GPP for Data Centres
Observations on first criteria proposals

8 December 2017

Green Public Procurement Criteria are being developed for data centres. The objective is to ensure that public bodies can make informed, sustainable choices when procuring data centre services and that the public sector exploits its purchasing power to drive the market towards greater long term sustainability. The first proposals were discussed at a workshop on 16th November in Seville and these notes summarise the observations made by the UK data centre sector at that meeting, and subsequently. General comments are followed by observations on specific criteria.

1 General Comments

Introduction

Data centres are complex environments that bring together multiple vertical sectors and technologies. Moreover, data centres do different things: they fulfil a wide range of organisational requirements and therefore vary markedly in operation and business model. This makes the developments of robust, one-size-fits-all sustainability criteria a very tricky task. The industry has long been wrestling with the problem of developing a single, universally applicable performance metric. After many years and very significant resource, multiple metrics and standards have been developed each of which perform a limited function, with associated pros and cons, but no single metric (see: Data Centre Performance Metrics for Tiny Tots). The same applies to standards. We also consider that LCA has a limited function in data centres: while LCA may confirm energy and carbon hotspots, complexity renders the activity expensive and the variety of operational models means that results are not comparable (see Evaluating the Carbon Impact of ICT: the Answer to Life, the Universe and Everything)

Industry data

We were uncomfortable with the industry data cited and in general poor quality data is too frequently presented as a basis for regulatory intervention. For instance, the UK's commercial data centre sector, by far the largest in Europe, currently accounts for 0.76% of UK electricity use (2016 figures, measured and auditable from CCA Report on Progress against Second Target) and 0.28% of the UK's primary energy supply, taking into account the generating efficiency factor. More information can be supplied if needed. Total sector energy use is unclear and projections derived from assumption-based modelling are unlikely to be helpful. We take particular issue with the projected energy growth of the sector to 2030 (page 29) and the associated assumptions, which are not in line with industry data.

In general, data centre energy use projections should take into account net growth in digital services resulting from government policy, digitisation, consumer preferences and developments like smart grid and IOT. However, these predictions should also take account of migration of IT function out of distributed accommodation and in-house server centres (where it is invisible) into consolidated, purpose built facilities (where it is accountable), which delivers a net energy reduction. They rarely do. There is the further argument that data centres enable efficiency and dematerialisation across the wider economy, but that is beyond the scope of this activity.

Proof of Pudding test

Our “acid test” for this exercise would be whether a public procurement process could meet all the requirements of these criteria and still deliver a hopelessly inefficient data centre operation, for instance by over-provisioning. At the moment we think the answer may be “yes” because we are unsure whether the following considerations have been – or can be- accommodated in the process:

1. Measures to ensure that the proposed provision is suitable for the requirement – e.g. that a local authority storing information on shoe purchases in Wolverhampton in 1972 does not specify an Uptime Tier 4 requirement.
2. That the proposed provision has been right-sized to the requirement (future hardware requirements are not necessarily well-informed by existing hardware use).
3. That the IT hardware itself is appropriate for the task being done.
4. That there is an adequate decision making process in place to evaluate the different options for delivering this function – e.g. outsourced to colocation, cloud, MSP or in-house.

Shortcomings of a tick box exercise

We have concerns that procurement criteria can result in a tick box exercise replacing productive dialogue. For many years techUK has run a Concept Viability service where government departments or agencies planning an ICT project discuss the objectives and requirements before procurement with a range of stakeholders (suppliers and customers) who may identify potential pitfalls in implementation or shortcomings in the technical requirements, socialise the procurer with the art of the possible and suggest alternative ways of delivering the same outcomes. Similarly, the Crown Hosting activity in the UK demonstrates a very successful alternative route to procurement of certain types of data entre services, where the criteria are pre-determined and public bodies can contract services confident in the knowledge that sustainability elements have been accommodated.

EU Code of Conduct

We welcome references to the EU Code of Conduct for Energy Efficiency in Data Centres. In some member states, government procurement guidelines specify CoC criteria. We would strongly support reference to the best practices within the CoC but would not advocate any proposals that require formal participation. This is because the best practices are also available through a CENELEC TR and secondly because participation does not guarantee performance, so an undertaking regarding best practices rather than participation would be more meaningful.

Referencing existing standards, protocols and best practices:

While we support the way that the proposals reference existing standards in many places, we think that there is further scope for external references. Where there is a legislative requirement e.g. WEEE, then there is no need for a parallel criterion. Where a standard exists, simple reference to that standard should be ample, for instance ASHRAE specifies temperature and humidity envelopes so there is no need to restate or second guess these. There are also points where relevant standards are not included – e.g. in disposal – and there may be scope to consider their inclusion. More than one standard may work adequately for a given criterion.

NACE codes

The data centre sector is not described by a single NACE or SIC code and we would advise that NACE codes are not specified in procurement of data centre services. We examined sector codes a few years ago and while a large cohort are described under 6311, a significant cohort of facilities are listed under other NACE codes. Further details can be supplied if needed.

Definitions

Data centre definitions can also be problematic. A data centre should consolidate IT function, so distributed IT in server rooms and cupboards cannot be described as “data centre” activity. The purpose of a data centre is largely to replace this distributed function with a more efficient, secure, concentrated solution so to describe them as the

same thing is inappropriate. The number of data centres varies of course depending on the definition. For the purposes of the UK Climate Change Agreement the definition of a data centre is an electricity supply of at least 200KW, regulated temperature and humidity and back up power provision.

Further information

While we are not directly engaged in projects like EURECA, it seems that there is substantial overlap between the two activities. While this is acknowledged to some extent in the narrative documents, we nevertheless get the feeling that an opportunity has been missed here and that there is scope for more explicit referencing of relevant models, activities, initiatives and resources.

We are of course very happy to provide further information on any of the points made above or in the proposed amendments. If necessary, techUK's Data Centres Technical Committee can be consulted on technical and operational issues.

2 Comments on the proposed GPP Criteria

The table below duplicates the proposals and differentiates the technical specification (obligatory requirements) from the award criteria. Obligatory requirements are shaded in yellow or light yellow, depending on whether they are core or comprehensive criteria. Page references relate to the Technical Report: Draft First Criteria Proposals, which is available here: http://susproc.jrc.ec.europa.eu/Data_Centres/documents.html . Contract performance classes have not been included for the time being.

1.1	**Renewable Energy Factor (p47)**	
Award spec comp criteria	The contractor shall maximise the amount of renewable electricity used to provide the service. Points shall be awarded in proportion to the bidder that offers the highest REF for their electricity use.	We have major reservations about REF as a criterion. On the one hand we would prefer to see priority given to genuine efficiency improvements and would be concerned if power purchasing decisions were considered a satisfactory proxy for good energy stewardship. There is the additional issue that in energy markets that are highly controlled by government, such as the UK, such purchases will have little real effect on the generating mix. Availability of renewable power may also depend on local government initiatives. We would like to see evidence that such purchases drive additional renewable generation. There is then, however the additional concern that energy generation is not a core function of data centre operation or management so this criterion would then extend to activities that are out of scope for an operator. This would penalise small operators in particular and operators that do not control the electricity contracts. On the other hand, there are now formal protocols for accounting for renewables (GHG protocol for instance) and commitment to renewables by branded corporates and large energy users does send important messages to the market. If included, the criterion must reflect how renewable electricity is procured and how this matches consumption. This may also be a function

		of location. The criterion must also reflect the generation sources that provide power to the data centre, not certificates that offset conventional power emissions.
1.2	**Facility greenhouse gas inventory (new DCs only) (p53)**	
Award spec, Comp criteria	Points shall be awarded in the proportion to the bidder that offers the lowest greenhouse gas emission per year operation of the project. Bidders shall estimate the GHG emissions for one year's operation of their data centre design according to the contracting authorities technical specification.	We disagree with this proposal, though accept it is award criteria and not a basic requirement. It is not indicative of the operating conditions required to deliver reliable data centre services nor is it indicative of the energy efficiency of the activity. Moreover, projected GHG inventory is a theoretical exercise that may not necessarily reflect reality once the data centre is running. We are not convinced it would add much value. It would be burdensome and the projections are unlikely to be reliable due to the subjective nature of LCA and other limitations of the process. Points could be given for a plan or efforts to reduce GHG emissions to the extent practical given the data centre location, opportunities for free cooling and efforts to expand the use of on-site generation. This will, to some extent, be limited by the tender length because the installation of renewable generation assets generally require contract terms of 10-20 years which is an unrealistic time frame for the data centre contract.
2.1	**Server Energy Efficiency (p62)**	
Tech spec core criteria,	Servers shall meet the energy efficiency requirements of the latest version of the ENERGY STAR standard	No issues with the criteria proposed – we support alignment with ENERGY STAR - but it is far more important to right size the IT resource than adopt the most efficient servers. As mentioned at the stakeholder meeting, replacing ten legacy servers with ten new servers would be a very inefficient solution: two new servers would probably be more than adequate. We accept that it could be tricky to define criteria for right sizing but there may be precedents elsewhere.
Tech spec, comp criteria	" "	The focus should be on what actions are taken to minimize the hardware footprint and maximize the workload delivered per unit of hardware and unit of energy consumed. The IT system performance criteria should have criteria based on system performance and minimization of the power required to deliver the workload in the data centre. Put another way, is the server's configuration and performance sized to minimize the power demand of the servers deployed in the data centre to do the workload? Storage products can also be consolidated using COMs (Capacity Optimisation Methods)– a storage efficiency criteria is not needed to drive a smaller storage product footprint. There are also software

		defined storage products that reduce storage product footprint and energy use. So another IT system performance item could focus on COMs to make data storage more efficient. That criteria should focus on having data storage capability with the (1) at least one COMs which increases storage capacity while maintaining the desired system transactional or sequential performance and (2) tiered storage capability to optimize the placement of data on the most efficient storage device type for the data use. The use of applications/software or other virtual computing options to reduce "zombie servers" should be included to assist in reducing/managing workloads as well as reducing the power consumption. In addition, we strongly recommend the EU to monitor the outcome of the EcoDesign LOT 9 developments, in order to have the right balance between what will be legally required from data centre IT equipment such as servers under EcoDesign and what is feasible criteria for energy efficiency as under Green Public Procurement.
Award spec, core & comp criteria	Points awarded if product is more energy efficient than the threshold laid down in the latest version of the ENERGY STAR for servers	No issues in principle, see comments above.
2.2	**IT Equipment Utilisation (p68)**	
Award spec, comp criteria	Points will be awarded based on the anticipated average utilisation rate for the IT equipment (or servers)	We have concerns that an anticipated utilisation rate will not be enforceable as a criterion. Server utilisation is an important criterion but again this is about having the right equipment for the application. A server can be at high utilisation but be working very inefficiently because it is the wrong type of machine for the application. Utilization is a function of the workload type, the service level agreement demanded by the customer (i.e. a critical defence capability may have a very low utilization most of the time but a high utilization when specific events like an incursion of an unidentified aircraft into a country's airspace (lots of other examples available) and the ability of the workload to be virtualized. A better criteria would be that the service must come with a utilization optimization tool like Densify or TSOLogic which can assess and identify the best application placements to optimize server utilization based on the required service level requirements dictated by the government agency or other client.
2.3	**Emissions of hazardous substances (p78)**	

Award spec, comp criteria,	Points shall be awarded where the main printed circuit board of the server models used are halogen free and a fire test simulating improper WEEE disposal shows carcinogenic PAHs emissions to be ≤0.1mg TEQ/g	Responsible end of life management is important but alignment with EPEAT should be the criterion. New EPEAT requirements are peer reviewed and will be finalised mid 2018. Please see attached analysis that cross-references EPEAT criteria against GPP criteria for transparency. Improper WEEE disposal requirements are fraught with difficulty: they require producers to simulate improper WEEE disposal for all devices. Very clear definitions would also be required regarding what comprises improper disposal. Moreover in a largely B-to-B market where servers are used at scale, the risk of suboptimal or improper disposal conditions is less applicable than in a B-to-C market where distribution of devices through the disposal supply chain is less well controlled. Data centre product reuse and recovery is very high: the industry has well established highly efficient return, repair and reuse programmes. Today the recovery rate of storage and servers is already ~ 85 %. EU countries have well established WEEE schemes and safe recycling infrastructure. End of Life Printed circuit boards are valuable inputs for recyclers because of their precious metal content: the risk of suboptimal waste management, potentially releasing dioxins/furans, is therefore low. Reference could be made to existing reaction to fire test standards such as ISO 5660 Halogen free could be retained as an award criterion. Reference should be made to a formal definition of Halogen Free: e.g.: IEC 61249-2-21
2.4	**Design for Durability (p75)**	
Tech Spec Core criteria	The tenderer shall provide a minimum two year warranty effective from delivery of the servers. This shall cover repair or replacement and include a service agreement with options for pickup and return or onsite repairs. The warranty shall guarantee that the products are in conformity with the contract specifications at no additional cost.	
Tech spec, comp criteria	The tenderer shall provide a minimum two year warranty effective from delivery of the servers. This shall cover repair or replacement and include a service agreement with options for pickup and return or onsite repairs. The warranty shall guarantee that the products are in conformity with the contract specifications at no additional cost.	
Award spec,	Points shall be awarded to each additional year of warranty and service agreement offered for	We disagree with this proposal. One of the main reasons for inefficiency in public sector data centre operations is the desire, reinforced by policy, to

comp criteria	servers that is more than the minimum technical specification Points shall be awarded to the bidder that offers the longest warranty	sweat assets for as long as possible. If a data centre is to be run sustainably, server assets should be refreshed regularly. Commercial operators calculate server refresh cycles based energy consumption against embodied energy. Regular scrutiny of this kind is essential for efficient running. Proposing approaches that encourage extended longevity of servers is therefore likely to be counterproductive from an energy stewardship perspective.
2.5	**Design for Disassembly and Repair (p75)**	
Tech spec, core criteria	The tenderer shall provide clear disassembly and repair instructions to enable a non destructive disassembly of servers for the purpose of replacing key components or parts for upgrades or repairs. This shall be made available in hard copy or via the manufacturer's webpage.	These seem to be in alignment with WEEE which is already a legal obligation. The proposal should clarify what additional provisions are intended here over and above legal requirements.
Award spec, core criteria	The tenderer shall guarantee the availability of spare parts for servers for at least three years from the date of purchase	See above
Award Spec, Comp criteria	The tenderer will guarantee the availability of spare parts for servers for at least five years from the date of purchase. Compatible parts with improved capacity or performance where relevant shall be made available.	We prefer to discourage operators from extending server life.
2.6	**Design for dismantling and recycling (p76)**	
Tech spec, comp criteria	As above for each server model to be used in execution of the contract the bidder shall provide a dismantling test report detailing the specific steps and tools required to recover: Printer circuit boards relating to computing functions >10cm2 Internal power supply units HDD/SSD drives	
2.7	**End of Life Management (p 77)**	
Tech spec, Core criteria, comp criteria	Tendered shall provide a re-use and recycling service once the servers have reached the end of service life. They shall report on the proportion of equipment re-used or recycled, supported by details of the following: Collection Confidential handling and secure data erasure (unless conducted in-house) Testing, servicing and upgrading Remarketing for re-use in the EU Dismantling for recycling and/or disposal Preparation of items for re-use as well as recycling and disposal operations shall be carried out in full compliance with WEEE Directive	*There are technical standards that we could refer to e.g. there are several standards regarding disposal and data erasure that, if adhered to, could reduce the number of hard disks that are shredded. We are happy to connect you to some of the major recyclers if specific expertise is needed here.*

Award spec, comp criteria	As above plus points shall be awarded to tenderers operating a tracking system for servers with a unique identifier for each item of IT equipment in their inventory. The system shall enable the proportion of items re-used or recycled to be verified and whether they remained in the EU or were exported.	
2.8	**Cooling management – higher temperature hardware (p81)**	
Tech spec, core criteria	TS2.8: select ICT hardware which is warrantied to operate within allowable temperature range of 15-32 degrees C	We suggest reference to the appropriate ASHRAE TC9.9 standard, likely to be 2 (3 and 4 are not intended for continuous use) and not make mention of any specific figures or temperature ranges. Moreover, hardware that is warrantied to operate outside these temperature ranges – i.e. hotter – should not be excluded just because it goes above the range.
Comp criteria	Ditto, but range is 10-35 degrees C	Same comment applies. Refer to relevant ASHRAE standard and leave it there.
3.1	**PUE (p88)**	
Tech spec, core criteria	The bidder shall demonstrate that the predicted design PUE of the data centre facility is lower than 1.4 at 100% IT equipment load (based on typical annual weather data)	PUE is a ratio and not a measure of data centre efficiency. PUE should not be used to compare one facility against another. It can be used to compare a single facility with itself over time, provided its limitations are clearly understood. On balance, we think that careful consideration needs to be given to the default inclusion of PUE and that excluding it from the criteria might send a useful signal to the industry. Moreover, the definition of an optimum PUE depends on the data center function and the requirements for redundancy, resiliency and back-up. A better criteria for larger projects could be that the data center has a real time, analytics based cooling system management that adjusts CRAC speed to match cooling and heat load or which provides feedback on hot and cold spots in the data center to allow the data center operator to optimise air flow and minimise energy use. Several IoT based systems are available on the market to provide this level of cooling control. The EU Code of Conduct for data centres includes a number of alternative efficiency criteria that could be referenced.
Tech spec, comp criteria	The bidder shall demonstrate that the predicted design PUE of the data centre facility is lower than 1.4 at 100% IT equipment load (based on typical annual weather data)	See comment above
Award spec, core & comp criteria	The newly designed facilities (not yet operational) or existing facilities les than 1 year old (from start of operation) points could be awarded in one of two ways: Relative to the benchmark PUE value above	We support the recognition that legacy data centres will likely have higher PUE values at 100% load and not that it is appropriate to set different PUE targets for legacy data centres. Here again, the primary criteria should be provision of a real time, analytics

	Relative to the best performing PUE offer For newly designed facilities points could be awarded relative to the best predicted design PUE at 25% load For existing facilities operational for between 1-5 years, points could be awarded where the bidder can demonstrate that the measured PUE would be less than 1.6 at 100% load For existing facilities operation of more than 5 years, points could be awarded where the bidder can demonstrate that the measured PUE of the data centre facility would be less than 1.8 at 100% load.	based cooling system management that adjusts CRAC speed to match cooling and heat load or which provides feedback on hot and cold spots in the data center to allow the data center operator to optimize air flow and minimize energy use. Several IoT based systems are available on the market to provide this level of cooling control in a data center.
3.2	**Reuse of waste heat (p96)**	
Tech spec, Comp criteria	The data centre shall be connected to and supply at least 30% of the data centres waste heat expressed as the Energy Reuse Factor to the local district heating network	This should be related to local conditions, including the proximity of suitable customers and heat networks. Data centre waste heat is generally low grade. In theory if an operator had no waste heat they should not be penalised for not reusing it. There may be other legitimate users for waste heat that are not district heating schemes (glasshouses?) so could we say local end users as in the award criteria?
Award spec, Comp criteria	Points shall be awarded to bidders that commit to supplying more than 30% of the data centre's waste heat to local end users. An additional point shall be given for every 10% of waste heat the data centre supplies.	The document is very unclear on the economics criteria for heat reuse, pointing only to unreferenced case studies to state that paybacks were around 3 years. Concentrating waste heat can be difficult – and energy intensive - depending on the cooling configuration of the data center. Transport to point of use may be complicated and require significant cost. To prevent unintended consequences an economic test might be applied to this requirement, with consideration of things like the impact of the availability of free cooling and the cost of collecting, concentrating, transporting and ducting the waste heat.
3.3	**Cooling Management (p100)**	
Award spec, comp criteria	The data centre designer or operator shall be awarded point based on the % of operating hours that the environmental conditions will be maintained within the temperature range of 18-27˚C	Remove any specific temperature ranges and refer to the relevant ASHRAE standard. Data centre operators, will by definition, intend to operate within the ASHRAE recommended operating range of 18-27˚C. Operators should not receive points for doing what is required to ensure reliable operation. The data centre operator should receive points for the following actions to manage data centre temperature:

		1. Operate the data centre at the upper end of the ASHRAE recommended range: 24˚C to 27˚C. 2. Use automated cooling system control to maximize the hours of free cooling used to cool the data centre. 3. Use data centre level temperature and air flow measurement and control to minimize energy required to deliver cooling to the data centre and balance air flow and cooling delivery to support and maintain operation at the upper range of the ASHRAE recommended range.
3.4	**Minimise water discharged on site (p 105)**	
Award spec core & comp criteria	The data centre designer (or operator) shall be awarded points based on the volume of water discharged on site. Points shall be awarded to bidders that commit to discharge less than 2 litres per KWh of IT equipment electricity consumed (annually)	Applies to a minority of facilities. It is possible to measure water discharge but the importance will relate to local conditions. Regarding water consumption, the type of water used matters much more than the amount: if water is being consumed from aquifers then consumption is very important because depletion is long term. In Europe, the chemicals and energy required to make water drinkable are an additional consideration even if water is not scarce. If grey water is being used then consumption is less or an issue. Local climate conditions also affect the importance of this criterion – consumption is far more important in Madrid than Stockholm.

3 Further information

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