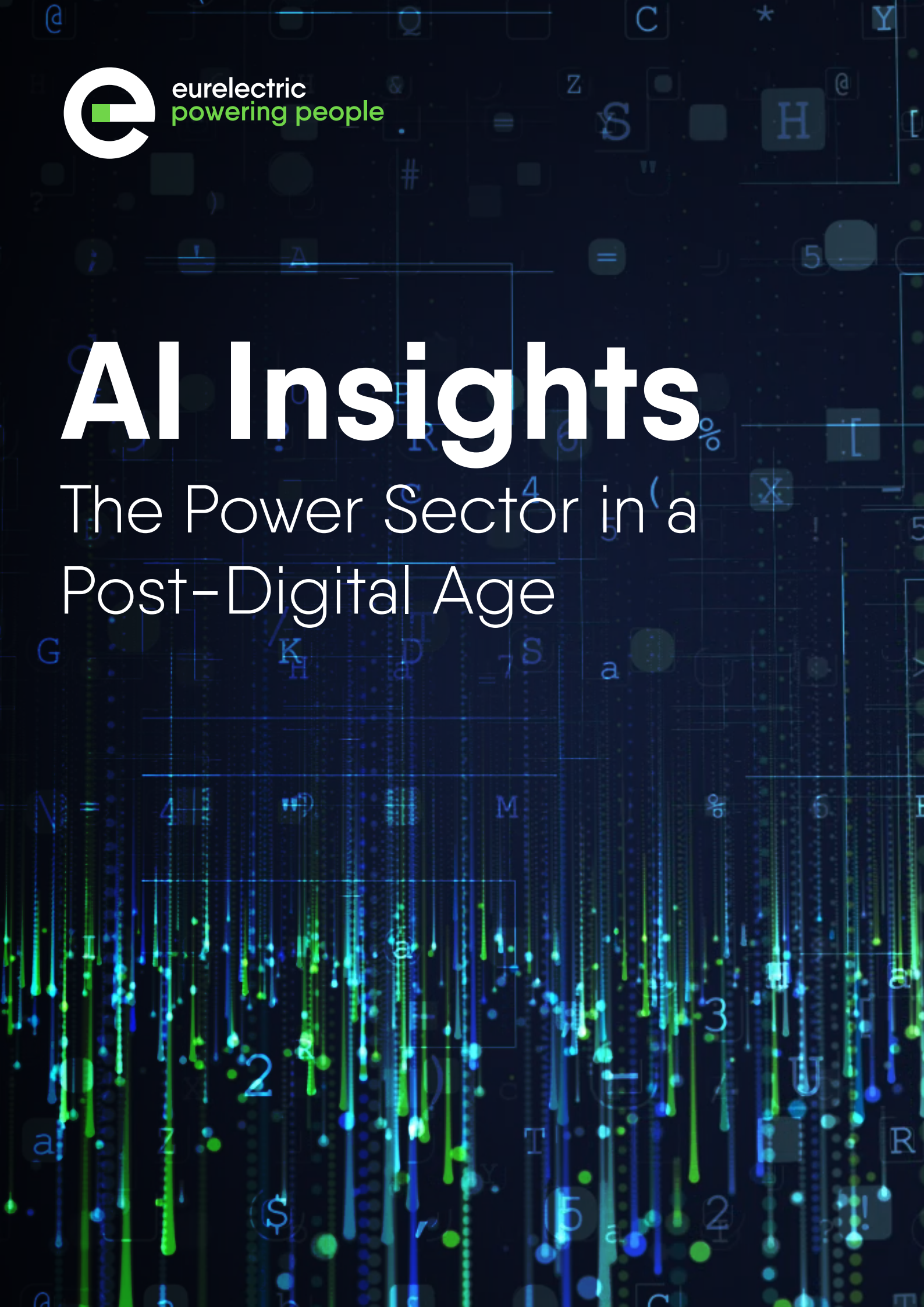
eurelectric
powering people

AI Insights

The Power Sector in a Post-Digital Age



eurelectric
powering people

AI revolution is happening and at a pace faster than anyone anticipated. The ongoing situation has forced industries to re-think their attitude towards AI technologies. The AI driven utility might be a role model amongst all operational business models known to date.

Beyond Digital Platform is the first professional forum focusing on unlocking the potential of utilising AI and digital technologies and designing a common vision for the power sector in a post-digital age. The Platform brings together innovation, digital and AI experts from across different sectors to exchange ideas, discuss challenges, find solutions and influence policy. Its mission is to accelerate the energy transition through facilitating the role of AI and digitalisation in the European power sector.

From May to October 2020, the Platform held a series of four workshops where the AI Insights were developed culminating into the presentation at the Digitopia event on 26 November 2020. The second phase of the project will focus on developing and disseminating policy recommendations during 2021.

BEYOND DIGITAL

Dépôt légal: D/2020/12.105/66

Contact: **Darya MUSTAFAYEVA – Advisor - Strategic Communications & International Projects**
– dmustafayeva@eurelectric.org

Summary

AI offers enormous potential for the energy industry and is a fundamental building block of the clean energy transition. It will lead to greater automation, saving money and driving operating efficiencies, the development of new products and services and - perhaps most importantly - enable a reduction in carbon emissions. But the extent to which it will deliver the greatest possible returns for the energy industry will depend both on the acumen and involvement of senior executives to identify opportunities to create new value streams and ensure that projects progress from proof of concept stage, but also active and constructive engagement with regulators and policymakers.

Policymakers will have to walk a fine line between strong regulation to manage the known and as yet unknown risks of AI, while giving the young technology room to develop and providing the necessary incentives. And regulation on data access must protect consumer rights to privacy, which the Commission has recognised as a priority, but also respect companies' legitimate interests and allow adequate access to data for solution providers. Somehow a compromise must be found that allows data to be anonymised, aggregated or otherwise sanitised so that it can be fed into digital interfaces without jeopardising consumer trust. Finding the 'goldilocks' level of regulation, ensuring the appropriate data is open and facilitating interoperability will be the key to success.

Narrow AI refers to the technology when it is able to handle just one particular task. General or strong AI is more complex. Applications of narrow AI will drive efficiencies in the short term, which will boost confidence in the technology. General AI projects will be more transformational but will take longer and will need to prove their maturity before scaling up. Complex decision-making required in the real world will need to be translated into AI language before we will be able to fully trust a machine to drive our cars, for example. But if trust can be established and ethical considerations are taken into account, the limits of what is possible with AI will likely be pushed to the boundaries of current human imagination.

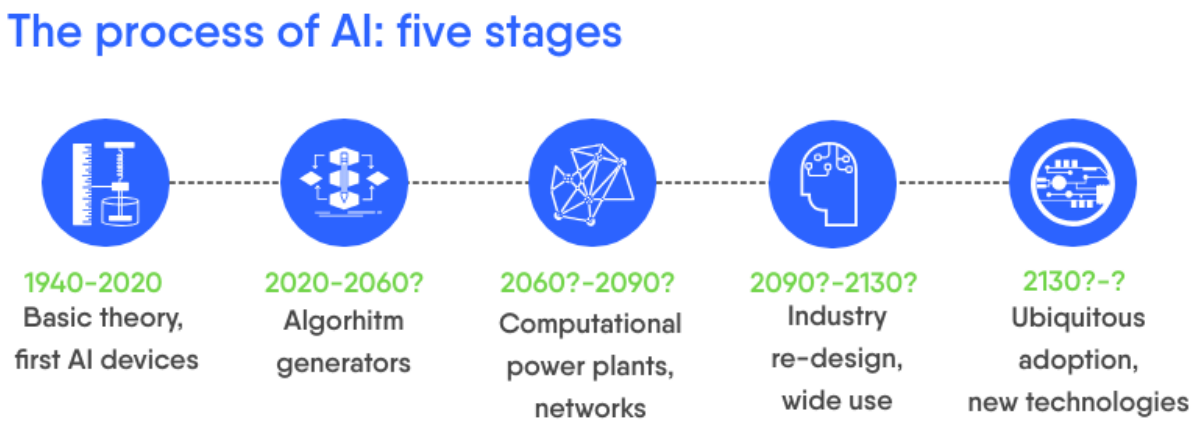
1. **AI, and other digital technologies, offer huge opportunities for the clean energy transition**
2. **AI needs the right incentives and room to develop its full potential**
3. **Regulation must protect consumer privacy, ethics and establish trust**

Introduction

Artificial Intelligence and other exponential technologies, such as digital communications, high speed internet (5G), blockchain, computing power and memory are becoming more and more interconnected. They will play a critical role in the clean energy transition and the unprecedented nexus of these technologies presents significant challenges and opportunities for the power sector.

Artificial intelligence is breaking through the limits of human capabilities at just the right time, as radical transformation of the electricity sector is essential for a cost-effective clean energy transition. The digitalisation and decentralisation of generation, transmission and distribution with real-time dispatching of flexible assets, interdependency and interoperability create an enormous data footprint that cannot be managed with traditional operating systems. But the climate emergency demands this crucial mission must be accomplished.

This paper, which has been developed by the Eurelectric Beyond Digital Platform, examines the opportunities for utilities to harness the benefits of AI and how this is paramount in order to deliver Europe's Green Deal aspirations. It will also document some of the challenges and the latest regulatory steps seeking to address them.



Source: INC42 – AI and electricity historical parallels

While Europe has taken a leadership role in tackling the climate crisis, it has been slow off the starting block in the AI race, so far losing ground to the US and China. A new European Parliament special committee on Artificial Intelligence in a Digital Age (AIDA) wants to close the gap and see European companies developing digital talent and platforms, supported by greater investment in AI. Despite the COVID pandemic, Europe should still aim to attract more than €20bn/year of investment in AI over the next decade, EU Commissioner for the Digital Age Margrethe Vestager has said. The EU's €750 billion green recovery package Next Generation EU should be a good

source of funding for the digital transition as many AI projects will facilitate the adoption of distributed renewable energy.

Romanian MEP Dragoș Tudorache, chair of the AIDA committee, said: "It is commonplace to lament our place in the AI race. Clearly, we are behind in investment, by quite a sizeable margin too, but I do believe if we wake up soon enough, we can make up this gap." However, the latest budget earmarked less than €500 million spread over seven years to strengthen the EU's digital skills, which will not be adequate to deliver the boost it needs to catch up to the AI superpowers.

AI experts prefer the term 'augmented intelligence', highlighting the symbiotic future relationship between man and machine rather than the sci-fi image of a rogue android with a mind of its own. Human oversight will always be required at some level to ensure future ethical dilemmas are addressed appropriately and that the machine's interpretation of data and algorithms makes sense in the real world. In fact, AI and other digital tools will enable the democratisation of energy away from centralised control desks, so that consumers will play a much more conscious role in how they use power.

Good data is like oxygen for this new man/machine hybrid – it cannot function without it. The success of AI applications in the energy sector will depend on access to widespread high-quality data and data infrastructure, which is now possible as data storage capacity has increased, while its cost has plummeted. But regulation and policies will have to balance the need for data sharing with the protection of consumer privacy and preserving Europe's industrial confidentiality and competitiveness.

As Moore's law that predicted the doubling of the number of transistors on a chip every two years is coming to an end, the next generation of computing efficiency will be found in software, algorithms and cloud applications. AI is already being used extensively in the energy industry for incremental efficiency improvements which deliver small cost savings on a wide scale. But the jury is still out on the extent to which it will create completely new business and revenue models. It will clearly allow the workforce to become more agile and dedicate a larger proportion of their time to customer-focused value-added activities rather than drudgework. Many repetitive jobs such as data entry, quality assurance or candidate screening will be automated.

Forecasts for the AI business opportunity are staggering. Gartner predicts that AI augmentation will create $2.9 trillion in business value globally next year, and 6.2 billion hours of worker productivity.

The International Data Corporation predicts that worldwide revenues for the AI market including software, hardware and services will reach $156.5 billion in 2020, an increase of 12.3% year-on-year. AI revenue will top $300 billion by 2024 with a five-year compound annual growth rate (CAGR) of 17.1%, it says. If Europe continues at its current pace on AI it could add around €2.7 trillion, or 20% to its combined economic output by 2030, according to McKinsey. But if it accelerates to catch up with the US, a total of €3.6 trillion could be added to GDP in this period.

Nearly 25% more companies used AI last year compared to 2018, and most executives report a subsequent increase in revenue, with 44% of those who adopted it saying AI reduced costs, according to the latest McKinsey Global Survey. But early mover advantage will fade soon, warns the Deloitte AI Institute in its report "Thriving in the Pervasive Era of AI". While using AI for

efficiency improvements can boost productivity, companies can go beyond this objective by leveraging AI to create new products, the report says.

Time will tell whether AI lives up to its hype, but some predict it will lead to future innovations we cannot even imagine. Google's CEO Sundar Pichai said that AI is one of the most important things humanity is working on, potentially more profound than electricity or fire. It is a good analogy, because while the benefits are huge, the implications of careless management or losing control are serious.

A careful balancing act will be required to manage the potential risks, avoid bias and safeguard consumer privacy while allowing sufficient access to data and designing regulations that are robust and effective without strangling innovation.

What is it?

AI is an umbrella term for a range of technologies which can simulate human reasoning powers by analysing data. At its core AI has the fundamental impact of reducing the cost of prediction and as that cost falls, then more and more activities will be shaped as prediction issues. In the same way photography moved from a chemistry challenge to a digital challenge, so many issues will move to being prediction issues. Whether self-learning models or algorithm-based management, machine learning, deep learning or reinforcement learning, utilities have a range of innovative business models and services to choose from.

- Reinforcement learning can help optimise complex decisions, especially when good output examples are not available. In this way the model can learn sequentially which is the best action to take and this could often be applicable in the energy sector. It creates a decision strategy by testing multiple combinations and identifying the right one. Use cases include automated driving, financial trading, optimising engineering systems and energy management, and fine-tuning CAPEX decisions.
- Machine learning and deep learning can be used to interpret patterns in real conditions and use them to make predictions, for example for power outage prediction, asset optimisation, fraud detection, predictive maintenance and load forecasting.
- The digital twin is a cyber model of a physical asset which can be used for network flow management, equipment failure detection and asset management.
- Blockchain, a distributed ledger technology associated with AI, can increase transparency and guarantee the origin of electricity.

AI can be divided into weak/narrow and strong/general categories. Narrow AI performs a single task or a set of closely related tasks such as weather apps or digital assistants. They tend to focus on finding efficiencies and can already be found in a surprising number of everyday applications. General or strong AI can handle a range of complex tasks such as data processing and decision-making.

Cloud platforms such as Microsoft Azure, Amazon AWS, Google Cloud and general-purpose AI frameworks such as IBM Watson provide AI services that are already available to many utilities. More bespoke services are offered by companies like C3.AI, depsys, OpenText or large utility-focused engineering firms such as ABB, GE or Siemens and systems integrators like Accenture,

Cognizant, Infosys, Wipro and TCS. Many utilities are working with or have acquired AI start-ups, sometimes leading to a culture clash between the old and new style of working.

Working with start-ups presents significant opportunities but also some challenges, including technical, practical, legal, reputational and IP ownership risks, according to consulting firm Best Practice AI. Many of these risks stem from cultural gaps so it is imperative to understand them before utilities and start-ups work together. Utilities are starting to understand the need to 'disrupt themselves' with more agile, innovative thinkers, but they are conservative in nature for a good reason, as they cannot jeopardise security of supply if a project fails.

In the short term the immediate applications of AI are likely to be around optimising existing assets but the highest potential for AI application can often be found at the intersection of different sectors, for example the electrification of transport and heat, smart homes to maximise energy efficiency through integration and autonomous optimisation, flexibility services for grids and edge computing to enable the rapid response of decentralised energy assets with limited intervention. But while new AI projects may promise some 'silver-bullet' solutions, often it is at the point of integration with older legacy systems that obstacles are encountered.

A recent study by the French Association Think Smart Grids has shown that almost all European utility companies have tried Big Data projects through Proof of Concepts, often with start-ups. But Big Data has so far failed to live up to its expectations as the 'next big thing', according to AI specialist DC Brain in a recent paper.

Public funding for innovative projects is available, for example under the European Union's Horizon Europe programme, which focuses on Europe-wide co-operation rather than deep tech development and niche products. The Commission has proposed that the Union allocates at least €1 billion per year in funding from the Horizon Europe and Digital Europe programmes to invest in AI. The Digital Europe programme will also help to make AI available to small and medium-size enterprises through digital innovation hubs, strengthened testing and experimentation facilities, data spaces and training programmes.

But there is a yawning chasm between pilot phase and commercialisation. Start-ups need to prove that they can actually see some adoption of the solutions they offer when the market is mature enough. Start-up incubators such as Free Electrons, Creative Destruction Lab Oxford AI programme, EIT InnoEnergy's Business Booster and the Tech Boost for Smart Energy and Industry consortium led by French Alternative Energies and Atomic Energy Commission can play a useful role in matching up innovative projects with interested utilities which have the balance sheet to bridge the 'valley of death'.

The issue of how AI is being applied to the world of energy has not gone unnoticed by the UK as it leaves the EU and seeks to find new relationships in the world based around research and innovation. On the one hand, it has a good track record of decarbonising and also has more AI start-ups than Paris and Berlin put together, however from this strong potential position, and despite the fact that it has recognised the 4th Industrial Revolution as important, it has failed so far to lay out a comprehensive AI strategy for energy. There is however work going on to create an International Centre for AI, Energy and Climate Change which is seeking to create an ecosystem that brings together policy and regulations, applied research, industry, an incubation space and funding, with the aim increasing the adoption of AI and creating new start-ups. "We believe that you need to create and ecosystem that reduces the barriers to entry for AI practitioners and

allows hundreds of new start-ups to be created," says Paul Massara, former CEO of Npower and co-founder of the Centre.

A new world of opportunity

AI is an enabler of rapid transformation in the energy sector. Utilities are moving away from simply supplying energy to an energy-as-a-service model, where the customer experience is what distinguishes power providers.

Decarbonisation and decentralisation play a paramount role in the long-term transformation of the electricity system. Moving towards 100% decarbonisation requires the integration of distributed renewable electricity generation, mainly photovoltaic sources, with consumers and, soon, with storage devices. In a decentralized energy system, energy flows happen bi-directionally and the boundaries between producers and consumers fade. As result, the grid becomes more complex to manage and operate because system operators must deal with situations in which the peripherical production is limited or exceeds consumption. Renewable resources such as solar and wind are variable by their nature and can increase volatility in the energy production: therefore, future carbon-free electric grids must rely on other forms of controllable generation or consumption to match the supply of energy to demand.

A necessary step towards a decarbonised system is grid digitalisation where the main goal is to guarantee a reliable and seamless operation leveraging on data coming from the field. Utilities understand this and are increasingly investing to improve data transmission channels (5G, fiber), in the internet of things solutions/edge computing and in smart meters and sensors. All these technologies are becoming cheaper with time, and they are enabling new operational capabilities for the power grids of the future.

At the same time, the widespread roll-out of smart meters will allow for the application of AI-enabled demand response and flexibility services that will facilitate the greening of the grid by better matching customer usage with intermittent renewable output. Effective monitoring and customer behaviour forecasting are essential to better match up supply and demand with flexibility tools, for example with smart home and smart electric vehicle charging services.

One solution to control this volatility is presented by virtual power plants (VPP), systems that aggregate heterogeneous distributed energy sources (DER) such as stationary batteries, solar panels, electric vehicles and flexible loads to modulate aggregated power exchanged with the grid and deliver energy services needed to maintain grid stability. A VPP can efficiently provide flexibility, thus allowing the system to better react to fluctuations. AI and advanced analytics tools play a key role to manage such complexity; they enable the automation of the processes, the maximisation of financial returns from participation to energy markets and lead to an overall increased stability of the grid.

Organisations are recognising the value of AI: 84% of C-suite executives believe they must leverage AI to achieve their growth objectives, according to Accenture, and 80% of utilities executives believe they risk going out of business in five years if they don't scale AI. Automation not only drives consistency and scalability to business processes, it also drives growth. But rather than searching for ways to implement AI projects, utilities should identify pain points they have and conduct analysis to determine which digital tools best fit the problem. Accenture found that 87% of executives acknowledge they know how to pilot, but struggle to scale AI across the business.

An AI strategy should be seen as a journey, which should start with walking before running. A solid foundation is required to craft a different approach and build new skills.

Energy System Applications

Enhanced forecasting

Many utilities find that predictive maintenance and asset optimisation is a good place to start testing AI solutions, as efficiency gains offer fast returns on investment. These solutions save time and money while improving quality and safety.

Examples of utility AI applications

For example, ABB's Asset Health application allows models and current operational data to predict asset failure and allow for condition-based maintenance schedules. Dutch company OneWatt's technology employs smart acoustic sensors that use sound data and machine learning to predict motor failures.

Offshore wind turbines are difficult to maintain due to their remote location, and so present a prime opportunity for AI-driven solutions. Machine learning and AI is used in the Horizon 2020 Romeo project to optimise the operation and cost of offshore wind turbines through predictive decision-making. Portuguese data analytics platform provider Jungle AI forecasts wind plant failures before they happen which reduces downtime and increases availability of turbines. French start-up Sterblue provides an autonomous drone inspection solution for wind turbines with an AI back end to analyse the inspection data. Spanish utility Iberdrola uses AI to plan maintenance, monitor electricity usage and optimise distribution. Italian utility Enel uses AI in the whole value chain, on both structured and unstructured data, from predictive maintenance for the grip optimisation, production forecast, flexibility and optimisation for grid decarbonisation,

sentiment analysis for brand reputation, customer value and image recognition for asset management and anomaly detection.

Possibly the most extensive example is in China, where State Grid is using AI to manage equipment, including fault detection, control, and diagnosis in facilities. China State Grid uses power grid demand forecasting, identifying type and severity of grid breakdowns, computer vision to identify defects in transmission lines, and predictive maintenance of electricity equipment. Texas-based utility ONCOR uses AI and geospatial technologies to help predict where vegetative growth is most likely to interfere with power lines - which can cause blackouts and wildfires - allowing managers to better plan for preventative maintenance.

One of the biggest challenges for grid management as the share of renewable generation grows is the variable nature of its output based on weather conditions. Many solutions are emerging to address this challenge, possibly the best-known being Google DeepMind's wind energy output forecaster which it claims boosted its 'value' by about 20%. Options for solar forecasting are also being tested. OpenClimate Fix is using artificial intelligence to predict how clouds affect solar output using a 'nowcasting' model working with National Grid ESO and the Met Office, and using satellite data with cloud imagery and production statistics from around 600 PV systems from PVoutput.org. Deep learning algorithms are also able to learn by trial and error. For example, Norway's Agder Energi developed an algorithm to optimise water usage in hydropower plants.

AI-driven data analysis can also help determine the optimal location for low-carbon technologies by predicting the impact on network capacity, as demonstrated by the UK's Western Power Distribution and Electralink who are seeking to improve congestion management. Danish transmission system operator Energinet engaged IBM to design a 'virtual operator', which could estimate risks of operational limit violations based on simulation data.

Focused customer solutions

The Enel group widely deploys chatbot and virtual assistants in the retail sector. Both in Italy and in Spain, Enel is developing customer solutions with an AI-enabled voice assistant technology to advise them on more efficient energy consumption and optimising costs or for consumption reporting and client assistant. In Italy, Enel's customer management can be made more efficient thanks to the virtual assistant Elena available on a 24/7 basis on different channels: Telegram, Enel Energia web page, Facebook Messenger, phone channel and WhatsApp. Using a complex systems of AI algorithms, Elena can guarantee for every customer an easy, fast and complete user experience providing support on the different Enel Energia services. For instance, Elena can give information about energy readings or the status of supply activation, the different methods for paying a bill or where you can find the nearest service point.

In the US, CubeLogic's Know Your Customer application uses data from social media and the internet to give insight into market trends and activity.

Smart devices such as Amazon Alexa, Google Home and Google Nest, often described as part of a 'smart home', allow customers to set their thermostats and other control systems to automatically monitor their energy consumption based on desired comfort levels. Appliances can be switched off when power is expensive, or cars and other batteries can be charged when

power is cheap. Energy suppliers can use AI to forecast likely customer behaviour and plan accordingly.

A division of Ireland's largest utility Electricity Supply Board ESB Networks is rolling out a smart metering programme using AI to support the installation process. The installer takes photos before and after the home installation. Computer Vision is then used to ensure the job has been completed and the appropriate standards have been applied.

Iberdrola STAR project in Spain installed over 10 million smart meters and automated secondary substations and now Iberdrola is running developments such as fault and fraud detection, and an Automatic Replenishment Algorithm (ARA), resulting in an Increase of reliability (> 99.995%). Iberdrola has also become 1.8 times faster in network fault recovery due to its AI-based ARA tool, automatically detecting and isolating the smallest area of the network to speed up recovery, and reduced operating costs by 12%.

AI and digital twin technologies can also create 'smart cities', where public lighting, mobility and planning can be coordinated remotely. Enel's Urban Futurability project in São Paulo, Brazil is a 3D digital model that matches the local electricity infrastructure via thousands of sensors installed on the actual grid, each communicating information on grid status in real-time to both the distributor and local stakeholders. This digital twin can be used to create greater awareness of energy use and efficiency.

Harnessing demand-side flexibility and energy efficiency

One of the most important ways AI will drive the energy transition is in optimising distributed resources and battery storage with customer demand, including electric vehicles. As the electricity grid morphs from a one-day transmission of electricity from large centralised power plants to hundreds of thousands of small generators and smart devices with bidirectional flows, system management requires a superhuman effort.

Many virtual power plant and internet of things projects are already in operation, where flexibility resources are aggregated and can provide services to the grid. Some were supported by the EU's Horizon 2020 programme, for example a smart system of renewable energy storage based on Integrated EVs and batteries to empower mobile, distributed and centralised energy storage in the distribution grid' (INVADE) - a cloud-based flexibility management system incorporating machine learning and other advanced analytical techniques. The project explores how big data, machine learning and analytics can be integrated into existing smart home solutions.

Electric vehicles present an opportunity for flexibility where vehicle-to-grid technology can be used to optimise charging, and AI is being deployed to enhance this. A team from Stanford University, the Massachusetts Institute of Technology and the Toyota Research Institute published findings from battery testing aimed at cutting electric vehicle charging times down to 10 minutes using AI without increasing the degradation of lithium-ion batteries.

Habitat Energy is using cutting edge AI to optimise grid scale batteries taking into account the chemistry, the degradation factors, the replacement cost and how the individual batteries can be optimised every five mins across multiple traded markets.

The benefits go beyond the power sector: Utonomy is helping to create a smart gas grid by using AI along with hardware to optimise pressure in gas grids in order to reduce leakage but also to allow greater access of biomethane and hydrogen.

And AI can even be used to address a problem it creates itself, that big computer servers burn a lot of energy: Google's Deepmind says it has used reinforcement learning to reduce energy use in its data centres by 15%.

Iberdrola is utilising its own predictive maintenance system ASPA (Advanced System of Predictive Analysis), for its onshore wind fleet, since 2017. Using digital twins for the wind turbines Iberdrola can identify signs of turbine failures before they occur, reducing corrective maintenance time and, thereby, enhances the reliability of the turbine's energy generation. Thanks to this improvements Iberdrola is saving 50,000 man-hours/year, -10% major correctives and -20% parts supply.

Data interoperability and quality

Data has been described as the new oil, and there is no doubt that it is an essential ingredient if AI is to work. Clean and properly organised data is required for AI development and implementation, and clear guidelines in terms of sharing data, interoperability and standardisation are crucial. According to analyst firm Cognilytica, over 80% of the time it takes to implement an AI project is spent on data preparation and labelling for use in machine learning projects.

The widespread rollout of smart meters and advanced sensor technology have created a tsunami of data which calls for sophisticated storage and analysis tools. With a sampling rate of four times per hour, 1 million smart meters installed in the smart grid would result in more than 35 billion records (Sagiroglu et al., 2016). There will be a 530% increase in global data volume from 33 zettabytes in 2018 to 175 zettabytes in 2025, according to an EU fact sheet: Artificial Intelligence: Threats and Opportunities.

There is lack of near real-time data in standardised formats across Europe, but efforts are underway to address that problem. Representatives from several countries are involved in the GAIA-X initiative which seeks to create a new data infrastructure for Europe where data can be shared in an environment of trust and digital sovereignty is maintained. Further, Belgium's grid operator Elia has launched an energy data exchange start-up re.alto which will provide easy access to data for users and providers using standardised energy APIs. Transmission grid operator association ENTSO-E hosts a transparency platform that should help facilitate TSO/DSO communication.

Data sharing is promoted by the Clean Energy Package, introducing a set of rules around data management, data protection and cyber security, including the need for transparency and non-discriminatory access to data, as well as data interoperability. The data strategy released in February Shaping Europe's Digital Future set out the Commission's views on data, saying that the way it is collected and used must place the interests of the individual first and fully comply with the EU's strict data protection rules. At the same time, it notes that the increasing volume of non-personal industrial data and public data in Europe, combined with technological change in how the data is stored and processed, will constitute a potential source of growth and innovation that should be tapped.

Trade association DIGITALEUROPE urged the Commission in a recent call to action to foster a partnership culture to encourage sharing of data between the public and private sectors, and to have assurance that joining a data partnership will not contravene antitrust legislation. It also recommends that the European Single Market should remain connected with the rest of the world and that EU efforts should be based on international standards.

Europe's strict privacy laws under GDPR are already causing headaches for multinational platforms, for example Facebook which has recently been told by Ireland's privacy watchdog, which regulates it in the EU, that it will have to stop transferring its European users' data to the US.

Open data agreements should be explored as governance mechanisms with the principle "as open as needed, as closed as necessary". The UK government recently published a response to its Smart Data Review, which outlines plans for legislation to mandate industry involvement in Smart Data initiatives across multiple industries including energy. Building on this the Energy Data Taskforce has laid out a series of recommendations, such as the presumption of data being open. This is now being picked up by the regulator Ofgem to ensure that the energy sector is opening more and more data. It is essential that data must also be handled in a way that is lawful, secure, fair, ethical, sustainable and accountable. In most European member states the transmission system operators, which are the gatekeepers to a large share of potentially very useful data, are regulated monopolies. This presents a particular challenge to find the right level of regulatory oversight when the data needs to flow between the regulated and commercial sectors.

Utilities should monitor the degree to which customer privacy is respected. In the energy sector, legitimate interest/performance of the contract should be used as the main rule. But a rule is embedded in the GDPR legislation that says automated processes must be explainable, so the explainability of the outcomes of the AI systems and the data used will be looked at, for example why they are turned down for a loan.

The forthcoming E-privacy Regulation also poses challenges for AI in the energy sector, as in the current draft the privacy statement is extended to non-personal data. And while not focused directly on data or AI, the Digital Services Act expected to be revealed on 2 December 2020 will have implications for the way digital services are allowed to operate that may require a review of AI practices. It will aim to create a framework spanning a wide range of services that will govern liability, competition, employment and advertising using digital tools.

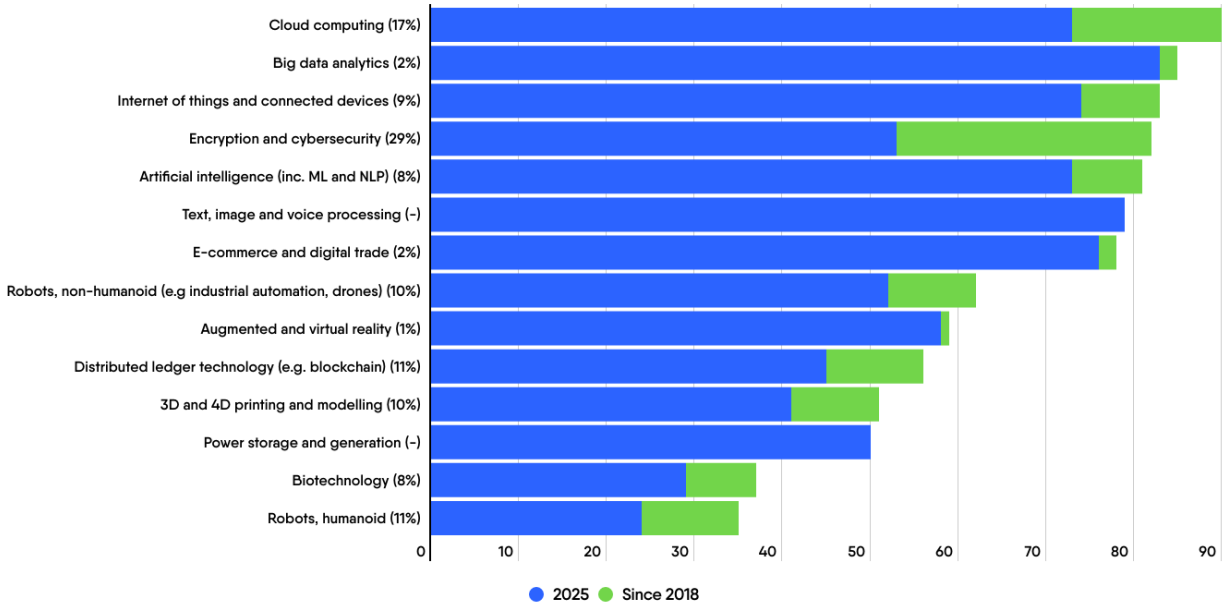
A revised European coordinated plan on AI and draft regulatory framework will be published in the first quarter of 2021.

Future of work: closing the digital skills gap

Technology is no longer the barrier to further digital evolution. No matter how advanced the technology becomes, any AI strategy will fail if a utility's workforce is not on board. Employees may be reluctant to implement change if they fear robots may render their positions redundant, even if there is evidence that they will enhance rather than replace their jobs.

A 2018 PwC study found that AI could replace 30% of jobs by the mid-2030s, but it will create more jobs by boosting economic growth. A 2019 survey of 100 executives from leading firms by Dun & Bradstreet showed similar results, finding that 40% of organisations are adding more jobs as a result of bringing AI into their business, with just 8% cutting jobs.

Technologies likely to be adopted by 2025 (by share of companies surveyed)



Source: The Future of Jobs Report 2020, World Economic Forum

New digital technologies will drive demand for new job roles and skill sets, according to the latest World Economic Forum Future of Jobs report, which predicts that 81% of energy sector companies will adopt AI by 2025. Cloud computing, big data and e-commerce are high priorities, and there has been a significant rise in interest in encryption, reflecting an increased focus on cybersecurity. The extent of disruption depends on a worker's occupation and skill set. Functions that include managing, advising, decision-making, reasoning, communicating and interacting will still require human interaction, while more repetitive tasks such as data entry will see workforce reduction.

Jobs that require creativity, strategy, social and manual dexterity will be less likely to see redundancies than those that can be replaced by machines such as assembly line inspectors, customer service representatives and truck drivers. At the same time, skilled data scientists and programmers will be in high demand.

The European Commission's February white paper Ocn Artificial Intelligence - A European approach to excellence and trust set out some steps towards attracting AI expert scientists and including a reinforcement of the Skills Agenda, as well as an updated Digital Education Action Plan to improve education and training systems and make them fit for the digital age. It will also build awareness of AI at all levels of education and will work on a revised Coordinated Plan on AI to be developed with the Member States. It also plans to create a lighthouse centre of research and innovation for AI to attract talent and foster a 'made-in-Europe' standard of excellence.

Even so, the electricity industry will have to compete with other sectors to recruit the best data scientists and programmers, but will also benefit from upskilling existing staff who understand the business. Hackathons and AI challenges within the industry can promote "learning by doing". Finally, AI can be used in the hiring process to screen candidates, and also to select optimal training.

Responsible and ethical AI

Having an AI-ready culture where digitalisation is perceived as an augmentation of human abilities and where strong governance is embedded from the outset will give projects a greater chance of success.

Positive customer engagement is critical for AI applications in the business-to-consumer (B2C) market. If customers do not trust AI, they may be reluctant to provide their data, although in the case of 'narrow' AI it is often invisible to the end user. For this reason, communicating the outcome and objectives of AI solutions could make them more trustworthy and reliable for consumers: the risk of sharing data and the concern of privacy need to be outweighed by social gains and company reward.

Clarifying the benefit of using customer data in both the short and long term, it is important to promote data sharing, respecting the business-to-government (B2G) and business-to-business (B2B) guidance in the private sector. This includes the re-use of data based on commercial and non-commercial conditional data-sharing agreements that does not need to be unlimited.

Utilities need to show that they will safeguard consumer data. The European Commission has set out guidelines for trustworthy AI drafted by an expert group that say three components are necessary: (1) it should comply with the law, (2) it should fulfil ethical principles and (3) it should be robust. The guidelines list seven key requirements that AI systems should meet in order to be trustworthy:

- Human agency and oversight
- Technical robustness and safety
- Privacy and Data governance
- Transparency
- Diversity, non-discrimination and fairness
- Societal and environmental well-being
- Accountability

There is so much to be gained from digital transformation, as long as utilities treat the consumer with respect and in an all-inclusive and ethical way. Some consumers will engage proactively or passively with new flexibility tools offered through smart meters, while more vulnerable, less tech-savvy customers may be left behind. As progress moves beyond affluent early adopters of renewables to the majority population, there is an increased risk of discrimination. Early use cases should focus on those that support the most vulnerable customers and monitor unintended bias.

Lack of trust can also be highly detrimental in B2B relationships. Wider governance mechanisms should be set up to address the ethical issues and to ensure there is transparency and trust by the public and utilities' workforce on how algorithms are used.

Data owners, AI providers and customers could set up their own 'fair codes of conduct' in order to achieve transparency, accountability, causality and fairness, which are key features for the development of AI. In fact, the transparency and explainability of decisions are key factors for their acceptance and can help to detect anomalies and therefore reduce the risk of bias. Moreover, the quality of AI based decisions is strictly related to the quality and the quantity of available data.

For this reason, data donor schemes and data monetisation algorithms, always based on consent management and clear and transparent rules, defined within a clear scope and purposes, should be welcomed and considered in the codes of conduct. Another key factor to increase the availability of data is to have architectural and technical solutions for the exchange and sharing data across European borders.

With a more informed understanding of models, end users might more readily accept the products and solutions powered by AI, while growing regulator demands might be more easily satisfied. However, effective messaging can be complex and highly dependent on a host of variables and human factors, precluding anything resembling a "one-size-fits-all" approach. Intelligibility is an area of cutting-edge, interdisciplinary research, building on ideas from machine learning, psychology, human-computer interaction, and design. Achieving intelligibility in practice through a prescriptive regulatory model would be unworkable.

Explainability and transparency of how a deep neural network works needs to be concrete and operational in specific contexts for consumers or other end-users with no training or expertise in data science to understand. A governance standard, industry best practices and voluntary processes need to be defined as options that would allow teams to efficiently debug systems when issues around fairness are experienced by end-users.

Additionally, given that the principal source of solutions aimed at increasing the intelligibility of machine learning models is research, policymakers should ensure appropriate funding and investment in this area, as well as foster cooperation with the private sector.

Further guidance on explainability prepared by the UK's Information Commissioner's Office and the Alan Turing Institute can be found here. Several international organisations have adopted AI principles, for example the Organisation for Economic Cooperation and Development and the World Economic Forum, and consulting firms such as Deloitte have published trustworthy AI frameworks.

Enabling policy environment: aligning the regulatory framework with the new EU AI Strategy

Commission President Ursula von der Leyen has called for a coordinated European approach on the human and ethical implications of AI as well as a reflection on the better use of big data for innovation. Policy options were set out in the paper On Artificial Intelligence - A European approach to excellence and trust, which suggests that the new technology should be subject to legislation and says otherwise there is a risk of fragmentation in the internal market.

In response to comments received during the consultation period, the Commission has considered a temporary ban on facial recognition and remote biometric identification technology in order to protect citizens' rights and safeguard from discrimination. This could lead to a divergence in regulation between the EU and the US, which advocated for a hands-off approach in guidance published earlier this year. This threatens to create additional costs and technical challenges for international firms and may stifle development.

Given the nascent nature of AI and the numerous sociotechnical challenges it can bring, a governance-based approach to legislation identifying broad objectives will be more welcomed by industry than a prescriptive one. Governance processes could help developers and deployers of covered AI systems identify and quantify any relevant risks of harm to individuals or society (including risks related to unfairness) and, where those risks are determined to be significant, to implement measures to mitigate against them.

Developers of high-risk AI systems might be required to adopt internal policies and procedures to promote the development of trustworthy AI, for example to ensure transparency with customers, users, and other affected stakeholders about risks inherent in the use of the relevant AI system. Rigid regulatory and compliance procedures may hinder innovation, especially if they are not adapted at the same speed as AI developments.

On the other hand, the EU may capitalise on its reputation as a well-regulated bloc to reinforce the image of 'trustworthy AI' with a greater emphasis on human values, citizen protection and

ethical principles than other countries, according to the Carnegie Endowment for International Peace report 'Europe and AI: Leading, Lagging Behind, or Carving Its Own Way?'

"Given the need to address the societal, ethical, and regulatory challenges posed by AI, the EU's stated added value is in leveraging its robust regulatory and market power—the so-called "Brussels effect"—into a competitive edge under the banner of 'trustworthy AI.' Designed to alleviate potential harm as well as to permit accountability and oversight, this vision for AI-enabled technologies could set Europe apart from its global competitors. It can also serve as a key component of increasing the EU's digital sovereignty by ensuring that European users have more choice and control," the report says.

Any company implementing an AI strategy using European customer data will have to consider the upcoming actions on AI, Data Governance Act, European Data Spaces, E-privacy regulation, and the outcome in defining a data transfer mechanism between the EU and US.

But even after having secured access to data, regulated companies need to make sure they can recover investment spent on digital technologies. One of the most frequently cited regulatory reforms holding back digital transformation is the linking of cost recovery to capital expenditure rather than operating expenditure, meaning utilities are incentivised to spend money on physical infrastructure rather than frequently more efficient software solutions. Moving to a whole-of-life total expenditure or TOTEX review similar to the UK's approach would facilitate investment in IT projects including AI.

eurelectric

Union of the Electricity Industry - Eurelectric aisbl
Boulevard de l'Impératrice, 66 – bte 2 - 1000 Brussels, Belgium
Tel: + 32 2 515 10 00 - VAT: BE 0462 679 112 • www.eurelectric.org
EU Transparency Register number: 4271427696-87