



MACPZA: Solar Panel Recycling

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June 3, 2021

- Brief recap of goal and process
- Summary of 4 potential solar panel recycling models
- Summary of how the stakeholders ranked the 4 models
- Consensus policy ideas
- Thoughts from MACPZA

Challenges for counties and other local units of government

- PV installations are uncharted territory that is growing quickly for municipal and local governments and property owners;
- Not all counties require decommissioning plans or financial assurance, and there is no standard plan and financial assurance requirements/mechanisms for solar installations < 50 MW that are locally permitted;
- Counties and local governments do not know what type or level of financial assurance is appropriate;
- Loss of local zoning and permitting authority if permitting is taken over by state for <50 MW installations;
- Shift siting and decommissioning risk to the state by reducing threshold for local permitting to <50 MW;

Challenges for counties and other local units of government

- Zoning officers are seeing a wide variety of preliminary decommissioning plans with various claims related to decommissioning costs, salvage value of equipment, claims that “our panels are landfill friendly”, etc.
- Local government concerns about abandoned installations and who is liable for site if panels fail, developer disappears, property owner defaults on taxes, etc;
- Concerns about disposal, recycling, and regulatory status of panels at end of life;
- Counties could consider moratoriums on solar installations until these issues can be sorted out.

Recap of goal and process

Goal statement:

- Collaborate to develop and implement PV panel end of life management policy and programs that conserve resources, protect health, promote renewable energy, and support PV panel recycling infrastructure and technology

Collaboration:

- MnSEIA and Commerce
- Regular communication with MACPZA and AMC
- Regular communication with Illinois Sustainable Technology Center and their IL stakeholder process
- North Carolina: participated in webinar and commented on draft plan

Recap of goal and process

Seven webinars over 18 months:

- June 27, 2019: Intro, white paper, first survey on issues
- October 9, 2019: National/Regional overview - SEIA, ISTC, NREL
- December 11, 2019: PV use/forecasts, manufacturers, recyclers, urban mining
- March 18, 2020: Product Stewardship 101 and EPEAT
- June 11, 2020: Policy options/survey, Commerce/Decommissioning, local govt
- December 10, 2020: Further discussion EOL/circular economy, local govt
- December 17, 2020: Expanded discussion of policy options

Commerce/PUC model extended to solar facilities under 50 MW: permittee individual responsibility

- Permittees for wind and solar facilities regulated by Commerce/PUC are individually responsible for decommissioning under MN laws and rules.
- Decommissioning plan included in initial permit application, update it every five years, start setting aside funds partway into the project life (no later than year 10), and be fully funded by the time of decommissioning. This does not include a requirement to recycle.
- Currently these requirements apply to wind facilities over 5 MW and solar facilities over 50 MW.
- Identical requirements could be extended to owners/permittees of all solar facilities, presumably coupled with a recycling requirement and disposal ban

Product Stewardship model

- Manufacturers or their stewardship organization will operate the end of life program.
- Typically a program would be established on a specific date, would be financed through the panels sold after that date, and would collect and recycle (properly manage) all panels removed from service after that date, regardless of installation date, size of installation, or category of owner/permittee.
- The program fee assessed on panels may be fully or partly internalized by the manufacturer or paid by the purchaser. No end of life fees.
- A stewardship program inherently provides manufacturers with incentives to improve a product's environmental attributes and recyclability, but mfr decisions may not change.

Product Stewardship Recap from March

Product stewardship means that all parties involved in designing, manufacturing, selling and using a product take responsibility for environmental impacts at every stage of that product's life.

- Requires manufacturers to share in the financial and physical responsibility for collecting and recycling products at the end of their useful lives
- Incentivize the use of recycled materials in new products and design products to be less toxic and easier to recycle
- Examples: E-waste, paint, batteries, lighting, mercury thermostats
- Operated by individual companies or through a stewardship organization
- PV Cycle information provided as background info early in this process [EU system operating in each country under WEEE]



Rate payer funded/statewide program model

- All ratepayers benefit from solar energy in the state generation mix
- Ratepayers fund an end of life management program for all products being removed from service in the state.
 - Surcharge on the electric bill, likely based on consumption, for the sake of equity. Flat fee, unit of consumption, percent of bill options
 - No end of life fees for owner/permittee.
- Utilities would collect and transmit the funds to an entity operating a statewide collection and management program for all products being removed from service.
- Fees may change over time depending on the needs of the program.
- Similar to regulated utilities in Minnesota.

Permittee funded/statewide program model

- Since the owners/permittees of renewable energy production facilities are responsible for their projects and benefit from their investment in these facilities to produce renewable energy that they use or sell into the grid/power pool, the owners/permittees could fund an end of life management program for all products being removed from service in the state; not paid at end of life.
- Permittees would pay into a fund that would be used by an entity operating a statewide collection and management program for all products being removed from service.
- The payment schedule could be tied to annual generation and/or number of panels and/or rated capacity of the installation. [option: reinstate sales tax]
- Fees may change over time depending on the needs of the program.

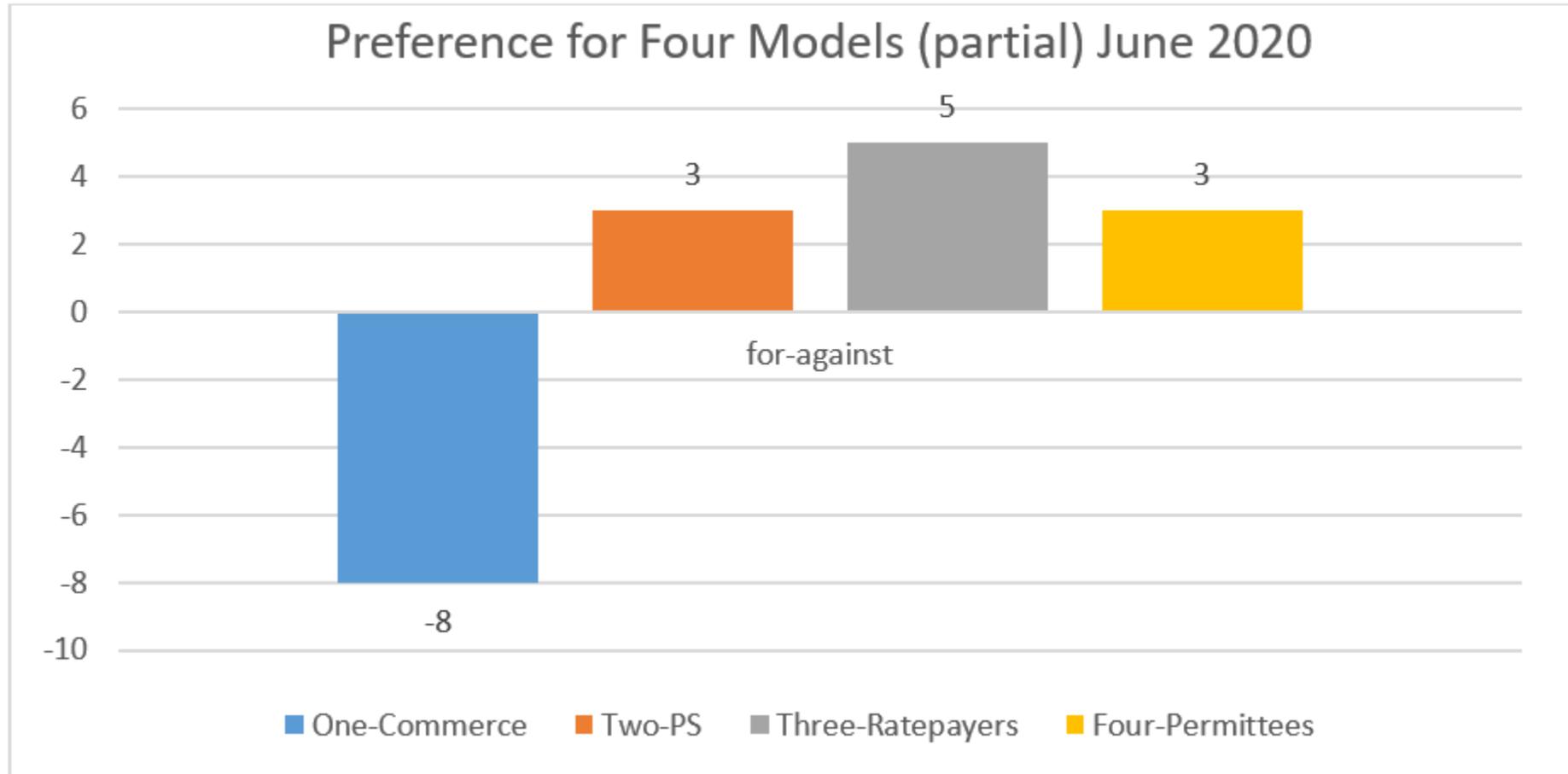
June and December 2020 survey background

- Stakeholders had the opportunity to hear a Product Stewardship 101 presentation, a presentation on DOC Decommissioning guidance/requirements for wind >5mw and solar 50mw, along with the 2018-2019 Decommissioning working group report and recommendations
- MPCA went over all four models
- Stakeholders ranked the four models and offered comments in June. Unfortunately there was a survey glitch and only 15 rankings were captured, but all comments were captured. MPCA went over the survey results in June

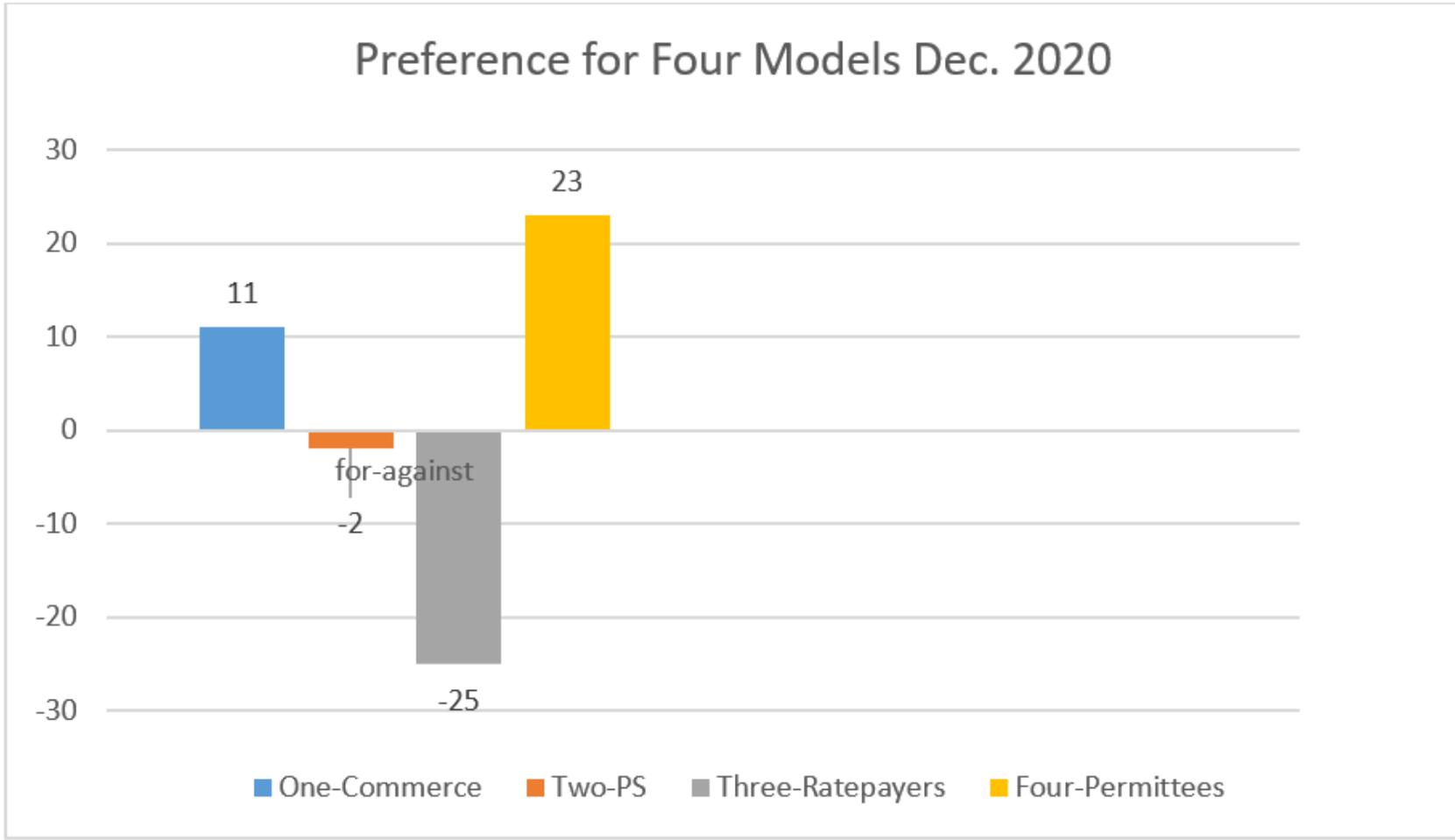
June and December 2020 survey background

- June and December webinars offered more information on policy and bills in other states, local government perspectives, overview of solar from Commerce and the current state of recycling and research trends from National Renewable Energy Laboratory and Recycle PV Solar.
- In December, MPCA gave an in depth look at the four policy models, including a comparison table of the 4 models, and followed up with a ranking survey again. There were 40 participants recorded this time.

June: Preference for four program options



December: Preference for four program options



Recap: Why is end of life management important?

IRENA-IEA Photovoltaic Power Systems Task 12 PV Sustainability

“In addition to its positive impacts on energy security and climate change, PV technology is also among the most environmentally friendly technologies of all energy and electricity generation technologies, particularly when evaluated from a life-cycle viewpoint, including end-of-life management. This means that proper end-of-life management is an indispensable issue for “clean” energy technologies.”

“Managing end-of-life PV modules to recover valuable materials that can displace virgin ones is an important step toward meeting the challenge of sustainability.”

Report IEA-PVPS T12-10:2018, page 5

Consensus policy ideas raised by stakeholders in webinar conversations and written comments

1. require recycling and reuse with landfill ban;
 2. manufacturers tied in for design;
 3. costs internalized to the project or developer (permittee);
 4. no costs that create disadvantages for anyone;
 5. consistent and predictable approach for everyone;
 6. applies to all installations, residential to utility scale
- Survey results show strong preference for permittee-funded options, in part because this is the funding/responsibility model in the solar sector
 - All of the models, except rate payer funded, represent a type of permittee funded model. Which of these or combination would best meet all of our objectives?

Questions

- Which model or combination of models do MACPZA members and their counties think would be viable?
- Any barriers that would need to be addressed? Any major drawbacks to any of the models?
- Initial thoughts about what MACPZA and counties could support and how?
- What more is needed?
- MPCA next steps

2021 state update

- Washington: stewardship law enacted 2018. Implementation now delayed to 2025.
- New Jersey and North Carolina: enacted laws requiring a study of end-of-life PV management options. NC study recommended no action for 10 years. No results from NJ yet.
- Hawaii and California: bills calling for a study.
- Rhode Island: current bill for product stewardship.
- Maine: bill to establish recycling program overseen by the state and funded by fees at purchase, includes disposal ban and recycling requirement.
- European Union: panel takeback requirement under WEEE administered by PV Cycle in each country.
- Illinois: Illinois Sustainable Technology Center stakeholder process similar to what we've done. Keeping participants and process confidential.
- Minnesota: 2020 PV panel stewardship bill not heard due to Covid19.

Thank you!

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Comments: Commerce/PUC model extended to solar facilities under 50 MW

Appeal/Pro:

- Consistent standards, established framework
- Financial assurance starts midway through project life, fully funded by time of decommissioning
- Permittee responsibility
- Extending to all ground mount installations will level the playing field
- Periodic updates can account for changing conditions

Unworkable/Con:

- May not be appropriate for small facilities, e.g., residential, <40kw
- Should include standard amount of financial assurance per MW
- Start funding earlier
- Still needs recycling requirement/disposal ban
- No tie to panel manufacturer/panel design for reuse/recyclability

Comments: Product Stewardship Model

Appeal/Pro:

- Tie to manufacturer/panel design for reuse/recyclability
- Covers all panels regardless of installation type/size/owner, plus orphans
- Keeps costs embedded/internalized in cost of installation/energy
- Front end funding, not end of life
- State cost limited to program oversight
- Can cover other components

Unworkable/Con:

- Can't add any costs with already slim margins
- How to assess fees on all sales for use in the state
- Ensure that fees and costs are right for the program
- Ensure that program is well run
- Precedent for use with such a long-lived product: current fees/future costs
- Product stewardship won't work/various reasons

Comments: Ratepayer Funded Model

Appeal/Pro:

- Minimal cost impacts to solar and developer
- Eliminates risk of cost impacts on specific projects
- Collective responsibility for recycling/end of life management
- Similarities to nuclear and coal

Unworkable/Con:

- Need to account for low income ratepayers
- No tie to manufacturer/panel design for reuse/recyclability
- No connection to developer/permittee; costs are externalized
- Do all ratepayers benefit from solar and renewables? Or just developers/subscribers?

Comments: Permittee Funded Model

Appeal/Pro:

- Costs are borne by permittee during life of project/internalized
- Standardized across jurisdictions and projects
- Third party professional management of end of life system
- [many comments reiterating these points]

Unworkable/Con:

- No tie to manufacturer/panel design for reuse/recyclability
- Coverage of events (e.g., storms, damage) during project life?
- Fees and management structure need to be defined
- Impacts on local jurisdictions
- Challenge for government with enforcement and oversight

Other ideas raised in survey responses

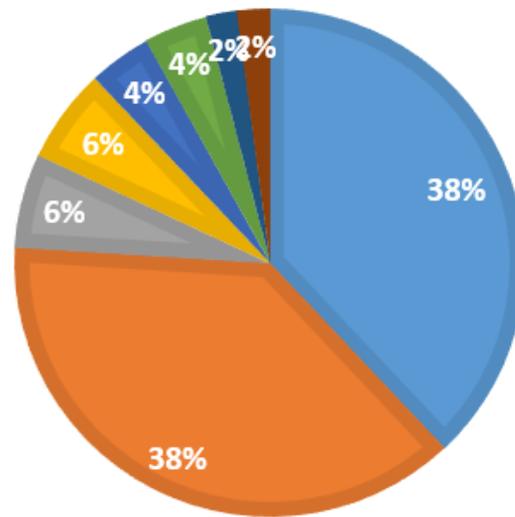
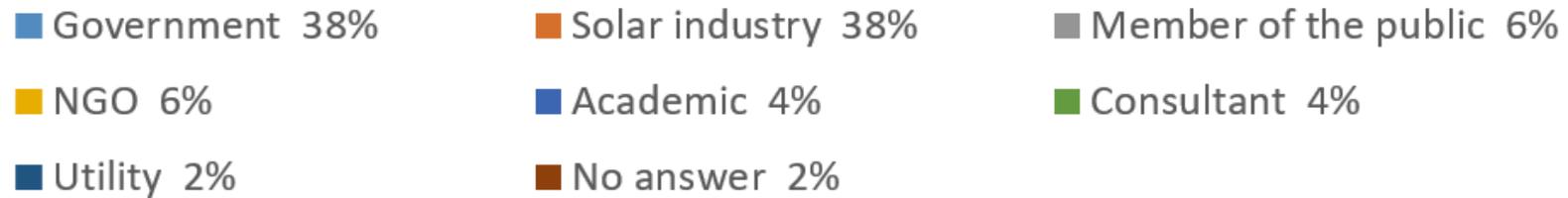
- Why so much focus on funding?
- Look at other funding options [what are people's ideas?]
- Sales tax – reinstitute and dedicate to statewide program for end of life
- State support of recycling technology and infrastructure
- No regulations, just incentives
- Need only landfill ban and recycling requirement
- Prioritize repurpose and reuse

Other ideas raised in survey responses

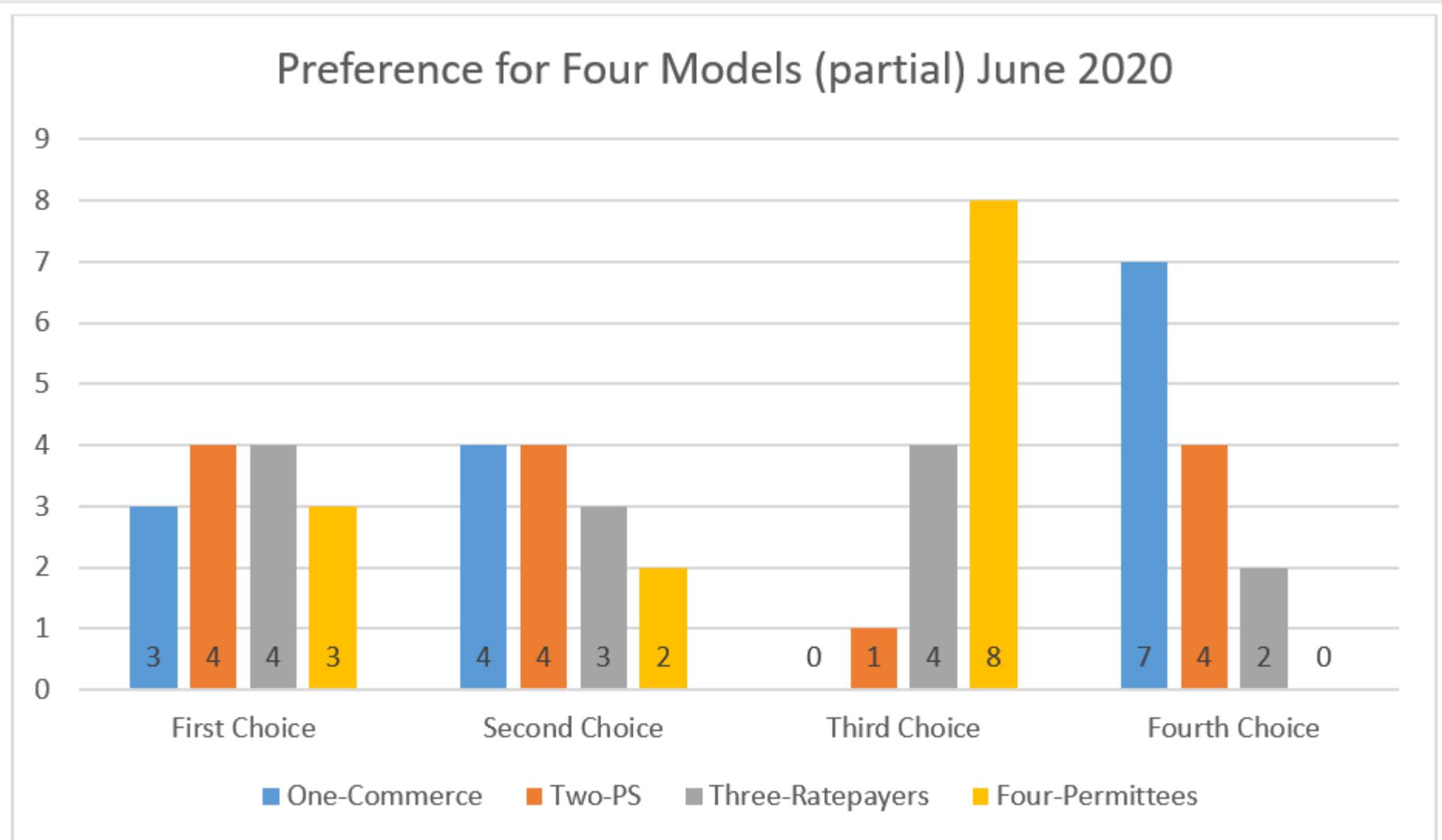
- Need immediate solutions, there is more waste now than people realize
- Hybrid of different program options
- Financial assurance options: look at requirements for hazardous waste facilities
- Washington State product stewardship legislation for PV modules
- PV Cycle – more than 10 years experience in EU and countries

June 2020 Participants

PARTICIPANTS: JUNE 2020 SURVEY ON 4 POTENTIAL SOLAR PANEL EOL MODELS

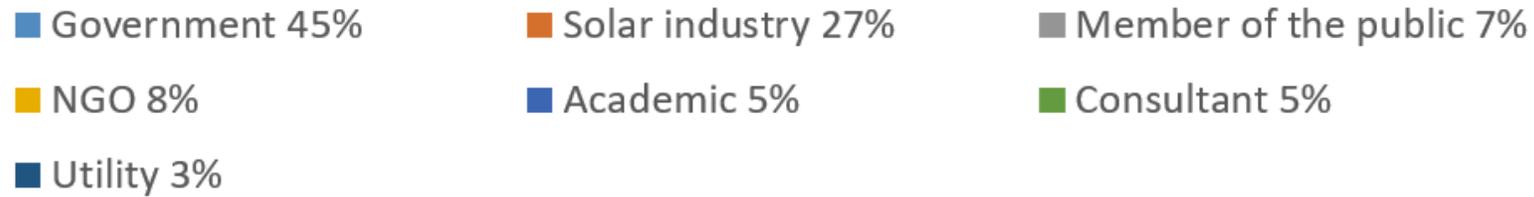


June: Preference for four program options



December 2020 Participants

PARTICIPANTS: DECEMBER 2020 SURVEY ON 4 POTENTIAL SOLAR PANEL EOL MODELS



December: Preference for four program options

