MARYLAND COMMISSION ON CLIMATE CHANGE

The Solar Photovoltaic Systems Recovery, Reuse, and Recycling Working Group

Meeting Minutes

Monday, August 19, 2024, 1:00pm-3:00pm E.T.

Meeting Location: Online via Google Video

Attendees

Member Names	**Affiliation**	*Present*
Sen. Benjamin Brooks	Senate of Maryland	X
Del. Mike Rogers	Maryland House of Delegates	
Tyler Abbott, Chair	Maryland Department of the Environment, designee	X
Evie Schwartz	Maryland Energy Administration, designee	X
Josh Kurtz	Maryland Department of Natural Resources, designee	
David Chy	Public Service Commission	
Diana Menendez	Chesapeake Climate Action Network	
Pearl Donohoo-Vallett	Pepco Holdings	
David Beugelmans	Gordon Feinblatt, LLC	
Stacey Onoh/Oriaifo	Exelon	X
Scott Elias	CleanCapital	X
Bob Sadzinski	Maryland Department of Natural Resources	X

Non-members

Stephanie Vo, Bradley Baker, Kathleen Kennedy, Bradley Phelps, Garvin Heath, Sreyas Chintapalli, Susanne Thon, Shannon McDonald, Andrew Kays, Victoria Nellis, Cindy Osorto, Morgan Mills, Jared Williams, David Comis, Duwane Rager, Rael

Meeting Overview and Roll Call

- Tyler Abbott introduced the meeting
- Bradley Baker completed roll call of members

Maryland DNR's Decommissioning Report - Bob Sadzinski, Power Plant Research Program

- Overview of CPCN and PPRP: they make licensing recommendations to the PSC (who has the authority)
- First solar case in 2011
    - Estimated increase in solar cases in Maryland
- PPRP has estimates of how many panels will be decommissioned in the future
- Bob described the decommissioning process
- Decommission = not generating electricity for sale
- Cost of decommissioning solar panels varies significantly across applications
- Oldest solar PV system is ~15 years
- Andrew Kays: For the removal slide, I presume that this does not include home roof installs or other projects that would not go through CPCN (e.g., .5 or 1 MW). Is this correct?
- Bradley Baker: Do these companies have to recertify these bonds each year?
    - Sadinski: Bonds will increase
- Garvin Heath: NREL in electric power research institute will complete a tool to calculate standardized decommissioning costs. If you'd like to participate in testing and learning more about that, reach out to Garvin.
- David Comis: I had asked developers about why so many panels on the field, they said they need to have that on hand so that they have the matching panel on hand (which may have been discontinued otherwise)
- Evie Schwartz: Did I read the EoL 12 months after the end of not generating electricity of sale?
    - Sadzinski: Worked with developers to ask what is reasonable? For example, if a storm comes through and knocks everything off, it's an evolving science
    - Scott Elias: Different states/counties have different definitions. Some states say 1 year. Some say 18 months.
        - It's similar to the construction cycle, it can take a long time.

Life Cycle Assessment (LCA) of Solar PV Systems and Harmonized LCAs of electricity generation technologies - Garvin Heath, NREL

- IEA PVPS Task 12 - been around since 1993
- Life cycle for electricity generation technologies
    - All technologies have this, and combustion technologies have an additional fuel cycle
- LCA have been practiced for 40 years and have set standards and guidelines
- In LCAs, we establish system boundaries and collect several different key parameters and data
- Most environmental impacts from solar panels are embodied into the manufacturing, which is global
- CdTe has a lower efficiency but has lower GHG emissions
- Recycling makes a small contribution at end of life when looking at GHG emissions
- GHG emissions are decreasing with the development of mono-Si PV systems over time
- Payback time is about 1 year for PV panels
- Many stakeholders have questions about human health risks of PV panels, and NREL has several publications assessing these concerns
    - All NREL health assessments found that cancer and noncancer risks were lower than EPA guidelines, even in the extreme leaching cases for solar PV panels
- Circular economy is different from a recycling economy, which actually fits into the linear economy
- Maryland projected to have more glass waste in 2050 (from NREL PViCE model)
- Lots more job opportunities from recycling than landfilling

- Sadzinski: Lifetime GHG going down for solar - why is that?
    - Heath: One of the main factors is because of the module efficiencies (lifetime CO2 / lifetime electricity generation). There are other changes, such as wafer thickness (which is made up for pure silicon).
- Andrew Kays: Have you seen a base number of panels/units to recycle to make a recycling operation/business viable (annual basis)? Thinking of economic development.
    - Heath: Recycling is a low margin business, so you need high volume in order to make revenue and profit is revenue - cost. Recycling is capital intensive, so that skews recycling businesses to a relatively large scale before becoming profitable. Few dedicated PV recyclers, most are existing recyclers and each other these have a different focus (e.g. metal vs. glass). SolarCycle is the largest and most dedicated PV-specific recycler. There are now sustainability standards for PV systems.
- Baker: Why are the renewable energies in the graph so skewed?
    - Heath: For every technology except for biopower, there is nothing below zero - we expect to see this.
- Elias: SEIA is working on ANSI standards around decommissioning and end-of-life equipment (not finalized or started), https://www.seia.org/initiatives/standards-development
    - SEIA 601: Solar and Energy Storage Equipment Decommissioning Standard
    - SEIA 602: Solar Equipment Minimum Requirements for Recyclers
    - SEIA 603: Solar Equipment End-of-Performance / End-of-Life Management Standard
- SEIA standards aim to be complementary with R2 standards

Study Update - Kathleen Kennedy and Bradley Phelps, University of Maryland; Johns Hopkins University

- Profile of current Maryland solar installations
    - To reach RPS goals, Maryland will need more solar deployment
    - Largest solar arrays are on Eastern Shore
    - Utility-scale solar are mostly on greenfields
- End-of-life options in a PV circular economy
    - Circular economy principles are important to take into account for the lifetime of solar panels
- There are different policy options for recycling
    - Many states have made progress for policies to promote recycling or promoting reuse
    - There were two previous MD legislations to create PV recycling fund
- Overview of PV-ICE model
    - Designed for solar materials analysis
- Modeling scenarios
    - 9 scenarios modeling different deployment levels and EOL policy approaches
- Landfills and Solar
    - Different scenarios will impact landfills differently
- Next steps
    - Impact assessment of model results
    - Outreach to counties and solar installers and developers

Discussion

- No further discussion from members.

Public comment

- No public comment.