efca Position Paper

Carbon-neutral and responsible AI

The energy efficiency challenge in emerging digital technologies

28 November 2024

The European Federation of Engineering Consultancy Associations (EFCA) has member associations in 26 countries, representing more than 10,000 companies from the European engineering consultancy industry and related fields. Based in Brussels, EFCA is committed to facilitating constructive dialogue with European Institutions on issues impacting our industry; and engaging with international stakeholders on shared interests.

Summary of Key Recommendations

1. AI and emerging technologies are the new embodied carbon. They need to be incorporated into whole life carbon policy and Life Cycle Assessments.

2. Avoid further stress on over-stretched energy grids in urban areas, with sensible planning of the location of new energy-intensive data centres and other industrial and business users.

3. Target the most energy-intensive industries, both those responsible for data centres and those intensive users of frontier technologies. Rely on existing regulation first, incentives that encourage energy efficiency second; and as a last resort, new or reinforced regulation to ensure compliance.

4. Don't forget water! Include targeted measures in the eventual Water Resilience Initiative.

5. A European Commission Expert Group on AI and Energy Consumption co-ordinated by DGs Connect and Energy, including relevant industry stakeholders and other partners. The aim should be to reduce duplication of processes and data storage, implement effective design tools for the built environment, and find other energy saving solutions.

Introduction

The imminent exponential growth in the use of AI by governments, businesses and citizens is creating an unprecedented demand for energy, mainly by the "Big Tech" companies. Their consumption is said in a recent paper[1] to be equivalent, collectively to that of some developed countries. Referring to the "energy quadrilemma", the paper addresses in particular consumption by data centres. In this document, we touch on this specific challenge, but in the context of the wider problems to be solved; and we look at some of the possible solutions. We also wade into the question of who should get priority access to AI and consider how to find a balance between regulation and incentives.

The next generation built environment, whether from new construction or renovation, needs to stand up to a growing number of threats, including the climate emergency, cyberattack and other deliberate acts of sabotage. Buildings must meet the needs of a growing and diverse

[1] *Powering the 4th industrial age.* White Paper by Tractebel and RED https://shorturl.at/bF5Ai.

population, with changing demographics. Decaying infrastructure is fast reaching its limits in terms of resilience against the above future threats. AI will be a novel - and then eventually established feature of our future built environment. Consulting engineers will be amongst those experts to adopt AI quickly, as a way of designing in more resilience, to our living and working spaces and our essential transport, utility, health and other services. The sector is also well placed to help find ways of improving energy performance, to avoid the plethora of promising technology inadvertently exacerbating the climate emergency.

Definition

Throughout this document we refer to "frontier technologies". These include, but are not limited to: AI, Digital Twins, cloud platforms and BIM enabled technologies[2]. All of these require supporting structures, in particular data centres. However, our sector will be a user of the technology, rather than a creator of the products and services that require data centres (although engineers will be involved in their design and construction). This should be kept in mind when reading the document.

Starting Points

This paper was co-authored by several engineers and experts from the sector. Our starting points were as follows:

- EFCA supports the use of AI and other relevant technologies, hitherto referred to as "frontier technologies" for **beneficial outcomes** for the economy, climate, environment and society as well as for the consulting engineering sector. However, the exponential increase in the corresponding energy consumption needs to be addressed and EFCA wants to initiate a dialogue on how to **minimise energy consumption** with intelligent solutions, that come as far as possible from the energy-intensive industries themselves.
- As the speed of implementation is rapid, **we need to have this dialogue now**, before planned facilities/sites (data centres etc.) and emerging tools, not yet on the market, have been rolled out, without the necessary and available energy saving measures included. We also need to prepare for **the level and speed of scaling up** that will be required, so this can be effectively managed.
- **Frontier technologies are a growing source of embodied carbon**, both from the value chain supporting the data centres and technology, but also from their use in the design, construction and operational phases of the built environment.
- As scientists and designers – and increasingly digital experts, **engineers have the right knowledge and competence** and are at the centre of the search for potential solutions. They are therefore key players in the development of any policy framework.
- Represented in Brussels, the sector can offer its expertise to the EU institutions, to ensure that the deployment of the emerging, next generation digital solutions, does not **inadvertently exacerbate the climate emergency**.

---

[2] *The term that broadly encompasses AI and emerging technologies is often referred to as "frontier technologies" or "advanced technologies." These terms include artificial intelligence (AI), along with other cutting-edge innovations like :machine learning and deep learning, Blockchain, Internet of Things (IoT,), quantum computing, 5G and advanced telecommunications, Augmented Reality (AR) and Virtual Reality (VR), robotics, biotechnology, nanotechnology etc.*

What problem are we trying to solve?

- Frontier technologies are everywhere, but some are overall more beneficial and will bring a net gain to society, while others (including non-essential entertainment and leisure applications) could arguably, even ultimately result in a net detriment, given their impact on the environment.

- Net benefits (increased productivity, closing the skills gap, a more sustainable and resilient built environment etc.) have to be weighted in a trade-off against the disadvantages. The obvious ones include the increase in energy consumption and emissions which may lead to the worsening of the climate emergency and the less talked about water-intensive cooling processes[3]. As a sector, consulting engineers (along with others) are struggling to keep pace with the rapidity of further development, expansion and potential uses of these technologies. Therefore as a sector, we are unable to be conclusive about the extent of the likely trade-off presented by frontier technologies.

- Available evidence and impact data are sketchy and incomplete. We have few baseline data and only some projections on future energy demand but even these are rapidly changing. We do know that compared with energy consumption of buildings (40% of all energy used being the frequently cited figure, but as little as 15% in Denmark and Norway), data centres collectively use around 4% of all energy consumption at the moment and this is set to more than double by 2030. No differentiation between consumption by different types of application or user is available. Furthermore, we need an honest assessment of where we are with AI in general. Some is working better than others. In short, much more research and evidence is urgently required. Independent impact studies that go beyond environmental factors and explore how AI applications influence inequality, job displacement and social cohesion would provide a broader view, that would help identify which technologies truly bring societal value.

- Is it sensible to locate data centres in urban areas where there are already overstretched energy grids? There needs to be a serious, transparent and collaborative review of the planning and location of these facilities, by the technology companies that represent the largest owners of these facilities, the energy companies, urban planning and other public authorities. The needs of big tech must be balanced with the more pressing needs of the environment and impact on society. Furthermore, the onus should be on responsible expansion of data centres, that tackles the intensive water consumption as well as the increased energy demand, which far outpaces the corresponding available power. Without such collaboration, the best solutions for performance and efficiency, as well as for society, will not be implemented.

[3] *Here we refer specifically to the environmental impact, but there will be other representative organisations that address the well-being on users and their likely loss of some privacy.*

Recommendations for energy savings: the low-hanging fruit

There are ways that energy consumption can be reduced already, including (by stakeholder):

Software providers

- Stopping the requirement for users to store their data in the provider's cloud, thus enabling the use of just one cloud for such storage.
- Focus on interoperability and open standards – less "waste" from multiple, unnecessary use of relevant processes and duplication.

Construction ecosystem, including engineering sector

- Improve the collaborative use of BIM so that only one model is used and shared, rather than all players in the value chain creating their own model. This is wasteful and increases energy use unnecessarily.
- Design in energy efficiency at the beginning, for new data centres, so that they are already green. Consulting engineers can help with low carbon design.

Big Tech companies/data centres/ software providers

- Energy saving processes such as "evaporative cooling", which (like human sweating) enables cooling of computers and the buildings in which they are being used, by water evaporation. This method is cheaper than other cooling systems and also better for the environment.
- Transfer of waste heat generated by computing processes and servers to other uses (examples: aquaculture, drying in industrial processes, domestic heating). This way there is a kind of industrial symbiosis.
- Ensure that new data centres have been designed for maximum energy efficiency. Public sector owners/users of data centres should insist on this in procurement and private sector owners must act responsibly by choosing low carbon designs.
- Better scheduling of back-up cycles for servers. Even though these are not the most energy intensive processes, they are easy to make more efficient, so worth improving.
- More efficient use of servers, to ensure that they always run at full capacity, thus minimising the overall impact of AI, by tackling the energy consumption at source.

Policy makers

- One potentially high-impact, albeit controversial way of minimising energy use could be to prioritise the use of applications that are actually useful for industry and other sectors that are essential to the economy and well-being (health sector etc.) Many applications are just for the pleasure of the users and add no value to the above. Policy makers need to bear this in mind and consider how to reduce energy consumption from non-essential applications, that are purely for entertainment and pleasure. AI can also be used for other frivolous purposes, for which it is not needed. This is wasteful.
- Mandate energy monitoring for companies and sectors heavily reliant on frontier technologies, including both operational energy and lifecycle assessments.

- Put additional responsibility onto the big corporate giants. Promising work is already being done, with Google looking for energy efficiency solutions and Amazon claiming to be the largest corporate purchaser of renewable energy in the world.

Creating a framework to ensure a manageable growth, with win-win outcomes

A mix of regulation and incentives are required.

- The Energy Efficiency Directive (EU/2023/1791) requires mandatory energy audits for data centres and other large enterprises. The recently adopted Delegated Regulation (EU) 2024/1364 on the first phase of the establishment of a common Union rating scheme for data centres, requires the reporting of key sustainability indicators. The common methodology established for that purpose, will enable the collection of valuable data and is a positive step. With both of these instruments, we see the existing regulatory framework tackling the energy consumption of AI.
- With regard to standardisation, EFCA recommends the widespread adoption by all industry stakeholders of the voluntary ISO 50001 for Energy Management. This can ensure that measures are taken to improve energy performance.
- In all regulation and incentives developed, whilst renewable energy supply is the obvious choice, EFCA promotes material- and technology-neutrality in the built environment. We do not advocate for one technology over another, as the choice depends on many factors.
- More regulation over the efficient use of servers in data would oblige big tech companies to work at optimum capacity. Having said that, EFCA wants to avoid over-regulation inadvertently killing innovation, and we need to make space for the necessary development. We want the business of data centres and other relevant providers and users to be effective.
- Even preferring incentives where they exist, we expect that regulation is ultimately inevitable. Consulting engineers can guide this process. We would start by advocating for simplicity in any regulation, transparency and feasibility as well as calling for appropriately paced policy development. Regulating too fast would be counter-productive. In particular, taxonomy, which was a promising idea, has failed at implementation level. This does not bode well as a solution for achieving energy efficiency in AI and other relevant digital and data processes.

Next Step – An Expert Group co-ordinated by the European Commission

EFCA would like to see the creation of an Expert Group on AI and Energy Consumption, co-ordinated by DG Connect and DG Energy. All relevant industry stakeholders should be invited. This kind of group has worked well in the past, tackling other important challenges, such as the decarbonisation of transport infrastructure. It would provide a forum for debate and collaboration and bring together the right people to discuss regulatory and non-regulatory approaches to solving the problem. Consulting engineers will be ready to participate.

For further information, contact Sue Arundale, Director General, efca@efca.be