CBI
Ministry of Foreign Affairs

CBI Product Factsheet for Electronic Components for Smart Meters in Germany

'Practical market insights on your product'

The growing number of smart grid projects in Germany and in Europe, drive the importance of smart meters. These meters are not only used for consumption recording, but also as a two-way communication tool and as a controlling unit for energy supply and demand within smart grids. Germany has been able to build up its know-how through numerous smart grid and efficient energy development projects. While the demand for smart meters is expected to grow considerably in countries such as UK, Spain and Portugal, Germany is lagging behind in the outlook due to the lack of a clear legislative framework. Germany is a strategically important market for electronic component suppliers both because of its strong in-country production infrastructure and because it is an important trade-hub in Europe. Suppliers of electronic components and suppliers of smart meters as finished products are recommended to start actively sharing their experiences in relation to smart metering through co-projects or open innovation.

Product Definition

A smart meter records consumption of electric energy and transmits the information for monitoring, controlling and billing purposes. Intelligent smart meters enable two-way communication between the meter and the controlling unit.

The main applications of smart meters include electricity metering, as well as measuring gas, heating and water consumption. There are smart meters for residential and non-residential (offices and industrial) buildings, as well as for utilities and smart grid[1] operators. With the increasing penetration of smart

[1] *Smart grid* is an electric grid, a network of transmission lines, substations, transformers and more that deliver electricity from the power plant to a house or business, and that allows a two-way communication between the utility and its customers. (Source: Smartgrid.gov)

grids, smart meters are regarded as a flexible and efficient controlling unit for energy demand and supply.

All of the components used in any circuitry are important for smart meters. Typically that would be sensors (HS codes 85422950/960/990), chips (HS code 85421405, 85421355, 85421360, 85421966, 8541500, 85422161, 85421200, 85422970, 8542320, 85421940, 8542500), capacitors (HS codes 85321000, 85322100/200/300/400/500/900), resistors (HS code 85459010, 85331000, 85332100/900, 85333100/900, 85334010/90), some wound components and various electromechanical components (HS codes 85366910/30, 85366990, 85369010, 85369085, 85361010/50/90, 85364110/90, 85364900, 853650). In terms of smart metering, some developing countries are more advanced than Europe, e.g. India started selling smart meters years ahead of Europe and can share a great deal of experience in this field.

The leading distributors of smart meters in Germany are the energy supply companies including E.ON, RWE, EWE, Yellow Strom, Vattenfall, EnBW, Discovergy. The leading suppliers of smart meters in Europe include Aidon, Arqiva, Connode, CURRENT, Echelon Corporation, Elster Group, Hewlett-Packard, IBM, Iskraemeco, Itron, Landis+Gyr (European market leader), Logica, Powel, Power Plus Communications AG, Sensus, Xemex.

Photo example: **Smart Meter**

Source: Fotolia

Photo example: **Disassembled meter**

Source: Fotolia

Product Specifications

Quality: The requirements for smart meters are constantly growing, as meters become more complex. Electronic components for smart meters and smart meters as finished products have to fulfil agreed specifications and use up-to-date technology.

- Key quality criteria for smart meters include
  - supported functions or capability, e.g. support of metering quantities including energy delivered, energy received;
  - accuracy in electricity metering;
  - data security;
  - interoperability;
  - advanced functionalities such as pre-payment metering, limiting and emergency modes (especially for demand/response metering), possibility for remote access in the configurations of smart meters, demand forecasting;
  - communication with the energy operator (smart grid) and energy user (households);
  - connectivity to various devices such as displays, tablets, smartphones, and transmitters.
- Depending on the application, smart meters can be more or less complex. With an integrated-sensor chip, smart meters can function as intelligent

controlling units capable of monitoring and controlling the energy demand and supply from a number of operators and from different energy sources (including renewable energy, i.e. solar panels).
- Product reliability and product design play an important role for European customers. Smart meters must function effectively without any damage in order to ensure low after-sales costs. The product design must meet European requirements, e.g. no signs of fingerprints on product surface, clean and accurate packaging.
- To assure durability and safety, products must comply with the relevant EU regulations and standards. The materials used have to comply with RoHS and must also meet REACH requirements (see Legislative Requirements in this report). No hazardous substances should be used in smart meters.

Labelling:

- Smart meters are typically labelled with:
  - manufacturer's name;
  - meter type;
  - serial number;
  - operating voltage;
  - a LAN ID.
- Subassemblies of smart meters would be typically labelled with description of the content, including the following information:
  - type of product;
  - model type;
  - quantity;
  - net and gross weight (in kilograms);
  - supplier/manufacturer name and location;
  - serial number.
- DC exporters have to familiarise themselves with the energy-related product directive Waste of Electrical and Electronic Equipment (WEEE) in order to formulate labels, indicate all product information and mark products accordingly (e.g. the symbol of the crossed-out wheelie-bin).

Photo examples: *Labelling*

Photo examples: *Packaging*

Packaging:

- Smart meters and components for smart meters are typically packaged in plastic bags and cardboard boxes to protect them from damage. The buyer might specify packaging requirements.

Legislative Requirements

To assure durability and safety, products must comply with the relevant EU regulations and standards. Compliance with European legislative, as well as non-legislative requirements is a basic necessity for all exporters in the electronics and electrical engineering sector. Below you will find the main mandatory requirements for your products. Make sure you have familiarised yourself with legal requirements in terms of labelling, dangerous substances, product safety and liability. Your products must comply with all EU directives.

- ***Liability for defective products***. This liability applies to all products manufactured or imported into the European market. Typically the company that brings the product into the European market is responsible, but a claim can be passed onto the producer or exporter.

Considerations for action

- Familiarise yourself with standards that specifically apply to your products. To ensure that your products are of high quality, review your quality assurance and testing procedure, e.g. through the implementation of an accredited quality management system (ISO 9001). Carefully formulate labels, instructions for use and disclaimers. Finally, make sure

	your insurance covers product liability. See the document EU legislation: Liability for defective products on CBI's Market intelligence platform.

• ***CE marking***. All electronic components for smart meters and smart meters as a finished product must meet several technical standards laid down in the EU legislation. The manufacturer must carry out a conformity assessment and if compliant, the product must be marked with the CE mark. With a few exceptions all components must be marked with the CE mark. Electronic components, a sub-system or parts of a finished product do not legally require a CE mark, however, market requirements mean that nearly all customers will still demand the CE mark for most components, particularly if the components are critical to the application. For smart meters the following directives may be relevant:
  • Electromagnetic compatibility (EMC Directive 2004/108/EC)
  • Low voltage equipment (LVD 2006/95/EC)
  • Ecodesign for Energy related products (Directive 2009/125/EC)
	• Apply for the CE mark, which is required by all customers, even if your product is a sub-system or part of a finished product and legally does not require the CE mark. If you are a manufacturer, you have to be familiar with the process of affixing the CE marking to your products. The European Commission has a very insightful website that illustrates the key steps from the start to trading the product. See the following documents for more information on EU legislation on CBI's Market intelligence platform:
	  • CE marking for Electromagnetic compatibility
	  • CE marking for Low Voltage Devices
	  • CE marking for Eco-design of energy related products

• ***Waste of Electrical and Electronic Equipment (WEEE).*** If you want to export electronic or electrical products to the EU, you have to take into account that your EU buyers have obligations regarding the disposal of these products. EU producers are obliged to participate in product take-back schemes. Although, this does not directly affect exporters from developing countries, the requirements may have an impact in terms of EU buyers asking their suppliers to meet specific design requirements or provide certain information.	• Make sure your product design complies with WEEE and enables product recycling, recovery or dismantling. (Note that these requirements may differ per EU Member State.) Carefully formulate labels and mark products in accordance with WEEE (e.g. the symbol of the crossed-out wheelie-bin). See the document EU legislation: EU legislation: Waste Electrical and Electronic Equipment (WEEE) on CBI's Market intelligence platform.
• ***Labelling of energy-related products.*** EU producers and exporters are obliged to indicate energy consumption on household appliances and other energy-related products (the list is being extended to include industrial products). Make sure you check when importing your products and discuss this with your European customers.	• Make sure you indicate all product details (including, energy class, performance, capacity, noise level, etc.) required by the EU. See the document on EU legislation: Energy labelling of energy using and energy-related products on CBI's Market intelligence platform.
• ***REACH regulation*** to manage the risks from chemicals and provide safety information on the substances concerned. This legislation restricts the use of certain hazardous chemicals. Furthermore, it sets some requirements regarding information on the used chemicals. Manufacturers are required to provide their buyers with information on the properties of chemical substances used.	• Ask your buyer for their requirements regarding REACH. List all chemicals, including raw materials and additional materials, used in your production process. See the document Chemicals REACH on CBI's Market intelligence platform.

• ***Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).*** The directive bans the introduction into the EU market of electrical and electronic equipment that contains more than the agreed levels of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl and polybrominateddiphenyl ether flame retardants.	• Make sure that none of the hazardous substances referred to in the RoHS Directive is used in your production process. Exporters of electronic components have to meet the requirements under both RoHS and REACH, since they are complementary. See the document Substances in Electrical and Electronic Equipment (RoHS) on CBI's Market intelligence platform.

Non-Legislative Requirements

	Considerations for action
• ***Quality management systems (QMS) – ISO 9001***. If you plan to export to Europe, all products must meet the buyers' quality demands. ISO 9001 is designed to make sure that the manufactured and/or exported products to Europe meet the needs of customers. This document provides information on the world's most widely used QMS.	• Apply for ISO 9001 as quickly as possible and understand your target customers' requirements. • See the document Quality management systems on CBI's Market intelligence platform.
• ***Parameters for Smart meter technologies, using a unique frequency range, ISO 18000***. There are several documents for various air interface communications at defined frequency range.	• Familiarise yourself with different parts of ISO 18000 and find out if your products fall under one or several of the defined frequency ranges. See the ISO webpage for more information on the guidelines ISO 18000.
• ***Data encoding rules and logical memory functions, ISO 15961, 15962, 15963.*** The ISO standards for item management address the interface with the application system, deal with data processing, and describing numbering systems for the identification of RF tags.	• Familiarise yourself with ISO standards for item management and find out if your products fall under one or several of the defined data management standards. See the ISO webpage for more information on the guidelines ISO 15961, 15962, 15963.
• ***Information security management system, ISO 27001.*** The ISO standard for managing information security and instituting security controls.	• Familiarise yourself with ISO standards for information security and find out if your products fall under one or several of the standards. See the ISO webpage for more information on the guidelines ISO 27001.
• ***Occupational health and safety in the electronic components sector***. Occupational health and safety (OHS) issues are all aspects related to labour conditions and are very often part of EU buyers' social requirements for their suppliers.	• Consider implementing a management system on OHS (e.g. OHSAS 18000). European buyers are becoming increasingly sensitive in terms of transparency in the supply chain and in labour conditions at all levels. Even though these requirements are not mandatory, they will definitely give you a competitive advantage over other DC exporters if you can comply with them.

- ***Electronic Industry Citizenship Coalition (EICC) Initiative.*** The most important sustainability initiative in the Electronics Sector, in Europe and internationally, focuses on social, ethical, health and safety, as well as environmental issues. Members are required to comply with the Code requirements. Some industry buyers can require their suppliers to follow the EICC code of conduct. This is particularly relevant for first tier suppliers.

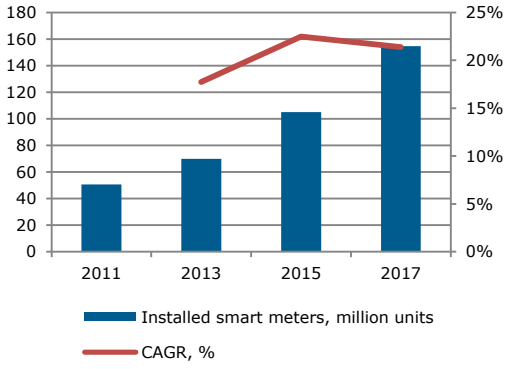
See the document Occupational health and safety in the electronic components sector on CBI's Market intelligence platform.

- Find out what buyers (read industry) may require regarding the EICC code of conduct. Try to implement this policy; this will give you an advantage over other exporters. Explain your steps in this area on your website and in other company literature. See EICC webpage for more information on the sustainability initiative.

Trade and Macro-Economic Statistics
Use of Smart Meters in Germany

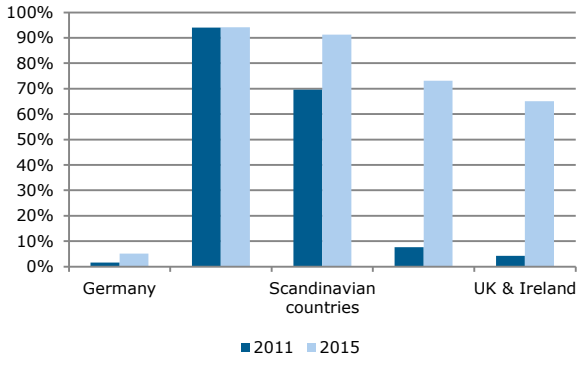
Germany has considerable experience in smart metering through R&D and pilot projects in smart grid technologies. There is no clear legislative framework in Germany and no programmes to support the European guidelines for recommendations of smart meters. The demand forecast for the installation of smart meters is relatively moderate. DC suppliers will have opportunities to share their knowledge in smart metering through co-projects, as well as in targeting other European countries through re-exports in Germany.

Figure 1: Number of installed smart meters in Europe, million units



Source: Berg Insight

Figure 2: Share of smart meters out of total number of meters installed in the country, %



Source: Sentec, IMS Research

Most important developments

- Germany is not the leader in the implementation of smart meters, but it plays an important role in smart meter development and pilot projects. In the "European Landscape Report 2012" (Source: SmartRegions), Germany is characterised as a "Market driver," being behind "Dynamic movers" - UK, Spain, Italy, Malta, Finland, the Netherlands among others. Unlike Germany, "Dynamic movers" not only have a clear implementation strategy

Considerations for action

- DC exporters, especially those with a solid know-how in smart metering have opportunities in sharing their knowledge with European peers through co-design of smart meters and co-projects in smart grid or smart metering in Germany. Through knowledge sharing and cooperation, DC suppliers will be able to position themselves as experienced and reliable partners and suppliers of electronic components, sub-assemblies and

of smart meters, but also a clear legal framework. Germany is leading in projects focusing on consumer engagement. Besides smart metering, Germany is actively investing in smart grid projects. In 2012, Germany invested 12% of the total spending on smart grid projects in Europe, accounting for investments of around € 0.5 billion (Source: JRC Scientific and Policy Reports). Germany will continue to contribute significantly to smart grid and smart meter implementation projects.

- Berg Insight analysts expect € 15.8 billion in investment in the deployment of 110 million smart meters between 2011 and 2017 (CAGR[2] of 20.5%). Germany will not see such a rapid development in the implementation of smart meters as other European countries:
  - Germany is lacking on a clear legislative framework to support the wider implementation of smart meters. Other European countries have introduced mandatory implementation of smart meters, e.g. Italy, Malta, Sweden, and the UK.
  - In August 2013, Germany reported that it will probably not follow the EU guidance and will not recommend smart meter installation in households, because of cost concerns.
  - In Germany, only 1.6% of total meter population accounted for smart meters in 2011. Currently, there are about 48 million traditional meters in Germany.
  - IMS Research forecasts that this share will rise to slightly above 5% by 2015.
  - In 2010, only 15 out of 800 utilities offered smart metering products.

smart meters.

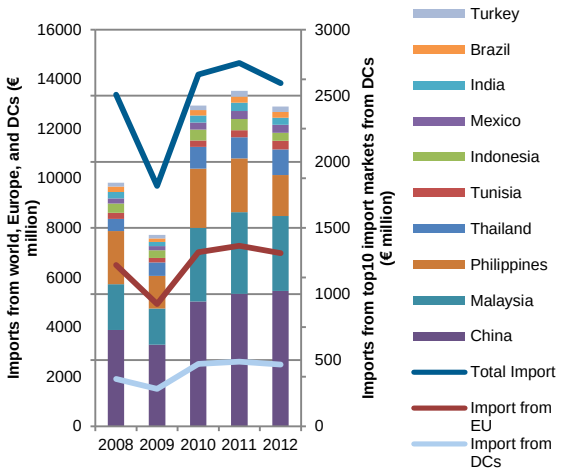
- Familiarise yourself with the European guidance on the recommendation of smart meters and the upcoming steps in the legislative framework on smart meters in Germany. Be aware of the modest forecast of the in-country demand for smart meters. DC exporters have opportunities in targeting other European markets through re-exports in Germany.

Imports and Exports of Electronic Components

Germany is a strategically important market for electronic component suppliers both because of its strong in-country production infrastructure and because it is an important trade-hub in Europe. Electronic components that are typically used in smart meters include sensors, capacitors, resistors and electromechanical components. The positive development of imports from DCs in Germany demonstrates the increasing significance of cooperation with developing countries.

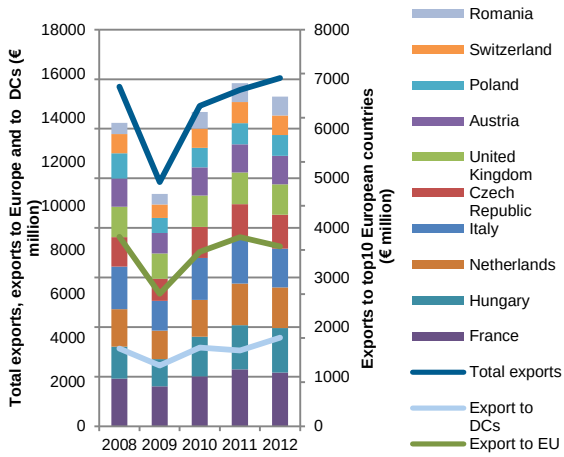
[2] *CAGR* - Compound Annual Growth Rate

Figure 3: Total imports of sensors, capacitors, resistors and electromechanical components in Germany, value in € million



Source: Eurostat (2013)

Figure 4: Import of sensors, capacitors, resistors and electromechanical components in Germany from DCs and Europe in 2012, value in € million



Source: Eurostat (2013)

Most important developments

- Germany is a significant target market for electronic component suppliers, being the largest importer of sensors, capacitors, resistors and electromechanical components, which are typically used in smart meters. Imports of these components in Germany grew by CAGR 1% in 2008-2012. In particular, imports from developing countries saw strong growth (7% CAGR in 2008-2012), riding high on the trend of the increasing importance of cooperation. Besides the largest importers of sensors, capacitors, resistors and electromechanical components to Germany (China and Malaysia), other DCs saw strong growth too, these included Thailand (20.6% CAGR in 2008-2012), Tunisia (8.5% CAGR in 2008-2012), Mexico (11.5% CAGR in 2008-2012), and Turkey (8.9% CAGR in 2008-2012). The outlook for electronic component imports in Germany is positive, and the share of imports from DCs will increase compared to imports from other European countries.
- Germany's exports of sensors, capacitors, resistors and electromechanical components remained strong despite the European crisis and recorded a marginal 1% CAGR in 2008-2012. Germany's largest share of exports goes to European countries. The largest uptake was seen in exports to France (3.1% CAGR in 2008-2012), Hungary (8.4% CAGR in 2008-2012), Czech Republic (3.8% CAGR in 2008-2012), and Romania (13.8% CAGR in 2008-2012). Germany will continue to be the leading exporter not only of electronic components, but also of smart meters as complete solutions and/or sub-systems or assemblies.

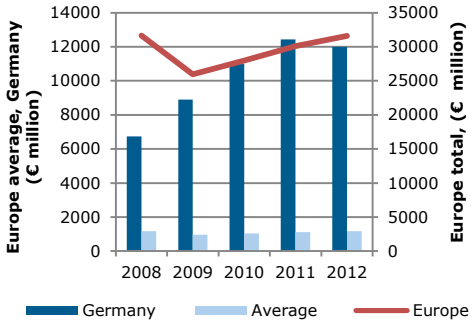
Considerations for action

- Electronic component producers have opportunities to supply German smart meter manufacturers with low-cost hardware and electronic components, e.g. sensors, capacitors, resistors. Find out who are the potential customers in Germany. Approach local smart meter manufacturers (Power Plus Communications AG, Voltaris, Landys+Gyr), chip manufacturers, software developers or any other integration service providers.
- Germany is a strategically important market for those electronic components suppliers who target other European countries through re-exports.

Production and Consumption of Electronic Components

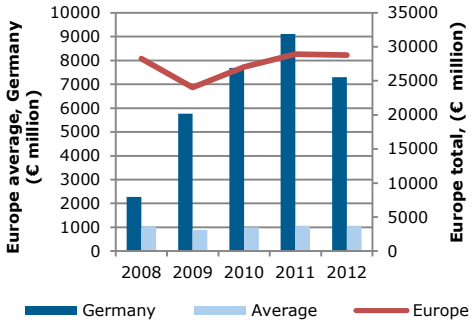
The production of lower-cost electronic components is being increasingly outsourced, and the importance of cooperation with developing countries is growing. DC exporters should approach German producers of smart meters, as well as other manufacturers (e.g. chips), software developers or any other integration service providers with low-priced electronic components.

Figure 5: Production of sensors, capacitors, resistors and electromechanical components in Germany, value in € million



Source: Prodcom(2013)

Figure 6: Consumption* of sensors, capacitors, resistors and electromechanical components in Germany, value in € million



*Apparent consumption (Production-Exports+Imports)
Source: Prodcom (2013)

Most important developments

- Germany is strong in the production of sensors, capacitors, resistors and electromechanical components. Besides components, Germany is an important producer of smart meters and other innovative solutions in Europe. With the increasing focus on high-tech products and the growing importance of cooperation, Germany is increasingly looking for suppliers of low-cost electronic components.

Considerations for action

- DC exporters have opportunities to supply German producers of smart meters, as well as other manufacturers (e.g. chips), software developers or any other integration service providers with better-priced electronic components, including sensors, capacitors, resistors and electromechanical components.

Market Trends

Most important developments

- One of the major challenges facing smart meter suppliers is the cost of the smart meters and the cost of refitting the infrastructure to support two-way communication. The costs range from € 100-400 per metering point, depending on the choices in communication infrastructure, functionalities and local conditions. Most of the electronic components used in smart meter designs are standard components, saving time and money, but there is an increasing requirement for higher reliability components to make sure the units can meet the life expectancy needed in the field.

Considerations for action

- As the utilities try to drive down costs, the component/meter suppliers will need to further integrate the less costly electronic components and sub-assemblies. Position yourself to be able to provide cost-efficient standard offering components, as well as, more integrated and more reliable solutions, which will allow OEMs to save costs.

• Development of smart grid and energy distribution creates a new market for suppliers of power electronics and for suppliers of smart meters as finished goods in Europe. The energy distribution market in Europe (including Germany) is driven by: ○ Technological developments such as management and optimisation of energy supply and demand, as well as the ongoing development of energy smart controllers, storage, transportation and security solutions; ○ Technological developments that enable the penetration of renewable sources in power generation (e.g. solar panels, wind turbines); ○ Governmental support of the use of renewable energy in the EU and in Germany; ○ Cost-efficiency of power generated by renewable sources. Along with the development of smart grid and energy distribution, the importance of smart meters (used not only for consumption recording, but also for two-way communication between the meter and the central system) is set to increase.	• Opportunities for DC exporters that have the necessary know-how in smart metering include: ○ participation in smart grid pilot projects through a co-design. Familiarise yourself with the on-going and planned smart grid projects in Germany; ○ specialisation in electronic components for smart meters. Consider either cooperation with companies that produce smart metering solutions, or offering your own solutions, including hardware (assemblies or sub-assemblies), software, solution design and know-how.
• Two-way communication will remain one of the critical technological issues in smart meter development. Currently, power line communication (PLC) has the leading role in the European meter communications market, but not to the exclusion of GSM/GPRS. The role of private radio frequency (RF) systems is less clear. The trend will be towards expanding beyond remote data connection, into multipurpose smart grid communication networks.	• Make sure that your components are compatible with the predominant communication technologies. Follow the developments in the smart meter communications arena in order to provide the most up-to-date solutions. Educate yourself on the industry standards and issues such as information security. Make sure to emphasise these qualities when marketing your components.
• The role of cooperation between developing countries and Europe, as well as between the European member states is growing. Many smart grid pilot projects in Europe are co-managed by several countries. For example, Germany (together with Austria, France, the Netherlands, Portugal and Spain) took part in the Open Node project which focused on the electrical distribution grid operation, including the operation of smart meters, power and grid operation. Currently, Germany is co-leading the Grid4EU project together with 5 other European countries.	• Get to know current and planned European projects in smart grid and smart meter development and implementation. Actively share your experience in smart metering through open innovations, discussion forums and blogs. Let European peers know about your strong know-how through active communication and clustering.
• The supply chain of smart meters includes suppliers of hardware, software, system integration services, and communication providers creating opportunities for DC exporters to enter the market through different suppliers. Profit margins are migrating from hardware to software, network	• DC exporters have opportunities to supply electronic components for smart meters not only directly to smart meter manufacturers, but also to integration service and software providers. Research solution providers and consider partnering with these companies.

and communications.

- European companies will increasingly have to face various risks that need to be measured and managed in order to keep the total cost of ownership (TCO) at a reasonable level. Both smaller and larger companies will increasingly look for the most reliable suppliers and will try to eliminate the risk through supplier contract and cost management.

- European SMEs present better opportunities as potential customers for DC exporters, but larger companies may also contact you as a potential supplier. That is why visibility on the market is crucial. Develop your sales and marketing strategy:
  - Work on well-structured and up-to-date content in your company's website;
  - Attend trade shows several years in a row; start preparations for the trade show far in advance (see a list of trade shows in Useful Sources in this report);
  - Work on your *Unique Buying Proposition, i.e.* why should European OEMs buy your product;
  - Work on product pricing.

For more information on entering the European market, please refer to CBI Trendmapping for Electronics and Electrical Engineering.

Market Channels and Segments

See CBI Market Channels and Segments for Electronics and Electrical Engineering, because the supply chain of electronic components for smart meters does not differ significantly from this general overview.

Market Competitiveness

See CBI Market Competitiveness for Electronics and Electrical Engineering, because competitiveness of electronic components for smart meters does not differ significantly from this general overview.

Main Sources

- Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway, URL: http://www.bundesnetzagentur.de
- SmartRegions, supported by the European Commission under the Intelligent Energy - Europe Programme, URL: http://www.smartregions.net/
- German Energy Agency DENA, URL: http://www.effiziente-energiesysteme.de/
- ZVEI (German association of electronic industry), URL: http://www.zvei.org
- German Association for Electrical, Electronic & Information Technologies VDE, URL: http://www.vde.com

Leading trade fairs in Europe

- Hannover Messe, URL: www.hannovermesse.de
- Electronica, URL: www.electronica.de
- PCIM, URL: www.pcim.com
- EFA, URL: www.efa-messe.com
- Belektro, URL: www.belektro.de
- Embedded World, URL: www.embedded-world.de
- CeBIT, URL: www.cebit.de

More information
CBI market information:

- CBI Tradewatch for Electronics and Electrical Engineering;
- CBI Trendmapping for Electronics and Electrical Engineering;
- CBI Market Channels and Segments for Electronics and Electrical Engineering;
- CBI Market Competitiveness for Electronics and Electrical Engineering.

This survey was compiled for CBI by Global Intelligence Alliance
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