Assessment Framework for Data Centres in the Context of Activity 8.1 in the Taxonomy Climate Delegated Act

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Introduction

1. CONTEXT OF THE ASSESSMENT FRAMEWORK

The **EU Taxonomy Regulation**[1] establishes a green classification system that translates the EU's climate and environmental objectives into criteria for specific economic activities for investment purposes.[2] While it does not set mandatory requirements on environmental performance for specific economic activities, it provides a common understanding of economic activities that make a substantial contribution to the EU's environmental goals. Large financial and non-financial companies that fall under the scope of the **Non-Financial Reporting Directive**[3] are required to disclose to what extent the activities that they carry out meet the criteria set out in the EU Taxonomy. Market participants who are not subject to mandatory reporting may use the EU Taxonomy voluntarily.[4] The EU Taxonomy Regulation is implemented through delegated acts that specify the technical screening criteria to address the six environmental objectives: climate mitigation, climate adaptation, water, circular economy, pollution prevention and biodiversity.

The **EU Taxonomy Climate Delegated Act**[5] deals with the first two of those objectives. It sets out the technical screening criteria to identify whether an economic activity contributes substantially to, respectively, climate change mitigation and to climate change adaptation, while doing no significant harm to other environmental objectives.[6] Section 8.1 of the EU Taxonomy Climate Delegated Act addresses the economic activity "***Data processing, hosting and related activities***". The technical screening criteria for determining whether economic activities of this category can be classified as making a substantial contribution to climate change **mitigation** (Annex I) include audited compliance with the relevant practices of the European Code of Conduct for Energy Efficiency in Data Centres[7] (CoC). As such, the EU Taxonomy and its Climate Delegated Act are among the key tools to achieve the Digital Strategy's objective of making European data centres climate neutral, highly energy efficient and sustainable by 2030. When it comes to the contribution of "Data processing, hosting and related activities" to climate change **adaptation (Annex II)**, the CoC is not considered a technical screening criterion itself, but it is also referenced in the Do No Significant Harm criterion for climate change mitigation.

The CoC is a useful collection of best practices but lacks a framework for third-party control, hindering the practical application of the above-mentioned technical screening criterion requiring an audited implementation of the CoC's best practices. After stakeholders raised awareness for this issue, the European Commission tasked the Testing Inspection

[1] Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088 (OJ L 198 22.06.2020)

[2] See DG FISMA's FAQs: 'What is the EU Taxonomy and how will it work in practice?' https://finance.ec.europa.eu/system/files/2021-04/sustainable-finance-taxonomy-faq_en.pdf; and 'How should financial and non-financial undertakings report Taxonomy-eligible economic activities and assets in accordance with the Taxonomy Regulation Article 8 Disclosures Delegated Act?' https://finance.ec.europa.eu/system/files/2022-01/sustainable-finance-taxonomy-article-8-report-eligible-activities-assets-faq_en.pdf.

[3] Directive 2014/95/EU of the European Parliament and of the Council of 22 October 2014 amending Directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups (OJ L 330, 15.11.2014)

[4] For example, investors may choose to use the EU Taxonomy criteria for screening and identifying sustainable investment opportunities as part of their due diligence.

[5] Commission Delegated Regulation (EU) 2021/2139 of 4 June 2021 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives (OJ L 442, 9.12.2021).

[6] The EU Taxonomy Compass provides a visual representation of the contents of the EU Taxonomy, starting with the Delegated Act on the climate objectives (climate change mitigation (Annex I) and climate change adaptation (Annex II), as published in the Official Journal on 9 December 2021: https://ec.europa.eu/sustainable-finance-taxonomy/taxonomy-compass

[7] The most recent version of the European Code of Conduct on Data Centre Energy Efficiency is the latest version published at the Joint Research Centre European Energy Efficiency Platform (E3P) website, https://e3p.jrc.ec.europa.eu/communities/data-centres-code-conduct, with a transition period of six months starting from the day of its publication (the 2023 version is available at https://e3p.jrc.ec.europa.eu/publications/2023-best-practice-guidelines-eu-code-conduct-data-centre-energy-efficiency).

and Certification Council (TIC Council) to prepare an Assessment framework for data centres to fill that gap, the result of which is presented in this document and its annexes. Following a public call for experts, the TIC Council formed a drafting group of technical experts. At the same time, the European Commission's Joint Research Centre convened a steering group building on the CoC Best Practices Committee. The steering group advised the drafting group throughout the process on the compatibility of the draft assessment framework with the CoC and ensured that the framework was delivered within the timeframe set.

Based on the work of these groups, the final assessment framework is adopted as a new standalone document based on The European Code of Conduct for Energy Efficiency in Data Centres. This document compliments the CoC Best Practices Document by making the Practices more requirement based rather than recommendations. The assessment framework therefore provides auditors with the necessary tools to verify whether a data centre correctly applies the Practices contained within the CoC. Thus, it allows market players to correctly complete their disclosures for Taxonomy alignment as part of their non-financial reporting without any ambiguity.

2. APPLYING THE ASSESSMENT FRAMEWORK

This assessment framework serves the implementation of the second substantial contribution criterion for climate change mitigation (Annex I) and might also prove helpful for the assessment of the Do No Significant Harm criterion for climate change mitigation (Annex II; see also section 5 on the application of the assessment framework). All screening criteria (substantial contribution and do no significant harm) are included in Annex A to this document.

The burden of proof for Taxonomy-alignment lies with the economic operators who are required to disclose or wish to voluntarily showcase their share of Taxonomy-aligned activities. In the case of colocation data centres, the demonstration of compliance with the European Code of Conduct on Data Centre Energy Efficiency might require close cooperation and the exchange of technical data between hosts and tenants.

During the audit and verification process, the auditor will use this assessment framework to review all 106 the relevant CoC best practices. Annex B contains definitions from the CoC, which are relevant for the application of this assessment framework. In addition to this and as part of the evidence gathering to verify compliance with the technical screening criteria from the Taxonomy Climate Delegated Act, the auditor will verify the stipulated systems and procedures for measurement, recording and reporting of data and also the KPIs (Key Performance Indicators) of operational sustainability. In accordance with the screening criteria, the 106 best practices will be addressed in the form of "Compliant", "Non-applicable (with justification)" or "equivalent alternative", or "Non-compliant", with the relevant supporting evidence.

The technical screening criterion for a substantial contribution to climate change mitigation (see Annex A) requires the auditor to take a pass/fail decision: *"the activity has implemented all relevant practices listed as "expected practices" in the most recent version of the European Code of Conduct on Data Centre Energy Efficiency, or in CEN-CENELEC document CLC TR50600-99-1 "Data centre facilities and infrastructures - Part 99-1: Recommended practices for energy management"." It is to be noted that the substantial contribution criteria for climate change mitigation also include the following sentence: "Alternative best practices from the European Code of Conduct on Data Centre Energy Efficiency or other equivalent sources may be identified as direct replacements if they result in similar energy savings."* According to the interpretation of the drafting and steering group, this would leave room for the EN5600-5-1 Maturity Model, if it can be justified that level 4 in combination with the continual improvement programme is an equivalent source resulting in similar energy savings as the implementation of all relevant practices from the Code of Conduct.

The assessment framework may also serve as a basis for determining a data centre's compliance with the do no significant harm criterion for climate change mitigation as laid down for activity 8.1 in Annex II of the EU Taxonomy Climate Delegated Act, even though an audit for this criterion is not required. Indeed, an auditor may use this assessment framework to determine whether "*the activity has demonstrated best efforts to implement the relevant practices listed as "expected practices" in the most recent version of the European Code of Conduct on Data Centre Energy Efficiency*[654]*, or in CEN-CENELEC document CLC TR50600-99-1 "Data centre facilities and infrastructures - Part 99-1: Recommended practices for energy management"*[655] *and has implemented all expected practices that have been assigned the maximum value of 5 according to the most recent version of the European Code of Conduct on Data Centre Energy Efficiency*."

3. REQUIREMENTS FOR AUDIT FIRMS

Guidelines on conformity assessment tools for Auditing Firms

- **ISO/IEC 17000 – Conformity assessment**
  General terms and definitions relating to conformity assessment, including the accreditation of conformity assessment bodies, and to the use of conformity assessment to facilitate trade.

- **ISO/17021 – Conformity assessment of management systems**

Principles and requirements for the competence, consistency and impartiality of bodies providing audit and certification of all types of management systems

- **ISO/IEC 17029:2019 - Conformity Assessment:**
  General principles and requirements for the competence, consistent operation and impartiality of bodies performing validation/verification as conformity assessment activities. Bodies operating in according to ISO/IEC 1702019 can provide Validation/Verification as a First-party, Second-party or Third-party activity.
- **ISO/IEC 19011 - Guidance on auditing management systems**
  Guidance on auditing management systems, including the principles of auditing, managing an audit programme and conducting management system audits, as well as guidance on the evaluation of competence of individuals involved in the audit process.

ANNEX A: TAXONOMY CRITERIA FOR DATA CENTRES

The EU Taxonomy Climate Delegated Act captures data centres as part of activity 8.*1 "Data processing, hosting and related activities"*. For this activity, the following criteria are laid down in the respective annexes of the Delegated Act:
Annex I *- Technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to* ***climate change mitigation*** *and for determining whether that economic activity causes no significant harm to any of the other environmental objectives*

I. Description

Storage, manipulation, management, movement, control, display, switching, interchange, transmission or processing of data through data centres[8], including edge computing.
The economic activities in this category could be associated with NACE code J63.11 in accordance with the statistical classification of economic activities established by Regulation (EC) No 1893/2006.
An economic activity in this category is a transitional activity as referred to in Article 10(2) of Regulation (EU) 2020/852 where it complies with the technical screening criteria set out in this Section.

II. Substantial contribution criteria

1. The activity has implemented all relevant practices listed as "expected practices" in the most recent version of the European Code of Conduct on Data Centre Energy Efficiency[9], or in CEN-CENELEC document CLC TR50600-99-1 "Data

[8] Data centres include the following equipment: ICT equipment and services; cooling; data centre power equipment; data centre power distribution equipment; data centre building; monitoring systems.

[9] The most recent version of the European Code of Conduct on Data Centre Energy Efficiency is the latest version published at the Joint Research Centre European Energy Efficiency Platform (E3P) website, https://e3p.jrc.ec.europa.eu/communities/data-centres-code-conduct, with a transition period of six months starting from the day of its publication (the 2023 version is available at https://e3p.jrc.ec.europa.eu/publications/2023-best-practice-guidelines-eu-code-conduct-data-centre-energy-efficiency).

centre facilities and infrastructures - Part 99-1: Recommended practices for energy management"[10].
The implementation of those practices is verified by an independent third-party and audited at least every three years.
2. Where an expected practice is not considered relevant due to physical, logistical, planning or other constraints, an explanation of why the expected practice is not applicable or practical is provided. Alternative best practices from the European Code of Conduct on Data Centre Energy Efficiency or other equivalent sources may be identified as direct replacements if they result in similar energy savings.
3. The global warming potential (GWP) of refrigerants used in the data centre cooling system does not exceed 675.

III. Do no significant harm criteria

Climate adaptation
The activity complies with the criteria set out in Appendix A to this Annex.
Water
The activity complies with the criteria set out in Appendix B to this Annex.
Circular economy
The equipment used meets the requirements laid down in Directive 2009/125/EC for servers and data storage products.
The equipment used does not contain the restricted substances listed in Annex II to Directive 2011/65/EU of the European Parliament and of the Council[11], except where the concentration values by weight in homogeneous materials do not exceed the maximum values listed in that Annex.
A waste management plan is in place and ensures maximal recycling at end of life of electrical and electronic equipment, including through contractual agreements with recycling partners, reflection in financial projections or official project documentation.
At its end of life, the equipment undergoes preparation for reuse, recovery or recycling operations, or proper treatment, including the removal of all fluids and a selective treatment in accordance with Annex VII to Directive 2012/19/EU of the European Parliament and of the Council[12].
Pollution prevention
N/A
Biodiversity
N/A

***Annex II** - Technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to **climate change adaptation** and for determining whether that economic activity causes no significant harm to any of the other environmental objectives*

I. Description

Storage, manipulation, management, movement, control, display, switching, interchange, transmission or processing of data through data centres[13], including edge computing.
The economic activities in this category could be associated with NACE code J63.11 in accordance with the statistical classification of economic activities established by Regulation (EC) No 1893/2006.

II. Substantial contribution criteria

1. The economic activity has implemented physical and non-physical solutions ('adaptation solutions') that substantially reduce the most important physical climate risks that are material to that activity.
2. The physical climate risks that are material to the activity have been identified from those listed in Appendix A to this Annex by performing a robust climate risk and vulnerability assessment with the following steps:

a. screening of the activity to identify which physical climate risks from the list in Appendix A to this Annex may affect the performance of the economic activity during its expected lifetime;

[10] Issued on 1 July 2019 by the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENELEC), (version of [adoption date]: https://www.cenelec.eu/dyn/www/f?p=104:110:508227404055501::::FSP_ORG_ID,FSP_PROJECT,FSP_LANG_ID:1258297,65095,25).

[11] Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (OJ L 174, 1.7.2011, p. 88).

[12] Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (OJ L 197, 24.7.2012, p. 38).

[13] Data centres include the following equipment: ICT equipment and services; cooling; data centre power equipment; data centre power distribution equipment; data centre building; monitoring systems.

b. where the activity is assessed to be at risk from one or more of the physical climate risks listed in Appendix A to this Annex, a climate risk and vulnerability assessment to assess the materiality of the physical climate risks on the economic activity;

c. an assessment of adaptation solutions that can reduce the identified physical climate risk.

The climate risk and vulnerability assessment is proportionate to the scale of the activity and its expected lifespan, such that:

a. for activities with an expected lifespan of less than 10 years, the assessment is performed, at least by using climate projections at the smallest appropriate scale;

b. for all other activities, the assessment is performed using the highest available resolution, state-of-the-art climate projections across the existing range of future scenarios[14] consistent with the expected lifetime of the activity, including, at least, 10 to 30 year climate projections scenarios for major investments.

3. The climate projections and assessment of impacts are based on best practice and available guidance and take into account the state-of-the-art science for vulnerability and risk analysis and related methodologies in line with the most recent Intergovernmental Panel on Climate Change reports[15], scientific peer-reviewed publications and open source[16] or paying models.

4. The adaptation solutions implemented:

a. do not adversely affect the adaptation efforts or the level of resilience to physical climate risks of other people, of nature, of cultural heritage, of assets and of other economic activities;

b. favour nature-based solutions[17] or rely on blue or green infrastructure[18] to the extent possible;

c. are consistent with local, sectoral, regional or national adaptation plans and strategies;

d. are monitored and measured against pre-defined indicators and remedial action is considered where those indicators are not met;

e. where the solution implemented is physical and consists in an activity for which technical screening criteria have been specified in this Annex, the solution complies with the do no significant harm technical screening criteria for that activity.

III. Do no significant harm criteria

Climate mitigation

The activity has demonstrated best efforts to implement the relevant practices listed as "expected practices" in the most recent version of the European Code of Conduct on Data Centre Energy Efficiency[19], or in CEN-CENELEC document CLC TR50600-99-1 "Data centre facilities and infrastructures - Part 99-1: Recommended practices for energy

[14] Future scenarios include Intergovernmental Panel on Climate Change representative concentration pathways RCP2.6, RCP4.5, RCP6.0 and RCP8.5.

[15] Assessments Reports on Climate Change: Impacts, Adaptation and Vulnerability, published periodically by the Intergovernmental Panel on Climate Change (IPCC), the United Nations body for assessing the science related to climate change produces, https://www.ipcc.ch/reports/.

[16] Such as Copernicus services managed by the European Commission.

[17] Nature-based solutions are defined as 'solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions'. Therefore, nature-based solutions benefit biodiversity and support the delivery of a range of ecosystem services (version of [adoption date]: https://ec.europa.eu/info/research-and-innovation/research-area/environment/nature-based-solutions_en/).

[18] See Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Green Infrastructure (GI) — Enhancing Europe's Natural Capital (COM/2013/0249 final).

[19] The most recent version of the European Code of Conduct on Data Centre Energy Efficiency is the latest version published at the Joint Research Centre European Energy Efficiency Platform (E3P) website, https://e3p.jrc.ec.europa.eu/communities/data-centres-code-conduct, with a transition period of six months starting from the day of its publication (the 2023 version is available at https://e3p.jrc.ec.europa.eu/publications/2023-best-practice-guidelines-eu-code-conduct-data-centre-energy-efficiency).

management"[20] *and has implemented all expected practices that have been assigned the maximum value of 5 according to the most recent version of the European Code of Conduct on Data Centre Energy Efficiency.*

Water

The activity complies with the criteria set out in Appendix B to this Annex.

Circular economy

The equipment used meets the requirements laid down in Directive 2009/125/EC for servers and data storage products.

The equipment used does not contain the restricted substances listed in Annex II to Directive 2011/65/EU, except where the concentration values by weight in homogeneous materials do not exceed the maximum values listed in that Annex.

A waste management plan is in place and ensures maximal recycling at end of life of electrical and electronic equipment, including through contractual agreements with recycling partners, reflection in financial projections or official project documentation.

At its end of life, the equipment undergoes preparation for re-use, recovery or recycling operations, or proper treatment, including the removal of all fluids and a selective treatment in accordance with Annex VII to Directive 2012/19/EU.

Pollution prevention

N/A

Biodiversity

N/A

ANNEX B: RELEVANT DEFINITIONS RELATED TO THE EUROPEAN CODE OF CONDUCT FOR ENERGY EFFICIENCY IN DATA CENTRES

Expected Minimum Practices (taken from the EU Code of Conduct 2.2)

The less disruptive or intrusive of the Practices are identified as being applied to the existing data centre and IT equipment, retrospectively where necessary. It is accepted that a number of the Practices identified as expected are inappropriate or present an unnecessary burden when applied to an existing running data centre. These Practices are identified as being expected either, when new IT equipment or software is sourced and deployed, or during a retrofit of the facility. These Practices provide substantial benefits and are intended to achieve efficiency improvements through the natural churn of equipment and facilities.

All expected Practices should be applied to any data centre constructed from 2011 onwards, specifically all Practices marked as "Entire data centre", "New software", "New IT equipment" and "New build or retrofit" which are within the applicants' control.

Retrofit is intended to describe major disruptive works in the data centre which present the opportunity at little incremental cost to implement these additional Practices. Examples of retrofit would be (a) when the power to the data floor is shut off and the IT equipment and cabinets removed it is expected that Practice **5.1.1** Contained hot or cold aisle would be implemented (b) if the CRAC / CRAH units are being upgraded or replaced it is expected that Practice **5.5.1** Variable speed fans would be implemented as part of this change

Applicability of Expected Practices (taken from the EU Code of Conduct 2.5)

It is understood that not all operators will be able to implement all of the expected Practices in their facilities due to physical, logistical, planning or other constraints. In these instances an explanation of why the expected action is not applicable or practical should be provided in the "Reason why this Practice cannot be implemented in this data centre" column in the reporting form, alternative best practices from the Code of Conduct or other sources may be identified as direct replacements if they result in similar energy savings.

Ensure that Asset Management for IT, Mechanical and Electrical assets etc. is implemented and controlled according to a standard and accepted methodology. An example of which would be ISO 55001

Understanding the numbers, types and purposes of the assets deployed in a data centre underpins effective energy

[20] Issued on 1 July 2019 by the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENELEC), (version of [adoption date]: https://www.cenelec.eu/dyn/www/f?p=104:110:508227404055501::::FSP_ORG_ID,FSP_PROJECT,FSP_LANG_ID:1258297,65095,25).

management.

International recognized Management Systems referenced within the EU Code of Conduct (CoC)

- Asset Management (ISO 55001): CoC Section 3.2.7
- Energy Management Systems: (EN ISO 50001): CoC Section 3.2.6
- Environmental Management: (EN ISO 14001): CoC Section 3.2.5
- Life Cycle Assessment (EN ISO 14040 and EN ISO 14044): CoC Section 3.2.4

EU/International recognized Standards for Data Center resource Efficiency KPIs referenced within the EU Code of Conduct (CoC)

- EN 50600-4-1 or ISO/IEC 30134-1: General requirements
- EN 50600-4-2 or ISO/IEC 30134-2: Power Usage Effectiveness (PUE)
- EN 50600-4-3 or ISO/IEC 30134-3: Renewable Energy Factor (REF)
- ISO/IEC 30134-4: IT Equipment Energy Efficiency for Servers (ITEEsv)
- ISO/IEC 30134-5: IT Equipment Energy Utilization for Servers (ITEUsv)
- EN 50600-4-6 or ISO/IEC 30134-6: Energy Refuse Factor (ERF)
- EN 50600-4-7 or ISO/IEC 30134-7: Cooling Efficiency (CER)
- EN 50600-4-8 or ISO/IEC 30134-8: Carbon Usage Effectiveness (CUE)
- EN 50600-4-9 or ISO/IEC 30134-9: Water Usage Effectiveness (WUE)

CoC No	Name	Description	Expected	Value	Framework (latest version of the standard where not specified)	Evidence
3.1.1	Group Involvement	Establish an approval board containing representatives from all disciplines including Senior Management, IT, M&E Engineering, Applications/Software and Procurement. Require the approval of this group for any significant decision to ensure that the impacts of the decision have been properly understood and an effective solution reached. For example, this could include the definition of standard IT hardware lists through considering the M&E implications of different types of hardware. This group could be seen as the functional equivalent of a change board.	Entire Data Centre	5	The organisation shall establish an approval board that meets on a regular basis and shall contain representatives from all disciplines including Senior Management, IT, M&E Engineering, Applications/Software and Procurement. The organisation shall require the approval of this group for any significant decision to ensure that the impacts of the decision have been properly understood and an effective solution reached. For example, this could include the definition of standard IT hardware lists through considering the M&E implications of different types of hardware. This group could be seen as the functional equivalent of a change board. The meeting minutes shall be documented. Note: the frequency of the meetings shall be at the descretion of the organisation, but should be once every 3 months. tThe agenda should also be at the descretion of the organisation, but should include, but not be limited to the following, Attendees, Agenda, Items for discussion, Actions arising, AOB.	Evidence would be copies of the approval board minutes including circulation list.
3.2.1	Consider the embodied environmental impact of installed devices	Carry out an audit of existing equipment to maximise any unused existing capability by ensuring that all areas of optimisation, consolidation and aggregation are identified prior to new material investment. The most important element to this in terms of impact is the IT equipment. The severity of impact is related to the frequency of refresh and replacement.	Entire Data Centre	3	The organisation shall carry out and document an audit of all existing equipment to maximise any unused existing capability by ensuring that all areas of optimisation, consolidation and aggregation are identified prior to new material investment. Note: The severity of impact is related to the frequency of refresh and replacement.	Audit Documents
3.2.2	Mechanical and electrical equipment environmental operating ranges	Recommend the selection and deployment of mechanical and electrical equipment which does not itself require additional cooling beyond standard office room cooling in normal operation (the exception to this being some UPS batteries). Note: Some UPS batteries require to be kept at lower temperatures to preserve performance and reliability and to maximise operational lifetime.	New build or retrofit	4	The organisation shall recommend the selection and deployment of mechanical and electrical equipment which does not itself require additional cooling beyond standard office room cooling in normal operation. Note: the exception to this being some UPS batteries. Some UPS batteries require to be kept at lower temperatures to preserve performance and reliability and to maximise operational lifetime.	Design & Procurement Documents
3.2.4	Life Cycle Assessment	Introduce a plan for Life Cycle Assessment (LCA) in accordance with EU guidelines and internationally standardised methodologies. Examples of which would be ISO 14040 and ISO 14044. EN 15978 'Sustainability of construction works - assessment of environmental performance of buildings - calculation method' is also a standard that is considered relevant to this Practice. Note: This Practice aims to reduce overall carbon footprint and improve sustainability rather than directly improve energy efficiency. A list of recommended environmental sustainability practices is available in the CEN/CENELEC document CLC/TR 50600-99-2.	New build or retrofit	3	The organisation shall introduce a plan for Life Cycle Assessment (LCA) in accordance with EU guidelines and internationally standardised methodologies. Note: Examples are notably the latest version of EN ISO 14040, EN ISO 14044, EN 15978 "'Sustainability of construction works – assessment of environmental performance of buildings – calculation method' is also a standard that is considered relevant to this Practice. Note: This Practice aims to reduce overall carbon footprint and improve sustainability rather than directly improve energy efficiency. A list of recommended environmental sustainability practices is available in the latest version of CEN/CENELEC document CLC/TR 50600-99-2.	LCA documents
3.2.5	Environmental Management	Introduce a plan for Environmental Management in accordance with emerging EU guidelines and internationally standardised methodologies. An example of which would be ISO 14001. Consider appointing a cross functional Environmental Sustainability Manager to take responsibility for this initiative.	Entire Data Centre	3	The organisation shall introduce a plan for Environmental Management in accordance with emerging EU guidelines and internationally standardised methodologies, for example EN ISO 14001. The organisation shall consider appointing a cross-functional Environmental Sustainability Manager to take responsibility for this initiative. Note: this practice can be fullfilled by implementation of practice 326.	ISO 14001 or Equivalent Documents or Certificate
3.2.6	Energy Management	Introduce a plan for Energy Management in accordance with emerging EU guidelines and internationally standardised methodologies. An example of which would be ISO 50001. Note: The Code of Conduct can be used effectively to underpin the expectations and reporting requirements specifically for data centres in relation to ISO 50001. Consider appointing a cross functional Energy Manager to take responsibility for this initiative.	Entire Data Centre	3	The organisation shall introduce a plan for Energy Management in accordance with emerging EU guidelines and internationally standardised methodologies, for example EN ISO 50001. Note: The Code of Conduct can be used effectively to underpin the expectations and reporting requirements specifically for data centres in relation to EN ISO 50001. The organisation Consider appointing a cross functional Energy Manager to take responsibility for this initiative. Note: this practice can be fullfilled by implementation of practice 325.	ISO50001 or Equivalent Documents or Certificate.
3.2.7	Asset Management	Ensure that Asset Management for both IT and mechanical and electrical assets etc. is implemented and controlled according to a standard and accepted methodology. An example of which would be ISO 55000. Understanding the numbers, types and purposes of the assets deployed in a datacentre underpins effective energy management.	Entire Data Centre	3	The organisation shall ensure that Asset Management for both IT as well as mechanical and electrical assets is implemented and controlled according to a standard and accepted methodology. Note: ISO 55000 is relevant. Note: Understanding the numbers, types and purposes of the assets deployed in a data centre underpins effective energy management.	ISO55000 or equivalent documents. Certificate or review of Asset Management System

CoC No	Name	Description	Expected	Value	Framework (latest version of the standard where not specified)	Evidence
3.2.8	Sustainable energy usage	Consider the proportion of energy used by the data centre that comes from renewable /sustainable sources. Recording and reporting on the proportion of sustainable / renewable energy used against the overall energy consumption is expected to become an expected monitoring and reporting requirement in time. Note: Standardised metrics in this area are available as EN 50600-4-3 or ISO/IEC30134-3. EN 50600 4-3 "Information technology —Data centre facilities and infrastructures —Part 4-3: Renewable Energy Factor" specifies the "Renewable Energy Factor, REF" as the ratio of the renewable energy (in kWh) to the total energy consumption (in kWh). Note: REF covers all renewable energy purchased from the utility (with guarantee of origin) and produced on-site. However,renewable energy produced on-site, that is not consumed on-site and partly or in total sold to the grid, shall be excluded from REF. Note: CLC/TR 50600-99-1 and CLC/TR50600-99-2 address Best Practices for Data Centre Energy Efficiency and Environmental Sustainability respectively. Both are a part of the European EN 50600 Standard series. Note: The EN 50600 series has now been adopted by ISO/IEC as ISO/IEC TS 22237. Note: ETSI EN 305 200-3-1 KPIREN KPI excludes both energy from grid and energy not consumed on site, in conformance with net zero initiatives.	Entire Data Centre	1	The organisation shall consider, report and document the proportion of energy used by the data centre that comes from renewable/sustainable sources. Recording and reporting on the proportion of sustainable/renewable energy used against the overall energy consumption is expected to become an expected monitoring and reporting requirement in time. Note 1: Standardised metrics in this area are available, such as EN 50600-4-3. EN 50600-4-3 "Information technology — Data centre facilities and infrastructures — Part 4-3: Renewable Energy Factor" specifies the Renewable Energy Factor, CLC/TR 50600-99-1 and CLC/TR 50600-99-2 address "Best Practic+G34es for Data Centre Energy Efficiency" and "Environmental Sustainability" respectively. Note 2: EN 50600-1, EN 50600-2-X and EN 50600-3-1 have been adopted by ISO/IEC as ISO/IEC TS 22237. Note: ETSI EN 305 200-3-1 KPIREN KPI excludes both energy from grid and energy not consumed on site, in conformance with net zero initiatives.	Documents relating to the procurement of sustainable energy/Renewable energy certificate from Supplier/ DCiM/BMS/EMS information showing REF values
3.2.12	Monitor and manage air quality	Ensure that air quality is monitored and managed to ensure that critical equipment is not damaged by particulates or corrosive elements which might impact both IT equipment and cooling equipment in terms of performance, energy efficiency and reliability. This should inform the choice of filters used and the planned replacement schedule as well as the frequency of routine technical cleaning programme (including underfloorand ceiling void areas if applicable). Filter choices should be informed by ISO16890-1. Note: The ASHRAE white paper '2011 Gaseous and Particulate Contamination Guidelines for Data Centers' recommends that data centre air quality is monitored and cleaned according to ISO 14644-8 Class 8. This can be achieved by routine technical cleaning and simple filtration. Note: Airborne Contaminants including gaseous contaminants should be managed according to ANSI/ISA 71.04-2013.	Entire Data Centre	2	The organisation shall ensure that air quality is monitored and managed to ensure that critical equipment is not affected by particulates or corrosive elements which might impact both IT equipment and cooling equipment in terms of performance, energy efficiency and reliability. This should inform the choice of filters used and the planned replacement schedule as well as the frequency of routine technical cleaning programme (including underfloor and ceiling void areas if applicable). Filter choices should be informed by EN ISO 16890-1. Note 1: The ASHRAE white paper '2011 Gaseous and Particulate Contamination Guidelines for Data Centers' recommends that data centre air quality is monitored and cleaned according to EN ISO 14644-8, Class 8. This can be achieved by routine technical cleaning and simple filtration. Note 2: Airborne Contaminants including gaseous contaminants should be managed according to ANSI/ISA 71.04-2013.	Air Quality Management Documents, Service records
3.2.13	Consider technical areas of data centres as industrial space	The data centre technical areas and plant rooms should be considered as an industrial space, designed built and operated with the single primary objective of delivering high availability IT services reliably and efficiently. Note: This objective aims to prevent the energy efficiency of the technical space being compromised by the need for human comfort other than to comply with local statutory requirement and law (Health and Safety etc.). Note: Data Centres are primarily technical spaces, not office space, and should therefore only require the control make up air volumes and environmental conditions to pressurise the spaces in order avoid ingress of particles and contaminants rather than for seated human comfort. This only relates to those areas of the centre intended to hold operational IT equipment or supporting mechanical or electrical infrastructure. These areas should not contain desks or workstations. Note: This is not intended to reduce or impose conditions on dedicated and purpose built office space within the data centre building.	Entire Data Centre	3	The data centre technical areas and plant rooms shall be considered as an industrial space, designed, built and operated efficiently for ICT equipment rather than for human comfort. Note: This objective aims to prevent the energy efficiency of the technical space being compromised by the need for human comfort other than to comply with local statutory requirement and law (Health and Safety etc.). Note: Data Centres are primarily technical spaces, not office space, and should therefore only require the control make up air volumes and environmental conditions to pressurise the spaces in order avoid ingress of particles and contaminants rather than for seated human comfort. This only relates to those areas of the centre intended to hold operational IT equipment or supporting mechanical or electrical infrastructure. These areas should not contain desks or workstations. Note: This is not intended to reduce or impose conditions on dedicated and purpose-built office space within the data centre building. Note: the air quality can be monitored according to EN50600-2-3.	Visual Inspection, Design Documents and Design Brief
3.2.14	Site Documentation	Ensure that high quality, accurate O&M manuals, As-Built records, commissioning records, schematics and single lines diagrams are available in order to enable all installed infrastructure and equipment to be maintained as originally designed and operated at optimum levels of efficiency. Accurate documentation and records are essential to the correct operation and use of energy efficiency functions built-In by equipment manufacturers. Updates should be made whenever any settings are changed or equipment is added, replaced or modified. Historical records should also be kept. Effective commissioning and delivery of detailed and accurate documentation should be a key part of any project handover. Note: EN 50600-3-1 can be referenced for more detail on this area.	Entire Data Centre	3	The organisation shall ensure that high quality, accurate SOPs, MOPs, EOPs, O&M manuals, As-Built records, commissioning records, schematics and single lines diagrams are available in order to enable all installed infrastructure and equipment to be maintained as originally designed and operated at optimum levels of efficiency. Updates shall be made whenever any settings are changed or equipment is added, replaced or modified. Historical records shall also be kept. Effective commissioning and delivery of detailed and accurate documentation shall be a key part of any project handover. Note: SOPs= Standard operating procedures, MOPs=maintenance operating portocols, EOPs=emergiences operating procedures Note: EN 50600-3-1 can be referenced for more detail on this area. Note: Accurate documentation and records are essential to the correct operation and use of energy efficiency functions built-In by equipment manufacturers.	Review Site Documents, should contain O&M Manuals, Drawings, schematics and be available in digital or physical form.
3.2.15	Training and Development	Ensure the Data Centre Manager and any appointed Energy Manager has relevant and appropriate training to fulfil an energy efficiency role and have an in-depth appreciation of Best Practices (such as this Code of Conduct). Ensure that both IT and Facilities personnel are aware of Data Centre energy efficiency Best Practises (such as this Code of Conduct) in order to support organisational strategies to reduce IT energy usage. Remove silos and promote a minimum level of common understanding relating to datacentre Operations and Management. An overall training methodology should be defined and delivered to all relevant personnel in order to improve individual personal development and develop suitably qualified and experienced data centre personnel. Note: Properly trained and qualified personnel are essential to efficient data centre operation.	Entire Data Centre	3	The organisation shall ensure the Data Centre Manager and any appointed Energy Manager has relevant and appropriate training to fulfil an energy efficiency role and have an in-depth appreciation of Best Practices. The organisation shall ensure that both IT and Facilities personnel are aware of Data Centre energy efficiency Best Practices in order to support organisational strategies to reduce IT energy usage. Note: It is the intention to remove silos and promote a minimum level of common understanding related to data centre Operations and Management. An overall training methodology should be defined and delivered to all relevant personnel in order to improve individual personal development and develop suitably qualified and experienced data centre personnel. Note: Properly trained and qualified personnel are essential to an efficient data centre operation.	Training company certificates, Internal training matrix, list of participants

CoC No	Name	Description	Expected	Value	Framework (latest version of the standard where not specified)	Evidence
3.3.1	Build resilience to business requirements	Only the level of resilience and therefore availability actually justified by business requirements and impact analysis should be built or purchased in the case of a collocation customer. 2N infrastructures are frequently unnecessary and inappropriate. If only a single level of resilience is available in the data centre an increased resilience or availability for critical services might be obtained by splitting the IT platform across multiple sites and making applications resilient to the loss of an individual site.	New build or retrofit	3	The organisation shall consider and document the level of resilience and availability actually justified by business requirements and impact analysis that should be built or purchased in the case of a colocation customer. Note 1: EN 50600-1 mandates a risk analysis to determine the level of redundancy of DC infrastuctures to properly reflect the level of desired resilience and availability.	Review of Design Drawings/Project Scope
3.3.2	Consider multiple levels of resilience	It is possible to build a single data centre to provide multiple levels of power and cooling resilience to different floor areas. Many co-location providers already deliver this, for example, optional 'grey' power feeds without UPS or generator back up.	New build or retrofit	3	The organisation shall consider and document the provision of multiple levels of power and cooling resilience to different floor areas. Note: for example, optional 'grey' power feeds without UPS or generator back up.	Review of Design Drawings/Project Scope/Service Charging Models
3.3.3	Lean provisioning of power and cooling for a maximum of 18 months of data floor capacity	The provisioning of excess power and cooling capacity in the data centre drives substantial fixed losses and is unnecessary. Planning a data centre for modular (scalable) expansion and then building out this capacity in a rolling program of deployments is more efficient. This also allows the technology 'generation' of the IT equipment and supporting M&E infrastructure to be matched, improving both efficiency and the ability to respond to business requirements.	New build or retrofit	3	The organisation shall consider and document the lean provisioning of power and cooling capacity in the data centre for a maximum of 18 months of data floor capacity. Note: The provisioning of excess power and cooling capacity in the data centre drives substantial fixed losses and is unnecessary.	Review of Design Drawings/Project Scope
3.3.4	Design infrastructure to maximise part load efficiency	All areas of the data centre should be designed to maximise the energy efficiency of the facility under partial fill / partial load and variable IT electrical and cooling loads. This is in addition to one off modular provisioning and should consider the response of the infrastructure to dynamic loads.E.G. Appropriately controlled Variable Frequency (or speed) Drive for pumps, fans and compressors.	New build or retrofit	3	The organisation shall design the data centre to maximise the energy efficiency of the facility under partial fill/partial load and variable IT electrical and cooling loads. A part load strategy shall be documented. All areas of the data centre should be designed to maximise the energy efficiency of the facility under partial fill/partial load and variable IT electrical and cooling loads. Note: This is in addition to one off modular provisioning and should consider the response of the infrastructure to dynamic loads. E.G. Appropriately controlled Variable Frequency (or speed) Drive for pumps, fans and compressors.	Part load strategy document and SOPs
4.1.1	IT hardware – Power	Include the Energy efficiency performance of the IT device as a high priority decision factor in the tender process. This may be through the use of SERT (http://www.spec.org/sert/) or SPEC Power. (http://www.spec.org/power_ssj2008/results/) or similar metrics or through application or deployment of specific user metrics more closely aligned to the target environment, which may include service level or reliability components. The power consumption of the device at the expected utilisation or applied workload should be considered in addition to peak performance per Watt figures. Reference ISO/IEC 30134-4: 2017 Information technology — Data centres —Key performance indicators — Part 4: IT Equipment Energy Efficiency for servers (ITEEsv) Also ETSI - EN 303 470 Environmental Engineering (EE); Energy Efficiency measurement methodology and metrics for servers	New IT Equipment	5	When procuring IT equipment (including network equipment, servers, storage systems, etc.) an organisation shall require the manufacturer to deliver an external report, such as an associated SPECpower or SERT report or measurements based on ETSI EN 303 407 for the equipment. This report shall show the power consumption of the equipment at different utilization levels as well as in idling state.	Updated & approved IT equipment selection & procurement process & manufacturer data sheet
4.1.2	New IT hardware – Restricted (legacy) operating temperature and humidity range	If no equipment can be procured which meets the operating temperature and humidity range of Practice 4.1.3 (ASHRAE Class A2), then equipment supporting (at a minimum), the restricted (legacy) range of 15°C to 32°C inlet temperature and humidity from –12°C DP and 8% rh to 27°C DP and 80% rh may be procured. This range is defined as the ASHRAE Allowable range for Class A1 class equipment. Class A1 equipment is typically defined as Enterprise class servers (including mainframes) and storage products such as tape devices and libraries.To support the restrictive range of operation equipment should be installed in a separate area of the data floor in order to facilitate the segregation of equipment requiring tighter environmental controls as described in Practices 5.1.11, 5.1.4 and 5.1.5. In unusual cases where older technology equipment must be procured due to compatibility and application validation requirements (an example being air traffic control systems), these systems should be considered as subset of this Practice and installed so as not to restrict the operation of other equipment described above. A summary of ASHRAE environmental guidelines can be found at: https://www.ashrae.org/File%20Library/Technical%20Resources/Publication%20Errata%20and%20Updates/90577_errata.pdf	New IT Equipment	4	In such a cases when no equipment can be procured which meets the operating temperature and humidity range of ASHRAE Class A2, then the organisation shall require procurement of equipment supporting the range of ASHRAE Class A1.	Updated & approved IT equipment selection & procurement process
4.1.3	New IT hardware – Expected operating temperature and humidity range	Include the operating temperature and humidity ranges at the air intake of new equipment as high priority decision factors in the tender process. Equipment should be able to withstand and be within warranty for the full range of 10°C to 35°C inlet temperature and humidity –12°C DP and 8% rh to 27°C DP and 80% rh. This is defined by the ASHRAE Class A2 allowable temperature and humidity range. Vendors are required to publish (not make available on request) any restriction to the operating hours within this range for any model or range which restricts warranty to less than continuous operation within the allowable range. To address equipment types which cannot be procured to meet this specification exclusions and mitigation measures are provided in Practices 4.1.2 for new IT equipment, 5.1.11 for existing data centres and 5.1.4 for new build data centres. Directly liquid cooled IT devices are addressed in Practice 4.1.14. A summary of ASHRAE environmental guidelines can be found at: https://www.ashrae.org/File%20Library/Technical%20Resources/Publication%20Errata%20and%20Updates/90577_errata.pdf	New IT Equipment	5	The organisation shall include operating temperature and humidity ranges at the air intake of new equipment as a high priority decision factor in the tender process. Equipment should be able to withstand and be within warranty for the full range of the ASHRAE Class A2 allowable temperature and humidity range.	Updated & approved IT equipment selection & procurement process

CoC No	Name	Description	Expected	Value	Framework (latest version of the standard where not specified)	Evidence
4.1.5	Select IT equipment suitable for the data centre power density and cooling delivery capabilities	Select and deploy IT equipment at the designed power density (per cabinet or m²) of the data centre to avoid running the cooling system outside design parameters. Note: Increasing power density may create cooling and air flow management problems reducing both capacity and efficiency. Power and cooling need to be considered as capacity constraints in addition to physical space as referenced in Practice 5.5.6.	New IT Equipment	3	The organisation shall have data center design documents that define the power density requirement. The power density requirements shall be considered during provisioning. Note: Increasing power density may create cooling and air flow management problems reducing both capacity and efficiency.	Updated and approved data center design document
4.1.6	IT equipment power usage against inlet temperature	When selecting new IT equipment require the vendor to supply at minimum the total system power for a range of temperatures covering the full allowable inlet temperature range for the equipment at 100% load on a specified recognised benchmark such as Linpack, SERT (http://www.spec.org/sert/) or SPEC Power http://www.spec.org/power_ssj2008/). Data should be provided for 5°C or smaller steps of inlet temperature. As a minimum comply with the EU EcoDesign Directive and Lot 9 amendments to EU Commission regulation for servers and online storage systems. Considered optional but recommended; Total system power covering the full allowable inlet temperature range under 0% and 50% load on the selected benchmark. These sets of data shown easily in a single table and single chart will allow a data centre operator to select equipment to meet their chosen operating temperature range without significant increase in power consumption. This Practice is intended to improve the thermal performance of IT equipment by allowing operators to avoid devices with compromised cooling designs and creating a market pressure toward devices which operate equally well at increased intake temperature. Consider referencing and using the current U.S. EPA ENERGY STAR specifications for Servers. Consider referencing and using the current U.S. EPA ENERGY STAR specifications for Data Center Storage.	New IT Equipment	5	Organisations shall require the suppliers of IT equipment to deliver a report on the total power consumption of the system at different inlet temperature levels (in 5°C intervals) or as an alternative, supplement the SPECpower, SERT or EN 303 470 reports with such overview of system power use at different inlet temperature intervals (in 5°C intervals).	Updated & approved IT equipment selection & procurement process
4.1.7	Select equipment suitable for the data centre - Air flow direction	When selecting equipment for installation into cabinets ensure that the air flow direction matches the air flow design for that area. This is commonly front to rear or front to top. If the equipment uses a different air flow direction to that defined for the area into which it is installed (such as right to left when the cabinet is intended to be front to back) it should only be used with a correction mechanism such as ducts, or special cabinets that divert the air flow to the defined direction. Equipment with non-standard air flow will compromise the air flow management of the data centre and therefore restrict the ability to increase temperature set points. It is possible to mitigate this issue by segregating such equipment according to Practices 5.1.11, 5.1.4 and 5.1.5.	New IT Equipment	5	Organisations shall require suppliers to deliver equipment that has an airflow direction which matches the data center design. If the equipment does not match the design, it should only be used with a correction mechanism in place, such as ducts or special cabinets that divert airflow in the desired direction.	Updated & approved IT equipment selection & procurement process; Updated guidelines for installing IT equipment in cabinets
4.1.8	Enable power management features	Formally change the deployment process to include the enabling of power management features on IT hardware as it is deployed. This includes BIOS, operating system and driver settings.	New IT Equipment	5	Organisations which own and deploy their own IT & networking equipment shall ensure that power management features are enabled in the Basic Input Output System (BIOS) settings or Unified Extensible Firmware Interface (UEFI), operating systems and driver settings of all equipment that has those features available. For organisations that install IT equipment on behalf of 3rd parties, the terms of service or contracts shall require the customers to enable power management features in the BIOS or ask the vendor to do so on their behalf. When IT equipment is installed for the first time, power management features shall be enabled and documented irrespective of the ownership of the equipment. Note: exceptions need to be documented.	Updated IT deployment & configuration process OR updated terms of service and/or customer contracts and documentation of the power management features of each equipment item and list of exceptions
4.1.9	Provision only to the actual IT power usage required	Provision power and cooling only to the planned power draw of the IT equipment as configured (based on the components actually installed), rather than the Power Supply Unit (PSU) size or nameplate rating. This is intended to avoid over-sizing of electrical infrastructure resulting in a low (partial) load and therefore inefficient operation. Note: This may require changes to the provisioning if the IT equipment performance is increased or upgraded.	New IT Equipment	3	The organisation designing or retrofitting a new space shall provision power and cooling only to the planned power draw of the IT equipment as configured (based on the components actually installed), rather than the PowerSupply Unit (PSU) or nameplate rating.	Updated and approved data center design document
4.1.10	EU Eco Design / Energy Star compliant hardware	As a minimum comply with the EU EcoDesign Directive and Lot 9 amendments to EU Commission regulation for servers and online storage systems. The Energy Star Labelling programs for IT equipment should be used as a guide to server selection where and when available for that class of equipment. Operators who are able to determine the in-use energy efficiency of hardware through more advanced or effective analysis should selectthe most efficient equipment for their scenario. This Practice should be in line with the current U.S. EPA ENERGY STAR specifications for Servers. Additionally reference and use the current U.S. EPA ENERGY STAR specifications for Data Center Storage.	New IT Equipment	4	The organisation shall procure IT equipment which has the highest efficiency in power usage for their given scenario, meeting as a minimum the Eco-design requirement, using ETSI EN 303 470 or the ISO/IEC 21836 as the measurement methodology. ENERGY STAR specifcation can be used as a reference, and organisations shall conduct their own analysis to identify the equipment with the highest efficiency.	Updated & approved IT equipment selection & procurement process

CoC No	Name	Description	Expected	Value	Framework (latest version of the standard where not specified)	Evidence
4.1.11	Energy & temperature reporting hardware	Select equipment with power and inlet temperature reporting capabilities, preferably reporting energy used as a counter in addition to power as a gauge. Where applicable, industry standard reporting approaches should be used such as IPMI, DMTF Redfish and SMASH. To assist in the implementation of temperature and energy monitoring across abroad range of data centres all devices with an IP interface should support one of;□ SNMP polling of inlet temperature and power draw. Note that event based SNMP traps and SNMP configuration are not required□ IPMI polling of inlet temperature and power draw (subject to inlet temperature being included as per IPMI or Redfish) □ An interface protocol which the operators' existing monitoring platform is able to retrieve inlet temperature and power draw data from without the purchase of additional licenses from the equipment vendor The intent of this Practice is to provide energy and environmental monitoring of the data centre through normal equipment churn.	New IT Equipment	3	Organisations shall require that the equipment delivered by suppliers is capable of delivering power usage information as well as inlet temperature information via machine-readable interfaces, such as IPMI, DMTF Redfish or SMASH. This interface should be available through an IP based interface and support SNMP polling. Accessing the aforementioned interfaces should not require additional hardware, licenses or software by the vendor but rather should be open standards for integration with existing monitoring systems. As an alternative, the equipment vendor may provide a configuration interface to define an endpoint to which the same metering information is pushed/sent instead of offering a poll-based mechanism. This should still adhere to the SNMP protocol or another open protocol.	Updated & approved IT equipment selection & procurement process
4.1.12	Control of equipment energy use	Select equipment which provides mechanisms to allow the external control of its energy use. An example of this would be the ability to externally restrict a server's maximum energy use or trigger the shutdown of components, entire systems or sub-systems. Consider the use of user defined policies.	Optional	5	Organisations shall require equipment suppliers to provide functionality to reduce the energy use of equipment and sub-systems within the equipment (e.g. disabling functionality) through programmatic and machine-accessible interfaces (APIs), where possible without vendor specific software or additional equipment being required.	Updated & approved IT equipment selection & procurement process
4.1.13	When forced to use select free standing equipment suitable for the data centre – Airflow direction	If no alternative is available select equipment which is free standing or supplied in custom cabinets so that the air flow direction of the enclosures match the airflow design in that area of the data centre. This is commonly front to rear or front to top. Specifically the equipment should match the hot / cold aisle layout or containment scheme implemented in the facility. Equipment with non-standard air flow can compromise the air flow management of the data centre and restrict the ability to raise temperature set points. It is possible to mitigate this compromise by segregating such equipment according to Practices 5.1.11, 5.1.4 and 5.1.5 Note: Try to avoid free standing equipment as it usually does not allow a well organised airflow through the data centre especially if the major part of the room is equipped with well organised IT equipment mounted in cabinets.	New IT Equipment	4	The organisation shall have an approved data centre design principle document, that also deals with free-standing equipment. If no alternative is available select equipment which is free standing or supplied in custom cabinets so that the air flow direction of the enclosures match the airflow design in that area of the data centre. This is commonly front to rear or front to top.Specifically the equipment should match the hot/cold aisle layout or containment scheme implemented in the facility. Equipment with non-standard air flow can compromise the air flow management of the data centre and restrict the ability to raise temperature set points. It is possible to mitigate this compromise by segregating such equipment according to Best Practices 5.1.4, 5.1.5, and 5.1.11 of this Framework. Note: Try to avoid free standing equipment as it usually does not allow a well organised airflow through the data centre especially if the major part of the room is equipped with well organised IT equipment mounted in cabinets.	Updated and approved data center design document
4.1.15	AC/DC Converter efficiency	Select IT equipment containing high efficiency AC/DC power converters. These should be rated at 90% power efficiency or better across the range of loads expected for the equipment to be installed. Reference ISO/IEC 30134-4: 2017 Information technology — Data centres —Key performance indicators — Part 4: ITEquipment Energy Efficiency for servers (ITEEsv) Also ETSI - EN 303 470 Environmental Engineering (EE); Energy Efficiency measurement methodology and metrics for servers. This Practice should also be implemented in line with the IEC 62040-5 standard.	New IT Equipment	3	Organisation shall include high-efficiency Power Supply Units (PSUs), with at least a rated efficiency of 90% or better (80 PLUS Platinum) as part of their equipment selection process. Note: Also ETSI - EN 303 470 Environmental Engineering (EE); Energy Efficiency measurement methodology and metrics for servers. This Practice should also be implemented inline with EN 62040-5-3.	Updated & approved IT equipment selection & procurement process
4.2.1	Deploy Virtualisation technologies	Processes should be put in place to require senior business approval for any new service that requires dedicated hardware and will not run on a resource sharing platform. This applies to servers, storage and networking aspects of the service.	New IT Equipment	5	The organisation shall implement a capacity management process which handles non-virtualised hardware. Within the process, the use of non-virtualised hardware is an exception and requires senior business approval.	Approved capacity management processes
4.2.2	Reduce IT hardware resilience level	Determine the business impact of service incidents for each deployed service and deploy only the level of hardware resilience that is fully justified. Ensure that the IT hardware resilience level is agreed by the application owners.	New IT Equipment	4	The organisation shall have a service design document which contains the contractual obligations and the required service availbility.	Approved service design document
4.2.3	Reduce hot / cold standby equipment	Determine the business impact of service incidents for each IT service and deploy only the level of Business Continuity / Disaster Recovery stand by IT equipment and resilience that is fully justified by the business impact.	New IT Equipment	4	The organisation shall have a service design document which contains the contractual obligations and the required service availbility.	Approved design document
4.2.4	Select efficient software	Make the energy use performance of the software a primary selection factor. Whilst forecasting and measurement tools and methods are still being developed, approximations could be used such as the (under load) power draw of the hardware required to meet performance and availability targets. This is an extension of existing capacity planning and benchmarking processes. See "Further development of software efficiency definitions" in section 11.	New Software	5	The organisation shall, when procuring third-party software, make the energy use performance of the software a primary selection factor. Whilst forecasting and measurement tools and methods are still being developed, approximations could be used such as the (under load) power draw of the hardware required to meet performance and availability targets. This is an extension of existing capacity planning and benchmarking processes. See "Further development of software efficiency definitions" in section 11 of the Code of Conduct.	Updated procurement guidelines for purchasing external software (Software-as-a-Service, Cloud Services, On-Premise Software)

CoC No	Name	Description	Expected	Value	Framework (latest version of the standard where not specified)	Evidence
4.2.5	Develop efficient software	Make the energy use performance of the software a major success factor of the project. Whilst forecasting and measurement tools and methods are still being developed approximations, could be used such as the (under load) power draw of the hardware required to meet performance and availability targets. This is an extension of existing capacity planning and benchmarking processes. Performance optimisation should not be seen as a low impact area to reduce the project budget. See “Further development of software efficiency definitions” in section 11.	New Software	5	The organisation shall make the energy use performance of the software a primary development factor. Whilst forecasting and measurement tools and methods are still being developed, approximations could be used such as the (under load) power draw of the hardware required to meet performance and availability targets. This is an extension of existing capacity planning and benchmarking processes. See “Further development of software efficiency definitions” in section 11 of the Code of Conduct.	Updated software development guidelines for the internal IT organisations which include required practices on environmental impact & energy use reporting for internal- and external-use.
4.2.6	Incentives to develop efficient software	If software development is being outsourced then include the energy use of the software in the bonus / penalty clauses of the contract. Whilst forecasting and measurement tools and methods are still being developed approximations, could be used such as the (under load) power draw of the hardware required to meet performance and availability targets. This is an extension of existing capacity planning and benchmarking processes. Performance optimisation should not be seen as a low impact area to reduce the project budget. See “Further development of software efficiency definitions” in section 11.	Optional	5	Make the energy use performance of the software a major success factor of the project. Whilst forecasting and measurement tools and methods are still being developed approximations, could be used such as the (under load) power draw of the hardware required to meet performance and availability targets. This is an extension of existing capacity planning and benchmarking processes. Performance optimisation should not be seen as a low impact area to reduce the project budget. See “Further development of software efficiency definitions” in section 11 of the Code of Conduct.	Updated procurement guidelines for third-party software development, maintenance and management services.
4.3.1	Audit existing physical and service estate	Audit the existing physical and logical estate to establish what equipment is in place and what service(s) it delivers. Consider the implementation of an ITIL type Configuration Management Data base and Service Catalogue. A useful standard and reference to use in support of this Practice could be ISO 55000 See Practice 3.2.7.	Entire Data Centre	5	Organisations shall maintain a catalogue which specifies which physcial equipment is delivering which digital service, application or storage space. Note: organisations can consider ISO 55000 as well as ITIL type configuration management systems.	A configuration & asset database exists and is frequently updated. All physical equipment is allocated to at least one application, service or storage.
4.3.2	Decommission and remove unused equipment	Completely decommission and remove any equipment that is not required or used to support services no longer in use. Installed hardware should be regularly examined to ensure that it is still required and is supporting active services. Ensure the decommissioning and removal of test and development platforms once no longer needed.	Entire Data Centre	5	The organisation shall completely decommission and remove any equipment that is not required or used to support services no longer in use. Installed hardware should be regularly examined to ensure that it is still required and is supporting active services. Ensure the decommissioning and removal of test and development platforms once no longer needed. The organisation shall document the IT equipment and their usage and use that report on decision on decommissioning.	IT monitoring system reporting the average utilization rate per server over set time periods is available. Updated guidelines on how idling equipment should be treated and optimized.
4.3.3	Virtualise and archive legacy services	Servers or services which cannot be decommissioned for compliance or other reasons but which are not used on a regular basis should be virtualised and then the disk images archived to a low power media. These services can then be brought online when genuinely required.	Optional	5	The organisation shall ensure that servers or services which cannot be decommissioned for compliance or other reasons but which are not used on a regular basis should be virtualised and then the disk images archived to a low power media. These services can then be brought online when genuinely required. The organisation shall have a process to virtualize and archive any non-essential servers/services to low power media.	Documented process.
4.3.4	Consolidation of existing services	Existing services that do not achieve high utilisation of their hardware should be consolidated through the use of resource sharing technologies to improve the use of physical resources. This applies to servers, storage and networking devices.	Entire Data Centre	5	The organisation shall consolidate services that do not achieve high utilisation through the use of resource sharing technologies to improve the use of physical resources. This applies to servers, storage and networking devices.	IT monitoring system reporting the average utilization rate per server over set time periods is available. Updated guidelines on how idling equipment should be treated and optimized.
4.3.5	Decommission of low business value services	Identify services whose business value or criticality is low and that do not justify the financial or environmental overhead. Consider decommissioning or archiving these services or remove to locations with less reliability / resilience to reduce energy and financial overhead.	Entire Data Centre	4	The organisation shall decommission, archive or move to locations with less reliability/resilience any services with less business value and criticality and without justifying financial and environmental overhead.	A report on the business value, criticality and the financial overhead of the services is available. Updated guidelines on how less critical equipment should be treated and optimized.

CoC No	Name	Description	Expected	Value	Framework (latest version of the standard where not specified)	Evidence
4.3.6	Shut down and consider removal of idle equipment	Servers, networking and storage equipment that is idle for significant time and cannot be virtualised or archived should be shut down or put into a low power 'sleep' state. Complete removal should also be considered. Note: It will be necessary to validate the ability of legacy applications and hardware to survive these state changes without loss of function or reliability.	Entire Data Centre	4	The organisation shall identify servers, networking and storage equipment that are idle for significant time and those that cannot be virtualised or archived should be shut down or put into a low power 'sleep' state. Complete removal should also be considered. Note: It will be necessary to validate the ability of legacy applications and hardware to survive these state changes without loss of function or reliability. The organisation should either remove, put into sleep-mode or virtualize equipment which is idling significantly (total resource utilization of memory, storage and CPU less than <25% over a 30 day period). Legacy applications should be migrated to a virtualized environment or archived if they lead to significant equipment being kept available but left idling.	IT monitoring system reporting the average utilization rate per server over set time periods is available. Updated guidelines on how idling equipment should be treated and optimized. Project documentation.
4.3.8	Audit of existing IT equipment environmental requirements	Identify the allowable intake temperature and humidity ranges for existing installed IT equipment. Equipment with restrictive intake temperature ranges should be identified so that it may be either marked for replacement with newer equipment capable of a wider intake range or moved and dealt with according to Practices "Equipment segregation" (5.1.11) and "Separate environmental zones" (5.1.4 and 5.1.5).	Entire Data Centre	4	The organisation shall identify the allowable intake temperature and humidity ranges for existing installed IT equipment. Equipment with restrictive intake temperature ranges shall be identified so that it should be either marked for replacement with newer equipment capable of a wider intake range or moved and dealt with according to Best Practices "Separate environmental zones" (5.1.4 and 5.1.5) and "Equipment segregation" (5.1.11) of this Framework . The organisation shall create a report on the operating environmental ranges of devices.	Environmental range report
4.4.1	Data management policy	Develop a data management policy to define which data should be kept, for how long and at what level of protection. Communicate the policy to users and enforce. Particular care should be taken to understand the energy consumption impact of any data retention requirements.	Entire Data Centre	3	The organisation shall develop a data management policy to define which data should be kept, for how long and at what level of protection. Communicate the policy (via an acceptable use policy or storage policy) to users and enforce. Particular care should be taken to understand the energy consumption impact of any data retention requirements. The organisation shall implement a retention- & energy-based data management strategy which should support user-level requirement setting on retention duration, priority, redundancy etc. Each user shall receive reporting on their data usage as well as the associated energy- and resource-utilization.	Data policy & configuration system is accessible for users in the organisation. Reporting on the energy-usage of storage space is available to users on a monthly basis. Data storage options are available that can respond to user & policy requirements.
5.1.1	Design – Hot / Cold aisle	As the power densities and airflow volumes of IT equipment have increased it has become necessary to ensure that equipment shares an airflow direction, within the cabinet, in adjacent cabinets and across aisles.The hot / cold aisle concept aligns equipment air flow to create aisles between cabinets that are fed cold air from which all of the equipment draws intake air in conjunction with hot aisles with no cold air feed to which all equipment exhausts air. Reinforce Hot / Cold aisle design with empty but fully blanked cabinets (or solid doors) rather than leaving gaps in aisles.	New IT Equipment and New build or retrofit	5	The organisation shall adopt a hot & cold airflow management concept. Note: the intention is to align equipment air flow to create aisles between cabinets that are fed cold air from which all of the equipment draws intake air in conjunction with hot aisles with no cold air feed to which all equipment exhausts air. Reinforce Hot/Cold aisle design with empty but fully blanked cabinets (or solid doors) rather than leaving gaps in aisles.	Approved data centre operation procedures document, data from BMS, EMS and DCiM if in use, physical inspection and updated Design documents
5.1.2	Design – Contained hot or cold air	There are a number of design concepts whose basic intent is to contain and separate the cold air from the heated return air on the data floor; - Hot aisle containment - Cold aisle containment - Contained cabinet supply, - Contained room return and room supply. - Contained cabinet return, and cabinet chimneys. - Contained cabinet supply, Contained cabinet return. Note: Failure to contain air flow results in both a reduction in achievable cooling efficiency and an increase in risk. Changes in IT hardware and IT management tools mean that the airflow and heat output of IT devices is no longer constant and may vary rapidly due to power management and workload allocation tools. This may result in rapid changes to data floor airflow pattern and IT equipment intake temperature which cannot be easily predicted or prevented. This Practice supersedes Practice 5.1.1 when implemented.	New build or retrofit	5	The organisation shall adapt these data centre design concepts that contain hot and cold air. Note: Examples include: - Hot aisle containment - Cold aisle containment - Contained cabinet supply, - Contained room return and room supply. - Contained cabinet return, and cabinet chimneys. - Contained cabinet supply, Contained cabinet return - Reardoor cooling	Approved data centre operation procedures document, data from BMS, EMS and DCiM if in use, physical inspection and updated Design documents
5.1.3	Design – Contained hot or cold air – Retrofit	Where hot / cold aisle separation is already in use but there is no containment of hot or cold air it is possible to retrofit to provide basic separation for example using curtains or other methods. Care should be taken to assess and verify fire system requirements and regulations.	New build or retrofit	4	Where hot/cold aisle separation is already in use but there is no containment of hot or cold air, the organisation shall retrofit to provide basic separation for example using curtains or other methods. Note: Care should be taken to assess and verify fire system requirements and regulations.	Approved data centre operation procedures document, data from BMS, EMS and DCiM if in use, physical inspection and updated Design documents
5.1.4	Cabinet air flow management – Blanking Plates	Installation of blanking plates where there is no equipment to reduce hot air re-circulating through gaps in the cabinet. This reduces air heated by one device being ingested by another device, increasing intake temperature and reducing efficiency.	Entire Data Centre	4	The organisation shall have processes (during provisioning and data centre operation) to install blanking plates where there is no equipment to reduce hot air re-circulating through gaps in the cabinet.	Approved data centre operation procedures document, data from BMS, EMS and DCiM if in use, physical inspection and updated Design documents
5.1.5	Cabinet air flow management – Other openings	Installation of aperture brushes (draught excluders) or cover plates to cover all air leakage opportunities in each cabinet. This includes;□ floor openings at the base of the cabinet□ Gaps at the sides, top and bottom of the cabinet between equipment or mounting rails and the perimeter of the cabinet	New build or retrofit	3	The organisation shall have processes (during provisioning and data centre operation) to install aperture brushes (draught excluders) or cover plates to cover all air leakage opportunities in each cabinet. Note: This includes floor openings at the base of the cabinet, Gaps at the sides, top and bottom ofthe cabinet between equipment or mounting rails and the perimeter of the cabinet. Not limited to aperture brushes, but blankings shades, cabinet side panel, cool boots, cool air inlet ducts and sealed outlets.	Approved data centre operation procedures document, data from BMS, EMS and DCiM if in use, physical inspection and updated Design documents

CoC No	Name	Description	Expected	Value	Framework (latest version of the standard where not specified)	Evidence
5.1.6	Provide adequate free area on cabinet doors	Solid doors should be replaced (where cooling ventilation is necessary), with perforated doors to ensure adequate cooling airflow. Solid doors impede the cooling airflow and promote recirculation within the enclosed cabinet increasing equipment inlet temperatures. ISO/IEC 14763-2 recommends a minimum of at least 66% perforated area. 80% is considered an ideal target by other authorities.	New IT Equipment New build or retrofit	3	The organisation shall have processes (during provisioning and data centre operation) to install perforated doors to ensure adequate cooling airflow. Note: Solid doors impede the cooling airflow and promote recirculation within the enclosed cabinet increasing equipment inlet temperatures. EN 50174-2 recommends a minimum of at least 66% perforated area. 80% is considered an ideal target by other organisations.	Approved data centre operation procedures document, data from BMS, EMS and DCiM if in use, physical inspection and updated Design documents
5.1.7	Raised floor air flow management	Close all unwanted apertures in the raised floor. Review placement and opening factors of vented tiles to reduce bypass. Maintain unbroken rows of cabinets to prevent re-circulated air. If necessary fill with empty fully blanked cabinets. Managing unbroken rows is especially important in hot and cold aisle environments. Any opening between the aisles will degrade the separation of hot and cold air.	Entire Data Centre	3	The organisation shall have processes (during provisioning and data centre operation) to Close all unwanted apertures in the raised floor. Note: Review placement and opening factors of vented tiles to reduce bypass. Maintain unbroken rows of cabinets to prevent re-circulated air. If necessary fill with empty fully blanked cabinets. Managing unbroken rows is especially important in hot and cold aisle environments. Any opening between the aisles will degrade the separation of hot and cold air.	Approved data centre operation procedures document, data from BMS, EMS and DCiM if in use, physical inspection and updated Design documents
5.1.8	Raised floor air flow management – Obstructions	Review the placement and level of obstruction created by cabling, cable trays and other structures in the airflow paths, these obstruct airflow and create turbulence, increasing the resistance and increasing the energy requirements of air movement and may increase velocities, causing negative pressure. Ensure that the under-floor area is as free of obstructions as possible. The use of overhead cabling trays can substantially reduce the level of obstruction.	Entire Data Centre	3	The organisation shall have processes (during provisioning and data centre operation) to review the placement and level of obstruction created by cabling, cable trays and other structures in the air flow paths. Note: these obstruct airflow and create turbulence, increasing the resistance and increasing the energy requirements of air movement and may increase velocities, causing negative pressure. Ensure that the under-floor area is as free of obstructions as possible. The use of overhead cabling trays can substantially reduce the level of obstruction.	Approved data centre operation procedures document, data from BMS, EMS and DCiM if in use, physical inspection and updated Design documents
5.1.11	Equipment segregation	Deploy groups of equipment with substantially different environmental requirements and / or equipment airflow direction in a separate area. Where equipment has different environmental requirements it is preferable to provide separate environmental controls.This objective of this Practice is to address the issue of the data centre cooling plant settings being constrained by the equipment with the most restrictive environmental range or poor air flow control as this compromises the efficiency of the entire data centre. Note: This Practice applies to IT, mechanical and electrical equipment installed in the datacentre.	New IT Equipment and New build or retrofit	3	The organisation shall deploy groups of equipment with substantially different environmental requirements and/or equipment airflow direction in a separate area, where available.	Approved data centre operation procedures document, data from BMS, EMS and DCiM if in use, physical inspection and updated Design documents
5.1.12	Control of supplied air flow volume minimizing over pressure	Investigate operating cooling unit fans to ensure a slight oversupply of air compared to IT equipment flow demand to minimise recirculation whilst avoiding oversupply of air volume (results in bypass and fan energy wastage). This principle is particularly applicable contained systems. In contained air systems, ensure that there is a slightly positive pressure (preferably no more than 5Pa) in the cold air stream with respect to the hot air stream.	New build or retrofit	3	The organisation shall set operating setpoints for cooling unit fans in a way to ensure only a slight oversupply of air compared to IT equipment flow demand to minimise recirculation whilst avoiding oversupply of air volume (results in bypass and fan energy wastage). Note: This principle is particularly applicable in containement systems. In contained air systems, ensure that there is a slightly positive pressure (preferably no more than 5 Pa) in the cold air stream with respect to the hot air stream.	Approved data centre operation procedures document, data from BMS, EMS and DCiM if in use, physical inspection and updated Design documents
5.2.2	Shut down unnecessary cooling equipment	If the facility is not yet fully populated or space has been cleared through consolidation non variable plant such as fixed speed fan CRAC / CRAH units shall be turned off in the empty areas. Note: This should not be applied in cases where operating more plant at lower load is more efficient, e.g. variable speed drive CRAC / CRAH units.	Entire Data Centre	4	If the facility is not yet fully populated or space has been cleared through consolidation, the organisation shall turn off non variable systems/devices such as fixed speed fan CRAC/CRAH units in the empty areas. Note: This should not be applied in cases where operating more plant at lower load is more efficient, e.g. variable speed drive CRAC/CRAH units.	Approved data centre operation procedures document, data from BMS, EMS and DCiM if in use, physical inspection and updated Design documents
5.2.3	Review of cooling before IT equipment changes	The availability of cooling including the placement and flow of vented tiles should be reviewed before all IT equipment changes to optimise the use of cooling resources.	Entire Data Centre	4	The organisation shall have a process to manage the placement and the airflow of vented tiles to optimise the use of cooling resources.	Approved data centre operation procedures document, data from BMS, EMS and DCiM if in use, physical inspection and updated Design documents
5.2.4	Define and review of cooling strategy	Periodically review the IT equipment and cooling deployment against defined strategy.	Entire Data Centre	4	The organisation shall have regular reviews between the operator of the DC and the customer to ensure that the cooling deployment matches against needs, forecasts and provisioning. Reviews should be documented and available for review by DC Management, customers and external auditors (with appropriate permissions).	Approved data centre operation procedures document or customer liasion document (reviews conducted as part of Best Practice 3.1.1 "Group Involvement" of this Framework, if applicable) Updated design documents
5.2.5	Review CRAC / CRAH Settings	Ensure that CRAC / CRAH units in occupied areas have appropriate and consistent temperature and relative humidity settings properly calibrated to avoid units working against each other. For example many CRAC / CRAH units now have the option to connect their controls and run together when installed in the same area. Care should be taken to understand and avoid any potential new failure modes or single points of failure that may be introduced.	Entire Data Centre	4	The organisation shall have operation procedure to ensure that CRAC/CRAH units in occupied areas have appropriate and consistent temperature and relative humidity settings calibrated to avoid units working against each other. Note: For example many CRAC/CRAH units now have the option to connect their controls and run together when installed in the same area. Care should be taken to understand and avoid any potential new failure modes or single points of failure that may be introduced. BMS monitoring shall be in place to indentify failures.	Approved data centre operation procedures document, live-demonstration of BMS or updated Design documents

CoC No	Name	Description	Expected	Value	Framework (latest version of the standard where not specified)	Evidence
5.2.7	Effective regular maintenance of cooling plant	Implement effective regular maintenance of the cooling system in order to conserve or achieve a “like new condition” is essential to maintain the designed cooling efficiency of the data centre. Examples include: belt tension, condenser coil fouling (water or air side), evaporator fouling etc. This includes regular filter changes to maintain air quality and reduce friction losses along with the routine monitoring of air quality and a regular technical cleaning regime (including under-floor areas if applicable).	Entire Data Centre	2	The organisation shall implement regular (required by the manufacturer/integrator) maintenance of the cooling system to maintain the designed cooling efficiency of the data centre. The maintainance shall include operations to conserve or achieve a “like new condition” and is essential to maintain the designed cooling efficiency of the data centre. Note: Examples include: belt tension, condenser coil fouling (water or air side), evaporator fouling etc. This includes regular filter changes to maintain air quality and reduce friction losses along with the routine monitoring of air quality and a regular technical cleaning regime (including under-floor areas if applicable).	Maintenace and service reports
5.2.8	Review and optimise chilled water temperature	Review and if possible increase the chilled water temperature set points to maximise the use of free cooling and reduce compressor energy consumption. Seasonal impact should be taken into account where applicable. Set points should be raised together with supply airflow set points to avoid reducing capacity. Review and if useful increase the chilled water temperature difference to reduce the water flow and thereby to reduce pump energy consumption. Where a DX system is used the evaporator temperatures should be reviewed. Electronic Expansion Valves (EEVs) allow better control and permit higher evaporator temperatures than Thermostatic Expansion Valves (TEVs).	Entire Data Centre	4	The organisation shall review and increase the chilled water temperature set points to maximise the use of free cooling and reduce compressor energy consumption. Note: Seasonal impact should be taken into account where applicable. Set points should be raised together with supply air flow set points to avoid reducing capacity. Review and if useful increase the chilled water temperature difference to reduce the water flow and thereby to reduce pump energy consumption. Note: Where a DX system is used, the evaporator temperatures should be reviewed. Electronic Expansion Valves (EEVs) allow better control and permit higher evaporator temperatures than Thermostatic ExpansionValves (TEVs).	Approved data centre operation procedures document, live-demonstration of BMS, EMS and DCiM if in use or updated Design documents
5.3.1	Review and if possible raise target IT equipment intake air temperature	Data Centres should be designed and operated at their highest efficiency to deliver intake air to the IT equipment within the temperature range of 10°C to 35°C (50°F to 95°F). The current, relevant standard is the ASHRAE Class A2 allowable range for Data Centres. Operations in this range enable energy savings by reducing or eliminating overcooling. Note: Some data centres may contain equipment with legacy environmental ranges as defined in 4.1.2, the maximum temperature for these facilities will be restricted by this equipment until segregation can be achieved as described in Practices 5.1.11, 5.1.4 and 5.1.5. Note: Additional Best Practices for airflow management as defined in section 5.1 may need to be implemented at the same time to ensure successful operations. Note: Some, particularly older, IT equipment may exhibit significant increases in fan power consumption as intake temperature is increased. Validate that your IT equipment will not consume more energy than is saved in the cooling system. A summary of ASHRAE environmental guidelines can be found at: https://www.ashrae.org/File%20Library/Technical%20Resources/Publication%20Errata%20and%20Updates/90577_errata.pdf	Entire Data Centre	4	The organisation shall design and operate the Datacenter at the upper limits of the applicable ASHRAE Standards. Note: the relevant standard is ASHRAE Class A2 range. A summary of ASHRAE environmental guidelines can be found at: https://www.ashrae.org/file%20library/technical%20resources/bookstore/supplemental%20files/referencecard_2021thermalguidelines.pdf Note: Some data centres may contain equipment with legacy environmental ranges as defined in 4.1.2, the maximum temperature for these facilities will be restricted by this equipment until segregation can be achieved as described in Practices 5.1.11, 5.1.4 and 5.1.5.	Approved data centre operation procedures document, live-demonstration of BMS, EMS and DCiM if in use or updated Design documents
5.3.2	Review and widen the working humidity range	Reduce the lower humidity set point(s) of the data centre within the ASHRAE Class A2 range (–12°C DP and 8% rh to 27°C DP and 80% rh) to reduce the demand for humidification. Review and if practical increase the upper humidity set point(s) of the data floor within the current A2 humidity range of (–12°C DP and 8% rh to 27°C DP and 80% rh) to decrease the dehumidification loads within the facility.The relevant standard is the ASHRAE Class A2 allowable range for Data Centers. Note: Some data centres may contain equipment with legacy environmental ranges as defined in 4.1.2, the humidity range forthese facilities will be restricted by this equipment until segregation can be achieved as described in Practices 5.1.11, 5.1.4 and 5.1.5. Controlling humidity within a wider range of humidity ratio or relative humidity can reduce humidification and dehumidification loads and therefore energy consumption. A summary of ASHRAE environmental guidelines can be found at: https://www.ashrae.org/File%20Library/Technical%20Resources/Publication%20Errata%20and%20Updates/90577_errata.pdf	Entire Data Centre	4	The organisation shall reduce the lower humidity set point(s) of the data centre within the ASHRAE Class A2 range. Note: Some data centres may contain equipment with legacy environmental ranges as defined in 4.1.2, the humidity range for these facilities will be restricted by this equipment until segregation can be achieved as described in Practices 5.1.11, 5.1.4 and 5.1.5. Controlling humidity within a wider range of humidity ratio or relative humidity can reduce humidification and dehumidification loads and therefore energy consumption. A summary of ASHRAE environmental guidelines can be found at: https://www.ashrae.org/file%20library/technical%20resources/bookstore/supplemental%20files/referencecard_2021thermalguidelines.pdf	Approved data centre operation procedures document, live-demonstration of BMS, EMS and DCiM if in use or updated Design documents
5.3.3	Expanded IT equipment inlet environmental conditions (temperature and humidity)	Where appropriate and effective, Data Centres can be designed and operated within the air inlet temperature and relative humidity ranges of 5°C to 40°C and 5% to 80% rh, non-condensing respectively, and under exceptional conditions up to +45°C as described in ETSI EN 300 019–1-3 Class 3.1. Note: Using the full range up to 40°C or 45°C will allow for the complete elimination of refrigeration in most climates allowing the operator to eliminate the capital and maintenance cost of the cooling systems.	Optional	5	The organisation shall consider designing and operating Data Centres within the air inlet temperature and relative humidity ranges of 5°C to 40°C and 5% to 80% rh, avoiding condensing conditions, and under exceptional conditions up to +45°C as described in ETSI EN 300 019–1-3 Class 3.1.	Result of the assessment Updated & approved IT equipment selection & procurement process & manufacturer data sheet Updated design documents Meeting minutes (See Best Practice 3.1.1. "Group Involvement" of this Framework)
5.3.4	Separate environmental zones	Where a data centre houses both IT equipment compliant with the extended range of Practice 4.1.3 and other equipment which requires more restrictive temperature or humidity control as described in Practice 4.1.2, separate areas should be provided. These areas should have separate environmental controls and may use separate cooling systems to facilitate optimisation of the cooling efficiency of each zone. Examples are equipment which;□ Requires tighter environmental controls to maintain battery capacity and lifetime such as UPS□ Requires tighter environmental controls to meet archival criteria such as tape□ Requires tighter environmental controls to meet long warranty durations (10+ year). The objective of this Practice is to avoid the need to set the data centre cooling plant for the equipment with the most restrictive environmental range and therefore compromising the efficiency of the entire data centre.	New build or retrofit	4	The organisation, where a data centre houses both IT equipment compliant with the extended range of Practice 4.1.3 and other equipment which requires more restrictive temperature or humidity control as described in Practice 4.1.2, shall consider providing separate environmental zones/areas. These areas should have separate environmental controls and may use separate cooling systems to facilitate optimisation of the cooling efficiency of each zone. Examples are equipment which;• Requires tighter environmental controls to maintain battery capacity and lifetime such as UPS• Requires tighter environmental controls to meet archival criteria such as tape• Requires tighter environmental controls to meet long warranty durations (10+ year) The objective of this Practice is to avoid the need to set the data centre cooling plant for the equipment with the most restrictive environmental range and therefore compromising the efficiency of the entire datacentre.	Layouts/Design Documents/On site inspection/DCiM/EMS/BMS Data

CoC No	Name	Description	Expected	Value	Framework (latest version of the standard where not specified)	Evidence
5.3.5	Separate environmental zones – Colocation or Managed Service Provider	Customers requiring extremely tight environmental control or items such as legacy equipment should not compromise the entire data centre for specific items of equipment. Service providers should design in such a way that discrete areas may be offered to customers with additional “close control”cooling equipment in order to match specific requirements this and therefore offer a tighter SLA that would inevitably involve reduced energy efficiency. These legacy equipment support areas may be differentially priced to include the capital and operational (Metered), cost overhead of supporting a less energy efficient legacy environment as an incentive for customers to install IT equipment in more efficient areas and consider the options for more energy efficient delivery of IT services.	New build or retrofit	4	Colocation organisations shall provide separate environmental zones for customers that require extremely tight environmental control or items such as legacy equipment so that they should not compromise the entire data centre for specific items of legacy equipment. Service providers should design in such a way that discrete areas may be offered to customers with additional “close control” cooling equipment in order to match specific requirements this and therefore offer a tighter SLA that would inevitably involve reduced energy efficiency. These legacy equipment support areas may be differentially priced to include the capital and operational (Metered), cost overhead of supporting a less energy efficient legacy environment as an incentive for customers to install IT equipment in more efficient areas and consider the options for more energy efficient delivery of IT services.	Cooling distribution layouts/Contract/On site inspection/DCiM/EMS/BMS Data Result of the assessment
5.4.1.1	Direct air free cooling	External air is used to cool the facility with different operating modes usually deployed. When outdoor conditions are cold exhaust air can be re-circulated and mixed with intake air to control supply air temperature and humidity. In many cases full mechanical cooling /refrigeration capacity is required as a backup to allow operation during periods of high airborne pollutant (E.G. External fires). For this reason special attention should be focussed on external air quality monitoring and filtration. Additional backup mechanical cooling with chiller or CRAC may also be considered to ensure cooling at extreme ambient temperature and humidity conditions or for system redundancy. Note: This design tends to have the lowest temperature difference between external temperature and IT supply air. Note: IT equipment is likely to be exposed to a large humidity range to allow direct air free cooling to work effectively. The achievable free cooling hours are directly constrained by the chosen upper humidity limit.	Optional	5	The organisation shall consider External air is used to cool the facility with different operating modes usually deployed. When outdoor conditions are cold exhaust air can be re-circulated and mixed with intake air to control supply air temperature and humidity. In many cases full mechanical cooling/refrigeration capacity is required as a backup to allow operation during periods of high airborne pollutant (E.G. External fires). For this reason special attention should be focussed on external air quality monitoring and filtration. Additional backup mechanical cooling with chiller or CRAC may also be considered to ensure cooling at extreme ambient temperature and humidity conditions or for system redundancy. Note: This design tends to have the lowest temperature difference between external temperature and IT supply air. Note: IT equipment is likely to be exposed to a large humidity range to allow direct air free cooling to work effectively. The achievable free cooling hours are directly constrained by the chosen upper humidity limit.	Inspection free cooling operation mode according climate conditions/DCiM/EMS/BMS Data and Layout/Design Documents and commissioning documents
5.4.1.2	Indirect air free cooling	Recirculated air within the facility is primarily passed through an air to air heat exchanger against external air (may have adiabatic cooling) to remove heat to the atmosphere. A variation of this is a thermal wheel, quasi –indirect free cooling system. This design tends to have a low temperature difference between external temperature and IT supply air. Note: The operating IT equipment humidity range may be well controlled at negligible energy cost in this type of design. Note: Air filtration demand is lower compared to direct air free cooling as data centre air is circulating and no external air is induced.	Optional	5	The organisation shall consider circulating air within the facility through an air to air heat exchanger against external air (may have adiabaticcooling) to reject heat to the atmosphere. Avariation of this is a thermal wheel, quasi –indirect free cooling system.This design tends to have a low temperaturedifference between external temperature andIT supply air.Note: The operating IT equipment humidityrange may be well controlled at negligibleenergy cost in this type of design.Note: Air filtration demand is lower comparedto direct air free cooling as data centre air iscirculating and no external air is induced.	Inspection AHU Data and presence of air free cooling/Design documents/DCiM/EMS/BMS Data
5.4.1.3	Indirect water free cooling with CRAH and dry cooler or cooling tower	Chilled water cooled by the external ambient air via a free cooling coil. This may be achieved by dry coolers or by evaporative assistance through spray onto the dry coolers. This design tends to have a highe temperature difference between external temperature and IT supply air. Note: Operating IT equipment humidity range may be well controlled at negligible energy cost in this type of design. Note: In this system additional backup mechanical cooling with chiller or CRAC may be considered to ensure cooling at extreme ambient temperature and humidity conditions or for system redundancy.	Optional	5	The organisation shall consider designing cooling systems that produce chilled water cooled by external ambient air via a free cooling coil.	Use of free cooling coils/On site inspection/DCiM/EMS/BMS Data and Design Documents
5.4.1.8	Free Cooling installation	Investigate the installation of free cooling in all new builds and retrofits or upgrades of cooling systems.	New build or retrofit	5	The organisation shall consider free cooling installations in all new buildings and retrofits or upgrades of cooling systems.	Inspection free cooling system/On site inspection/DCiM/EMS/BMS Data
5.4.2.1	Chillers with high COP (EER)	Where refrigeration^ {1} is installed make the Coefficient Of Performance (COP) or Energy Efficiency Ratio (EER) of chiller systems through their likely working range a high priority decision factor during procurement of new plant.	New build or retrofit	3	When new cooling systems are planned, the Coefficient Of Performance (COP) or Energy Efficiency Ratio (EER) shall be a prioritised criteria in the planning, selection and procurement process.	Cooling plant documentation. Procurement Documents, Design Documents
5.4.2.2	Cooling system operating temperatures	Evaluate the opportunity to decrease condensing temperature and increase evaporating temperature; reducing delta T between these temperatures means less work is required in cooling cycle hence improved efficiency. These temperatures are dependent on required IT equipment intake air temperatures and the quality of air flow management (see Temperature and Humidity Settings).	Entire Data Centre	3	The operator shall evaluate the opportunity to decrease condensing temperature and increase evaporating temperature.	Design documents/DCiM/EMS/BMS Data
5.4.2.3	Efficient part load operation	Optimise the facility for the partial load it will experience for the majority of operational time rather than max load. Examples are exploiting the heat exchange area, reducing fan energy consumption, sequencing chillers and operating cooling towers with shared load.	New build or retrofit	3	The organisation shall optimise the design of the cooling plant for the load situation it will experience for the majority of the operational time, rather than the maximum load.	Design documents/DCiM/EMS/BMS Data
5.4.2.4	Variable speed drives for compressors, pumps and fans	Using variable speed control reduces energy consumption for these components in the part load condition where they operate for much of the time. Consider new or retrofit of Electrically Commutated (EC) motors which are significantly more energy efficient than traditional AC motors across a wide range of speeds. In addition to installing variable speed drives it is critical to include the ability to properly control the speed according to demand. It is of limited value to install drives which are manually set at a constant speed or have limited control settings.	New build or retrofit	2	The organisation shall install, where feasible, variable speed drives and the corresponding management mechanism to control the speed of compressors, pumps and fans for the load conditions they operate in the majority of the time. The organisation shall consider installing new or retrofit of Electrically Commutated (EC) motors which aresignificantly more energy efficient thantraditional AC motors across a wide range of speeds.	Design documents/DCiM/EMS/BMS Data
5.4.2.5	Select systems which facilitate the use of “Free Cooling”	Cooling designs should be chosen which allow the use of as much “Free Cooling” as is possible according to the physical site constraints, local climatic or regulatory conditions that may be applicable. Select systems which facilitate the use of free cooling. In some data centres it may be possible to use direct or indirect air side free cooling. Others may not have sufficient available space and may require a chilled liquid cooling system to allow the effective use of economised cooling.	New build or retrofit	5	The organisation shall choose cooling designs which allow the use of as much free cooling as possible with respect to physical site constraints, local climate or applicable regulatory conditions.	Design documents/DCiM/EMS/BMS Data

CoC No	Name	Description	Expected	Value	Framework (latest version of the standard where not specified)	Evidence
5.4.2.6	Do not share data centre chilled water system with comfort cooling	In buildings which are principally designed to provide an appropriate environment for IT equipment, and that have cooling systems designed to remove heat from technical spaces, do not share chilled water systems with human comfort cooling in other parts of the building.The required temperature to achieve latent cooling for comfort cooling is substantially below that required for sensible cooling of the data centre and will compromise the efficiency of the data centre cooling system. If comfort cooling remains a requirement consider the use of heat pumps to provide either cooling or heating for office area comfort.	New build or retrofit	4	Mixed-use buildings (offices and technical areas) shall not share chilled water systems between human confort cooling and technical cooling (data halls, technical spaces).	Cooling system design documentation/DCiM/EMS/BMS Data
5.4.2.7	Do not allow non IT equipment to dictate cooling system set-points	Where other equipment requires a more restrictive temperature or humidity control range than the IT equipment this should not be permitted to dictate the set points of the cooling system responsible for the IT equipment.	New build or retrofit	4	The organisation shall define the set points of the cooling system responsible for the IT equipment by the IT equipment temperature and humidity range, and not by other equipment with a more restrictive temperature and humidity control range. Note: This is specific to the white space where the IT equipment is installed.	Inspection cooling system temperature and humidity set up /DCiM/EMS/BMS Data
5.4.2.8	Chilled water pump control strategy	Chilled water systems configured with dualn pumps, one active, one on standby, can be reviewed for improved energy efficiency during operation. Using the pump manufacturers' graphs of energy use vs pump speed, evaluate running two pumps in parallel vs a single pump running at a higher speed. If beneficial implement the running of two low speed pumps to reduce energy usage while achieving the same target flow rate and pressure.	New build or retrofit	1	Chilled water systems configured with dual pumps, one active, one on standby, shall be reviewed for improved energy efficiency.	Design documents/DCiM/EMS/BMS Data
5.5.1	Variable Speed Fans	Many old CRAC / CRAH units operate fixed speed fans which consume substantial power and obstruct attempts to manage the data floor temperature. Variable speed fans are particularly effective where there is a high level of redundancy in the cooling system, low utilisation of the facility or highly variable IT electrical load. These fans may be controlled by factors such as the supply or return air temperature or the chilled air plenum pressure. Note: CRAC / CRAH units with fixed speed compressors have minimum flow requirements which constrain the minimum operating load and therefore minimum airflow.	New build or retrofit	4	The organisation shall install variable speed fans where there is a high level of redundancy in the cooling system, low utilisation of the facility or highly variable IT electrical load.	Design documents/DCiM/EMS/BMS Data
5.5.2	Control on CRAC / CRAH unit supply air temperature	Controlling on supply temperature ensures an even supply air temperature independent of the load on each CRAC / CRAH unit. Historically many CRAC / CRAH units were controlled on return temperature which is no longer considered appropriate practice.	New build or retrofit	3	The organisation shall control supply air temperature in order to ensure an even supply air temperature independent of the load on each CRAC/CRAH unit.	Design documents/DCiM/EMS/BMS Data
5.5.5	Do not control humidity at CRAC / CRAH unit	The only humidity control that should be present in the data centre is that on fresh "Make Up" air coming into the building and not on re-circulating air within the equipment rooms. Humidity control at the CRAC / CRAH unit is unnecessary and undesirable. Humidity control should be centralised. Do not install humidity control at the CRAC /CRAH unit on re-circulating air. Instead control the specific humidity of the make-up air at the supply AHU. This provides better control and allows use of adiabatic humidification (with lower energy consumption) and potential additional opportunities for some free cooling. The chilled water loop or DX evaporator temperature should in any case be too high to provide de-humidification. When purchasing new CRAC / CRAH units select models which are not equipped with humidity control capability, including any reheat capability, this will reduce both capital and on-going maintenance costs.	New build or retrofit	4	The only humidity control that shall be present in the data centre is the air intake coming into the building. Humidity control shall be centralised. Note: This provides better control and allows use of adiabatic humidification (with lower energy consumption) and potential additional opportunities for some free cooling. Note: Humidity control at the CRAC/CRAH unit is unnecessary and undesirable.Humidity control should be centralised. Do not install humidity control at the CRAC/RAH unit on re-circulating air. Instead control the specific humidity of the make-up air at the supply AHU. This provides better control and allows use of adiabatic humidification (with lower energyconsumption) and potential additional opportunities for some free cooling. The chilled water loop or DX evaporator temperature should in any case be too high to provide de-humidification. When purchasing new CRAC/CRAH units select models which are not equipped with humidity control capability, including any reheat capability, this will reduce both capital and on-going maintenance costs.	Design documents/DCiM/EMS/BMS Data and commissioning documents
5.5.6	Cooling unit sizing and selection	Air volumes required by IT equipment not only depend on the IT load (kW) but also on the IT equipment delta-T, which will also vary with utilisation. Consider these factors, plus likely future utilisation and bypass to size the cooling units design flow rates. As airflow is inversely proportional to delta T for the same load, if the IT delta-T is overestimated, this will result in undersized CRAC / CRAH air volumes and potential air management problems. Additionally, if it is underestimated, CRAC / CRAH air volumes will be oversized which makes low part load inefficient operation and air bypass more likely.	New build or retrofit	4	The organisation shall calculate the air volumes supplied by CRAC/CRAHs for IT equipment based on the IT load (kW) and on the IT equipment delta-T. Note: The volumes will depend on the IT load.	Design documents/DCiM/EMS/BMS Data and commissioning documents
5.7.1	Waste heat re-use	Evaluate the possibility of providing grade heating to industrial space or to other targets such as adjacent office space fresh air directly from heat rejected from the datacentre. This does not reduce the energy consumed by the data centre itself but does offset the total energy overhead by potentially reducing energy use elsewhere.	New build or retrofit	4	The organisation shall evaluate the possibility of providing waste heating from the data centre to an industrial space or to other targets, such as adjacent office spaces.	Inspection re-use waste heating projects
5.7.2	Heat pump assisted waste heat re-use	Where it is not possible to directly re-use the waste heat from the data centre due to the temperature being too low it can still be economic to use additional heat pumps to raise the temperature to a useful point. This possibility should be evaluated and can potentially supply office, district and other heating needs.	New build or retrofit	4	Where it is not possible to directly re-use the waste heating from the data centre, the organisation shall evaluate the use of heat pumps in order to provide waste heating to an industrial space or to other targets, such as adjacent office spaces.	Inspection re-use waste heating projects

CoC No	Name	Description	Expected	Value	Framework (latest version of the standard where not specified)	Evidence
6.1.1	Modular UPS deployment	It is now possible to purchase modular (scalable) UPS systems across a broadrange of power delivery capacities. Physical installation, transformers and cabling are prepared to meet the design electrical load of the facility but the sources of inefficiency (such switching units and batteries) are installed, as required, in modular units. This substantially reduces both the capital cost and the fixed overhead losses of these systems. In low power installations these may be frames with plug in modules whilst in larger installations these are more likely to be entire UPS units.	New build or retrofit	3	The organisation shall use modular UPS systems. Note: It is now possible to purchase modular (scalable) UPS systems across a broad range of power delivery capacities. This can substantially reduce both the capital cost and the fixed overhead losses of these systems. In low power installations, these may be frames with plug-in modules, whilst in larger installations these are more likely to be entire UPS units.	Design Documents/Procurement
6.1.2	High efficiency UPS	If static AC UPS systems are to be installed select energy efficient UPS systems that are compliant with the “elite requirements” of the 2021 version of the EU Code of Conduct on Energy Efficiency of AC Uninterruptible Power Systems. A UPS compliant to this Code of Conduct requirement should also be compliant to IEC 62040 series for UPS systems, which also provides environmental operating conditions. A UPS conforming to this standard should be able to perform as rated when operating within the following minimum ambient ranges: Temperature 0°C to +40°C. Relative Humidity 20% to 80%. Note: Rotary and Direct Current UPS systems are not included in the 2021 versionof the EU Code of Conduct on ACU ninterruptible Power Systems, but this does not in any way suggest that rotary or Direct Current UPS should not be used, rather that these technologies are not currently coveredby an EU Code of Conduct providing shared evidence of meeting high efficiency requirements for these systems. Also consider referencing and using the current U.S. EPA ENERGY STAR specifications for Uninterruptible Power Supplies (UPS).	New build or retrofit	3	The organisation shall use and document results of high efficiency UPS systems that are compliant with the “elite requirements” of the 2021 or latest version of the EU Code of Conduct on Energy Efficiency of AC Uninterruptible Power Systems. A UPS compliant to this Code of Conduct requirement shall also be compliant to EN 62040 series for UPS systems which also provides environmental operating conditions. A UPS conforming to this standard should be able to perform as rated when operating within the following minimum ambient ranges: Temperature 0°C to +40°C. Relative Humidity 20% to 80%. Note: Rotary and Direct Current UPS systems are not included in the 2021 or latest version of the EU Code of Conduct on AC Uninterruptible Power Systems, but this does not in any way suggest that rotary or Direct Current UPS should not be used, rather that these technologies are not currently covered by an EU Code of Conduct providing shared evidence of meeting high efficiency requirements for these systems.	O&M Manuals/Check against EUCOC for UPS
6.1.3	Use efficient UPS operating modes	Deploy UPS units in their most efficient operating modes where appropriate. Note Use of alternative UPS technologies such as rotary or direct current systems may be considered. The comparison and evaluation of the technologies shall be based on latest and non-biased information about available products in the market. Some UPS systems may have technologies allowing energy optimisation at partial load levels and these shall be taken into account as appropriate for the application. This may also be particularly relevant for any UPS system feeding mechanical loads e.g. CRAC/CRAH fans.	New build or retrofit	2	The organisation shall consider using UPS units in their most efficient operating modes. Note: Use of alternative UPS technologies such as rotary or direct current systems may be considered. The comparison and evaluation of the technologies shall be based on latest and non-biased information about available products in the market. Some UPS systems may have technologies allowing energy optimisation at partial load levels and these shall be taken into account as appropriate for the application. This may also be particularly relevant for any UPS system feeding mechanical loads e.g. CRAC/CRAH fans.	Visual Inspection of Operational Modes/if not appropriate explain
6.1.4	Elimination of Isolation Transformers	Isolation transformers in power distribution to IT equipment down to 120 V are typically not required in Europe and should be eliminated from designs as they introduce additional transformer losses unnecessarily.	New build or retrofit	3	The organisation shall eliminate the use of isolation transformers in power distribution.	Review of Design Documents
6.1.5	Efficient part load operation	Electrical infrastructure should remain energy efficient under partial fill and variable IT electrical loads as described in Practice 3.3.4.	New build or retrofit	3	The organisation shall implement and document an efficient part load strategy. Electrical infrastructure should remain energy efficient under partial fill and variable IT electrical loads as described in Practice 3.3.4 of the Code of Conduct.	Part Load Strategy/SOPs
7.1.1	Turn off Lights	Lights should be turned off, preferably automatically whenever areas of the building are unoccupied, for example switches which turn off lighting a specified time after manual activation. Motion detector activated lighting is generally sufficient to support security camera systems.	Entire Data Centre	1	The organisation shall turn off lighting (preferably automatically) whenever areas of the building are unoccupied.	Visual Inspection IIGHTING CONTROL SYSTEM
7.1.2	Low energy lighting	Low energy lighting systems should be used in the data centre. LED lighting is an example.	New build or retrofit	1	The organisation shall deploy low energy lighting systems in the data centre spaces, e.g LED lighting systems.	Visual Inspection/Review of Bulbs/System
7.1.3	Pale coloured fixtures and fittings	Use pale / light colours on walls, floors fixtures and fittings including cabinets etc. to reduce the amount of lighting required to illuminate a data hall and therefore the energy consumed for lighting. This will also ensure good levels of visibility both throughout the hall and within cabinets.	New build or retrofit	1	The organisation shall use pale/light colours on walls, floors fixtures and fittings including cabinets, etc. to reduce the amount of lighting required to illuminate a computer room and therefore the energy consumed for lighting. Note: This will also ensure good levels of visibility both throughout the hall and within cabinets.	Visual Inspection
7.1.4	Energy & temperature reporting hardware	Select Mechanical and Electrical equipment with direct local metering of power usage and/or temperature reporting capabilities (where appropriate), preferably reporting energy used as a counter in addition to power as a gauge.To assist in the implementation of temperature and energy monitoring across abroad range of data centre infrastructure all monitoring devices installed should be able to use existing networks and operate on an Open Protocol basis.This interface protocol should enable all operators’ existing monitoring platform to be able to retrieve data from the installed meters without the purchase of additional licenses from the equipment vendor The intent of this Practice is to provide energy and environmental monitoring of the data centre throughout the entire infrastructure with increasing levels of granularity.	New build or retrofit	3	The organisation shall select mechanical and electrical equipment with local metering/monitoring of energy usage and/or temperature as appropriate. Capabilities shall allow for reporting cumulative periodic energy consumption (kWh), in addition to instantaneous power usage (kW). Temperature reporting shall allow for visibility of temperature trends over a period of time as well as instantaneous temperature readings. Note: To assist in the implementation of temperature and energy monitoring across a broad range of data centre infrastructure all monitoring devices installed should be able to use existing networks and operate on an Open Protocol basis. This interface protocol should enable all operators’ existing monitoring platform to be able to retrieve data from the installed meters without the purchase of additional licenses from the equipment vendor. The intent of this Practice is to provide energy and environmental monitoring of the data centre throughout the entire infrastructure with increasing levels of granularity.	Design Documents/Visual Inspection/DCiM/BMS/EMS

CoC No	Name	Description	Expected	Value	Framework (latest version of the standard where not specified)	Evidence
8.1.1	Locate M&E plant outside the cooled area	Heat generating Mechanical and Electrical plant such as UPS units should be located outside the cooled areas of the data centre wherever possible to reduce the loading on the data centre cooling plant.	New build or retrofit	2	The organisation shall locate, where possible, mechanical and electrical equipment (e.g. UPS units) which generate heat outside the cooled data centre spaces to reduce the load on the data centre cooling system.	Design Documents/Visual Inspection
8.1.2	Select or create a building with sufficient 'slab to slab' separation / ceiling height	Where air movement is used to cool the IT equipment, insufficient ceiling height will frequently hamper the use and efficiency of air cooling technologies such as raised floor, suspended ceiling, aisle containment or ducts in the data centre.	New build or retrofit	3	Where air movement is used to cool the IT equipment, the organisation shall ensure sufficient room space to enable the use of efficient air cooling technologies such as raised floor, suspended ceiling, aisle containment or ducts in the data centre.	Design Documents/Visual Inspection
8.1.3	Facilitate the use of "Free Cooling"	The physical layout of the building should not obstruct or restrict the use of free cooling (either air or water) or other equipment with an economisation / free cooling mode.	New build or retrofit	3	The organisation shall ensure that the physical layout of the building does not obstruct or restrict the use of free cooling (either air-side or water-side), or other equipment with an economization or free cooling mode.	Design Documents/Visual Inspection
8.1.4	Location and orientation of plant equipment	Cooling equipment, particularly dry or adiabatic coolers should be located in an area of free air movement to avoid trapping it in a local hot spot. Ideally this equipment should also be located in a position on the site where the waste heat does not affect other buildings and create further demand for air conditioning.	New build or retrofit	2	The organisation shall place cooling equipment, particularly dry or adiabatic coolers, in an area with free air movement. Note: This equipment should be located in a position on the site where the waste heat does not affect other buildings and create further demand for air conditioning.	Design Documents/Visual Inspection
8.1.5	Minimise direct solar heating	Minimise solar heating (insolation), of the cooled areas of the data centre by providing shade or increasing the albedo (reflectivity) of the building through the use of light coloured roof and wall surfaces. Shade may be constructed, provided by utilising natural features including "green roof" systems. Effective insulation can be provided by using suitable wall and roof coverings. There should also be no external windows in the data centre to prevent heating from direct sunlight. This is also good practice from a security point of view. Failure to protect against solar heating (insolation) will result in additional cooling requirements.	New build or retrofit	2	The organisation shall minimize solar heating (insolation) of the cooled areas of the data centre by providing shade or increasing the albedo (reflectivity) of the building. Note: this can be achieved through the use of light coloured roof and wall surfaces and by avoiding the use of external windows in data centre spaces. Failure to protect against solar heating (insolation) will result in additional cooling requirements. Shade can be constructed or provided by utilizing natural features including "green roof" systems.	Design Documents/Visual Inspection
9.1.1	Incoming energy consumption meter	Install metering equipment capable of measuring the total energy use of the data centre including all power conditioning, distribution and cooling systems. This should be separate from any non data centre building loads. Note: This is required for Code of Conduct reporting.	Entire Data Centre	4	The organisation shall install metering equipment capable of measuring the total energy use of the data centre according the EN 50600-4-2 or ISO/IEC 30134-2. Note: see cross-reference table.	Design Documents/Visual Inspection/DCiM/EMS/BMS Data
9.1.2	IT Energy consumption meter	Install metering equipment capable of measuring the total energy delivered to IT systems. This may also include other power feeds where non UPS protected power is delivered to the cabinets. Note: This is required for Code of Conduct reporting.	Entire Data Centre	4	The organisation shall install metering equipment capable of measuring the total energy delivered to IT systems. According the EN 50600-4-2 or ISO/IEC 30134-2. Note: see cross-reference table.	Design Documents/Visual Inspection/DCiM/EMS/BMS Data
9.1.3	Room level metering of supply air temperature and humidity	Install metering equipment at room level capable of indicating the supply air temperature and humidity for the IT equipment.	Entire Data Centre	2	The organisation shall install metering equipment at room level in the computer room space capable of indicating the supply air temperature and humidity for the IT equipment. According the EN 50600-2-3 or ISO/IEC22237-4. Note: see cross-reference table.	Design Documents/ operation and maintenace documents/Visual Inspection/DCiM/EMS/BMS Data
9.1.4	CRAC / CRAH unit level metering of supply or return air temperature	Collect data from CRAC / CRAH units on supply and return (dependent upon operating mode) air temperature.	Entire Data Centre	3	The organisation shall collect data from CRAC / CRAH units on supply and return (dependent upon operating mode) air temperature. According the EN 50600-2-3 or ISO/IEC 22237-4. Note: see cross-reference table.	Design Documents/ operation and maintenace documents/Visual Inspection/DCiM/EMS/BMS Data
9.1.5	Distribution board level metering of Mechanical and Electrical energy consumption	Improve visibility and granularity of datacentre infrastructure overheads	New build or retrofit	3	The organisation shall install metering equipment at distribution board level for measuring the energy use of mechanical and electrical components. Note: Total energy use includes energy for electricity, heating/cooling and all fuels required for data centre operation (see EN 50600-4-2; ISO/IEC 30134-2 PUE). Note: see cross-reference table.	Design Documents/ operation and maintenace documents/Visual Inspection/DCiM/EMS/BMS Data
9.2.1	Periodic manual readings	As an entry level, energy, temperature and humidity (dry bulb temperature, relative humidity and dew point temperature) should be made available to allow reporting to be performed based on periodic manual readings of measurement and metering equipment. This should occur at regular times, ideally at peak load. Note: Energy reporting is already mandated for Code of Conduct reporting requirements also that automated readings are considered to be a replacement for this Practice when applying for Participant status.	Entire Data Centre	3	Organisations carrying out manual data collection shall at least collect energy, temperature and humidity to facilitate reporting based on these readings. Measurements should occur at regular intervals, ideally at peak load.	Design Documents/Visual Inspection/DCiM/EMS/BMS Data

CoC No	Name	Description	Expected	Value	Framework (latest version of the standard where not specified)	Evidence
9.2.2	Automated daily readings	Automated daily readings enable more effective management of energy use. Note: Supersedes Periodic manual readings.	New build or retrofit	4	In cases where an organisation has deployed an automated system, the system shall collect automated readings to enable a more effective management of energy use.	Design Documents/Visual Inspection/DCiM/EMS/BMS Data
9.2.4	Achieved free cooling / economised cooling hours	Require collection and logging of full free cooling, partial free cooling and full refrigerant and compressor based cooling hours throughout the year.The intent being to record the amount of time and energy spent running on mechanical refrigerant and compressor based cooling versus the use of free cooling in order to reduce the amount of time spent on mechanical cooling during the year. The site design, cooling system operational set-points and IT equipment environmental control ranges should allow the data centre to operate without refrigeration for a significant part of the year with no refrigeration for the IT cooling load as evaluated against a Typical Meteorological Year for the site. Note: This refers to mechanical compressors and heat pumps, any device which uses energy to raise the temperature of the rejected heat.	New build or retrofit	4	If a free cooling cooling solution has been deployed, the organisation shall collect and log full free cooling, partial free cooling and full refrigerant and compressor-based cooling hours throughout the year. Note: The data is used to reduce the time spent on mechanical cooling during the year. The site design, cooling system operational set-points and IT equipment environmental control ranges should allow the data centre to operate without refrigeration for a significant part of the year with no refrigeration for the IT cooling load as evaluated against a Typical Meteorological Year for the site. This refers to mechanical compressors and heat pumps, any device which uses energy to raise the temperature of the rejected heat.	Design Documents/Visual Inspection/DCiM/EMS/BMS Data and SOPs, MOPs
9.3.1	Written Reporting	Minimum reporting consists of periodic written reports on energy consumption and environmental ranges. All written reports and submissions should reference the Category being reported and ensure that the required method of data collection and calculation determined by the Standardised ISO KPIs from the ISO/IEC 30134 series (or EN 50600 equivalent), should be used in all reports, written or otherwise if reported. These Standardised KPIs include PUE, pPUE, REF, ITEESV, ITEUSV, ERF, CER, CUE, WUE. Note: Determining the averaged DCiE or PUE over the reporting period is already mandated by the Code of Conduct reporting requirements. This report may be produced by an automated system. Note: All DCiE and PUE calculations should be completed according to the guidelines set out by EN 50600-4-2 which is equivalent to ISO/IEC 30134-2. EN 50600-4-2:2016 “Information technology — Data centre facilities and infrastructures — Part 4-2: Power Usage Effectiveness”. Note: Different categories of PUE ranging from 0 to 3 representing increasing levels of reporting granularity.	Entire Data Centre	4	The organisation shall provide written reports on energy consumption and environmental ranges on a regular basis. All written reports and submissions shall reference the Category being reported and ensure that the required method of data collection and calculation determined by standardized KPIs according to EN 50600-4-X (X=1 to 9), ISO/IEC 30134-4 and ISO/IEC 30134-5 shall be used in all reports, written or otherwise if reported. These Standardised KPIs include PUE, pPUE, REF, ITEESV, ITEUSV, ERF, CER, CUE, WUE. Note: Different categories of PUE, CUE and WUE ranging from 1 to 3 representing increasing levels of reporting granularity.	Design Documents/Visual Inspection/DCiM/EMS/BMS Data/DCM Monthly Report
9.3.4	Achieved free cooling / economised cooling hours	Require reporting of full free cooling, partial free cooling and full refrigerant and compressor based cooling hours throughout the year.The intent being to report the amount or time and energy spent running on mechanical refrigerant and compressor based cooling versus the use of free cooling in order to reduce the amount of time spent on mechanical cooling during the year. The site design, cooling system operational set-points and IT equipment environmental control ranges should allow the data centre to operate without refrigeration for a significant part of the year with no refrigeration for the IT cooling load as evaluated against a Typical Meteorological Year for the site. Note: This refers to mechanical compressors and heat pumps, any device which uses energy to raise the temperature of the rejected heat.	New build or retrofit	4	If a free cooling solution has been deployed, the organisation shall report full free cooling, partial free cooling and full refrigerant and compressor-based cooling hours throughout the year.	Design Documents/Visual Inspection/DCiM/EMS/BMS Data

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