

Background Notes EcoLogo™ Program Standard Review (Round 1)

May 14, 2009

CCD-003 Electricity-Renewable Low-Impact
(E) SOLAR-POWERED ELECTRICITY

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1. Introduction

Solar-powered electricity is currently considered in the EcoLogo™ standard for renewable low-impact electricity (CCD-003). One solar-powered generating facility amounting to a total capacity of 0.0134 MW has already been third-party certified by the EcoLogo™ Program.

Solar-powered electricity products can offer considerable environmental benefits, and meet strict requirements for solid waste disposal and recycling, amongst others.

During a preliminary research period, the EcoLogo™ Program engaged with stakeholders to narrow down the scope of environmental criteria categories needing revision or to be added to the standard. As such, the EcoLogo™ Program was able to narrow down its criteria scope. The scope will be presented in this document. Moreover, the EcoLogo™ Program will propose environmental leadership criteria for further stakeholder review, as well as outline unresolved questions for further consideration by stakeholders.

2. Revised Criteria Statement to the Current Active Standard

Following preliminary research and a discussion with stakeholders, the EcoLogo™ Program will address the following environmental impact categories, and related stressors, by proposing to revise certain criteria statements to the current active standard. Each proposed criteria statement is followed by a rationale explaining why we are proposing the revision to the standard. Only those topics that were discussed with stakeholder will be presented below.

2.1. Waste Management (including Toxics Management and Recyclability of Materials)

[Revised]:

10. To meet the requirements of this **standard**, solar-powered electricity must be generated in such a manner that adequate arrangements (i.e., financial reserves) have been made for the proper disposal **and/or** recycling of all solid waste resulting **from the manufacturing of solar cells**, and of the generation of electricity including the disposal of **batteries** and machinery or equipment used in the generation process itself, that contains measurable levels of cadmium.

[Current]:

To meet the requirements of this criteria document, solar-powered electricity must be generated in such a manner that adequate arrangements (i.e., financial reserves) have been made for the proper disposal or recycling of all solid waste resulting from the generation of electricity, including the disposal of equipment or machinery used in the generation process itself, that contains measurable levels of cadmium.

Rationale:

Alsema & Nieuwlaar (n.d.) and Fthenakis, V.M. & Bowerman, B. (n.d.) have shown that substances used for module production can be harmful to workers, the public, or the environment if not handled properly. This is why the EcoLogo™ is proposing to address the manufacturing stage of solar cells within CCD-003. Alsema & Nieuwlaar (n.d.) have also stated that the use of lead-acid batteries is primarily responsible for the environmental impacts of solar home systems, and therefore suggest that battery recycling schemes are of great importance for these types of systems. Thus, the EcoLogo™ Program is also proposing to address this issue within CCD-003.

Moreover, Müller, A., Karsten, W., & Alsema, E. (n.d.) have shown that the recycling of solar modules using the Deutsche Solar recycling process is more environmentally advantageous than a landfill-incineration process or a shredder process with subsequent sorting. The principal reason is that this recycling process ensures that no new wafers need to be produced. This is especially important considering the scarcity of silicon and indium (Fast Company, 2009). However, recycling schemes for solar cells are still relatively in their infancy in North America as elsewhere at this time. In fact, "PV modules are designed to generate clean, renewable energy for over 25 years. With the first significant installations in the early 1990s, full-scale end-of-life recycling is still another 10-15 years away" (PV Cycle Association, 2008). Plus, only a very small fraction of the market recycles solar cells currently (Hulmes, D., 2008). For these reasons, the EcoLogo™ Program cannot strictly mandate recycling at this time. Still, we greatly encourage recycling of solar electricity systems to proliferate. Demanding that EcoLogo™ certified solar-powered generators keep investment reserves for this purpose is a way to ensure this.

3. Unchanged Criteria Statements in the Current Active Standard

Following preliminary research and a discussion with stakeholders, the EcoLogo™ Program proposes to keep certain criteria statements intact. Only those criteria statements that were discussed with stakeholders will be presented below. A rationale explaining why we are proposing to keep statements unchanged is provided.

3.1. Greenhouse Gas Emissions

Rationale:

See *General Considerations Background Notes* presented elsewhere for the review of CCD-003.

4. Considerations Withdrawn from Review

Following preliminary research and a discussion with stakeholders, the EcoLogo™ Program has withdrawn the following environmental considerations from this review. Only those topics that were discussed with stakeholder will be presented below. Below, we provide a rationale explaining why we have decided not to address these considerations further during this review.

4.1. Criteria Air Emissions (CO, NO_x, SO_x and PM)

Rationale:

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Background Notes: CCD-003 Standard Review

See *General Considerations Background Notes* presented elsewhere for the review of CCD-003.

4.2. Use of Copper in Photovoltaic Inverters

Rationale:

The EcoLogo™ Program does not believe that the potential impact due to the use of copper in PV inverters is significant enough at this point to warrant further attention especially considering, in comparison, the scale of use of copper in power lines. However, the EcoLogo™ Program does believe that copper use, as with other non renewable resources, should be used in the most efficient way and recycled when possible to avoid its depletion.

4.3. Choice of Materials

Rationale:

Following further research, the EcoLogo™ Program is not convinced that the EcoLogo™ Program can mandate particular solar technologies that use particular materials demonstrating greater environmental leadership at this time. This is because the solar technologies that have been shown to demonstrate environmental leadership, compared to other solar cells, still represent a small fraction of the solar market. For instance, the CdTe photovoltaic modules have been shown to be the least impacting photovoltaic technology currently available from several important points of view, such as the amount of material input required, the acidification potential, global warming potential, abiotic depletion, and eco-toxicity potential according to Raugei, Bargigli & Ulgiati (n.d.). They represent less than 12% of the world market according to Boyle (2004). On the other hand, polysilicon feedstock and Ribbon-Growth-on-Substrate wafers which can yield a 50% reduction of 10 environmental impact categories (incl. abiotic depletion human toxicity, terrestrial ecotoxicity amongst others etc) in comparison with present day standard technology according to Alsema & Wild-Scholten (2004), only represents 5% of the world solar market according to Boyle (2004). Because solar power already represents environmental leadership in many respects compared to other electricity generating technologies, and because the market of environmental leaders in the solar cell materials domain is still small, the EcoLogo™ Program has decided not to consider this issue further during this review.

4.4. Efficiency

Rationale:

According to the National Renewable Energy Laboratory (2008): "Capacity factors for current parabolic trough systems under development range from 25% for solar only plants to greater than 40% for plants with thermal storage". Moreover, they suggest that as the cost of thermal storage is reduced, future parabolic trough plants could yield capacity factors greater than 70%. On the other hand, according to Boyle (2004), commercially available PV modules have generally low efficiencies that range between 10 and 17%. Although some solar power systems are more efficient at transforming solar radiation into electricity, the EcoLogo™ Program has decided not to mandate greater efficiency as part of CCD-003. This is due to the fact that, it has not been possible to create a method to compare different efficiencies across different power technologies. In other words, percentage efficiency in one power technology (such as wind) cannot be equated to an efficiency for say biomass combustion. Also, it is too unclear how changes in efficiency translate in terms of

quantifiable environmental benefits at this time.

4.5. Battery Impacts

Rationale:

Although the EcoLogo™ Program understands that improving battery lifetime would help ensure a more efficient use of energy, we did not find sufficient data to suggest that there currently is a battery system in North America that represents environmental leadership in this domain. However, this is an area that requires further research. This is substantiated by Nieuwlaar and Alsema (1997), which mention that a life cycle analysis of stand alone PV system:

“indicated that batteries are responsible for most of the environmental impacts due to the relatively short life span and its heavy metal content. Although a large part of the batteries recycled, a relatively large part of total energy, and raw material consumption of the system is applied for the production and assembly of batteries together with a large part of the emissions and waste which are generated.”

4.6. Land Use

Rationale:

See *General Considerations Background Notes* presented elsewhere for the review of CCD-003.

5. Unresolved Issues

Following preliminary research and a discussion with stakeholders, the EcoLogo™ Program has not been capable of resolving certain issues. Indeed, no clear direction could be found indicating how EcoLogo™ should address these issues, although, in certain cases, several proposals were brought forward. The goal of the EcoLogo™ Program is to determine whether these issues can be resolved and what criteria statement could be included in the standard. Only the topic that were discussed with stakeholder will be presented below.

5.1. Energy Use

Rationale:

See *General Considerations Background Notes* presented elsewhere for the review of CCD-003.

6. References

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