In the glass industry, energy efficiency is already a top priority for economic reasons. Yet the issue is currently gaining even greater importance as a result of legislative changes: All member states of the European Union are obliged to transpose a new EU directive on energy efficiency into national law. This will have consequences for businesses in each country. Siemens shows glass producers how to best respond to these changes.

The European Energy Efficiency Directive (EED) came into force in December 2012. It aims to ensure that EU Member States will achieve the target set in 2007 of reducing primary energy consumption by 20 percent by the year 2020, despite considerable delays. The EED sets out clear requirements for large companies within the EU: They are obliged to conduct energy audits every four years, and must have completed the first audit by December 5th, 2015. Alternatively, they may introduce an energy management system in line with ISO 50001. The chosen management system must be certified by the start of 2017.

Which businesses are affected?
For European companies, the question now is whether they are impacted by the directive or not. The EED affects all companies that are not classified as small and medium-sized enterprises (SMEs), as defined by EU law. A business is considered to be larger than an SME if one of the following two factors applies (see also Fig. 1):

- The company has over 250 employees; or
- An annual turnover of over EUR 50 million and its total annual balance sheet exceeds EUR 43 million. Partner companies and affiliated companies in the EU and non-EU countries are also taken into consideration. The EED applies to companies in all sectors, from manufacturing companies such as glass producers, to banks, insurance companies and retail businesses.

Implementation at the national level
Companies affected by the EED must observe the specific guidelines in their own country. As each EU Member State must transpose the EED into national law, the precise guidelines may vary from country to country (Fig. 2).

Many EU states have not yet adapted their legislation to the new directive, or have only done so in part, although the deadline for this process was in June 2014. In countries where the EED has already been successfully implemented, there are discrepancies in the precise definition of a large enterprise, as well as in the standards for audits and the qualification of auditors.

Audit or energy management system
Companies concerned by the EED must decide whether they wish to undergo regular energy audits or introduce more comprehensive energy management systems.
an on-going energy management system. For both options, there are clearly defined requirements in the EED and in each national legislation. An audit is a scheduled inspection of energy usage and performance within a company. Audits are to be conducted every four years, and include suggestions for optimization based on efficiency calculations. Audits must adhere to the standard EN 16247, which includes an on-site inspection of all business locations. They must also comply with an array of minimum criteria, as listed in Annex VI of the Directive. For example, the audits must be based on life-cycle cost analyses instead of simple payback periods in order to assess energy efficiency measures over the long term.

Unlike audits, energy management systems constitute an ongoing process. Energy consumption data is continually acquired, a range of efficiency measures are developed and the optimum concept is implemented. All company levels are involved in the process, from management down to production lines. Permanently monitoring data and displaying energy flows provides a transparent overview of the entire lifecycle of a particular product. Energy management systems must adhere to standard EN ISO 50001, which is compatible with other standards in the ISO family. This means that energy efficiency can be incorporated into existing management systems. An overview of the differences between audits and management systems is shown in Fig. 3.

<table>
<thead>
<tr>
<th>Achievement &amp; added-value</th>
<th>Energy audit</th>
<th>Energy management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of energy efficiency optimisation potential</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Catalogue of optimization measures, prioritisation and action plan</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Long-term strategic approach including a written policy concerning energy efficiency</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Top management involvement and therefore engagement throughout all staff levels</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Limited financial effort for a single &amp; individual site</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Written programs and documented commitments on annual targets and action plans</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Consistent monitoring on pre-defined KPIs and therefore on-going compatibility on-site and throughout the group</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Continuous improvement of energy and utility related performance</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

* Companies that adopt EMS usually save up to 10 to 30% of their total energy use.
* The majority of energy and energy cost savings (more than 70%) can be attributed to the cost of low-cost operational energy performance improvement actions.

**Caption 3**

**Energy audits vs. energy management systems**

**Energy management pays off**

An energy management system allows companies in the glass industry to transparently monitor their day-to-day energy consumption. Manufacturing glass is an energy-intensive process, therefore conserving resources and protecting the environment are vital concerns for glass producers. With the continuous improvement process according to ISO 50001, glass manufacturers are not only able to sustainably reduce their energy consumption levels – they can also increase their productivity and gain advantages over international competitors. A further plus factor is that a number of countries – including Germany – provide financial support for energy management, subject to certain conditions. In Germany, companies have access to a compensation scheme under the Renewable Energies Act (EEG). They can also benefit from tax relief under German energy and electricity tax laws.

Audits, on the other hand, may involve considerable costs for businesses with several locations. The German Federal Ministry for Economic Affairs and Energy predicts that each audit will cost a company between EUR 2400 and EUR 8000, with an average price tag of EUR 4000 per audit. In addition, businesses will incur this expense and added workload every four years, while an energy management system operates on an ongoing basis. The costs for a management system, however, can generally be recouped through energy savings.

The deadlines for EED compliance are also a strong argument in favor of an energy management system. According to the directive, the first energy audit must be completed by accredited experts by December 5th, 2015 at the latest. Due to the shortage of certified auditors, companies should expect delays in this process. Although an energy management system must also be introduced by this date (in Germany at least), companies have until the start of 2017 to launch the system and have it certified in accordance with ISO 50001.

**Simatic B.Data: Energy management at the company level**

Once a company has opted for an energy management system, it is time to choose the right solution. Solutions from Siemens are widely used in the glass industry. Siemens offers a range of scalable energy management solutions, extending all the way up to its comprehensive Simatic B.Data system. B.Data accurately acquires and records energy flows at the company level, as required by the EED (Fig. 4).

![Caption 4](www.siemens.com/glass)

**Simatic B.Data: The energy management system helps glass manufacturers reduce energy costs through improved controlling and more efficient procurement and operating processes.**

**Energy monitoring and controlling**

The software makes energy consumption and costs transparent by providing detailed data and key figures for all media, such as electricity, gas and water. It is even possible to display the impact of environmental variables such as
temperature and humidity. This means it is no longer necessary to produce and coordinate energy consumption lists across the company's various locations. Energy managers at the individual sites have direct access to current data online.

In addition to energy monitoring, the tool also offers an energy controlling function: Drawing on specific key figures, B.Data uses pure consumption data to calculate valuable efficiency indicators. The manufacturer can then use these indicators to compare individual plant segments or sites, for example, or to define benchmarks.

This detailed information is a huge advantage in efforts to manufacture more efficiently, as is demonstrated in the following practical example: To produce a ton of molten glass requires between 5 to 6 MJ of energy. Based on consumption patterns, it is possible to accurately trace wear and tear in the melting furnaces. The heavier the wear and tear in the refractory material, the greater the amount of energy required. With B.Data's assistance, glass producers can make an informed decision on when to invest in a new melting furnace.

Optimizing energy procurement
B.Data users can forecast their plants' future energy requirements. Based on these requirements, they can select the ideal tariffs and purchase their energy at the best prices. B.Data also supports glass producers in their day-to-day operations with a number of useful functions. For example, the software makes it easy to generate reports – such as those required for internal audits or environmental authorities – and export them to Microsoft Excel. B.Data even enables companies to trace and assess measures for increasing energy efficiency in line with ISO 50001. Adherence to this standard is a requirement for a number of national incentive programs. Further benefits include meter management and automatic consumption readings via a range of interfaces.

A solution for the glass industry
The Simatic B.Data energy management system from Siemens is the ideal solution to help businesses in the glass industry meet the requirements of the EED. This methodical system establishes continuous and sustainable energy efficiency in business operations. Operating companies clearly understand their energy consumption levels. They are able to trace energy costs back to their source, and they have a clear overview of where energy costs can be reduced. Simatic B.Data also increases productivity and provides a basis for safe investment decisions. The B.Data starter package helps businesses take the first steps in energy management. This service contains detailed instructions and is already set up for the most common data sources. Energy reports are also preconfigured for up to 30 measuring points, while dashboards offer a clear picture of all energy data. The starter package can be upgraded to a fully functional Simatic B.Data system at any time.