#3 Renewable Energy Equipment

Subcommittee Meeting #3 Summary – Renewable Energy Equipment
September 2, 2021 9AM-12PM

Subcommittee meeting #3 of the Renewable Energy Equipment Subcommittee (#3-REE) was convened virtually via Zoom on September 2, 2021 from 9AM-11 AM, CST. Attendance for #3-REE is provided in Table 1 below.

Table 1. #3-REE Subcommittee Membership and Attendance

Name	Company	Attended 9/2/21
Jeff Maxted	Alliant Energy	Present
Jenny Coughlin	MidAmerican Energy Company	Present
Chaz Allen	Iowa Utility Association	Present
Joshua Syhlman	TPI Composites	Absent
Rick Hurt	SCISWA	Present
Dan Nickey	Iowa Waste Reduction Center	Present
Shelene Codner	Region XII Council of Governments - IWE	Present
Shelly Peterson	IEDA	Present
Jerry Brown	Collins Aerospace	Absent
Sally Buck	Valmont Industries, Inc., Coatings Division	Absent
Steve Guyer	Iowa Environmental Council	Present
Kenneth Sulma	Iowa Utilities Board	Present
Dustin Miller	American Clean Power Association	Present
Brad Hartkopf	Iowa Association of Business and Industry	Present
Mary Wittry	Carroll County Solid Waste Management	Present
Theresa Stiner	DNR Internal SMM Team	Present
Laurie Rasmus	DNR Internal SMM Team	Present
Jeff Fiagle	DNR Internal SMM Team	Present
Tom Anderson	DNR Internal SMM Team	Present
Jennifer Wright	DNR Internal SMM Team	Present
Amie Davidson	DNR Internal SMM Team	Absent
Michelle Leonard	Consultant – SCS Engineers	Present
Christine Collier	Consultant – SCS Engineers	Present
Jeff Phillips	Consultant – SCS Engineers	Present
Karen Luken	Sub-Consultant – EESI*	Present
Dan Litchfield (Guest speaker)	Invenergy	Present
Sam Oswalt		Present
Jeff Danielson	American Clean Power Association	Present
Peder Mewis	Clean Grid Alliance	Present
(402) 916-0047		Present

* Economic Environmental Solutions International

A. Subcommittee #3 - REE Summary

The meeting began with the project consulting team reviewing the agenda for this meeting (see Attachment A), the overall objectives of the Sustainable Materials Management (SMM) – Vision for Iowa project, the process and goals of the project process, and the goals for today's subcommittee meeting. The Stakeholder Meeting #2 schedule and Subcommittee responsibilities were also discussed. The slides presented for this Subcommittee meeting (including those from guest speaker Dan Litchfield) are included in Attachment B.

Subcommittee members asked about this project's process and if there are planned SMM practices already identified for implementation. Furthermore, some subcommittee members expressed concerns that businesses may not want to implement SMM practices.

The project consultant team stated that Phase I of the SMM project involved many stakeholders representing a variety of industries and integrated solid waste management (ISWM) programs and services managers, and concluded that SMM practices would improve Iowa's current approach to material management. The stakeholders that participated in Phase I predominantly concluded that SMM practices should be identified and considered for implementation in Iowa. Phase II of the SMM project is to engage with a broader base of stakeholders to identify and prioritize specific materials for possible SMM practices, and then evaluate potential strategies to implement SMM practices focused on prioritized materials. It was discussed that strategies identified in Phase II of this project would then be considered for potential implementation which is considered Phase III of this project.

The project consultant team and Department of Natural Resources (DNR) staff reminded subcommittee members that SMM is a long process and priorities and strategies may change over time as additional information is collected and evaluated. Furthermore, the role of Phase II isn't to implement any potential SMM practice. Rather, its role is to identify potential strategies and then work with subcommittee and stakeholder members in evaluating and prioritizing potential strategies. Part of this process also includes developing a better understanding of the waste management challenges we may have today and may have in the future so that we can identify better management practices.

The project consultant team introduced guest speaker Dan Litchfield with Invenergy. Dan provided a summary on Invenergy, their involvement in renewable energy projects, the benefits of renewable energy, the expected market and infrastructure growth in Iowa, and discussed the end of life management of solar energy equipment.

Dan indicated that Iowa has large queue of potential solar projects that are expected to generated 3 gigawatts (GW) of power and have approximately 415 megawatts (MW) of storage potential. Utilities are working with manufacturers and local municipalities to develop appropriate use and decommissioning plans for this infrastructure to minimize negative community and environmental impacts associated with these projects.

Dan stated that renewable energy equipment and utilities (large or small) would prefer incentives that support innovation rather than regulations that would likely increase costs for consumers. There are several activities already underway (i.e., University research, business collaboration, etc.) that can help provide innovative and market based solutions for improved end of life management solutions. With the expected growth in the solar energy market and the significant increase in number of panels and associated energy storage systems (i.e., Lithium-ion batteries), there is an economies of scale

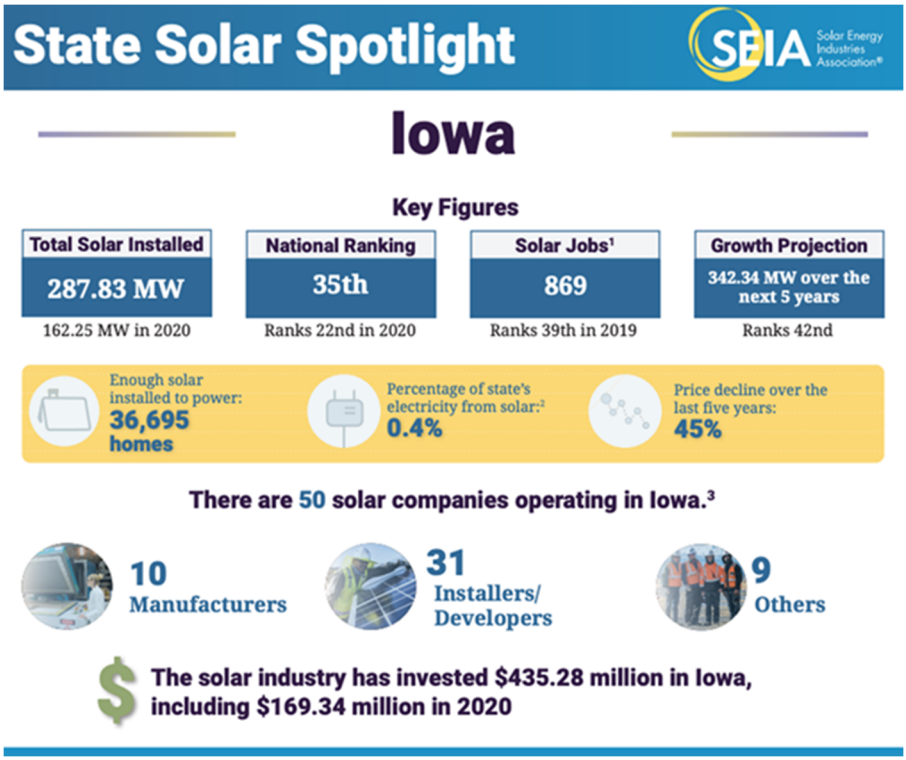
established which increases demand for these raw materials and also then supports the demand for businesses that can successfully recycle these materials for reuse. There are already several businesses within the United States that provide decommissioning and recycling services associated with the solar energy market. It is anticipated that more companies will join the market as demand continues to increase.

Dan also mentioned growing market for repurposing old solar panel systems for use in third-world countries. Decommissioned solar panels in the United States primarily still have decent energy production capabilities, just less so than the panels that are likely replacing them. Rather than recycling these resources, there is an opportunity to connect with other nations that need power in locations that may not have reliable electrical grid services.

Finally, Dan stressed that we need to create more renewable energy and that end-of-life management is a short-term barrier that we can solve.

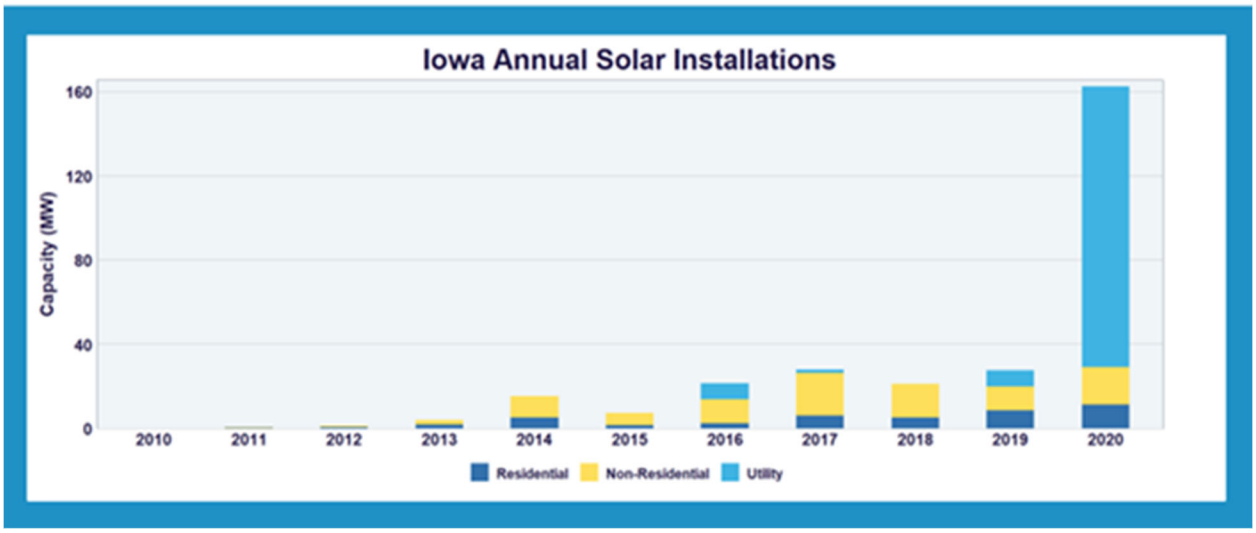
The project consultant team then presented Iowa solar energy market statistics. This data is illustrated in Figures 1 and 2 below.

Figure 1 – Iowa Solar Spotlight



Source: Solar Energy Industries Association

Figure 2 – Iowa Annual Solar Installations



Source: Solar Energy Industries Association

Figure 2 shows the energy production capacity in Iowa as well as the type of installations that have occurred (i.e., residential, non-residential, and utility) over the past 10-years. Figure 2 indicates a significant increase in energy production capacity as well as installations by utilities between 2019 and 2020.

The project consultant team presented information on the recycling and reuse of solar panels. For silicon-based solar panels, the recycling process involves separating the glass and aluminum. Approximately 95 percent of the glass and 100 percent of the metals are reused. Any remaining materials are heated to evaporate the plastics. Remaining silicon is then recycled. For thin-based solar panels, the recycling process typically involves shredding the panels and then using chemicals to remove the film. Approximately 90 percent of the glass is reused and 95 percent of the semiconductor materials are reused. Remaining metals are then separated and processed.

The project consultant team presented an example legislative strategy recently implemented by the state of Washington to promote the local renewable energy industry through modifying tax incentives. The legislation required solar panel manufactures to establish free solar panel recycling services for residential consumers. The legislation was adopted in 2017 and the implementation date has been extended to 2025.

The project consultant team then identified the following end of life management models for renewable energy equipment:

- Decommissioning Plans
- Product Stewardship

- Rate-Payer Funded
- Permittee Funded

The project consultant lead the Subcommittee members through a discussion covering what can be done in Iowa to ensure sufficient funding for end of life material management and what topics should this Subcommittee focus on over the next one to three years. The following is a summary of the discussion for each of these questions.

What can be done in Iowa to ensure sufficient funding for end-of-life management?

- Large utilities are managing the end of life for renewable energy equipment – but perhaps good governance is also important to level the playing field and include all utilities (with different strategies based on some criteria).
- Looking at large utility scale projects, most of them already have decommissioning plans which address some end of life. However, they don't address issues during the life of the project (i.e., re-powering blades or panels). Perhaps ordinances could be established that require funds to be set aside to manage these "during life-use" issues.
- It is important to look at any potential solutions that are on the macro- and micro-scale. From the state and county side - the ordinances/regulations need to be consistent across the board. Especially, if we are looking at incentives.
- Utility scale projects are different than commercial or residential projects. We are confident that third-party companies will pop up to manage the end of life materials especially with the massive amounts of materials that will be generated.
- What can the State of Iowa do to facilitate recycling companies locating in the State?
- There are a lot of good things happening in the management of wind turbines. We are going to continue to do what is best for all of our customers. We would want to make sure that any policies that are developed over time are equitable.
- If a company is putting in infrastructure, they could have a financial assurance mechanism to manage these materials. However, for homeowners perhaps some incentives could be established as financial assurance isn't likely applicable in their case. From a landfill perspective, it is very cheap to manage these materials for disposal.
- The wind turbine projects are doing a good job of managing the wastes but the blades are a challenge. End markets should be established to help encourage reuse and recycling of these materials.
- Technology is advancing and some of the waste we have or will be producing will not be there in the future. On residential scale, there are tax incentives for using some of these technologies. Perhaps this could be extended to those that recycle these materials.

- Concerning reuse of solar panels, we could focus on getting these materials to developing countries (non-profits, missions, etc.). But we need to make sure there is an end of life process and solution in the countries that are receiving these panels.
- More private industry needs to be represented in this group. Large manufacturers that may want to use renewable energy at their facilities should be invited to participate.
- The Iowa Economic Development Authority's State Energy Center is providing resources to support research in managing end of life for wind turbines. Perhaps this research could be presented during the next Subcommittee meeting.
- If we are wanting to connect with developing nations to discuss opportunities to provide them solar panels for reuse, perhaps we can connect with the president of the Solid Waste Association of North America (SWANA) to help us make those connections.
- We could consider establishing solar panel take back programs similar to what we have for battery take back programs.
- Financial assurance requirements for large scale projects to ensure proper decommissioning is a good idea.
- We should invite individuals representing municipally owned and cooperative energy utilities to participate in this group. We should also invite manufacturers of wind turbines, solar panels, and energy storage equipment to this group.
- Bring in folks that may potentially be affected by policies.
- We need to make sure we are reflecting the fact that a majority of these materials are not hazardous and inert and that the volume of the material is able to be managed.
- We are excited about our wind turbine recycling opportunities. Whatever the outcome of this group is, we want to make sure it is fair and equitable to all of our customers.

<u>Is there anything in the next one to three years that we should be focusing on?</u>

- Encourage policies that foster research for technologies to solve some of the end of life material management challenges.
- We need to encourage, to the extent that we can, solutions that drive businesses and solutions to move into Iowa.
- Consider reestablishing the renewable energy tax credit. This could serve as a model for Iowa.
- Public education is important to help promote the benefits of renewable energy. There may be a negative connotation with the renewable energy infrastructure, but we need to be sure the public understands all of the benefits that renewable energy solutions provide.

B. Research Request List

There were no topics identified for further research. However, the following individuals or organizations were identified as those to consider inviting to participate in future Subcommittee Meetings:

- John Deere;
- Pella Windows;
- Large manufacturers that may want to use renewable energy at their facilities;
- Municipal and cooperative Utility representatives; and
- Manufacturers of windmill turbines, solar panels, and battery storage systems.

C. Other Notes

Other items of note from the #3-REE meeting are as follows:

- Second Stakeholder Meeting will be held on September 30, 2021. Subcommittee members in addition to other interested parties are invited and encouraged to attend.

Attachments:

Attachment A: Agenda

Attachment B: PowerPoint Presentations

Attachment A
Agenda

Subcommittee Meeting #3 – Renewable Energy Equipment

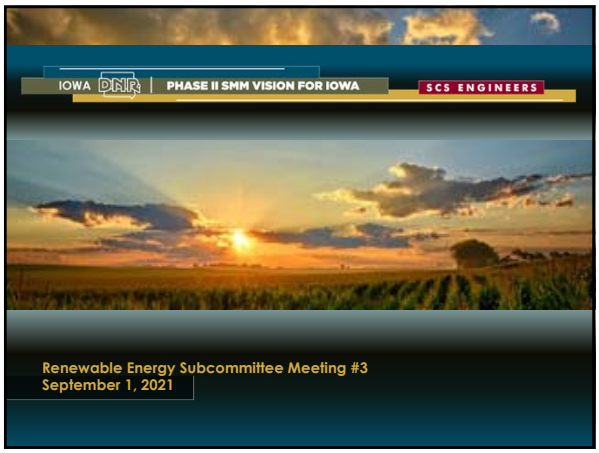
September 2, 2021

9:00AM – 12:00AM (CST)

Virtual Meeting

1. Recap SMM Goal, Process, and Schedule
2. Additional Data
3. Fundamental Questions
4. State of Washington Solar EPR
5. Reusing Solar Panels
6. Break
7. Revisit Minnesota Model
8. Potential Strategies
9. Next Steps
    a. Stakeholder Meeting#2 (September 30, 2021)
    b. Future meetings dates and logistics

Attachment B
PowerPoint Presentations



Agenda

- **Recap SMM Goal, Process, and Schedule**
- **Additional Data**
- **Fundamental Questions**
- **State of Washington Solar EPR**
- **Reusing Solar Panels**
- **Break**
- **Revisit Minnesota Model**
- **Potential Strategies**
- **Next Steps**
  - Stakeholder Meeting#2 (September 30, 2021)
  - Future meetings dates and logistics

Goal

Establish a clear direction for implementing an SMM system with immediate, medium and long-term strategies

Phases of SMM Process

Phase I: What is it and should we do it?

Phase II: Prioritization and timing of what we should do and how we should accomplish it

Phase III: Ongoing Implementation

Phase II Process

Select specific material types within each category

Define and prioritize specific strategies
- Legislation
- Policies
- Programs
- Infrastructure

Identify implementation timeline, responsible party, funding measures, and performance metrics

Material Types Selected

Organics & Fibers	Plastics	Renewable Energy Equipment	Construction & Demolition
Edible Food	Single-Use PET Water Bottles	Wind Turbines	Interior Building Components
Pre-Consumer Spoiled Food	Plastic Film/Bags	Solar Panels	Roofing Materials
Compostable/AD Paper, Food and Yard Waste	Polystyrene (Styrofoam)	Storage Batteries	Drywall, Plaster and Gypsum Board
			Treated and Untreated Wood

Subcommittee Role

- Finalized Material-Specific Groups
- Continue as Active Working Groups
- Size and Composition May Change
  - Combination of Invitation and Application
  - Composition is Fluid
- Representation of Various Interests Reflecting Material Life Cycle
- Make Recommendations to the Stakeholders
- Vital to Project Progress and Success

Stakeholder Group Role

- Provide various perspectives on how SMM will be adopted and implemented in Iowa
- Provide on-going guidance to subcommittees
- Will consider and endorse subcommittee recommendations

Subcommittee Recommendation Process

1. Develop Recommendations
2. Present Recommendations to Stakeholders
3. Consider Stakeholder Input and Modify Recommendations
4. Present Further Developed Recommendations to Stakeholders

Today's Focus

Where Do We Go Next

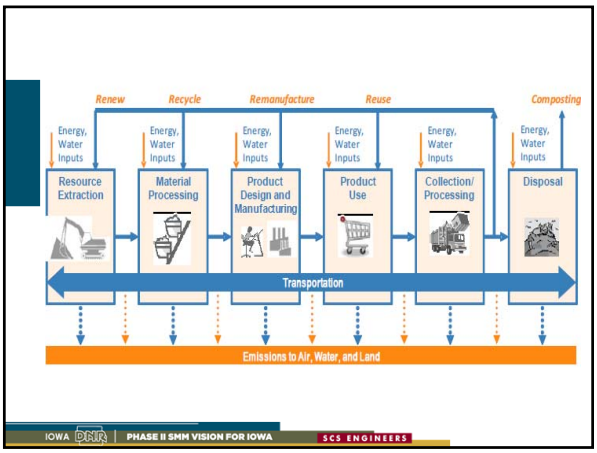
1. Present strategies and rankings to the Stakeholder Group on September 30th
2. Receive input from Stakeholder Group
3. Reconvene to
   - Reevaluate strategy ranking
   - Identify implementation timelines, responsible party, funding measures, and performance metrics
4. Present implementation requirements to Stakeholder Group

Stakeholder Meeting #2: Sept 30th

- Subcommittees Present Recommendations
- Led by Appointed Representative
- Assistance from Facilitators
- Breakout rooms for Further Discussion

Agenda

9:00 – 9:15	Welcome and Introductions
9:15 – 11:30	Subcommittee Updates
11:30 – 11:45	Initial Group Comments/Breakout Selection
11:45 – 12:30	Lunch Break
12:30 – 1:15	Breakout #1
1:15 – 1:20	Switch Break
1:20 – 2:05	Breakout #2
2:05 – 2:30	Wrap Up and Next Steps



Guest Presentation

Invenergy Renewables SMM for Solar and Storage September 2, 2021

Innovators Building A Sustainable World

Invenergy Renewables

World's Leading Privately Held Renewable Energy Company

RENEWABLE PROJECT DEVELOPMENT CORE BUSINESS

Invenergy Renewables

Our Foundation
Developing and operating the technologies of the renewable energy future

Wind
109 projects
17,276 megawatts

Solar
48 projects
5,832 megawatts

Storage
18 projects
1,611 megawatt hours
486 megawatts

Transmission
1,400+ miles operating or under contract

DIVERSIFIED SOLUTIONS

Invenergy Services
Award-winning asset manager and operator for owners of renewable energy facilities

Invenergy Transmission
Experience developing 1,400+ miles of transmission infrastructure to bring power to market

Invenergy Renewables

Example project: Badger Hollow Solar

- Iowa County, WI
- 300 MW in two phases
- Single axis trackers mounted to steel H-piles
- Approx 900,000 bifacial solar modules
- "Decommissioning cost is calculated as the sum of the cost of disassembly, removal and disposal of the PV modules and balance of system, as may be offset by the gains from the salvage value of materials."
- Point: strong incentive to maximize salvage value.

Invenergy Renewables

Solar Ground Cover

- Builds soil (sequestering carbon)
- Reduces storm water runoff
- Improves downstream water quality

Tallgrass Prairie Center
UNIVERSITY OF NORTHERN IOWA

Invenergy

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Frame of reference on materials and waste

Renewables are resource extraction and generation combined.

Invenergy's Worthwhile East Solar Project, 149 MW, GCU-2019-0004:

Emission Component	Tons per Year	Tons per 30-Year Operation
CO_2	328,000	9,840,000
SO_2	242	7,250
NO_x	362	10,800

Iowa Environmental Council's estimates of 2020 Coal-Fueled Plant Emissions:

	Total
Sulfur Dioxide (tons)	17,000
Nitrogen Oxides (tons)	9,913
Mercury (lbs)	50
Carbon Dioxide (tons)	17,342,000
Fly ash (tons)	142,900

We need to deploy renewables and solid waste challenges are solvable.

Invenergy Renewables

Iowa's Solar and Storage future

Iowa has a large pipeline in MISO queue of potential solar energy projects (3 GW) and 415 MW of storage.

We prefer policy that incentivizes innovation and supply chain development for recycling, rather than regulations that drive up the cost to consumers. Universities like UNI and businesses in Iowa can work together to help solve the challenges.

Most of the materials used in clean energy processes are inert and appropriate for solid waste disposal, but diversion is a shared goal of the clean energy industry.

Decommissioning plans are common practice and provide for responsible retirement of facilities.

Invenergy Renewables

Current Solar Recycling Industry

Advancing technology
- Several General Electronics Recyclers (Mechanical Processes)
- Few Solar-Specific Recyclers (Thermal & Chemical Processes)

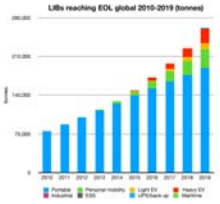
Active efforts to reduce recycling costs ahead of recycling demand
- Typical 30 to 40+ year solar panel useful life
- Projected 20+% industry compound annual growth rate

Active Industry Engagement and Research
- Solar Energy Industries Association (SEIA) and American Clean Power (ACP) working groups
- 5 SEIA-approved solar recyclers

Invenergy Renewables

Battery Recycling

- Lithium-ion battery (LIB) recycling is not well established due to economical and technological constraints, but the market demand for recovered materials is expected to grow
- We are fast-approaching a turning point when the first large scale storage and EVs reach their end of life, greatly accelerating recycling demand and profitability
- The Li-ion battery market is expected to grow at a CAGR of 25%, driven by light and heavy Evs
- Economies of scale in recycling processes and increasing demand for raw materials are key to decreasing recycling costs



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Decommissioning an Energy Storage System

- End of life is typically after 7300 cycles (e.g. 365 per year for 20 years)
- Decommissioning services are provided by multiple companies
  - Evaluate the condition of the batteries
  - Determine if they can be reused responsibly
  - If not, they are recycled in a hydrometallurgical process
  - Provide a certification of recycling

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Li-ion Recycling Companies

Company	Type	City	State/ Province	Country	Status	Partner(s)
Li-Cycle	Processing	Toronto	Ontario	Canada	Operational	Renewance
Renewance	Decommissioning	Schaumburg	Illinois	USA	Operational	Li-cycle
Bluewater Battery Logistics	Decommissioning	Santa Barbara	California	USA	Operational	ABTC
Redwood Materials	Processing	Carson City	Nevada	USA	Operational	Nissan Panasonic
American Battery Technology Co (ABTC)	Processing	Reno	Nevada	USA	Operational	Bluewater
Kinsbursky Brothers	Processing	Anaheim	California	USA	Operational	Tesla
Call2Recycle, Inc.	Electronics Processing	Atlanta	Georgia	USA	Planned	
Brunp Recycling Technology	Processing	Lishui	Guangdong	China	Operational	CATL
SungEel HiTech	Processing	Gunsan	North Jeolla	S. Korea	Not in US Planned 2022	Igneo
Igneo	Processing	High Plains	New York	USA		SungEel
Umicore	Processing	Brussels		Belgium	Operational	
Posco Hy Clean Metal	Processing	Gwangyang	Jeollanam-do	S. Korea	Planned	
Revolt (Northvolt)	Processing	Stockholm		Sweden	Planned Nov 2021	
Tesla	Processing	Lingang	Shanghai	China	Planned	
Ganfeng Lithium	Processing			Mexico	Planned	

Inven

Innovators building a sustainable world

English

Innovadores construyendo un mundo sustentable

Spanish

持続可能な世界作りを目指す革新者

Japanese

Innowatorzy budujący zrównoważony świat

Polish

Des innovateurs construisant un monde durable

French

Follow-ups:
Dan Litchfield
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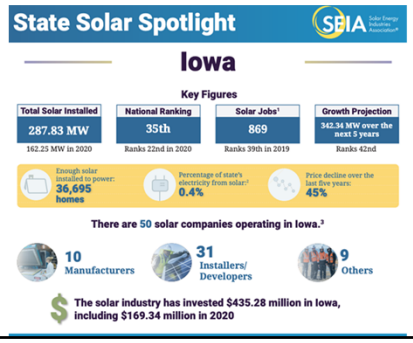
773-318-1289

Invenergy Renewables

Join us.

Background on Solar Panels



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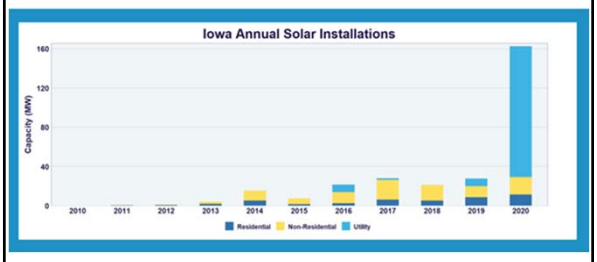
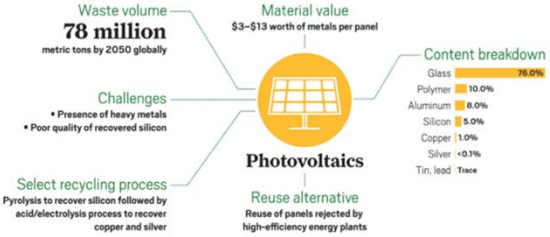
Background Solar



Background on Solar

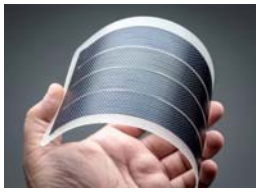


Solar Reuse and Recycling

- The silicon-based PV panels (the most common of the two panels) are first disassembled, and the glass and aluminum are separated
- 95% of the glass and 100% of the metal are reused
- The remaining materials are heated to 930 degrees which causes the plastic to evaporate
- The remaining silicon is recycled

Solar Reuse and Recycling

- Thin film-based PV panels are shredded into roughly 5mm pieces and separated to remove the film using peroxide and acid.
- Through the processes of removing interlayer materials and rinsing glass, nearly 90% of the glass is reused.
- 95% of the semiconductor material is reused via a precipitation and dewatering process.
- The remaining metals are then separated and processed.



Photovoltaic Module Stewardship Program

State of Washington

Senate Bill 5939

In 2017, the Washington state Legislature passed Senate Bill 5939 to promote a sustainable, local renewable energy industry through modifying tax incentives

Manufacturers of photovoltaic (PV) modules to provide the public a free and convenient and environmentally sound system for recycling modules sold in or into the state after July 1, 2017

What the Program Covers

All PV modules used for residential, commercial, or agricultural purposes that are installed on, connected to, or integral with buildings

Freestanding off-grid power generation systems such as water pumping stations, electric vehicle charging stations, solar fencing, solar-powered signs and solar-powered street lights

Who Is A "Manufacturer?"

The manufacturer of a PV module covered by law includes an entity that:

- Has legal ownership of the brand name or cobrand of PV module.
- Imports a PV module branded by a manufacturer that has no physical presence in the United States of America.
- Sells at retail a PV module acquired from an importer and chooses to take legal responsibility in place of the importer as the manufacturer of that product.
- Chooses to take legal responsibility on behalf of a manufacturer as defined in the previous bullets

Stakeholder Advisory Committee

- Whatcom County Health
- Panasonic Corporation of North America
- Solar Washington
- Solar Energy Industries Association
- National Renewable Energy Laboratory
- Zero Waste Washington
- CED Greentech
- Itek Energy
- South Sound Solar
- First Solar, Inc.
- Silicon 2 Solar
- Washington Refuse and Recycling Association
- Seattle Public Utilities

Implementation Timeline

July 7, 2017 Chapter 70.355 RCW PV Module Stewardship and Takeback Program – effective date

December 2017 Finalize stakeholder group. January 2017 Phase one draft guidelines

February 21, 2018 First stakeholder meeting

Implementation Timeline

April 6, 2018 Comment period on phase one draft guidelines. Ongoing Phase two draft guidelines

May 15, 2018 Second stakeholder meeting. Ongoing Comment period on phase two draft guidelines. Ongoing Phase three draft guidelines

August 29, 2018 Third stakeholder meeting. Ongoing Comment period on phase three draft guidelines. Ongoing Phase four draft guidelines

Implementation Timeline

November 9, 2018 Fourth stakeholder meeting. Ongoing Comment period on phase four draft guidelines.

April 2019 Ecology sends administrative fee invoices to manufacturers.

July 1, 2019 Final guidelines that includes requirements for approved recycling plans is published.

January 1, 2020 All initial plans are submitted to Ecology.

Timeline

January 1, 2021 All recycling plans are implemented and fully operational

January 1, 2021 Only PV module manufacturers participating in a recycling plan are sold in or into Washington

April 1, 2022 Each year, the authorized party for a recycling plan files with Ecology a report describing the results of their recycling program for the preceding year

Implementation Status

- Legislation adopted in 2017
- After January 1, 2021, PV must have an approved stewardship plan to sell their modules in or into Washington.
- This date has been extended to 2025
- Initial legislation has been amended two times

Reuse of Solar Panels

Solar Panel Reuse

Waste panels often aren't waste; they're just degraded by time in the sun or less efficient than newer models.

They may not be good enough for urban homeowners and cutting-edge utilities, but they work perfectly well for anyone in a sunny climate in need of stable, off-grid power who doesn't want to pay full price

Solar Panel Reuse

Potentially huge market

Between 2010 and 2019, the number of people living without electricity declined from 1.2 billion to 759 million worldwide.

Some gap closure by new power lines and other transmission facilities. But most of it was achieved by installing small solar systems

Solar Panel Reuse

As of last year, 420 million people got their electricity from off-grid solar systems

By 2030, according to the World Bank, that number could nearly double.

Nobody knows how much of this market has been met by secondhand panels and systems. R3 Tech, a major broker, "pessimistically" guessed that there are 10 million

Wind Energy in Iowa

- 5,590 total wind turbines that are producing over 10,951 megawatts (MW) of electricity.
  - 16,670 individual wind turbine blades

End-of-Life Management Models

- Decommissioning Plan
- Product Stewardship
- Rate-Payer Funded
- Permittee Funded

Discussion

- What can be done in Iowa to ensure sufficient funds for end of life management?
- How can the state incentivize recycling and encourage rural/developing reuse?
- Different strategies for utility-scale, muni/coop, homeowner?
- Should additional stakeholders be invited?

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Where Do We Go Next
Present strategies and rankings to the Stakeholder Group on September 30th
Receive input from Stakeholder Group
Reconvene to
•Reevaluate strategy ranking
•Identify implementation timelines, responsible party, funding measures, and performance metrics
Present implementation requirements to Stakeholder Group
IOWA DNR | PHASE II SMM VISION FOR IOWA
SCS ENGINEERS