Towards Planet-Proof Computing: Ten Key Elements EU Data Centre Sustainability Policy Should Take Onboard

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Introduction

When we hear digital technologies described as 'virtual' or 'cloud', it conjures up a feeling of immateriality or weightlessness. Yet this belies the very tangible impact of digital infrastructures on our environment. Data centres, in practice rather faceless warehouses, are the backbone of the digital transformation and have a profound ecological footprint. Across Europe data centres have made headlines over their increasing energy and water consumption, particularly following the advent of AI. Other news stories highlight the gobbling-up of renewable energy sources.

The Commission has set a specific goal of 'highly energy efficient and sustainable data centres by no later than 2030'. Later this year the Commission will submit a report to the European Parliament and to the Council which will assess the feasibility of transition towards a net-zero emission data centres sector. For the first time this report will be based on data reported by data centre operators under the Common Union Rating Scheme for Data Centres Regulation. This will be an importance chance for the EU to adapt and strengthen its regulatory approach to contain the environmental impact of this ever-expanding sector.

We argue in a recent article that despite measures to increase energy efficiency and renewable energy consumption, the unfettered growth of the data centres sector jeopardizes the achievement of the 2030 sustainability goal. In this blog post, we present ten elements that will be key in the development of the next iteration of EU's data centre sustainability policy.

Data centres: a primer

In contrast to the uniformly accepted definition of cloud computing, there is no single definition of data centres. EU legislation defines data centres as 'industrial structures or groups of structures used to house, connect and operate computer systems, servers and associated equipment for data storage, processing and distribution, as well as other related activities' (EED Article 2(49)).[1] Data centres are commonly classified according to their floor size and power capacity. The type of data centres that have attracted the most attention, are 'hyperscale' data centres, which have a floor size of over 10.000 m^2, with 2000+ server racks and a power capacity of over 10 MW. Data centres' development and construction typically require government authorizations by the EU Member State.

The EU has recognised both the environmental promises and pitfalls of increased digitalisation in the EU Green Deal,particularly its impact on overall greenhouse gas (GHG) emissions. As a result, the Commission has declared the policy aim of a 'twin transition' of decarbonisation and digitalisation. Locking these two aims together is potentially very powerful. On the one hand, digitalisation has been described as a 'critical enabler' for achieving the Green Deal's objective of climate neutrality by 2050. On the other, the resulting increase in computing infrastructure has an growing ecological footprint which needs to be made more sustainable. To

achieve this, the EU has adopted a legal framework which aims to improve energy efficiency of data centres, offset the resulting GHG emissions and gradually replace carbon-based energy with renewable energy.

1. Recalibrate electricity consumption estimates

Electricity is essential to the operation of data centres. A common metric used by the sector is Power Usage Effectiveness (PUE). This measures a data centre's energy efficiency, calculated by dividing the total facility power by the power consumption of the IT equipment. According to the current state of the industry, on average PUE tends to be 1.56, which means for every 1MWh used for computing, around one and a half times more energy input is required. Cooling a data centre is the biggest user of this energy, as well as the greatest source of its GHG emissions.

Estimates on data centre electricity consumption range widely. The Commission has been working with a range of estimates based on a 2020 study, spanning a best case of 98.52 TWh by 2030 and a worst case of 160 TWh by 2030. However, the International Energy Agency forecasts that data centre electricity consumption in the EU could already grow to 150 TWh by 2026, with the energy needs of AI driving greater demand. These more recent estimates are concerning, as the current policies do not seek to contain the data centre sector's overall electricity consumption, assuming that the tech sector will be able to meet its own sustainability ambitions. It is likely that the Commission will update its forecast of best- and worst-case scenarios based on the newly industry-reported data on energy consumption. However, the data centre sector's rapid growth cannot be left unchecked and unmanaged if the EU wants to meet its 2030 goal.

2. Integrating the rebound effect into energy efficiency policies

Data centre energy consumption received considerable attention during the legislative procedure for the EED. Article 12(4) provides that Member States must encourage data centres with a power demand equal or greater than 1MW to take into account the best practices of the European Code of Conduct for Energy Efficiency in Data Centres. The Code of Conduct is also included as part of the technical screening criteria for data hosting in the EU Taxonomy Climate Delegated Act (Activity 8.1), as well as in the Green Public Procurement criteria. The Ecodesign Regulation for Servers and Data Storage Products also includes specific design requirements for servers.

Until recently, EU institutions didn't sufficiently take possible rebound effects into consideration in its approach to managing data centre energy efficiency. The rebound effect is the phenomenon where an increase in energy efficiency of a technology leads to an increase in its use, potentially offsetting those gains. Strikingly in 2023, the Commission statedthat the increase in energy and growing reliance on cloud computing to enable technologies such as AI had offset efficiency gains made thus far. Accordingly, the 2030 sustainability goal and the sector's carbon footprint should be made binding.

3. Address distribution conflicts over access to renewable energy

Another key policy aim is to increase the use of renewable energy by data centres to mitigate rising GHG emissions. This resulted in provisions in the revised Renewable Energy Directive (RED) aimed at speeding up the processing of permits for new renewable energy plants. The current approach, however, does not resolve the conflict of who gets this limited renewable energy and what it is used for. While the major data centre operators advertise their commitment to the use of renewable energy, this takes energy from local communities and other industries. In Ireland, for example, the growing demand of data centres has outpaced all additional wind energy generated in Ireland since 2017. In its review, the Commission needs to take into account how the sector's growing energy needs affect the EU's overall carbon budget and objectives for decarbonizing other sectors.

4. Industry's push for nuclear energy

Clearly, there is a strong push to harness nuclear energy to power digital technologies and AI as this is seen as a carbon-free energy source. At the AI Action Summit in Paris earlier this year the French President Emmanuel Macron promoted his countries' nuclear energy for AI development with the words "Plug, baby, plug". The UK AI action plan will explore constructing Small Modular Reactors (SMR) to power AI data centres. Harnessing nuclear power for data centers does not merely raise questions of nuclear safety. Nuclear SMRs are not yet tried and tested; research finds that they produce more radioactive waste instead of less. In addition, this push raises questions about unbridled power by a handful of big tech companies over computing resources when they invest in nuclear SMRs. The EU should not endorse nuclear SMRs as a solution to sustainable computing without critically examining potential negative impacts.

5. Reduce over-emphasis on waste heat reuse

In addition to GHG emissions, data centres also produce a significant amount of waste heat, which further contributes global warming and pollution. In line with the energy efficiency first principle, waste heat should be reduced as far as is possible and only unavoidable waste heat should be re-used. Discourse at the EU level however focused considerably on waste heat reuse as something of a 'silver bullet' for countering increased energy consumption and emissions of digital technologies. Article 26 EED for example requires data centres to provide waste heat to district heating systems unless it is not technically or economically feasible to do so, which is often the case. The EU should therefore shift the focus to further reduce waste heat and require reuse of waste heat only where unavoidable.

6. Strengthen public and local transparency

Beyond energy efficiency, the legislative framework on data centre sustainability introduces considerable reporting requirements but only a certain measure of public transparency. Based on the reported data, the Commission will build a publicly available database with aggregated data at the Member State or regional level. However, as was pointed out, this will not allow for comprehensive analysis and comparison across sites

and regions. Without greater public transparency, it will be difficult for local communities and civil society to gain insights into the sustainability impact of data centres at the local level, where they are most felt. The Commission should make detailed data available in the EED database.

7. Reporting of location-based consumption and emissions data

Another issue concerns data centres' transparency about location-based resource consumption and GHG emissions. Under the Common Union Rating Scheme for Data Centres Regulation (Annex II) and the EU Taxonomy Climate Delegated Regulation (Activity 8.1), data centre operators can report Renewable Energy Certificates (RECs) with a guarantee of origin. RECs can be sourced from anywhere in Europe and be attributed to any data centre location. In practice this means that operators can obscure location-based scope 2 and 3 emissions, which occur at the site of the data centre. Only data centre operators covered by the CSRD must differentiate between location-based and market based emissions in its disclosures.

According to the Common Union Rating Scheme for Data Centres Regulation data centre operators must disclose their water consumption. This is significant development, as data centre operators guard this information closely, particularly potable water usage. Many data centre operators engage in water stewardship programmes which operate similarly to carbon offsets: they compensate for water consumed but do not necessarily replenish it in the areas where it was consumed. Therefore, EU regulation should always require location-based reporting of resource consumption and GHG emissions which must be separated from carbon offsetting and water stewardship programmes.

8. Provide incentives for investments in sustainable computing

The EU has introduced considerable sustainability reporting obligations for large companies, with the aim of steering investment to more sustainable activities. The EU Taxonomy Regulation provides a classification system for investors and companies that includes two activities relevant to data centres: data processing, hosting and related activities and supporting the sale or reuse of servers and data storage products. A key issue is that companies are not required to engage in EU Taxonomy aligned activities, rather the Taxonomy relies on voluntary participation. At most, large companies that are subject to the Corporate Sustainable Reporting Directive (CSRD) will be required to disclose their turnover and expenditure from aligned sustainable activities. Considering the current growth trajectory of the data centre industry there is little reason to believe that financial investors and (big) tech companies will only invest in sustainable computing infrastructure. To ensure this hoped-for shift in investment, EU policy needs to introduce binding requirements for sustainable data centre investments.

9. Blind spots: software and dark data

Legislation focusing on energy efficiency focuses on the energy efficiency of hardware, particularly through the Ecodesign Regulation for servers and data storage products. This focus on hardware leaves optimisation

through more sustainable software out of its scope. Equally, the significant carbon footprint caused by dark data is out of the scope of EU digital sustainability policy. This refers to information assets that organisations collect, process and store but fail to use for other purposes. The Commission should assess the potential contribution of sustainable software and reducing dark data storage for its sustainable data centre strategy.

10. The need for public value-oriented computing

The EU's current approach to regulating data centre sustainability does not sufficiently integrate public value-oriented requirements. There is increasing recognition of the need to ensure increased digitalization truly contributes to the common good. Introducing a proportionality framework for AI and other resource intensive computing applications can be a means of assessing whether their development and use for a particular task is proportional to its carbon footprint.

Finally, as computing can take place remotely, EU policy ought to be broadly aware about the computing workloads EU customers consume in third countries and vice versa. Third countries where regulation of data centres' sustainability is significantly lower than in the EU could otherwise bear the brunt of EU outsourcing of computing needs. Such would contradict the spirit of sustainability efforts in the EU and run afoul of the UN Sustainable Development Goals.

Concluding remarks

Undoubtedly, data centre sustainability has become a highly politically salient issue where industrial, innovation and sustainability goals can collide. The risk is that the twin transition becomes lopsided, prioritising digitalisation over sustainability. The forthcoming Commission Report will therefore be a key moment in furthering data centre sustainability in the EU. This report will likely also inform a new legislative proposal for a Cloud and AI Development Act, which aims to set 'minimum standards' for energy efficiency of AI development.

This blog post provided ten key elements that should be considered by EU decision-makers when deliberating a new iteration of EU data centres sustainability policy.

1. The Commission's data centre energy consumption forecasts will require updating, as its current worst case estimates for 2030 will most likely be outpaced.

2. The EU policy goal to achieve 'highly energy efficient and sustainable data centres by no later than 2030' should be made legally binding. In addition, the Commission should propose measures to manage the data centres' sector's growth and carbon footprint.
3. The Commission should better consider how the data centre sector's growing renewable energy needs affect the EU's overall carbon budget and objectives for decarbonising other sectors.

4. The EU should not endorse nuclear SMRs as a potential source of carbon-free energy for data centres before requiring scientifically backed assessments.
5. There needs to be more emphasis on reducing waste heat and only reusing unavoidable waste heat.
6. The data collected through the EED and included in the publicly available database should include disaggregated, as well as aggregated data, to allow environmental impacts on local areas to be better understood by stakeholders and the public.
7. Reporting requirements should mandate operators to more clearly separate RECs and water stewardship programmes from local resource consumption and emissions in their disclosures.
8. Reporting requirements in the EU Taxonomy and CSRD should be strengthened by economic incentives and binding requirements for data centres operators to engage in sustainable data centre practices.
9. In addition to energy efficiency measures for hardware, the additional potential of using sustainable software and reducing dark data ought to be assessed.
10. EU policy should incorporate proportionality frameworks for AI and other resource intensive applications to ensure their purported contribution to sustainability is proportional to their ecological footprint.

Having reviewed the large body of EU legislation and policy, we cannot escape the impression that the current policy approach will not contain the ever-increasing ecological footprint of the data centre sector in the EU. It is essential that the currently highly technical discourse be broadened to include societal discussion on the impacts of digitalisation and AI. An update and upgrade to the EU data centre sustainability policy will be essential to ensuring that the data centre sector evolves in line with societal needs and planetary boundaries.

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[1] Commission Regulation (EU) 132/2022 of 28 January 2022 amending Regulation (EC) No 1099/2008 of the European Parliament and of the Council on energy statistics, as regards the implementation of updates for the annual, monthly and short-term monthly energy statistics, OJ 2022 L 20/208, Annex A 2.6.3.1.16.

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