**Date last modified/updated:** Click here to enter a date. **Internal audit:** Click here to enter a date.

**Who last modified/updated:** Click here to enter text. **Management review:** Click here to enter a date.

**This part of the Navigator Playbook is completed when you have:**

1. **Determined what data or information is needed to establish trends in EnMS performance, including trends in nonconformities, corrective actions, and results in monitoring and measurement, internal and external audits, and evaluations of compliance with applicable energy-related legal and other requirements.**
2. **Determined what data or information is needed to monitor, measure, analyze and evaluate the results of the EnMS and its effectiveness as related to the intended outcomes of your EnMS and the strategic goals and priorities of your organization.**
3. **Determined the methods to be used, when the monitoring and measurement will be done, and when the results will be analyzed and evaluated.**
4. **Implemented the monitoring, measurement analysis of EnMS performance and the evaluation of EnMS effectiveness.**
5. Determine what data or information is needed to establish trends in EnMS performance, including trends in nonconformities, corrective actions, and results in monitoring and measurement, internal and external audits, and evaluations of compliance with applicable energy-related legal and other requirements.

|  |  |  |
| --- | --- | --- |
| [ ]  | We have established a process for determining the results of the management system and for connecting these results back to top management’s expectations and the organization’s strategic direction and priorities. | We have a mind map connecting records to top management’s expectations to track results of processes in the EnMS. |
| [ ]  | These expectations and priorities include:  | Click here to enter text. |

[ ]  Cost savings

[ ]  Reduction of CO2 emissions

[ ]  Reduced risks to security of energy supply

[ ]  Improved community relations

[ ]  Other Click here to enter text.

[ ]  Other Click here to enter text.

|  |  |  |
| --- | --- | --- |
| [ ]  | We have evaluated the effectiveness of the EnMS using the performance evaluation and improvement processes of the EnMS as outlined below: | We attest to these elements through the 50001 Ready Navigator.  |

[ ]  Monitoring, measurement and analysis (this task).

[ ]  Evaluating compliance with the applicable energy-related legal and other requirements (People and Legal Requirements Affecting the EnMS task).

[ ]  Performing internal audits to provide information on whether the EnMS is effectively implemented and maintained (Internal Audits task).

[ ]  Management review of the EnMS’s ongoing suitability, adequacy, effectiveness and alignment with the strategic direction of the organization (Management Review task).

[ ]  Finding and fixing nonconformities and problems in the management system (Corrective Actions task).

|  |  |  |
| --- | --- | --- |
| [ ]  | We have developed trend information on EnMS performance and prepared it for review by top management and evaluation of EnMS effectiveness. This trend information includes: | We use our standardized trend report document to share information with top management during our management review meeting. |

[ ]  Nonconformities

[ ]  Corrective actions

[ ]  Monitoring and measuring results

[ ]  Results of EnMS internal audits

[ ]  Results of EnMS external audits (if applicable)

[ ]  Results of evaluations of compliance with applicable energy-related legal and other requirements

*The following worksheet can be useful in identifying the compliance evaluation trend information, along with other data and metrics related to trends in EnMS performance that will be monitored, measured and analyzed for management review and the evaluation of the EnMS effectiveness.*

Monitoring and Measurement of Key Characteristics Planning Worksheet

**Date:** Click here to enter a date. **Prepared by:** Click here to enter text.

**Key Characteristic: Energy sources, Current energy use and consumption**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Energy Source/****Energy Use/****Energy Consumption** | **Department** | **How will it be monitored/ measured?** | **How often will it be monitored/ measured?** | **How will the data be analyzed?** | **What calibration is required?** |
| Solar Energy | Click here to enter text. | We have generation tracking software | We will monitor generation weekly | Calculate weekly average | Click here to enter text. |
| Natural Gas | Facilities | Using utility bills  | Monthly | Normalized using square footage and occupancy average | Click here to enter text. |
| Fossil fuel based electricity | Facilities | Using utility bills | monthly | Normalized using square footage and occupancy average | Click here to enter text. |

**Key Characteristic: Significant energy uses**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Significant Energy Use** | **Department** | **How will it be monitored/ measured?** | **How often will it be monitored/ measured?** | **How will the data be analyzed?** | **What calibration is required?** |
| Wet Lab | Biofuels Research | Building electricity meters and user logs | monthly | Normalize consumption by area and occupancy | Click here to enter text. |
| Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. |
| Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. |

**Key Characteristic: Variables affecting significant energy uses**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Significant Energy Use Variable** | **Department** | **How will it be monitored/ measured?** | **How often will it be monitored/ measured?** | **How will the data be analyzed?** | **What calibration is required?** |
| Temperature | n/a | Click here to enter text. | annually | Use monthly averages to eliminate required analysis  | Click here to enter text. |
| Humidity | n/a | Click here to enter text. | annually | Use monthly averages to eliminate analysis requirement | Click here to enter text. |
| Building occupancy | Biofuels Research | Using approximations from work records | Monthly | Monthly averages will be calculated to align with electricity consumption data | Click here to enter text. |

**Key Characteristic: Future energy use and consumption of the significant energy uses**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Future Energy Use/Consumption** | **Department** | **How will it be monitored/ measured?** | **How often will it be monitored/ measured?** | **How will the data be analyzed?** | **What calibration is required?** |
| Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. |
| Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. |
| Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. |

**Key Characteristic: Energy Performance Indicators (EnPIs)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EnPI** | **Department** | **How will it be monitored/ measured?** | **How often will it be monitored/ measured?** | **How will the data be analyzed?** | **What calibration is required?** |
| kWh/sq ft | all | Utility bills | We collect bills monthly, and measure performance annually | We will calculate simple ratios, and track relationship with other variables using the EnPI tool. | Click here to enter text. |
| kWh/occupation | Biofuels Research | Utility bills and badge-in records | Monthly, and measurement will occur annually | We will calculate simple ratios | Click here to enter text. |
| kWh/month | all | Utility bills | Monthly, and measurement will occur annually | We will use the EnPI tool | Click here to enter text. |

**Key Characteristic: Action plan completion and effectiveness in achieving objectives and targets**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Action Plan/****Objectives and Targets** | **Department** | **How will it be monitored/ measured?** | **How often will it be monitored/ measured?** | **How will the data be analyzed?** | **What calibration is required?** |
| AP: Motion-sensor lights  | Biofuels Research | Utility bills; bi-annual testing of the switching | Monthly, and measurement will occur annually | We will calculate simple ratios | Click here to enter text. |
| Ob: Reduce data center electricity consumption | Computing and Data Analytics | Utility bills | Monthly monitoring and annual measurement | We will use EnPI lite tool to track performance | Click here to enter text. |
| Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. |

**Key Characteristic: Prioritized energy performance improvement opportunities**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Energy Improvement Opportunity** | **Department** | **How will it be monitored/ measured?** | **How often will it be monitored/ measured?** | **How will the data be analyzed?** | **What calibration is required?** |
| Motion-sensor lights  | Biofuels Research | Utility bills; bi-annual testing of the switching | Monthly, and measurement will occur annually | We will calculate simple ratios | Click here to enter text. |
| Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. |
| Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. |

**Key Characteristic: Actual vs. expected energy consumption**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Actual vs. Expected Energy Consumption** | **Department** | **How will it be monitored/ measured?** | **How often will it be monitored/ measured?** | **How will the data be analyzed?** | **What calibration is required?** |
| Electricity used at this site | all | Utility bills | We will monitor monthly and measure annually | We will measure by maintaining records of monthly electricity consumption and consumption per sq ft/month and compare measurements over time | Click here to enter text. |
| Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. |
| Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. |

1. Determine what data or information is needed to monitor, measure, analyze and evaluate the results of the EnMS and its effectiveness as related to the intended outcomes of your EnMS and the strategic goals and priorities of your organization.

|  |  |  |
| --- | --- | --- |
| [ ]  | We reviewed the outcomes, strategic goals and issues that were developed in the task addressing An EnMS and Your Organization. | We have a ‘MS Map’ visually representing the relationship between different elements of the system and the outcomes goals and issues  |
| [ ]  | We developed metrics for the EnMS that align with and support these outcomes, goals and priorities.  | We use our EnPIs to quantify our objectives, outcomes, and goals. We design objective criteria ranking tables to outline objective prioritization processes. |
| [ ]  | We have obtained input from top management as appropriate. | Top Management has approved the elements of the EnMS in management briefings and review meetings. |

1. Determine the methods to be used, when the monitoring and measurement will be done, and when the results will be analyzed and evaluated.

[ ]  We have determined the monitoring and measurement methods to be used and when to evaluate results.

We have detailed these methods in the above tables.

*The following worksheet can be helpful in determining and capturing when monitoring and measurement will be done and when results will be analyzed and evaluated. These results will help support your consideration of the timing of internal audits, compliance evaluations, strategic planning and management reviews.*

Energy Measurement Plan Worksheet

Using the output from the Monitoring and Measurement of Key Characteristics Planning Worksheet, complete the following worksheet to develop your Energy Measurement Plan.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **System/ Process/ Equipment and Location** | **What data is collected?** | **How will it be monitored/ measured?** | **How often will it be monitored/ measured?** | **Who is responsible for monitoring and measurement?** | **What calibration is required?** | **What operational control/ maintenance/ design procurement action or action plan is it linked to?** | **Where is data recorded?** | **How is data analyzed?** | **What significant deviation requires action?** | **How does this demonstrate performance?** |
| Biofuel Wet Lab Research | kWh consumed monthyl, occupancy, temperature, humidity | We will use EnPI tool to assess performance. We also calculate simple ratios to assess per occupant | Monthly monitoring and annual measurement | Energy Manager | Click here to enter text. | This is linked to our procurement of motion sensor light switches, as detailed in the pertinent action plan | We record data in our EnMS data shared drive folder | We analyze data using simple calculation and EnPI tool as needed.  | Significant deviation is a 5% increase in consumption relative to a 2019 baseline | Reduced energy consumption in this SEU aligns with our related objective and targets. This also contributes to our policy-level goals to reduce consumption. |
| Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. |
| Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. |
| Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. |
| Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. |
| Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. | Click here to enter text. |

1. Implement the monitoring, measurement analysis of EnMS performance and the evaluation of EnMS effectiveness.

[ ]  We performed our compliance evaluations as prescribed under the task guidance for Legal Requirements Affecting the EnMS and all necessary information has been collected.

[ ]  We initiated the collection, monitoring, measurement and analysis of the information needed to develop trend in the results and have implemented these as an integral part of the compliance evaluation process.

[ ]  We implemented the monitoring and measurement activities needed to analyze the results related to specific strategic goals and priorities and the achievement of specific intended outcomes.

[ ]  We have recorded all of our monitoring and measurement activities and are retaining them as documented information.

Hint: Monitoring

* This task draws heavily on information gathered in the Energy Review, so make sure all data is well documented and organized.
* Continual improvement for this task means that there is no set order to monitoring SEUs, relevant variables, action plans, improvement opportunities, and improvement projects.
* Key characteristics can be used to assess the performance of other key characteristics, such that improvement projects can be monitored by evaluating SEU performance.

[ ]  We are monitoring our implemented projects and have listed details below:

(Note: Table may be modified to accommodate unique criteria)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Implemented Project | When implemented | SEU addressed | Baseline Consumption | Monitoring plan/methods | SEU Performance Improved? | Action Plan changes | Improvement opportunities Identified |
|      Motion Sensor light in Biofuels Wet Lab |       |      Biofuels Wet Lab |       |      We monitor this project through monthly electric utility bills |      yes |      no |      n/a |
|       |       |       |       |       |       |       |       |
|       |       |       |       |       |       |       |       |
|       |       |       |       |       |       |       |       |
|       |       |       |       |       |       |       |       |

Click here to enter text.

Top Management Approval

|  |  |  |
| --- | --- | --- |
| [ ]  | Date approved: | Click here to enter a date. |
| [ ]  | Who approved: | Click here to enter text. |

Comments