Module 9: Monitoring and Measurement of Results
Put energy management into practice

At the end of this module you will be able to…

Develop energy monitoring and measurement plan

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Content

○ ISO50001 & Higg FEM references

○ Possible ways of performance monitoring

○ Establishing auditing mechanism

○ Management review

○ Reporting performance

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Requirements as per ISO50001

ISO50001 references

9.1 Monitoring, measurement, analysis and evaluation of energy performance and the EnMS

- Develop Monitoring & Measuremet plan

- Evaluate its energy performance and the effectiveness of the EnMS

- Improvement in energy performance shall be evaluated by comparing EnPI value(s) against the EnB(s)

- Investigate and respond to significant deviations in energy performance.

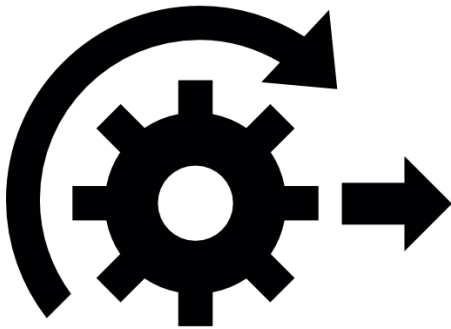- Evaluation of compliance with legal requirements and other requirements

9.2 Internal Audit

9.3 Management Review

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Requirements as per Higg FEM

Higg FEM references

- – Demonstrated continual improvements compared to baselines (Level 2)
- – Develop Science-Based Targets (Level 3)

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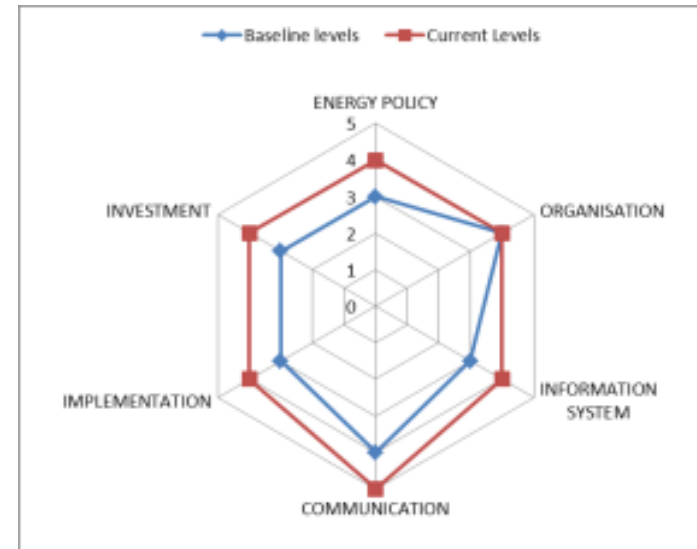# Monitoring and reviewing progress and performance

Examples of tools

- EnMS Maturity Matrix

- CbD 10 Best Practices Assessment Tool

- Eco map

- Audit protocol as per Higg FEM

- Checklist tools

- …

Using EnMS Maturity Matrix

- Maturity Matrix is a useful tool to carry out a brief self-check and quickly assess where a facility might stand with regard to energy management.

- The indicators of the Maturity Matrix describe what successful energy management implies.

Baseline levels — Current Levels

ENERGY POLICY
5
4
3
2
1
0
INVESTMENT — ORGANISATION — INFORMATION SYSTEM — COMMUNICATION — IMPLEMENTATION

Company LEVEL	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
ENERGY POLICY	No energy policy	General guidelines but not documented.	Written energy policy set by management but not adopted.	Formal energy policy established with objectives and targets but weak implementation due to lack of committment from top management (Not part of Management Reviews).	Documented and communicated Energy Policy with; defined scope & boundaries, measurable energy objectives & targets, commitment to legal & other compliances, supporting energy efficiency in purchasing, and is integreal part of management reviews.

Company LEVEL	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
ORGANISATION	No energy management or any formal delegation of responsibility for energy consumption.	Energy management is the part-time responsibility of someone with limited authority or influence, mostly from technical side but no links to financial department.	Energy manager assigned, reporting to ad-hoc committee, but line management and authority are unclear.	Energy manager and energy team members are nominated by top management comprising of technical, financial and purchase departments but roles and responsibilities are unclear	Energy management fully integrated into management structure. Clear delegation of responsibility for energy consumption. Energy planning is conducted on defined intervals including energy profiling and energy Reviews, leading to clearly set energy action plans and is integral part of management reviews.

Monitoring and reviewing progress and performance - Using Maturity Matrix tool
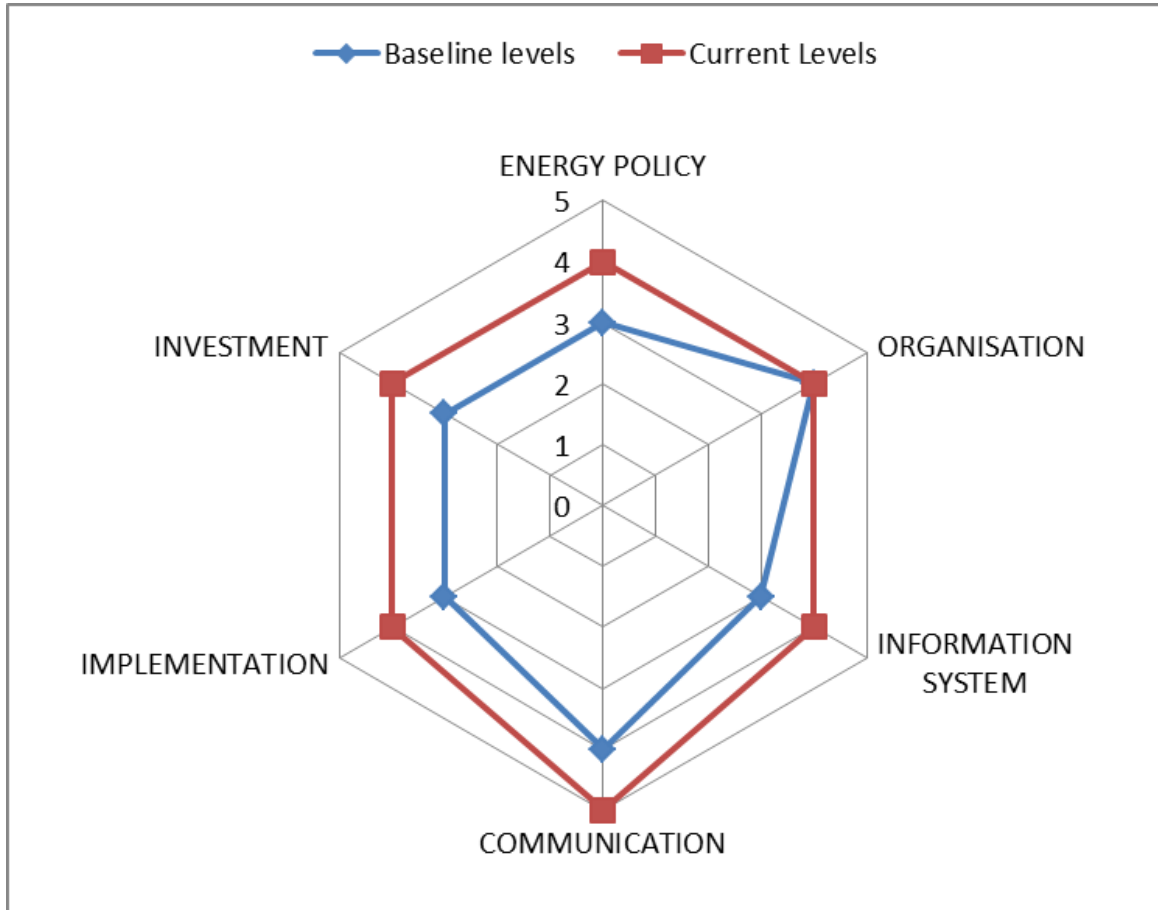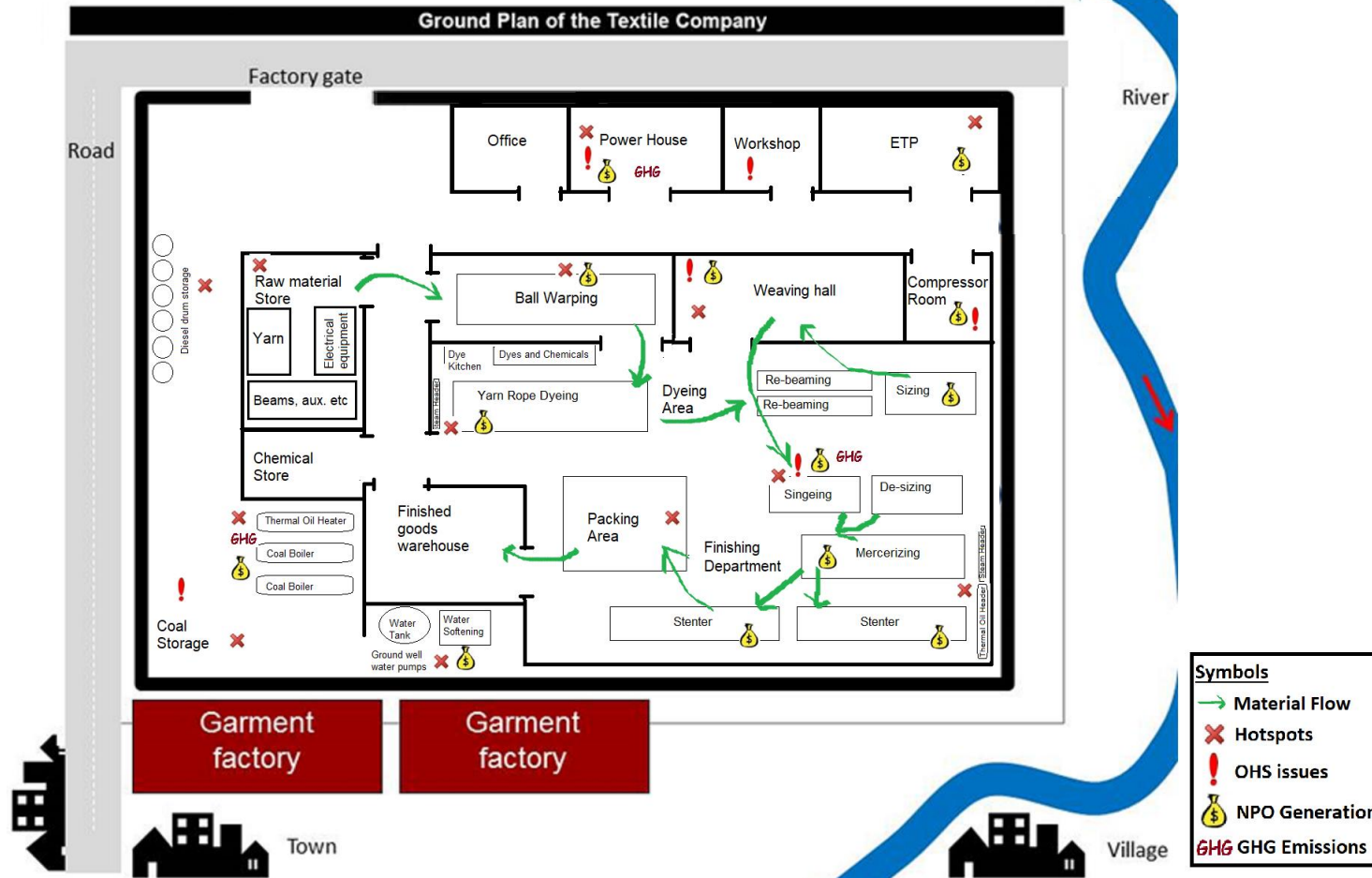
Review and update your Eco-maps

- Eco-maps help to systematically record critical areas including fire risk, NPO generation, Hazardous, and hot spot in an easily understandable way.

- It can be possible to use as management information tools and evaluation progress of EnMS towards goal
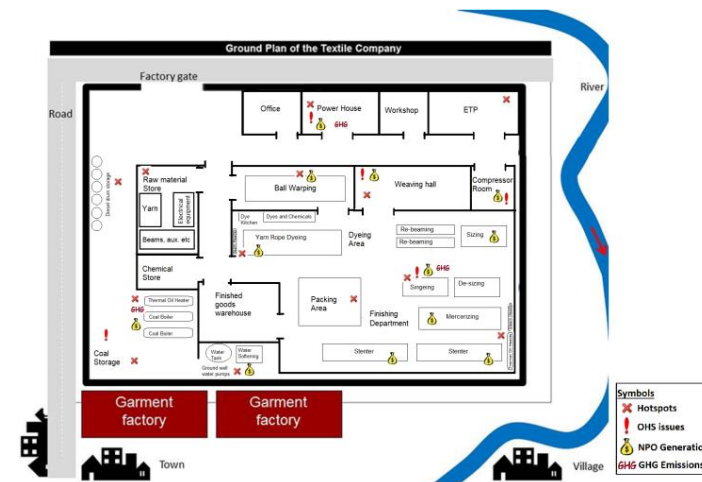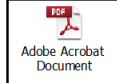
Review and update your Eco-maps

Monitor your EnPIs - Example

	Key Performance Indicators (KPI's) - Calculated per kg of fabric produced				
GHG (From utilities) [tCO2]	Fresh Water [L/kg]	Process water [m³/kg]	Steam [kg/kg]	Electrical (total) [kWh/kg]	GHG (From utilities)[kg/kg]
8,298	134.67	125.40	8.18	5.24	5.07
8,384	142.27	130.00	7.11	4.31	4.29
8,704	126.06	113.90	6.77	4.28	4.14
8,724	125.96	113.80	6.72	4.26	4.11
8,674	125.86	113.70	6.82	4.36	4.05
8,724	125.76	113.60	6.92	4.46	4.03

Monitor Implementation of Action Plans

Resource Efficiency Measures	Status Visit-01; 15 Jul. 2021	Status Visit-02; 01 Sep. 2021	Supporting Documents
Use of Graded Coal for Steam Boilers and Oil Heaters	Trial to be conducted before 2nd monitoring visit	Trials are in process, we will compare data after completion of trials within next week.	
Reduction of Excess Oxygen at Steam Boilers and Oil Heaters	Oxygen sensors to be installed; manual control shall be applied	Procurement process initiated, Demand Raised.	Adobe Acrobat Document
Waste Heat Recovery from Stenters	no decision taken yet	Work in process, Currently working on PLEVIA system. Heat recovery system will be implemented step wise.	
Recovery and Reuse of Steam Condensate – Division-1	Thinking about heat recovery from condensate	Work in process, steam traps procurement initiated (getting quotations)	Adobe Acrobat Document
Insulation of steam and thermal oil network	Will start step wise insulation of steam/thermal oil valves	Working started	Adobe Acrobat Document
Install steam pressure and temperature gauges on all machines		Work in process, identifiction of critical points in process to install steam pressure and temperature gauges	

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Assess impact of measures
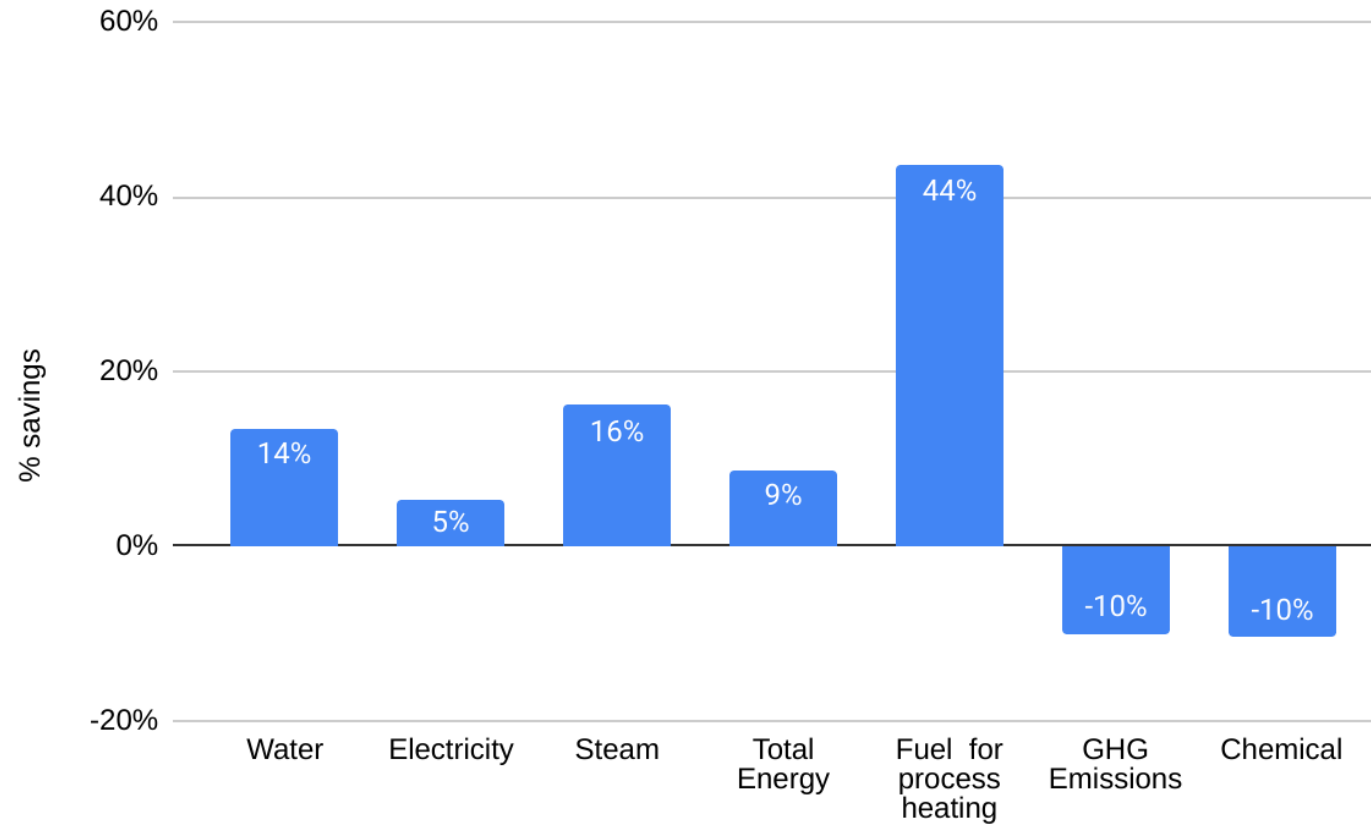
Audit your energy management system

For your internal/external audit programme to be effective…

- develop audit procedures and protocols;

- determine an appropriate audit frequency;

- select and train your auditors; and,

- maintain audit records.

Refer to "ISO 50001 Implementation_Resources (Step 6)" for templates

Recommended elements of your audit procedure

- audit planning

- audit scope (areas and activities covered)

- audit frequency

- audit methods

- key responsibilities

- reporting mechanisms

- recordkeeping

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Audit your energy management system

Issues to check

- EnMS audit program developed? How to be accomplished?

- Who needs to be involved in audit process?

- Possible links with other audit programmes (for example, air quality, EMS or health & safety management system audits)?

- Appropriate audit frequency decided?

- EnMS auditors selected ? Required competence?

- Training needed for EnMS auditors?

- Documentation of audits?

- Ways of communicating audit results (e.g. to top management)?

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Audit your energy management system

Audit protocols under Higg FEM

- Higg Index Facilities Environmental Module (FEM) http://apparelcoalition.org/the-higg-index/ covering
  - Environmental Management systems
  - Energy use and greenhouse gas emissions
  - Water use
  - Wastewater/effluent
  - Emissions to Air
  - Waste management
  - Chemical use and management

Conduct management review

Key question of management review

"Is the energy management system working?" (i.e., is it suitable, adequate and effective, given our needs?)

Linking EnMS audits, corrective action and management reviews

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        ┌──────────────┐
        │     EnMS     │
   ┌──► │ established/ │ ──┐
   │    │   revised    │   │
   │    └──────────────┘   │
   │                       ▼
┌──────────────┐    ┌──────────────┐
│  Management  │ ◄──│   Periodic   │
│   reviews    │    │   internal   │
│              │    │    audits    │
└──────────────┘    └──────────────┘
   ▲                       │
   │    ┌──────────────┐   │
   │    │  Corrective  │   │
   └────│    action    │ ◄─┘
        │   process    │
        └──────────────┘
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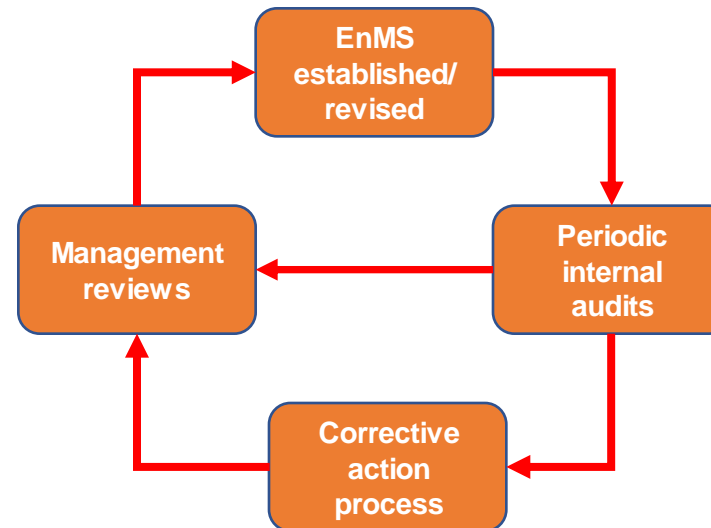
Conduct management review

Example of agenda points for a management review

- Follow-up actions from previous management reviews

- Energy performance of the company

- Extent to which objectives and targets have been met

- Results of internal/external audits

- Results of evaluation of compliance with legal and other requirements Status of corrective and preventive action

- Communication from external parties, including complaints, praise,….

- Changing circumstances, including developments in legal and other requirements (e.g. new client targets, new emission standards,…)

- Other recommendations for improvement

- Proposed changes to the energy management system

- Energy policy

- Risk assessment or other procedures

- Objectives, targets and programs/plans

- Other elements

Refer to "ISO 50001 Implementation_Resources (Step 7)" for templates

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Report performance and progress

Possible elements of company performance report:

- A statement of commitment from the CEO or equivalent;

- A review of the nature of the business;

- An explanation of how the company determined what EnM issues are needed to manage and an explanation of the issues;

- An explanation of how stakeholders were involved;

- A description of company's EnM goals, objectives and targets;

- Information on how has the company performed against the goals, objectives and targets;

- A statement on future plans for EnM improvement;

- A statement of future goals, objectives and targets;

- A statement on any standards or guidelines used for reporting;

- An independent assurance statement.

Key takeaways

- Monitoring is not only required for the EnPIs, but also for the energy action plan. Devise a standard method to monitor the progress of action plan and improvements in the EnPIs

- During and after implementation of energy management measures, you may use the tools like EnMS Maturity Matrix of CbD 10 Best Practices Tool to evaluate your improvements. You may also update your eco-map and visualize your improvements

- Internal EnMS audit helps to evaluate the performance of your energy management system. Results of the audit become inputs to the management review.

- Key question for the management audit is "Is the energy management system working?" (i.e., is it suitable, adequate and effective, given our needs?). Certain changes may be required in the energy policy, objectives, targets, action plans or resource allocation for your next cycle of change.

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Plan next steps

- •Update your eco-map

- •Conduct self-assessment again using EnMS Maturity matrix and compare results with baseline assessment

- •Record progress on action plans and update your energy baselines

- •Conduct internal audit and management review.

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