MARKET-READY SOLUTIONS THAT CUT ELECTRICITY COSTS AND EMISSIONS

EUROPEAN LOW VOLTAGE INDUSTRY CONTRIBUTION TO SMART GRID

CAPIEL

european coordinating committee of manufacturers of electrical switchgear and controlgear

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FOREWORD
from Presidents

As the world braces itself for the energy challenges of the 21st century, Europe is seeking to set global standards for energy efficiency. EU 2020 objectives (so-called "20-20-20" targets, see Page 10) for energy conservation, emission reduction, and the use of renewable energy sources have implications. Therefore industrial sector, together with commercial and residential buildings, must rethink the way of managing its electricity consumption within the European Grid.

Smart grid is interconnected: its real-time bi-directional flows of energy and information will change the energy profiles of both end-users and utilities. The traditional grid should be updated for that purpose.

The core technologies are in place. They enable manufacturing sites as well as residential and commercial buildings to leverage the potential of their production and consumption capabilities. Customers should participate in the smart grid environment by planning ahead, using load-shedding, shifting solutions, and responding to variable-pricing signals.

To ensure this functionality, the power and data distribution has to be designed adequately and the interface between the public smart grid and the local smart grid must be clearly defined and compatible in both directions. It is an essential task for CAPIEL to contribute in standardization of this interface.

CAPIEL brings together all related companies and guides their customers towards smart use of the interconnected grid. So the customers can make saving energy more smart and efficient in a smart grid.

It´s our industry that makes it possible.

Europe's Electrical Product Industry: engineering solutions to make power grids smart

The aim of the Low Voltage Electrical Industry in Europe is to ensure that end-users from the industrial, commercial building and residential sectors reap the benefits of the smart grid.

Close to end-users

For decades now, we have tailored products and systems for homes, commercial facilities, and manufacturing process industries. Over that time we have built up an in-depth understanding of needs, processes and constraint in those sectors.

Accordingly, we have developed the smart systems that will connect them to the smart grid and help them make the most of their energy. Our systems are smart-grid ready now.

About CAPIEL

CAPIEL, the Coordinating Committee for the Associations of Manufacturers of Industrial Electrical Switchgear and controlgear in the European Union, was founded in 1968. It is a broad-based group that represents twelve national associations comprising more than 550 manufacturers in Austria, Belgium, Finland, France, Germany, Italy, Netherlands, Spain and the United Kingdom.

Members of national associations represented by CAPIEL include small, medium and large-sized companies that employ nearly 120,000 people directly in Europe and have a combined turnover of €18.25 billion.

The smart grid: more an evolution than a revolution

Factors driving the smart grid evolution

- Growing energy demand.
- A shift in the nature and patterns of demand and electricity use prompted by:
  - the advent of renewable energies
  - the emergence of the plug-in electric vehicle
  - on-going deregulation of the power industry.
- The inefficiency of the current grid infrastructure, which was not designed for decentralised production.
- Growing public concern over the environment backed and formalised by government policies and ever more stringent regulations.

What is the smart grid?

The power grids of the 20th century were centralised and supplier-controlled. Soon, they will be replaced by highly efficient, decentralised grids where the flow of power and information is two-way. These smart grids have evolved as intelligent devices and systems have been introduced across their low-level components.

The systems and devices will communicate over high-speed bandwidths to control local distributed energy resources on both the supply and demand sides.

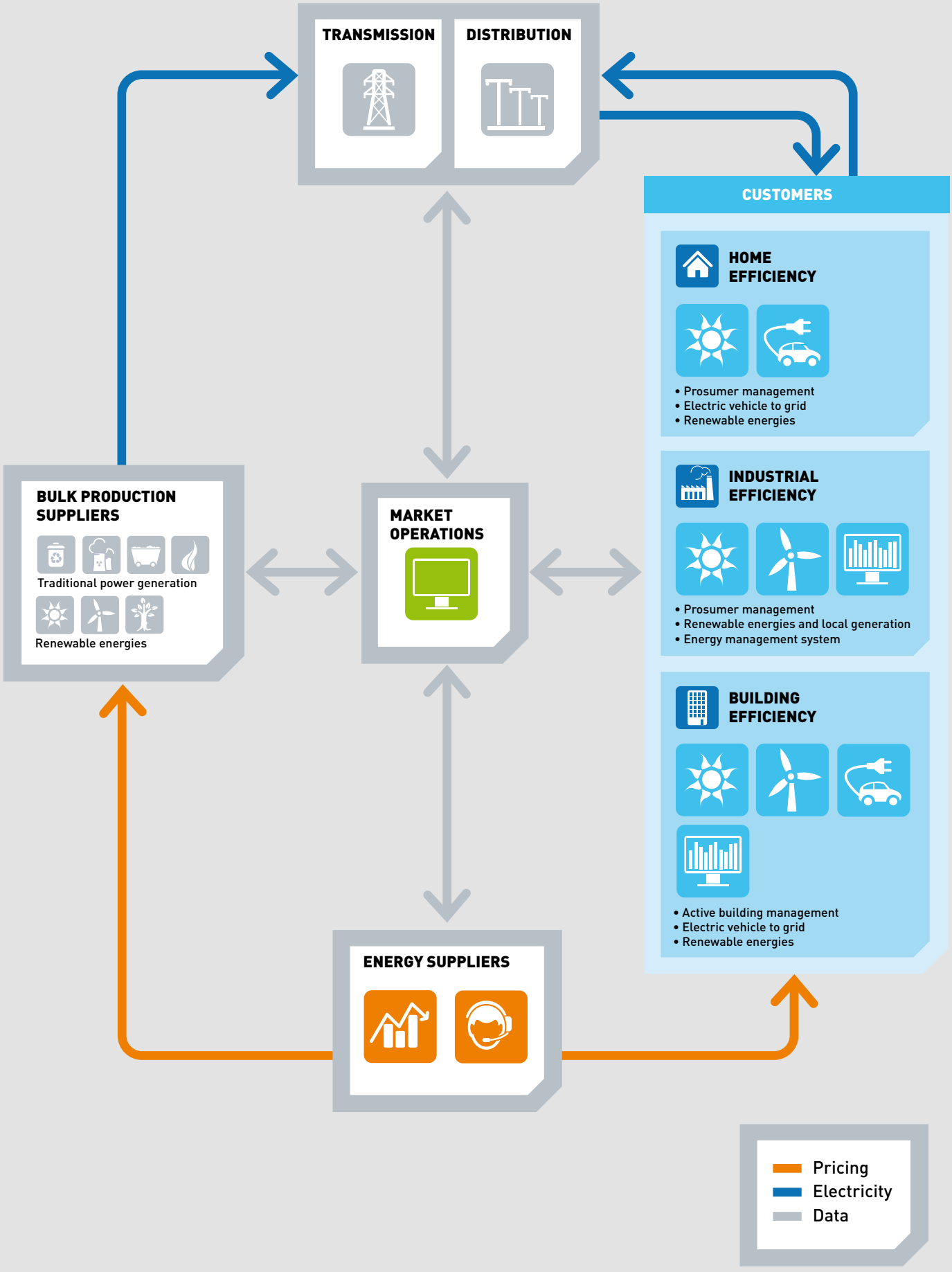
These resources (renewable energy sources, flexible loads, storage systems) are not backups: they are integral, interconnected parts of the grid.

How does the smart grid work?

Smart users and utilities respond in real time to changes in demand, supply, cost, the quality of electricity, and emissions. Users use this real-time, high-quality information flow to manage their use of power so that it meets their needs. The smart grid integrates demand-response technologies enabling them to reduce or reschedule their power use during peak times.

Across the network smart power systems and devices enable users to track with high precision their usage, control their own consumption, improve their energy efficiency, and help mitigate global warming and depletion of natural resources.

The business-related and environmental benefits will be immense.


TRANSMISSION
DISTRIBUTION
CUSTOMERS
HOME EFFICIENCY
• Prosumer management
• Electric vehicle to grid
• Renewable energies
INDUSTRIAL EFFICIENCY
• Prosumer management
• Renewable energies and local generation
• Energy management system
BUILDING EFFICIENCY
• Active building management
• Electric vehicle to grid
• Renewable energies
BULK PRODUCTION SUPPLIERS
Traditional power generation
Renewable energies
MARKET OPERATIONS
ENERGY SUPPLIERS
Pricing
Electricity
Data

Usage makes the smart grid smarter

The smart grid has ushered in a paradigm shift in the shape of a grid, where supply and production dynamically interact to ensure balance.

This new equation can work only if users act smart. All will then benefit. But first they need smart systems that will empower them.

Smart power systems allow users to monitor and control their loads to meet the grid challenge (enabling the two-way communication between users and the grid).

This is where the Low Voltage Electrical Industry steps in. We are uniquely positioned to identify needs, advise on and supply the smart solutions that help users make the smart grid smarter.

Demand-response: the great enabler

Demand-response is the mechanism that will enable users to modify their electrical profile by reducing their consumption, increasing loads at times of high production and low demand, or activating energy storage or production systems. It is what enables the smart grid by making energy reliably available on request.

Demand-response is:
Any action taken to balance the supply and demand of electricity on a signal or notification from the grid and/or as a result of financial incentive from a utility, grid operator, or demand-response service provider (DRSP). End-users may also change their usage patterns in response to changes in the price of electricity over time.

Smart usage turns consumers into prosumers

Empowered by smart electrical systems, users cease to be mere consumers. They become prosumers – proactively consuming and even the producing electricity for sale.

Prosumers (proactive producers and consumers) produce or store electricity that can offset a grid's electricity needs during periods of peak demand.

But what characterises prosumers is that they can change their energy user profile on demand:

- they can feed power or energy into the grid in either "negawatts" or "posiwatts"
- they can absorb peak energy from renewable sources.

New energy use metrics

Just as new mindsets and behaviours have evolved with the smart grid, so have ways of measuring energy use. New metrics have emerged: negawatts and posiwatts.

Negawatts: energy not consumed at a certain time because of load shifting (the postponement of energy consumption to a more suitable time) or load shaving (adjusting load profiles so that they stay beyond targeted values).

Posiwatts: locally produced energy that is fed into the grid.

Prosumers will help drive flexibility – on both supply and demand sides. The advantages will be lower costs, optimized intake from renewable power sources, and a manageably sized distribution grid.

Smart usage in industry, commercial buildings and homes

The Low Voltage Electrical Industry offers a large portfolio of solutions that turn consumers into prosumers and put the "smart" in smart grid.

Our **smart devices** (circuit breakers, relays, contactors, etc.) do more than protect and control loads. They are intelligent and give users load control capabilities. With our solutions, switchboards get smart.

Our **smart power systems** complement management systems to offer best-in-class solutions in:

- commercial buildings, with building management systems (BMS)
- residential buildings, with home management systems (HMS)
- the manufacturing industry, with plant management systems (PMS)

Existing solutions

In all sectors our customers already have installed systems of low-voltage switchgear and control gears. We offer them a smooth, controlled transition to the smart grid.

- We upgrade them with gradual retrofits – to control their loads and production sources in the smart grid context.
- Customers do not always realise their assets have communication capabilities. We help them make use of their dormant functionalities.

New solutions

Because we are smart-grid-ready, we are delivering new solutions, such as:

- electricity storage systems - we are investigating both stationary solutions and systems
- new communication and energy management tools enabling smart grid users to interact with grid actors and regulators.

EXAMPLES

Capiel companies are deploying smart grid technologies in projects across Europe in the domestic, commercial and industry sectors. They have implemented smart grids that have proved themselves as local contributions to the global challenges of energy optimization and lower emissions. All that's missing is a standardized interface with wider upstream grids.

Industry

The BMW plant in Regensburg (Germany) with nearly 10.000 employees wanted a plant-wide energy optimization system that operated as a seamless, integrated part of plant operations. Beside grid supply, the plant operates an own combined block heat and power plant within its local grid.

The solution leveraged intranet and internet technologies to incorporate a smart grid into the plant's enterprise management system. The automated energy management systems and devices monitor energy use, control processes, and measure energy consumption at plant and load levels. The result is a holistic plant-wide smart grid that integrates energy production, availability, productivity and management together with a continuous benchmark process to reach the final goal: efficient and economic usage of energy to increase competitiveness with the lowest environmental impact.

Commercial buildings

The Issy Grid Project is in a Paris business district where 10,000 people work. The buildings are smart, intercommunicating and interacting to supply each other with electricity. The aim is that the district should use locally generated power only.

Our commitment to the end-user

The Low Voltage Industry and its partners across the electrical engineering industry work together to bring end-users:

• Empowerment and support

With our smart, demand-response technologies, we empower users to make the transition from the traditional to the smart grid. With our expertise and understanding of their needs we support them and ensure they use the smart grid to meet their needs – not the other way round.

• Guidance

We are committed to guiding our customers towards smart usage, because the smart grid is only as smart as its users.

• The assurance of security

We guarantee absolute security for all confidential or proprietary information. Our solutions incorporate privacy and cybersecurity devices that afford full access and network protection against any malicious attacks.

• Control

We enable customers to take full control of their energy usage. They will get more out of their existing assets, cut their energy-related operating costs, and control their emissions. What's more, our systems are very affordable: customers can account for them in their operating expenditure.

• Electrical safety

The smart grid is first and foremost an electrical system, and electrical systems are our core competence. That is why we build all of our solutions on safety. The smart grid can bring greater safety and stability – but on condition that electrical distribution professionals handle installations.

The solution leverages demand-side expertise to retrofit the BMS of five buildings with energy distribution systems and electrical vehicle facilities. It has built a smart grid interface with analytic demand management so that buildings can connect with upstream systems. Improved access to demand-response schemes and green energy sources has helped cut energy-related costs and emissions.

Residential

The City of Stockholm is pioneering an environmentally friendly, smart-grid-connected district in the Royal Seaport neighbourhood. Central components of this smart grid are so-called "active houses" which intervene in the smart grid as part of their active energy management capabilities.

The implemented solution results for Stockholm's first active house that will enable residents to schedule their electricity consumption outside times of peak demand and better steward generation resources. Low Voltage technology will also enable them to consume power (e.g. charge an EV) at times when low-carbon electricity is plentiful.

Smart meters – important but not enough

Smart metering systems are an essential part of the smart grid.

They collect and communicate data – e.g. energy produced, bidirectional load curve flows. They also have two-way communication capabilities which make them remotely controllable.

In fact, numerous smart grid functionalities cannot be deployed without them. However, they are not enough on their own.

Restricting "smartness" to meters meets the needs of homes and commercial buildings only partly. And it doesn't meet the needs of industrial buildings at all.

The smart power systems and devices supplied by the Electrical Low Voltage industry (represented by CAPIEL) provide a more comprehensive answer to the energy challenges.

Economic and environmental benefits of smart use

- **Full, real-time control over energy usage** and greatly improved energy efficiency as smart grid technologies help users leverage their existing assets.
- **Additional operating electricity savings** of up to 10% and even electrical self-sufficiency.
- **A more stable, better balanced grid** where there are less outages and no cascading blackouts.
- **More efficient management of peaks** and troughs in demand. Automated grids will greatly enhance productivity and energy conservation by adapting output to peaks and troughs as end-users and power plants purchase and deliver energy in a two-way flow.
- **Improved environmental quality** as users purchase cleaner, low-emission generation. As renewable energy sources are more regularly accessed, they will become more even and centralised environmentally-friendly generation will also increase.
- **Enormous savings on investment** as utilities cancel or delay the building of new generation infrastructure and consumers are not taxed to foot the bill.
- **Europe builds and strengthens its energy independence** as home-grown Low Voltage expertise enables ever smarter use of the smart grid.

Smart usage can play a part in the **20-20-20** targets by 2020

Europe has set ambitious targets to reduce its CO_2 emissions by 20%, to reduce primary energy use by 20%, and to increase its share of renewable energies by 20%. The smart grid has a part to play.

20% cut in emissions

Smart users can shift their usage to off-peak periods, so reducing amounts of fuel used at peak production. They could slash emissions by a factor of 10.

20% renewables

In some countries renewable energy input has reached the point where grids cannot absorb any more variable uncontrolled power. The integration of renewables at end-user level opens new deployment vistas.

20% cut in consumption

Smart users will proactively control their electricity usage. Smart buildings, for example, produce and store electricity. The result is a two-way electricity flow between the building and the grid, with the building managing supply and demand, so reducing energy waste and emissions.

When the economy and the environment benefit, so does society

We are industry leaders who see the smart grid as an opportunity for the entire Low Voltage sector in Europe – from vendors to local contractors. As a driving force in Europe's bid to lead in smart grid-connected systems, we believe our solutions will help create long-term, high value-added employment, enhance retail energy market competition, and incentivise greenhouse gas emission reductions.

How?

- By building and rooting such expertise in Europe we will create hubs of expertise where jobs cannot be relocated.
- The cross-fertilisation of digital and energy technologies will generate new high skill job opportunities.
- Smart grids provide a platform for developing new, innovative energy services, while addressing data protection and cybersecurity challenges. Priority investment areas are the electrical vehicle, renewable energies, and smart networks and buildings.
- The switch from the conventional, centralised grid to the smart, distributive grid will generate employment across the EU, where joint public-private projects are burgeoning.

As leading European Low Voltage manufacturers, we supply switchgear and controlgear that meet the needs of small and medium smart grid users. Our areas of expertise and our commitment to customer concerns prompted us to form an industry association, CAPIEL. Its aim is to evolve together as smart users of the grid.

The electrical Low Voltage industry:

- has in-depth experience and understanding of its customers in the industrial, commercial, and residential sectors
- is close to its customers and understand their concerns for data privacy and cybersecurity
- has experience and expertise in working "behind the meter" – i.e. understanding the dynamics of demand-response and energy efficiency and how to integrate them into end-users' sites
- offers much more than just energy efficiency solutions. It enables their customers to connect with the smart grid and to leverage demand response, so helping them save energy and grow their businesses.

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