Section: Operation

Task 18: We consider energy performance improvement opportunities and operational controls when designing new, modified, or renovated sites, equipment, systems, and processes.

Getting It Done

1. Identify the sites, equipment, systems, and processes that can have significant impact on energy performance.
2. Incorporate consideration of energy opportunities and operational controls in design projects.
3. Include results of energy performance considerations in specification, design, and procurement activities, where applicable.
4. Retain records of the results of design activities related to energy performance.

Task Overview

In ISO 50001, the design requirements are not associated with the design of products or services to be sold or offered as a service; they are applicable to the development of new, modified, and renovated sites, equipment, systems, and processes that can have a major impact on energy performance within the scope of the energy management system (EnMS). These requirements incorporate consideration of energy performance improvement opportunities and operational controls into design activities. This can provide the basis for more innovative and energy-efficient designs.

This guidance is relevant to Section 8.2 of the ISO 50001:2018 standard.

Associated Resources Short Description
no resources for this questions

Full Description

Identify energy uses that have significant impact on energy performance

Any sites, equipment, systems, or processes that are within the scope of the EnMS that can or will significantly impact energy performance fall under the design requirements of ISO 50001. This means that energy performance improvement opportunities and operational controls must be considered when you design, renovate, or modify any sites, equipment, systems, and processes that can significantly impact your energy efficiency, energy use, and energy consumption.

Depending on project specifics, items that can significantly affect energy performance include sites,

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equipment, systems, or processes associated with:

- Management and operation of significant energy uses
- Achievement of energy objectives, targets, and action plans
- Energy performance indicators (EnPIs)

Incorporate consideration of energy opportunities and operational control in design projects

When designing new sites, equipment, systems, and processes, or renovating or modifying existing ones, think about how they can or will affect your organization's energy performance. Identify:

- Potential energy performance improvements that can be considered for the design
- Any operational controls that may be needed, including controls necessary to achieve energy performance improvement and minimize or appropriately manage the impacts of the design on your organization's energy performance

Examples of design for energy performance improvement include the following:

- Design lighting to automatically adjust according to the amount of daylight present. (equipment)
- Design air conditioning systems to use a water-cooled central chiller instead of an air-cooled split system for cooling. (system)
- Design the molding process such that hydraulic pumps only pump the volume needed instead of operating at full speed and pumping full volume. (processes)

Some questions to ask when designing new, modified, or renovated sites, equipment, systems, and processes include:

- What characteristics of this item impact energy consumption (past, current, or future)?
- Where and how can energy consumption be reduced?

When evaluating the opportunities for improving energy performance, consider the following:

- How will the existing sites, equipment, systems, and processes be modified?
- What specific items can be changed to optimize energy use and reduce energy consumption over time?
- What is the right energy source for this application?
- What are the technological options?
- What operational controls are needed to achieve and sustain design intended energy performance?

For energy-optimized designs to achieve their full potential, the design process should be coupled with proper operational controls. Since equipment controls can be bypassed or disabled, an operational control strategy should be combined with optimized design to ensure anticipated energy savings are achieved.

The optional Playbook worksheet can be useful in identifying and evaluating energy performance improvement opportunities and operational controls in design activities.

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Learn More: **Example Misapplications of Energy-Efficient Technologies**

When designing or upgrading sites, equipment, systems, or processes that can significantly impact energy performance, it is important that close attention be paid to how new energy-efficient technology is specified, applied, and used to avoid misapplications. Installation of “energy-efficient” equipment does not ensure improved efficiency if the retrofit is not properly specified. And, no energy efficient technology will capture savings when installed or programmed incorrectly.

As an example, consider energy efficient air conditioner induction motors. Premium efficiency motors are manufactured using high quality materials to reduce losses, and they consistently demonstrate energy improvements of 2 to 5 percent over standard motors. A downside of improved efficiency is that in most cases energy-efficient motors operate at higher speeds than standard motors. This presents a problem in centrifugal device applications such as pumps and fans because higher speed corresponds to higher energy consumption. When replacing standard motors with energy-efficient motors in centrifugal applications, ensure that the replacement motor has the same rated speed as the original, or increased energy consumption will result.

Another example related to improper installation of energy-efficient technology concerns air-side economizers. Air-side economizers are a common approach to energy savings in new or retrofit sites. The economizer is a set of outside air dampers that is controlled to bring in outside air when its temperature is below that of the return air. While this technology is a proven method to reduce cooling costs in buildings, a recent survey by the California Energy Commission found that almost 70 percent of the installed airside economizers were not functioning correctly and, consequently, not saving energy. Misapplications discovered included dampers not connected to actuators so they would not open, and improperly programmed controls that fail to open the dampers when the outside conditions are cool enough. These installation errors should be identified and corrected during construction.

Include energy performance considerations in specification, design, and procurement

Once the questions above have been answered, take action to improve energy performance. The results of the energy performance considerations must be incorporated, where applicable, into the specification, design, and procurement activities related to the project. This should ensure that the decisions on energy efficiency related to the design are carried out. Incorporating results into procurement specifications and activities keeps the purchasing department involved, ensures their awareness of procurement requirements to support energy performance improvements, and provides the justification for any additional costs.

When designing or upgrading sites, equipment, systems, or processes that can significantly impact energy performance, pay close attention to how new energy-efficient technology is specified, applied, and used in order to avoid misapplications. Installation of “energy-efficient” equipment does not ensure improved operation or energy savings if the retrofit is not properly specified. Moreover, no energy-efficient technology will capture savings when installed or programmed incorrectly.

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Record results of design activities

Retain documented information on the results of design activities to show energy considerations were properly addressed. This can take a variety of forms, such as completed checklists, meeting minutes, design drawings, purchasing specifications, and project records.

Learn More: **Energy Considerations in Design**

Recommendations for Energy Considerations in Design

- Energy Consideration in Design is not intended to apply to products and services, but rather sites, equipment, and systems.
- Sites, equipment, and systems to be improved through design should be associated with SEUs, EnPIs, and energy objectives and targets.
- Proper implementation of design projects for energy performance improvement should include proper operational control.

Decarbonization

When adding control of energy-related GHG emissions to the EnMS, your organization should consider energy performance improvement and energy-related GHG emission reduction opportunities, and operational controls that affect energy-related GHG emissions when you design, renovate, or modify any sites, equipment, systems, and processes that can significantly impact the objectives of your EnMS.

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, in addition to the guidance for the energy management system you should:

1. **Identify energy uses that have a significant impact on energy performance**. Identify energy uses, such as processes or equipment, that can have a significant impact on energy-related GHG emissions. Consider energy-related GHG emissions performance improvement opportunities and operational controls when you design, renovate, or modify any of these sites, equipment, systems, or processes.
2. **Incorporate consideration of energy opportunities and operational control in design projects**. Include design considerations for reducing energy-related GHG emissions. This can include:
    a. Potential energy-related GHG emission reductions that can be considered for the design (such as choosing equipment that uses lower energy-related GHG emitting fuels)
    b. Any operational controls that may be needed, including controls necessary to achieve energy-related GHG emission reductions and minimize or appropriately manage the impacts of the design on your organization’s energy-related GHG emissions

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3. **Include energy performance considerations in specification, design, and procurement.** Ensure the results of energy-related GHG emissions considerations are incorporated into the specification, design, and procurement activities related to the project. Communicate the additional considerations to the appropriate personnel. This can include procurement, design, engineering, and maintenance personnel. Ensure that action is taken to improve energy-related GHG emissions performance.
4. **Record results of design activities.** Retain documented information on the results of design activities to show energy-related GHG emissions considerations were properly addressed.

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. **Identify energy uses that have a significant impact on energy performance**. If one exists, review your current list of the energy uses that can have a significant impact on energy performance. Add to that list any processes or equipment that can have a significant impact on energy-related GHG emissions. Consider energy-related GHG emissions performance improvement opportunities and operational controls when you design, renovate, or modify any of these sites, equipment, systems, or processes.
2. **Review the consideration of energy opportunities and operational control in design projects**. Include additional design considerations for reducing energy-related GHG emissions. This can include:
    a. Potential energy-related GHG emission reductions that can be considered for the design (such as choosing equipment that uses lower energy-related GHG emitting fuels)
    b. Any operational controls that may be needed, including controls necessary to achieve energy-related GHG emission reductions and minimize or appropriately manage the impacts of the design on your organization's energy-related GHG emissions
3. **Include energy performance considerations in specification, design, and procurement.** Ensure the results of energy-related GHG emissions considerations are incorporated into the specification, design, and procurement activities related to the project. Communicate the additional considerations to the appropriate personnel. This can include procurement, design, engineering, and maintenance personnel. Ensure that action is taken to improve energy-related GHG emissions performance.
4. **Record results of design activities.** Retain documented information on the results of design activities to show energy-related GHG emissions considerations were properly addressed.

Commercial ERP

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

Buildings with planned renovations or retrofits represent a prime opportunity to include low-carbon designs into existing efforts and should also be prioritized for emissions reduction audits. (Milestone 2) The amount of growth or contraction of the portfolio floor area is another key input into the emission

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reduction scenario analysis. Building acquisitions or sales and new construction plans will impact portfolio-level emission reduction estimates. Potential changes in building use (such as conversion from an office to a lab) can alter emissions and provide an opportunity to incorporate decarbonization into associated renovations (Milestone 4).

Energy efficiency and decarbonization practices for new construction will also affect the emissions impact of portfolio changes. Consider developing net zero energy and all- electric specifications for new construction to avoid the need to mitigate these emissions again in the future. It is typically more cost-effective to reduce a building's emissions during design and construction than after it is built. Ensure capital planning departments are properly incentivized to incorporate and retain decarbonization components in the design and construction of new facilities. (Milestone 4)

Industrial ERP

This task relates to considering energy performance when specifying and designing new equipment, systems, or services. Likewise, potential emissions reduction measures and scenarios for deploying these measures should be evaluated for feasibility and potential impact on emissions.

The guidance for Task 18 is found within the following sections of the ERP Industrial Framework:

Milestone 3:

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).

Ongoing Implementation:

Develop work plan – Develop a work plan for the ERP that outlines actions, sets timelines, and assigns personnel and capital. This provides accountability for the projects being implemented. Quantify risks and constraints for ERMs to predict potential delays in implementation. Build in time and resources for analysis, design, implementation, testing, and training for new projects.

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