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# Consumption reference values per data center type

Calculation proposal for decree n° 2019-771 of 23 July 2019

DVTD / Service Bâtiments / Bruno LAFITTE

23/03/2022

# Decree so called « tertiary sector »

For all tertiary buildings with total area ≥ 1 000 m²



**1**

**Reduction of final energy consumption in respect to a reference year not before 2010**

- **- 40 % in 2030**
- **- 50 % in 2040**
- **- 60 % in 2050**

**2**

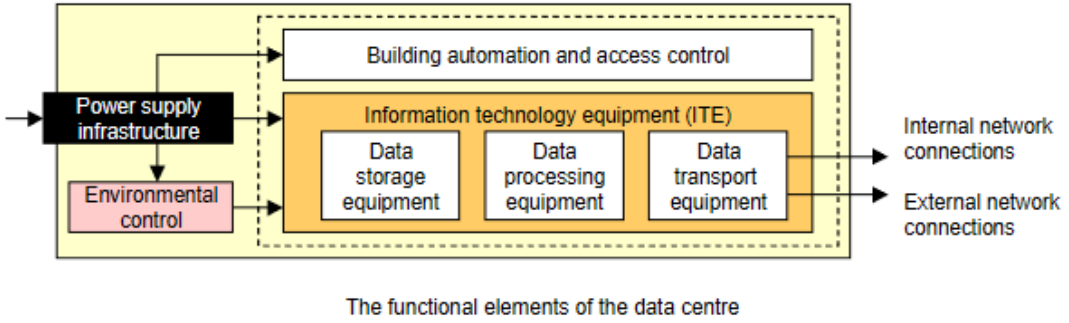
**Consumption lower than a maximum target value in 2030**

- **Expressed in kWh/m²/year**
- **Fixed depending on the activity**
- **Considering use intensity change**

# Data centres consumption

IT consumptions : servers, routers, switches, storage ..

Non IT consumption : cooling, UPS, lighting …



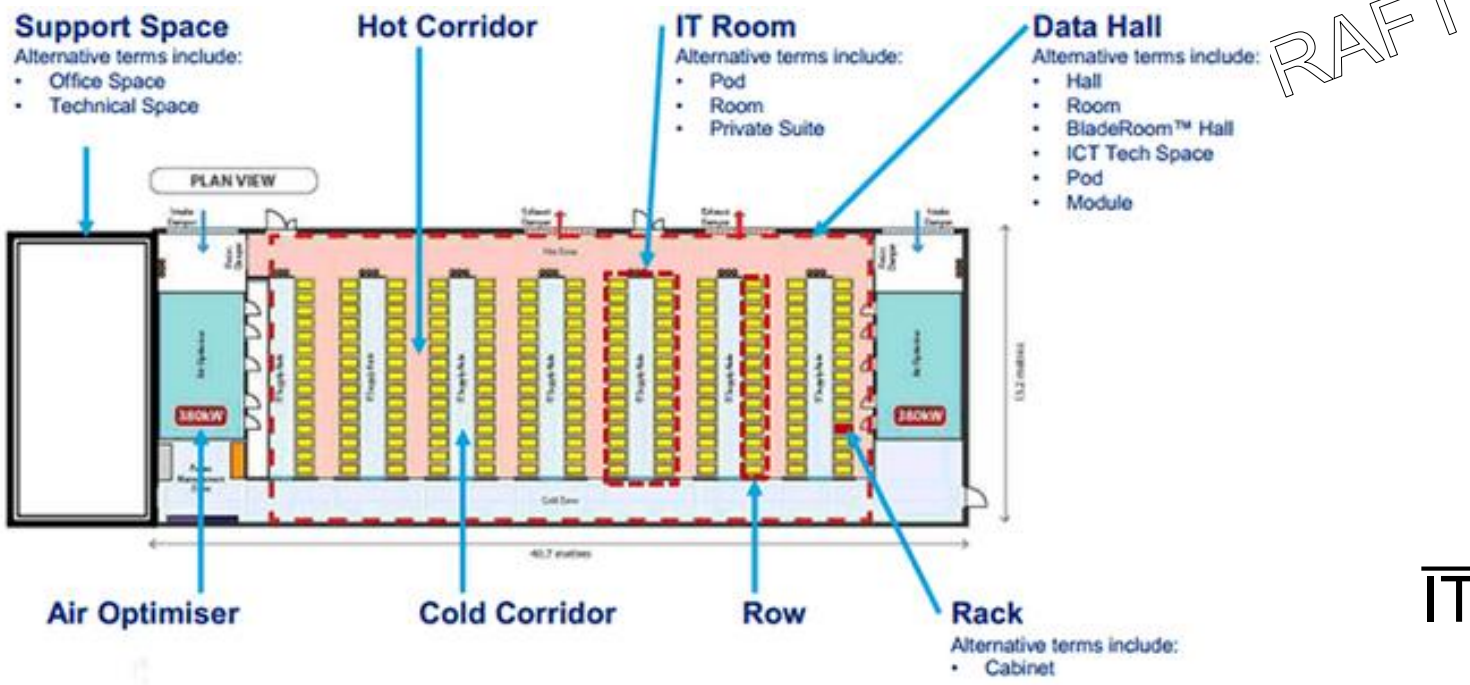

The functional elements of the data centre

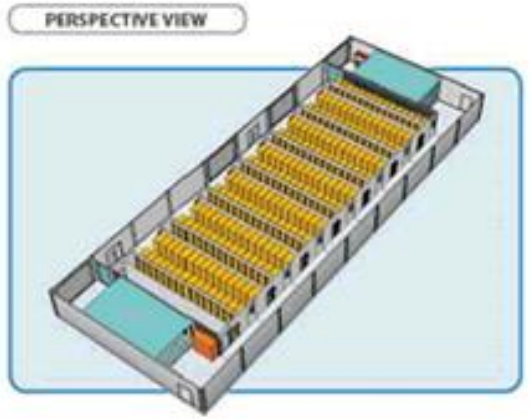


DC consumption = IT equipment consumption + non IT equipment consumption

$$P.U.E. = \frac{\text{energy used as a whole}}{\text{energy used by just the IT equipment}}$$

# Data centre design




$$\frac{\text{rack surface}}{\text{IT room surface}} = 1/3$$

New South Wales Government, Australia

# IT consumption **maximum allowed**

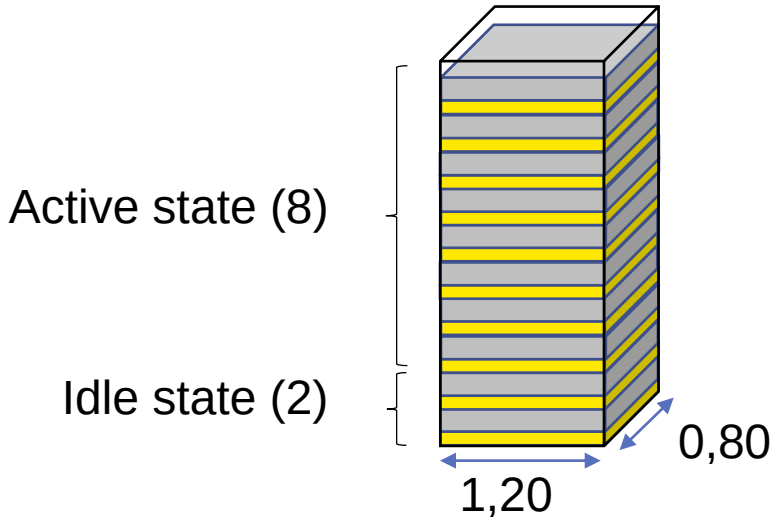
IT consumption per IT square meter per year =

Number of hours per year

1 Power density (W / rack) x 2 (rack surface/IT room surface) x 3 (utilization rate* x 8760 h)

+ 4 (Power in idle state x (1- utilization rate) x 8760 h






**Typical rack with 10 servers**

* The *utilization rate* is defined as the overall extent to which *data center* servers are being used and is usually recorded as a percentage.

# Overall consumption **maximum allowed**

Overall consumption per IT square meter

5

= IT consumption per square meter per year x P.U.E.

# Reference values in 2030

| Categories | IT area | 1 IT power density or nominal power (W/rack) | 3 Utilization rate | 5 PUE | 4 Idle power* | 2 rack surface/IT room surface |
|---|---|---|---|---|---|---|
| **Server closet** | < 20 m² | 4000 | 50% | 2 | 80 | 1/3 |
| **Server room** | 20 m² to 100 m² | 3000 | 40% | 1,8 | 80 | 1/3 |
| **Mini scale data centre** | 100 m² to 500 m² | 3500 | 40% | 1,7 | 80 | 1/3 |
| **Small scale data centre** | 500 m² to 1000 m² | 4000 | 40% | 1,6 | 80 | 1/3 |
| **Medium scale data centre** | 1000 m² to 5000 m² | 4500 | 50% | 1,5 | 80 | 1/3 |
| **Large scale data centre** | 5000 m² to 10 000 m² | 5000 | 50% | 1,4 | 80 | 1/3 |
| **Hyperscale data centre** | > 10 000 m² | 10000 | 60% | 1,2 | 80 | 1/3 |

* Regulation 2019/424, table 3 : Base idle state power allowance for Blade or multi-node servers (2 servers in idle mode per rack of 10 servers)

# Modulation with intensity

$Consumption_{modulated}$ (kWh/year/m²IT) =

$Consumption_{reference}$ x [(Utilization rate / $Utilization\ rate_{reference}$)

x (Power density / $Power\ density_{reference}$)]



Modulation equivalent to modulation with change in the volume of data processed

# Conclusion

Limitations :

- More tests needed with real data center values
- Average reference values to update ?

…..

Opportunities :

- With few non intrusive data from DC operators : set individual consumption limits or target
- Push for higher power density, higher utilization rate, higher rack density in IT room and lower idle power

…..

Open questions :

- Should we consider the type of data processed ?
- Should we complicate the modulation formula ?
- May we consider that formula for european regulation/delegated act or for labelling ?

…….

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# MERCI !

**Direction Ville et Territoire Durables / Service Bâtiment**
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# Responsabilities

4 categories of stakeholders in DC :

1. The owner of the building
2. The lessor
3. The operator
4. The owner of IT devices



If the operator (3) is separate from the lessee (most of the cases), the situation is equivalent to a classic delagation contract. First responsabilty is to the delegator, responsability of the delagatee is stated in the contract. For an example, a public service delagatee (private), operating a building (swimming pool, theatre …) take the responsability for the owner of the building.
For colocation data centres, the owner of IT equipment (4) is considered as a lessee (suject functional entity). He is responsible of its own consumption. The operator (3) of the building charges the energy bill (ellectricity supply and cooling) to the owner of IT equipment.
To sum up, when the owner of the building (1) is operating the building but not the IT equipment wich belongs to several lessees, each lessee is responsible of its own consumption and should declare it based on the information given by the operator. **The lessee should ensure that the operator of the building operates in an efficient way.**

# Typical cases

| Configuration / Role | colocation | | Cloud service provider |
|---|---|---|---|
| | Operator | Customer (lessee) | |
| 1.The owner of the building | X (more often) | | x |
| 2. Lessor | x | | X (service offer) |
| 3. Operator of the building | x | | x |
| 4. Owner of IT | | x | x |

# Data center classifications - availability

The Availability Class concept of EN 50600-1:2019 EN 50600-2 series

Availability and power dansity of IT (W/m2) nominal power is often related



| | Availability of overall set of facilities and infrastructures | | | |
|---|---|---|---|---|
| | Low | Medium | High | Very high |
| | AVAILABILITY CLASS | | | |
| Infrastructure | 1 | 2 | 3 | 4 |
| Power supply<br><br>EN 50600-2-2 | Single path to primary distribution equipment<br>-<br>Single source | Single path to primary distribution equipment<br>-<br>Redundant sources | Multiple paths to primary distribution equipment<br>-<br>Redundant sources | Multiple paths to primary distribution equipment<br>-<br>Multiple sources |
| Power distribution<br>EN 50600-2-2<br>and<br>environmental control<br>EN 50600-2-3 | Single path | Single path with redundancy | Multiple paths<br>-<br>Concurrent repair/operate solution | Multiple paths<br>-<br>Fault tolerant except during maintenance |
| Telecommunications cabling<br><br>EN 50600-2-4 | Single path<br>-<br>direct connections or fixed infrastructure with single access network connection | Single path<br>-<br>fixed infrastructure with multiple access network connections | Multiple paths<br>-<br>fixed infrastructure with diverse pathways with multiple access network connections | Multiple paths<br>-<br>fixed infrastructure with diverse pathways and redundant distribution zones and multiple access network connections |