.

Learn More: **Energy assessments**

The types of opportunities identified depend on the scope and intent of the assessment, but they may address energy purchasing improvements, better operating and maintenance practices, and renovation or replacement of existing energy equipment. Elements of an energy assessment include the following:

- Determining the scope of an assessment, including buildings, systems, and utility metering
- Reviewing any past energy-optimization projects to help focus the scope of the assessment
- Reviewing past assessments and determining additional or updated information requirements
- Developing the energy assessment plan based on the identified scope
- Conducting the assessment
- Recording the findings of the assessment(s)

Many sources, including national governments, provide a variety of resources for identifying energy savings opportunities in specific energy systems, including a variety of online system assessment tools. System analysis tools are available for compressed air systems, fans, motors, pumps, process heating systems, steam systems, and industrial buildings. As an example, the American Society of Mechanical Engineers (ASME) System Assessment standards also provide guidance on energy system assessments. ASME guidance is available on sites and specific energy systems related to both industrial and commercial organizations.

Personnel working for or on behalf of your organization are generally useful in defining energy opportunities not discovered during an energy assessment. These personnel may be closely associated with energy equipment or processes and may uncover unique opportunities because of their experience. Using this type of asset offers the potential to discover unconventional improvements and engage personnel who otherwise may not be actively involved in energy management.

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Energy assessments are very effective but can be expensive. Other approaches to defining energy performance improvement opportunities are described in the “Learn More” link directly below.

Learn More: **Other approaches to defining energy performance improvement opportunities**

The following sources can help to identify energy performance improvement opportunities:

- Employee suggestions
- Utility representatives
- Service technicians
- Commercial building standards
- Industrial sector standards
- Equipment standards
- Government organizations
- Equipment vendors

The optional Playbook worksheet can be helpful in finding and using other methods to identify opportunities. It identifies several different methods for spotting opportunities, as well as suggested contact points and possible outcomes of applying the method.

Establish criteria for prioritizing opportunities

The next step in energy planning is to prioritize the opportunities. The choice of prioritization method is up to the organization; however, it must be systematic and ongoing. It can be difficult and time-consuming for your organization to process every potential improvement idea; prioritizing them based on defined criteria helps you focus resources on the most practical opportunities.

The following activities will help you develop and apply criteria for prioritizing opportunities:

- Get the right people together.
- Review relevant organizational information.
- Determine criteria.
- Develop tools or techniques for applying criteria.
- Apply criteria to prioritize opportunities.

Get the right people together. Involve individuals from different functions and levels within your organization in developing the criteria for prioritizing your organization’s opportunities. Different points of view will ensure consideration of a wide range of potential factors. If the energy team already has adequate representation from across the various functions and levels, then no additions to the team may be needed. On the other hand, this can be a time to involve other personnel who may bring specific knowledge or experience useful to the process of setting the criteria for prioritizing opportunities. This could include, for example, personnel knowledgeable about your organization’s capital planning or project justification processes.

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Review relevant organizational information. The energy team should gather and review organizational information that may affect the criteria and the approach to be used in prioritizing opportunities. In addition, it may be helpful for the energy team to be aware of any existing risk assessment processes already in use by your organization, and a clear understanding of your organization's safety and environmental risk tolerance.

Learn More: **Relevant organizational information**

Relevant organizational information could include:

- organizational business strategies.
- current hurdles or financial requirements for proposed capital projects.
- operations and maintenance (O&M) projects.
- other types of resource or funding requests.
- production or market forecasts.
- corporate requirements.

Determine criteria. When selecting criteria, consider the organizational information you collected, and develop criteria that will address your organization's needs and requirements.

Learn More: **Criteria examples**

Examples of criteria include:

- estimated energy or cost savings.
- cost of opportunity implementation.
- return on investment, internal rate of return, net present value, and life cycle cost.
- ease of opportunity implementation.
- length of implementation period.
- possible safety, health, and environmental issues.
- maintenance impact.
- production or operational impact.

You determine the type and number of criteria to be used. One or two criteria may be sufficient, or many may be required. You also determine whether scoring or rating scales for each criterion will be established and applied (e.g., a range of energy savings that are acceptable). If only one criterion is to be used, a simple go / no go limit may be adequate. Multiple criteria typically require a process for determining the relative importance of each criteria and how they will be evaluated (see the next activity).

Remember to maintain documented information on the criteria that will be used to prioritize the opportunities. This ensures the criteria are clearly understood and uniformly applied. The optional

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Playbook worksheet can give you some ideas on how criteria can be documented.

Apply criteria for prioritizing opportunities

Develop tools or techniques for applying criteria. You now have developed criteria for prioritizing opportunities. This ensures that your organization's resources are focused on the most viable set of potential energy performance improvement projects. Developing tools or techniques to apply the criteria can make the process of prioritization easier.

If your organization already has the tools to prioritize potential projects, it may make sense to use (or adapt) those same tools for prioritizing energy performance improvement opportunities.

Typically, the criteria used to evaluate projects will have different levels of importance. If the criteria are not equally important, then the energy team should determine the relative weighting.

As an example, within your organization, estimated cost savings may be more important than the ease of implementing the opportunity. In this case, cost savings might be weighted twice as heavily as the ease of implementation criteria.

Apply criteria to prioritize opportunities. Reorder the list of energy opportunities from highest to lowest priority. Use a "reality check" to evaluate the prioritized list; that is, ensure the list makes sense from perspectives that may not be directly reflected by the criteria, and that the opportunities seem to fall in line with the organization's expectations. If one or more of the opportunities appear to not make sense, it may be necessary to reevaluate the criteria or the weightings used for the criteria. Consider the following questions:

- Does the prioritized list make sense with regard to your organization's overall business objectives and plans?
- Are there criteria that have not been considered that have skewed the prioritization?
- Do the weights reflect your organization's priorities?
- Are there any planned organizational or other changes that will affect the prioritized list?

As new energy opportunities are identified, ensure they are prioritized and included in the list.

Implement processes to update the prioritized energy opportunities

As a component of the energy review, the prioritized opportunities for energy performance improvement must be updated at specific intervals and when major changes in sites, equipment, systems, or energy-using processes take place. The specific interval for the updating is defined by your organization. The interval chosen can be the same as that defined for the energy review as a whole, or as defined for other components of the energy review, or defined as an interval specific only to the updating of the energy opportunities. The minimum interval typically chosen by organizations is at least once a year.

Ensuring that energy opportunities are updated when major changes are made should be integrated with the updating of all components of the energy review in response to major changes in sites, equipment,

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systems, and energy-using processes. Such changes can present new opportunities for energy performance improvement, can negate some energy opportunities, or can affect the prioritization of the energy opportunities. The best approach for appropriate updating is to ensure that the relevant personnel (e.g., energy manager, energy team leader, one or more members of the energy team) are included in the planning for the types of major changes mentioned above. To be effective for the EnMS, change management processes must give attention to the effects of the changes on the energy situation of the organization, including the energy review and all its components.

Decarbonization

Identifying and prioritizing opportunities for energy performance improvement is a key component of the energy review process. In adding energy-related GHG emissions reduction opportunities to this process, your organization may want to consider that:

1. Identified energy performance improvement opportunities have an estimate of energy-related GHG emissions reduction associated with them.
2. Opportunities are identified for energy-related GHG emissions types (i.e. Scope 1, 2, or 3) included in the scope and boundaries of the EnMS.
3. Energy-related GHG emissions are included in the opportunity prioritization process.

The choice of prioritization method is up to the organization; however, it must be documented, systematic, and ongoing. When adding energy-related GHG emissions to your criteria, you should develop a process for determining the relative importance of energy-related GHG emissions to the other criteria which will depend largely on the magnitude and speed of GHG emissions reduction your organization seeks to achieve.

It is important to maintain documented information on the criteria that will be used to prioritize the opportunities. This ensures the criteria are clearly understood, uniformly applied, and can be modified if priorities change in the future.

Establishing a new EnMS prioritizing decarbonization

If you do not have an existing 50001 Ready-based EnMS and want to build one that also helps your organization manage energy-related GHG emissions, you should follow the guidance in the “Full Description” tab keeping the following in mind:

1. **Identify energy performance improvement opportunities**. Identify both energy performance improvement opportunities and energy-related GHG emissions reduction opportunities.
2. **Establish criteria for prioritizing opportunities**. When developing your criteria and processes for prioritizing opportunities, include energy-related GHG emissions as one of the criteria. Keep in mind your organization’s GHG-related objectives and targets set in Task 12 Objectives and Targets.
3. **Apply criteria for prioritizing opportunities**. Ensure that any tools or techniques developed for applying the criteria include energy-related GHG emissions.
4. **Implement processes to update the prioritized energy opportunities**. Ensure that your

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process for updating energy opportunities takes into consideration that the relative importance of energy-related GHG emissions in your organization can change and how that might affect the criteria for prioritizing opportunities.

Adapting an existing EnMS to prioritize decarbonization

If you have an existing 50001 Ready-based EnMS and want to adapt it to manage energy-related GHG emissions, you should:

1. **Review your existing energy performance improvement opportunities**. Review your existing list of energy performance improvement opportunities and quantify their energy-related GHG emissions reduction potential. Include which type of GHG emissions (i.e. Scope 1, 2, or 3 emissions) the opportunity addresses. Assess if the current list aptly covers your organization's GHG emissions reduction opportunities.
2. **Update your criteria for prioritizing opportunities**. Update your criteria for prioritizing opportunities to include energy-related GHG emissions. Keep in mind your organization's GHG-related objectives and targets set in Task 12 Objectives and Targets.
3. **Apply criteria for prioritizing opportunities**. Apply the updated criteria to your list of opportunities. Keep in mind that adding energy-related GHG emissions to your criteria and process may significantly change the priority of projects.
4. **Review your processes to update the prioritized energy opportunities**. The relative importance of energy-related GHG emissions may change over time, so have a process in place to adjust the weighting of GHG emissions when prioritizing opportunities.

Commercial ERP

The guidance for this task is from the following sections from the ERP Framework: ERP Framework Introduction and Milestones 2, 3, 4, and 5.

The ERP Framework guides organizations to systematically develop and evaluate scenarios at the portfolio level and proactively plan for the resources needed to complete actions in their buildings. This approach moves organizations from implementing individual ad hoc projects toward a path of transforming and improving their entire portfolio in a holistic and systematic fashion.

With ambitious GHG emissions reduction goals, most or all buildings within a portfolio will likely need to implement some level of emissions reduction measures. However, organizations are often challenged with how to understand the magnitude of the emissions reduction opportunities in a large portfolio of buildings without conducting assessments at each building. The purpose of this task is to categorize the buildings within the portfolio to identify representative buildings that cover the diversity of building types and systems. Start by defining the key characteristics that differentiate your buildings. Next, use these characteristics to categorize buildings in the portfolio. You will then selects a sample of buildings for decarbonization audits that represent the different categories. The results from the representative building audits are scaled across similar buildings to estimate emissions reduction impacts and develop potential scenarios at the portfolio level. Vehicle fleets should also be included as a portfolio-wide measure. (Milestone 2) *Please refer to the full ERP Framework for more information on District Heat*

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Studies, Green Power Procurement, and Fleet Emissions.

After categorizing building portfolios, the organization will move forward with GHG emissions reduction audits on the representative buildings as described above and assess additional measures at the portfolio level, such as green power procurement. The Emissions Reduction Audits serve three main purposes:

1. Define packages of emissions reduction measures (ERMs) to implement that achieve targets for a building.
2. Define measure packages for each category of buildings in the portfolio to support scaling audit results across the portfolio.
3. Define individual measures to apply through portfolio-wide policies and requirements.

These actions will allow the organization to select ERMs to implement immediately. While emissions reduction audits of representative buildings may not capture unique opportunities at each building in the portfolio, they will identify the appropriate strategies to apply within each building category. Furthermore, the results from these audits can be scaled across the portfolio to estimate emissions reductions as described further in Task 13 (Action Plans for Continual Improvement). Other approaches might be used when developing emissions reduction estimates (including a comparison to benchmarks like ENERGY STAR or automated building-stock analysis). Emissions reduction audits can support these approaches by facilitating the rapid implementation of identified emissions reduction opportunities and increasing the accuracy of the analysis. (Milestone 2)

The emissions reduction audit results in the following types of measures that are combined into packages of measures that meet the building's GHG reduction target (Milestone 3):

- Energy efficiency
- Electrification (e.g., using heat pumps rather than
- electric resistance heating)
- Fugitive emissions (e.g., mitigating refrigerant leaks; use of low-GWP refrigerants)
- On-site renewable energy

Further, building audits and portfolio assessments will result in measures that can be implemented as standard practice across the portfolio. Table below contains examples of portfolio-level practices to be considered. (Milestone 3)

Portfolio Level Policies and Requirements

Policy/Requirement	**Description**
Renovation/refresh requirements	Renovation and refresh requirements that incorporate energy efficiency, deep retrofits, and electrification. For example, include LED lighting and advanced lighting control into organizational guidelines.
Equipment purchasing and upgrade requirements	Performance standards that promote efficiency and limit the installation of new fossil fuel combustion equipment whenever feasible

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Operations and maintenance (O&M) practices	Requirements for building operations with a decarbonization focus for internal O&M staff and external contractors
New construction design specifications	Design specifications that minimize or eliminate emissions generated from new construction, such as energy use or GHG intensity targets, a net zero energy target, and all-electric buildings.
Building automation system upgrades	Common sequences and setpoints for building automation systems (BAS) and a plan to modernize the BAS
Energy management and information systems (EMIS)	Requirements for tracking, visualizing, and analyzing energy, carbon, and BAS data from disparate sources
Grid integration	Policies that promote responsiveness to electric grid conditions, including demand response and energy storage measures
Low global warming potential (GWP) refrigerants	Policies to monitor refrigerant use, identify leaks, and phase-in low-GWP refrigerants
Vehicle purchasing requirements	Requirements for electric or alternative fuel vehicles based on review of organizational needs
Staffing	Staffing policies to effectively implement the ERP, including energy management, sustainability, facilities, and procurement
On-site solar screening	Screening for on-site solar opportunities through a portfolio-level review
Green lease policy	Organizational policies for green leases (new and renewals) that align financial benefits of sustainability initiatives to both parties
Training policies	Ensuring that current personnel have ongoing training to maintain and enable further GHG emissions reductions

By developing and analyzing multiple scenarios, an organization can compare the costs and benefits of each scenario and select a decarbonization pathway that best meets their needs. (Milestone 4) After developing multiple emissions reduction scenarios, an organization will assess which scenario best meets its organizational needs and defines a final emissions reduction pathway. The evaluation criteria defined in the Emissions Reduction Plan scope of work are applied at this phase to determine the relative merits of each scenario (see examples in table below). (Milestone 5)

Evaluation Criteria

Evaluation Criteria	**Description**
Economic Evaluation	Assess the comparative economic performance between scenarios, taking into consideration the financial criteria used in the organization (lifecycle cost, net present value, return on investment, simple payback).
Emissions Reductions	Compare the emissions reduction potential of each scenario, including the certainty of meeting emissions reduction targets.
Operational Impacts	Assess the comparative impact to facilities operations, including maintainability, disruption, and system complexity.
Occupant Benefits	Identify whether certain scenarios may provide additional benefits to building occupants, including health and wellness.
Resilience	Assess which scenarios will best position the organization to support occupants, business services, and assets during extreme events.

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Risk Management	Identify how each scenario will address the regulatory and financial risks from performance standards, carbon charges, and supply disruptions.
Equity	Assess the equity impacts of each scenario, identifying opportunities to align investment decisions in ways that strengthen environmental justice.

Prioritize measures that use less energy or avoid emissions, then transition to low-carbon energy sources and low global warming potential (GWP) refrigerants, with the goal of reducing emissions without the use of carbon offsets. The scope of the plan will include both near-term actions and a transition to low- to no-carbon operations in the longer term. Near-term strategies such as electrification-readiness efforts will prepare organizations for deep emissions reduction projects across their portfolio as the electric grid decarbonizes over the next few decades. The planning horizon for the ERP is 10–20 years, depending on an organization's goals. The framework lays the groundwork for applying technical strategies to reduce on-site emissions across a portfolio.

Industrial ERP

The processes for identifying and prioritizing energy performance improvement opportunities and GHG emissions reductions are very similar, and the prioritized energy performance opportunities will often result in emissions reductions. However, evaluation criteria must be clearly defined to address situations when an energy performance improvement opportunity may increase emissions, or when an emissions reduction opportunity may increase energy consumption. The scenario development process described in Milestone 4 of the ERP Industrial Framework will be helpful in resolving such issues.

The guidance for Task 10 is found within the following sections of the ERP Industrial Framework:

Milestone 2:

Select systems for further analysis – Decide which systems and facilities in the portfolio to prioritize. Generally, this means prioritizing SGEs – though organizations may prioritize based on cost, location, ease of technology piloting, scalability, or other characteristics. These priorities may depend on the organization (e.g., appetite for risk), the current policy environment (e.g., state, local, or utility policies, programs, and incentives that encourage organizations to prioritize emissions reductions in certain regions), or market conditions (e.g., relative fuel prices).

Milestone 3:

Facility-level GHG Emissions Reduction Assessments – Conducting facility-level assessments allows organizations to gain insight into individual facilities' GHG emissions and identify, quantify, and prioritize emission reduction measures (ERMs). Such an assessment should go beyond a traditional energy audit by identifying many types of ERMs, not just energy efficiency opportunities. Furthermore, potential ERMs should primarily be assessed on emission reduction potential, not energy or cost savings.

Identify ERMs - Examine the facility's energy use, production needs, operational characteristics, and other factors to identify ERMs. Depending on the facility and the processes involved, ERMs may include adopting energy efficiency, electrification, renewable fuels and energy sources, and carbon capture strategies.

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Evaluate and Prioritize Options - Evaluate the potential impact and feasibility of the identified ERMs by analyzing the costs, benefits, and risks associated with each. Co-benefits should also be assessed and quantified whenever possible. Often, ERMs can yield additional improvements to safety, productivity, product quality, waste reduction, and more. Simple cost analysis may dissuade organizations from implementing ERMs that in reality show strong returns when assessed using comprehensive financial tools and analysis. While prioritizing the ERMs, take into consideration other important parameters such as the regulatory requirements for GHG emissions in the region and scalability/replicability. It is important to recall that the emission reduction potential of an individual ERM is likely to be affected by which other ERMs are implemented concurrently and how the organization procures energy over the course of an ERM's duration (e.g., expected grid emissions factor over the lifetime of electrical equipment).

Facility-level ERMs can be classified into four technology pillars, as outlined in DOE's Industrial Decarbonization Roadmap. The four pillars are:

- Energy Efficiency
- Electrification
- Low Carbon Fuels, Feedstocks, and Energy Sources (LCFFES)
- Carbon Capture, Utilization, and Storage

Portfolio-level GHG Emissions Reduction Assessment – Conduct a portfolio-level GHG emissions reduction assessment to identify, quantify, and prioritize ERMs that are implemented, led, and/or approved at the portfolio level, such as strategic energy management, clean energy procurement, demand management/load flexibility, circular economy strategies, or strategic business changes. This can also help companies understand the risks and opportunities associated with transitioning to a low-carbon economy. For a complete list of portfolio-wide ERM examples, you can refer to the ERP Framework document.

Milestone 4:

Combining inputs to develop multiple scenarios – There are different technical approaches to scaling the results from facility-level assessments to the broader portfolio. The scaling should identify which measures are related to specific categories and apply emissions projects appropriately. This process may include scaling using:

- Energy system type (steam, process heating, etc.)
- Energy use intensity
- Equipment capacity
- Facility location
- Available space

Context will dictate which method is most relevant – e.g., organizations may initially scale electrification projects in regions where the grid's emissions factor is the lowest, or they may prioritize fuel-switching in systems that currently use higher carbon intensity fuels, such as coal.

- The phasing (or timing) of different ERMs will depend on factors such as:

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- Technical feasibility
- Cost-effectiveness
- Availability of resources
- Regulatory environment (e.g., fuel switching and safety regulations)
- Market conditions
- Grid electricity decarbonization projections
- Other sustainability goals

Milestone 5:

Assess scenarios and select pathway – After developing multiple emissions reduction scenarios (Milestone 4), assess which one best meets organizational needs using the evaluation criteria defined in Milestone 1, selecting it as the emissions reduction pathway. This will be a pathway that not only satisfies expected emissions reductions, but also optimizes additional criteria as much as possible based on organizational priorities.

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