#5 Renewable Energy Equipment

Subcommittee Meeting #5 Summary – Renewable Energy Equipment
March 30, 2022 1PM-4PM

Subcommittee meeting #5 (there was no Subcommittee meeting #4) of the Renewable Energy Equipment Subcommittee (#5-REE) was convened virtually via Zoom on March 30, 2022 from 1PM-4PM, CST. Attendance for #5-REE is provided in Table 1 below.

Table 1. #5-REE Subcommittee Membership and Attendance

Name	Company	Attended 3/30/22
Jeff Maxted	Alliant Energy	Absent
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	Absent
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	Absent
Brad Hartkopf	Iowa Association of Business and Industry	Present
Mary Wittry	Carroll County Solid Waste Management	Present
Regi Goodale	Iowa Association of Electric Cooperatives	Present
Jeff Gorrie	Iowa Association of Municipal Utilities	Absent
Madeline Schmitt	Iowa DOT	Present
Samuel Sturtz	Iowa DOT	Present
Theresa Stiner	DNR Internal SMM Team	Present
Laurie Rasmus	DNR Internal SMM Team	Absent
Jeff Fiagle	DNR Internal SMM Team	Absent
Tom Anderson	DNR Internal SMM Team	Present
Jennifer Wright	DNR Internal SMM Team	Present
Ed Tormey	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

* Economic Environmental Solutions International

I. Subcommittee #5 - REE Summary

The meeting began with a brief introduction of attendees and an overview of the agenda for this meeting (see Attachment A). The project consultant team then reviewed the overall objectives of the Sustainable Materials Management (SMM) – Vision for Iowa project, the process of the project to date, and the goals for today's subcommittee meeting.

The project consultant team then reviewed research that had previously been done concerning renewable energy equipment and the need for renewable energy. A summary of the reviewed research is below. The presentation slides are included in Attachment A.

A. Research Summary and Discussions

Solar Panels Research Summary:

- Market:
    - While Iowa is ranked 35th in the US for solar energy production, the industry in Iowa is growing and is projected to continue to do so at a rapid pace. Over $169 million was invested in this industry in Iowa in 2020 alone.
    - Iowa currently produces more than 287 megawatts (MW) in solar energy and is projected to produce a total of more than 342 MW in the next 5-years.
- Solar Panel Recycling Challenges:
    - Recycling a standard 60-cell silicon panel can net a recycler approximately $3 for the recovered metals. However, the costs to recycle this panel can range between $12 to $25. Additionally, the cost to dispose of the panel in a landfill is typically less than $1.
    - In order to increase recycling of solar panels, it is thought that revenues received from this process need to exceed recycling processing costs as well as be more fiscally advantageous than current low disposal costs.
- Extended Producer Responsibility Example:
    - The state of Washington passed a bill to promote local recycling of solar panels by establishing tax incentives. The bill requires manufacturers to provide the public with free recycling opportunities. This bill covers all photovoltaic (PV) modules used for residential, commercial or agricultural purposes. It excludes free standing off-grid power generation and charging systems.

Wind Energy Research Summary:

- Market:
    - Iowa is ranked 2nd in the US for wind energy production. Iowa has approximately 5,600 total wind turbines producing more than 10,000 MW of electricity. There are more than 16,000 wind turbine blades in operation in Iowa.

- Wind Turbine Recycling Challenges:
    - The composite material in the wind turbine blades are difficult to recycle due to the strong materials and resins used to manufacture them.
    - The project consultant team showed a video produced by the Rethink Channel titled "Tackling Wind's Waste Problem." The video discussed wind turbine blade manufacturing and end of life management practices being developed in Europe. The following is a summary of the video (https://youtu.be/FfnqBePvKCI):
        - Approximately 85% of the whole wind turbine mass can be recycled. However, the blades are difficult to recycle and are therefore typically landfilled.
        - Manufacturers are researching the use of different resins that can be separated from the other materials so that they can be easier to recycle. This process uses acidic acid rather than high temperatures and complex chemicals – therefore the process is cheaper, and less harmful to the environment than other practices.
        - Recyclable wind turbine blades are more expensive to manufacture than traditional blades. But it is hoped that the costs will continue to decrease over time. Furthermore, it is anticipated that owners of these wind turbine blades (i.e., manufacturers, utilities, etc.) who are responsible for the management of these products at the end of their usefulness will financially benefit as recycling the products will be more cost effective than seeking disposal options.
        - Manufacturers are also looking at methods to reuse the materials from previous wind turbine blades for the creation of new blades. Thus, reducing material costs as well as eliminating disposal costs.
        - It is estimated that over 1,400 wind turbine blades in the US will be removed each year until 2025 and will require end of life management.

The project consultant team then lead the group in a brief discussion related to the topics in the presented research summaries and video. The following lists the posed question and attendee responses/discussion.

WHAT CAN BE DONE IN THE SHORT TERM TO MANAGE WIND TURBINE BLADES IN IOWA?

- GE just announced that they have manufactured recyclable wind turbine blades.
- Going forward, solutions will be developed by various parties including manufacturers and utilities.
- A strategy that is being researched involves shredding wind turbine blades and using this material in cement kilns and as aggregate materials. Solutions like this will continue to become more relevant as operational costs decrease.

SHOULD THERE BE A MANDATE THAT ONLY RECYCLABLE WIND TURBINE BLADES SHOULD BE USED FOR NEW INSTALLATIONS?

- We are always looking at new technologies. We have made the commitment and are implementing internal plans and polices to recycle blades that come out of service. We are not currently landfilling any blades. That said, I don't think the use of recyclable blades should be mandated. We are interested in circularity (i.e., material from old blades going into the manufacturing of new blades) – but it has to make business sense.
- No government mandate. Market based solutions would be preferred.
- We should be looking at an incentive based approach.
- It sounds like the corporations that are manufacturing these blades already have "birth to death" solutions for these products.

IF THERE IS A MARKET FOR RECYCLABLE WIND TURBINE BLADES – SHOULD MANUFACTURES RECEIVE A DISCOUNT ON THEIR DISPOSAL COSTS FOR USING THESE PRODUCTS? OR PERHAPS CHARGE MANUFACTURERS HIGHER DISPOSAL FEES FOR NOT USING AVAILABLE RECYCLABLE WIND TURBINE BLADES?

- There are landfills that will not accept blades and those that try to accept them have charged higher disposal fees because they take up a lot of volume and do not decompose.
- Our landfill is not going to give any reduced fees to a company that is recycling but still has waste. If the waste takes up more space, the fee will be adjusted accordingly. To incentivize the reuse or recycling of these blades, this will have to come from someone else (i.e., not a landfill agency).
- We will take blades but only from our planning area. Disposal will and does work – but the blades do not compact, break down, etc. We charge differently for these materials due to volume consumption of landfill airspace. We have received and disposed of a total of two blades. Iowa has flow control so not all landfills are in areas where there is wind energy projects necessitating management of these types of wastes.

COULD A DISPOSAL FEE PREMIUM BE PLACED ON WIND TURBINE BLADES TO INCENTIVIZE UTILITIES TO PURCHASE RECYCLABLE BLADES?

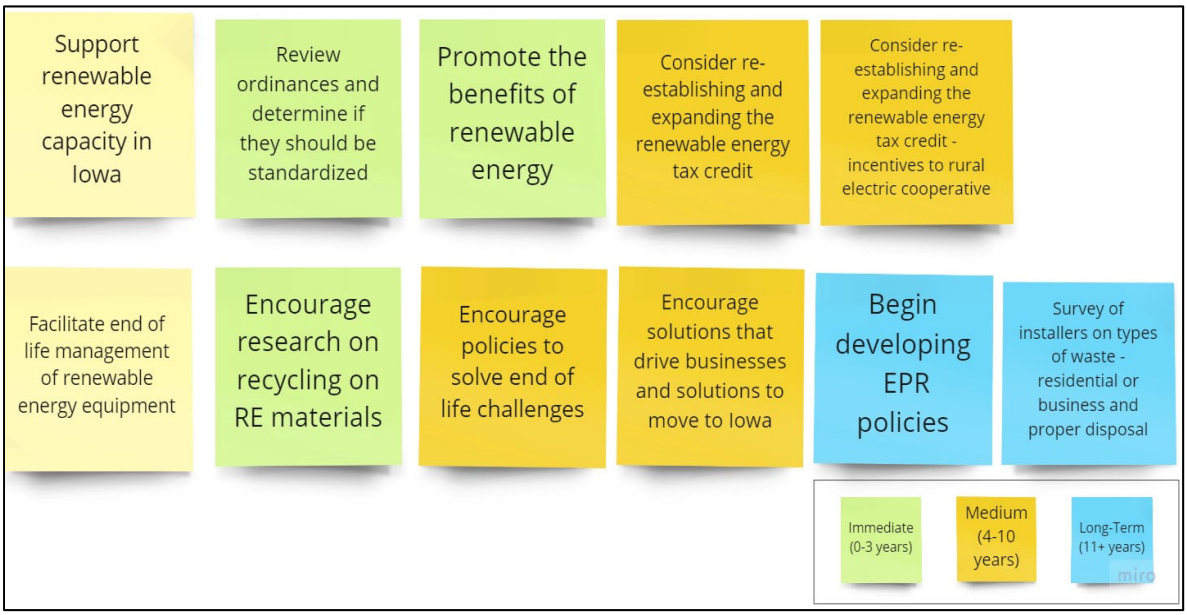
- I would be interested in knowing if there is a cost recovery to the manufacturer if they can take them back and reuse these materials? I would like to see the focus be on the manufacturing of the blade rather than the disposal of the blade.

B. Strategy Discussion:

The project consultant team then presented potential objectives and strategies (see Figure 1) based on the discussions during the previous Subcommittee meeting held September 2, 2021. Two main objectives were identified as:

- Support Renewable Energy Capacity in Iowa; and
- Facilitate End of Life Management of Renewable Energy Equipment.

Figure 1 – Renewable Energy Equipment Potential Strategies and Priorities



Below is a summary of the discussion for each of the proposed objectives and associated strategies.

C. Objective 1: Support Renewable Energy Capacity in Iowa

Strategy: Review County Ordinances and Determine if They Should be Standardized – Short Term

Subcommittee Member Discussion

- It is worth looking into. It may not go further than just looking at the ordinances. [Note: It would not fall under the DNR to establish wind ordinances. The responsible party for this policy was not established or identified.]
- From a landfill's perspective, we are planning on what we know is already coming in. To mandate that we would have to take more in, that would cause problems concerning planning, and construction schedules.
- We have planning areas to help us plan for the management of the waste that is generated in the planning area. Mandating us to take more waste from other areas would not be fair.
- We have already been looking into County ordinances. We are finding that even those that have ordinances in place are going against their own ordinances due to public opposition. There have been some lawsuits from developers against counties that have changed these ordinances during a project. When we do this at a 99 county level, there will always be issues. The Utility Board has talked about establishing a state level approach.
- Should there be statewide ordinances for siting solar or wind energy projects?
    - Personal opinion is no. But, if we don't have a statewide approach, we will likely have 99 different approaches that don't help us in supporting renewable energy capacity in Iowa.

- I cannot support legislation without knowing what they may look like or do.
- Public concerns with these projects includes aesthetics, noise, threats to avian wildlife, and other quality of life impacts. There was a bill in the legislation that established criteria for where these types of projects could be sited. The bill was very limiting and appeared to be intended to eliminate these types of project in Iowa. The bill did not pass, but is concerning.

Strategy: Promote the Benefits of Renewable Energy – Short Term

Subcommittee Member Discussion

- We are always promoting renewable energy through our website, outreach to communities and customers, and the work done at the capital. Other industry groups are doing the same. I don't think it the responsibility of a regulatory agency to promote one type of energy over another. Perhaps the strategy should be "support the promotion of the benefits of renewable energy"
- The DNR doesn't discourage the benefits of renewable energy. We encourage renewable energy. This would probably be more IEDA than DNR.
- We have a sitting bill every year at legislation. No one has made a decision on what the best way to go about this is. We need to try and solve citizen's concerns and we don't know how to do that.

Strategy: Consider Re-Establishing and Expanding the Renewable Energy Tax Credit – Medium Term

Subcommittee Member Discussion

- We are working on this on a federal level.
- We used to have this in Iowa but we no longer do. The Internal Revenue Service's 45Q tax credit has differing levels of credits based on how something is done. The same principal could apply to recyclable versus non-recyclable.

Strategy: Consider Expanding the Renewable Energy Tax Credit Inventive to Rural Electric Cooperative – Medium Term

Subcommittee Member Discussion

- No discussion.

D. Objective 2: Facilitate End of Life Management of Renewable Energy Equipment

Strategy: Encourage Research on Recycling on Renewable Energy Materials – Short Term

Subcommittee Member Discussion

- The Iowa Energy Center Board provides financial support to those that are conducting this type of research. The funding for these Energy Grants has sunset. Brian Selinger (Director of the Iowa Energy Office) would be the one to ask. The money was coming from the utilities. Going forward it doesn't have to come from the utilities – but this funding was beneficial to this research.

- I think we should get the manufacturer involved in this process. They know the materials going into the production and likely know best how to manage the materials at the end of the products useful life. They don't survive if we don't solve this problem.
- It would also be appreciated if the IEDA could provide an update on end of life projects that they have funded.

Strategy: Encourage Policies to Solve End of Life Challenges – Medium Term

Subcommittee Member Discussion

- No comments.

Strategy: Encourage Solutions that Drive Businesses and Solution to Move to Iowa – Medium Term

Subcommittee Member Discussion

- Let's table and see what we can get from IEDA.

Strategy: Begin Developing EPR Policies – Long Term

Subcommittee Member Discussion

- Convene a committee to explore a statewide siting strategy and proper end of life management – with conclusions to be developed before year 11.

Strategy: Survey of Installers on Types of Waste – Residential or Business and Proposal Disposal – Long Term

Subcommittee Member Discussion

- I don't think this is needed. There are other ways to get this data.
- The information that Shelly forwarded is very helpful and helps answer this question. Looking at the waste stream of the solar panel itself – but over 90% of the panels that are out there are crystalline. Panels going to landfills today are going there because they are likely damaged. We have time to manage this strategy – because the volume of these panels needing to be disposed are not in mass at least until 11 years out.
- GKAT Reclamation in Des Moines, Iowa is already recycling or looking to recycle solar panels. It could be beneficial to invite one of the owners (Larry Young) to attend and present at a future Subcommittee meeting.
- ABI would be against EPR and similar policies that would cause any significant increase in costs to businesses.

The project consultant team closed the meeting by thanking participants and asking them to review and provide comments to the summary notes of this meeting which will be submitted to all Subcommittee members.

E. Research Request List

Contact IEDA to obtain their input on:

- Promoting the benefits of renewable energy

- Research on Recycling of Renewable Energy Materials
- Encouraging business that would recycle renewable energy equipment to locate in Iowa

F. Other Notes

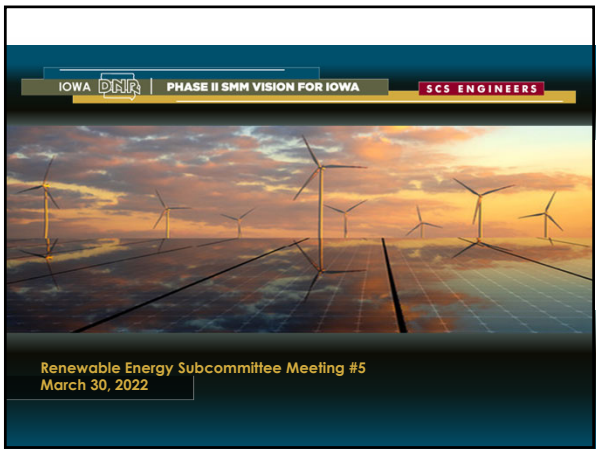
Other items of note from the #5-REE meeting are as follows:

- Based on the outcome of the March Subcommittee meeting, DNR and the project consultant does not believe an April meeting is necessary to further discuss how to implement the renewable energy strategies. Below is a summary of how the strategies should be framed for the presentation at the June 15, 2022 Stakeholder Meeting #3:
  - Years 0-3
    - DNR and project consultant suggest counties be made aware of end-of-life management issues.
  - Years 4-10
    - Explore the possibility of establishing statewide standards for end-of-life management.
    - Review County ordinances and determine if they should be standardized. This may not go beyond the review stage.
    - Begin developing EPR policies by convening a committee to start exploring policies.
  - Years 11+
    - No strategies identified for this timeframe.
  - Other
    - Promote the Benefits of Renewable Energy - This would be up to IEDA not DNR.
    - Consider Re-Establishing and Expanding the Renewable Energy Tax Credit – There was confusion as to whether there ever was a state of Iowa renewable energy tax credit. Some felt it was on the national level. The state is not considering a renewable energy tax credit.
    - Consider Expanding the Renewable Energy Tax Credit Incentives to Rural Electric Cooperative – There was no discussion on this.
    - Encourage Research on Recycling of Renewable Energy Materials - IEDA to provide an update on end-of-life projects that they have funded.
    - Encourage Policies to Solve End of Life Challenges – No discussion on this.
    - Encourage businesses that recycle renewable energy equipment to move to Iowa – Need to obtain input from IEDA.
    - Survey of Installers on Types of Waste – Residential or Business and Proposal Disposal – This strategy is no longer needed.

  If any REE Subcommittee member believes there should be an April 2022 meeting, please contact Christine Collier at ccollier@scsengineers.com or (515) 418-0677.

Attachments:
Attachment A: PowerPoint Presentation

Attachment A
PowerPoint Presentation



Agenda

1. **Introductions**
   a. Project Team
   b. Subcommittee Members
2. **Background**
   a. Sustainable Materials Management
   b. SMM Vision for Iowa Project
   c. Process
3. Review Renewable Energy Research
4. Strategies Discussion

What is SMM?

"Sustainable materials management is an approach to using and reusing materials most productively throughout their entire life cycles"

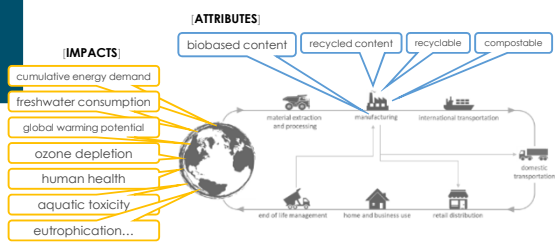
It represents a change in how our society thinks about the use of natural resources and environmental protection

Source: USEPA

What Isn't SMM?

- Product Bans without LCA on alternative products
- Landfill diversion requirements without:
  - Strategies to reduce generation
  - Sufficient infrastructure and funding to collect and process
  - Assessment of impact on greenhouse gas emissions; especially at landfills with landfill gas to energy systems
  - Assessing the impact of GHG emissions from transporting recyclables across country/world
  - Viable off-take markets

Life Cycle Approach



ODEQ, D. Allaway, 2019

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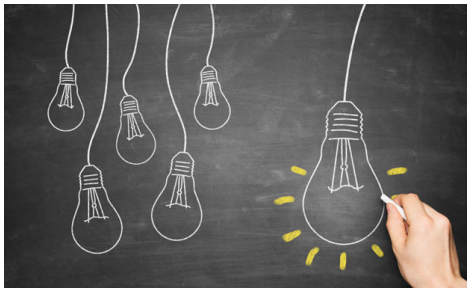
Project Goal

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

Process to Date

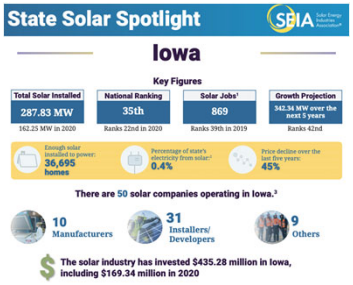
Select specific material types within each category → Conduct and Review Research → Identify material-specific objectives → Develop Implementation Strategies

Renewable Energy Research



Solar Energy

Background - Solar



Solar Reuse and Recycling

A recycler taking apart a standard, 60-cell silicon panel can get about $3 for the recovered aluminum, copper, and glass → The cost of recycling that panel in the U.S. is anywhere between $12 and $25 — after transportation costs → It typically costs less than a dollar to dispose a solar panel in a solid waste landfill

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

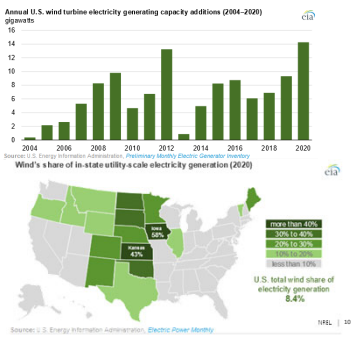
All PV modules used for residential, commercial, or agricultural purposes that are installed on, connected to, or integral with buildings

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

Wind Energy

Growing U.S. wind energy generating capacity

The U.S. installed more wind turbine capacity in 2020 than in any other year

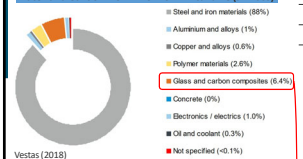


Wind Energy in Iowa

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

Wind Turbine Recycling Potential

Material breakdown of V120-2.0 MW turbine (% mass)



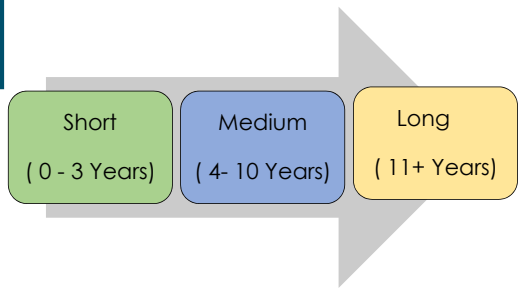
Composite blade materials make up largest fraction of turbine materials that are not recycled

End-of-life treatment of V120-2.0 MW turbine components

Material	Treatment		
	Recycling	Incineration	Landfill
Large metal components (tower, nacelle frame)	98%	0%	2%
Other major components (generator, gearbox, cables)	95%	0%	5%
Steel	92%	0%	8%
Aluminum	92%	0%	8%
Copper	92%	0%	8%
Polymers	0%	50%	50%
Fluids	0%	0%	100%
All other materials	0%	0%	100%

Strategy Discussion

Strategy Implementation Schedule



Strategy Implementation Considerations

- Implementation Approach
- Legislation/Policies
- Infrastructure
- Funding Needs and Sources

Support Renewable Energy Capacity in Iowa

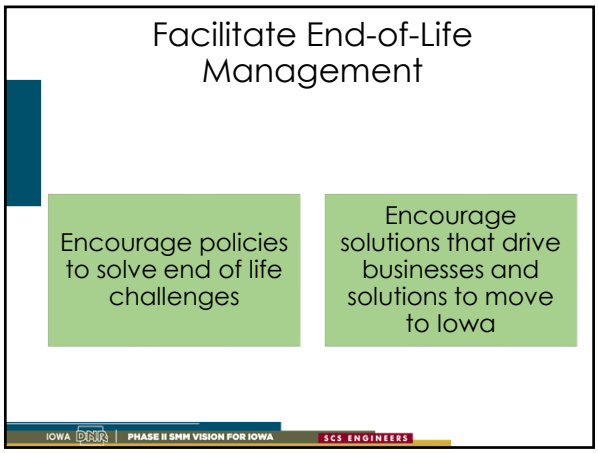
- Review county ordinances and determine if they should be standardized
- Promote the benefits of renewable energy

Support renewable energy capacity in Iowa

- Consider re-establishing and expanding the renewable energy tax credit
- Consider expanding the renewable energy tax credit - incentives to rural electric cooperative

Facilitate End-of-Life Management

Encourage research on recycling on RE materials


Facilitate End-of-Life Management
Encourage policies to solve end of life challenges
Encourage solutions that drive businesses and solutions to move to Iowa
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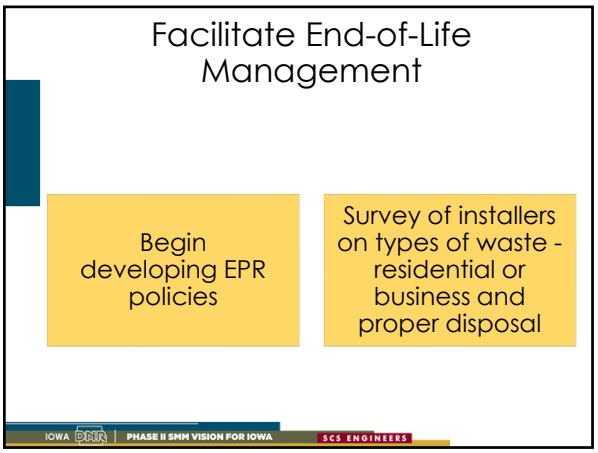
Facilitate End-of-Life Management
Begin developing EPR policies
Survey of installers on types of waste - residential or business and proper disposal
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