[ISO/IEC 30134 00 Factsheet]

[How do I use this methodology? Ask for support!]

	ISO/IEC 30134 : Information technology – Data centres – Key Performance indicators
Name of Initiative/Methodology	ISO/IEC 30134 series: information technology – Data centres – Key Performance indicators. • ISO/IEC 30134-1: Part 1 - Overview and general requirements • ISO/IEC 30134-2: Part 2 - Power usage effectiveness (PUE) • ISO/IEC 30134-3: Part 3 - Renewable energy factor (RES) • ISO/IEC 30134-4: Part 4 - IT equipment energy efficiency for servers (ITEE) • ISO/IEC 30134-5: Part 5 - IT equipment utilization for servers (ITEU_SV) Additional parts under preparation : • Part 6: Energy Reuse Factor (ERF) Additional parts dedicated to other KPIs will be developed further
Link to the latest published version	ISO/IEC 30134-1 (2016); Part 1: https://www.iso.org/standard/63450.html ISO/IEC 30134-2 (2016); Part 2: https://www.iso.org/standard/63451.html ISO/IEC 30134-3 (2016); Part 3: https://www.iso.org/standard/66127.html ISO/IEC 30134-4 (2017); Part 4: https://www.iso.org/standard/66191.html ISO/IEC 30134-5 (2017); Part 5: https://www.iso.org/standard/66934.html
Developed by	The International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) : ISO/IEC JTC 1/SC 39
History and Status	• Parts 1-3: Developed and finished in 2016, actual enquiry for update versions • Parts 4&5: Developed and finished in 2017 • Part 6: under development
Involved companies / parties	• No companies or other parties involved
Scope	✖ **Organisation env. accounting** ✖ Scope 1 ✖ Scope 2 ✖ Scope 3 ✖ **Product env. assessment** ✖ Life cycle approach ✖ Use phase only ✖ GWP ✔ Energy (focus on secondary energy) ✔ KPIs • Energy consumption • Renewable energy • Energy efficiency • Task efficiency • Energy reuse
System(s) covered by the methodology	• Data centres (DC) and its boundaries, thus are including the following elements : ∘ IT and network telecommunications/infrastructure ∘ Power generation and distribution infrastructure ∘ Environmental control/infrastructure ∘ Security and safety infrastructure • Renewable energy generation plants owned and controlled by the data centre, whether the energy is generated on site or obtained (i.e. any energy for which the data centre owns the legal rights to the environmental attributes of renewable generation
Goals	• Enabling the optimum resource effectiveness of data centres through: ∘ Minimization of energy and other resource consumption ∘ Maximization of IT load's task effectiveness within the data centre ∘ Energy reuse in the form of waste heat ∘ Use of renewable energy • Providing a suite of effective Key Performance Indicators (KPI) in relation to the objectives described above in order to define an improvement roadmap.
Generic features	• The term "resource usage effectiveness" is preferred to "resource usage efficiency", which is restricted to situations where the input and output parameters used to define the KPIs have the same units. • In order to allow a facility to measure and monitor progress in each individual area, the KPIs are designed to be : ∘ Applicable to all types of data centres ∘ Technology neutral ∘ Geographically neutral • In order to be based upon parameters measurable in an unambiguous manner, the following procedure shall be respected for the implementation of the KPIs: ∘ The KPIs shall be assessed over a defined period of time ∘ All parameters relevant to the assessment of the KPI shall be measured over a period not exceeding a specified time ∘ The maximum time between measurements defines the time interval between which KPIs shall re-assessed • The ISO/IEC 30134- series does not specify limits or targets for any KPI and does not describe or imply, unless specifically stated, any form of aggregation of individual KPIs into a combined nor an overall KPI for data centre resource usage effectiveness or efficiency

ICT-specific features	**Part 2: Power Usage Effectiveness (PUE)** • PUE illustrates the energy allocation of a data centre. • PUE provides means to determine : ∘ Opportunities for the improvement of the operational efficiency of the DC ∘ The improvement of the designs and processes of a DC over time ∘ A design target or goal for new DC across the anticipated IT load range • PUE = E_{DC}/E_{IT} ; where: ∘ E_{IT} is the IT equipment energy consumption (annual) in kWh and includes : IT equipment and supplemental equipment ∘ E_{DC} is the total DC energy consumption (annual) in kWh and includes : E_{IT}, power delivery, cooling system and others • Measurements of E_{DC} and E_{IT} shall be undertaken using either: ∘ Watt meters with the capability to report energy usage, or ∘ Kilowatt-hour (kWh) meters that report the actual energy usage through simultaneous measurement of voltage, current and power factor over time • Derivatives of PUE may be useful in certain circumstances • PUE should not be used to compare different DC • PUE does not take into account: energy efficiency of the IT load, its utilisation or productivity; efficiency of onsite electricity generation; efficiency of other resources such as human resources, space or water; use of renewable energy resources or accounts for reuse of waste by products. • 3 PUE categories are defined according to the energy consumption measurement process used for the PUE calculation: ∘ PUE_1 : based on uninterruptible power supply output, it provides a basic level of resolution of energy performance data ∘ PUE_2 : based on power distribution unit output, it provides an intermediate level of resolution of energy performance data ∘ PUE_3 : based on IT equipment input, it provides an advanced level of resolution of energy performance data • The use of PUE category is based on the following distribution: ∘ PUE > 1.5: Category 1 to 3 ∘ 1.5 >= PUE > 1.2: Category 2 to 3 ∘ PUE =< 1.2: Category 3 • The correct reporting of power usage effectiveness relies on multiple elements e.g.: ∘ Use standard construct for communicating PUE data ∘ Provide required information and supporting evidence for public reporting of PUE **Part 3: Renewable energy factor (REF)** • REF metric describes the percentage of a renewable energy (RE) over total DC energy. It provides an assessment of the mitigation of carbon emission that originated from energy consumption in a DC. • REF is an effective KPI to monitor the use of RE and to increase the diversity of energy dependence and improve the sustainability of a DC by enhancing the use of RE. • The use of this KPI allows DC managers to improve a DC's energy procurement process and increase the diversity of energy dependence of a DC. In addition, customers can also use this KPI as a guide to select a DC. • REF = Eren/ E_{DC} ; where: ∘ E_{DC} is the total DC energy consumption (annual) in kWh ∘ Eren is the RE in kWh owned and controlled by a DC • REF shall have a maximum value of 1.00 indicating 100% of the total DC energy is RE. Thus, in the case of on-site generation of RE beyond the need of the DC, the excess power generated shall not be accounted for REF. • Measurements of E_{DC} and E_{IT} shall be undertaken using either: ∘ Watt meters with the capability to report energy usage, or ∘ Kilowatt-hour (kWh) meters that report the actual energy usage through simultaneous measurement of voltage, current and power factor over time **Part 4: IT Equipment Energy Efficiency for servers (ITEEsv)** • The IT Equipment Energy Efficiency for servers (ITEEsv) metrics quantifies the energy efficiency characteristics of servers in a DC. It describes the maximum performance per kW of all servers or a group of servers in the DC based upon a specification or potential performance of these servers. It reflects the energy effectiveness capability of servers, not the energy effectiveness at a real operating situation of the servers. • ITEEsv defines the method to obtain average energy effectiveness or efficiency for servers, despite the difficulty to calculate the summarized value of the energy effectiveness or efficiency among different types of IT equipment, since the metrics for measuring their performance are different and simple addition or average is not an appropriate method for summarizing. • ITEEsv can assist stakeholders with improving energy effectiveness of their servers by providing a measure of work performed per unit of power consumed. A higher ITEEsv value indicates higher processing capacity per unit of electric power (at maximum power). ∘ When a server is replaced, the ITEEsv of the new equipment should be greater than that of the old equipment. ∘ When additional servers are added to increase capacity, the impact of the new equipment on ITEEsv should be determined. ∘ When a DC is reconfigured, the design ITEEsv should be an improvement over the baseline calculation. • ITEEsv is intended for self-improvement of a given DC or a part of a DC, not for comparison among different DC. ITEEsv should not be used to set regulation for a DC or individual server. • ITEEsv corresponds to the sum of the *SMPEi* divided by the sum of the *SMPOi*, with: ∘ *SMPEi*: maximum performance of server *i*, shall be obtained from direct measurement or from performance benchmark results (from manufacturer) ∘ *SMPOi*: maximum power consumption of server *i* in kW, shall be obtained from direct measurement or the use of a power consumption data (provided by the manufacturer). *SMPOi* shall represent the average power used during the benchmark execution which obtained its corresponding *SMPEi* value • When using the benchmark method to determine *SMPE* and *SMPO*: ∘ The benchmark should represent the application of the servers being tested. ∘ One benchmark method should be applied for all servers, and benchmark methods shall not be mixed. ∘ If one benchmark method is not appropriate for all servers due to a difference in server type, configurations, or intended loads, then servers should be grouped so that one benchmark method can be applied. Then the ITEEsv of the servers in a group shall be calculated. ITEEsv should not be added among these groups. ∘ If SMPE and SMPO cannot be accurately determined for any servers in a group, those servers shall not be included in the calculation of ITEEsv. ∘ When comparing historical ITEEsv values of a given data centre, the same benchmark method shall be used every time ITEEsv is measured. **Part 5: IT Equipment Utilization for servers (ITEUsv)** • ITEUsv describes the utilization of the server equipment in the DC in operational conditions. ITEUsv is developed with the knowledge that server energy efficiency tends to be optimal with higher utilization level. ITEUsv accounts for utilization (the amount of time the server is actually doing work) and power management (the ability of the server to reduce the energy consumption when the server is not fully loaded) aspects. • ITEusv(t) is the average Central Processing Unit (CPU) utilization of all servers or a group of servers in a DC at time *t*. ∘ It corresponds to the sum of the *CUSi*(t) divided by *N*, with: ▪ *CUSi*(t): CPU utilization ratio of server *i* at time *t*, measured by a performance monitoring tool provided by a server operating system ▪ *N*: the number of servers in a DC or in a group running at time *t* ∘ When some servers are working at very low load, a DC owner/operator can improve ITEUsv(t) by reducing the number of operating servers with virtualization techniques, while maintaining the whole workload of the C. ∘ If a DC owner/operator utilizes server "power OFF" function to save energy consumption of servers in idle state, ITEUsv(t) shall be calculated by subtracting servers at "power OFF" state. ∘ The ITEUsv(t) value is high when most servers are running at high utilization status at time t. • ITEUsv indicates average CPU utilization in a year for all servers or a group of servers. ∘ The DC shall monitor ITEUsv(t) for a year and collect all data. The DC shall then calculate the annual average of ITEUsv(t), which is the ITEUsv. ∘ The interval of measurement shall be between 1 min and 1 h. The DC shall decide the interval based upon server operating conditions. ∘ In case the measurement is made in a partial section of the DC or a group of servers in a DC, then the measured area shall be stated. This group shall be identical and designated to a measurement group of ITEEsv. ITEUsv shall not be summed among these groups. When there is no CPU monitoring tool applicable to some servers, these servers shall not be included in these groups. • During the measurement, the maximum value of ITEUsv(t) and its time shall be recorded. The maximum value of ITEUsv(t), or peak ITEUsv(t), is useful to set a target value of ITEUsv
Examples of implementation / experience feedback	None identified

Interaction with other methodologies	• [IEC 60050-732] International Electrotechnical Vocabulary — Part 732: Computer network technology

How do I use this methodology? Ask for support!