

R2 Certification R2v3 - Addition of PV Modules -Responses to the First Round of Public Comments April 28th-June 12th, 2023

Section	Clause	Comment	Recommended Change	Disposition	R2 TAC's Response/Reason for Disposition
OVERALL - Appendices		Globally, it is way too early for SERI to be this prescriptive. I will send a cover letter, which we can discuss before I make it public if you like. I don't believe anyone drafting these has been to Africa, Asia, Latin America markets for SVP, and, intentional or not, SERI is potentially entering into "restraint of trade". One possible interpretation - which should be considered in ALL Appendices (which could be accomplished in court) would be to disallow R2 Recyclers to be restrained from claiming to be "Appendix B certified" under R2. If we do not claim that our SVP management process is certified under R2, we would not lose our R2 licenses for computers when we kept a working middleman relationship between SV Elective Upgrade companies and third party buyers. SERI could market that Activity Covered Under An Appendix is preferable or may be required under some contracts. But we don't believe SERI can legally threaten to remove certification for Recycling, or Hard Drives, if we continue in an existing business trading solar panels for reuse, the same as SERI cannot threaten legal action over claims of conformity to the standard.	Footnote: While being certified to trading under the Appendices is preferred and evidence of the highest recycling standards, SERI does not consider performing the trade without being certified to such as a violation of any other certified activity.	No change	R2 Certification is audited and issued for all the activities of a facility, not individually selected activities. R2v3 Core Requirement 1(a) sets this requirement within the R2 Standard. The current standards development activity of the R2 TAC is to add PV modules to the R2 Standard. Changing the requirement under Core Requirement 1(a) is not within the scope of the current standards development activity but could be considered during the next 5-year review of the entire standard.
DEFINITIONS - Focus Material	Focus Material - 4) when received by a downstream R2 certified facility.	We have used solar panels we have put on our own roof or local school roofs, which are functioning and generating electricity. As worded, even this reuse is not compliant unless the final user pays SERI and auditors, which appears an illegal requirement that could legally constitute Racketeering. SERI needs to allow for innovation and demonstration of appropriate use, and to stop trying to use "flow control" (also illegal) contracting to interdict interstate trade.	add 5) Or other valid evidence of reuse including warranty, in use monitoring, contracting, or innovative function.	No change	In the definition section, the Focus Material is solar cells, not solar panels (PV modules). It applies to the end-of-life disposition of the solar cell, and not the reuse of the entire PV module. PV modules capable of reuse are separated in accordance with Core 6(d)(4)(C) and processed for potential reuse through Appendix C -Test and Repair or sent downstream to a downstream vendor qualified in accordance with Appendix A. Functioning PV modules are classified under the new R2 Equipment Categoization (REC) Table 5 for reuse, and are available for resale or reuse as a functioning product without further downstream R2 control. The Focus Materials definition would not be applicable to working PV modules.
DEFINITIONS - Photovoltaic Modules	PV	What about an independent personal solar device that directly charges a devices or an attached power pack?	Expand the definition, or add in personal usage solar devices (not attached as per the calculator example).	Change	The definition of PV modules was revised so that the personal solar devices would not be precluded and the revised definition will be released in the second round of public comment.
APPENDIX G - Photovoltaic (PV) Modules	1 An R2 Facility shall manage PV modules as an R2 Controlled Stream.	This should apply only to EOL panels and Cadmium bearing panels until or unless there is evidence of panel mismanagement.	(1) An R2 Facility shall manage EOL PV modules as an R2 Controlled Stream.	No change	This requirement integrates PV modules received at a facility into the structure of the R2 Standard for responsible processing throughout the existing requirements of the standard. The Introduction to the R2 Standard states, "The R2 Standard establishes responsible reuse and recycling ("R2") practices for the management and processing of used electronics globally." Throughout the R2 Standard, scope is determined by "used electronics equipment, components, and materials." EOL represents a limited portion of "used" and would therefore narrow the scope just for PV modules creating an exception from the norm. Limiting PV modules to EOL would not fit with the scope of the R2 standard. Both PV modules for reuse (used) and recycling (EOL) are intended to be managed as an R2 Controlled Stream under the requirements of the standard.

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APPENDIX G - Photovoltaic (PV) Modules		Plastic and glass should be called out within the FM Plans, and managed. Could be a further update in future R2 versions, but the plastic should really be called out for these PVs as it has been aged in the sun for some time, and can pose larger environmental risks.	Update Appendix G to go further with the FM plan.	No change	In Core Requirement 8(a)(1), the R2 Standard requires the R2 Facility to state how the facility and its downstream vendors shall conform to the applicable requirements of the R2 Standard including the demonstrated expertise and capabilities required to process each type of electronic equipment containing an FM. In the draft Appendix G -PV Modules, section 2 states that the facility shall manage PV modules in accordance with all applicable R2 requirement as defined for electronic equipment, therefore Core Requirement 8(a)(1) would apply to PV modules, and the facility's FM Management Plan should include not only how they are managing solar cells but the aluminum frame, glass, plastic, etc. of the PV module, so the suggested language is already a requirement under the R2 Standard. Furthermore, when other portions of the PV module such as glass and any plastic film covering that glass are co-mingled due to processing techniques, that management is accounted for in the draft definition of solar cells as a Focus Material. If effective processing techniques can remove glass and plastic, then glass and plastic will be managed under Core 8(c), which requires management in accordance with Core Requirement 2, and is otherwise intergrated into the facility's EHSMS to ensure handling that is in full legal compliance, protective of the environment, and protective of worker and public health and safety.
APPENDIX G - Photovoltaic (PV) Modules	General Principle	Doesn't mention brokering for PVs..."General Principle -To ensure that any R2 Facility that handles or processes photovoltaic (PV) modules, also known as solar panels, does so in a safe and environmentally sound manner, in accordance with all applicable R2 requirements.", just "R2 Facility"...	R2 Facility, R2 certified Brokers, etc.	Change	A new section, Appendix G(10), for brokering PV modules was added to the draft Appendix G and will be released for a second round of public comment.
APPENDIX G - Photovoltaic (PV) Modules	1 and 7	Can we manage a solar panel as an Unrestricted Stream per the REC as Clause (7) indicates following the REC or only as an R2 Controlled Stream per (1)?	Clarify the use of managing solar panels based on stream.	Change	Table 1: R2 Applicability of the R2 Equipment Categorization (REC) was revised to add PV modules to the R2 Controlled Stream column to make it clear that PV modules are an R2 Controlled Stream and the changes to the REC will be released for a second round of public comment.
APPENDIX G - Photovoltaic (PV) Modules	6 Damaged ¹ PV modules shall not be stored or processed outdoors unless the risks of the outdoor operations have been assessed and controls established to prevent uncontrolled releases to the environment.	There should be at least some evidence that this is a problem, or it risks adding unnecessary costs which will discourage reuse and recycling. "Damaged" could apply to the inverter, or the aluminum frame, or hail damage which does not prevent reuse. If language is not modified, reuse of lightly damaged panels will be prevented and the marketplace will turn away from R2.	(6) Heavily Damaged, non-functioning and unrepairable PV modules shall not be stored or processed outdoors unless the risks of the outdoor operations have been assessed and controls established to prevent uncontrolled releases to the environment.	No change	The footnote defines damage as damage to glass or to encapsulation of the solar cell. The requirement does not prohibit storage and processing outdoors, but ensures that risks have been assessed and controls established to prevent uncontrolled releases to the environment. The existing language does not prevent or restrict reuse of lightly damaged panels.

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APPENDIX G - Photovoltaic (PV) Modules	7 An R2 Facility shall evaluate PV modules in accordance with the defined process in Core Requirement 6(a) to determine the capability of reuse and direct evaluated PV modules to the appropriate next process.	Since the current expertise is among buyers who fly in, inspect, and make offers for panels in various condition, it is too early for R2 to make assumptions about REC. At a minimum, there should be an added clause allowing "evidence of expertise by the purchaser, including contractual language and explanation of final use". Since panels have no risk of "acid bath" or scrap metal value, it is too early to presume that R2 recyclers are the "expert" in functionality and transactions. This could also drive us all to just set up separate companies to avoid R2 altogether if there are indeed innovative and environmentally beneficial uses that R2 REC failed to anticipate or consider.	(7) Unless there is evidence of a binding reuse contract with positive environmental outcomes, An R2 Facility shall evaluate PV modules in accordance with the defined process in Core Requirement 6(a) to determine the capability of reuse and direct evaluated PV modules to the appropriate next process.	No change	This requirement is in place to ensure that the R2 Facility has a process for determining the capability of reuse and directing evaluated PV modules to the appropriate next process which depends on the evaluation and the internal capabilities of the R2 Facility. The language in draft Appendix G(7) does not prevent buyers from evaluating PV modules for the capability of reuse and having them tested for functionality by the facility which would follow the requirements in the draft Appendix G(8)(a)(1)(A-D) or being sent downstream to the buyer under Appendix G(8)(b). The R2 Standard does not require that an R2 Facility use an R2 Certified Facility as a downstream vendor but does require certain qualifications be met for both an R2 Certified Facility as well as a non-R2 certified facility. The existing language in the draft Appendix G(8)(b) is consistent with the R2 Standard in requiring the same level of testing for both R2 Certified and non-R2 Certified downstream vendors. There is no provision for contracts to negate the testing requirements for any type of equipment.
APPENDIX G - Photovoltaic (PV) Modules	7 An R2 Facility shall evaluate PV modules in accordance with the defined process in Core Requirement 6(a) to determine the capability of reuse and direct evaluated PV modules to the appropriate next process.	Testing or evaluating every single panel for reuse is potentially expensive and time-consuming. If this can be done on a batch level or work order level, it would greatly decrease the burden of testing every panel. This can be done by testing a sample from the batch of panels, using process knowledge, and/or using information from the waste generator. Please see ISO 2859-1 standard for an example of lot-by-lot testing.	Clarify in (7) that the method of evaluation of panels for reuse shall be up to the facility.	No Change	There is no provision to negate testing every device in the R2 Standard. Allowing devices, or specifically, PV modules here, that are not tested to be considered functional under the R2 Standard and no longer subject to downstream R2 control could cause potentially negative outcomes such as some of the PV modules not working and being sent as working PV modules potentially resulting in illegal transboundary shipments of waste, or resulting in the dumping of the unwanted PV modules in the batch in a location that does not have the infrastructure to handle the waste.
APPENDIX G - Photovoltaic (PV) Modules	8(a) Tested, refurbished and/or repaired internally	I have PhD degree in long term degradation of solar cells and panel and have deep knowledge of power degradation after long exposure in the field. I feel that the testing section need major changes as the current version don't covers the full testing method of PV modules. Following additional testing methods must be added. Here I have tried to explain the method but in the appendix G only shorter form should be included. Sometime in the module, one or more cell arrays are no longer able to generate power due to internal busbar connection failure, so we have to define a rule that to what percentage of power vs original power of the panel is acceptable for reuse. In my opinion any results upto 80% of the original power is acceptable for reuse. For testing AAA type sun simulator must be used and all the following current-voltage characteristics must be presented with all functional modules. Short Circuit Current (ISC): Open Circuit Voltage (VOC): Maximum Power Point (PM): Current at Maximum Power Point (IM): The Voltage at Maximum Power Point (VM): Fill Factor (FF): Efficiency (η): Temperature coefficient (TC) (this is important to determine performance in the appropriate climate condition, hotter or colder). Reverse breakdown voltage is the reverse anode voltage at which the diode conducts a specified amount of reverse current. During PV panel testing we must also perform reverse breakdown voltage to estimate the quality of the bypass diode (installed at the end of the each array). Reverse breakdown measurements are very important in determining the fire hazards of the panels in case of partial shading of the PV panel.	I have PhD degree in long term degradation of solar cells and panel and have deep knowledge of power degradation after long exposure in the field. I feel that the testing section need major changes as the current version don't covers the full testing method of PV modules. Following additional testing methods must be added. Here I have tried to explain the method but in the appendix G only shorter form should be included. Sometime in the module, one or more cell arrays are no longer able to generate power due to internal busbar connection failure, so we have to define a rule that to what percentage of power vs original power of the panel is acceptable for reuse. In my opinion any results upto 80% of the original power is acceptable for reuse. For testing AAA type sun simulator must be used and all the following current-voltage characteristics must be presented with all functional modules. Short Circuit Current (ISC): Open Circuit Voltage (VOC): Maximum Power Point (PM): Current at Maximum Power Point (IM): The Voltage at Maximum Power Point (VM): Fill Factor (FF): Efficiency (η): Temperature coefficient (TC) (this is important to determine performance in the appropriate climate condition, hotter or colder). Reverse breakdown voltage is the reverse anode voltage at which the diode conducts a specified amount of reverse current. During PV panel testing we must also perform reverse breakdown voltage to estimate the quality of the bypass diode (installed at the end of the each array). Reverse breakdown measurements are very important in determining the fire hazards of the panels in case of partial shading of the PV panel.	Offer as guidance for product safety testing	Standard test conditions of power output is already required in the draft Appendix G(8)(a)(1)(A). The draft Appendix G includes disclosure of the total power output of the panel in watts and the ratio of power output to the originally designed level. Any further specific tests performed by the R2 Facility would be included as part of the Facility's R2 Reuse Plan, this includes Product safety plans per Appendix C(2)(c). Product safety plans demonstrate the actions the R2 Facility undertakes to investigate and verify that the equipment and components are safe to reuse, including procedures to check for conditions affecting product safety, and responding to recalls. The suggested detailed testing could be provided as guidance as part of the procedures to check for conditions affecting product safety.

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APPENDIX G - Photovoltaic (PV) Modules	8(a)(1)(B) The ratio of power output to the originally designed level, expressed as a percentage of the original, and	This is a useless requirement, as the baseline (original power) has nothing to do with the science of reuse. A 2020 solar power operating at 50% efficiency is more valuable than a 1980 solar panel operating at 100% efficiency. This is another example of SERI putting together standards without in depth investigation of buyers, it's a rush to judgement.	(B) The ratio of power output, and	No change	The total power output of the panel in watts was included because of the following reasons: warranty reasons; buyers looking to combine multiple panels (some new and some used) to reach an intended output and the need to understand the ratio of power output to the originally designed level; buyers expectation; and consumer protection.
APPENDIX G - Photovoltaic (PV) Modules	8(a)(1)(C) Repairs made to the PV module, and	This creates potential logical problems where, for example, if an R2 buyer purchased working panels from a known, reliable client who pre-tests the panels, if that supplier is not interested in becoming R2 certified, that the R2 company must either a) perform the same tests over again, or b) destroy the working panel, or c) sent it to downstream Appendix A recycler. If we are supplying reuse panels, are short of a half load, and purchase warranted used panels from a non-R2 company, the only reason to prevent that appears to be SERI's interest in forcing more companies to pay SERI to adapt the standard. There's no groundswell of demand for that except by "planned obsolescence" anti-reuse interests. Or leave it in and add D)	8a) 1 D) Other records or evidence of functionality such as warranty from suppliers or inspection by buyers.	No change	There is no requirement in the R2 Standard that the supplier needs to be R2 Certified. In fact, the process described in Core Requirement 6(b)(2)(B)&(C) would also be applicable in this situation and would not require the R2 Facility to perform all tests again. The requirements in Core Requirement 6 referenced above were added to the R2 Standard to encourage reuse when working with a supplier that is not R2 certified. The requirement in the draft Appendix G(8)(a)(1)(C) about disclosure is about transparency of any repairs made to PV modules. It does not create a requirement to test all PV modules again, or to destroy working panels which is inconsistent with Core Requirement 2 and the hierarchy of management strategies, nor does it require that PV modules be sent to an R2 Certified facility.
APPENDIX G - Photovoltaic (PV) Modules	8(b) Transferred to a downstream vendor qualified in accordance with Appendix A - Downstream Recycling Chain, for testing, repair, and refurbishing.	There is definitely not yet a mature field of such downstream vendors, or any evidence that overseas reuse companies who perform their own inspection and testing ("fly and buy") should be disqualified at such an early stage, before any evidence of solar panel misuse or dumping has been presented	(b) Transferred to a downstream vendor qualified in accordance with Appendix A -Downstream Recycling Chain, for testing, repair, and refurbishing, or to an independent buyer providing contracts and specifications for their own reuse systems..	No change	The R2 Standard does not require that an R2 Facility use an R2 Certified Facility as a downstream vendor but does require certain qualifications be met for both an R2 Certified Facility as well as a non-R2 certified facility. The existing language in the draft Appendix G(8)(b) is consistent with the R2 Standard in requiring the same level of testing for both R2 Certified and non-R2 Certified downstream vendors. There is no provision for contracts to negate the testing requirements for any type of equipment.
R2 Equipment Categorization (REC)	Table 5	As we explain in the cover letter, this eliminates trade with reputable, inspected, professional refurbishers who purchase panels for reuse, just as damaged automobiles are purchased for repair and resale. REC for Version3 for electronics arguably took place when there was over a decade of experience and a large capacity of certified downstream vendors. There is no evidence that the used solar panel refurbishing market has any intention of joining R2, which creates an appearance of illegal racketeering to control the flow of used reuse goods for the purpose of growing SERI. Again, there has been no diagnosis or evidence that these reuse buyers are environmentally inferior to the very small cadre of "experts" on the TAC used to draft these REC. SERI should seriously hit the "pause" button until you obtain legal advice as to whether banning "other buyers providing evidence of expertise and reuse qualifications". Saying that repair cannot be contracted out to a non-certified third party is illegal, guys. You can write it in a way that has very strict "evidence" requirements that the non-certified third party is not a "sham" recycler, but it is illegal to do it the way you are writing this, especially 1) Absent any claim that non-certified buyers are a problem, and 2) That there pre-exists a market (like the one R2 V1 and V2 created for Rv3 to issue REC) of downstream certified buyers. I get panels from electively upgraded solar fields, we have a relationship with the solar panel upgrade supplier, they give us written descriptions, and we take them at their word, and the buyers are repeat buyers happy with their purchases making free market trade decision, and	PV-F3 Other written evidence of subcontractor with sufficient expertise to purchase and repair evidently functional PVs outside the market of R2 Certification.	No change	If the PV modules are in the R2 Facility's control, those downstream vendors performing repair would need to be qualified as a downstream vendor in accordance with Appendix A. The R2 Standard does not require that an R2 Facility use an R2 Certified Facility as a downstream vendor but does require certain qualifications be met for both an R2 Certified Facility as well as a non-R2 certified facility. Regarding repairs made to PV modules under the R2 Standard, the downstream vendor would need to disclose what repairs were made in accordance with PV-F2 of the REC Table 5.