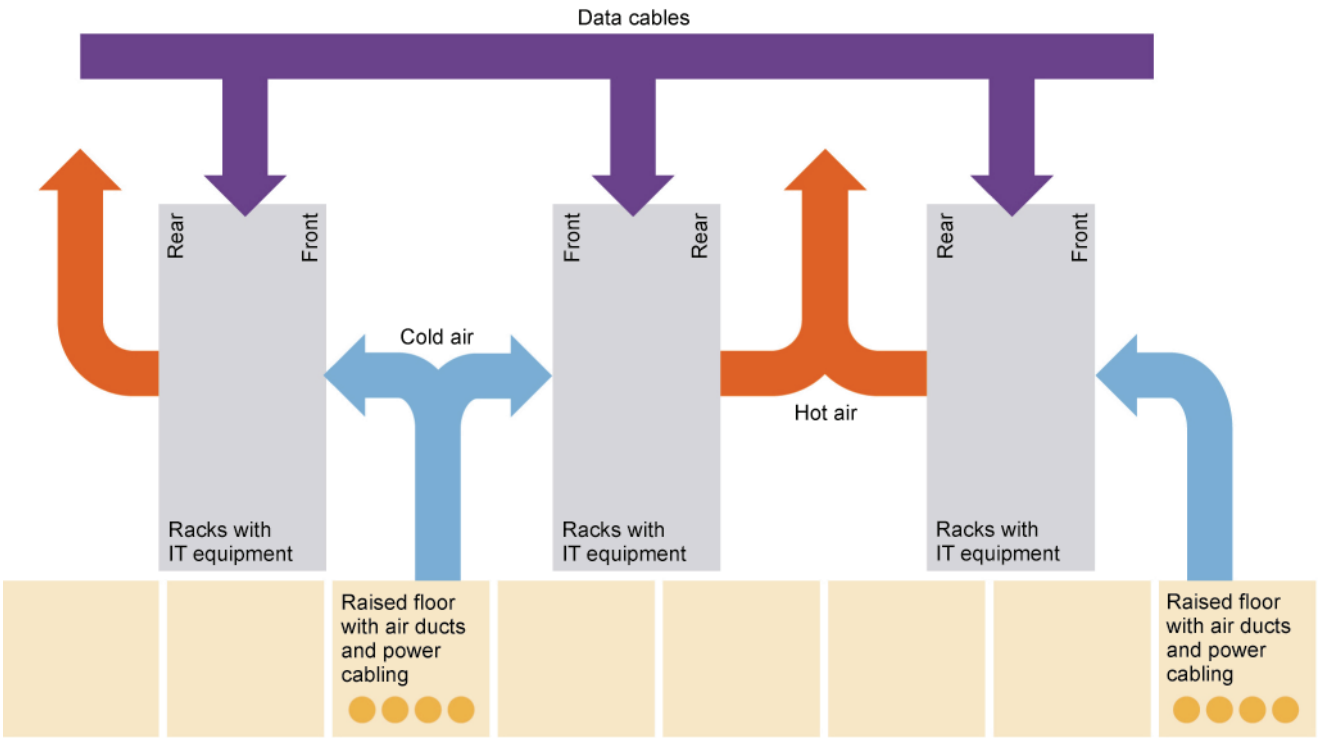
Green Sustainable Data Centres

Checklist - EU Code of Conduct on Data Centres

Annex



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First edition 2014

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INTRODUCTION

On completion of this checklist, learners should be able to:
– Identify and recognise data centre energy efficiency best practices within the Code of Conduct.
– Define the extent to which best practice is in place in their data centre.

Expected minimum practices
– Practices are marked in the expected column as:

Category	*Description*
Entire Data Centre	Expected to be applied to all existing IT, Mechanical and Electrical equipment within the data centre
New Software	Expected during any new software install or upgrade
New IT Equipment	Expected for new or replacement IT equipment
New build or retrofit	Expected for any data centre built or undergoing a significant refit of the M&E equipment

Value of practices
– Each practice has been assigned a qualitative value to indicate the level of benefit to be expected. These values are from 1 to 5 with 5 indicating the maximum value.
– All practices outlined in this document are mandatory for a green and sustainable data centre but data centre managers are encourage to implement the most valuable practices before the less valuable ones.

Marking practice status
– The learner should mark each practice in the checklist form as one of:

Mark	*Description*
No mark	Not implemented.
Committed Date	Not yet implemented but a program is in place to implement the practice by the specified date.
I	Implemented practice.
E	Endorsed practice, this practice cannot be implemented by the student as it is outside the area of responsibility, but it is endorsed to their suppliers or customers.
I & E	This practice is partially within the control of the applicant. The applicant has implemented the practice as fas as practical and endorsed the practice to their customers or suppliers.

1 Data Centre Utilisation, Management and Planning

1.1 INVOLVEMENT OF ORGANISATIONAL GROUPS

No	*Name*	*Description*	*Value*	*Mark*
1.1.1	Group involvement	Establish an approval board containing representatives from all disciplines (software, IT, M&E). 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.	5	–

1.2 GENERAL POLICIES

No	*Name*	*Description*	*Value*	*Mark*
1.2.1	Consider the embedded energy in 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.	3	–

1.3 RESILIENCE LEVEL AND PROVISIONING

No	*Name*	*Description*	*Value*	*Mark*
1.3.1	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.	3	–
1.3.2	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.	3	–
1.3.3	Lean provisioning of power and cooling for a maximum of 18 months of data floor capacity	he provisioning of excess power and cooling capacity in the data centre drives substantial fixed losses and is unnecessary.	3	–
1.3.4	Design to maximise the part load efficiency once provisioned	The design of all areas of the data centre should be maximise the achieved efficiency of the facility under partial fill and variable IT electrical load.	3	–

2 IT Equipment and Services

2.1 SELECTION AND DEPLOYMENT OF NEW IT EQUIPMENT

No	*Name*	*Description*	*Value*	*Mark*
2.1.1	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 Energy Star or SPECPower	5	–
2.1.2	New IT hardware – Restricted (legacy) operating temperature and humidity range	Where no equipment of the type being procured meets the operating temperature and humidity range of practice 2.1.3, then equipment supportingat a minimum the restricted (legacy) range of 15°C - 32°C inlet temperature (59°F – 89.6°F) and humidity from 20% to 80% relative humidity and below 17°C maximum dew point (62.6°F) may be procured.	4	–
2.1.3	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.	5	–
2.1.4	Select equipment suitable for the data centre – Air flow direction	When selecting equipment for installation into racks ensure that the air flow direction matches the air flow design for that area. This is commonly front to rear or front to top.	4	–
2.1.5	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.	5	–
2.1.6	Provision to the as configured power	Provision power and cooling only to the as-configured power draw capability of the equipment, not the PSU or nameplate rating.	3	–
2.1.7	Energy Star compliant hardware	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.	3	–
2.1.8	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.	3	–
2.1.9	Select free standing equipment suitable for the data centre – Air flow direction	When selecting equipment which is free standing or supplied in custom racks the air flow direction of the enclosures should match the air flow design in that area of the data centre. This is commonly front to rear or front to top.	4	–
2.1.10	IT equipment power against inlet temperature	When selecting new IT equipment require the vendor to supply at minimum; Either the total system power or cooling fan power for temperatures covering the full allowable inlet temperature range for the equipment under 100% load on a specified benchmark such as SPECPower http://www.spec.org/power_ssj2008/).	4	–

2.2 DEPLOYMENT OF NEW IT SERVICES

No	*Name*	*Description*	*Value*	*Mark*
2.2.1	Deploy using Grid and 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.	5	–
2.2.2	Reduce IT hardware resilience level	Determine the business impact of service incidents for each deployed service and deploy only the level of hardware resilience actually justified.	4	–
2.2.3	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 standby IT equipment and resilience that is actually justified by the business impact.	4	–
2.2.4	Select efficient software	Make the energy use performance of the software a primary selection factor.	4	–
2.2.5	Develop efficient software	Make the energy use performance of the software a major success factor of the project.	4	–

2.3 MANAGEMENT OF EXISTING IT EQUIPMENT AND SERVICES

No	*Name*	*Description*	*Value*	*Mark*
2.3.1	Decommission unused services	Completely decommission and remove, the supporting hardware for unused services	5	–
2.3.2	Audit of exiting IT environmental requirements	Identify the allowable intake temperature and humidity ranges for existing installed IT equipment.	4	–

2.4 DATA MANAGEMENT

No	*Name*	*Description*	*Value*	*Mark*
2.4.1	Data management policy	Develop a data management policy to define which data should be kept, for how long and at what level of protection	3	–

3 Cooling

3.1 AIR FLOW MANAGEMENT AND DESIGN

No	*Name*	*Description*	*Value*	*Mark*
3.1.1	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 rack supply, room return Room supply, contained rack return, (inc. Rack chimneys) Contained rack supply, Contained rack return This action is expected for air cooled facilities over 1kW per square meter power density.	5	–
3.1.2	Rack air flow management –Blanking Plates	Installation of blanking plates where there is no equipment to reduce hot air re-circulating through gaps in the rack.	3	–
3.1.3	Rack air flow management –Other openings	Installation of aperture brushes (draught excluders) or cover plates to cover all air leakage opportunities in each rack.	3	–
3.1.4	Raised floor air flow management	Close all unwanted apertures in the raised floor. Review placement and opening factors of vented tiles to reduce bypass.	3	–
3.1.5	Design – Hot/cold aisle	As the power densities and air flow volumes of IT equipment have increased it has become necessary to ensure that equipment shares an air flow direction, within the rack, in adjacent racks and across aisles.	3	–
3.1.6	Equipment segregation	Deploy groups of equipment with substantially different environmental requirements and / or equipment airflow direction in a separate area. Where the equipment has different environmental requirements it is preferable to provide separate environmental controls.	3	–
3.1.7	Provide adequate free area on rack doors	Solid doors can be replaced (where doors are necessary) with partially perforated doors to ensure adequate cooling airflow which often impede the cooling airflow and may promote recirculation within the enclosed cabinet further increasing the equipment intake temperature.	3	–
3.1.8	Separate environmental zones	Where a data centre houses both IT equipment compliant with the extended range of practice and other equipment which requires more restrictive temperature or humidity control separate areas should be provided.	4	–
3.1.9	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.	4	–

3.2 COOLING MANAGEMENT

No	*Name*	*Description*	*Value*	*Mark*
3.2.1	Review of cooling before IT equipment changes	The availability of cooling including the placement and flow of vented tiles should be reviewed before each IT equipment change to optimise the use of cooling resources.	2	–
3.2.2	Review of cooling strategy	Periodically review the IT equipment and cooling deployment against strategy.	2	–
3.2.3	Effective regular maintenance of cooling plant	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.	2	–

3.3 TEMPERATURE AND HUMIDITY

No	*Name*	*Description*	*Value*	*Mark*
3.3.1	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).	4	–
3.3.2	Review and increase the working humidity range	Reduce the lower humidity set point(s) of the data centre within the ASHRAE Class A2 range (20% relative humidity) to remove de-humidification losses.	4	–
3.3.3	Review and if possible raise chilled water temperature	Review and if possible increase the chilled water temperature set points to maximise the use of free cooling economisers and reduce compressor energy consumption.	4	–
3.3.4	Industrial Space	The data centre should be considered as an industrial space, designed built and operate with the single primary objective of delivering high availability IT services reliably and efficiently.	3	–

3.4 COOLING PLANT – HIGH EFFICIENCY COOLING PLANT

No	*Name*	*Description*	*Value*	*Mark*
3.4.1	Chillers with high COP	Where refrigeration is installed make the Coefficient Of Performance of chiller systems through their likely working range a high priority decision factor during procurement of new plant.	3	–
3.4.2	Cooling system operating temperatures	Evaluate the opportunity to decrease condensing temperature or increase evaporating temperature; reducing delta T between these temperatures means less work is required in cooling cycle hence improved efficiency.	3	–
3.4.3	Efficient part load operation	Optimise the facility for the partial load it will experience for most of operational time rather than max load. e.g. sequence chillers, operate cooling towers with shared load for increased heat exchange area	3	–
3.4.4	Variable speed drives for compressors, pumps and fans	Reduced energy consumption for these components in the part load condition where they operate for much of the time.	2	–
3.4.5	Select systems which facilitate the use of economisers	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.	4	–
3.4.6	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.	4	–

3.5 COMPUTER ROOM AIR CONDITIONERS

No	Name	Description	Value	Mark
3.5.1	Variable Speed Fans	Many old CRAC units operate fixed speed fans which consume substantial power and obstruct attempts to manage the data floor temperature.	4	–
3.5.2	Do not control humidity at CRAC 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 unit is unnecessary and undesirable.	4	–

4 Data Centre Power Equipment

4.1 SELECTION AND DEPLOYMENT OF NEW POWER EQUIPMENT

No	Name	Description	Value	Mark
4.1.1	Modular UPS deployment	It is now possible to purchase modular (scalable) UPS systems across a broad range of power delivery capacities.	3	–
4.1.2	High efficiency UPS	High efficiency UPS systems should be selected, of any technology including electronic or rotary to meet site requirements.	3	–
4.1.3	Use efficient UPS operating modes	UPS should be deployed in their most efficient operating modes such as line interactive.	2	–
4.1.4	Elimination of Isolation Transformers	Isolation transformers in power distribution to IT equipment down to 110V are typically not required in Europe and should be eliminated from designs as they introduce additional transformer lossesunnecessarily.	3	–

5 Other Data Centre Equipment

5.1 GENERAL PRACTICES

No	Name	Description	Value	Mark
5.1.1	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.	1	–
5.1.2	Low energy lighting	Low energy lighting systems should be used in the data centre.	1	–

6 Monitoring

6.1 ENERGY USE AND ENVIRONMENTAL MEASUREMENT

No	Name	Description	Value	Mark
6.1.1	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.	3	–
6.1.2	IT Energy consumption meter	Install metering equipment capable of measuring the total energy delivered to IT systems, including power distribution units.	3	–

6.2 ENERGY USE AND ENVIRONMENTAL COLLECTION AND LOGGING

No	Name	Description	Value	Mark
6.2.1	Periodic manual readings	Entry level energy, temperature and humidity (dry bulb temperature, relative humidity and dew point temperature) reporting can be performed with periodic manual readings of measurement and metering equipment. This should occur at regular times, ideally at peak load.	3	–
6.2.2	Achieved economised cooling hours – new build DC	Require collection and logging of full economiser, partial economiser and full mechanical hours throughout the year.	3	–

6.3 ENERGY USE AND ENVIRONMENTAL REPORTING

No	Name	Description	Value	Mark
6.3.1	Written report	Entry level reporting consists of periodic written reports on energy consumption and environmental ranges. This should include determining the averaged DCIE or PUE over the reporting period.	3	–
6.3.2	Achieved economised cooling hours – new build DC	Require reporting to log full economiser, partial economiser and full mechanical hours throughout the year.	3	–