Guidelines for implementing ISO 50001 Energy Management Systems

in the oil and gas industry

Climate change
2013



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in the oil and gas industry

Contents

Purpose of this guide

The oil and gas industry is energy-intensive. Energy efficiency and energy savings have long been essential to the industry's operations. They translate into cost savings and have in recent years assumed even more relevance in the context of greenhouse gas (GHG) emissions reductions, as well as higher fuel prices and energy supply constraints in certain regions of the world. Energy management through a well-structured 'energy management system' (EnMS) ensures that energy issues are properly taken into consideration in all aspects of the industry's activities.

In July 2011, the International Organization for Standardization (ISO) released the ISO 50001 standard, *Energy management systems—Requirements with guidance for use,* which provides the essential framework and guidelines for establishing and operating an energy management system in general terms.

Beyond the generic guidelines and recommendations of the ISO standard, this document provides further guidance from a more specific, oil and gas industry perspective, and includes examples and case studies directly relevant to oil and gas organizations and operations. It should be read in conjunction with ISO 50001.

The aim of this document is to assist the oil and gas industry in the creation and implementation of energy management systems in accordance with ISO 50001. It is in no way intended to define or impose rules, constraints or additional requirements to the oil and gas industry beyond what is required by ISO 50001. It merely clarifies and interprets the ISO standard in the context of oil and gas operations, and provides contextual examples where relevant.

The structure of this document mirrors that of Section 4 of ISO 50001, as described in a publicly available ISO publication (ISO, 2011). Some sub-sections of ISO 50001 are self-explanatory and are directly applicable throughout the oil and gas industry. In such cases, no additional guidance is provided beyond a short interpretation of the ISO text where appropriate. For other sub-sections, there are specific circumstances or existing practices in the oil and gas industry or in its different sub-sectors (upstream, midstream and downstream) which warrant additional guidance, and this is presented mostly in the form of a checklist and/or good practice examples.

Where relevant, other public documents are also cited as references.

Guidelines for implementing ISO 50001 Energy Management Systems in the oil and gas industry

1. Scope

No oil and gas-specific comments.

2. Normative references

No oil and gas-specific comments.

3. Terms and definitions

The terms and definitions given in ISO 50001 are valid for this document.

4. Energy management systems requirements

Many sites or companies in the oil and gas industry have already implemented management systems, mostly in the fields of quality (ISO 9001) and environment (ISO 14001). This should facilitate implementation of an energy management system (EnMS) following ISO 50001 because most requirements are of a similar nature, in particular those related to record keeping. In those cases where an EnMS is to be implemented as a stand-alone system, it may be necessary to define basic processes.

Some oil and gas companies in Europe have already adopted the EN 16001 European standard which addresses the same issues as EN 50001. With the promulgation of ISO 50001, EN 16001 has now been withdrawn.

4.1 General requirements

Oil and gas industry activities encompass a number of sub-sectors (upstream, midstream, and downstream, with the latter split between refining and distribution/marketing). Some oil and gas companies are engaged in all sub-sectors while others only operate within a subset.

The scope of the EnMS may be company-wide, sector specific or may apply to specific sites (or subsets within a site) at the discretion of each company. In practice, certification to ISO 50001 will often be obtained for specific sites. For each site, the boundaries are likely to be the same as for existing ISO systems.

4.2 Management responsibility

4.2.1 Top management

Active top management involvement is recognized as one of the key elements of any successful EnMS, in order to provide momentum, resources and communication within and outside the company.

Particularly in large organizations active in many different sub-sectors, the appropriate level of 'top management' needs to be considered carefully to ensure a balance between a high level of visibility and credibility, while being sufficiently close to the business. The choice of management representative should follow the same considerations.

4.2.2 Management representative

The size and composition of the 'energy management team' may be adapted to the scope of the EnMS and may vary from a single person to a large team.

Even where the EnMS is company-wide and covers many or all sub-sectors of the oil and gas business, consideration may be given to sector-focused representatives and/or teams in order to recognize and capture the specific circumstances and requirements of each sub-sector. Effective coordination at the corporate level should be considered to ensure cross-fertilization between sub-sectors, and consistent application of the common EnMS principles and procedures and communication throughout the organization. Team members may be recruited from different disciplines and company levels to ensure that all relevant perspectives—strategic, operational/technical, environmental and economic—are taken into account.

Illustrative examples of energy management systems from specific oil and gas companies

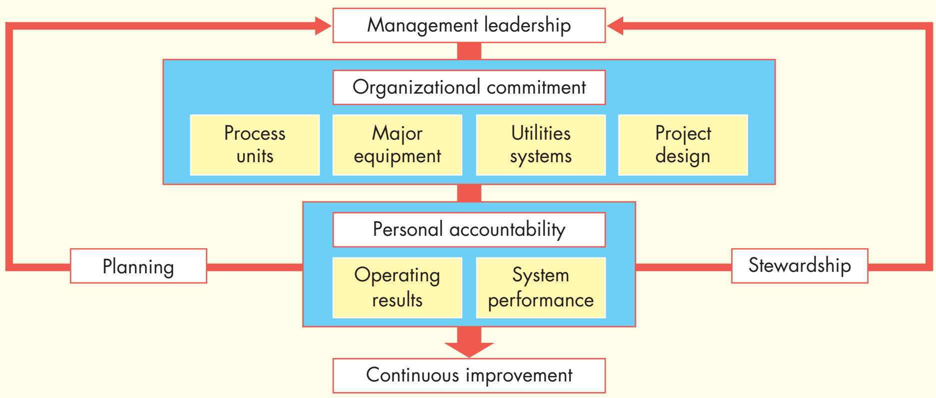
Chevron

Chevron has implemented Energy Management Processes through its Corporate-wide Operational Excellence System. Energy coordinators and/or Base Business optimization subject matter experts develop and improve best practices that can be shared among business units and conduct energy assessments to assist in prioritizing energy conservation and optimization opportunities across the company.

ExxonMobil

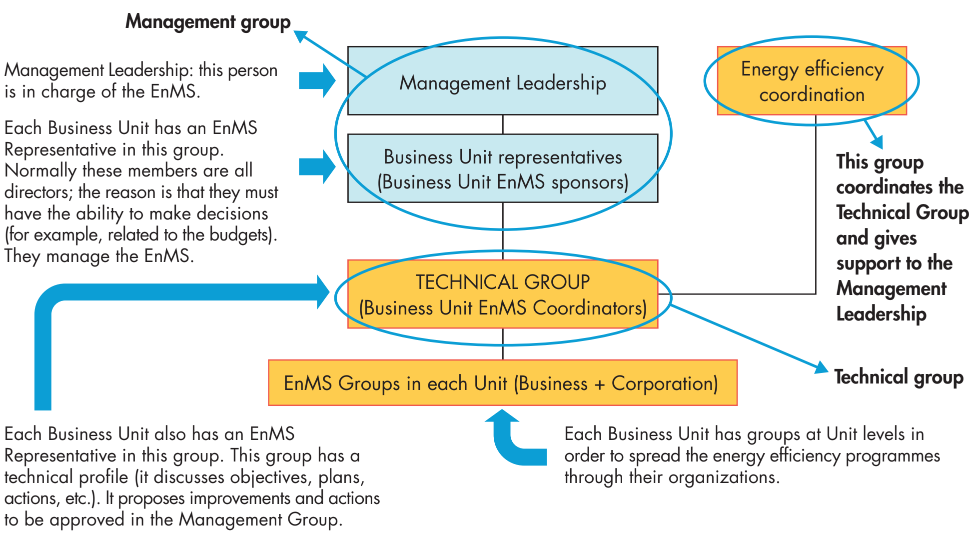
ExxonMobil have implemented the Global Energy Management System (GEMS) throughout the refining and chemicals organizations. A related system, the Production Operations Energy Management System (POEMS), has been implemented in the upstream business.

GEMS design



Repsol

Organizational structure:



4.3 Energy policy

The oil and gas industry is in the unique position of being both an energy supplier and an energy consumer. This may be reflected in the corporate energy policy. Energy policies may be expressed in stand-alone documents or integrated into existing environmental, HSE (health, safety, environment) or sustainability policies.

Illustrative examples of energy policies from specific oil and gas companies

Repsol energy policy

Repsol undertakes a commitment to make efficient use of energy at its facilities and during its activities, with the purpose of preserving natural resources, reducing atmospheric emissions and helping to mitigate the effects of climate change.

Management will lead and promote energy efficiency programmes, ensuring that the organization works in accordance with the principles established in this policy.

Repsol will establish objectives and targets in order to improve energy performance and reduce the relevant greenhouse gas emissions. In order to achieve them, Management will ensure the availability of the necessary information and resources.

Repsol will continuously improve the use of energy resources at its facilities and during its activities throughout their entire life cycle, optimizing the technology and design of processes as well as the operation of its facilities, and supporting the purchase of energy-efficient products and services.

Repsol will ensure compliance with the legal requirements in force and other requirements to which the organization subscribes related to energy performance, including energy efficiency and the use and consumption of energy. The company will also encourage the adaptation of its operations and facilities to ensure compliance with any changes that may be made to the legal framework in force, and will establish common standards for the management of energy efficiency in all the areas and countries in which it operates.

In order to promote greater awareness among all stakeholders, Repsol will provide them with reliable and transparent information regarding its energy consumption, its corresponding greenhouse gas emissions and the improvement actions undertaken.

Repsol considers that 'complying and ensuring compliance' with this policy is the responsibility of all individuals who take part in its activities.

Incorporating energy performance into Chevron's business

Chevron has incorporated energy performance into its business for more than two decades. In 1991, the company created the position of Corporate Energy Coordinator and established the Chevron Energy Index to monitor and foster energy improvements corporate-wide. Since then, Chevron has improved its energy performance by more than 30%.

To drive this agenda forward, Chevron is running two key initiatives: 1) to improve energy performance in existing businesses by developing and deploying Chevron best practices; and 2) to economically design new facilities with high levels of energy efficiency. Since energy costs (within a large energy company) typically represent about 25–50% of total operating expenses in the company's largest business segments, energy efficiency improvements also contribute to large cost savings. The points below provide an overview of Chevron's lessons learned and key energy efficiency principles.

1. Create a long-term vision of what excellence looks like in business segments to help keep alignment and move towards industry-leading performance.
2. Create a culture where best practices are created, shared and freely adopted.
3. Implement industry-leading targets and ensure consistency in calculation of performance gaps to industry-leading performance.
4. Use internal and external benchmarks to identify improvement opportunities.
5. Conduct internal energy reviews to provide expert feedback to local management.
6. Track and manage key energy metrics.
7. Focus on new projects with a secondary focus on replacing equipment in existing projects.

4.4 Energy planning

4.4.1 General

Energy planning and its elements described below form the core of the EnMS. The first step is the energy review which includes an inventory of past and present energy use, a list of the variables affecting energy consumption, a definition of what constitutes a 'significant energy use', and an analysis of these factors. It is followed by the selection of energy performance indicators. The final outcome is the definition of an energy baseline.

4.4.2 Legal and other requirements

Oil and gas companies are bound by the laws and regulations of the countries in which they operate. Local personnel must be fully aware of the relevant energy-related national legislation, the requirements outlined by operating permits and the constraints they impose and opportunities they afford.

In view of the international character of the business, certain activities may also need to conform to the laws and regulations of multiple countries. Corporate levels EnMS need to take this into account so that they can accommodate compliance with a diversity of regulations. Site level EnMS must be fully compliant with applicable local regulations.

4.4.3 Energy review

Energy planning implies an inventory of all significant energy consuming activities. In an organization involved in many activities along the oil and gas supply chain, this may not be a trivial exercise.

In determining the scope of energy consuming activities to be taken into account, consideration needs to be given to the inclusion or exclusion of energy consumed by third parties on behalf of the business (e.g. in transport or provision of services).

A generic inventory of some energy consuming activities

This list is for illustration only and is not exhaustive. It should be adapted to each specific case.

Exploration:
- Seismic

Field development:
- Area clearing
- Road construction
- Infrastructure set-up
- Drilling waste transport and treatment
- Hydraulic fracturing
- Construction of facilities
- Raw materials
- Transport and installation

Production:
- Extraction (inc. pumping, gas lift, etc.)
- Treatment (including utilities)
- Auxiliaries (e.g. supply ships, living quarters, workers' transport, etc.)

Crude oil and gas transport:
- Pumps and compressors (pipelines)
- Rail, road and ship transport

Refining / petrochemical plants:
- Process plants
- Utilities
- Tank farms
- Auxiliaries
- Terminals

Distribution:
- Terminals
- Depots
- Rail
- Trucks
- Pipelines
- Barges

Marketing:
- Service stations

Site abandonment:
- Demolition
- Waste disposal

Frequency and depth of the review should reflect all relevant factors such as the age of the facility, previous reviews, progress already made, coincidence with maintenance outage of equipment, structural opportunities, etc.

The inventory of energy-consuming activities should include, where relevant, the whole life cycle of projects from construction to abandonment. It can be linked to the register of environmental impacts elaborated under the scope of ISO 14001.

Information is commonly collected and generated through:

- operational data (from process data, measurements, invoicing etc.);
- energy assessments;
- specific energy studies (in-depth studies to improve a process); and
- total site studies (to identify synergies between plants).

Energy consumption figures should, preferably, be established on the basis of actual plant data although design data may be used as a second choice.

A critical review of the inventory may be carried out to identify the most significant energy consumers which might warrant further analysis. Definition of a 'significance' threshold becomes an important matter in this respect. ISO 50001 does not impose criteria to define 'significance' but leaves it up to each organization to determine this. When first implementing an EnMS, a practical approach may be to first set the significance threshold at a fairly high level in order to focus initially on the larger energy consumers, leaving the smaller ones to be dealt with in later reviews and/or cycles. Significance criteria could be defined using thresholds for absolute, specific or relative indicators, e.g. above a certain total energy consumption (GJ); above a certain specific energy consumption (GJ/t production); above a certain percentage of a site's or company's total energy consumption considered 'material'; or a certain percentage above an internal/external benchmark value.

In many of the complex operations common in the oil and gas industry, a simple tally of energy use does not provide a good basis for a valid comparison between figures from different operating sites, or even from the same site over time. Performance analysis usually requires definition of normalized data (e.g. to allow for different levels of activity, different types of equipment, etc.) and/or performance indicators (see 4.4.5).

An organization can improve its energy efficiency over time through optimizing operating conditions, improving maintenance schedules and practices, sharing good practice and integrating the energy dimension into all new projects (new units or revamping of existing plants). The first two points are commonly addressed through on-site energy reviews or assessments involving a specialist team visiting a site over several days and working closely with the local personnel. After making an inventory and analysing performance, the team focuses on identifying specific areas for energy performance improvement, and on developing concrete proposals and prioritizing actions.

Good practice may be derived from either in-company or wider industry experience. Opportunities may involve operational improvements, organizational changes, and minor or major investments. The experience gained by the visiting teams helps dissemination of good practice.

Energy saving proposals are often categorized according those items that require:

- no investment (mostly related to improving operation of the units);
- minor investment (mostly related to minor modifications and maintenance); and
- significant investment (mostly related to implementing new technologies or more efficient system designs).

Illustrative examples from specific oil and gas companies

ExxonMobil

Global Energy Management System (GEMS) best practice manuals

GEMS development

- Best practices are documented in a 12-volume set for:
  - Process units
  - Major equipment
  - Utilities systems
  - Project design
- Contain 1200 pages and identify more than 200 key energy variables
- Cover process units, major equipment and utilities
- Focus on key energy-related aspects of operations and maintenance
- Also incorporate energy efficiency into project design for new facilities

The first two categories usually focus on optimization of existing systems and equipment through operation or maintenance, and on implementation of minor physical changes. They may address distillation processes, heaters and boilers, heat exchange and recovery systems, flares, steam system optimization, thermal insulation, reduction of steam leakages, electricity production, major rotating equipment, fuel selection, housekeeping, etc. Up-to-date drawings and manuals, and fit-for-purpose and correctly calibrated metering devices are essential to monitor energy consumption of the main equipment. Modelling, optimization or advanced process control systems help achieve optimal operating conditions in process units and utility networks over time.

The third category may address heat integration and recovery (new/additional heat exchangers, optimization/rearrangement within process units and/or between units), installation of more energy-efficient equipment (e.g. burners, major drivers), use of excess gas or pressure energy (lost energy through pressure drops), e.g. for power generation, upgrading of utility systems (combined heat and power), and optimization of hydrogen production systems in refineries.

The Energy Star® programme, sponsored by the US EPA, developed a useful detailed guide in this respect (LBNL, 2005).

The energy review invariably results in a large number of proposals that need to be prioritized. Clear prioritization criteria may be appropriate at the outset. They are usually based on a combination of saving potential and financial return where significant costs are involved. The 80/20 rule will generally apply, i.e. 20% of the proposals providing 80% of the potential savings.

The energy review should be documented in a report detailing the energy consumption structure, the improvement proposals and the intended time schedule for implementation, as well as all supporting technical data.

4.4.4 Energy performance indicators

Oil and gas operations are generally complex, involving many sub-activities with a high level of variability both between similar operating sites and over time. Performance indicators that take this diversity into account are therefore essential for understanding and analysing energy performance. Energy performance improvement requires efforts and actions at all levels of the organization with indicators that are relevant and adapted to each level.

Definition of indicators should be as accurate as possible, outlining scope and boundaries and identifying the metric. They should preferably be in line with international reporting standards to allow for comparison and internal and external benchmarking. When evaluating energy efficiency using these indicators, care must be exercised to compare them in like categories. Indicator values will reflect energy efficiency achieved by operational efficiencies and specific improvement projects, but the overall values will vary greatly depending on many factors (e.g. for upstream, the type of hydrocarbon, reservoir characteristics including age, the recovery method(s) employed, etc.).

Indicators based on operational data (lagging)

Energy performance is commonly assessed with 'lagging indicators' which are retrospective metrics based on actual operational data, reflecting the as-is situation on energy performance.

Operational level indicators

These are typically relatively simple process functions calculated on a semi- or fully-continuous basis serving to measure and monitor energy usage over the short term, down to a single unit/facility. They are commonly developed for each site and each processing entity according to the specific local situation (see also 4.5.5).

Care must be taken to account for different quality levels of either products or resources when assessing energy performance. One approach could be to use exergy-based indicators rather than energy-based ones[1].

Site level indicators

These are based on aggregated data from the site and are commonly calculated on a quarterly or yearly basis. They serve to measure and monitor the energy efficiency of the site over time and/or against peers.

Absolute energy consumption (in units of energy per year) may be used for management and/or financial reporting purposes but is of little interest as an energy performance indicator because it does not refer to the corresponding level of activity.

Specific energy consumption (expressed in units of energy per unit of production or feedstock processed) is a commonly used indicator. It is often referred to as energy intensity. This is, however, of limited use for comparison or benchmarking of facilities of different complexity or asset type (e.g. gas field/plant vs. oil field).

In many parts of the oil and gas industry, energy consumption is the result of a combination of a large number of factors. In oil and gas upstream production operations this may include location, climatic conditions, reservoir characteristics, age, etc. In refining, energy consumption is dictated not only by size (e.g. in terms of crude processing) but also, and in a major way, by the complexity of the refinery. As a result, each operating facility has its own structural energy consumption that reflects the specific tasks that it carries out and the environment

[1] For a definition of exergy see http://en.wikipedia.org/wiki/Exergy

Solomon Associates — Energy Intensity Index™ (EII®)

In close cooperation with the refining industry worldwide, Solomon Associates have developed their Energy Intensity Index™ or EII® as the dimensionless ratio of the actual energy used by a refinery divided by a standard energy usage.

Each generic process unit type used in refineries has been assigned a standard energy factor determined by Solomon Associates from an analysis of their extensive dataset covering the majority of world refineries over a period of up to 30 years.

The standard energy usage of a refinery for a given period is the sum product of the individual factors by the throughputs of the process units operated by the particular refinery during that period.

The EII® effectively takes into account both size and complexity, so that the EII®s of different refineries, and/or the EII® of a given refinery over time, can be validly compared. The lower the index the better the performance.

in which it operates. The specific energy consumption, a relatively simple metric, may be inadequate as an energy performance metric because it does not account for this diversity.

In the refining sector most companies rely on the Energy Intensity Index™ (EII®) developed by Solomon Associates.

With the possible exception of shipping (IMO, 2009), industry-wide indicators have thus far not been used in other oil and gas sub-sectors, particularly in upstream oil and gas production.

Corporate level indicators

In complex organizations, central monitoring and communication with corporate management can be facilitated by company-wide consolidated indicators. A problem that may occur is the use of different bases for different operational units (e.g. barrels oil or gas produced in upstream activities; tonnes of crude processed in refineries; volumes of product sold, etc.). Site level indicators therefore need to be defined in a way that allows appropriate unit conversion for later consolidation. A balance needs to be struck between monitoring needs at corporate level and the reporting effort this creates at the site level.

Indicators linked to EnMS implementation (leading)

Implementation of an EnMS provides the opportunity to develop so-called 'leading' indicators which, although not directly related to energy performance, monitor the achievements in the key work processes or management approaches, reflecting the status of implementation of certain EnMS elements. Examples include:

- number of energy inventories done;
- percentage of completed energy assessments compared to plan;
- number of energy-related non-conformities (where operational practices or equipment meet company standards or good practice);
- percentage of energy-related improvement actions completed compared to plan;
- percentage of supplier assessments where energy has been included; and
- coverage of sites with EnMS.

Definitions and calculation considerations

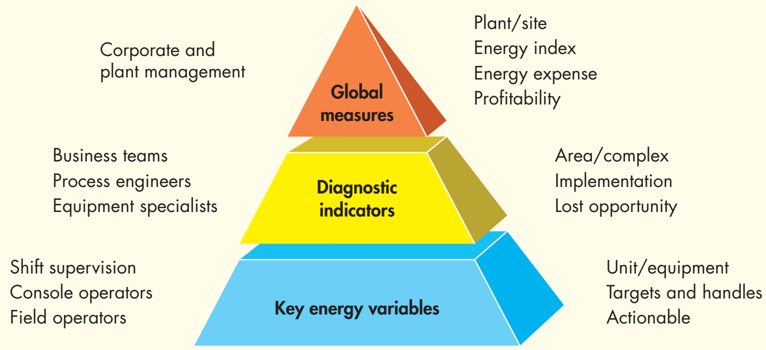
Examples of some basic concepts and their definitions are included below, ordered by level of complexity. These types of indicators can be defined for any type of facility, irrespective of size or configuration:

Illustrative example from specific oil and gas company

ExxonMobil

GEMS measurement: the following diagram illustrates the overall approach taken by ExxonMobil, from corporate level to field operator.

GEMS measurement



a) *Total energy consumption of a facility:*
This refers to the total amount of energy consumed by the facility. It depends on the production level of the facility. More energy is used for higher activity levels than for lower levels. Values are obtained from meters, control instrument measurements, energy balances, etc.

b) *Energy intensity, specific energy consumption, or fuel economy:*
For each sector, group, plant or facility characterized by a single activity, the specific energy consumption is the ratio of total energy consumption of the activity or facility per unit of activity, measured in (energy units)/(production or activity unit). Examples include:

- Transport sector: fuel used (energy units) per km, or passenger kilometres driven, or per cargo tonne km.
- Industrial sector: total energy consumed (including electricity, natural gas, and other fuels) per tonne of product or per energy-equivalent mass or volume.
- Residential and commercial sectors: electricity use per unit of surface area or volume.
- Electricity sector: power plant efficiency (GJ_{out}/GJ_{in}). For combined heat and power plants, efficiency calculations need to take into account both electrical and thermal outputs.

c) *Energy intensity indicator or intensity index:*
The Energy Intensity (EI) indicator of a business unit or facility compares its actual energy consumption with the consumption a reference facility with the same characteristics and activity as defined in Section 4.4.5.

In practice, the following equation can be used:

$$EI_{\text{Indicator}} = \frac{\text{Real Energy Consumption}_{\text{year X}}}{\text{Reference Energy Consumption}_{\text{year X}}}$$

For a group of facilities, the energy intensity can be calculated as:

$$EI_{\text{Indicator}} = \frac{\Sigma\,(\text{Specific Consumption Year X} \times \text{Activity Year X})_{\text{facility}}}{\Sigma\,(\text{Specific Consumption Base Year} \times \text{Activity Year X}_{\text{facility}}}$$

This indicator shows how the actual energy consumption of facilities improved or worsened compared with a base year. Periodic monitoring of this indicator helps a facility track the relative status and progress of its energy management activities (maintenance, operation, etc).

To determine the EI index of a business unit, one needs to know the Specific Consumption (SC) for each production facility for both the reference year and the year that is being studied.

Energy savings can be calculated based on percent changes of an EI indicator relative to its base year. For example, using a base year of 1990, then EI_{1990} = 1. If, for example, in 2010, EI_{2010} = 70, then this would represent a 30% energy saving in 2010 compared to the energy that would otherwise have been used in 2010 at 1990 levels.

4.4.5 Energy baseline

The energy baseline is one of the outputs of the energy review. It is the quantitative reference to be used for assessing future actual data. It reflects the scope of activities under review. To be directly useful the baseline must be performance-based with normalized data and/or performance indicators.

Additional guidance documents on energy baselines for both projects and for monitoring of operations are in preparation at the ISO.

One way to construct a baseline for monitoring could be by assessing the reference energy consumption for a facility for the current year (N) according to the specific consumption of individual units or plants for the previous year:

$$\text{Baseline Energy Consumption}_{\text{Year N}} =$$
$$\Sigma\,(\text{Specific Consumption}_{\text{Year N-1}} \times \text{Activity}_{\text{Year N}})_{\text{facility}}$$

According to the same principle, a reference energy consumption could also be estimated, assuming that specific consumption corresponds to a reference value (in general for one year, called year/baseline). For a given year x, the baseline consumption would be calculated with the following formula:

$$\text{Baseline Energy Consumption}_{\text{year X / reference}} =$$
$$\Sigma\,(\text{Specific Consumption}_{\text{Reference}} \times \text{Activity}_{\text{Year X}})_{\text{facility}}$$

This value can be regarded as the 'business-as-usual' energy consumption, assuming individual plants operate at the same specific energy consumption in all periods. To account for seasonal fluctuations in specific energy consumption, an annual average value can be used.

Where calculation of specific consumption is complex, statistical methods can be used.

It may be useful to differentiate between a historical baseline (past to present) and a projected 'business as usual' baseline, and perhaps a projection based on full implementation of good practice and standards.

4.4.6 Energy objectives, energy targets and energy management action plans

Overall objectives should be defined and be consistent with the wider vision and objectives of the organization. They should then be translated into objectives and practical targets for each segment of the business, for each site and eventually for each processing entity with correspondingly decreasing time horizons.

A business segment or a site would typically have yearly targets whereas operational indicators in a process unit would have to be met by each shift. Targets are often conveniently expressed in terms of improvement of the performance indicators over time.

Objectives and targets at all levels should be regularly updated to reflect and take account of the results of previous energy reviews in terms of specific items to be improved.

4.5 Implementation and operation

4.5.1 General

No oil and gas-specific comments.

4.5.2 Competence, training and awareness

Competences fall into two main areas:

- the EnMS itself, i.e. all competences and knowledge necessary for all actors to be aware, understand, operate and control the EnMS; and
- energy science, i.e. the technical understanding and expertise required to inventory and analyse energy usage, and identify and take advantage of opportunities for improvement.

Illustrative examples from specific oil and gas companies

Total

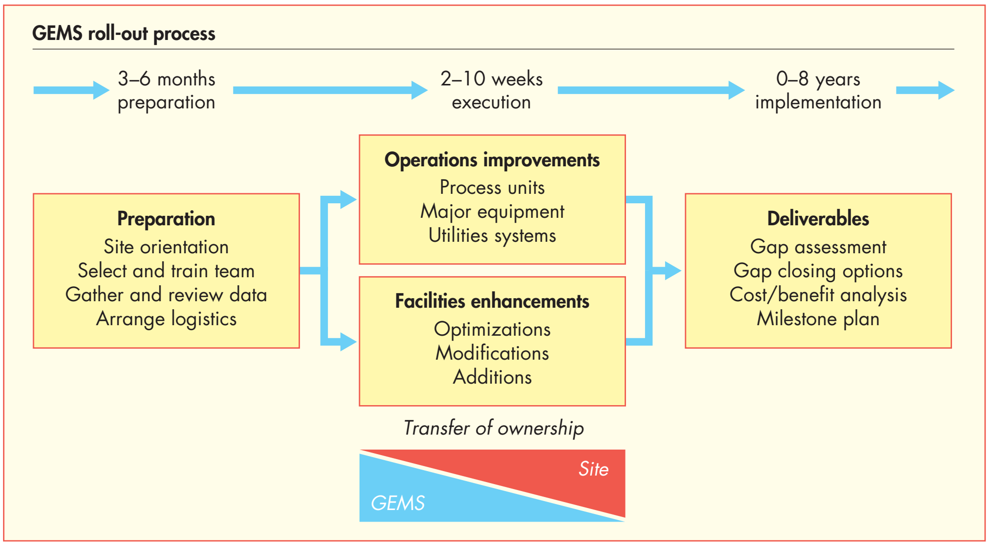
Cross-cutting matrix of the energy performance management framework

	Holding	Divisions		
		Consolidation/ aggregation	Sector of activity (Business unit)	Subsidiary/Site/Units
STRATEGY-VISION	Energy Committee Input Group Policy	Commitments/ Action plans	Energy performance objectives	
OPERATIONS and PROJECTS	Corporate Social Reporting (CSR)	Energy reporting		
operations/ maintenance		Global Key Performance Indicator (KPI)	Identification of major contributors	Identification of detailed energy performance indicators
new project		Good practices		Instruments
		Energy performance benchmarks		Daily optimization
		EE design	Technical standards	
MANAGEMENT/ ORGANIZATION	Energy Efficiency and Environment	LTP	Steering/ Coordination/ Energy focal point	Energy correspondent
	Energy audit framework	Ad hoc committee	Implementation audit methodology	Energy audit/ Energy balance/ Gap analysis/ Action plan
COMMUNICATION/ INFORMATION/ AWARENESS	Road map Action plan Training Seminar	Commitment and motivation policy	Awareness campaign	
R&D and TECHNOLOGY	Scientific Division Corporate Technology Group	Technological innovations Best Available Techniques (BAT)	Technological expertise	

Illustrative example from specific oil and gas company

ExxonMobil

GEMS roll-out process:



The degree to which energy science expertise needs to be developed in-house depends typically on the overall policy of the organization and its size. Larger organizations may consider having their own energy experts and assessment teams, whereas smaller companies may rely on external expert consultants.

A training plan may be included in the overall energy planning cycle.

4.5.3 Communication

Internal communication on energy-related issues can make use of existing communication paths for environmental and safety topics. During the implementation phase of the EnMS it could be sufficient to perform a communication campaign focusing solely on energy issues, and informing staff about the EnMS itself as well as about the related policies, targets and action plans in place. A communication plan may be included in the overall energy planning cycle.

A successful communication campaign increases awareness of all company staff of the importance of good energy management, and motivates staff to achieve good energy performance and savings.

For external communication, the energy-related topics can be easily integrated into existing environmental or sustainability reports (but it may not necessarily be limited to this).

4.5.4 Documentation

The documentation system required to run the EnMS and fulfil the requirements of ISO 50001 (e.g. type of documents, information flows, control and archiving) is expected to have much in common with what is necessary for other ISO standard series such as ISO 9000 and 14000. A high level of integration with such existing documentation systems may be sought.

4.5.5 Operational control

Operational level indicators are important to maintain focus on energy use and efficiency, ensure that energy is monitored and controlled where it is used, and identify deviations in performance at an early stage. Operational procedures and work instructions should be reviewed with regard to activities influencing energy performance and revised accordingly in order to ensure energy-efficient operation.

4.5.6 Design

The original design of a facility can have a major influence on its energy efficiency, impacting most aspects of the operation of the future plant. (See illustrative example from Total.) Energy consumption and efficiency should therefore be an area of focus early in the design phase of any new project involving either grass root facilities, new plants or major revamps at existing sites. This is particularly important in the latter case where the existing facilities and infrastructure will impose specific constraints on, for example, heat integration opportunities or installation of additional hardware. In all cases, it is preferable to take the whole site into account relative to energy performance and the criteria used to assess it.

Energy-efficient design involves proper attention to:

- the use of efficient energy converters (e.g. electric motors, burners, variable speed/frequency drives);
- minimization of heat/power/pressure losses;
- optimization of pipe sizes to minimize life-cycle costs;
- heat and power integration, including optimum use of waste heat;
- integration/optimization opportunities with neighbouring facilities;
- application of best practice in building design and construction; and
- use of advanced, longer-life lighting systems (e.g. LEDs).

In order to recognize the long-term value of energy efficiency clearly, it is essential that the future cost of energy is accounted for correctly in project economics, i.e. that the measurable benefits of energy efficiency be accounted for over the entire lifetime of the project. Building an energy-efficient plant may require additional investment but will be more attractive than considering energy-related changes at a later stage. Site-specific energy incentives, provided by local utilities, may also help project economics.

Another aspect of energy management is to consider 'life cycle' energy performance over the life time of an asset. For example, especially in upstream oil and gas operations, flow volumes can change significantly over time as a field ramps up to peak production, perhaps levels out, and then eventually declines over time. If fluid production and distribution systems are designed for maximum peak capacity, then they will likely only operate for a limited time at design capacity, and may spend most of their time at suboptimal operating conditions which will degrade energy efficiency and possibly lead to reliability issues. Designing facilities to adapt to significant load changes over time and maintain high efficiency operation could lead to large operating expense savings over the life of the asset.

Engineering standards and specifications as well as project management procedures may be reviewed to reflect these requirements.

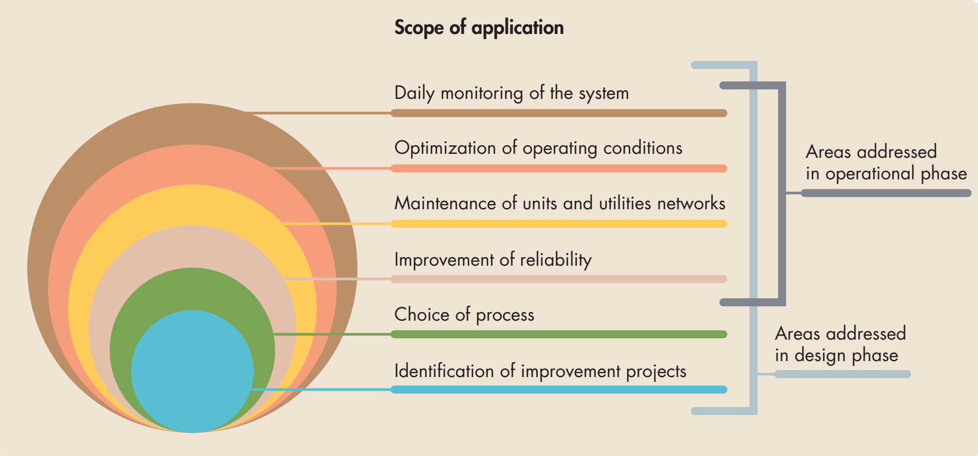
4.5.7 Procurement of energy services, products, equipment and energy

ISO 50001 requires the organization to evaluate the lifetime energy performance of purchased products and services that are expected to have a significant impact on its overall energy performance, and to make suppliers aware that energy performance is one aspect of the procurement evaluation process. The standard of energy performance required for purchase approval is for the company/organization to decide.

Illustrative examples from specific oil and gas companies

Total

Areas of energy focus at different stages of a project:



4.6 Checking

4.6.1 Monitoring, measurement and analysis

The monitoring system required to run the EnMS is expected to have much in common with what is necessary for other ISO standard series such as ISO 9000 and 14000. A high level of integration with such existing monitoring systems may be advantageous. Monitoring results are used for the analysis of all energy performance indicators.

4.6.2 Evaluation of legal requirements and other

The compliance system required to run the EnMS is expected to have much in common with what is necessary for other ISO standard series such as ISO 9000 and 14000. A high level of integration with such existing compliance systems may be advantageous.

4.6.3 Internal audit of the EnMS

Internal audits of the EnMS may be integrated in existing audit schemes for quality or environmental management systems. A high degree of overlap will occur, especially with regard to internal audits as specified by ISO 14001.

Note that these are system or process audits. They are different from technical energy audits and reviews carried out under the EnMS.

4.6.4 Nonconformities, correction, corrective action and preventive action

The continual improvement of energy performance and the EnMS itself has much in common with what is necessary for other ISO standard series such as ISO 9000 and 14000 and, therefore, may follow the company's existing procedures, e.g. the 'plan-do-check-act' approach. A high level of integration with existing systems for evaluation and investigation of nonconformities, as well as action setting and monitoring, may be advantageous.

The determination of nonconformities should be aligned with the organization's energy policy and targets, and should reflect the focus set by the energy management plan. Examples of EnMS non-conformities include:

- breaches of the criteria for efficient operation and maintenance as defined under 4.5.5;
- non-achievement of target values defined for certain performance indicators as set under 4.4.6;
- non-fulfilment of energy management plans as defined under 4.4.6; and
- exceedance of deadlines for improvement actions as set under 4.6.4.

4.6.5 Control of records

Procedures and systems required for record control may be similar to what may already be in place to comply with other ISO standards such as the 9000 or 14000 series.

4.7 Management review

The management review required under the EnMS is expected to have much in common with what is necessary for other ISO standard series such as ISO 9000 and 14000. A high level of integration with existing management review procedures may be advantageous.

From the results of the management review, improvements and actions for the next activity cycle may result. As a result of this review, the criterion defining 'significant energy uses' for future activity cycles could be adjusted.

4.7.1 General

No oil and gas-specific comments.

4.7.2 Input to management review

No oil and gas-specific comments.

4.7.3 Output from management review

No oil and gas-specific comments.

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IPIECA is the global oil and gas industry association for environmental and social issues. It develops, shares and promotes good practices and knowledge to help the industry improve its environmental and social performance, and is the industry's principal channel of communication with the United Nations. Through its member-led working groups and executive leadership, IPIECA brings together the collective expertise of oil and gas companies and associations. Its unique position within the industry enables its members to respond effectively to key environmental and social issues.

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OGP represents the upstream oil and gas industry before international organizations including the International Maritime Organization, the United Nations Environment Programme (UNEP) Regional Seas Conventions and other groups under the UN umbrella. At the regional level, OGP is the industry representative to the European Commission and Parliament and the OSPAR Commission for the North East Atlantic. Equally important is OGP's role in promulgating best practices, particularly in the areas of health, safety, the environment and social responsibility.

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