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JOINT RESEARCH CENTRE
Institute for Energy
Renewable Energies Unit

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Code of Conduct on Data Centres Energy Efficiency Version 2.0

Endorser Guidelines and Registration Form

Valid as from 1.1.2010

Introduction

This Code of Conduct has been created in response to increasing energy consumption in data centres and the need to reduce the related environmental, economic and energy supply security impacts. The aim is to inform and stimulate data centre operators and owners to reduce energy consumption in a cost-effective manner without hampering the mission critical function of data centres. The Code of Conduct aims to achieve this by improving understanding of energy demand within the data centre, raising awareness, and recommending energy efficient best practice and targets.

This Code of Conduct is a voluntary initiative aimed to bring interested stakeholders together, including the coordination of other similar activities by manufacturers, vendors, consultants and utilities. Parties signing up will be expected to follow the intent of this Code of Conduct and abide by a set of agreed commitments.

Environmental Statement

Electricity consumed in data centres, including enterprise servers, ICT equipment, cooling equipment and power equipment, is expected to contribute substantially to the electricity consumed in the European Union (EU) commercial sector[1] in the near future. Western European electricity consumption of 56 TWh per year can be estimated for the year 2007[2] and is projected to increase to 104 TWh per year by 2020.

The projected energy consumption rise poses a problem for EU energy and environmental policies. It is important that the energy efficiency of data centres is maximised to ensure the carbon emissions and other impacts such as strain on infrastructure associated with increases in energy consumption are mitigated.

Problem Statement

Historically, data centres have been designed with large tolerances for operational and capacity changes, including possible future expansion. Many today use design practices that are woefully outdated. These factors lead to power consumption inefficiencies. In most cases only a small fraction of the grid power consumed by the data centre actually gets to the IT systems. Most enterprise data centres today run significant quantities of redundant power and cooling systems typically to provide higher levels of reliability. Additionally IT systems are frequently run at a low average utilisation

Over provisioning, ensuring availability and associated costs were previously considered a negligible risk to business performance because energy costs were relatively small in comparison to the IT budget, and environmental responsibility was not considered to be the remit of the IT department. However, with rising energy prices this is no longer the case, and the issue of energy consumption at the individual data centre level is becoming increasingly

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[1] The commercial sector is also referred as the tertiary sector and it includes both private and public building hosting data centre. In this case energy consumption of data centres of companies in the industrial sector is included.

[2] This is based upon the Draft UK Market Transformation Programme European Enterprise Server installed base model, and assumes an upper bound ratio of 1:2 between electricity consumed by the server equipment within the data centre or server room, against that consumed by cooling equipment and through power losses. The lower bound ratio of 1:1 gives total electricity consumption close to 37 TWh. The upper and lower bound ratio is based on several different sources of measurements of electricity consumption in the data centre.

important as operational energy expenditures and ecological impact of the energy consumed begins to play an ever important role in overall cost of ownership of data centres.

Preliminary evidence and the increasing willingness of manufacturers and vendors to compete on the basis of energy efficiency in data centres confirms that there are efficiency gains (for example simply by using existing power management technologies) still to be realised without prohibitive initial costs that can lower the Total Cost of Ownership (TCO).

Businesses are also becoming increasingly aware of their environmental impacts and the need to reduce these.

Many data centres operators are simply not aware of the financial, environmental and infrastructure benefits to be gained from improving the energy efficiency of their facilities. Even awareness does not necessarily lead to good decision making, simply because there is no framework in place for the operators to aspire to. Making data centres more energy efficient is a multidimensional challenge that requires a concerted effort to optimise power distribution, cooling infrastructure, IT equipment and IT output.

Many activities have been initiated within the industry[3] and there are numerous vendor specific products and services on offer. However, there is a risk of confusion, mixed messages and uncoordinated activities. Independent assessment and coordination – tailored to European conditions such as climate and energy markets regulation – is required to lower the barriers of access to and application of these energy saving opportunities.

A voluntary scheme within the EU such as the Code of Conduct will provide a platform to bring together European stakeholders to discuss and agree voluntary actions which will improve energy efficiency.

To help all parties address the issue of energy efficiency, data centre owners and operators, data centre equipment and component manufacturers, service providers, and other large procurers of such equipment will be invited to participate in the Code of Conduct, by signing this Code of Conduct.

This Code of Conduct proposes general principles and practical actions to be followed by all parties involved in data centres, operating in the EU, to result in more efficient and economic use of energy, without jeopardising the reliability and operational continuity of the services provided by data centres.

Scope

For the purposes of the Code of Conduct, the term "data centres" includes all buildings, facilities and rooms which contain enterprise servers, server communication equipment, cooling equipment and power equipment, and provide some form of data service (e.g. large scale mission critical facilities all the way down to small server rooms located in office buildings).

The focus of this Code of Conduct covers two main areas:

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[3] These include the US DoE, the US EPA Energy Star, the Green Grid association, Climate Savers Computing Initiative, the IEEE E-Server project

1. IT Load – this relates to the consumption efficiency of the IT equipment in the data centre and can be described as the IT work capacity available for a given IT power consumption. It is also important to consider the utilisation of that capacity as part of efficiency in the data centre

2. Facilities Load – this relates to the mechanical and electrical systems that support the IT electrical load such as as cooling systems (chiller plant, fans, pumps) air conditioning units, UPS, PDU's etc..

However the Code of Conduct will consider the data centre as a complete system, trying to optimise the IT system and the infrastructure together to deliver the desired services in the most efficient manner.

In common with other industry bodies the Code of Conduct will <u>initially</u> use the ratio of IT Load to Facilities Load as the key metric in assessing infrastructure efficiency. This will be known as 'facility efficiency'. The Code of Conduct will also be concerned with the efficiency with which the IT equipment utilises the power delivered, this will be known as 'asset efficiency'. As efficiency metrics for data centres are further developed and agreed, it is expected that the Code of Conduct will adopt more comprehensive metrics which may also cover the IT system design, the IT hardware asset utilisation, and the IT hardware efficiency.

To understand the entire efficiency of a data centre both facility and asset efficiency should be considered.

The Code of Conduct has both an <u>equipment</u> and <u>system-level</u> scope. At the equipment level, this Code of Conduct covers typical equipment used within data centres required to provide data, internet and communication services. This includes all energy using equipment within the data centre, such as: IT equipment (e.g. rack optimised and non-rack optimised enterprise servers, blade servers, storage and networking equipment), cooling equipment (e.g. computer room air-conditioner units) and power equipment (e.g. uninterruptible power supplies and power distributions units), and miscellaneous equipment (e.g. lighting). At system level the Code of Conduct proposes actions which optimise equipment interaction and the system design (e.g. improved cooling design, correct sizing of cooling, correct air management and temperature settings, correct selection of power distribution), to minimize overall energy consumption.

The Code of Conduct covers both <u>existing and new data centres (facility under construction or coming into service)</u>.

Aims and Objectives

To minimize energy consumption of data centres.

This Code of Conduct is a "multipurpose" document, allowing different stakeholders to commit to improve efficiency in their own areas of competence. The primary target of this Code of Conduct is the data centre owner / operator, who is encouraged to commit to undertake and implement energy efficient solutions in existing or new data centres, whilst respecting the life cycle cost effectiveness and the performance availability of the system.

The Code of Conduct aims to:

1. Develop and promote a set of easily understood metrics to measure the current efficiencies and improvement going forward in conjunction with other industry thought leadership fora.
2. Provide an open process and forum for discussion representing European stakeholder requirements.
3. Produce a common set of principles to refer to and work in coordination with other international initiatives
4. Raise awareness among managers, owners, investors, with targeted information and material on the opportunity to improve efficiency[4]. Suppliers of efficient services and equipment, as well as other organisations[5] can become allied in and endorsers of these targeted campaigns.
5. Create and provide an enabling tool for industry to implement cost-effective energy saving opportunities
6. Develop practical voluntary commitments which when implemented improve the energy efficiency of data centres and in so doing minimise the TCO.
7. Determine and accelerate the application of energy efficient technologies.
8. Foster the development of tools that promote energy efficient procurement practices.
9. Support procurement, by providing criteria for equipment (based on the Energy Star Programme specifications, when available, and other Codes of Conduct[6]), and best practice recommendations
10. Monitor and assess actions to properly determine both the progress and areas for improvement.
11. Set energy efficiency targets, for public and corporate data centre owners and operators (targets are differentiated according to the size and status of existing data centres, the geographical location, the return on investments, etc).
12. Provides reference for other participants. The values of the Code of Conduct goes beyond the number of companies that sign and commit themselves, as the principles can be implemented also by other companies, which may not decide to make a public commitment. The existence of the European Code of Conduct introduces targets and guidelines which are open to every data centre.

Commitments and Monitoring

The Code of Conduct is addressed primarily to the Data Centre Owners and Operators which may become Participant, and secondly to the supply chain and service providers which may become Endorsers. This document is addressed to Endorser, the rules and the commitments for Participants are described in the Participants Guidelines and Registration Form document.

The Code of Conduct is:

13. flexible and open, so as to be applicable to the great variety of data centre situations;
14. sufficiently precise to ensure that companies that carry out the commitment will achieve a significant part of potential energy savings, which are monitored and reported in a transparent manner
15. adaptable to the large variety of national efficiency programmes, climates and energy infrastructures

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4 This information could be disseminated through messages and information campaigns sponsored by governmental bodies at EU and national level, which are seen as independent and unbiased organisations.
5 e.g. the Green Grid association
6 e.g. the Code of Conduct for UPSs.

Endorsers Commitment

General Principles:

1. Organisations eligible to become Endorsers include:

- Vendors
- Consultancies (design, engineering, maintenance and service companies)
- Utilities
- Customers of data centre services
- Industry Associations/Standards bodies (e.g. ASHRAE, BCS, national ICT industry associations).
- Educational institutions

2. They are expected to utilise the Code of Conduct in order the develop products, solutions and programmes to enable data centre owners and operators to meet the goals and expectations of the Code of Conduct.

3. Furthermore, some organisations that intervene in some aspect of the design, building or operation of data centres may take actions which contribute to the overall Code of Conduct goals of improving the energy efficiency of data centres. The nature of these actions will of course be dependent upon on the organisation's activities, for instance;

- a manufacturer of IT or air-conditioner components might develop specific material to help raise user awareness of energy efficiency issues, or might introduce or encourage use of high efficiency products
- engineering consultancies might develop specific guidelines (based on the list of best practices) to ensure that energy consumption is taken into account in the design process
- a trade association might develop an "Energy Efficiency Charter"
- a training or educational institution might emphasise and extend the treatment of energy efficiency
- an electricity company could instigate a specific Data Centre Demand Side Management programme
- Energy Service Companies (ESCOs) might develop financing instruments adapted to Data Centres

4. Organisations that support the aims of the Code of Conduct and endeavour to persuade their clients, suppliers or members to sign the Code of Conduct and commit to some of the above actions may sign up as Endorsers of the Code of Conduct.

5. The Code of Conduct recognises the contribution to be made by Endorsers such as manufacturers, consultants or industry bodies. Example commitments for Endorsers of each type are identified below;

Best practice commitments for vendors and manufacturers;
1. Provide product/service assistance and information to data centre owners and operators or consultants, including but not limited to;
    a. Equipment power consumption labelling using standard metrics
    b. Workload to power data for IT equipment
    c. Power efficiency performance data across a full operating range for mechanical and electrical equipment
2. Expand and clearly label temperature and humidity limits in warranties
3. Offer hardware or services to meet power limitation
4. Develop and assist in training programmes
5. Promote the Code of Conduct best practices

Best practice commitments for consultants and engineering firms;
1. Offer energy efficiency advisory services
2. Calculate and present energy efficiency benefits and power demand of options
3. Promote the Code of Conduct best practices
4. Develop services to implement the Code of Conduct best practices

Best practice commitments for utilities
1. Ask data centre owners and operators to consider signing up to Code of Conduct and checking power provisioning is realistic
2. Explore energy services and energy performance contracting

Best practice commitments for customers of data centre services;
1. Promote best practice and procurement standards
2. Use Code of Conduct participant status and best practice adoption as part of procurement processes
3. Promote the Code of Conduct
4. Promote the Code of Conduct best practices
5. Support Research Development & Delivery
6. Consider and campaign for standardised international metrics and standards

Best practice commitments for industry associations / Standards bodies;
1. Develop and support industry specific literature including:
    a. Technical training
    b. Manuals
    c. Case studies
2. Integrate Energy Efficiency into existing guidelines e.g. ITSMF[7] library
3. Promote the Code of Conduct best practices
4. Help develop independent metrics, standards, gather data etc.

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[7] The IT Service Management Forum

6. Endorsers shall once a year upon successful registration report their activities towards achieving their commitments, including the best practice commitment, directly to the Code of Conduct secretariat (Annex D of the Code).

CODE OF CONDUCT ON DATA CENTRES
ENDORSER SIGNING FORM

The organisation/company

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signs the Code of Conduct on Data Centres and commits itself to abide to the principles described in the Code.

1. The company is signing the Code of Conduct as an Endorser to the Code in the role of:

☐   Vendor or Manufacturer
☐   Consultancy (design, engineering, maintenance and service companies)
☐   Utility
☐   Customer of data centre services
☐   Industry Association / Standards body.
☐   Educational institution

2. Please add a description of which services, products, solutions you offer to make data centres more efficient (if space below not enough attach additional sheets):

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3. Please add a description of the actions which your organisation will carry out to promote the Code of Conduct and its goals to your clients, suppliers or members (when annual reporting is due, Endorser must provide evidence of the implementation of the actions):

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4. Please indicate which data centres, operators or sectors you will engage to persuade to implement or participate in the Code of Conduct

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5. Please describe how your offerings will support the commitments relevant to your organisation's category, as listed:

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For the organisation
Director or person authorised to sign:
Name: …………………………………………

Managerial function: …………………………………………

Address   …………………………………………
Tel. / Fax.   ………………………/ ………………….
Email

Signature   …………………………………………

Please send the signed form to:

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N.B.
Your application will be evaluated within 40 working days of reception,
Endorser status starts only when the European Commission - DG JRC positive reply letter
will be sent to you.
Endorsers failing to implement their planned actions or not reporting will have the Endorser
status terminated.