**Annex 2**

**Energy Efficiency Report**

**on the award criteria for the DE-UZ 214**

**eco-label**

**for climate-friendly colocation data center**

|  |  |  |
| --- | --- | --- |
| Type of report: | Energy efficiency report upon application  Energy Efficiency Report on the Final Evaluation | |
| Applicant/Signatory: | |  |
| Address: | |  |
| Designation RZ: | |  |
| Location RZ: | |  |
| Date of commissioning of the RZ: | |  |
| Date of application: | |  |
| Date Character Assignment: | |  |
| Editor: | |  |
| Reporting period: | | from:       until: |
| Creation date report: | |  |

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# Introduction

This energy efficiency report is submitted for the application and final evaluation of the requirements of the Blue Angel eco-label for climate-friendly colocation data center (DE-UZ 214). This document template, which specifies the structure of the energy efficiency report, is attached as Annex 2 to the DE-UZ 214 award criteria.

This report can be used as a template for the **"Energy Efficiency Report on Application"** (cf. Section 3.1.5 of the Award Criteria) as well as a template for the "**Energy Efficiency Report on Final Evaluation"** (cf. Section 3.2.2 of the Award Criteria).

This energy efficiency report must be checked by an independent auditor and compliance with the requirements must be confirmed. RAL gGmbH, with the support of the Federal Environment Agency, appoints auditors (see Annex 3 to the contract) who can carry out the audit of the submitted documents. The approval of auditors ensures that the examination of the reports is carried out independently and with a high level of professional qualification.

During the term of the sign use contract, the data center must be operated in an energy-efficient manner, and energy efficiency criteria must be taken into account when new building technology is purchased. To this end, the requirements specified in section 3.2 of the award criteria must be met.

The "Energy Efficiency Report on Application" must be submitted to RAL gGmbH by the applicant at the time of application. The following aspects must be observed:

1. general information about the data center is expected in part 1 of the report.

2. part 2 of the report must document compliance with all requirements applicable at the time of application.

3. part 2 of the report contains additional information to be completed if this template is to be used as an "Energy Efficiency Report for Final Evaluation" (see below).

4. the "Energy Efficiency Report on Application" must be checked for plausibility and confirmed by an independent auditor.

An **"Energy Efficiency Report for Final Evaluation"** must be submitted to RAL gGmbH no later than 6 months before the end of the agreed contract period. The **"Energy Efficiency Report for the Final Evaluation"** can be updated from the "Energy Efficiency Report at Application". It must be updated for this purpose and additionally supplemented by the information provided in Part 2 under the heading "The following applies to the continuation of this report as an "Energy Efficiency Report for Final Evaluation"". The "Energy Efficiency Report for Final Evaluation" does not require an external audit by an auditor.

Reading aid

Table 1 below provides an overview of the annexes to the contract for use of the eco-label "Climate-friendly colocation data center" DE-UZ 214 and explains their content as well as their function in the application and in the final evaluation (see also at the end of this document: Overview of annexes to the contract).

Table 1: Overview of the annexes to the contract

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Annex** | **Content** | **Template available** | **Part of the application** | **Part of the final evaluation** |
| Annex 1 | Applicant declares compliance with the requirement of the eco-label | Yes | Yes | No |
| Annex 2 | Energy efficiency report at the time of application | Yes | Yes | No |
| Annex 2 | Energy efficiency report for final evaluation | Yes | No | Yes |
| Annex 2d | Energy efficiency report (Excel spreadsheet):  New acquisition of PDUs | Yes | No | Yes |
| Annex 2e | Energy efficiency report (Excel spreadsheet): Monitoring Energy | Yes | Yes | Yes |
| Annex 2g | Energy efficiency report (Excel spreadsheet): Refrigeration plants | Yes | Yes | Yes |
| Annex 3 | List of auditors | Yes | Nein | No |
| Annex 4 | Auditor's report | No | Yes | No |
| Annex 5 | Proof of energy provision or electricity identification in accordance with §42 of the German Energy Industry Act (Energiewirtschaftsge-setz) | No | Yes | No |
| Annex 6 | Information materials for Colo customers on energy saving | No | Yes | No |
| Annex 7 | Sample contract for colocation service billing | No | Yes | No |

The following Table 2 serves to assign the respective sections from the award criteria DE-UZ 214 January 2020 edition to the chapters of this energy efficiency report and appendices.

Table 2: Allocation of the sections of the award criteria to the chapters of Annex 2

|  |  |  |
| --- | --- | --- |
| **Section of the award criteria** | **Chapter in the energy efficiency report** | **Annex** |
| **3.1 Requirements for application** | - |  |
| **3.1.1 Building services engineering and energy supply** | - |  |
| 3.1.1.1 Power Usage Effectiveness (PUE) | 2.1 Determination of the Power Usage Effectiveness at the time of application |  |
| 3.1.1.2 Energy efficiency of the cooling system | 2.7.2 Energy efficiency of the cooling system (calculation of the annual performance factor) |  |
| 3.1.1.3 Refrigerant | 2.7.1 General information on the cooling system, subitem No. 7 |  |
| 3.1.1.4 Electrical energy | 2.2 Electrical energy | Annex 5 |
| **3.1.2 Efficiency of space** | 2.5 Efficiency of space |  |
| **3.1.3 Incentives for energy saving** | - |  |
| 3.1.3.1 Information requirements | - | Annex 6 |
| 3.1.3.2 Consumption-based billing | - | Annex 7 |
| **3.1.4 Energy efficiency report at the time of application** | this energy efficiency report | Annex 2  Annex 4: Auditor report |
| **3.2 Requirements during the term** | - |  |
| **3.2.1 Building technology and energy monitoring** | - |  |
| 3.2.1.1 Monitoring of electrical energy and water | 2.6.1 Monitoring electrical energy and water (monthly and annually | Annex 2e (Energy), 2g (Refrigeration),  Annex 2 (Energy & Water) |
| 3.2.1.2 New acquisition of components of the cooling system | 2.7.1 General information on the cooling system, subitem No. 7 + 2.8.2 Energy efficiency of the cooling system (calculation of the annual performance factor) |  |
| 3.2.1.3 New acquisition of uninterruptible power supply (UPS) | 2.8 Uninterruptible power supply (UPS) |  |
| 3.2.1.4 New acquisition of switchgear | 2.3 Electrical switchgear |  |
| 3.2.1.5 New acquisition of intelligent power distribution units (PDUs) | 2.4.1 Inventory list of newly acquired intelligent PDUs | Annex 2d |
| 3.2.1.6 Consideration of life cycle costs in procurement | - | Annex 1 |
| **3.2.2 Energieeffizienzbericht zur Abschlussevaluation** | der aktualisierte Energieeffizienzbericht | Annex 2 |

# Part 1: General information about the data center

## Areas, operating concept and classification

1. Area oft he data center (RZs)
   1. What is the **maximum** area you can use in your data center for your computer, storage and network components?      m2
   2. What is the area you currently use in your data center for your computer, storage and network components?      m2

⇨ If 1.1 is greater than 1.2, continue with 1.3, otherwise continue with 1.3.2.

* 1. Are you planning to expand your data center in the current space? (Yes/No)

⇨ If Yes:

* + 1. Does the maximum available space (question 1) limit the further expansion of your data center? (Yes/No)
    2. Does the power supply, such as the maximum connected load, limit the expansion of your data center? (Yes/No)
    3. Do other expansion limitations exist? (Yes/No)
  1. Please assign your data center to one (or more) function type(s) of the different data center owners/operators.

|  |  |  |
| --- | --- | --- |
|  | **Typ** | **Function** |
|  | Operator | Operates the overall data center and has all aspects (building, power supply, air conditioning and IT facilities) under its control. |
|  | Colocation  Provider | Operates the data center primarily for the purpose of selling or leasing the space, power and air conditioning to the customers who install and manage the IT hardware. |
|  | Colocation  Customer | Owns and manages the IT facilities in a data center. A colocation customer buys or rents the space, power and air conditioning of a data center from a colocation provider. |
|  | Managed Service Provider (MSP) | Owns and manages data center space, power, air conditioning, IT facilities, and portions of software to deliver IT services to customers. This includes conventional IT outsourcing. |
|  | Managed Service Provider (MSP)  in Colocation | A managed service provider that rents/purchases the space, power or air conditioning of a data center from a colocation provider (and does not manage it itself). |

Quelle: EU Code of Conduct on Data Centres Energy Efficiency, Version 5.1.1

1. Areas of responsibility
   1. Which areas are the responsibility of your company:

|  | **Area of responsibility** | **Description** |
| --- | --- | --- |
|  | Building | The building, including security, location and maintenance. |
|  | Mechanical & electrical plant | The selection, installation, configuration, maintenance and management of the mechanical and electrical system. |
|  | RZ area | The installation, configuration, maintenance and management of the main area of a data centre on which the IT equipment is installed. |
|  | IT cabinets | The installation, configuration, maintenance and management of the IT cabinets (racks) in which the IT equipment is installed. |
|  | IT Facilities | The selection, installation, configuration, maintenance and management of physical IT facilities. |
|  | Operating system / virtualization | The selection, installation, configuration, maintenance and management of the operating system and virtualisation software installed on the IT facility. This includes monitoring clients, hardware management officers, etc. |
|  | Software | The selection, installation, configuration, maintenance and management of the application software installed on the IT facility. |
|  | Business Practice | Deciding and communicating the business need for a  RZs, including the importance of the system, availability and maintenance requirements and data management processes. |

Quelle: EU Code of Conduct on Data Centres Energy Efficiency, Version 5.1.1

1. Does your data centre have to have a minimum availability? (Is your data centre infrastructure designed for a certain availability?) (Yes/No)

⇨ If yes, what is the minimum availability of your data centre?

According to the safety standard of the Tier classifications (Uptime Institut, USA)

Tier (1, 2, 3, 3+, 4) ⇨

According to the data centre category of the matrix for the planning aid for operationally secure data centres (BITKOM, https://www.bitkom.org/Bitkom/Publikationen/Betriebssicheres-Rechenzentrum.html)

RZ-Categorie (A – D) ⇨

According TÜV-Level IT ⇨       (enter TÜV Level)

According procent ⇨       (% enter )

According to lost hours per year ⇨       (Enter hours )

## Installed nominal IT capacities

How high are the installed nominal powers of the IT corresponding to the individual consumers according to the manufacturer's specifications (data sheets) below the measuring point MPIT2 of the following figure?

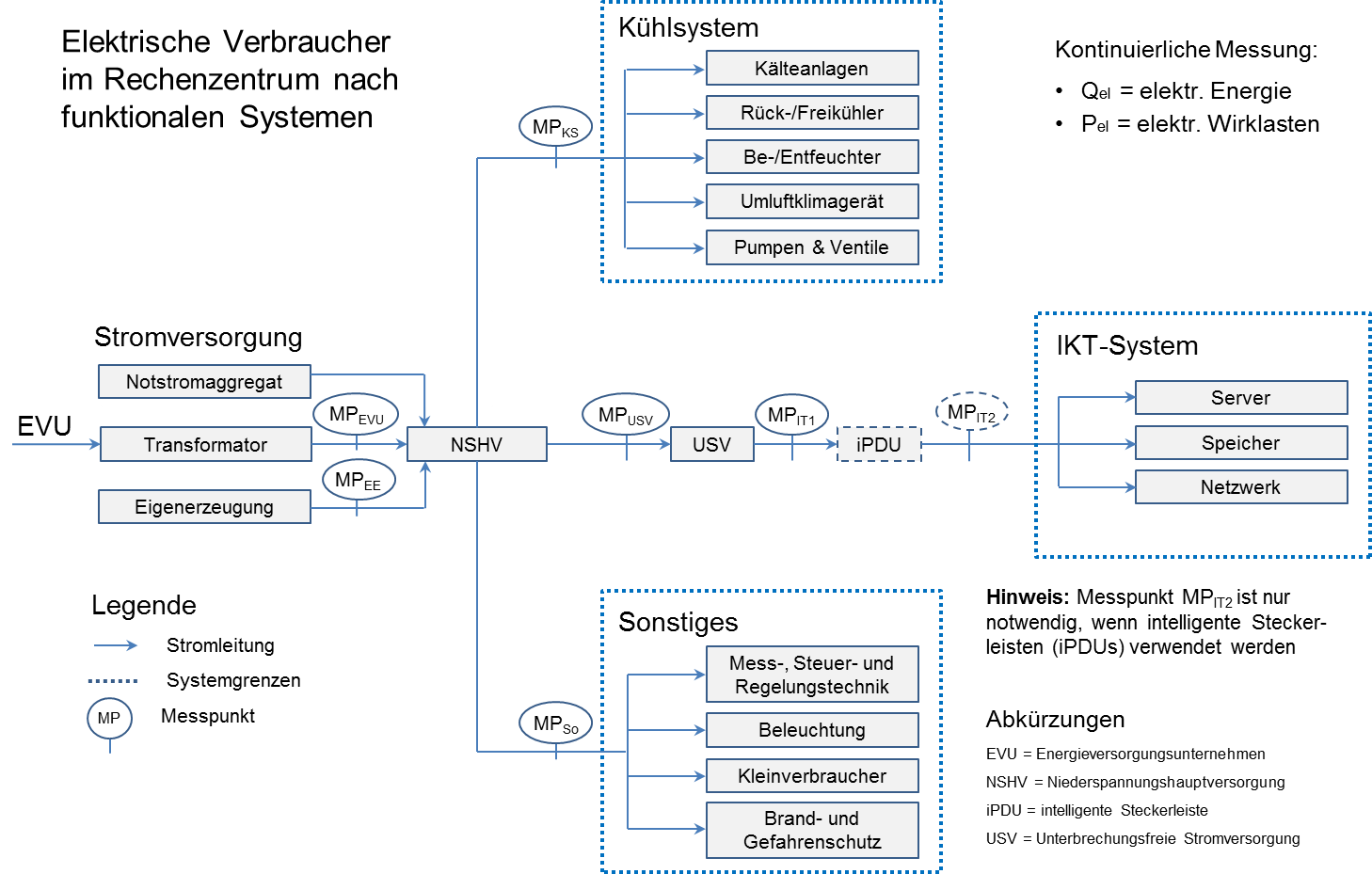


Figure 1: Measuring the essential components of a data centre Redundanzkonzepte

Which redundancy concepts are provided for the power supply units of the IT components? (Select for servers, storage systems and network devices respectively)

|  |  |  |  |
| --- | --- | --- | --- |
| **Redundancy concept** | **Server** | **Storage systems** | **Network devices** |
| **N** |  |  |  |
| **N+1** |  |  |  |
| **2N** |  |  |  |
| **2(N+1)** |  |  |  |
| **Others** |  |  |  |

# Part 2: Technical equipment and key figures

## Determining the Power Usage Effectiveness at the time of application

To determine the PUE value (Power Usage Effectiveness), a measurement concept must be implemented in the data centre in accordance with "Appendix B: Measurement Concept" of the award criteria.

The following table documents the Power Usage Effectiveness (PUE) value of the data centre for the past 12 months at the time of application:

Table 3 Documentation of the calculation of the PUE (Power Usage Effectiveness)

|  |  |  |
| --- | --- | --- |
| **Measured values and key figures** | | **Measuring point designation**  (see also Figure 1 as well as Annex B of the award criteria) |
| Measuring period | from:  until: |  |
| Annual electricity demand of the entire data centre | MWh/a | Qel,RZ,a = MPEVU + MPEE |
| Annual electricity demand of the IT components | MWh/a | Qel,IT,a = MPIT |
| Annual electricity demand of the cooling system | MWh/a | Qel,KS,a = MPKS |
| Annual electricity demand of the UPS systems (losses) | MWh/a | Qel,USV\_ Losses,a = MPIT1 - MPUSV |
| Annual power demand of the PDU (losses) | MWh/a | Qel,PDU\_ Losses,a = MPIT2 - MPIT1 |
| Annual electricity demand of other consumers | MWh/a | Qel,So,a = MPSo |
| PUE |  |  |
| **Please tick additionally if you make use of the exemption:** | | |
| PUE value based on: | Planning data (attached as annex)  Load test (attached as annex) | |

**The following applies to the continuation of this report as the "Energy Efficiency Report for Final Evaluation":**

The annual values of PUE and electricity demand are documented in chapter 2.6.1 Monitoring electrical energy (monthly and annually).

## Electrical energy

1. 100% of the data centre's electricity requirements are covered by renewable energies or decentralised combined heat and power plants:

Yes

No

1. The specific global warming potential of the electricity mix used is as follows in accordance with the electricity labelling pursuant to §42 of the German Energy Industry Act (Energiewirtschaftsgesetz)       g carbon dioxide equivalents per kilowatt hour of electricity .

## Electrical switchgear

1. The following gas or technology is used as an insulating medium in the medium-voltage and low-voltage switchgear to be used:
2. The electrical switchgear is free of sulphur hexafluoride (SF6):

yes (requirement for new acquisition)

no

## Inventory list

**The following applies to the continuation of this report as the "Energy Efficiency Report for Final Evaluation":**

### Inventarliste neu angeschaffter intelligenter PDUs

If new intelligent power distribution units (iPDUs) are purchased, they must be documented with their technical data in Appendix 2d. For this purpose, the spreadsheets of the PDUs (spreadsheet 2d of the present spreadsheet file) must be attached to the report as a printed attachment..

## Efficiency of space

As a contribution to reducing land sealing, the data centre should have the highest possible space efficiency. The applicant states the following characteristic values as information on its space efficiency:

Table 4: Documentation of the characteristic values for space efficiency

|  |  |
| --- | --- |
| **Characteristic values for space efficiency** | |
| Nominal IT power per square metre of gross floor area | (kWel/m²BGF) |
| Rated IT power per square metre of floor space  (built-up area) | (kWel/m²GF) |

* Gross floor area (BGF) is defined according to DIN 277-1 Floor Areas and Volume in Building - Part 1: Building Construction as the sum of the floor areas of all plan levels of a building over all usable storeys.
* Base area (GF) is to be equated with the "built-up area". It can be compared with the floor area.

**The following applies to the continuation of this report as the "Energy Efficiency Report for Final Evaluation":**

## Monitoring electrical energy and water

### Monitoring electrical energy and water (monthly and annually)

#### Monthly energy monitoring

For the energy efficiency report, the following values must be documented monthly for the past 12 months (cf. Appendix B: Measurement concept of the award criteria):

1. total electricity demand for data centres (MPEVU + MPEE) [kWhel].

2. power demand IT (MPIT2) [kWhel] 3.

3. cooling system electricity demand (MPKS) [kWhel].

4. electricity demand, other (MPSo) [kWhel].

5. total cooling load [kWhth].

6. total water consumption [m³] and water quality [drinking water | grey water |

rainwater].

The documentation is provided in the present spreadsheet file, which must be attached to this report as printed Annex 2e (Monitoring Energy) for indents 1 to 5 (electricity demand and cooling load) and Annex 2g (Refrigeration Systems) for indent 6 (water consumption).

#### Yearly monitoring

#### The following results of the monitoring are documented annually, based on time series, in the following table:

#### - Total electricity demand for data centres,

#### - electricity demand IT,

#### - PUE,

#### - JAZ.

#### Tabel: Documentation of the most important results of the annual energy monitoring

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year** | **Date** | **Total electricity demand for data centres** | **Electricity demand IT** | **PUE** | **JAZ** |
| Year 0  (Application) |  | MWhel/a | MWhel/a |  |  |
| Year 1 |  | MWhel/a | MWhel/a |  |  |
| Year 2 |  | MWhel/a | MWhel/a |  |  |
| ... Year n |  | MWhel/a | MWhel/a |  |  |

## Cooling system

### General information on the cooling system

1. How is the IT technology in the server room air-conditioned? (Please select from the following options, multiple answers possible):
   1. The air of the server room is air-conditioned (air conditioning of the server room).: (Yes/No).

⇨ If Yes, please specify how the server room is air-conditioned:

The air in the server room is only air-conditioned by ULK.

The air in the server room is only conditioned by direct evaporators.

Both: The air in the server room is climatised by direct evaporators and ULK.

Others:

* 1. Individual racks are directly/extra air-conditioned : (Yes/No)
  2. Both: Individual racks and the entire server room are air-conditioned:  
         (Yes/No)
  3. Other (please specify, e.g. "direct free cooling with the outside air" or "direct CPU cooling"):
  4. What is the measured temperature of the supply air at the recirculation air conditioning units (°C and/or direct evaporator)?      °C u/o Inlet-System     °C
  5. What is the measured temperature of the exhaust air at the recirculation air conditioning units (°C and/or direct evaporator)?      °C u/o Inletsystem     °C
  6. Please state for each ULK or direct evaporator in the DC :

For recirculation air conditioning units (ULK)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sequence number** |  |  |  |  |
| Number of installations of this type |  |  |  |  |
| Manufacturer |  |  |  |  |
| Model designation |  |  |  |  |
| Nominal power (kWel) |  |  |  |  |
| Nominal power (kWth) |  |  |  |  |
| Design temperature exhaust air (°C) |  |  |  |  |
| Design temperature supply air (°C) |  |  |  |  |
| Max. Volume flow under design condition (m³/h) |  |  |  |  |
| Fan speed adjustable? (Yes/No) |  |  |  |  |

For direct evaporators (split units):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sequence number** |  |  |  |  |
| Date of commissioning |  |  |  |  |
| Number of installations of this type |  |  |  |  |
| Manufacturer |  |  |  |  |
| Model designation |  |  |  |  |
| Nominal power (kWel) |  |  |  |  |
| Nominal power (kWth) |  |  |  |  |
| Design temperature exhaust air (°C) |  |  |  |  |
| Design temperature supply air (°C) |  |  |  |  |
| Max. Volume flow under design condition (m³/h) |  |  |  |  |
| Fan speed adjustable? (Yes/No) |  |  |  |  |
| Refrigerant used |  |  |  |  |
| Refrigerant charge |  |  |  |  |
| EER/  COP of the plant |  |  |  |  |

* 1. What is the air supply in the server room/ICT room?

Via a raised floor

Via a ceiling outlet

Via inlet systems between the racks

Others:

* 1. Separate cold and warm air consistently ? (Yes/No)

⇨ If yes, please select:

The racks are set up according to the cold-warm aisle principle but are not enclosed. .

The racks are set up according to the cold-aisle principle and the cold or hot aisle is completely enclosed.

Others:

* 1. What redundancies are provided for the ULK and/or direct evaporator u/o inlet systems?

|  |  |  |  |
| --- | --- | --- | --- |
| **Redundancy**  **concept** | **ULK** | **Direct evaporator** | **Inlet-System** |
| **N** |  |  |  |
| **N+1** |  |  |  |
| **2N** |  |  |  |
| **2(N+1)** |  |  |  |
| **Others** |  |  |  |

* 1. Do you use air cooling to cool the racks? (Yes/No)

⇨ If Yes: Please enter the design temperature of the

Supply air at the recirculation air handling unit/direct evaporator on :

Exhaust air on recirculation air handling unit/direct evaporator on :

* 1. Which coolant (liquid heat transfer medium, not air) do you use for server cooling?

Water

Other coolant :

* 1. What type of system is used to cool the racks?

Central coolant system

⇨ Please state the inlet temperature of the coolant (inlet temperature of the coolant into the ULK/direct evaporator/inlet system):      °C

⇨ Please state the return temperature of the coolant (outlet temperature of the coolant from the ULK/direct evaporator/inlet system):      °C

Decentralised system

⇨ Please briefly describe your decentralised cooling system:

1. Please specify for each pump type in your DC:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sequence number** |  |  |  |  |
| Number of pumps of this type |  |  |  |  |
| Manufacturer |  |  |  |  |
| Model designation |  |  |  |  |
| Nominal power (kWel) |  |  |  |  |
| Speed controlled? (Yes/No) |  |  |  |  |
| Redundancy concept (N, N+1, 2N, 2(N+1), other) |  |  |  |  |

1. Please provide the following information about the humidity in your data centre:
   1. What is the minimum permitted humidity (in %)?       %
   2. What is the maximum permitted humidity (in %)?       %
   3. Is moisture-sensitive equipment (e.g. storage) kept in another room?

(Yes/No)

1. Do you apply the principle of free cooling in your data centre?      (Yes/No)

⇨ If yes:

Indirect free cooling:

⇨ Simple indirect free cooling at outdoor temperatures less than or equal to      °C.

⇨ Hybrid[[1]](#footnote-3) indirect free cooling at outdoor temperatures less than or equal to      °C.

Direct free cooling :

⇨ Simple direct free cooling at outdoor temperatures less than or equal to      °C.

⇨ Hybrid direct free cooling at outdoor temperatures less than or equal to      °C.

* 1. Please specify for each free cooler type in your DC:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sequence number** |  |  |  |  |
| Type (direct/ indirect free cooling) |  |  |  |  |
| Type (only for indirect free cooling) [[2]](#footnote-4) |  |  |  |  |
| Number of installations of this type |  |  |  |  |
| Manufacturer |  |  |  |  |
| Model designation |  |  |  |  |
| Nominal electric power (kWel) |  |  |  |  |
| Cooling capacity (nominal value) (kWth) |  |  |  |  |

1. Do you use the waste heat of the data centre (e.g. for heating offices)?     (Yes/No)
2. What redundancy concept is envisaged for the refrigeration systems?

N

N+1

2N

2(N+1)

Other redundancy concept:

1. Please specify for each type of refrigeration system in your DC:

For compression refrigeration systems:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **For sorption refrigeration systems:** |  |  |  |  |
| Date of commissioning |  |  |  |  |
| Type (e.g. compression unit) |  |  |  |  |
| Number of installations of this type |  |  |  |  |
| Manufacturer |  |  |  |  |
| Model designation |  |  |  |  |
| Nominal electric power (kWel) |  |  |  |  |
| Cooling capacity (nominal value) (kWth) |  |  |  |  |
| Design temperature[[3]](#footnote-5) flow (°C) |  |  |  |  |
| Design temperature return (°C) |  |  |  |  |
| Refrigerant used |  |  |  |  |
| Refrigerant charge |  |  |  |  |
| EER/  COP of the plant |  |  |  |  |

For sorption refrigeration systems:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Laufende Nummer** **For sorption refrigeration systems:** |  |  |  |  |
| Date of commissioning |  |  |  |  |
| Type (e.g. waste or adsorption system) |  |  |  |  |
| Number of installations of this type |  |  |  |  |
| Manufacturer |  |  |  |  |
| Model designation |  |  |  |  |
| Cooling capacity (nominal value) (kWth) |  |  |  |  |
| therm. Drive power (nominal value) (kWth) |  |  |  |  |
| Nominal electric power (kWel) |  |  |  |  |
| Design temperature[[4]](#footnote-6) flow (°C) |  |  |  |  |
| Design temperature return (°C) |  |  |  |  |
| Refrigerant used |  |  |  |  |
| Refrigerant charge |  |  |  |  |
| Steppiness (Effect: Single/Double/  Triple) |  |  |  |  |
| Thermal ratio of the plant |  |  |  |  |
| therm.  SEER resp.  JAZ of the plant |  |  |  |  |

**For the continuation of this report as the "Energy Efficiency Report for Final Evaluation", the following applies:**

Newly installed refrigeration systems must be added to the preceding table.

If the exemption for the use of halogenated refrigerants is claimed for a maximum cooling capacity of 10 kWth per refrigeration system, the reasons are as follows:

1. Please enter the supply and return temperature for the cold water circuit (or coolant circuit for another coolant that is not air):

Flow temperature:      °C

Return temperature:      °C

1. Please provide the annual average temperature for the data centre location or tell us the postcode for the data centre location:     °C POSTCODE :

### Energy efficiency of the cooling system (calculation of the annual performance factor)

For cooling systems operated with electrically driven compression chillers, the seasonal performance factor must be determined by measurements at the required points according to "Annex B: Measurement concept" of the award criteria.

If an exception is claimed, please document the seasonal performance factor and, if applicable, its basis in accordance with the exception in Table 5. The planning data, the measurement protocol for the load test (Exception 1) and, if applicable, the calculation of the corresponding coefficients of performance or the specific greenhouse emissions (award criteria, requirement 3.1.1.2, Exception 2) are to be attached to this report as an appendix. The plausibility of these documents shall be checked and confirmed by the verifier.

Table 5: Documentation of the calculation of the annual performance factor (APF)

|  |  |
| --- | --- |
| **Energy demand of the previous 12 months** | |
| Heat to be dissipated:  Qth,RZ,a | (kWhth/a)  (Calculated according to VDI guideline 2078) |
| Energy demand of the cooling system (please tick and indicate corresponding value, cf. exemption regulation): | |
| Cooling system electric (Qel,RZ,a) | (kWhel/a) |
| Cooling system not electric (Qel,RZ,a) | (kWhel/a)  Alternative calculation of FSKM attached as an annex |
| JAZ | (kWhth/kWhel) |
| **For exemption 1** (commissioning of the cooling system less than twelve months ago)**, please tick additionally:** | |
| JAZ value based on | Planning data (attached as annex)  Load test (attached as annex) |

1. Do you use a sorption chiller in the cooling system? (Yes/No)

⇨ If yes, then complete Table 6 and attach the calculation of the specific greenhouse emissions for the cooling system with sorption chiller (FSKM) and the comparative calculation for the compression chiller (FKKM).

Table 6: Calculation of specific greenhouse gas emissions FSKM and FKKM

|  |  |
| --- | --- |
| **Bei Ausnahmeregelung 2** (Sorptionskältemaschine)**:** | |
| Specific greenhouse emissions Cooling system with sorption chiller (FSKM) | (kgCO2/kWhth) |
| Specific greenhouse emissions Comparison system with compression chiller (FKKM) | (kgCO2/kWhth) |
| Requirement FSKM ≤ FKKM fulfilled? | (Yes/No) |
| **For exception 3** (Colo data centre not fully utilised): | |
| Commissioning of the  Data centre | Commissioning < 1 year (min.: JAZ > 5)  1 year ≤ commissioning < 2 years (min.: JAZ > 6.5)  Commissioning ≥ 2 years (no exception) |

## Uninterruptible Power Supply (UPS)

1. Do you use a UPS in your data centre? (Yes/No)

⇨ If yes:

Please indicate which area(s) are protected by the UPS (multiple answers possible):

ICT components

Fans in the server room (e.g. ULK, inlet systems)

Pumps in the cooling circuit

Others

1. What technical concept do they use for the UPS?

Online operation with double conversion

Online operation with delta conversion

Standby operation with flywheel

Standby mode with battery (dynamic UPS)

UPS for linear standby operation

Others

1. Which redundancy concept is implemented in the UPS?

N (no redundancy)

N+1

2N

2(N+1)

Others

1. Please complete the following table for existing and newly purchased uninterruptible power supplies (UPS).

Table 7: Documentation of the efficiencies of the UPS systems

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sequence number** |  |  |  |  |
| Typ |  |  |  |  |
| Number of installations of this type |  |  |  |  |
| Manufacturer |  |  |  |  |
| Model designation |  |  |  |  |
| Power factor (cos phi) |  |  |  |  |
| Rated power (kVA) |  |  |  |  |
| Efficiency at 25% load |  |  |  |  |
| Efficiency at 50% load |  |  |  |  |
| Efficiency at 75% load |  |  |  |  |
| Efficiency at 100% load |  |  |  |  |

**For the continuation of this report as the "Energy Efficiency Report for Final Evaluation", the following applies:**

Newly purchased uninterruptible power supplies (UPS) must be added to the table above.

# Glossar

COP: Coefficient of Performance: Is a performance number for mechanical refrigeration systems and for mechanical heat pumps. It is the ratio of the generated cooling or heating capacity to the electrical power used.

CPU: Central Processing Unit (CPU) is the central processing unit of a computer.

Direct evaporator: Room air conditioner separated by an outdoor unit with separate outdoor and indoor units (condenser and evaporator). another name is split unit.

EER: Energy Efficiency Ratio is a dimensionless key figure that describes the energy efficiency of a system. In the case of mechanical refrigeration systems, it is the ratio of thermal energy generated (cooling) to the electrical energy used over a specified period of time. If the EER is recorded over a period of one year, it corresponds to the annual performance factor (APF) of the refrigeration system.

IT: Information technology (IT) is a generic term for the hardware and software used for data processing.

COP: COP is the ratio of the amount of cooling produced over a period of one year to the electrical energy used for this purpose. If the seasonal performance factor is not calculated for an individual refrigerating machine but for an entire cooling system, the cooling energy generated by free cooling (usually from outside air) is included in the balance. The electrical energy for driving the fans and pumps involved in cold distribution is also included.

KS: Cooling system is the sum of the technical equipment for cooling a building or individual rooms, e.g. a data centre.

KWS: The chiller (KWS) is a refrigerating machine that cools a liquid heat transfer medium (water).

PDU: Power Distribution Unit (PDU) is the power distribution unit within a server room that distributes the low-voltage current to the individual IT components.

Data centre: Data centre is a spatially limited technical facility used to process data securely, in large quantities, permanently over a long period of time and centrally.

SPEC power benchmark: Measure of the energy efficiency of a server.

ULK: Recirculating air-conditioning unit is an air-conditioning unit that circulates the air to be cooled, i.e. does not supply outside air, and cools it back to the desired temperature level via heat exchangers.

UPS: Uninterruptible power supply (UPS) is a device within the power supply of a data centre that increases the security of supply. The UPS bridges short-term interruptions in the power supply network through battery operation and ensures that the servers and storage systems can be shut down in an orderly manner in the event of a longer power failure.

# Overview of annexes to the contract

**Mandatory Annexes to the Energy Efficiency Report Contract for Applications under Section 3.1.5 of the Award Criteria**

**Annex 2** Energy Efficiency Report for Application (this document)

**Annex 2e** Monitoring Energy

(printout from EXCEL table, spreadsheet 2e\_Energy\_Monitoring)

**Annex 2g** Monitoring Water Consumption

(printout from EXCEL table, spreadsheet 2g\_refrigeration\_systems)

**Annex 4:** Expert opinion of a notified inspection agency on the completeness and plausibility of the energy efficiency report at the time of application (Annex 2) in accordance with section 3.1.5 Energy efficiency report at the time of application of the award criteria

**Annex 5:** Electricity labelling in accordance with §42 of the Energy Industry Act (Energiewirtschaftsgesetz) or individual proof of specific greenhouse gas emissions, if applicable justification of exemption in accordance with section 3.1.1.4 Electrical Energy of the award criteria

**Appendix 6:** Information material for Colo customers on energy saving in accordance with section 3.1.4.1 of the award criteria

**Annex 7:** Model contract for the billing of the colocation service pursuant to section 3.1.4.2 of the award criteria

**Mandatory Annexes to the Contract for Energy Efficiency Report for Final Evaluation according to Section 3.2.2 of the Award Criteria**

**Annex 2** Final Evaluation Energy Efficiency Report (this document)

**Annex 2 2d** Inventory list of newly acquired intelligent PDUs

(printout from EXCEL table, spreadsheet 2d\_PDU)

**Annex 2 2e** Monitoring Energy

(printout from EXCEL table, spreadsheet 2e\_Energy\_Monitoring)

**Annex 2 2g** Monitoring Water Consumption

(printout from EXCEL table, spreadsheet 2g\_Cooling\_systems)

**Optional annexes to the energy efficiency report, if exemptions are claimed:**

**Annex to chapter 2.1:** Calculation of the PUE value based on planning data or load tests according to award criteria section 3.1.1.1 Power Usage Effectiveness of the award criteria.

**Annex to chapter 2.7.2:** Calculation of the annual energy efficiency (AER) based on planning data or load tests according to Exception 1 to section 3.1.1.2 Cooling System Energy Efficiency of the Award Criteria

**Annex to Chapter 2.7.2:** Calculation of specific greenhouse gas emissions Cooling system with sorption chiller (FSKM) and comparative calculation of compression chiller (FKKM) according to Exception 2 to Section 3.1.1.2 Energy Efficiency of the Cooling System of the Award Criteria

1. Hybrid cooling is the combination of several cooling systems with different heat transfer media (usually air and water). [↑](#footnote-ref-3)
2. Indirect free coolers are used in the variants: Dry, hybrid or wet coolers [↑](#footnote-ref-4)
3. The design temperature refers to the return or supply temperature of the chiller under which the thermal cooling capacity (nominal value) specified by the manufacturer was determined. [↑](#footnote-ref-5)
4. The design temperature refers to the return or supply temperature of the chiller under which the thermal cooling capacity (nominal value) specified by the manufacturer was determined. [↑](#footnote-ref-6)