

# Energy – the challenges and opportunities of artificial intelligence

Artificial intelligence (AI) will free us to do what we do best: think critically and imagine new possibilities. More than threatening, AI will empower society. And the energy sector is no exception.

AI, which has been in the spotlight lately, will structurally affect future socio-economic growth, human development and Humanity's daily life. Many experts compare its potential impact to the rise of the internet or the mobile phone industry.

AI is the fastest growing technology right now. As with all new technologies, AI is experiencing a hype, i.e., a burst of publicity, promotion and intensive excitement, the promises of which may be hyperbolized. But make no mistake, the impact of AI will be disruptive for countries, for all economic sectors, the business world, governance, education, health, arts, professions, and for our way of working and socializing. The impacts on the energy sector will also be of high importance.

Experts predict the AI market will grow by 36% per year through 2030. But concern about AI shouldn't just be in the business arena. It should be about the kind of world we want to live in. Ensuring this is first and foremost the task and responsibility of all of us and leaders in civil society, business and politics.

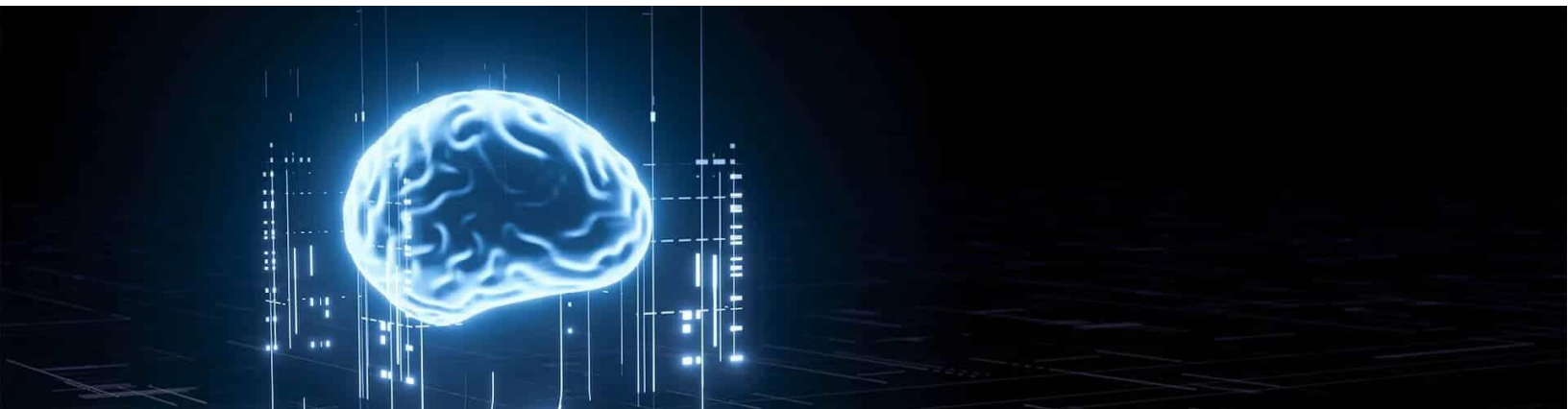
Although there are already specialized applications of AI in all areas, it is still in its infancy. The widespread use of AI raises major concerns about misuse, harmful implications, security, and raises several ethical issues.

## But what is AI?

The growing interest in AI is due to the exponential popularity of generative AI programs, based on deep learning techniques and neural networks to analyze large amounts of data and generate new content similar in style or structure, recently launched, such as ChatGPT or OpenAI's DALL-E.

Artificial intelligence is focused on creating machines that think and learn. AI is defined as the ability of a digital computer, or computer-controlled robot, to perform tasks commonly associated with intelligent beings. AI is thus the simulation of natural intelligence in machines that are programmed to learn and imitate the actions of humans. AI is the intelligence of machines, algorithms, programs, applications or systems, which can collect data, process it and produce results. Building an AI system is a careful process of reverse engineering human traits and capabilities into a machine and using its computational power to surpass what we are capable of.

The simplest and most common examples of AI are recommendations from friends on Facebook; e-mail spam filters; conversation bots; recommendations from Netflix and Spotify; Siri, Alexa and other smart assistants; as well as more complex applications related to automated financial investment; virtual travel reservation agent, among others.



## ChatGPT

ChatGPT is an application that answers questions in seconds (short prompts) in clear, concise and well-structured prose, and allows for continuous personalized interaction. ChatGPT pushes imagination to the limits, allowing everyone to create freely and for free (so far) from business plans to master's theses, passing through specialized articles, computer code, poetry, songs, love letters, or even imitating producers of established content. Better than reading about ChatGPT and the potential of generative AI is to try ChatGPT, at <https://openai.com/blog/chatgpt>.

## AI positioning in the energy sector

In the energy sector, AI provides a myriad of application scenarios that will support the energy transition and a climate-friendly energy system. Typical areas of application are demand/consumption assessment, price forecasting, electricity trading, smart grids, electricity, heat and transport sector coupling, predictive turbine maintenance, consumption optimization, grid management, energy efficiency of buildings.

Any AI is only as smart as its data. Therefore, the prerequisites for an increased use of AI in the energy system are the digitization of the sector and a correspondingly large set of assessable data. By making it possible to automatically analyze and evaluate large volumes of data in an intelligent way, AI helps make the energy sector more efficient and safer



AI's analytical and predictive capabilities will play a key role in the energy transition to renewable sources, and in reducing greenhouse gas emissions. According to studies, 93% of the UN environmental Sustainable Development Goals can be achieved with artificial intelligence solutions. The use of AI in energy forecasting leads to a balance in the grid, the reduction of consumption peaks/congestions, or an improvement in the efficiency of renewable energy sources such as solar and wind. The possibility of monitoring the energy flow in real time allows making predictions to reduce consumption at peak times, resulting in financial savings for consumers and, ultimately, a greener planet.

Buildings account for 39% of global greenhouse gas emissions (data from the World Economic Forum). Smart structures can solve these inefficiencies and reduce electricity consumption, as AI learns about the behavior of people and equipment, analyzes data to better understand the thermal performance of buildings. Take Google DeepMind, which optimized efficiency to reduce the energy used to cool one of Google's data centers by 40%, representing an overall 15% reduction in energy usage; or the example of people increasingly using integrated AI solutions to automatically turn off unused appliances when energy is expensive or turn on when solar energy is plentiful and cheap.

However, there are two critical factors: i) protecting user data and making the use of AI transparent and understandable and ii) ensuring good cybersecurity. In addition, those who are connected digitally and intelligently reveal a lot about themselves, and the system is vulnerable to cyber-attacks.

Energy supply and the entire energy system are part of a country's critical infrastructure. That's why cybersecurity is increasingly important, today and in the future, to protect the highly connected power grid from outside attacks and data theft. For example, studies have shown that the biggest obstacle to the acceptance of smart meters is the fear of revealing private information without knowing exactly how it is used.

Another AI challenge is the power consumption of the AI itself. Processing large amounts of data consumes a lot of electricity. When using AI for power system transformation, it is critical to also look at



how to design the data centers themselves to be energy efficient and as climate neutral as possible.

## What should decision makers do?

Private managers should promote the study and adoption of AI not only in their companies but also in the ecosystem in which they operate. This implies promoting awareness of the extreme importance of AI, demystifying it, promoting its practical use, investing in the development of AI skills and prioritizing digital infrastructure, the digitization of operations and the collection, processing and use of data. In this context, the definition of a plan for surveillance, objectification, preparation and pragmatic adoption of AI is recommended.

Governments have a broader and more complex task, which involves drawing up a National Digital Agenda for AI focused on promoting economic growth and human development, creating new industries and jobs, increasing productivity and improving efficiency, which ultimately leads to poverty reduction, the promotion of gender equality, greater prosperity and better living standards for all.

It is difficult to make predictions about this technology with such a disruptive and exponential effect. There are risks, there are valid fears and there will be transition costs. But it is certain that this technology will free human beings to do what they know how to do best: think critically and imagine new possibilities. More than threatening, artificial intelligence will empower the whole of society, especially non-technological users, the richest and the poorest. In the future, incrementally, we will all have AI assistants in business and our mundane tasks. It is up to each one of us to act in our own areas – in energy and in others –, being vigilant, learning and making the best use of artificial intelligence.

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