European Data Centre Association's
Technical Committee

Energy Efficiency Directive: KPIs and Metrics

A technical assessment of sustainability metrics and calculation methodologies

EUDCA Viewpoint

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The European Union's (EU) Energy Efficiency Directive (EED) is a key plank of the Green Deal encouraging more efficient use of energy that will contribute to reducing the EU's overall energy consumption. The Energy Efficiency Directive, says the EU, is a key driver of Europe's energy transition.

EUDCA welcomes the legislation and the aims of increasing efficiency and reducing overall energy consumption. After extensive discussion of the legislation and its implications, EUDCA has developed a viewpoint to facilitate further discussion to better allow data centre owners and operators to not just comply with the directive, but to ensure its ambitions are achievable.

Key performance indicators

Among the various classes of large energy users, the data centre industry already has well-established metrics and methodologies to measure its sustainability and efficiency of performance. Most of the key performance indicators (KPI) and metrics included in the EED are well established and practical to measure for the industry and are standardised in EN or ISO standards.

In its first phase the EED Delegated Regulation ((EU) 2024/1364) establishes a common rating scheme for data centres, and constitutes one of the first pieces of legislation aimed at creating a collective database of the sustainability and efficiency of data centres.

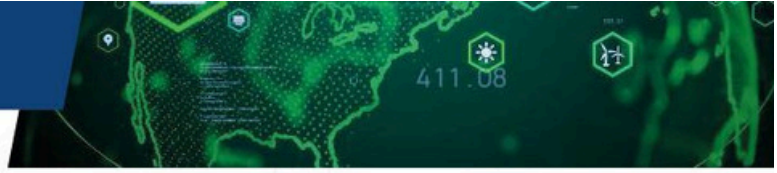
The new Delegated Act requires data centre operators above a 500kW threshold (or lower depending on how the Directive is implemented at the national level) to report on KPIs, ranging from data centre energy performance to information and communications technology (ICT) capacity and data traffic. All the information collected will go to form a database of the operation of the data centre sector across Europe.

Interpretative differences

However, there are some issues to consider. Most KPIs are defined according to standards, however there are some required KPIs which are less well defined, and which could affect the comparability and quality of the data submitted to the European database. Similarly, different translations or transpositions of some KPIs at national level, might lead to different results for the same operators across member states.

An example of potential interpretive uncertainty is the waste heat temperature measurement (Article 2, paragraph 1k). The aim of the KPI is to evaluate the possibility of exporting heat depending on the grade (temperature) of waste produced. The text indicates that the waste heat temperatures should be measured at the point when the heated fluid enters the exchanger at the data centre computer boundary. While this is true for air-based cooling systems, for liquid-based cooling systems this will be measured as the secondary liquid cooling fluid returning from the CRAC unit in the server room back to the chiller evaporator. Such differences must be noted and accounted for to ensure uniformity in measurement to facilitate reasonable comparisons.

Some KPIs like the ICT capacity indicators which indicate the performance of the IT equipment; or Data Traffic Indicators, are not directly associated with the energy consumed of the IT equipment; but are being recorded in an attempt to identify potential performance metrics relating to performance and IT energy



consumed. However, the data centre operators required to report this information generally cannot access this information.

Example and intent

A good example of established calculation methodology and KPIs is Power Usage Effectiveness (PUE). This is a metric that is easy to calculate, is very well recognised and used in the industry. It is however, impacted by location due to varying climatic conditions. This means that two data centres of the same design in different locations will have different PUEs. Where data centre designs differ, this compounds any comparison attempt.

PUE allows the inclusion of measurements on what is within the control of all data centre operators (e.g. UPS, cooling, etc.). This is, thus far, the best metric available to measure the efficiency of the data centre holistically, as opposed to other metrics where computing power and IT load are included.

The intention of the legislation is not to define the sustainability of the sector but to measure its energy efficiency. Most of the metrics relate primarily to energy rather than the sustainability of data centre operations. To define the sustainability of data centres, other and additional metrics should be considered, such as carbon usage effectiveness, IT equipment energy utilisation for servers (ITEUsv), and IT Equipment Energy Efficiency for Servers (ITEEsv). Focusing on only four metrics — PUE, Water Usage Effectiveness (WUE), Energy Reuse Factor (ERF), and Renewable Energy Factor (REF) — does not provide the full picture of data centre sustainability. The ERF metric in particular is not regarded by operators as a legitimate measure of operational efficiency, and recommend only to be included as a bonus, not as a core metric.

The data points need to be contextualised and measured against the layered structures of data centres.

- Digital infrastructure as a whole has control over the circularity and whole cycle life assessment of the entire infrastructure. This data requires policymakers to analyse the resources consumed versus the economic valued added of a strong digital economy.
- For other data points, related to efficiency and sustainability, colocation operators are not able to influence their outcomes with direct control (e.g. PUE, REF, WUE, Circular heat, etc.).
- For any metric related to IT equipment, colocation operators have no real possibility to affect their efficiency as the responsibility lies on customers.

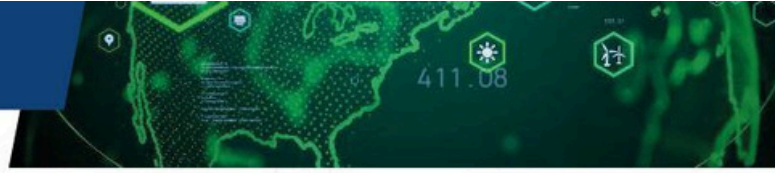
Furthermore, a distinction should be drawn between operational and design metrics, as well as the external conditions affecting operational metrics. All the metrics used in the sectors, aim to measure the infrastructure overhead under operational conditions, which might be influenced by external factors (e.g. cooling technology, local climate, availability of heat networks), and may rely on calculation methodologies and limitations.

Colocation concerns

An adequate understanding of data centre energy efficiency depends on scrutiny of both the infrastructure and the IT. These elements must be segregated for reporting purposes and confined to those activities within the control of the reportees.

There are further concerns for colocation data centre operations reporting.

As has been mentioned, some of the KPIs address parameters that colocation operators are simply unable to access as they pertain to their customers' servers. Given stringent security and confidentiality rules, such information cannot be reported, as is the case for ICT and network-related KPIs (Annex II, Sections 2 and 3).



The lack of scope in the KPIs can be dangerous and lead to reporting from the side of colocation operators that is suboptimal or inadequate, failing to correctly represent the actual energy efficiency improvements achieved by the data centre sector as a whole. Reporting obligations must be limited to factors within the direct control of the reportee.

Supportive industry

The data centre industry is supportive of the collection of information on its operation, as it will show the current development of the industry as well as map the impact of new trends in technological developments. (E.g. AI, chip manufacturing in conjunction with increased heat reuse and liquid cooling.)

To ensure the comparability and quality of the data collected, EUDCA believes more clarity should be given on the KPIs definition to ensure they are interpreted uniformly across member states by data centre operators and to indicators which are normalised through an ISO standard for example, adapted to a specific industry. Divergent interpretation of data points from operator to operator could make the collection of data inefficient and potentially lead to misleading results on the actual sustainability of data centre operators, especially in view of potential minimum performance standards. It must also be borne in mind that optimising on one KPI may have an impact, sometimes negative, on other KPIs.

The data collected should be adequately addressed and interpreted against the backdrop of this uncertainty and ineffective data collection system.

As operators are already reporting on some of the KPIs included in the EED, there should be no duplication of reporting or misalignment with existing requirements. The annual reporting poses a fixed cost on companies which might result in a significant burden, especially for small and medium companies, and costs that could be used for investments into actual energy improvements. The industry is supportive of the inclusion of KPIs referencing well-established industry standards (such as EN 50600), which are widely used by operators. However, for some less-known KPIs (such as electrical grid functions, etc.) more guidance should be provided.

For comprehensive mapping of industry development, the reporting should measure the energy efficiency achievement across all types of data centres, including enterprise and non-commercial ones. This would be achieved with an expansion of the scope, to include smaller data centres below 100 kW where market failure may exist.

Due consideration must also be given to the pace of technological development. For example, the current wave of adoption of AI workloads means a heavy reliance on new equipment which is primarily graphics processor unit (GPU) based. This next generation of equipment runs hotter and thus requires lower ambient temperatures to operate, making the attainment of very low PUEs extremely challenging. If the EU implements laws that operators cannot comply with, the risk is that they will seek alternative locations to invest, potentially impacting industry growth and competitiveness.

EUDCA would welcome the opportunity to work with the Commission to further develop guidance for the industry that would add to the extensive information available from the EUDCA EED Knowledge Hub, as well as directly from the EU Commission, with the aim of allowing the sector, and each stakeholder, to become more sustainable year after year.