Environmental Management Systems as New Tools to Enhance Sustainable Energy Use

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Synopsis

What role do Environmental Management Systems play in enhancing efficient and effective use of energy, both from an industrial and from a utility perspective?

Abstract

In 1993, the EU legislation on Environmental Management and Audits (EMAS) came into force. By the end of 1996, the international environmental management norm ISO 14001 had been completed. Although conceived as integrated approaches to environmental protection, these concepts prove to have significant positive effects on energy efficiency. This paper presents how EMS influence energy efficiency and to what extent they also enhance a second aspect of sustainable energy use, which is effective use of energy throughout the life cycle.

Two groups applying Environmental Management Systems (EMS) can be distinguished:

1) Industrial companies' energy efficiency improves by an increased awareness for their energy flows and costs induced by setting up an EMS. A number of case studies have proved that EMAS participation has been a decisive kick off for companies to start tackling their efficiency potentials. This is also due to the fact that EMAS as well as ISO 14001 call for continual environmental improvement. Commitment and action towards effective use of energy, however, remains so far the exception among companies implementing EMS.

2) A second aspect is that also energy utilities can participate in EMAS or set up environmental management systems following ISO 14001. If implemented correctly, this gives them a mighty tool for a more systematic approach to environmental management as a whole as well as to energy efficiency in particular. To achieve this, it is crucial for utilities not to restrict their efforts to the supply side and to marginal technical improvements on existing sites. Following the Integrated Resource Planning (IRP) approach, utilities participating in EMAS should integrate measures to make use of renewable energies as well as programs to enhance efficient use of energy by their customers into their EMS.

1. Energy Efficiency and Effective Use of Energy: Introduction into this paper's approach

To give the reader a better understanding of what this paper aims at, the presentation of the instrument investigated here - Environmental Management Systems - shall be preceded by some general remarks on what the author means by Sustainable Energy Use. Fig. 1 illustrates that the notion of Sustainable Energy Use is used here as a generic term including two topics:

- Energy efficiency, understood as a minimisation of energy losses on any stage of the life cycle or product chain

- Effective use of energy, understood as a minimisation of superfluous energy consumption in the economic system as a whole.

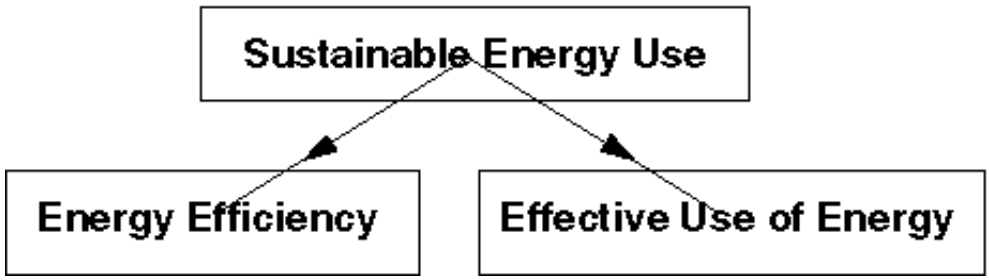

Figure 1-1. Understanding of Sustainable Energy Use in this paper

Fig. 1-2 shows a simple structural diagram of the life cycle of energy to illustrate what is meant by “stages” of this life cycle.

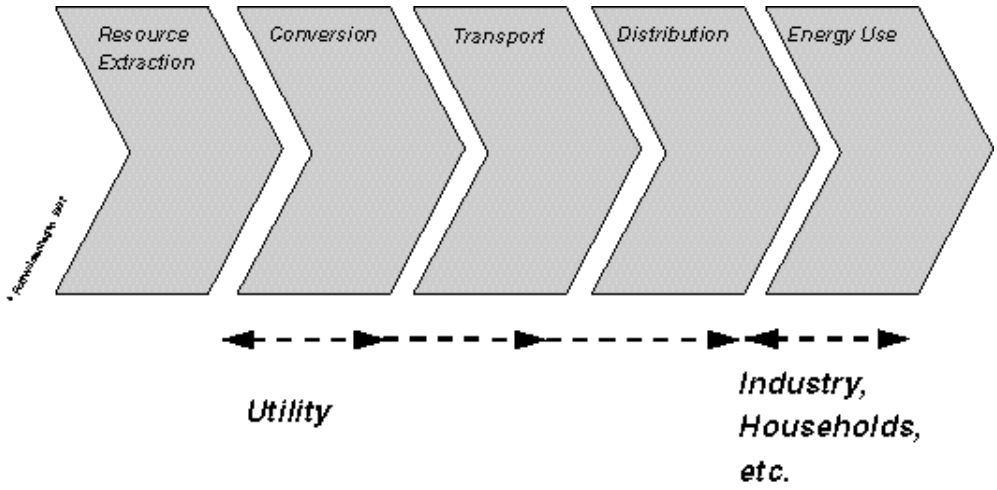

Figure 1-2. Life cycle of energy

With some empirical evidence, it can be stated that on each of these stages of the life cycle, energy is not efficiently used. That is, the actually required output could be generated with less input. So, energy efficiency in a first step may be defined as a reduction of losses on each of the stages. However, even if every actor along the product chain has reduced their losses, this does not necessarily provide for an effective use of energy in a systemic view. In other words, the needs of the final energy users could be satisfied with less energy input if changes over the whole chain were made.

This can be illustrated by looking at the energy used in food production. Energy efficiency would mean here that losses at the consumer level are kept low due to e.g. efficient refrigerators and ovens, that these appliances as well as the food products themselves are efficiently processed at well-maintained manufacturing sites, which in turn are supplied by a utility properly operating their transmission grid and generating electricity e.g. in a state-of-the-art combined-cycle power plant. Effective use of energy on the other hand could be achieved by system changes on different levels. In this example, changing the food from meat to vegetarian food as well as from greenhouse to seasonal outdoor vegetables would certainly imply bigger overall energy savings than improvements of any of the processes named above.[1]

This applies for the appliances, too. Providing houses with cool rooms instead of selling refrigerators to every household may well reduce energy consumption more than improving the refrigeration technology.[2] From a company point of view, this may mean that the company can lower environmental impact by enhancing chang-

es beyond their own operations perhaps more significantly than within their existing processes. In general, effective use of energy is achieved when needs of energy users are satisfied with minimum energetic input.

The same applies to the energy industry itself and has been investigated in the Demand-Side Management or Least-Cost Planning literature. It was argued that utilities should be responsible for satisfying peoples' *true needs*, which is not their demand for energy but for energy services such as heated rooms, warm meals etc. Least-Cost Planning publications have dealt a lot with these topics, which shall here be called effective use of energy.

This paper will consider both levels of sustainable energy use as described above. Criteria to be met by instruments attempting to improve these two levels result from research that has identified barriers to change like the following:[3]

Subject	Barriers	Criteria for instruments
Energy Efficiency	• Low energy prices • Insufficient information on available energy efficient technologies • Insufficient information on actual energy costs/lack of cost transparency • perceived low importance of EE issues on management level • lack of awareness at workforce level • preference for production-related investment • pay-back gaps	• increase energy prices • provide information on available EE technologies • provide information on actual energy flows and costs • increase awareness at management level • increase awareness at workforce level • give incentives for EE investments or highlight integrated pollution prevention measures • provide instruments to compare investments on a level playing field
Effective Use of Energy	• lack of inter-company and company-stakeholder co-operation • lack of information on energy flows outside the company • general lack of information concerning other stages of the product chain • insufficient product design	• enhance stakeholder dialogue • provide means to support integrated chain management • integration of product management • increase a company's innovativeness

The aim of this paper is to analyse what a relatively new instrument in environmental politics and management, Environmental Management Systems (EMS), can achieve in getting ahead towards sustainable energy use at both of these levels. Following a general characterisation of EMS in chapter 2, the impact of EMS on energy efficiency will be discussed in chapter 3, their impact on effective use of energy in chapter 4.

2. Environmental Management Systems (EMS)

Environmental Management Systems have been applied in companies since the early 1990s. A key event for their wide diffusion in businesses has been the codification in European regulation (EMAS)[4] and by the International Organisation for Standardisation (ISO) in 1993 and 1996 respectively. Before having a look at some details of these two regulations (see 2.2), general characteristics of EMS shall be described.

2.1 Characteristic features of EMS

Environmental Management Systems (EMS) are a concept for organisations to effectively deal with the environmental impacts of their activities. Typical elements of a company's EMS are:

- a company environmental policy,
  agreed upon on a high management level, including the declaration to strive for continuous improvement in that field.
- an initial environmental review or analysis,
  detecting the relevant environmental impacts of the company's activities and monitoring it, e.g. by means of an material and energy flow analysis.
- setting up an EMS which includes: organisational precautions for effective environmental protection, fixing responsibilities, keeping up with environmental legislation etc.
- periodic auditing,
  by internal staff as well as by external auditors or environmental verifiers
- environmental objectives
  set up autonomously by the company in line with their environmental policy as well as with environmental regulation and
- environmental programmes
  to implement the environmental objectives.

Moreover, EMS may include

- an environmental statement
  to provide information on the company's environmental impacts to the public.
- external validation
  of the EMS by an accredited environmental verifier

Fig. 2-1 gives an overview on the elements described here very briefly and also distinguishes them according to what legal basis is chosen for the design of an EMS.[5] This will be explained below.

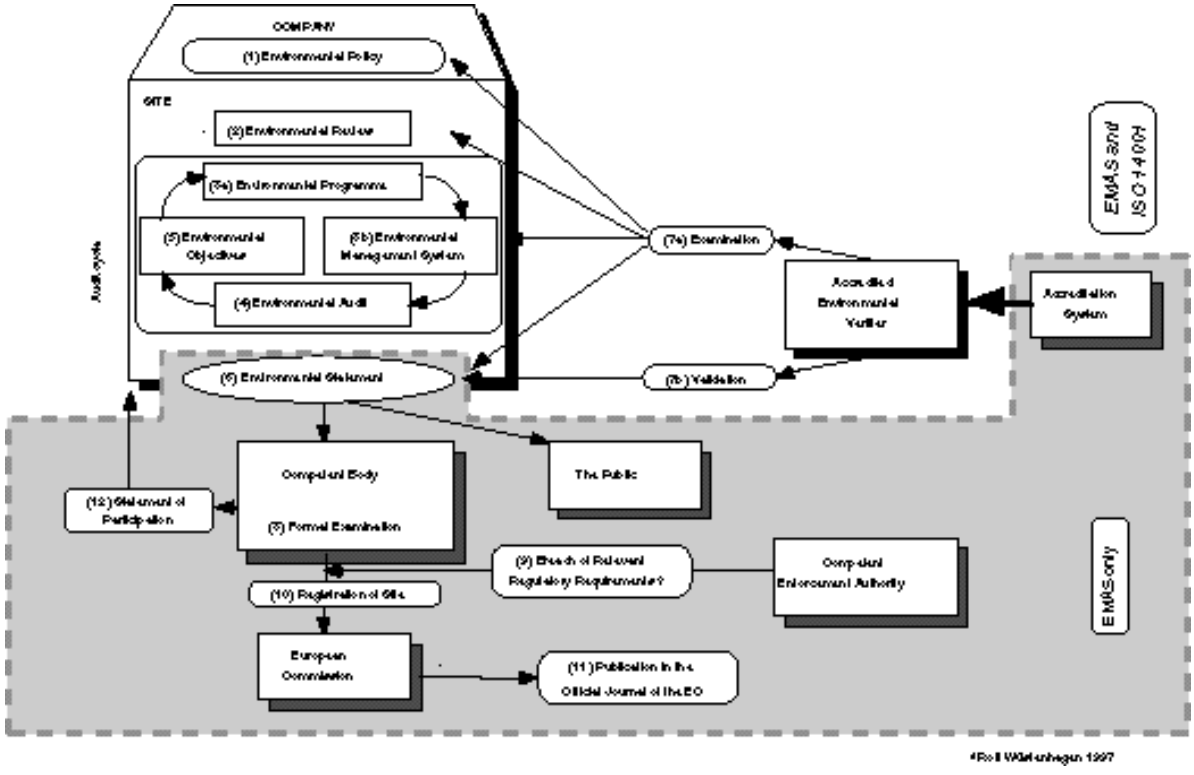

Figure 2-1. Structure and Elements of EMS according to EMAS and ISO 14001

2.2 Legal Basis of EMS

While EMS can originally be described as a management concept, they have become an instrument of environmental policy as well. This is due to their codification in international regulation, mainly in the European Communities' Environmental Management and Audit Scheme (EMAS), which was agreed upon in June 1993. This regulation introduces an EU-wide System for accreditation of environmental verifiers as well as for registration of participating company sites. It also describes in detail what elements should be contained in an EMS and gives in its annexes some guidelines on how to fill the structures with contents, such as "Good Management Practices". These practices are intended to form the basis of the company's environmental policy and include requirements like increasing environmental awareness and responsibility among employees or check in advance the environmental impacts of new products, processes and activities. EMAS annexes also specify environmental aspects to be covered, such as energy efficiency.

Another codification has taken place hosted by the International Organisation for Standardisation (ISO) in its ISO 14000 ff. series. These are international norms which are applicable to any organisation, but have no binding legal effects, because verification takes place on a pure private-sector basis. The first two norms, ISO 14001 and ISO 14004, have come into force in September 1996.[6]

Some important differences between EMAS and ISO 14001 are:
- EMAS restricts participation (more precisely: external validation) to industrial activities, i.e. energy generation is covered, energy services are not. ISO includes all activities
- EMAS is an official EU regulation, whereas ISO is a private sector system.
- Publication of an environmental statement or report is voluntary under ISO, whereas it is compulsory under EMAS

Both schemes have in common that participation is basically voluntary. Unlike in the case of mandatory schemes, companies seeking for participation must be motivated from other benefits than legal compliance. Among those are:[7]
- Risk reduction: setting up an EMS can help to reduce the probability of industrial accidents and liablility claims.
- Cost reduction: by identifying organisational weaknesses and inefficient material handling, companies may discover potentials for productivity improvements thanks to their EMS.
- Image reasons: companies introducing an EMS often seek for image improvements, e.g. due to the official participation statement included in EMAS. Open provision of environmental data to the public may improve credibility among stakeholders.
- Increased competitiveness: improving the internal and external environmental data base and introducing new organisational structures according to EMAS or ISO 14001 may lead to improved innovativeness.

2.3 Empirical status

Especially during the last two years, the spreading of EMS in businesses has increased notably. Just as an example, the number of company sites registered under EMAS in Germany alone was 321 during the first 12 months that the regulation was operational (DIHT 1996). Austria's site register includes 44 sites at the beginning of 1997 (UBA 1997), while other European states record somewhat lower numbers. Among those who participated are also a number of Energy Utilities, such as a power station of the UK Generation company National Power, three municipal utilities in Germany[8] and eight sites in Austria (UBA 1997). There are no official statistics on the number of companies certified according to ISO 14001, but estimations say for Switzerland that 57 companies have achieved certification under this norm as of January 1997 (IWÖ-HSG 1997).

Although these numbers are still minute compared to the total number of industrial companies and sites,[9] they indicate that EMS are a remarkable empirical phenomenon. The following chapter will thus investigate how and to what extent EMS are a viable instrument to enhance energy efficiency.

3. Increased Energy Efficiency through EMS

To properly analyse the impact of EMS on energy efficiency, it seems appropriate to distinguish two groups of EMS users: industrial companies and energy utilities.

3.1 Industrial EMS

Introducing an EMS in an industrial company has a number of effects on how the issue of energy efficiency is handled. Among them are:

- carrying out an initial environmental review improves the information about energy flows within the company, thus raising awareness for efficiency potentials
- provided that the initial review of material and energy flows results in a detailed controlling of related costs, the transparency for energy efficiency decisions is increased
- the obligation to formulate an environmental policy including the commitment to continuous improvement sets environmental protection and thus energy efficiency on the agenda at various company levels, including higher management (consciousness raising)
- the introduction of “safer” organisational structures (such as periodic auditing, fixed routines, etc.) increases the likelihood of good housekeeping and thus may help to decrease incidental losses of energy, too.
- the opportunity of communicating energy efficiency measures as improvements of environmental performance in an environmental statement or report increases their attractivity to decision makers
- EMAS demands for “economically viable application of best available technology” (EVABAT), thus it requires a special commitment to environmentally sound technology, such as energy efficient appliances.

This enumeration shows that a number of effects can be identified which are caused by EMS and result in better energy efficiency in a company.

3.2 Utility EMS

A second aspect in investigating the effects of EMS on energy efficiency is that energy utilities themselves are also able to introduce EMS.[10] The fact that the energy industry is rather a world apart from other industries - which applies to the companies and their associations as well as to the scientific community - makes it at first sight seem odd to treat it just like any other. Nonetheless, a growing number of energy utilities setting up EMS give evidence to that point of view.

The question what can be achieved by introducing EMS in energy utilities has to be answered grounded on the theoretical concepts and on empirical findings.

Although there is not much experience with practical implementation of EMS in utilities, some tendencies can be deduced. One is that the effects that apply to EMS in industrial companies lead to increased internal energy efficiency at utilities, too. A difference is probably that low awareness to energy issues is not a frequent phenomenon at utilities, as dealing with energy is their day-to-day business. It has been stated above that decision makers focusing on production-related issues keeps them away from realising energy-efficiency measures even if they have a reasonable pay-back period. This is obviously not a barrier to increasing internal energy efficiency at a utility, energy generation being the core process of those companies.

However, environmental statements of utilities recently participating in EMAS reveal that even those companies could identify efficiency potentials in their operations by introducing an EMS.[11] Such potentials may also be identified in areas that are not directly production-related but still cause relevant energy consumption.[12] Another effect may possible be that by being forced to introduce environmental aspects into the decision making, utilities reconsider their investment plans or are inspired to check new purchasing options such as renewable energies.

A significant aspect of empirical evidence however is that environmental management in many utilities is handled as something completely different from day-to-day business.[13] Though this is a common opinion in other industries, it seems important to notice in an industry whose business is the heavily polluting activity of energy

conversion. Looking at all aspects of environmental relevance except this activity seems thus misleading. The current practice of German utilities participating in EMAS to spend a significant part of their environmental programmes on measures like improving waste separation in the power station's canteen thus not correspond to a common understanding of "relevant environmental impacts".

It seems that EMS might be a good instrument to introduce the idea of managing the environment to a utility as much as to any other company, but that the mere introduction of a system alone does not provide for adequate results. One might say that there is a need for a strategic component in utility-EMS, which takes into account that energy utilities are causing more significant environmental impacts than producers of toys, beer or home electronics.

3.3 Evaluation

In reviewing the experiences made so far with EMS in both industrial companies and utilities, it seems as if EMS are good instruments for increasing (or at least maintaining) efficiency of day-to-day operations. The concepts formulated both in EMAS and in ISO 14001 also provide beneficial references to more strategic aspects, such as environmentally conscious purchasing and product planning. However these aspects are largely not met by companies' implementation of EMS today. It is difficult to say whether this is rather due to a lack of concreteness in the description of these instruments in the regulation, or whether it is just a result of the narrow focus of businesses.

4. More Effective Use of Energy through EMS?

The following chapter is to further investigate the role that EMS could play in enhancing a more effective use of energy in a systemic view. This shall be introduced by some remarks on the status of environmental effectiveness in industrial EMS (4.1), before these ideas are transferred to what this may mean in the case of utility-EMS (4.2).

4.1 Industrial EMS

As indicated above (see 1.), to enhance effective use of energy EMS should provide for:

- integration of product management
- provide means to support integrated chain management
- enhance stakeholder dialogue
- increase a company's innovativeness

Looking at the concepts laid down in EMAS and ISO 14001, it can be stated after some investigation that these aspects are included in their conception of EMS. They indicate that environmental aspects should be included in product planning, they point out that suppliers shall be audited, too, and thus underline the importance of purchasing for a company's environmental performance. At least EMAS with its compulsory environmental statement gives a strong incentive to establish a dialogue with stakeholders.[14] To evaluate the effect of an EMS on a company's innovativeness is not that easy. Freimann/Schwaderlapp 1995, pp. 48-49, come to the conclusion that today's implementation of EMS in many companies is focused on aspects of control and documentation rather than on designing "learning organisations" that could generate environmental innovations.

However there are points that speak against a major role of EMS in enhancing effective use of energy. Among these are the site-oriented approach described in EMAS as well as the non binding state of external communication in ISO.[15] Apparently the outcome of an EMS regarding effective use of energy depends to a large extent on how a company interprets its EMS.

Some examples may illustrate the span of possible interpretations: A German car manufacturer has recently registered its first site under EMAS. Their environmental objectives do not include any energy-related issues, but are restricted to some technical measures, mainly on waste management, and informational activities. In the same

environmental statement they printed neat little pictures of their cars, which have recently been attacked by Greenpeace for their poor fuel efficiency, without indicating whether the topic of their cars' fuel efficiency should be tackled as a consequence of environmental management, too.[16] On the other hand side, a Swiss logistics company has set up an EMS according to ISO 14001, and reports that one of the measures they have come up with is that they could avoid big amounts of energy intensive transports by setting up and operating regional maintenance centres for their customers.[17] This means for them opening a new business area in addition to selling transport services. A similar example is the case of a Swiss bank, which has started its EMS focusing on internal efficiency gains, mainly reducing the energy consumption for buildings and office equipment. Now they have proceeded to look at their products, including rating of their customers due to their environmental performance and development of financing and consulting services to advise their customers on environmental improvements.[18] In their energy efficiency guidelines, they commit themselves to actively promoting energy efficiency through participation in fairs, seminars etc.[19]

Obviously the latter two examples are closer to matching the prerequisites of effective use of energy than the first one. Some people argue that this has nothing to do with environmental management but that these are just examples of good business management. Indeed it is not certain in every case that the existence of an EMS resulted in these activities. Nonetheless if the objective is to improve environmental performance, it seems less useful to maintain a strict separation between environmental activities and "real business". Even if this implies that no precise causal relations can be made, establishing a closer link between a company's core business and their environmental efforts is vital for the long-run existence of such activities.

4.2 Applicability to Utility-EMS

As regards energy utilities, sophisticated concepts for enhancing effective use of energy have been developed within the Least-Cost Planning community.[20] Giving advice or incentives to customers to reduce their energy consumption is exactly aimed at achieving effective use of energy over the value chain. It has been argued that Least-Cost Planning is too much focused on costs and thus not a genuine instrument to enhance energy efficiency or environmental effectiveness. This is true to some extent, nevertheless designing LCP programmes can be considered a helpful way of environmentally responsible product planning.

Comparing LCP programmes to the kind of concepts developed by some progressive companies mentioned above under their EMS shows surprising parallels. As an example, the Swiss logistics company's concept for regional maintenance centres to avoid transports is well comparable to utilities offering energy performance contracting instead of selling kilowatt hours.

Unfortunately, just as in other industries, these progressive companies are a minority among utilities. Despite the fact that a combination of LCP activities and EMS introduction is not a major phenomenon among German or Swiss utilities, even those who follow both activities frequently do not see any link from one concept to another.[21] A reason for this might be the fact that EMS are usually introduced under the guidance of environmental protection departments who are well separated from other business units, such as the strategic planning or marketing departments responsible for LCP.

Leaving aside the fact that practical penetration of the concepts to date is low, one can ask what role EMS could play in a utility to enhance effective use of energy. Looking at recent experiences with utilities participating in EMAS, not much optimism seems warranted. At least the environmental statements of the German utilities investigated show a significant bias towards questions of marginal (environmental) relevance. As an example, none of them includes quantified reductions of greenhouse gas emissions into their environmental objectives, even though it is widely recognized that this is a relevant environmental impact of energy generation and some of the communities they are owned by have committed themselves to such objectives.

Nonetheless, the potential role of EMS could go considerably beyond that. This judgement is based on the following considerations:

• Utilities setting up an EMS must commit themselves to continuous environmental improvement. As such

improvements are very limited when looking at existing operations only, product-related aspects will sooner or later come into focus, as examples from other industries demonstrate.
- Existing regulations on EMS include - though not in a prominent place - hints on more systemic effects, such as including environmental aspects into purchasing and product design, or giving advice to customers on environmentally conscious product use.

Positive effects of utility-EMS can consequently be expected insofar as these systems provide incentives to the company and its staff to look over the fence. However, looking at the empirical evidence of utilities participating in EMAS so far, it seems that mentioning of strategic, product-related effects alone is not enough for concrete operationalization. Designing LCP programs may be one access to this topic. Other hints are given by the EMS concepts, such as enhanced stakeholder communication, or advice to customers on product use, as well as co-operation with suppliers on questions of energy use.

An important question in getting utility-EMS more adequate for enhancing effective use of energy concerns who should be the principal regulator of the energy system. LCP concepts usually assume that there is a vertically integrated utility which now extends is activities to the demand-side. Applied to the EMS topic, this would mean that utilitites should evaluate and manage environmental impacts of anything from the primary energy conversion to the provision of energy services at the customers' home or company site. This is often grounded on the notion of "product responsibility". Even if this seems ethically correct, there is some arguments against such a "mega-regulating" role of utilities.

- There are significant trade-offs in the objectives of generation and reduced demand which make it difficult to cope with within one organisation.
- In cybernetic terms, this can be explained by Ashby's Law: "Only variety can absorb variety" (Ashby 1964). Enlarging the system boundaries that far may ask too much from the utility's capability to cope with variety.[22]
- The current trend towards deregulation makes new approaches necessary.

The author's suggestion would thus be that demand-side efficiency aspects should be dealt with in the EMS of a company that is either

- a distributor buying electricity from various sources and selling it to industrial and smaller customers or
- an independent ESCO specially targeted at promoting effective use of energy.

Fig. 4-1 gives an idea of how that approach might be set into practice.[23]

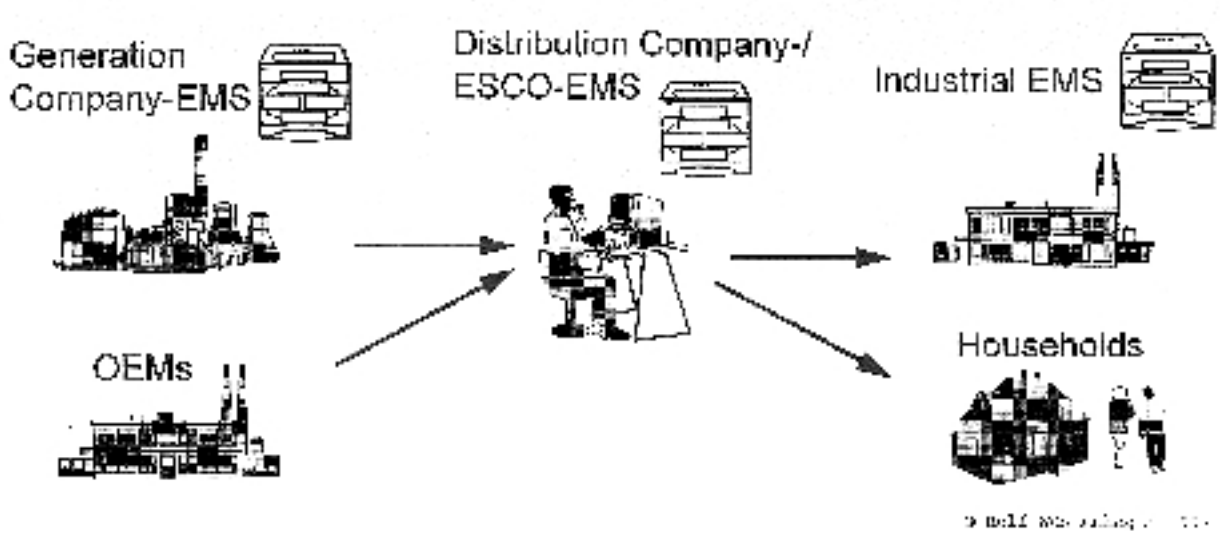

Figure 4-1. The distribution company or an ESCO as a gatekeeper in the product chain

5. Conclusions

The issues discussed in this paper can be summarised with a number of term pairs given below:

What can be achieved by applying Environmental Management Systems...

...in terms of.....	and/or in terms of...
efficiency	effectiveness
doing things right	doing the right things
internal	external
production	product
site	value chain
supply side	demand side
industrial activities	service activities
operations	strategy

?

It has been shown that EMS applied by industrial companies are definitely a useful tool to achieve efficiency gains, even if it is not self-evident that these effects are significant. Applied by utilities, the outcome of EMS depends even more on what the company makes of it. An EMS can be implemented very much in a defensive approach, thus focusing on documentation and control. Such approaches will neither result in significant improvements nor bring about product or service innovations that contribute to effective use of energy in a systemic sense.

So EMS are definitely not a substitute for a comprehensive energy policy, especially they should be accompanied by instruments to meet the criterion stated on first place above, which is increase energy prices, e.g. by means of taxes. Nevertheless EMS may still contribute to an accelerated realisation of the existing potential for energy efficiency in industry, and they may support a way of thinking that could end up in system improvements. It is these “soft” aspects, the implication of EMS on socio-economic change in companies and between them that makes their real value.

From a utility point of view, the introduction of EMS at their customers may assist in the emergence of a market for energy audit services offered by the utilities or ESCOs. Yet it is more probable that industrial customers will demand comprehensive environmental auditing assistance rather than energy specialists alone.

Another point is that co-operative strategies could be essential to achieve system-wide improvements. Future EMS regulation, such as a revised edition of the EU’s EMAS scheme planned for 1998, should thus name such options and auditing practice should check and reward them. Paying more attention to strategic product management within an EMS may be a first step to that direction.

Finally, governments may play an important role in these processes by promoting best practice, insuring credible evaluation & public transparency and demanding high quality standards for environmental verifiers.

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Endnotes

[1] For an evaluation of energetic impacts of different food alternatives see Bossel et al. 1994.
[2] See Tischner's innovative cooling concept named Fria (cf. Schmidt-Bleek, Tischner 1995, pp. 60-66).
[3] Cf. for example European Parliament 1996, pp. 17-18, with further references.
[4] In full length, EMAS stands for Eco-Management and Audit Scheme. The original text of the regulation has been published in the Official Journal of the European Communities of July 10, 1993, No L 168.
[5] For those readers who are unacquainted with EMS, you may refer to the original regulation documents EMAS and ISO 14001 or to one of the uncountable guides published to comment on them. Two particularly recommendable publications are LFU 1994 for EMAS and Dyllick et al. 1996 for ISO 14001.
[6] The full title of these norms, which are published in Europe by the European Committee for Standardization (CEN), Brussels - is: ISO 14001 : 1996 Environmental management systems — Specification with guidance for use, and ISO 14004 : 1996 Environmental management systems — General guidelines on principles, systems and supporting techniques.
[7] For further reference on the benefits of EMS for companies cf. Peglau/Schulz (1994), p. II.52, for empirical results on the motivation for companies to participate in EMAS cf. Gerling Consulting 1995. For a broader discussion of this topic see Wüstenhagen 1996, pp. 53 ff.
[8] which are Stadtwerke Unna, GEW Köln and Stadtwerke Karlsruhe (see their environmental statements in the reference section of this paper).
[9] Estimations of the German Federal Environment Agency say that the total amount of companies which could participate in EMAS is as high as 292.082 in Germany alone!
[10] This is true for any utility according to ISO 14001. According to EMAS, only the production of electricity, gas, hot water or steam can be subject to a validated EMS. Nevertheless these specifications are a bit fuzzy, and there is at least one example of a municipal utilit§y in Germany which has achieved validation with a major part of non-production activities (see Wüstenhagen 1996, p.63, for details).
[11] It should be pointed out that it seems not always clear whether the revelation of such potentials is really an effect caused by the introduction of an EMS or whether the environmental statement is not just a new channel to communicate investments that would have been realized anyway. (cf. GEW 1995, p. 19, who include electricity generation in a new facility for reduction of tension on the gas grid in their environmental program)
[12] E.g. the environmental programme of a Cologne-based German utility includes improving the insulation of the administration building. (GEW 1995, p. 19)
[13] This was e.g. expressed by Mr. Rolf Henriksson, Environmental Controller of the Swedish Utility Sydkraft AB (personal communication, 18.1.1996, Malmö).
[14] Although simply publishing an environmental statement or report is not yet a dialogue but rather a monologue.
[15] Note that both points of critique are met in the respective other regulation: ISO is not site-oriented, external communication in EMAS is compulsory.
[16] Cf. Volkswagen 1996.
[17] Personal communication with Mr. K. Zügel, Setz Gütertransport AG, Dintikon/Wuppertal, 23.1.1996
[18] Cf. SBC 1996
[19] SBC 1995
[20] See for a comprehensive overview in the German-speaking community Hennicke 1991 or Leprich 1994.
[21] An example for this common view has been expressed in an interview with the head of the environmental department of a south German utility about their EMS. After spending months on introducing the EMS, the interview partner, who was also a part-time assistant to the company's managing director, still said that LCP is a topic for the company's strategic planning department, and not relevant to him.
[22] This impression is also underlined by the author's experience in discussing with utility staff on the implementation of Management Systems that cover both generation and demand-side management.
[23] See Wüstenhagen 1996 for details.