



Development of the EU Green Public Procurement Criteria (GPP) for Data Centres

EEB comments on the 1st draft of the JRC technical report and GPP criteria proposal

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Summary

The European Commission (EC) is developing EU Green Public Procurement (GPP) criteria for Data Centres (DC). In October 2017, the Joint Research Centre (JRC) of the EC published the first draft of their technical report including proposals for draft GPP criteria. EU GPP criteria are formulated either as Selection criteria (SC), Technical specifications (TS), Award criteria (AC) or Contract performance clauses (C). For each set of criteria there is a choice between two levels of environmental ambition: core criteria and comprehensive criteria.

Based on the discussions of JRC's proposals during the first meeting of the Ad-Hoc Working Group (AHWG) on 16 November 2017, this paper provides recommendations and comments on the proposed GPP criteria on behalf of the EEB. The EEB has consulted this input together with its member organisations and other environmental NGOs.

In particular, we would like to highlight the following aspects for further consideration:

- Instead of looking at a list of isolated criteria, the GPP proposal should be structured by the different procurement scenarios (server procurement, cloud services ...).
- The criteria per case moreover must be discussed as a set of criteria and in how far they are complementing each other, capture all environmentally relevant aspects without key gaps or redundancy and without leading to technically mutually contradicting or limiting criteria.
- Next to evaluating such broader criteria packages as part of the comprehensive criteria set, a more reduced set of indicators should be evaluated such as 'energy consumption per useful work' in combination with strong end-of-life provisions in the core criteria set.
- The JRC should check the options to allow for "innovation-flexibility" of their proposed GPP criteria in the next version of the technical report as well as the possibility to develop Product Environmental Footprint Category Rules (PEFCRs) for DC.
- Taking into account the fast market and technology development for DC, the ambition level of the GPP criteria must be set very strict and ideally further strengthened over the time by introducing different tiers.
- The building infrastructure for DC should be included within the scope of the LCA analysis and related GPP criteria.
- The Criteria Proposal for DC on renewable electricity should be based on the staged approach as developed in the EU Ecolabel for tourist accommodation from January 2017 which is applicable both for the core and the comprehensive GPP criteria set. Third party verified environmental labels guaranteeing net extra production of renewable electricity or on site self-generation of renewable electricity for DC should benefit from an extra award criterion.
- The Facility Greenhouse Gas inventory should become a core criterion while additional environmental impact categories should be added in the comprehensive criteria set.
- Increase the warranty period for servers from 2 to 3 years in the core criteria and from 3 to 4 years in the comprehensive criteria but do not (!) give rewards for longer usage of servers in DC because their computation performance is constantly doubling every 1.5 years and for

older servers, it is environmentally advantageous to take them out of use and put better performing ones in place.

- Informal recycling overseas must be added as an environmental hotspot at the end-of-life. The proposal for end-of-life management should be made a core criterion and be strengthened in order to prevent the export of whole or de-polluted DC servers and key components with IT performance relevance through requiring documentation of proper dismantling, de-pollution and recycling standards in certified WEEE treatment facilities.
- While welcoming the award criterion on 'halogen-free' PCBs and the requirement for a fire test simulating improper WEEE disposal, a broader range of substances of concern should be excluded from DC equipment under GPP and the JRC should align its proposal e.g. with the criteria set in the EU Ecolabel for Computers.
- "Low value reuse applications" should be excluded from the waste heat calculations or this aspect could be covered by an award criterion based on the DC-wide net energy use.
- Water scarcity needs to be taken into account as a comprehensive criterion through net water consumption data. Water discharge itself is not a suitable environmental criterion.
- The usefulness of additional criteria covered for the Blue Angel Ecolabel on Energy Efficient DC Operation (RAL-UZ 161) from February 2015 should be evaluated by contacting current licence holders.
- The public sector needs additional guidance how to come to early and better sized demand estimations BEFORE embarking on GPP that cannot anymore act on too large orders.

Introductory remarks on the JRC's technical report

The EEB welcomes the effort to develop GPP criteria for Data Centres, including its key electronic and electrical components and also Data Centre services (jointly referred to as DC from here on). We also welcome the life cycle based approach (LCA), to ensure all major environmental impacts of DC are considered, also going beyond the usual focus on the use stage and its electricity consumption. While the use stage is key for climate change related impacts and most relevant for some others, the production of DC and their end-of-life contribute significantly, sometimes even dominantly to other environmental impacts.

We also welcome that a practical and robust approach is taken to enable using the insights of existing, detailed LCA work for developing relevant GPP recommendations, while the evidence base should be broadened to bring in additional environmental considerations. Finally, IT performance of the products and services will be key to select the best solutions for public procurement from an environmental perspective.

The EEB would like to highlight also some clear needs for improvement of parts of the analysis, and the criteria selection based upon, and we provide in the following specific feedback and proposals to develop powerful yet practical recommendations for GPP.

In several places throughout the technical report, the JRC references existing legislation (RoHS, WEEE) and Implementing Measures under the EU Ecodesign Directive. While it may be useful to use the same metrics and criteria as defined in European legislation, the ambition level of GPP must aim significantly higher than the legal minimum. Similarly, where criteria such as e.g. the Energy Star apply to a rather large share of the market, stricter values should be selected, to meet the GPP ambition properly (e.g. demanding better SERT / SEEM results for Server Efficiency Rating). **In general, the EEB strongly advocates for setting stricter values for criteria defined in policies and schemes that do not have the same environmental ambition level as GPP.**

Because the analysis of DC is necessarily building on past evidence, partly many years old, and the DC industry and technology is quickly evolving, we see the need to further increase the ambition for GPP over the time period the proposed set of criteria will be valid. Otherwise, the recommendations will already be outdated, i.e. behind the projected market and technology development, once they are finalised and published. **Therefore, the EEB proposes setting GPP criteria at the highest ambition level from the beginning, OR build in a time component through different tiers: criteria applicable e.g. in 2021 must to be more ambitious than in those in 2019 based on projected technological improvement.**

For example, the criterion for new servers to meet the upcoming Energy Star 3 criteria is foreseen to be based in adjusted SERT criteria. Since server performance which SERT measures, is about doubling any 1.5 years, the GPP criteria have to dynamically adjust to Energy Star updates (which currently occur only any 4-5 years, or so) or increase the SERT threshold value by roughly doubling it each 1.5 years after the GPP criteria are released. We note however that the comprehensive criteria give more points for higher performing servers, thus partly covering this issue while not increasing the threshold as such.

Environmental hotspots and priority improvement areas

The exclusion of housing production for DC is inappropriate. Relevant studies show that the environmental relevance is at the same level as the server and storage production combined. **The EEB calls for including the building infrastructure within the scope of the LCA analysis and GPP criteria related to the DC hull.**¹

The EEB also noticed that the analysis provided by the JRC so far has a blind spot on the environmental impacts of "informal recycling" of electronic waste overseas, with extremely high emissions of toxic substances. While servers largely and initially undergo disassembly and recycling in the EU, this does not apply necessarily to remaining parts and to other IT components of the DC. Despite the lack of relevant LCA data, there are enough other sources for evidence on this topic. **The EEB proposes adding informal recycling overseas as an environmental hotspot at the end-of-life stage.**

On the contrary, we see the identified sub-hotspot on disposal of mining waste to be a likely artefact from the specific LCA data source used in the contractor's study. At the same time the impact from clean room production, production of high purity chemicals/ materials etc. is likely be underrepresented because of the LCA data used in the various cited studies is poor in this regard. **The EEB suggests keeping the "manufacturing" hotspot but remove the specific reference to mining waste,** or provide evidence on its robustness, i.e. representative data does not from single sites, use of widely accepted LCIA methods, excluding theoretical long-term emissions, etc.

For the priority ranking of improvement areas (see Table 8, page 35-37), the potential environmental benefits, and in some cases other aspects, need to be revised in view of our other comments made here. **The EEB asks the Commission to update the table 8, to reflect new insights/feedback received during the 1st AHWG.**

Selecting highly energy efficient servers is the clearly most relevant criterion for servers, via tools like SERT or SEEM the IT performance of the server is foreseen to be included (via the Energy Star that uses SERT). We find it unclear and doubt therefore why the market would not be ready, as stated in table 8: performance is always relative, i.e. there are always the currently best performing servers available. **Accordingly, the rating for EU Market Readiness should be changed from "2" to "3". Verification should also be "3" because it is rather straight forward because it can be easily checked which models are in use in the DC through an IT inventory.** A minimum server IT performance is e.g. required by the 2015 German Blue Angel Ecolabel criteria for DC.

General comments on the structure of the GPP criteria proposal

The GPP criteria for each case (e.g. server procurement, cloud services, ...) need to be packaged in a way that they complement each other and jointly guide identification of the most environmentally preferable offers. Currently, the criteria are listed and discussed mostly as a list of isolated criteria,

¹ see e.g. <http://ieeexplore.ieee.org/document/6360435/>

while they will form a package when put into a tendering document. The current version of the JRC's technical report largely misses the need to increase robustness where the isolated use of certain criteria, including Power Utilisation Effectiveness (PUE), might give false incentives to vendors. **Therefore, the EEB suggests adding an evaluation step before publishing the next draft of the JRC's technical report in order to cluster the different sets / packages of criteria necessary for each procurement scenario. We need to make sure that they are both comprehensive and consistent in order also overcome weaknesses of using isolated indicators or indicators that do not work together well.**

The number of award criteria, especially in the comprehensive criteria set, is quite high and - referring to the preceding comment - it will often be challenging to combine the criteria in the right way to ensure good support for GPP. **The EEB prefers a much simpler approach to be investigated for the core criteria set that would avoid these issues for all procurements of complete DCs or DC services (i.e. not for single equipment): the overall DC use stage energy consumption (expressed as primary energy and in addition ideally weighted due to their environmental impact) divided by its output, expressed in bits exchanged with the clients/users (called "useful work" by The Green Grid²). This criterion would be combined with the additional end-of-Life criterion of the DC equipment and infrastructure (TC 2.7, SC 2.7 and CPC 2.7, see below). This indicator set automatically considers the IT performance of all components and of the DC as a system, including otherwise difficult-to-consider issues such as consolidation, virtualisation, Mechanical and Electrical Systems Performance etc., and would be technology neutral, i.e. innovation-flexible.**

This proposal would also implicitly address the environmental impacts of IT hardware production: as the server operation power consumption is high per useful work at low load levels, good results for this indicator are only possible, if few, efficient servers are used at high load. This means that this criterion also implicitly but correctly covers the amount of IT equipment needed including the embedded environmental impacts stemming from production.

The limited accuracy of using the sent/ received bits to express "useful work" - what is a frequent criticism for including this very general measure for the useful work - does not too much hamper the accuracy of this criterion in the GPP context: for a given procurement scenario, the work profile will be similar or identical, meaning that the bits exchanged are a well comparable measure. This is helped by the fact that server performance differs hugely among differently old servers, i.e. DCs with IT-wise low performing, old servers would be awarded less points, leading to a to-be-expected wider range of results for this criterion across offers from different providers.

Additional aspects to consider properly energy reuse in the overall DC net energy consumption, and ensure clear rules for allocation among DC services that come from partially used DCs (e.g. in collocation, cloud procurement), i.e. where the public sector body is not procuring a whole DC (in which case the comparison is more accurate). Even, if in the end specific obstacles would be identified that prevent its use in the GPP criteria for now, this is a much more powerful approach that could be focus of the next revision process for EU GPP criteria on DC.

² <https://www.thegreengrid.org/>

Fast cycles of technological innovations and operational developments are typical for DC industries. Therefore, it is especially important to avoid that static GPP criteria prevent the procurement of environmentally better, innovative solutions. Such a risk exists for example when defining temperature and humidity ranges for server inlet temperatures. But it is often the case also for other very detailed technical specifications and award criteria that are not directly linked to actual environmental impacts and IT system performance.

The EEB recommends the JRC to include a systematic check for the "innovation-flexibility" of their proposed GPP criteria in the next version of the technical report. Either, certain criteria need to capture different solutions instead of prescribing only a specific one, OR it needs to be possible for tenderers to demonstrate the environmental superiority of their solution compared to current DC technology that meet the GPP criteria. For the latter case, we suggest that the JRC examines the possibility to develop Product Environmental Footprint Category Rules (PEFCR) for DC solutions complying with the EC Guidance on PEF. This would be a pre-condition to define thresholds well above the European market average to be met for GPP and allow for a qualified and externally reviewed LCA study as means for verification in the comprehensive criteria set.

Criteria Area 1: Data Centre Performance

Renewable Energy Factor (AC 1.1, CPC 1.1)

Given the current oversupply of Guarantee of Origin Certificates for renewable electricity, the energy mix of a DC needs to consider a) that this must be NET extra produced renewable electricity, not just virtual shifting of existing production, which has no environmental benefit at all and b) that different renewables differ in their environmental profile. This is both discussed in chapter 2.1.6 in detail in the report, but it is finally concluded not to consider these two key aspects, as there would be no suitable certificates, type I labels etc. to guarantee this.

At the same time, there are both examples for European wide and national schemes for renewable electricity that promote investment in extra capacity and establish additional environmental criteria e.g. on biodiversity. We took note that the 2012 EU GPP criteria for electricity are currently outdated and no longer suitable to be referenced for data centres. Instead, the EEB recommends basing this criteria proposal on renewable electricity on the approach as outlined in Commission Decision (EU) 2017/175 of 25 January 2017 on establishing EU Ecolabel criteria for tourist accommodation. Criterion 38 and 39 therein could easily be adapted for staged GPP criteria proposal applicable for DC.

The EEB proposes changing the current AC1.1 into a Technical Specification applicable both to the core and the comprehensive criteria set. The electricity contributing to the Renewable Energy Factor (REF) must come from renewable sources as defined by Directive 2009/28/EC and can easily be documented by a Guarantee of Origin Scheme. If deemed necessary, different thresholds e.g. 50% REF for the core and 100% for the comprehensive level could be introduced. Additional award criteria should only be granted if

- a) the renewable electricity purchased has been awarded a third part certified environmental label that requires electricity production from new renewable plant capacity installed within the past 2

years or a financial part of the certified electricity procured is used to promote the investment in new renewable power capacities.

Or

b) the DC has installed on site electricity generation from renewable energy sources that generates a certain share of the overall electricity consumption of the DC. For the purposes of this criterion, biomass is only allowed from a source located within a 160 kilometres radius of the DC. If the self-generation of renewable electricity leads to the issuing of guarantees of origin, the self-generation can only be taken into account if the guarantees of origin do not end up on the market, but are cancelled to cover the local consumption of the DC.

Facility Greenhouse Gas Inventory (AC 1.2, CPC 1.2)

The EEB suggests making the Facility Greenhouse Gas inventory a core criterion. For the comprehensive criteria set additional environmental impacts could be included in the inventory such as land use, water scarcity, acidification, eutrophication, summer smog, ozone depletion, particulate matter. Other impacts associated with high uncertainty of related LCA methods, particularly toxicity impacts and minerals & metals resource depletion should be excluded for the time being. For this purpose, we suggest that the JRC examines the possibility to develop Product Environmental Footprint Category Rules (PEFCR) for DC complying with the EC Guidance on PEF.

Criteria Area 2: IT System Performance

Server energy efficiency (TS 2.1, AC 2.1)

IT equipment utilisation (AC 2.2, CPC 2.2)

The current criteria proposal makes sense, including that we should wait for the revised Energy Star and revised SERT or upcoming SEEM. A coherent approach with significantly higher ambition levels than foreseen in the upcoming implementing measure for enterprise servers under the EU Ecodesign Directive must be ensured. Please note our introductory remarks calling for a tiered approach, reflecting the projected technological improvements during the validity period of the EU GPP criteria set. Finally, we proposed developing an alternative approach to measure the overall DC use stage energy consumption divided by its output, expressed in bits exchanged with the clients/ users (see above).

Design for durability (TS 2.4, AC 2.4)

Reuse and resale of the entire server after being removed from the primary user may sound like a good idea. However, the environmentally best operation time of a server is likely around 3-4 years (but certainly also not below 1 year, as some stakeholders suggest). If the public sector is delisting servers (often after well more than 4 years), it would be environmentally disadvantageous if the server was used elsewhere, because it will be simply so energy-inefficient compared to the latest servers on the market: The computation performance of servers is constantly doubling every 1.5 years since decades, i.e. a 5 year old server is about 10 times less powerful than a new one. In other words: 1 new server does the same IT work as 10 old servers of 5 years age, at roughly the same electricity consumption and a similar environmental impact for hardware production.

Hence, these old servers are better taken out of use in general, i.e. also not be used elsewhere, outside the DC. Instead, they should be disassembled, components that are not critical for IT performance could be reused, others (including the Motherboard/CPU) might require further separation and treatment to allow for de-pollution and then go to high-quality material recycling. The GPP criteria should therefore not (!) give any rewards for longer usage of servers or promote the possibility to resell and export outdated DC servers after delisting "for reuse" because of the above reasons and because they in addition may at least in parts end up in informal recycling overseas. In contrast, rewarding of guaranteed and tracked disassembly and recycling inside the EU is suggested below for end-of-life management.

The EEB recommends increasing the warranty period for servers in TS 2.4 from 2 to 3 years, and from 3 to 4 years in the comprehensive criteria while deleting AC 2.4 which incentivizes the highest duration for the use of DC servers, also even e.g. 10 years, resulting in much higher negative environmental impacts than replacing with up-to-date performing computing technologies.

Design for disassembly and repair (TS 2.5, AC 2.5)

The EEB agrees with this criteria proposal.

Design for dismantling and recycling (TS 2.6)

The EEB agrees with this criteria proposal.

End of life management (TS 2.7, AC 2.3, AC 2.7, CPC 2.7)

Export of used servers and other IT electronic and electrical hardware (HDD, ...) for "repair" or reuse outside the EU leads to the well known problem of "informal recycling", i.e. the highly polluting extraction of a few valuable materials via unsound "recycling", including mercury emissions from gold-recovery, open burning of cables for copper recovery with PAH, HCl, Pb, particle emissions, etc. The currently suggested criterion would not prevent such practices effectively. It is key that the formulations in TS 2.7, AC 2.7 and CPC 2.7 allow export only of directly reusable components and sub-assemblies that have no key IT-performance relevance (other than e.g. the motherboard and CPU), i.e. not to allow export of whole servers, IT-critical components, or merely de-polluted servers.

If the disassembly to directly reusable or recyclable components and subassemblies is done at the DC, it will be not be economically attractive to ship these to overseas anymore. In addition, the tenderer must commit in the GPP offer for DC that the remaining parts of e.g. servers that cannot be used for replacement must be recycled according to European standards for collection, logistics & treatment requirements for Waste from Electronic and Electrical Equipment (WEEE) including respective specifications for de-pollution. Compliance with these standards needs to be documented and verified by a certification scheme such as WEEElabex. **The EEB proposes strengthening the criteria set for end-of-life management (TS 2.7, AC 2.7, CPC 2.7) by introducing a core criterion to prevent the export of whole DC servers and key components with IT performance relevance through requiring documentation of proper dismantling, de-pollution and recycling standards in certified WEEE treatment facilities.**

We consider the proposed award criterion AC 2.3 on emissions of hazardous substances as an important precautionary measure in addition to the above proposed criteria on end-of-life management

because it will remain difficult even with those provisions to control effectively that no IT equipment or WEEE from DC used for GPP will finally be exported overseas and end up in informal recycling that results in uncontrolled PAH emissions. **Therefore, the EEB welcomes the proposal to award tenderers whose main Printed Circuit Board of the server models used are ‘halogen free’ and to require a fire test simulating improper WEEE disposal. At the same time, we are convinced that a broader range of substances of concern should be excluded from DC equipment under GPP and the JRC should align its proposal e.g. with the criteria set in the EU Ecolabel for Computers.**

Temperature and Humidity Range (TS 2.8)

We would like to highlight that there are now new DC architectures sold in small series such as oil-immersed computing where humidity ranges are meaningless and there is no “air inlet”, hence no air inlet temperature to be met. **The EEB agrees with this criterion but suggests applying it only to directly air-cooled servers.**

Mechanical and Electrical Systems Performance

Power Utilisation Effectiveness (TS 3.1, AC 3.1, CPC 3.1)

For procurement of whole DC (incl. consolidation projects), the DC’s overall expected (and reviewed) energy consumption (preferably with the environmental impact profile of the energy carriers that are used) should be used for an award criterion. CPCs are then needed to measure the delivered performance after the DC is built or consolidated. For the procurement scenario of DC services (e.g. cloud), the energy/environmental profile as proposed above per “useful work” should be used and must be allocated to the procured share of the DC overall services.

Given the weaknesses of the Power Utilisation Effectiveness (PUE) as a performance metric that are mostly addressed in the report (and further ones being discussed during the 1st AHWG meeting), the EEB recommends not (!) using PUE as a criterion with only one exception: the procurement scenario of “co-location”, where PUE captures suitably the energetic performance covered by the contract while the IT equipment stems from the public body and is captured by other criteria.

Cooling – Reuse of waste heat (TS 3.2, AC 3.2a, AC 3.2b, CPC 3.2)

Energy reuse is in general a good idea but has even more disadvantages than those being currently identified in the JRC’s technical report: it creates a structural dependency on delivering the heat so that environmentally beneficial improvements in the DC with less heat produced would face the economic counter-incentive from the established heat reuse system. Moreover, the system efficiency of upgrading and transferring the low temperature heat from the DC via a heat network means that this is a low efficiency system, even if “all heat is reused”. Also, many heat reuses are merely a low value waste treatment in disguise, e.g. heating poorly insulated greenhouses that otherwise would not have been built.

The EEB recommends elaborating further on the weaknesses of the current proposal on heat reuse in the next version of the JRC’s technical report. At a minimum, we ask for exclusion of “low value reuse applications” from the waste heat calculations. We also note that this criterion is one example that

would be automatically covered by using an award criterion based on the DC-wide net energy use, in that case would not be needed as separate criterion.

Cooling management – Operating conditions control (AC 3.3, CPC 3.3)

The EEB agrees with this criteria proposal.

Cooling – Water discharge (AC 3.4, CPC 3.4)

The amount of water discharge is not a relevant environmentally meaningful criterion as such but the net water consumption certainly is which would mean measuring extraction from water bodies minus release / discharge. Obviously, in terms of environmental impacts this criterion needs to be linked to an assessment on water scarcity. Other parts of the text refer to emissions of problematic substances to water from DC operations that also cannot be captured by water discharge, while those are suitably covered by the respective environmental impact indicators. At the same time these emissions to water from DC operations are not identified as an environmental hotspot. This could mean that any potential GPP criteria could also be skipped in favour of having clear requirements on other aspects that matter more.

The EEB advocates for water scarcity to be taken into account through net water consumption data (i.e. loss from evaporation e.g. in chillers), but not as water discharge. This should become a comprehensive criterion that is only relevant in those EU Member States (or extra-EU cloud services) in regions with relevant water scarcity, e.g. southern Spain, Greece, etc.

Other issues to be addressed

The German Blue Angel Ecolabel on Energy Efficient DC Operation (RAL-UZ 161) from February 2015 lists a couple of additional criteria which are currently not part of the proposal for the EU GPP criteria on DC. In particular, the JRC could consider including the following aspects in the next draft of their technical report: e.g. provisions on the existence/ progress report on the implementation of an energy management system, efficiency of the Uninterruptible Power Supply (UPS), monitoring of electrical energy consumption and IT load, annual energy efficiency report, chlorine-free refrigerants of the cooling system.

The EEB suggests evaluating the usefulness of the additional criteria covered for the Blue Angel Ecolabel on Energy Efficient DC Operation (RAL-UZ 161) from February 2015 by contacting current license holders³.

Public procurement of DC, consolidation with new equipment, renewal of old equipment (particularly servers) etc. often leads to over-provisioning, i.e. purchasing much more computation power than what is actually needed. Ample examples exist of public sector owned DC that are continuously half-empty or with unused/ under-used equipment. Reasons are various: budget decisions before a real demand analysis is done that also considers the increased computation power, "be save" overestimation of demand, lack of any real, qualified expertise available to verify the need expressed by the in-

³ Contact details can be downloaded here: <https://www.blauer-engel.de/en/products/office/rechenzentren>

ternal IT staff or by contractors that possibly benefit from larger procurements, etc. This aspect is also listed in the hot spot table 8 as one with the highest “3” rating of environmental relevance, while it cannot be suitably factored into GPP criteria, as it needs to be addressed before a procurement call is written.

The EEB recommends including specific guidance for preparing call for tenders on procurement of DC / DC services / DC servers etc. This is required to help the public sector come to early and better sized demand estimations BEFORE embarking on GPP that cannot anymore act at that point on too large orders.

ENDS