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Review study related to imaging equipment Voluntary Agreement

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EuroVAprint	**Feriel Saouli**	**23 May 2017**

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				General comment 1. Study team make assumptions based on. scientific data (not groundless assumption such a "Failure rate" of consumables). 2. Study team should not stick to GPP criteria draft only. The draft is far from realistic (EuroVAprint has issued a statement about it: http://www.eurovaprint.eu/fileadmin/eurovaprint_files/pdfs/2018/Joint_comments_on_draft_EU_GPP_imaging_equipment_November_2018.pdf and still not adopted. 3. Information should be sourced from multiple parties and study team must analyze whole aspects of the referring reports. Quoting for e.g. *Source: IDC via DKWU inputs* can lead to biased information.		

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				4. Scientific study should take place on non-OEM cartridge/containers appreciating the fact that ink/toner is not just a colored water/powder. Ink/Toner is a functional part. Machines are designed to work with suitable ink/toner.		
2	1		16	**Draft report text-** Consumables are not in scope as individual products in the current VA, however they are included in some definitions. Furthermore, as mentioned, several VA requirements address cartridge design (requirement 5.4.1), use (requirement 6.6.2) and disposal (requirement 6.3). Cartridges are defined as those produced by or recommended by the OEM for use in imaging equipment products in scope, but non-OEM cartridges are also meant to be used by imaging equipment products (requirement 5.4.2). It is therefore recommended to include a definition of consumables in the VA and consider include them in the scope.	It is clear from the wording of the VA that cartridges are in scope of specific provisions of the VA. The OEMs would not object to adding a statement to that effect. However, the definitions of Product and Imaging Equipment are designed to cover printers but not cartridges. Any definitions of consumables to be included in the revised VA must be agreed by VA signatories. Cartridges are clearly in scope of the VA where there are specific references to cartridges. Equally there are provisions that apply to "OEM Cartridges" and "Non-OEM Cartridges". The old definition of "cartridge" included two limbs: "OEM cartridge" and "Non-OEM cartridge" so that the VA could refer to OEM or non-OEM cartridges as appropriate. Since then the OEMs have improved the definitions by including a generic definition of "cartridge"	

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					which applies to both OEM and non-OEM and have separate definitions of "OEM cartridge" and "non-OEM" cartridge. The definition of Product and Imaging Equipment is designed for hardware and deliberately doesn't include cartridges, but this doesn't mean that the provisions that refer to cartridges are somehow disapplied. A definition of "consumable" could possibly be included but the most recent draft provided by OEMs included a broader definition of cartridge that was designed to cover relevant "containers". The authors should review and revise this section of the report. To some extent the issue here seems to arise from the unusual process of producing a report based on the existing VA and when negotiations and drafting changes on a new version have been ongoing for a long time. On the scope question- considerations of including cartridges in scope of the revised VA have been discussed with the EC for 18+ months. As is acknowledged by the Task 7 report, it would be inappropriate to include print cartridge requirements only for OEMs, with no requirements for the rest of the cartridge market (remanufacturers, clones, etc.) and the market share requirements for	

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					a VA must be met. If cartridge requirements are to be considered in the study then consideration of status and requirements for the entire cartridge market should be included.	
3	1		16	**Draft report text-** Consumables can include containers, cartridges, drum units, fuser units and transfer units, more detailed descriptions of all the consumables are presented in the Task 4, however, in this study, the focus is on containers and cartridges as consumables.	The Voluntary Agreement is a document that will have legal effect. Therefore the definitions must be designed to serve the provisions of the document. It does not make sense to include generic definitions that are not relevant. Accordingly it is not relevant to include a definition of "consumable" that includes items such as drum and fuser units as this is not relevant for the VA. A limited definition of "consumable" could be included in the VA but the same effect is already achieved by the most recent definition of "cartridge" proposed by the OEMs.	
4	1		17	**Draft report text-** Specific definitions below have been drafted for the proposals of the ongoing revision of the EU Green Public Procurement (GPP) criteria for imaging equipment18. These definitions can be used to elaborate on the potential categorisation of consumables in a revised VA.	It is inappropriate to quote from an "on-going revision" because it obviously isn't final. The authors should clarify these are 'draft' definition proposals and acknowledge the critical role of manufacturers in providing appropriate definitions. OEMs are prepared to consider the definitions proposed as part of the EU GPP criteria but definitions used in the VA need to reflect and form part of the specific	

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					provisions of the VA and if the proposed GPP defintions are not appropriate for the VA then the OEMs will not use them in the VA. Just because some draft definitions have been developed for the GPP doesn't mean they are appropriate for the VA. In addition, as noted, the EU GPP definitions are not final.	
				These definitions of container and cartridge do not fit users/industries' common understanding. We believe users recognize user replaceable product which fits into a machine as "Cartridge" regardless of it has complex components or not. In addition, this definition of Container undermines signatories' efforts producing bottle-type ink models which you don't need to replace the cartridges/containers. 	Change the definitions to fit to common understanding: Cartridge: An end-user replaceable product, which fits into or onto an imaging equipment product Container: An end-user product that holds ink or toner and is emptied into an imaging equipment product Study team should sub-divide the term "Cartridge" if the team wish to distinct cartridges with and without complex components.	

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5	1		17	**Draft report text-** Furthermore, during the GPP study it became evident that along energy consumption during use, the most important life cycle environmental hotspot of imaging equipment products is the use and disposal of consumables. This is because imaging equipment products have become very efficient, in some cases the use of consumables surpasses the energy consumption in terms of significance. It is therefore important to set requirements for their use and disposal, which are harmonised with the ongoing adoption of the Circular Economy package in Ecodesign.	If the authors are quoting from their owns studies they should make this clear. The way this is written gives the impression that a separate and independent study reached certain conclusions when that was in fact another document created by the authors. This is potentially misleading. Any references by the authors to their own studies should make this clear in the text and include complete footnotes.	
…	1		18	**Draft report text-** It is recommended to include definitions and categorisation from the GPP study18, or similar, of consumables such as ink and toner containers, and ink and toner cartridges into the VA. As the VA requirements do address cartridges, definitions and categories could help understanding of the requirements and this approach aligns with multiple national and international labelling	If the authors are quoting or drawing conclusions from their own studies they should make this clear by both stating this in the text and with footnotes. The authors are quoting their own conclusions and then immediately (one page later) treating them as fact. OEMs do not agree with these conclusions. In the OEMs' view the authors should only be using reputable and verifiable third party sources. However, if the authors are going to quote their own studies this	

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				scheme, and lastly their use and disposal have been identified by previous studies as the most important life cycle environmental hotspot of imaging equipment.	must be made clear in the text and with footnotes so as not to mislead any readers	
	1		19-20	Table 6: Ecodesign networked standby requirements releva Requirement Area | Scope | Implementation Date and Re | January 2015 | Januar Network Standby Requirements | HiNA[23] Equipment | 12W | 8W | Other Networked Equipment | 6W | 3W | Printing equipment with a power supply of a rated power larger than 750 W and large format printing equipment | Large f printing	On pg 19 the authors clearly state large format printers are exempt from Lot 26 network standby power requirements, but table 6 seems to suggest something else. We request clarification, which would be as simple as deleting the third row in table 6. The purpose of the study is not to review or make recommendations on Lot 26. If the authors need to refer to Lot 26 then they should ensure that all references correctly reflect the conclusions reached in relation to Lot 26.	
	1		23	**Draft report text-** The Blue Angel criteria are developed by a multi stakeholder group consisting of government bodies, environmental and consumer associations, trade unions, industry and academia. There are two Blue Angel specifications that are relevant for the Voluntary Agreement on imaging equipment: the Blue Angel on imaging equipment (RAL-UZ 205)37 and the Blue Angle on	UZ-177 on remanufactured toner cartridges is NOT relevant to the VA as the VA does not include any obligations for remanufactured cartridges. It would only become relevant if the VA were revised to include all cartridges (OEM, remanufactured and clone/NBC along with substantive requirements for all). If the authors feel they must retain a reference to UZ-177 then this point should be made. Also, the authors appear to be eager to reference UZ-177 as it suggests a level of environmental performance for	

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				"Remanufactured Toner Modules" (RAL-UZ 177)38.	remanufactured cartridges, but fail to note that uptake is exceptionally low. Only 11 reman toner cartridges are currently certified to UZ-177. Therefore, again, if the authors feel that they must retain a reference to UZ-177 this point should be made.	
	1		64	**Draft report text-** Lastly, it is recommended to define the cartridges and containers and include them in the scope as discussed in section 1.1.3. See Figure 6 for the proposed revised scope for VA.	As noted previously the definitions need to be designed specifically to serve the provisions of the VA. The definition of "cartridge" most recently proposed by OEMs covers relevant "containers". Also as noted above, cartridges are clearly in scope where specifically referred to in the VA. OEMs and the Commission have discussed and agreed on the issue of including cartridges generally in scope. In addition report number 7 reaches a similar conclusion that there are reasons why cartridges cannot practically be included in the VA. Therefore the reports seem to be internally inconsistent on the issue.	
	1		29	**Draft report text-** Removal from scope of imaging equipment designed to operate directly on three-phase power	**This statement is not true.** Three phase imaging equipment has <u>never</u> been in scope of the ES spec. The incorrect statement should be corrected.	
	1	1.4 Figure 6	65	Professional Imaging Products are out of the scope in the draft of revised VA	VA scope should not be included Professional Imaging Products.	

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				because Professional Imaging Products are defined by Energy Star V3.0 and energy efficiency requirement applies to them by the standard of V2.1. As you say in the draft of report in Task 1, the definition does not include any upper limits on imaging speed. When a company get ecolabel, there is no problem because it is voluntary. However, the Voluntary Agreement requires the rate of compliance with energy star requirements. To include Professional Imaging Products are defined by Energy Star V3.0 is a big problem for VA. - The product is in the scope of Professional Imaging Products, but it cannot be complied with the standard by technical or practical issue. - For example, industrial large-scale printer that is an exemption of EU RoHS/WEEE. The new standard for Professional Imaging Products in Energy Star will be discussed in the future. So we do not believe it is feasible that the VA includes Professional Imaging Products.		

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	2		12	**Draft report text-** Current sales are based on 2015, due to the availability of data is limited to 2015 annual sales from the more reliable source, EU ENERGY STAR market report.	VA signatories are not familiar with this report, but doubt it is a reliable source of data due to historical issues with the EU ES database. That database was intended to automatically update with product info from the USEPA Energy Star qualified product list but that system just never worked. Registration on the EU ES database was always voluntary/optional. Note HP has never registered IE products on the EU database. If the largest OEM doesn't participate it is unlikely the market data has any veracity. Also, Table 3 refers to 'stakeholder consultation' as the source of future sales data. That is not a sufficient or acceptable citation. If a proper citation is not provided this prevents the reader to assess the underlying data and the quality of the sources of that data. Authors should properly cite data sources.	
	2		19	**Draft report text-** For ink it is assumed that 20 % of the ink is sold as cartridges and the remaining 80 % are sold as containers, according to inputs from stakeholders15.	Signatories find this statement to be very questionable and don't think it is anywhere near close to the reality. OEMs request the study note that VA signatories do not agree with the data provided.	
	2		22	**Draft report text-** The stock of ink and toner consumables is not calculated due to	The highlighted sentence is a significant statement for which no source is cited. Please provide a citation that will enable the	

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				consumables are used and discarded a few times within a year. The sales are far more important as the environmental impacts occur in the production and distribution phase. In connection to end-of-life, the number of discarded cartridges is also important, and this can be calculated based on the sales. In addition, the collection rate is highly important for ink and toner consumables since reuse, remanufacture and recycling can reduce the environmental impacts	OEMs to review and assess the source and respond with comments.	
2	2	2.2.1	22 And Figure 8 in page 23	"Compatible" segment must be divided into "remanufactured" and "new non-OEMs" because "new non-OEMs" cartridges have no benefit for circular economy.	Investigate market share of "remanufactured" and "new non-OEMs" cartridges and change Figure 8 accordingly.	
	2		23-24	Figure 8 (Source IDC via ETIRA inputs). Figure 9 (Source IDC via DKWU inputs)	What were the inputs from ETIRA and DKWU?	
	2		28	Circular economy trends	This section includes very minimal consideration of CE trends. All 'reduce' elements (design waste out, high yield cartridges, MPS, subscription/product as a service models, etc.) are discounted and the	

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					authors proceed immediately to cartridge reuse. We recommend this section include, at a minimum, an explanation from the authors why cartridge remanufacturing is the only CE trend considered in earnest, and why CE elements higher on the waste hierarchy are discounted wholesale.	
	2		28	**Draft report text-** Consumables, such as toner and ink cartridges, are less likely to be designed in order to facilitate ease of disassembly and recyclability due to concerns over leakage and potentially intention to create barrier for cartridge remanufacturing by competitors.	The report should deal with verifiable facts. The highlighted statement is speculation by the authors as to the intent of cartridge OEMs. The OEMs reject this allegation. Highlighted language should be deleted.	
	2		29	**Draft report text-** Trends for Consumables- According to remanufacturing stakeholders' inputs29, the complexity of cartridges and containers design are increasing which hampers the reusability of these consumables. There are increasingly more OEM cartridges with embedded software implemented that hinders the reuse, and more anti-reuse devices and tools are used to	This section of the report appears to be based primarily on discussions with remanufacturers and partially on a discussion with an OEM that remanufactures. It appears that the authors did not investigate a wider range of sources or selected only a limited set of sources/inputs to include in the report. In the OEMs' view this section does not accurately represent the trends and state of the market.	

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				prevent remanufacturing of the OEM cartridges. This means that less consumables are remanufactured by 3rd party remanufacturers which may impose increased environmental impacts. According to an OEM manufacturer30, remanufacturing toner cartridges has been a successful business plan, the process of remanufacturing and manufacturing a cartridge from new is identical once the cartridge empties are supplied by either their supplier or collected back from end-users. For cartridges unable to be reused, the materials are recycled into new products. Reuse and recycling of cartridges are gaining the focus of the OEM manufacturers but slowly.	In addition, some cartridge OEMs have had free cartridge takeback and recycling programs in place for decades.	
	2		31	**Draft report text-** The results in Table 12 show that there is considerable variability in the home and office imaging equipment market. This variability makes it difficult to identify average technologies.	This is not a correct usage of the word 'average'. There is no such thing as an average technology. Perhaps the authors mean 'typical' or 'common' or 'representative'.	

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	2		32-33	**Draft report text-** The base cases are chosen from Table 12, from each category, the speed range with the highest sales has been chosen, with the exception for inkjet monochrome printers, whose sales were low in general. The speed ranges have been crosschecked with average speed, they match quite well, except for laser monochrome MFDs and printers. To avoid overestimation of energy and resource consumptions, the speed range 20 < s ≤ 40 is chosen for these two categories too, as they also match the base case (V3 and V1) from preparatory study completed in 2008. There is no base case for copiers and fax, as their sales are relatively low and expected to continue to decline. Professional printer and MFD is also chosen to be a base case, as it is important to assess if they should be in or out of the scope of VA, and to estimate impacts of fully aligning with the newest draft of ENERGY STAR version 3.0 scope. Based on the sales distribution by speed categories and supported by stakeholder inputs33, the base cases	Unlike Fraunhofer IZM who conducted the original Lot 4 preparatory study the auth agree on suitable base cases. As a result comparisons between the original bases ca an example see table below from the original prep study identifying the products us comparable products in terms of speed, size, cost, functionality, etc. Note also that and only defines BC2 as color laser MFD 20-40 ppm. Comparing any products across color laser mfd products with significantly different speeds is simply meaningless. Product Case / Code / Technology / Function / Image / Speed / Format / Weight / Year / Price Product V2 / EPCMC-26 / EP-Copier / MFD / color / 26 ipm / A3 / 143 kg / 2005 / 8.000 € V2_a / EPCMC_05 / EP-Copier / MFD / color / 32 ipm / A3 / 179 kg / 2005 / 8.000 € V2_b / EPCMC_28 / EP-Copier / MFD / color / 25 ipm / A3 / 118 kg / 2005 / 7.000 € V2_c / EPCMC_31 / EP-Copier / MFD / color / 23 ipm / A3 / 132 kg / 2005 / 9.000 €	

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				in current study are chosen, and shown in Table 13. BC 1- 5 are supported by majority of stakeholders, EVAP did not support including BC 6 – 7, however BC 6 still showed relevant amount of sales, and the inclusion of BC 7 in analysis would provide better evidence whether VA should align with US ENERGY STAR and include them in the VA scope. The analyses in the later tasks will focus on these 7 base cases, instead of all speed categories.		
	2		35	BC7 Professional Products	Yes the USEPA introduced a new product category in the IE ES spec v3.0. The authors seem unaware that though this new category has been defined there is not currently a new TEC method, test method, or sufficient dataset needed to develop limits, as required. The few product models meeting the definition that were certified under v2.0 can certify to v3.0 as Professional Products but only have to meet the v2.0 TEC limits. As communicated to the authors the lack of test method, energy limits, etc., would seem to flag this new product category as not well enough defined for inclusion in this study or the VA.	

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4	2	2.4.4	39	There are no grounds of assumed "Failure rate". Actual Failure rate of OEM cartridges and containers is much smaller than 3% when the user uses only OEM cartridges. In addition, the draft report uses the term "Failure rate" without the definition and it bring us impossible to discuss in mutual understanding of "Failure rate".	Study team shall define the meaning of "Failure rate". And Study team shall conduct scientific research on failure rate.	
5	2	2.4.4	39	As page yield is determined by combination of toner/ink and printer, page yield of non-OEM cartridges unlikely be completely same as OEM cartridges.	Study team shall conduct scientific research about page yield of non-OEM cartridges. Also, data which signatories publish should be referred. Please refer independent testing reports in this page. https://www.brother.co.uk/supplies/why-brother-originals	
	2		48	Table 24	See comment below.	
	2		47-48	Consumer expenditure, such as purchase costs, installation costs, running costs and end of life costs for imaging equipment have been presented in this task. Based on these data, the LCC for several imaging equipment types have been calculated without including paper usage. The LCC, summarised the in table below, shows that the running costs of the	Any life cycle consideration of imaging equipment that does not include paper is fundamentally flawed. That is like studying the lifecycle of an automobile and not considering gasoline. Further, the authors lack of due diligence in appropriately identifying comparable products to create base cases renders Table 24, and all others like it in the study, meaningless.	

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				consumables such as toner and ink containers and cartridges is the largest share of the life cycle costs for most of the base cases chosen. From the consumer expenditure point of view, there could be opportunities to implement policy measures for the cartridges usage and costs.		
	3		9	**Draft report text-** The maximum TEC allowed per week for a given printer and MFD is the sum of requirements below plus an adder for A3-capable products and for professional products only, an adder for products where Wi-Fi is the interface used during the test, as follows: $TECMAX=TECreq+AdderA3+Adder\ Wi-Fi$	This statement is not correct. In ES v3.0 the Wi-Fi adder for TEC products is applicable to all non-professional TEC products with wifi enabled at shipment. The statement should be corrected.	
	3		12-13	**Draft report text-** The average energy consumption per week and per year for TEC products are shown in Table 4, which were retrieved from declared data for TEC per week in ENERGY STAR Database (accessed in September 2018). For professional printer and MFD, average TEC was based on speed, weight and	The ENERGY STAR TEC method is based on a products speed. The TEC limit, as well as the number of jobs printed during the test and the number of images per job, are calculated according to the product speed. **THEREFORE the TEC method only allows comparison of TEC products in the same category, color or mono, single function for multi function, AND with the same speed. It follows that**	

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				A3 capability analyses of EPEAT and ENERGY STAR datasets. Assuming 52 weeks in a year, the annual energy consumption is then calculated.	**averaging tested/calculated TEC values across a speed range (such as 20-40ppm in table 4 and throughout the reports) is an exercise with very little practical meaning.** Two color MFDs of the same speed can be compared, and it is possible to average the TEC values of a series of color MFDs of the same speed, but averaging the TEC values for a series of color MFDs with speeds from 20 to 40 ppm really has very little meaning. The narrower the range of speeds being averaged the more meaningful the outcome. Averaging a range between 20 and 40 ppm is essentially a meaningless exercise.	
	3		17	**Draft report text-** It should be noted that the charts show 0.0 kWh/week for some data points, this simply meant the energy consumption was not reported for that model, these should not be considered.	This statement is not correct. It is not a matter of the data not being reported, it is a matter of the data being reported according to the (ENERGY STAR) prescribed data rounding protocol, and it should be considered. The incorrect statement should be corrected.	
	3		19	**Draft report text-** ENERGY STAR off mode is comparable to the standby mode in the EU standby regulation 1275/2008, though the definitions differ slightly.	Yes the definitions differ. ENERGY STAR off mode really is comparable to Lot 6/26 off mode <u>not</u> standby mode.	

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6	3	3.1.2	22	It is inappropriate to Hard-OFF inkjet printers as they need periodical head purge.	17% Hard-off time in Figure 7 is unlikely reflect actual use. Or, if this value is correct, that means users are using inkjet printers inappropriately.	
	3		23	**Draft report text-** As imaging equipment products are becoming more energy efficient, the importance of consumables (mainly toner, ink and paper) is raising. An ongoing study on the revision of EU GPP criteria for Imaging Equipment19 concluded that consumables, which are consumed during use phase, are responsible for 20-30% of the life cycle Global Warming Potential and Primary Energy Demand of imaging equipment products, in particular printers and MFDs. Widely used voluntary schemes such as the Blue Angel, EPEAT and the Nordic Swan assess consumables in their certification criteria (as presented in Task 1 report), concurring on their importance. In conclusion, the consumption of toner and ink cartridges has been identified as one of the most important life cycle hotspots of printers and MFDs.	The authors are again quoting their own report, which is not final. This is not appropriate. If the authors are going to refer to another report they have produced then it must be a final report and it must be clearly referenced. The conclusion in the last sentence does not accurately state the conclusions of the referenced study. See comments on LCA studies below.	
	3		23	**Draft report text-**	Any lifecycle assessment of printing systems that does not consider paper is	

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				Concerning Life Cycle Costs (LCC), the revision of the EU GPP criteria study shows that paper and cartridge costs are dominant in the lifetime of printers and MFDs at different monthly print volumes, both for laser and inkjet technologies. When removing paper costs from the LCC (since paper is not a key focus in the current review study), cartridges costs are the dominant for all laser and inkjet printers and MFDs, except for professional products where purchase price is also an important life cycle cost.	fundamentally flawed. If authors of life cycle assessments do not consider all life cycle factors then the conclusions of the process can be very inaccurate, can be used to push a particular agenda and can result in bad decision making. The authors justify the removal of paper costs because "paper is not a key focus in the current review study". Why not? This fundamentally undermines those parts of the report that reference or rely on life cycle assesment or life cycle thinking.	
	3		28	**Draft report text-** • For laser printers and MFDs, the impacts from cartridges itself are at least as important as the contribution from the energy consumption during use. The LCA by Koehler et al. (2010) 29 actually found that the cartridge contribution is twice as much as the contribution from the energy in use. This means that the end-of-life treatment of cartridges are highly important.	The cited study compares a Xerox solid ink printer with a non-specified laser printer. Given the age of the study (2010) it is clear the laser printer would not be representative of printers currently on the market. Further, the study does NOT address refilling or remanufacturing of cartridges. VA signatories have not been able to find the full LCA study online but have found a white paper from the study (attached). Concerning the highlighted sentence, signatories have not found any	

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					evidence in the white paper to support the statement. The white paper shows, in a graph at the bottom of page 6 that, for the laser printer, the cartridge and energy contribution are roughly equal.  color qube LCA white paper.PDF	
	3		28	**Draft report text-** • For inkjet printers and MFDs, cartridges are also becoming important in terms of LCA. It is found in the LCA by Katarzyna (2012)30, the dominant impact of household inkjet printers come from the manufacturing (excluding the largest impact coming from paper consumption), which could include manufacturing of both equipment and cartridges, the third main impact is the energy consumption in the use phase and the fourth being the liquid ink usage. With increasing energy efficiency, the inkjet consumables become even more important.	The Katarzyna study looks at the full life cycle of the printer but does not address refilling or remanufacturing of cartridges. The highlighted sentence ("which could include manufacturing of both equipment and cartridges") is false and misleading because the study ignores cartridges altogether. The LCA does include ink but, as the boundary diagram on p. 96 and the discussion about ink on p. 100 clearly show, only the chemical components of the ink are included in the study. This study cannot be cited as making any conclusions about cartridges at all.	
	3		29	**Draft report text-** • According to the study commissioned by UK Cartridge	UKCRA (2008) study:	

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				Remanufacturers Association33, where the carbon footprints of remanufactured toner cartridges and single-use OEM cartridges have been assessed, 25 to 40% saving in carbon footprints have been found when the single-use cartridge (called 'single cycle cartridge') is compared to long life cartridges (which run up to 15 refilling cycles). Furthermore, when performing 5 refill cycles or more, the importance of consumer transport to enable the refilling becomes also a hotspot. However, this could vary widely depending on the fuel allocated per trip per refill of cartridge, as the consumer would most likely use the trip to carry out other activities. Generally, more refills mean less the contribution of manufacturing to the environmental impacts, and a reduction up to about 60% carbon footprint is possible for cartridges that can take 15 refills or more.	• The study was performed by Xanfeon and is not peer reviewed. • The study is outdated and therefore not representative of products currently on the market. • The study is not a LCA, just a carbon analysis. • The study excludes use-phase impacts (paper). • The study "**is restricted to toner cartridges manufactured to a high standard within the UK**" (p. 6). • The study assumes multiple remanufacturing cycles, up to 15, for the same OEM core. • The study "**does not apply to imported remanufactured toner cartridges or clones of OEM cartridges**". • Bottom line, not only does the study assume an unsupported number of remanufacturing cycles for a toner cartridge it also specifically states that its findings do not apply outside a narrow group of remanufacturers within the UK.	
	3		29	**Draft report text-** • The LCA case study by Krystofik et al. (2014)32 present significant reductions in	As the title states this study focuses on consumer behavior and therefore assumes all use phase impacts to be identical for refilled/remanufactured or OEM cartridges.	

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				environmental impacts when comparing cartridge refills and cartridge remanufacturing to single-use inkjet cartridges. It is found that the cartridge refills presented the lowest environmental impact with a saving of 76% in GWP (Global Warming Potential), and remanufactured inkjet cartridge provides a saving of 36% in GWP compared with a new single-use cartridge.	This is a very questionable assumption. Further, VM appear to be selectively quoting sections from this LCA to suit their purposes. In so doing they are grossly misrepresenting the conclusions of the study. Please consider the excerpts below from the abstract of the Krystofik et al study: Results and discussion Cartridge refills present the lowest environmental impact, offering a 76 % savings in global warming potential (GWP) impact compared to production and purchase of a new inkjet cartridge alternative, followed by the remanufacturing case, which provided a 36 % savings in GWP impact compared to the new inkjet cartridge. However, results varied widely, even switching to favor new cartridge purchase, depending on how consumer transport was modeled, specifically the mode of travel, travel patterns (number of trips), and method of allocating impact to each trip. Conclusions Refilling an original equipment manufacturer (OEM) cartridge four consecutive times provides the best	

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					alternative for reducing environmental impact for those consumers that purchase inkjet cartridges one at a time. On the other hand, consumers that purchase multiple cartridges in a single trip to a retailer reduce environmental impact more by transport minimization than by refilling. Results reinforce the need for more comprehensive inclusion of consumer behaviour when modelling life cycle environmental impact of product alternatives. The authors repeatedly refer to these selectively quoted sections of the study findings as justification for cartridge proposals/recommendations and included similarly selected excerpts in slides shared at the recent stakeholder meeting in Brussels. We ask that conclusions and recommendations included in the VA study be based on accurate and objective representations of referenced studies. If the authors make a decision to discount certain information they should include a full explanation and objective justification for doing so. (Also, note the most optimistic conclusion of the study [76% GWP reduction] assumes a cartridge is refilled four consecutive times. This is a highly unlikely scenario. The study itself notes	

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					refillers/remans preference for 'virgin cartridges'.)	
	3		29	**Draft report text-** • HP's study34 shows lower environmental impacts for OEM cartridges (study was commissioned by HP).	HP's study does NOT show lower environmental impacts for OEM cartridges. It shows parity between OEM cartridges and remanufactured cartridges.	
	3		30	**Draft report text-** Domestic inkjet printers are unlikely to be designed with durability in mind…	This statement appears to simply be the authors opinion and is immediately contradicted by the sentence that follows. Objectivity and consistency are important elements of any technical analysis. The authors should be using objective, verifiable and fully referenced sources and not inserting their own speculation or opinions into the study.	
	3		31	**Draft report text-** A way to improve the lifetime of imaging equipment is to design products with more possibilities of repair so it is more affordable for the consumers to repair than replace equipment. However, based on inputs from stakeholders40, the business models of many OEMs are to sell their equipment at a lower price and then to sell more consumables which increase the profit. In some cases, it is	The highlighted portion is outright speculation on the part of the authors. They do not consider the fact that household printers have very low volume output. Household printers simply don't print very much. It follows the need for repair is minimal. Speculation of this nature has no place in what is purported to be a technical assessment. The authors should be using objective, verifiable and fully referenced sources and not inserting their own speculation or opinions into the study.	

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				cheaper to purchase a new printer than to buy a full set off new cartridges41. This means that household equipment often is too expensive to repair compared to new equipment. So, products may be exchanged before the product is technical obsolete. The low price of new equipment may also have an impact on the second-hand market and makes it unattractive to buy second-hand equipment. Also, the availability of spare parts for household equipment seems very limited42. All in all, household equipment is not likely to be repaired and the repair of household equipment are assumed to be negligible in the coming tasks.		
	3		34	Figure 9 shows the process for recycling and remanufacturing toner and ink cartridges. A successfully tested remanufactured cartridge is subsequently brought to market, a remanufactured cartridge not successfully tested will be disassembled and its materials will be recycled.	Did the authors obtain objective and verifiable evidence that remanufacturers do recycle cartridges that they cannot use or that fail tests? Did the authors obtain evidence that this applies across all remanufacturers and that those remanufacturers don't dispose of the cartridges or send them for incineration? The OEMs also note that the authors give credit for this reported recycling but appear	

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					not to investigate whether the remanufacturers have programs to collect the remanufactured cartridges they have put on the market when those cartridges reach the end of their lives. Recycling waste generated in a factory environment is a completely different undertaking to collecting cartridges from end users. While giving credit to these limited activities by the remanufacturers the authors fail to recognize closed-loop collection and recycling programs operated by OEMs.	
	3		39	**Draft report text-** Table 18: Average annual energy consumption for each base case in 2018 (in BAU scenario).	Because the authors did not properly define the base case products all data provided for those base cases is unreliable, particularly when averaging TEC values for products of different speeds.	
	4		13	Table 3	Again, averaging TEC values of products with different speeds has little or no meaning. If the models whose TEC values were averaged are all of the same speed then the average is valid. If they are of different speeds it is not valid.	
	4		14	**Draft report text-** The figures show that many products registered in the US ENERGY STAR database have energy efficiency levels	During the ES v3.0 revision process it was revealed the USEPA were operating under some inaccurate assumptions regarding	

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				well below those required by the ENERGY STAR v2.0 specification limit. The US EPA estimates 99% of printers and MFDs on the US market, and within the scope of the ENERGY STAR v2.0 specification, were compliant with that specification by the end of 2017.4 This high ENERGY STAR penetration rate suggests that there are unlikely to be large numbers of highly inefficient imaging equipment (i.e. equipment that wouldn't even meet the ENERGY STAR v2.0 specification limits) models on the market. However, the new ENERGY STAR v3.0 specification proves that there is still sufficient variation in products to warrant the development of a new specification.	penetration rate. The 99% quoted here is not correct.	
	4		20	**Draft report text-** In terms of timescales, the release of new models of imaging equipment is, on average, significantly faster now than in the past. In the past many laser-based products typically had model lifetimes (i.e. the amount of time a model would be sold on the market with no or few changes) of many years. Individual components	**This is simply not true**. **ENERGY STAR penetration rate (in this case erroneous assumption about rate) does not track to model lifetime.** Laser products have long development cycles and build lives so it is quite common for these products to go through redesigns or design changes during their lifetime to accommodate new or anticipated energy efficiency requirements.	

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				(e.g. marking engines, motors etc) often have considerably longer lifetimes. Inkjet based models have typically had shorten lifetimes than laser-based models. However, the rapid increase in ENERGY STAR v2.0 penetration rates from 25% in 2013 to 99% by 2017 suggests that the model lifetime of most imaging equipment is now much reduced.	This, along with a large number of other comments, is why the OEMs have serious concerns about the level of research, investigation and verification carried out by the authors in support of the studies. At a minimum the last sentence should be deleted as it is simply incorrect.	
	4		21	**Draft report text-** The efficiency of IPS within products plays an important part in overall product energy efficiency levels. Given that the ENERGY STAR v2.0 and ENERGY STAR v3.0 TEC test procedures require measurement of energy use across a number of power modes they inherently address some aspects of IPS efficiency. That is, an imaging equipment product with a very low efficiency IPS would find it harder to meet the overall ENERGY STAR TEC limits. However, given that the ENERGY STAR TEC procedures assume high levels of usage, IPS efficiency in lower power modes may not be adequately addressed. This stems from the fact that IPS	This is not the case. Existing energy efficiency requirements (TEC limits, sleep mode and off mode limits) have already driven significant internal power supply efficiency. Also, in ES v3.0 the EPA has reduced the number of pages printed during the TEC test by a factor of 4. One result is that the measured TEC value is now much more heavily weighted to sleep mode, further driving internal power supply efficiency.	

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				efficiencies tend to be low when supporting low loads (i.e. low power demands). Where products are sat in low power modes for significant periods of time, the IPS efficiency would become more important.		
	4		23	**Draft report text-** Inkjet consumables either consist of a separate print-head and ink reservoir (i.e. a container), or a combined unit including the ink reservoir and a print-head (i.e. a cartridge). In container-based systems the print-head, a permanent component in the printer, contains most of the electronics required to support the printing process with the ink stored in a separate predominately plastic container. Ink containers often contain some electronic chips which support functionalities such as counting of outputs (i.e. the number of pages printed) through communication with the imaging equipment. Ink containers which do not contain electronic chips are typically larger and filled externally rather than replaced as with other ink containers.	While generally correct some amendments have been made for accuracy and to include additional detail: ”Inkjet consumables either consist of a separate print-head and ink cartridge (i.e. a separated system), or a combined unit including the ink reservoir and a print-head (i.e. an integrated cartridge). In separated systems the print-head, either permanent or long life component in the printer, contains most of the electronics required to fire drops with the ink stored in a separate cartridge. Ink cartridges often contain some electronic circuity which support a variety of functions (i.e. anti-counterfeit/fraud, the number of pages/drops printed, enhanced print quality and reliability, etc.) through communication with the imaging equipment to provide the best customer experience. Ink containers with or without electronic circuitry typically used to fill a tank in the printer and are not required to be inserted for printer to print.”	

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	4		24	**Draft report text-** Most laser toner cartridges also contain electronic chips to support functionality such as page counting.	Amend as follows: Most laser toner cartridges also contain electronic circuity which support a variety of functions (i.e. anti-counterfeit/fraud, the number of pages/drops printed, enhance print quality and reliability, etc.) through communication with the imaging equipment to provide the best customer experience.	
	4		24	**Table 5**	The OEMs have proposed defintions in the latest draft VA that were designed to work with the specific provisions of the VA.	
	4		25	**Draft report text-** Non-OEM manufacturer (new-built) – there are an increasing number of organisations which manufacture compatible new consumables for imaging equipment products. Consumables from these types of manufacturers are marketed under their own brands, these are known as "compatibles". Non-OEM manufacturer (remanufactured) – there are a large number of EU based organisations which take used OEM consumables and remanufacture or refill them for further use. The	**Add:** ...remanufacture or refill them both within and outside of the EU for further use.	

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				consumables from these manufacturers are often called “remanufactured” or “refilled”, the latter in this study is assumed the same as “reused”.		
	4		26	**Draft report text-** The use of consumables is one of the three life cycle environmental hotspots impacting the imaging equipment product group. Depending on the printing technology, the relative contribution of life cycle environmental impacts from the use of consumables can be as important as energy in use impacts and therefore the joint second most important after the use of paper. When paper use is excluded from the system boundaries, the embodied impacts from the consumables (i.e. from manufacturing) can become at least as important as in-use energy consumption, in terms of Global Warming Potential, Primary Energy Demand, Ozone Depletion, Acidification Potential, Eutrophication Potential, Resource Depletion Potential, amongst others. The relative impacts of paper,	This paragraph is oddly without attribution. The available and verifiable sources for these statements must be provided. Given previous similar statements in the reports the OEMs are concerned that some of these conclusions are based on mis-interpretation of other studies.	

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				consumables and energy in use are highly dependent on the type and even model of imaging equipment under consideration.		
	4		25-27	Electronic chips	Note the discussion of electronic chip technology and the functionality of those chips is entirely without footnotes or other citation. What are the authors' sources? Why are they not stated?	
	4		27	**Draft report text-** The page yield of consumables (i.e. the number of pages that can be printed before a consumable need to be replaced or refilled) is also an important indicator of material efficiency. Page yield is a common metric to benchmark consumables and due to its influence on their overall environmental impacts (i.e. lower yields result in more frequent consumable replacements) is considered important. The page yield of consumables varies significantly across the imaging equipment models on the EU market. Small inkjet consumables may have page yields of less than 300 pages, but consumables used in high volume printing devices may page yields of tens of thousands.	The authors did not use the cartridge print yield data HP provided for BC2. According to the methodology the data should be from the manufacturers of the base case products. This raises the question of where the authors obtained the data used to develop BC2. The source of this information has not been stated. This raises concerns that the authors have misunderstood the concept of a base case as defined in the prescribed methodology (base cases are narrowly defined representative products, data is then collected for those products and used for the assessment/analysis), and raises the concern that the authors may have selected data from other sources rather than from the manufacturers as provided by the methodology.	

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				In addition, there is often a significant amount of variance in the page yields of consumables designed for use in the same product. That is, manufacturers often offer consumables with either "standard" or "high" yields for the same imaging equipment model. Furthermore, the page yields of consumables offered by different manufacturers for similar performing products can also vary significantly. Table 6 illustrates the variability and average page yield for consumables for the base cases. This is an extract of the complete analysis shown in Table 27 in Annex I Additional Tables and Figures for some common types of imaging equipment. The values are based on page yield data secured found for a total of 104 products from a single large consumable supplier. Data was not available for some of the highest speed product types as consumables for these product types are not often sold on the open market.		
	4		32	**Draft report text-** There are often hazardous material concerns associated with consumables	Inks and toners are mixtures of chemicals and, as such, are subject (where applicable) to a number of regulations in the EU	

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				stemming from the use of chemicals and additives in toners and inks. Hazardous substances present in cartridges are usually not assessed in Life Cycle Assessments. However, during the operation of the imaging equipment products hazardous substances can be emitted, in theform of dust, volatile organic chemicals (VOCs), ozone, benzene, particulate matter and semi-volatile organic compounds (SVOCs). Information about the hazardous material content of cartridges/containers is available in several widely used sources of information and environmental initiatives including: • Material Safety Data Sheets • Blue Angel RAL-UZ 205 • Nordic Swan • Ecma 370 The level of detail provided about hazardous material content of consumables varies across the main initiatives. The material safety data sheets and the Ecma 370 provide the least amount of information about consumable hazardous material content. The Ecma-370 declaration	including REACH Regulation, CLP Regulation and Biocidal Products Regulation. The requirements apply equally to OEM, remanufacturer and clone products. Given that inks and toners (as with all other chemical mixtures) are already subject to extensive regulation it would not make sense to try and regulate inks and toners through the VA and the authors do not appear to be suggesting this. Therefore, the authors should consider the value and relevance of this section or, at least, clarify the reason for including it.	

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				includes criteria relating to: • cadmium content of photo conductors and inks/toners • labelling of consumables and provision of Safety Data Sheet (SDS) where consumables are classified as hazardous or where they contain a substance(s) for which there are Community workplace exposure limits In addition, the Blue Angel RAL-UZ 205 specification requires that no substances which contain mercury, cadmium, lead, nickel or chromium-VI-compounds are to be added to toners and inks. An exemption is included for high molecular weight complex nickel compounds used as colourants. There is also an exemption for production-related heavy metal (e.g. cobalt and nickel oxides and organotin compounds) contamination. Further restrictions are included for azo dyes (dyes or pigments) in toners and inks that can release carcinogenic aromatic amines as listed in Regulation (EC) 1907/2006 (REACH Regulation), Annex XVII, Appendix 8. Biocides which are not covered by an active substance dossier for preservatives for products during storage (product type 6)		

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				according to the Biocidal Product Regulation (BPR, Regulation (EU) 528/2012) are also not permitted under the Blue Angel rules. Furthermore, the Blue Angel RAL-UZ 205 specification also prohibits the inclusion of selenium, lead, mercury or cadmium (or any of their compounds) in photoconductor drums.		
	4		33 onwards	**Section 4.1.2.4.4 Consumables remanufacturing and barriers**	This section of the report contains refers to alleged technical and non-technical barriers to manufacturing. The so called "barriers" listed appear to be primarily based on complaints by remanufacturers which the authors are repeating. The authors do not appear to have carried out any detailed and objective assessment to identify and verify the facts.	
	4		33	**Draft report text-** As shown in Task 3, there are LCAs stating that the ability of a consumable to be remanufactured (i.e. a consumable that has been used, repaired by replacing wear parts and filled with new toner or ink incl. solid ink) can have an important impact on overall environmental impacts. However, there appear to be a range of issues which may limit the ability	Which LCA's precisely? It is important that the reports provide clear citations so that the sources can be verified. As stated previously, the authors have mis-interpreted the conclusions of some referenced studies.	

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				for some consumables to be remanufactured. The Commission recently published a study which investigates the consumable reuse market in detail11.		
	4		34	**Draft report text-** In investigating the interactions between OEMs and remanufacturers, the report published by the Commission claimed that no evidence of collaboration (such as providing mechanical details or software design of imaging equipment or consumables to the remanufacturers) between OEMs and remanufacturers could be found. The lack of collaboration between OEMs and remanufacturers, suggests that remanufacturers need to reverse-engineer any consumable parts that need to be replaced during the remanufacturing process, this is also confirmed by the stakeholder consultation with remanufacturers13.	Cartridge OEMs and cartridge remanufacturers are competitors. The authors are noting a lack of collaboration between competitors.	
	4		35	**Draft report text-** Most OEMs follow the business concept of retaining the customers within the brand, once the imaging equipment is purchased, this ensures	What is the basis for the highlighted statement? As noted previously the report should set out objective and verifiable statements with full references to sources. This appears to be an assumption. If the	

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				continuous profit from the same end-users over several consecutive years. It is therefore not OEMs' priority to encourage competitiveness of non-OEM consumables. From the regulatory perspective, it is positive impact regardless by who, as long as more and more consumables are remanufactured and reused. However, there are several different challenges limiting the ability to remanufacture imaging equipment consumables. These can be broken down into technical and non-technical barriers. The technical barriers would limit OEMs' own ability to remanufacture consumables as well if not addressed.	authors wish to make this statement they should provide a reasoned justification with full citations and assessing all reputable sources.	
	4			Non-technical barriers including IP rights	The report presents intellectual property and intellectual property law as being a major barrier to remanufacturing. This is not correct. EU remanufacturers can avoid infringing OEM IP by not using patented parts and by controlling their supply chains so that cartridges that were first sold outside the EU are not remanufactured and sold in the EU. The Section of Task 4 report dealing with IP law should be deleted. Assessment of IP law is not in the scope or methodology of the	

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					report and the report is not the appropriate forum for any such assessment. Viegand Maagøe is not qualified to carry out such an analysis and seems to have relied heavily on documents obtained from ETIRA's website. Also the analysis is not legally correct. The report appears to be presenting intellectual property law in the EU as unclear and not well understood. In fact relevant EU IP law principles are straightforward, well understood and consistently applied by the courts.	
	4		44	Table 7	The ENERGY STAR TEC method does not allow the comparison of products with different speeds.	
	4		67-68	Table 25	Again the TEC method does not allow for the comparison of products of different speeds. Such comparisons and averages have no meaning and ABSOLUTELY cannot be used as the basis for identifying improvement potential. Table 25 should be deleted from the report. For TEC products it is simply wrong.	
	4		68	**Draft report text-** Other environmental initiatives, such as EPEAT and Blue Angel, include significantly more environmental	The VA exists in place of an ecodesign regulation. Comparisons (assessments against) should be made with other	

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				design requirements, which are robustly written, and yet still enjoy high registration rates.	regulatory requirements and not with voluntary ecolabels.	
2	4	4.3	67	The report examines energy saving standards other than TEC such as internal power supply efficiency, but only the standards required by Energy Star are sufficient.	Evaluation is possible only with TEC, therefore it is not necessary to introduce other standards.	
3	4	4.3	69	The report examines the VA reference to the EPEAT criteria, but you should proceed with the review after confirming and clarifying the actual compliance status of each company.	There is no meaning if the requirement of EPEAT which almost company could not get the score is included in VA.	
	4	4.3	70	Patents are required to be disclosed for consumables that may restrict remanufacturing, but technical information cannot be disclosed.	The criteria should be eliminated. Otherwise third party should pay or contract to disclose the patents.	
	4	4.3	70	The criteria which identify the numbers and total weights of consumables will be a burden for companies because we calculate them in each EU country.	This requirement is not feasible because sales company complies with WEEE per each country. We believe this requirement is not necessary for VA.	
4	4	4.3	70	Requirement: any firmware updates sent to imaging equipment after they are placed on the market do not impact the use of remanufactured consumables.	The criteria should be eliminated. Otherwise third party should pay or contract to disclose the patents.	

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				This requirement would be difficult to meet as Manufacturer cannot guarantee third party products.		
	4		72	**Draft report text-** The rapid increase in the numbers of "cloned" and counterfeit consumables being imported into the EU market from Asia may also cause issues. These cloned and counterfeit consumables are often unsuitable for remanufacturing may contain restricted hazardous substances and manufacturers may not fulfil their obligations under the WEEE and RoHS Directives. Any requirements placed on OEM consumables would not result in reduced environmental impacts from these cloned consumables. The rise in cloned consumables is also impacting OEM, and remanufacturing organisations', revenue streams. This suggests that OEM consumable manufacturers may be more sensitive to extra financial burdens placed on their products whilst at the same time facing competition from cheaper imported products. Enforcement of existing EU legislation including WEEE, RoHS and patent rights on producers of cloned consumables would help to	OEMs welcome the acknowledgement that counterfeit and clone cartridges are a major problem. We note that this point was also made strongly by a member of the remanufacturing industry at the stakeholder meeting. This factor cannot be ignored in considering any VA obligations relating to cartridges. The OEMs also welcome the acknowledgement in this section of the importance of intellectual property and the ability to enforce intellectual property rights. However, a number of other sections of the present report portray enforcement of intellectual property in a negative light where considering remanufacturing. Enforcement of intellectual property rights is legitimate whether in relation to counterfeit, clones or remanufacturers.	

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				alleviate the negative impacts of these products. Enforcement of RoHs restrictions on all cloned consumables would ensure that these product types had a toxicity profile the same as OEM consumables. However, enforcing environmental legislation is complicated by the fact that many cloned consumables, and all counterfeit consumables, infringe intellectual property rights, and so, should not even be on the EU market.		
	5		17	**Draft report text-** Each year, the Inspector produces a compliance report, which includes an energy usage report for the period. See Table 6 for the estimated energy consumption of TEC and OM imaging equipment in scope of the VA for 2011 – 2017. However, these energy consumption figures (between 0.58 – 0.99 TWh/year shown in Table 6) deviate greatly from the BAU in preparatory study (2008) and Impact Assessment (2013), as well as the current review study's estimated total. The compliance report by Inspector states that the energy consumption for the TEC products is based on the	The authors should consider the fact that the data from the preparatory study published in 2008 contained projections and the VA compliance report is based on actual shipments and actual measured energy values. Having considered these facts the authors should review this section and, at least, state these facts.	

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				reported TEC value (kWh/week), and OM products energy consumption is based on the power reported for "printing", "ready", "sleep" and "off" mode and the preparatory study (2008) usage hours.		
	5		18	**Draft report text-** An updated savings analysis has been undertaken as part of this review study. The updated analysis includes updated sales and stock data sourced from EU ENERGY STAR market report 2017 and shipment total provided by signatories to the Independent Inspector for 2017.	Again, signatories are not familiar with, and could not find, this report. Reported sources must be available and verifiable. Given the title it is very likely the report does not contain accurate data for the EU market, as registration on the EU ES database was always optional.	
	5		18	**Draft report text-** The imaging equipment on the EU market falling under the definitions, but not covered by VA signatories might not be compliant with VA requirement.	As noted, the authors should not speculate or make assumptions. In fact, OEMs consider that there is a very good chance that the equipment referred to does comply with VA requirements. Statements in the report should reflect objective, verifiable and referenced information.	
	5		20	**Draft report text-** The table also provides the EU VA targets and actual reported compliance (blue cells), it is clear that the VA targets have not been very	It is simply not true the ES v2.0 penetration rate was 100% in 2015. It is not 100% today. During the ES v3.0 revision process it was revealed the EPA had made some erroneous assumptions about penetration rate which	

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				ambitious, given the US ENERGY STAR v2.0 penetration rates is already 100% in 2015, but the targets are set at 90% and 70% for OM and TEC. The actual reported compliance showed 99.7% and 93.8% for OM and TEC, closer to the actual US reported data.	has never been 100%. This statement should be corrected.	
	5		22	**Draft report text-** Overall, the study team's judgement is that the US ENERGY STAR scheme supported by initiatives by the European Commission, by the Member States and by other schemes outside the EU is a major driver for the development of more energy efficient imaging equipment and for increasing the market penetration rate. Furthermore, the judgement is that the VA is and has been an effective policy measure for securing that non-ENERGY STAR compliant products only enter the EU in small amounts. Finally, it is assumed that with the cessation of the US-EU ENERGY STAR agreement in February 2018, the VA targets on ENERGY STAR penetration rates may become a more significant driver of energy efficiency in the EU.	The OEMs welcome the inclusion of this important statement.	

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	5		23	**Draft report text-** Table 11 illustrates the average measured TEC and average ENERGY STAR v3.0 specification limits for products in the ENERGY STAR v3.0 dataset, categorised into each of the TEC Base Cases. The analysis shows that on average the ENERGY STAR v3.0 specification limits result in 21% less energy being used per TEC based product.	Again, averaging TEC values for products of different speeds has very little meaning. The resulting value is not what the authors think it is and it CANNOT be used to determine or identify improvement potential.	
	5		27	**Draft report text-** Indirect savings from paper usage is estimated by the impact assessment (2013) to be 4 TWh in 2015, 7 TWh in 2020 and nearly 8 TWh in 2030. No other indirect savings from resource efficiency such as from consumables or equipment were estimated by the impact assessment (2013). As the current study does not focus on the paper usage, it cannot be verified if this saving estimated by the impact assessment has been achieved by the VA.	Why doesn't the current study consider paper? It is a fundamental flaw to exclude the impact of paper from any study of the environmental impact of imaging equipment.	
	5		27	**Draft report text-** For example, the EPEAT initiative includes significantly more	The VA exists in place of an Ecodesign regulation. Therefore comparisions should	

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				environmental design criteria than the current VA, yet still has over 3000 registered products.	be made to other ecodesign regulations and not to voluntary ecolabels.	
	5		28	**Draft report text-** The paper used in imaging equipment can contribute to a large share of overall environmental burdens. In general, the faster an imaging equipment product the more paper it can be expected to use over its lifetime (i.e. users buy faster imaging equipment when they expect to use the product more often). As paper usage increases it becomes more important to reduce the associated impacts. For this reason, the VA and other major environmental initiatives include requirements for some products to have automatic duplexing functionality, N-up printing and ability to print on lower weight paper and recycled paper. Automatic duplexing enables the production of images on both sides of an output sheet without the need for users to manually turn and refeed paper into the imaging equipment product. Automatic duplexing is more common on faster laser-based products which are	So why is paper, and its impacts, not considered in this study? The reports repeatedly state that paper is not the focus of the study and then highlight that paper 'can contribute to a large share of overall environmental burdens' (for imaging equipment). The authors should at least set out a reasoned explanation for the approach. As noted, in the view of the OEMs, this approach significantly undermines a number of the statements made in the reports.	

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				designed to output higher volumes of images.		
	5		31	**Draft report text-** It is important to note that whilst the VA currently relies on ENERGY STAR for energy efficiency performance metrics, it does not require that signatories detail exactly how products meet the ENERGY STAR specification limits. In contrast, when products are registered in the ENERGY STAR database, manufacturers are required to detail exactly how products meet the ENERGY STAR specifications. The lack of detailed reporting in the VA becomes an issue when ENERGY STAR's additional energy allowances (i.e. extra energy allowances for defined product features) are applied in order to meet the ENERGY STAR specification limit. Without insight into which additional allowances have been applied it is not also possible to identify if a product definitely meets the ENERGY STAR specification.	**The highlighted sentence is simply incorrect. As with the EEPLIANT project the authors are looking for a non-compliance where one does not exist.** Again, most (for some signatories ALL) models in scope of the VA are tested and certified for ENERGY STAR according to the US ENERGY STAR third-party certification program. Also, the annual VA compliance report includes ENERGY STAR OM sleep mode and TEC limits which include any allowances a given model may qualify for.	
	5		31	**Draft report text-**	MSAs are free to operate as usual with the VA. If a product model is tested and there	

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				This level of confidentiality requirement for acquiring data would discourage any Member State to carry out market surveillance on imaging equipment, additionally to the fact that they do not possess the same rights of authority as for Ecodesign regulations. Due to the lack of transparency and access to the reported data and non-compliance models, verification of primary energy requirements has never been possible for Market Surveillance Authorities (MSAs) from the Member States. If an MSA would like to test an imaging equipment randomly, and if the product is found non-compliant, even if this product is originally self-declared compliant, the manufacturer would be shielded from any consequences due to the targeted compliance rates for OM and TEC products are, e.g. respectively 93% and 80% for 2017. It is therefore crucial for the integrity of the signatories and upholding the effectiveness of the VA, the at least the non-compliant models are accessible to the public and public authorities such as MSA	are questions about the result, the MSA can inquire with the Independent Inspector and provide the product model number and the compliance status including any relevant test reports would be provided. The manufacturer would not be 'shielded' from any consequences because the commitment is <100% of models. Compliance status is reported every year at the model level. These comments suggest that the authors have not properly understood the functioning of the VA. The authors should further investigate the functioning of the VA and review and revise the contents of the reports.	

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	5		33	**Draft report text-** Allegation of Non-Compliance Process - The VA sets out a process for allegations of non-compliance. However, any external party wishing to raise an allegation of non-compliance must first deposit €4,000 into an escrow account before the independent inspector will begin investigations. Whilst this fee is refunded is the allegation is upheld it is lost if either the Independent Inspector or the Steering Committee (Signatories and Commission) do not uphold the allegation.	Note that no party has ever used this process. The process was included in the VA to prevent frivolous, sensational, or otherwise unsubstantiated allegations from competitive interests. The authors have included many unsubstantiated allegations from remanufacturers in this report but it would appear that remanufacturers have never been confident enough in those allegations to avail themselves of the third-party allegation process.	
	5		34	**Draft report text-** Based on the reported compliance rates with VA and the average energy consumption of imaging equipment, it seems that the VA has been effective and efficient in achieving direct energy consumption savings, the estimated savings from impact assessment (2013) will be reached by 2020 and 2030. However, quantitative analyses cannot be made on the amount of the savings are driven exclusively by the	So the VA has been effective in achieving direct energy savings but it is evident the VA targets were not very ambitious? How is that evident? Please provide a detailed and reasoned explanation. (Note: the author's previously stated assumptions about ES v2.0 penetration rates are not correct.)	

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				VA, and by collateral influences from other initiatives already taken place in the US, the EU and other areas. It is though evident that the VA targets for compliance were not very ambitious regarding the primary requirement based on ENERGY STAR v2.0 from the first Tier in 2015.		
	5		34	**Draft report text-** However, it is inconclusive if the resource efficiency and information requirement have been effective, as contradictory descriptions of compliance have been expressed by signatories and the Independent Inspector on one hand and remanufacturers on another.	The VA is a self regulatory measure agreed between the European Commission and the imaging equipment manufacturing industry. It includes requirements for annual compliance reporting and annual audits, as well as a third-party allegation process (which remanufacturers have never availed themselves of). The VA has also been the subject of the EEPLIANT project and is open to standard market surveillance activities. Cartridge remanufacturers (part of OEMs' competition) have no standing to offer opinions on the compliance status of signatories. Statements such as this are repeated throughout the reports and should be deleted. If the authors wish to assess the compliance status of OEMs they can communicate with the Independent Inspector and reach and present their own conclusions and reasoning rather that quote unsubstantiated allegations.	

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	5		35	**Draft report text-** VA information requirements – the current VA requires that signatories publish environmental information about their products. However, the VA requirements fail to ensure that users can easily access this information at any given time. In addition, the VA fails to require that signatories publish information that addresses each of the VA requirements. A central source of information for any in scope models placed on the EU market would provide significant benefits for a range of stakeholders.	Please compare to CE mark conformity assessment process.	
	5		35	**Draft report text-** VA resource efficiency requirements – the level of ambition in the current VA is weak in comparison to other voluntary environmental initiatives. Large numbers of product registrations to some of the other more ambitious environmental initiatives suggests that the VA may not be delivering savings beyond a business as usual scenario. To combat this issue, the VA should include a wider range of requirements addressing each environmental impact	The comparison should be to ecodesign regulations, not voluntary ecolabels.	

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				area associated with imaging equipment.		
	5		36	**Draft report text-** Reliance on other initiatives – the VA currently relies on ENERGY STAR for energy efficiency performance metrics. However, the VA does not require that signatories detail exactly how products meet the ENERGY STAR specification limits. In contrast, when products are registered in the ENERGY STAR database, manufacturers are required to detail exactly how products meet the ENERGY STAR specifications. The lack of detailed reporting in the VA becomes an issue when ENERGY STAR's additional energy allowances (i.e. extra energy allowances for defined product features) are applied in order to meet the ENERGY STAR specification limit. Without insight into which additional allowances have been applied it is not also possible to identify if a product does meet the ENERGY STAR specification.	The highlighted sentence is incorrect. This language should be removed. The authors appear to be looking for a non-compliance where none exists.	
7	5	5.3.1	43	Values in Life Cycle Assessment data is very strange.	Review input data with signatories. Calculate in another LCA tools.	

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				1. In our LCA, energy demand in "use" stage is larger than in "production" stage. 2. Energy demand in "recycling" cannot be minus as running recycling facility and equipment require power.		
	6		8	Design Options	Because base cases in this study were not identified properly all identified and recommended design options are questionable at best. See previous comments on base case definition, comparisons made with base cases from the original preparatory study, the authors misunderstanding of the ENERGY STAR TEC method, etc.	
7	6	6.1 Table 1,2	8-12	The rules for selecting the product to be compared with the improvement rate are unclear.	Please clarify the rule. If we refer to the product one generation ago, it is difficult to improve the improvement rate of each product.	
	6		14	However, evidence shows that this particular aspect may prevent being to benefit from warranty terms, and it is thus important to ensure that the warranty period includes using such cartridges. *"However, evidence shows that this particular aspect may prevent being to benefit from warranty terms, and it is*	The reports make a number of statements about OEMs warranties. Information on warranty terms are generally available and can be assessed by the authors. Manufacturers do not commit to repair or replace printers or printheads if damage is caused due to the use of a remanufactured or refilled cartridge. This is a reasonable position. The authors do not appear to have assessed the facts and appear to have based	

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				thus important to ensure that the warranty period includes using such cartridges. This will incentivize the use of refilled and remanufactured cartridges, which would reduce the environmental impacts from the use of cartridges." is not acceptable unless study team show concrete evidence that OEMs' concerns are imaginary fears.	their statements on opinions and allegations. The authors should carry out a proper investigation and review and amend the references in the different reports accordingly. Study team shall show counter data to what signatories have. As there are in fact low quality non-OEM toner/inks, it is impossible to provide warranty to users who use non-OEM consumables. Please read independent testing reports, for e.g. here: https://www.brother.co.uk/supplies/why-brother-originals	
	6		14	this will incentivize the use of refilled and remanufactured cartridges, which would reduce the environmental impacts from the use of cartridges.	This comment is not necessarily supported by recognized LCA studies.	
	7		14	**Draft report text-** The current VA signatories do not include any consumable manufacturers or remanufacturers and the product scope does not include consumables (whether OEM, non-OEM new built or remanufactured consumables),	Correct, there would be unfair advantages for clones and remanufacturers not covered by the VA.	

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				therefore any potential requirements set for consumables will only cover up to 68% of the EU consumable market (the OEMs that are VA signatories), see Task 2 for more details. This means that the market coverage for consumables will not meet the condition that "self-regulation measure has a market coverage of at least 80%"9. In addition, it is unsure how non-OEM and remanufactured consumables will be addressed under the VA. If left unaddressed, the market coverage of these products could increase even more due to the unfair advantages of not being covered by the VA.		
9	6	6.1.9	20	DO9 formula does not take life difference between toner cartridge and Drum unit into account. (e.g. Toner: 3000 pages, Drum: 12000 pages).	CMass value should be without Drum value. Page yield/CMass shall not be lower than: For Toner Consumables: (2 × [10 × tanh(0.1+0.0003 × (CMass-10))-0.5]+1) For Ink Consumables: (2 × [15 × tanh(0.2+0.0004 × (CMass-8))-1]+2) where CMass is calculated as the mass (g) of each cartridge, as measured in it to be installed condition	