Energy Management in Large Enterprises – The New Energy Age Starts Here

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I. Introduction

Everyone is talking about energy. Good news – such as the expansion of renewable energies, smart electricity and gas meters, intelligent transmission and distribution networks ("smart grids"[*1]), and new technologies that allow more efficient usage of energy – mixes with bad news about the world's growing energy needs, ever increasing energy costs, the effects of rising CO_2 emissions, and the dramatic consequences for mankind, nature and the economy of serious incidents in oil drilling (such as in the Gulf of Mexico) or energy production (such as Fukushima). It is clear to any intelligent person reading this news that something has to be done.

Industrial companies including the public sector are by far the highest energy consumers with around 60%[(*2)]. Many companies in energy-intensive industries such as the chemicals sector, oil & gas, mining, milling, automotive, high-tech, telecommunications, travel & transportation, and retail (but also public infrastructure such as large towns with all the associated facilities like airports, universities, hospitals, and so on) have combined energy consumption of over 1 TWh p.a., which at normal energy prices for major customers leads to energy costs of €50 – 100 million per year. The upheavals in the energy market could in future threaten the very existence of some industrial companies, but at the same time, could also offer opportunities to pull further ahead of the competition. Efficient consumption of energy from the most cost-efficient and low-emission sources possible is becoming an ever more important target for industrial companies, and will soon become a necessity.

As the world's leading supplier of ERP software[(*3)] and the global market leader for customer information and billing systems in the utilities sector, SAP has unrivalled knowledge of the challenges facing industrial companies in matters of energy. By providing an Energy Management solution, SAP can offer these companies sustained and long-term support in improving their energy balance. This article outlines just such a software solution, and underlines the added value it can generate for these companies.

Energy Management has three fundamental aims:

1. **Improve Energy Efficiency**

   This area deals with finding ways to reduce energy consumption in a company. Simply consuming less energy (kWh), however, would only partly meet this aim. It is also about avoiding peak loads (kW) because the energy supplier has to design a capacitive supply system that is able to meet these peak loads. This is very expensive and risky: As a result, the energy supplier passes the costs onto its customer, the industrial company.

2. **Optimize the Energy Portfolio**

   Optimizing the energy portfolio is about planning the energy demand as precisely as possible. This plan can then be used to procure the required energy at the lowest possible price. The price of a kWh depends on the form of energy (electricity, gas, oil, etc.[*4]), the way in which the energy is generated (for electricity), the time of day, on regional and seasonal fluctuations, the supplier (where there is a choice of supplier), and ultimately on the type of contract that the company enters into with the energy supplier(s), and the range of contracts is extensive – particularly when it comes to large industrial companies.

3. Reduce and Manage Emissions

Thirdly, energy management is about avoiding emissions and keeping within the legally prescribed thresholds or quantities. Direct emissions, such as those produced from the burning of fossil fuels in energy production, lead to direct charges. In the case of indirect emissions, the energy supplier bears the cost of the emissions, and passes this onto the company in the energy price. However, indirect emissions are becoming as well unpopular, and avoiding these is not just becoming a cost issue for companies, but an image issue too.

These three objectives *depend on each other*. Understanding and making these relationships transparent, and incorporating these relationships into an optimized energy consumption and energy procurement plan is something that an Energy Management system can offer companies. Such a system could be of equal benefit to the engineers in production, the experts in procurement, and the company's Sustainability Officer. Ultimately, however, sustained energy management is something that applies to every employee in the company.

Top of the list comes electricity because in terms of volume and complexity, this represents by far the greatest challenge and greatest potential for Energy Management. Unless specifically stated otherwise, this article will therefore always refer to electricity when energy is mentioned. Fundamentally, an Energy Management system must, however, look at all forms of energy (gas, oil/diesel/petroleum, indirect forms of "useful energy" such as steam/hot water, cooling energy or compressed air, and natural resources, above all including water/effluent). SAP has therefore given the system the working title **Energy and Environmental Resource Management (EERM) System**. Figure 1 shows an overview of the contents of SAP's EERM System, which according to current plans is going to be released to first customers in 2013.

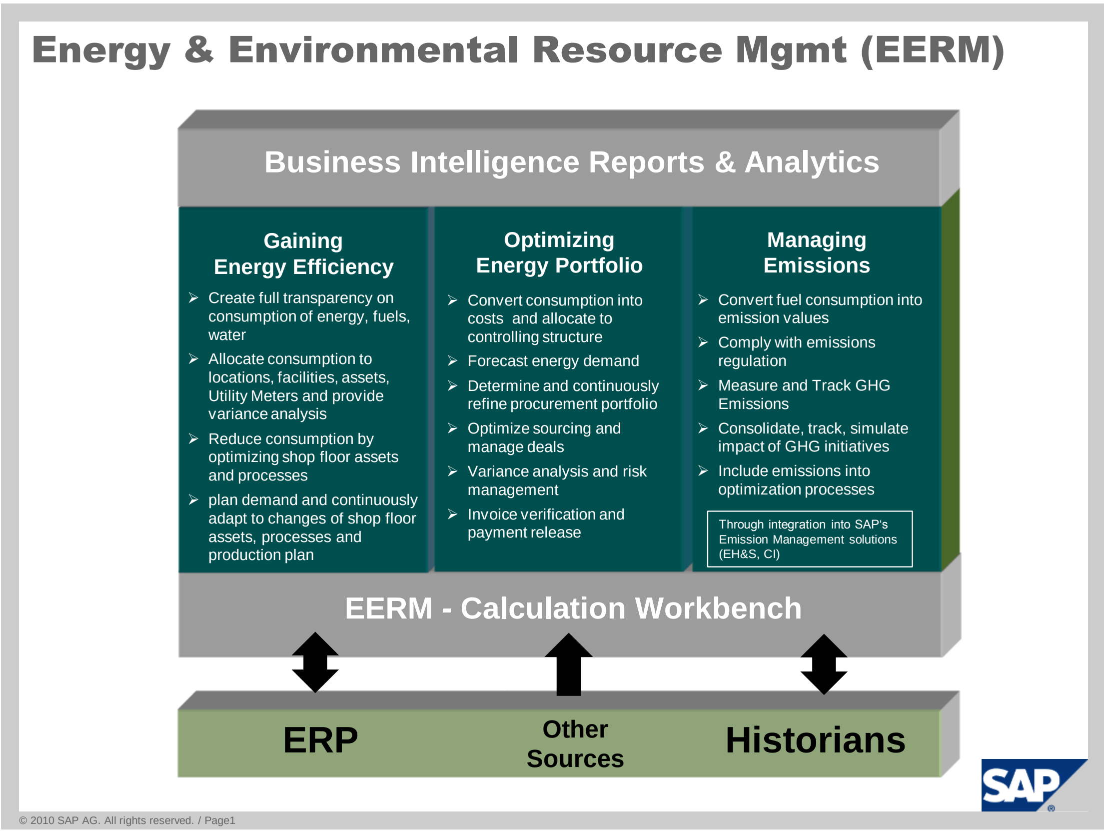

Figure 1

The following three sections will go into the three objectives in greater detail.

II. Improving Energy Efficiency in Production and Service Areas

Optimizing production flows is nothing new for any company in any industry. Companies have always sought to optimize their people, machines, materials, processes, locations, times, production cycles, quality (and much more) according to certain criteria. This also applies to services such as the maintenance of electricity/ gas/ or water meters by Utility companies, operating escalators or moving walkways in airports, or air-conditioning systems in hotels. In the past though, energy was not regarded as an especially relevant optimization area. After all, it was delivered as a “just-in-time” service, had a fixed price, and – thanks to lower levels of automation and the lower levels of office “comforts” – was not consumed in the large quantities that are usual today.

Industrial companies are realizing more and more that energy, as a key production resource, is becoming an increasingly important optimization area. Incorporating it into the various other optimization areas and algorithms would in itself not be a particular problem. However most companies generally lack the transparency needed to identify which production lines are consuming energy at what time, for what purpose (product, service), and to what extent. As such, they lack reliable measured data, and it is invariably difficult to optimize any area when there is no measuring in place.

The EERM system offers precisely such transparency, completeness, and intelligibility. The most important contribution the EERM system makes to the area of energy efficiency is to outline the actual energy consumption of the various production lines and/or services in a similar way to a cost accounting sheet. It provides the different areas of the company with a reliable picture of their energy consumption and allows them to comply with the consumption targets and related cost budgets. This requires the actual energy load profile[(*5)] of the production lines/devices in the form of a true measurement and at the lowest level possible. To achieve this it may be required to install a meter for devices that consume large amounts of energy. If this is not cost-effective, the EERM can also simulate the typical energy consumption behaviour of a device using a “synthetic load profile”[(*6)]. Final result is a hierarchy of “load profiles” for the measured or simulated energy consumption of a device, all the devices in a production line, all the production lines in a production area, all the production areas in a production location, all the locations of a company, and ultimately, the overall energy load profile of the entire company logically categorized according to electricity, gas, oil, water, and so on. This data can then be used to determine the energy demand per production unit or product, the Key Performance Indicator (KPI[*7]) that forms the baseline for optimization. Other KPIs are also easy to track, for example the electricity demand for all lines of the same type regardless of location, or the overall energy requirements of a location regardless of energy type.

However, identifying the energy consumption across all hierarchies is only the first step. Since energy prices are becoming increasingly tied to the time of day, the load profile of energy costs can sometimes differ greatly from the load profile of the energy consumption – with the cost profile generally being the more important consideration. This is especially the case in liberalized energy markets, where industrial companies are often accorded the same energy procurement rights as an energy supplier from the utilities industry. Figure 2 shows the load profile for a working day in a European industrial company, and compares this with the corresponding cost profile.

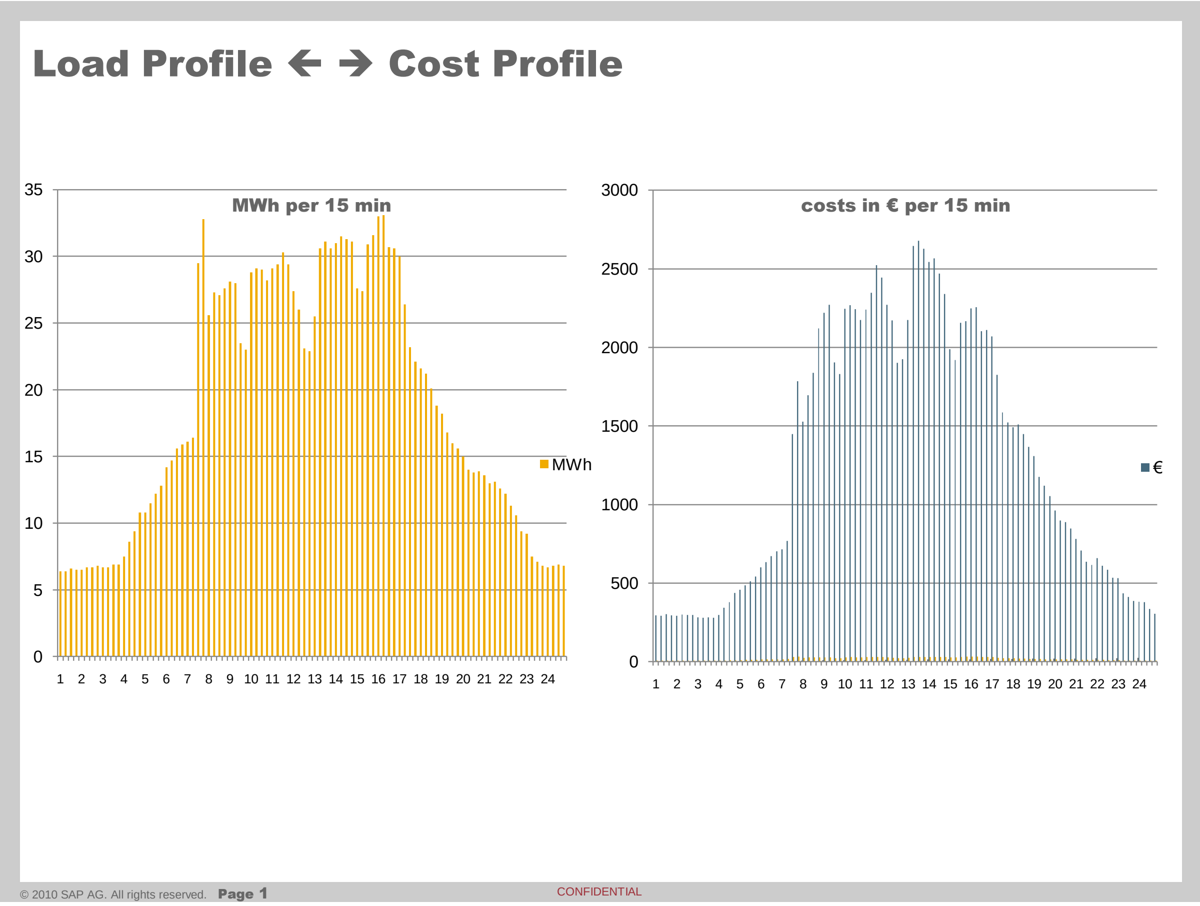

Figure 2

To calculate the cost profile, the various (often very complex) price conditions need to be simulated and calculated. To create the cost profile, the EERM has to perform this simulated preliminary calculation itself – a very useful function that we will discuss more in the next section “Optimizing the Energy Profile”.

Since a large company is often able to procure energy from several sources and at different prices/conditions, the energy manager generally calculates a mixed price, which is then used as the standard price in the energy cost accounting for a company location. However, it doesn’t have to be like this. Exceptions to this method are possible, but this makes things more complicated from a metering and settlement perspective.

So now that we’ve made the energy consumption and costs more transparent, how do we optimize them?

Remember: Energy was only one of the many criteria that had to be taken into account in the optimization process. The EERM system therefore needs to allow optimization algorithms for the individual devices, production lines and areas as a whole with options that include the other criteria, and incorporate these in the optimization calculations. So how can we obtain the data that needs to be included in the optimization calculations?

Essentially, there are three different types of data source:

1. Sensors and meters in the production lines and for specific devices. These provide up-to-date data from the production or service process.
2. Smart electricity, gas or water meters from utilities companies. These provide data about overall consumption.

Ideally, a historian system such as OSIsoft's PI system will act as the data hub and "Gateway" between these two data sources and the EERM system.

3. Data from one or more ERP system(s) about the devices and lines, the technical areas, buildings and locations, the products and production plans, the personnel and deployment plans, the energy supplier agreements, their prices/conditions/terms and much more.

The EERM system is defined in two ways based on the data from this third data source: On the one hand, the EERM system builds its data model on the data from the ERP system, and on the other, any changes to the ERP data resulting from change management projects for energy optimization (e.g. replacing devices/lines or moving production times) are reincorporated in the ERP system. In order for an EERM system to remain accurate and reliable, it must be permanently and consistently integrated and synchronized with the ERP systems.

Simply retaining this data, however, is not enough. The EERM system needs two other key features:

- To help experts identify optimization potentials, they need support and user-friendly instruments for analyzing and displaying the data.
- A calculation engine is needed in order to allow experts to simulate optimizations and compile findings about improved production management based on these simulations. To this end, formulas or smaller optimization applications can be stored in a formula database (in general, the Application Store). Industrial companies with extensive experience in the field of production optimization have a wide range of such optimization formulas and applications. These are extremely valuable to the company, and are therefore often treated as strictly confidential.

Figure 3 summarizes the properties an EERM system needs in order to improve energy efficiency.

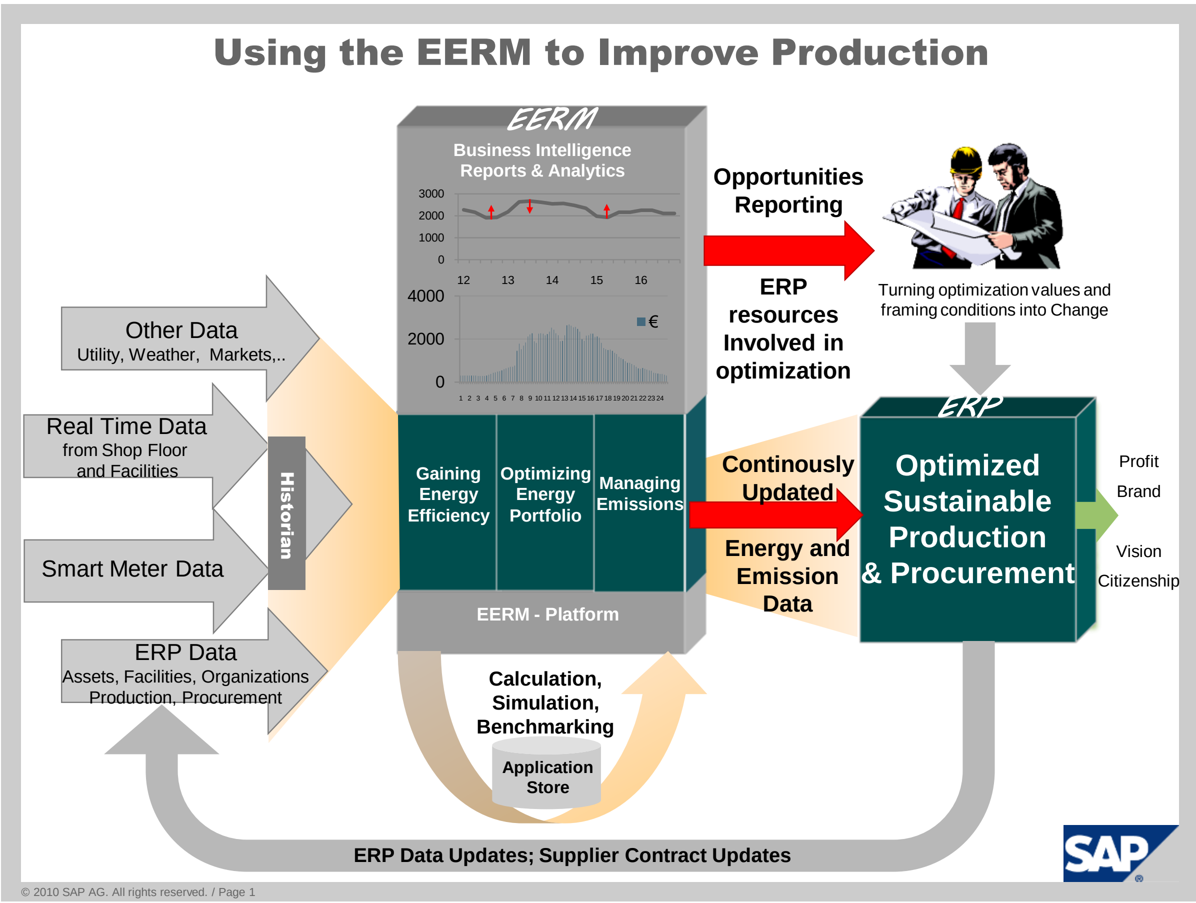

Figure 3

The graphic illustrates the benefits of the EERM system for the company:

- Energy consumption including actual costs can be allocated to the various devices/lines/production processes or service processes by the EERM system based on demand
- The resulting data transparency helps production experts identify possible optimization areas
- Using the calculation platform, various alternatives can be simulated, evaluated, and the optimum solution identified
- The EERM system is fundamentally industry and system agnostic: It can be used equally for the energy management of production lines or buildings in general
- The calculation platform works with a formula and application database in which industry-specific or line/device-specific algorithms and procedures can be defined and used in the calculations and simulations

The EERM system is a tool that helps experts familiar with the production lines and processes make decisions about possible optimizations. The EERM system cannot make these decisions itself. The optimization process usually ends with a series of projects with varying degrees of complexity in which the changes proposed by the experts are implemented (for example, replacing production lines, using alternative materials, changing production processes, moving production processes to different times of the day, relocating production to another location, and so on). In evaluating and deciding on the project, all costs need to be taken into account (one-off costs, long-term costs, tax benefits, etc.). With its data and applications, the ERP system helps the company to identify these costs. Once these have been determined, the company can then decide whether the projected benefits of the optimization measures justify the implementation costs.

Once the project has been given the green light, there are also ERP applications (such as Plant Maintenance, Asset Mgmt, Procurement, Project Management, and so on) that support the company during project implementation, monitor any discrepancies between the TARGET and ACTUAL status, and also implement the corresponding changes to the ERP data about devices/lines/products/resources. The optimization project is complete once these changes are also available in the EERM system following automatic synchronization with the updated ERP data.

III. Optimizing the Energy Portfolio

This section of the article now deals with the options available within an industrial company for reducing the energy procurement costs. Depending on the market and the extent of liberalization, if the industrial company looks at all the various options, it will be able to negotiate much better prices and purchasing conditions and realize significant cost saving potentials. However, the company must also take into account risks that could result in poorer purchasing conditions for the given demand period.

One absolute prerequisite for any industrial company wishing to optimize its energy procurement costs is that it can determine its future energy requirements as precisely as possible: The closer the respective period approaches, the more detailed these plans need to be. In addition to the engineer's maxim alluded to above "You can only optimize what you can measure" comes the buyer's maxim "Perfect procurement is only possible with perfect planning and compliance". A company can generally predict its energy requirements for production and services based on past values, but it must be sure that its production plans and/or the demand for its services are realistic. If it is not certain of these factors (for example due to strong unforeseeable fluctuations in demand for products/services), the forecasted energy demand will also be uncertain.

A key role of the EERM system, then, is to help the industrial company create an energy demand portfolio (primarily for electricity, but also for other forms of energy). This will result in an equal-weighted hierarchy of load profiles (forecasts, schedules) for the short-term, medium-term, and long-term future developed using a bottom-up approach based on the historical values for the various devices, production lines, production areas, and production locations. Added to this is company-specific information relevant to production such as the planned production growth, changes in working time provisions, and other similar factors. These forecasting methods are widely used in the Utilities industry, however the calculation algorithms need to be tailored to the specific requirements of the companies in the respective industries.

As for energy procurement itself, this is usually dealt with for each location as a whole by the company (i.e. for all production areas, lines, and devices within a location), and where applicable for multiple locations. The overall energy demand to be procured for a specific location is then structured as different procurement elements, and make up the "energy procurement portfolio". The load profile showing the overall demand is split into several elements, which can then each be handled separately in the energy portfolio during the procurement process. This split breaks the overall demand down into standard retail products such as "bands" or "peaks" as well as a "residual profile"[*8] that outline the difference between the forecasted energy demand and the allocated standard products. Figure 4 shows a possible configuration of the elements in such an energy portfolio.

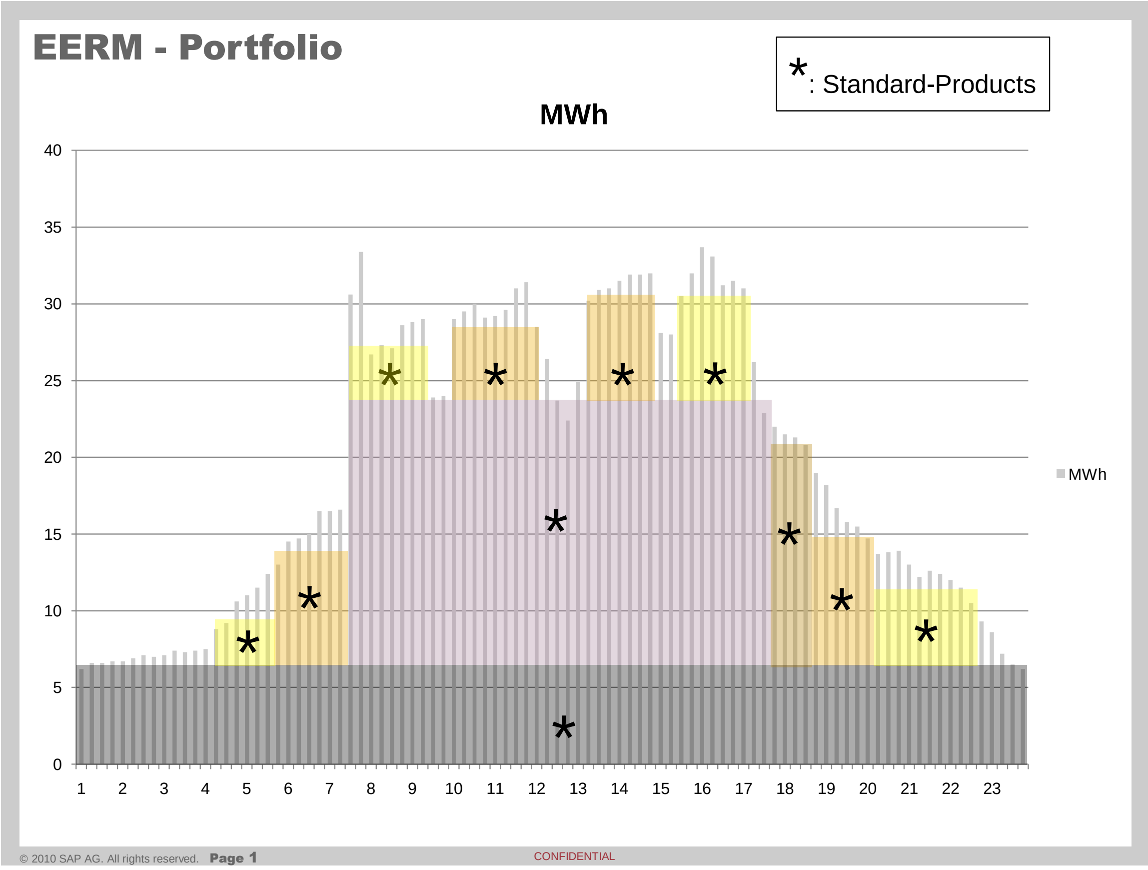

Figure 4

The procurement process for each individual portfolio element is similar to the process a Utility company would apply. As such, the EERM system should offer the functions of a typical energy portfolio management solution[*9] from the utilities sector:

- All the elements in the procurement portfolio are based on deals with their own tariffs, prices, and conditions
- Deals are concluded for standard products or "residual energy" and for any required periods (hrs. – quarters)
- The sources of supply may be different (different suppliers)
- Own generation can be supplied in the form of virtual deals, for example with prices that are based on the full costs of the generation plant
- Contracts can be agreed as fixed or as temporary options
- Basically all options available in energy trading[*10] for the utilities sector are available

Since the company knows the prices, conditions, order volumes/consumption covered by each contract, it can determine the invoice amounts during or following delivery and send this data to the energy supplier for the purposes of billing, or use it to check any bills issued by the energy supplier and, depending on the result, query or pay the bill.

Why does a procurement strategy with individual elements in an energy portfolio and several, temporary deals with multiple suppliers lead to such considerable cost savings compared to a procurement strategy in which the overall energy demand is covered by one unlimited full service agreement with one supplier (which is generally the case with all private consumers)? Essentially, this is due to the following two reasons:

- Industrial companies use the procurement practices that the energy supply industry itself uses. This allows them to procure energy at lower costs, but at higher risk.
- Industrial companies tailor their energy consumption to the price fluctuations in the market, consuming energy when it is cheapest, and reducing consumption during price peaks.

The minimum demand (that is, demand that the company knows will be required) is covered by standard products that - while offering excellent conditions- expose the company to a certain risk. For example: The industrial company orders a band of 30 MW of electricity from the energy supplier at a fixed price for a from/to period <date; time> or for a specific period of each day, the 30 MW is payable in full even if only partially consumed.

In order to provide industrial companies with integrated energy efficiency/energy portfolio management, the functions of the EERM system as described here will not suffice. Energy portfolio management is a complex issue, particularly in terms of electricity. It requires a procurement area with experienced energy portfolio managers, who among other things, are happy to work closely with the engineers that manage the production lines. Many companies still avoid costs for such experts, and continue to enter into the traditional supplier agreements for full supply with the utilities companies.

Another way in which industrial companies can better optimize their energy portfolio is to generate their own energy. This is hardly surprising because it means they then start to gain even more of an equal footing with the utilities companies themselves. If industrial companies have energy generation units that are highly flexible to manage (e.g. diesel generators, gas turbines), they can use these to generate the residual energy, they would otherwise have to buy on the market at volatile prices. Building and operating such systems requires expertise and experience, not to mention a great deal of administration. Industrial companies therefore often collaborate with energy supply companies or other experts, who act as contractors and assume responsibility for the construction and operation of the systems. This idea would also suggest that industrial companies are taking renewable energy sources into account for their energy generation. However, since the output from renewable sources of energy is difficult to plan (for a variety of well documented reasons), they are not suitable for covering residual energy demand.

With the gradual switchover from fossil fuels and nuclear power to renewable sources of energy, the probability of capacity problems at peak load times increases. This is a fundamental problem that consumers can not solely leave to the Utilities industry to resolve. A cooperative solution is required. The consumer (in our case, the industrial company) needs to cooperate with the energy suppliers to plan better for peak load periods in which the required amount of energy may not be available. The energy supply industry uses the term "Demand Response"[*11], which refers to a company's ability to tailor its energy consumption behaviour to a temporarily reduced delivery capacity quickly (preferably automatically) and with the least possible economic impact. While such a contingency plan allows companies to plan for the threat of a black out in exceptional cases, its main reason is to avoid (or "even out") peak loads across the entire market, so as to spare all those involved the extremely high costs that result (in the short-term: high energy prices, in the long-term: building additional power plants).

Companies can make their own preparations by ensuring they even out their own overall load profiles, especially during peak loads (for example, ramping up electric furnaces at the same time), and where this is impossible, by ensuring such events are planned and not unplanned.

Another option is for companies to make concrete provisions for operation at partial capacity with significantly reduced energy consumption. Discussions also often center around "negawatts"[*12] generated by industrial companies, that is, unconsumed megawatts, which – when combined with a number of other companies in the same energy market – significantly contribute to relieving the overall energy demand. This immediately raises the question of how this works both technically and commercially. Here are a few brief answers:

- From a technical point of view, the idea works by using emergency power generators. A better solution is for a company to establish energy storage systems and use this stored energy during bottleneck periods. Depending on the industry, there are several possible ways of storing energy; battery storage is just one of these. In exceptional cases, the company could move production times or even slow down production.
- The following method could be used on the commercial side (between the industrial company and the energy supplier): During the demand response period (normally a few hours), energy consumption is compared with the average consumption values on typical reference days (at the same times), and the difference is evaluated with a “negawatt” price, which on the one hand is based on the price agreed by the industrial company (or the full costs of own generation), and on the other on the peak prices demanded by the energy markets for the period in question.

Demand Response activities are normally implemented as projects between the industrial company and one or more of its energy suppliers. However, in the US state of California for example, the regulated energy suppliers actually leave the “collection of negawatts” to individual consultancy and service firms, which then process the commercial transactions with the industrial companies (under the supervision of the local regulator), and sell the collected negawatts to the utilities companies. In the Californian energy market, this is a much preferred practice to the construction of very expensive “peakers”[*13] (usually gas turbine power plants that are able to provide short-term balancing energy).

For industrial companies, professional and well-planned participation in demand response events is no longer just about cost savings, but also about significant added value opportunities. However, it means the company has to invest in its own energy generation plants and could also carry with it the must-avoid risk that losses from impacts on production are higher than the revenues generated from the demand response event.

IV. Reducing and Managing Emissions

Emissions[*14] are the less attractive side of manufacturing. However, experts are not short of options for avoiding emissions or even eliminating them completely. The fact that this does not happen is often due to a lack of transparency both in terms of the emissions values themselves and in terms of the costs and benefits of reducing them. Unfortunately in many cases, there also tends to be a downright lack of interest on the part of the company to deal with the emissions they cause. However, for a society in which sustainability, under the banner of conservation and emissions reductions, is one of the key issues, companies that ignore these topics are running increasingly serious risks: Risks such as increasing taxes and duties on emissions, risks from restricted productivity or decommissioning, risks of high compensation payments, and risks due to loss of image.

Manufacturing products or providing services can result in a wide range of emissions, for example emissions

- resulting from the burning of fossil fuels to generate energy in power stations,
- resulting from the burning of fossil fuels in motor engines,
- resulting from chemical processes,
- in the form of badly polluted waste water,
- in the form of radioactive or electromagnetic radiation
- in the form of loud noise or strong vibrations

Almost all emissions have now been legally regulated by way of qualitative and quantitative thresholds, which (unfortunately) are subject to country-specific rules, values, deadlines, and reporting procedures.

This introduction elucidates that the reduction and management of emissions is a theme of its own requiring its own system. Such central “Emissions Management System” is familiar with all local emission regulations, it knows all procedures of monitoring and disclosing of emission reports, it knows the companies emission sources and maintains the accrued emission values as well as the companies emission objectives and target values to be achieved, it knows the actual taxes, fees and incentives, finally it owns the Analytics Dashboard that provides senior management an up to date overview on its emission affairs.

Emissions caused in the production or service process are one more source of constraints that EERM can considered in the optimization process. This holds true for any emissions, not just for those that are related to the generation of energy. An example would be to measure waste water pollution and make its reduction subject to a process optimization. The EERM System owns or has access to the data it needs to extend its optimization work to also include emissions: it owns the data describing the devices and production lines and it owns the information on the overall optimization procedure in which the emissions represent one of several constraints. EERM can now use this data to involve the Central Emission Management System, leverage the intelligence of that system, receive translated values on emissions, related costs and potential risks back (like exceeding thresholds or volume limits etc) and apply these returned results in the optimization process.

The central Emission Management System may in return leverage the infrastructure underlying the EERM system and use the Gateway Historian as the permanent real time connection to all emission-relevant data from the shop floor.

The following examples explain the cooperation of both system:

- The EERM system integrates into the central Emission Mgmt System to receive the values of emissions associated with the company running its own gas turbine power plant. EERM uses the received emission values as part of its optimization process
- The EERM System integrates into the central Emission Mgmt System, accesses measured data on the pollution of water being used in the production process and uses this data in its optimization process

- The EERM system leverages the central Emission Mgmt System to receive information on the total emissions of the company's car fleet based on the submitted gas receipts for company cars, the mileage and the emission factors provided by the car manufacturer. Based on this information EERM can now involve emissions into car fleet related optimization processes. It would also be able to allocate the received emission volumes to organizations or to allocate it to the manufactured products or the executed services (emissions per product/service).

While the given examples are quite different from each other, they have one thing in common. It's that the emissions are caused by the industrial company itself ("direct" emissions).

Of increasing importance to industrial companies, however, are as well the indirect emissions: Those emissions whose associated emissions are not immediately caused by the company itself. It is only really possible to talk about sustainability if the products that a company manufactures/delivers/maintains/recycles can be manufactured with low emissions regardless of which company assumes which share in the supply chain. If these companies each measure the emissions that are generated within their part of the supply chain process, the EERM system would be able to involve the information on both the direct as well as the indirect emissions into its optimization processes.

V. SAP's Commitment to Energy Management is no Coincidence

There are several reasons why SAP has decided to enter the area of energy management.

- SAP became a world leader by developing industry-neutral applications for enterprise management and business support functions, including in some cases for very industry-specific core processes. In thousands of industries, the corresponding *SAP for <Industry>* platforms have become the nerve centres of the company's overall operations and administration. Information about equipment, lines, production/service areas, products and production plans, about sales employees and their managers, about procurement contracts with energy suppliers and the various billing processes, and much more is stored in the *SAP for <Industry>* solutions. SAP therefore has the ideal framing conditions on which to develop an energy management system. This explains why industrial companies are expecting SAP to help them in the increasingly important task of managing energy costs and avoiding the associated risks.
- The market leadership described above applies in particular to energy-intensive manufacturing industries (Oil&Gas, Metals & Mining, Chemicals, Mills, High-Tech, Automotive, Life Sciences, Industrial Machinery & Components, Consumer Products). SAP has extensive knowledge of the systems and production processes used in these industries.
- As outlined above, SAP ERP systems not only deliver the baseline data for the EERM system, they also perform the change management measures resulting from the optimization projects. These projects need to be planned, budgeted, staffed, and managed, the respective assets need to be purchased, delivered, expanded and installed, and put into live production – and all changes need to be updated accordingly in the ERP system. Thanks to the continuous synchronization, these changes are also imported back to the EERM system so that new optimizations are always based on the most up-to-date data. There is no doubt that an EERM system developed by SAP will manage such integration seamlessly.
- The EERM development will fully leverage SAP's past and future investments into Emission Management as it relates to the Environment, Health & Safety solution and the Carbon Impact solutions of SAP
- As the global leader for application software in the utilities sector, SAP has in-depth knowledge of energy supply and the core processes of Enterprise Asset Management, Customer Relationship Management and Billing, and Energy Capital Management. Over 750 million electricity/gas/water supply contracts are settled with the CRM&Billing solution on the *SAP for Utilities* platform used by around 1,000 utilities companies in some 70 countries, which also include millions of special contracts with major industrial companies.
- SAP has extensive experience integrating its solutions with data historian systems from its work with all production-line intensive industries – experience that will be of major benefit in developing the EERM system. The interface between the data historian and the *SAP for <Industry>* platforms is the crossover point from real-time processes in the co*mpanies to the bu*siness enterprise applications. SAP knows from its experiences with thousands of customers the added value of an ERP system, which records relevant and tested information from production areas in as close to real time as possible.
- In May 2011, oekom research AG, an independent ratings agency, nominated SAP AG as the best company in matters of sustainability out of all those listed on the DAX as well as the DOW JONES a*nd EURO STOXX 50 I*ndex. Such an accolade clearly illustrates that SAP has every right to claim the market leading position in the area of energy management, perhaps the most important area in the field of sustainability.

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*4: Form of energy http://www.wikischool.de/wiki/Energiearten_in_der_Energieversorgung

*5: Energy Load Profile http://de.wikipedia.org/wiki/Standardlastprofil

*6: Synthetic Load Profile http://de.wikipedia.org/wiki/Standardlastprofil

*7: Key Performance Indicator (KPI) http://de.wikipedia.org/wiki/Key_Performance_Indicator

*8: Residual Profile
http://help.sap.com/saphelp_nw73/helpdata/de/4b/9a4e7f540a0f30e10000000a421392/content.htm

*9: Portfolio Management http://de.wikipedia.org/wiki/Portfoliomanagement

*10: Energy Trading http://de.wikipedia.org/wiki/Energiehandel

*11: Demand Response http://en.wikipedia.org/wiki/Demand_response

*12: Negawatt http://en.wikipedia.org/wiki/Negawatt_power

*13: Peaker http://en.wikipedia.org/wiki/Peaking_power_plant

*14: Emission http://en.wikipedia.org/wiki/Emission

*15: Real Time Pricing http://en.wikipedia.org/wiki/Variable_pricing