

FORGING A JOINT COMMITMENT TO SUSTAINABLE AND COST-EFFICIENT ENERGY TRANSITION IN EUROPE



A new EU energy landscape takes shape

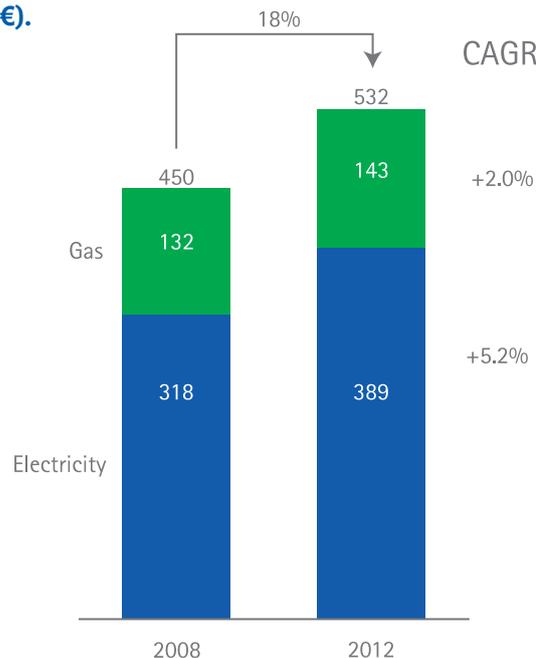
The European energy landscape is being transformed through a combination of decarbonisation, liberalisation and security of supply policies. The EU has made a unilateral commitment for 2020 that should see greenhouse gas emissions reduced by 20 percent compared to 1990 levels. The drive for economic competitiveness is well advanced, with the first and second liberalisation directives now transposed into national law by all Member States, and the 3rd Energy Package currently being implemented. And since 2000, security of supply has significantly improved, with the EU now aiming to reduce fossil energy imports by 26 percent by 2020, as well as cutting energy consumption by almost 15 percent. The Commission’s proposal for the 2030 Energy and Climate goals show that the 2020 agenda is only a first step in a long-term transition process.

The link between policymaking and rising energy expenditure

However, against this backdrop, there has been an escalation in expenditure on electricity and gas across Europe¹. Energy expenditure² has surged more than 18 percent since 2008 (from €450bn to €532bn), with electricity accounting for most of this increase (see Figure 1).

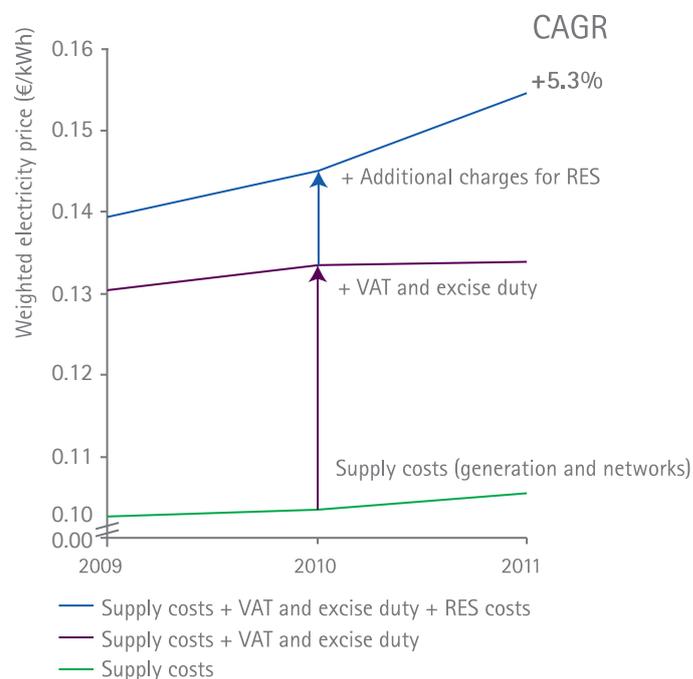
Rising prices were responsible for 96 percent of the €71bn increase in electricity expenditure between 2008 and 2012, while the volumes consumed were largely stable. And our analysis confirms that these price rises are being increasingly driven by charges for renewables support (Figure 2).³ In contrast, the costs of supplying electricity have remained relatively stable since 2009.

Figure 1. Electricity and gas expenditure 2008-2012 (bn€).



Sources: “Energy statistics - quantities, annual data,” © Eurostat, European Commission, June 2013, http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/EN/nrg_quant_esms.htm; Accenture analysis.

Figure 2. Weighted average electricity prices by component (2009-2011)*.



*The weighted price represents the average costs over different user categories, weighted by their relative consumption. The renewable energy costs represent the total costs for supporting renewables in the country distributed evenly over total consumption.

Sources: “Energy statistics - quantities, annual data,” © Eurostat, European Commission, June 2013, http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/EN/nrg_quant_esms.htm; “Status Review of Renewable and Energy Efficiency Support Schemes in Europe”, 25 June 2013, Council of European Energy Regulators, http://www.ceer.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_PAPERS/Electricity/Tab2/C12-SDE-33-03_RES%20SR_25%20June%202013%20revised%20publication.pdf; Accenture analysis.

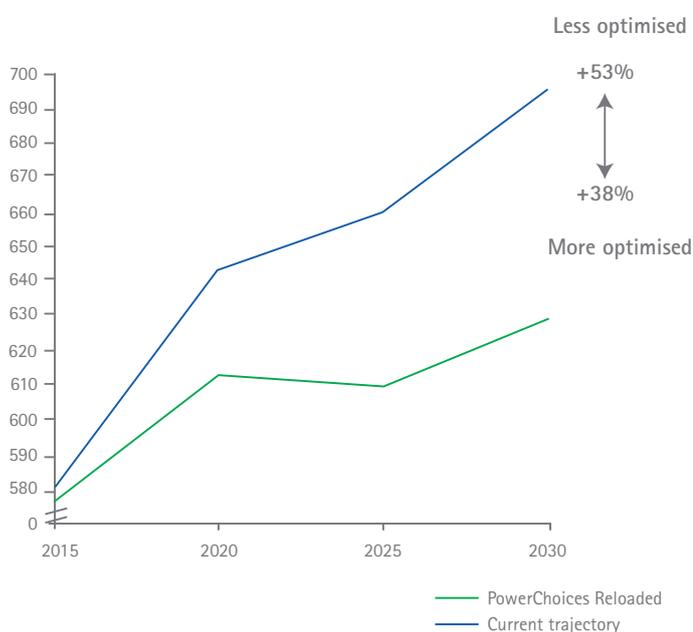
1 Our research covered France, Germany, Italy, the Netherlands, Poland, Spain, Sweden and the United Kingdom.

2 In the context of our research, energy expenditure = energy prices x volume consumed.

3 Although these charges currently may be a relatively small part of the total price, they are the fastest growing component.

The rises in electricity and gas expenditure in recent years have exceeded those in optimised scenarios, such as EURELECTRIC's 2013 analysis, *PowerChoices Reloaded*⁴. And this is just the beginning. Without addressing the barriers to meet the agreed decarbonisation objective in a cost-effective manner, our analysis shows that expenditure on electricity and gas in 2030 could be approximately 38 to 53 percent higher in Europe than it is today⁵, depending on the level of optimisation achieved (see Figure 3).

Figure 3. Electricity and gas expenditure 2010-2030 (bn€ in 2005 monetary value) projection – optimisation scenario.



Sources: “Energy statistics - quantities, annual data,” © Eurostat, European Commission, June 2013, http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/EN/nrg_quant_esms.htm; “Power Choices Reloaded: Europe’s Lost Decade,” © EURELECTRIC, May 2013, http://www.eurelectric.org/media/79057/power_choices_2013_final-2013-030-0353-01-e.pdf; Accenture analysis.

Households: increasing affordability issues

Without action to ensure policies are more cost-effective, the already considerable effect of these price rises on consumers is set to escalate. For European households, the average share of disposable income spent on electricity rose to 3.3 percent in 2012⁶ (up from 1.4 percent in 2008), and our projections indicate this could go as high as 4.7 percent by 2030.

There is no mistaking the evidence that market liberalisation has helped limit price increases by introducing greater competition in generation and retail, and through market coupling and cross-border interconnection. However, because residential energy prices have been increasing against a backdrop of falling disposable incomes, the share of customers said to have difficulty paying their energy bill continues to rise in many countries (currently ranging from 2 percent in the Netherlands to up to 15 percent in Germany⁷). With the projected rises in prices, this pressure on consumers is likely to increase.



4 “Power Choices Reloaded: Europe’s Lost Decade,” © EURELECTRIC, May 2013, http://www.eurelectric.org/media/79057/power_choices_2013_final-2013-030-0353-01-e.pdf.

5 This scenario is based on the ‘Lost-decade’ scenario of the *PowerChoices Reloaded* study, characterised by a difficult financial climate and an absence of strong climate action, policy or targets, resulting in a loss of momentum in the period to 2030.

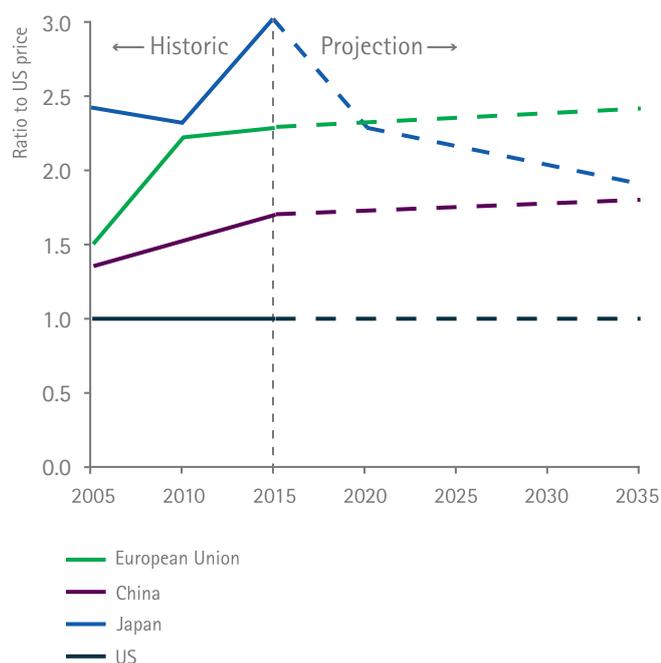
6 There are significant differences between countries. Italian households spent 2.7% of disposable income on energy in 2012, on average, while for households in Spain this was as much as 4.4%.

7 Directive 2009/72 mandates Member States to define the concept of vulnerable customers, which may refer to energy poverty. Therefore, the definitions of consumers with difficulty to meet energy bills or living in energy poverty differ by country.

Industry: increasing competitive pressure

Meanwhile, as the gap in electricity and gas prices between Europe and the United States keeps growing (see Figure 4), European industry is coming under increasing competitive pressure. In 2012, industrial users in Europe were paying more than twice as much for their electricity as their counterparts in the United States. The differences in gas prices were mainly the result of the plunge in wholesale gas prices in the United States due to soaring shale gas production, but differences in taxation also affect the relative price levels⁸. And according to current projections, by 2035 they will be paying closer to 2.5 times more. This could have significant long-term implications for industry in Europe.

Figure 4. Ratio of European Union, Japanese and Chinese to US industrial electricity prices, including taxes.



Sources: “Energy Prices and Taxes - Second Quarter 2013”, © OECD/IEA, 2013, http://www.oecd-ilibrary.org/energy/energy-prices-and-taxes/volume-2013/issue-2_energy_tax-v2013-2-en;jsessionid=562140slanmd9.x-oecd-live-01; “World Energy Outlook 2013”, © OECD/IEA, 2013, <http://www.worldenergyoutlook.org/>.

⁸ By mid-2012, pre-tax gas prices in Europe were close to five times higher than in the United States and prices in Japan were over seven times higher. This trend is explained primarily by the surge in US shale gas coupled with a historically mild winter, which has boosted overall gas availability and driven prices down to historically low levels. (“World Energy Outlook 2013”, © OECD/IEA, 2013, <http://www.worldenergyoutlook.org/>).

Core issue: reaching a tipping point

How did we get to this point? First and foremost among the causes is the **patchwork of national regulation** that has led to limited optimisation across Europe. Other reasons include slower cost reductions of some new energy technologies than originally predicted, and energy efficiency being less rapidly and less widely implemented than expected.

As the regulatory patchwork unnecessarily adds to the costs of the transition, a critical evaluation of the energy transition is required; not to question the ambitious objective, but to identify options for a more cost-effective transition pathway to reach the objective. Our research shows that energy expenditure could be stabilised from 2020 onwards (as shown in Figure 3), if we move towards pan-European optimisation of the energy system. This would be hugely beneficial for Europe’s households and industry: total expenditure on electricity and gas would reach €629bn in 2030 – 10 percent lower than without such action.

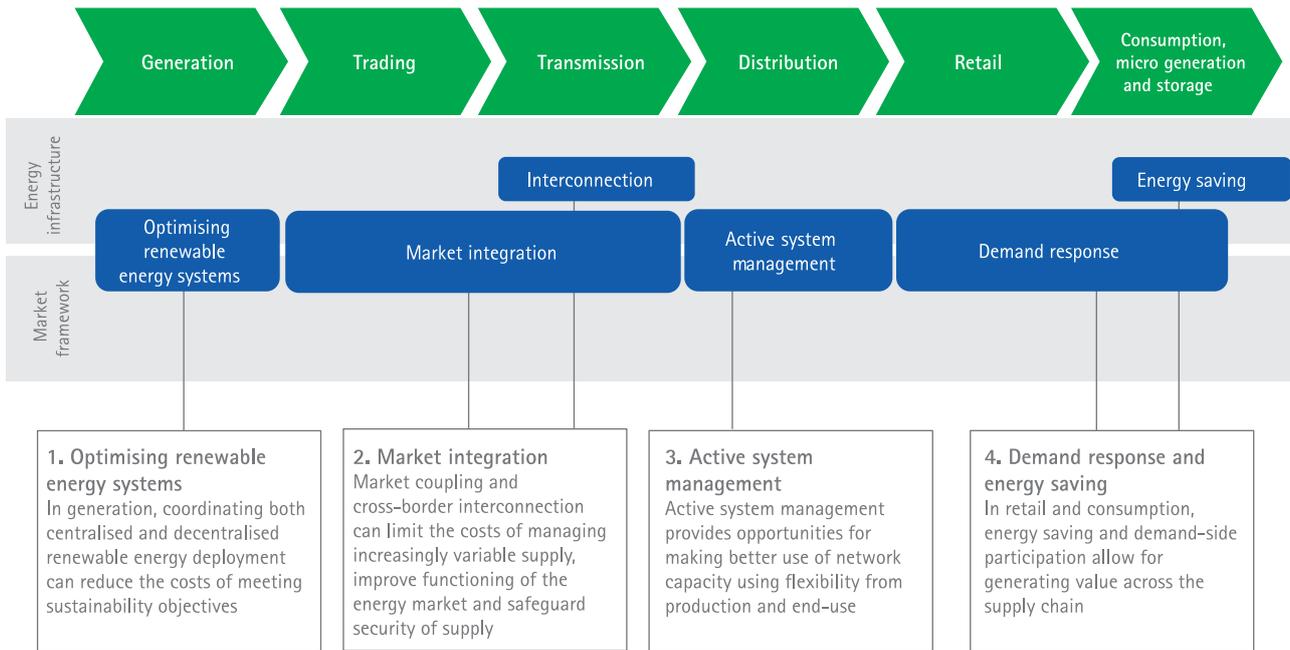


European-wide integration: the key to an energy-efficient transition

What can be done to optimise the energy system? Our analysis shows that the solution to achieving a more cost-efficient energy transition lies in implementing an

integrated set of levers across the electricity value chain – from generation, trading, transmission and distribution through to retail and consumption (see Figure 5).

Figure 5. An integrated set of levers across the electricity value chain.



Source: Accenture analysis.

Methodology

The quantitative analysis was based on three components. First, the baseline was taken from the *PowerChoices Reloaded* scenario undertaken by EURELECTRIC in 2013. From this work, the analysis was confined to eight countries: France, Germany, Italy, the Netherlands, Poland, Spain, Sweden and the United Kingdom. The baseline scenario already includes a significant amount of cost control and optimisation in its assumptions and remains a challenging target.

For the building blocks used in this study (see Figure 5), we focused on the electricity system, as rising electricity prices are the major driver of the increase in European energy expenditure. However, many of the measures are equally relevant for the European gas market. These building blocks are all considered to be solutions that could provide

optimisation of the European electricity system beyond that envisaged in *PowerChoices Reloaded*. The sources for the value of the building blocks were a combination of published studies; primarily, though not exclusively, EU Commission-funded studies, plus additional analysis by Accenture.

Given the wide breadth of the analysis with many source studies and the significant interaction between different components of the system, there is a large degree of uncertainty in the costs and benefits of the building blocks. High and low cases were developed for building blocks wherever possible, using ranges from published studies plus Accenture analysis. A significant number of newly enabled value areas from system optimisation have not been assessed, such as new business models and further operational cost control from increased system data and from greater competitive pressures across a more integrated European electricity system. As such, the analysis as a whole is expected to err on the conservative side.

Comprehensive implementation of all levers would first of all reduce the costs of energy transition. Moreover, with a coordinated, and collaborative commitment from utilities, governments and regulators, as well as engagement from consumers, it would help Europe achieve a better balance between its energy policy objectives of competitiveness, sustainability and security of supply.

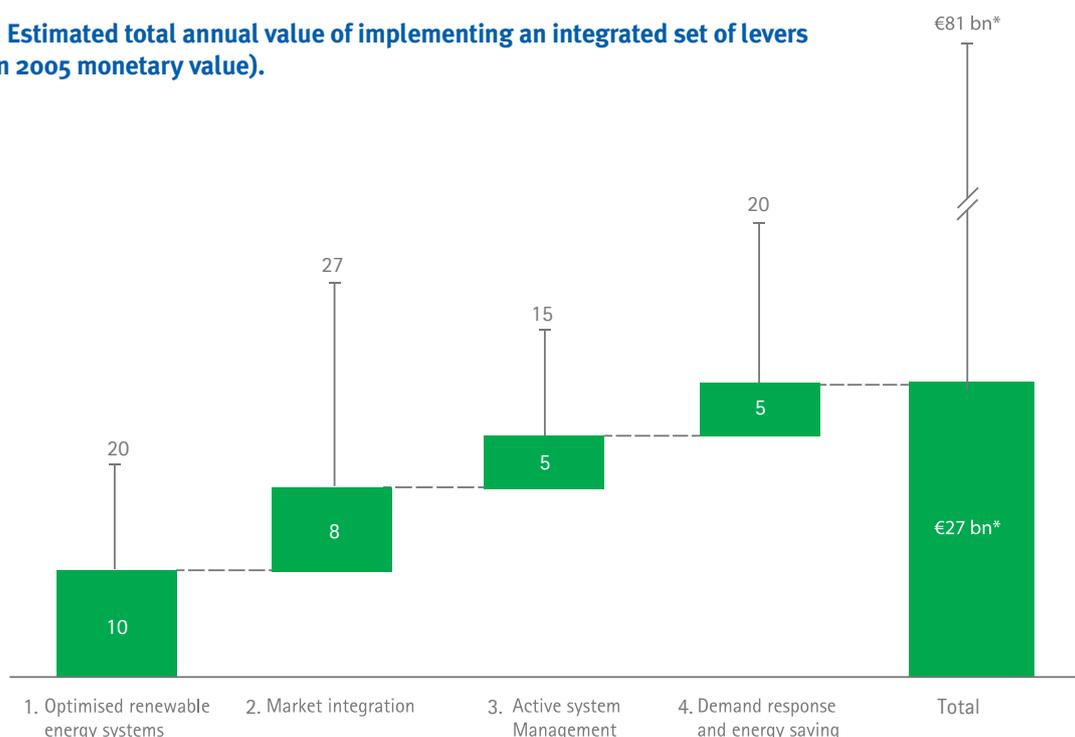
Shown in Figure 5, these levers can be summarised as follows:

1. Optimising renewable energy systems: In generation, the coordination of renewable energy deployments could significantly reduce the costs by ensuring that new capacity is in the optimal location and most appropriate mix to optimise load factors and integration costs, irrespective of national boundaries. This coordination could be achieved through a stable and meaningful value for

CO₂, gradually taking over from national renewables support schemes.

- 2. Market integration:** Across trading and transmission, market integration and increased cross-border interconnection could limit the costs of managing increasingly variable supply, improve the functioning of the energy market, and better safeguard security of supply.
- 3. Active system management:** In distribution, active system management—using flexibility from production and end use—provides new opportunities for making better use of generation and network capacity and reducing the costs of integration of distributed generation.
- 4. Demand response and energy saving:** Across retail and consumption, energy saving and demand-side participation to reduce peak demand could enable value to be generated throughout the supply chain.

Figure 6. Estimated total annual value of implementing an integrated set of levers (bn€05 in 2005 monetary value).



* The green bars are the bottom of the range, and therefore represent a conservative estimate. In total, the set of value levers could generate a value of €27 to €81 billion relative to the PowerChoices Reloaded scenario. All blocks refer to electricity only.

Sources: “Power Choices Reloaded: Europe’s Lost Decade,” © EURELECTRIC, May 2013, http://www.eurelectric.org/media/79057/power_choices_2013_final-2013-030-0353-01-e.pdf; Accenture analysis.

Opportunities exist for generating additional cost savings from existing measures (such as end-use efficiency), as well as from potential new value pockets and new retail business models. Recognising the interdependency of these levers and implementing them in an integrated, comprehensive manner is essential. Taking this approach, we estimate that this

could generate net savings of €27- €81bn per annum (see Figure 6). As shown, better-integrated markets and optimisation of renewables deployment constitute the largest opportunities for reducing the costs of energy transition in Europe. Without an integrated approach to implementation, however, the level of optimisation that could be achieved would be significantly reduced.

3. Active system management

Distribution systems, while decisive for the efficient integration of renewable energy sources, will face significant challenges over the next 20 years, from ageing assets, new distributed generation capacity and increasing consumer expectations. The growth of distributed generation (DG), in particular, places significant financial and technical stresses on distribution networks. Already, DG projects are being delayed by the unavailability of firm capacity caused by a lack of hosting capacity on the grid. The solution lies in the move to an active system management approach for distribution networks with investments required in areas such as smart metering, network monitoring, improved grid operational controls and enhanced analytics, representing an important part of the €400 billion investment needed in Europe's distribution networks to 2020¹⁰. Active system management acts as a key enabler of other measures, allowing a move away from the traditional *fit-and-forget* approach of addressing congestion by investing in more copper, towards an optimised and cost-effective network in which capacity is managed closer to real time, making better use of existing assets. There are a number of important capabilities within active system management, including increasing flexibility to improve DG integration, improving locational signals for new DG, enhancing asset management, and creating a more active distribution system management. More intelligence in network assets is a key enabler to accomplish this. Examples include the use of power electronics in the form of distribution STATCOMs and current fault limiters to provide the rapid voltage response required to manage a greater proportion of distributed resources.

Leveraging DG operational flexibility and consumer demand flexibility to enhance the carrying capacity of distribution networks could significantly reduce integration costs and speed up DG deployments. There are a number of ways this could be achieved. Remote operation of DG output would defer reinforcement and allow optimal use of existing grid capacity. Similarly, customer demand flexibility could be used to lower the total cost of integrating new DG, and distributed storage could be used to provide energy that would also lower the cost of DG integration, and provide local ancillary services such as voltage control through DG power electronics configuration.



Additional challenges remain. Within certain limits, most distribution companies are currently obliged to accept any new DG onto the network and guarantee sufficient network capacity to accommodate the loads of end users. This can place a significant burden on consumers, in terms of reinforcement or additional distribution losses. The solution lies in optimising new DG locations, by **providing locational and time-based signals for new DG and loads** that take account of the implications for reinforcement and operating costs across all voltage levels of the distribution network.

Improved asset management is another high-priority objective for active system management. At present, ageing assets and increasing network complexity from distributed resources demand a renewed surge of investment by distribution companies, as well as put pressure on the reliability and quality of supply. By introducing sophisticated analytics capabilities, remote monitoring of equipment condition and real-time load measurement, companies could realise a step-change in their understanding of loads and stresses on components throughout the distribution system. By increasing asset life and utilisation, this would defer the need for replacement and/or reinforcement, as well as reduce the need for field personnel to check asset status.

Improved distribution network operations, a key element in active system management, would address two existing problems. First, field operations in distribution businesses are constrained by a lack of real-time information and reliance on paper-based solutions. Combined with existing datasets, the use of smart technology could help field operations. For example, the process to identify, isolate, repair and re-energise faulted circuits can be speeded up considerably, resulting in fewer truck rolls and faster supply restoration for customers. Second, by leveraging vastly improved network data and targeted network control capabilities, smart network operations could significantly improve network utilisation, reliability and quality of supply.

¹⁰ "Power Distribution in Europe. Facts & Figures," © EURELECTRIC, 2013. http://www.eurelectric.org/media/113155/dso_report-web_final-2013-030-0764-01-e.pdf

Call for action: an urgent need for a joint agenda to optimise the energy system across Europe

Stakeholders from all sides, including policymakers, consumer organisations, industry and the energy sector, have recognised the major impact of the rising energy expenditure on Europe's households and industry, and all share a sense of urgency about the issue. Still, we see a considerable gap between awareness and action.

Going beyond shared recognition, all partners need to work together towards the common goal and on a pan-European basis, reaching across country boundaries. The energy sector, policymakers and regulators, consumer representatives, industrial players, and environmental groups need to bridge their differences.

With this cooperative mindset, utilities can underline their commitment to securing an effective, efficient energy transition by focusing greater effort on the

distribution, retail and consumption end of the value chain—whether through partnerships with each other, policymakers and regulators or with end users, as well as through innovative forms of collaboration with other sectors.

Although there has been considerable progress in addressing interconnectivity through the regulatory framework, the optimisation of generation, trading and transmission will be accelerated if there is constructive dialogue between utilities and regulators around European-wide market integration.

The success of our approach hinges on a genuine commitment to move forward together to develop a joint agenda for change, with efforts focused on key value levers across the full electricity value chain. The electricity industry will benefit – and so will Europe.

This document is produced by consultants at Accenture and by EURELECTRIC as general guidance. It is not intended to provide specific advice on your circumstances. If you require advice or further details on any matters referred to, please contact your Accenture or EURELECTRIC representatives.

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