



What is “Chemical Recycling”?

MWCOG Recycling Committee Meeting
December 1, 2022

**Scott Cassel, CEO/Founder
Product Stewardship Institute**

Context

- Chemical recycling in context of packaging EPR
- Orientation: PSI
 - National non-profit (501c3)
 - Board/Members: State & Local Governments
 - Partners: companies, environmental groups, int'l govts, others
- Goal: Dialogue → Decisions
 - Greater understanding of CR technologies
 - Role of CR technologies in plastics recycling
 - Criteria for governments to evaluate CR technologies for permitting

Me & Waste

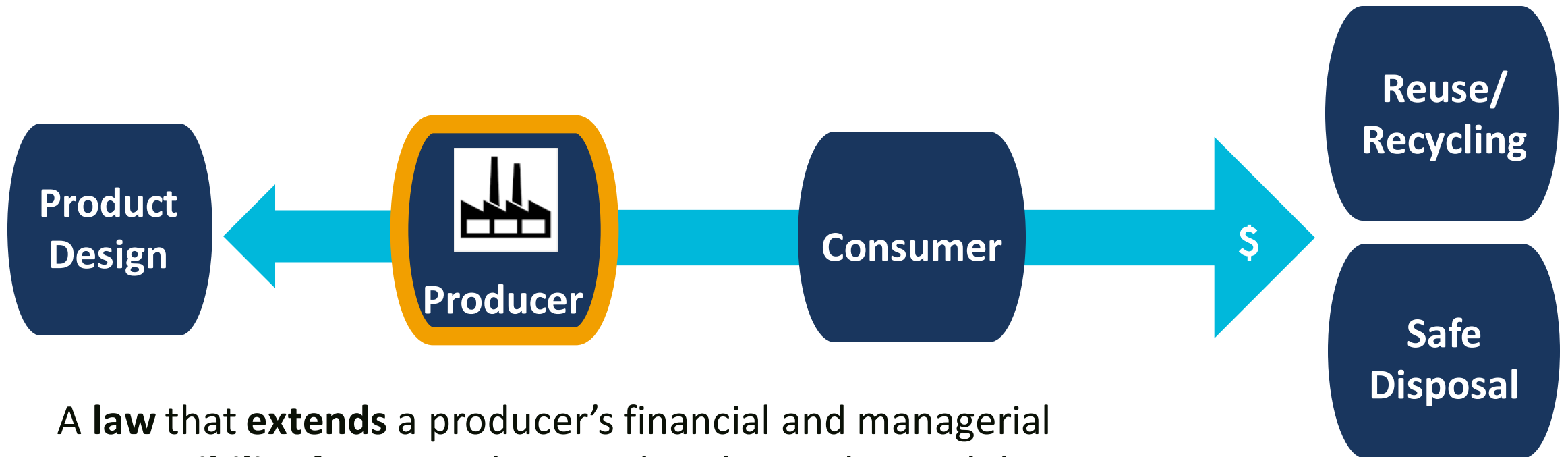
- 40 years – gov't, corporate, env'l nonprofit
- MA Executive Office of Energy & Env'l Affairs
Director of Waste Policy & Planning
- Founder, CEO – PSI
- Marine Debris Foundation – Board of Directors





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Extended Producer Responsibility (EPR)



A **law** that **extends** a producer's financial and managerial **responsibility** for its products and packaging beyond the manufacturing stage — both **upstream** to product design and **downstream** to **postconsumer** reuse, recycling, or safe disposal.

Product Categories



Solar Panels



Packaging



HHW



Radioactive
Devices



Electronics



Mattresses



Batteries



Mercury
Thermostats



Pharmaceuticals



Paint



Phone Books



Motor Oil



Medical Sharps



Lighting



Junk Mail



Carpet



Appliances with
Refrigerants



Framework



Textiles



Auto Switches



Gas Cylinders

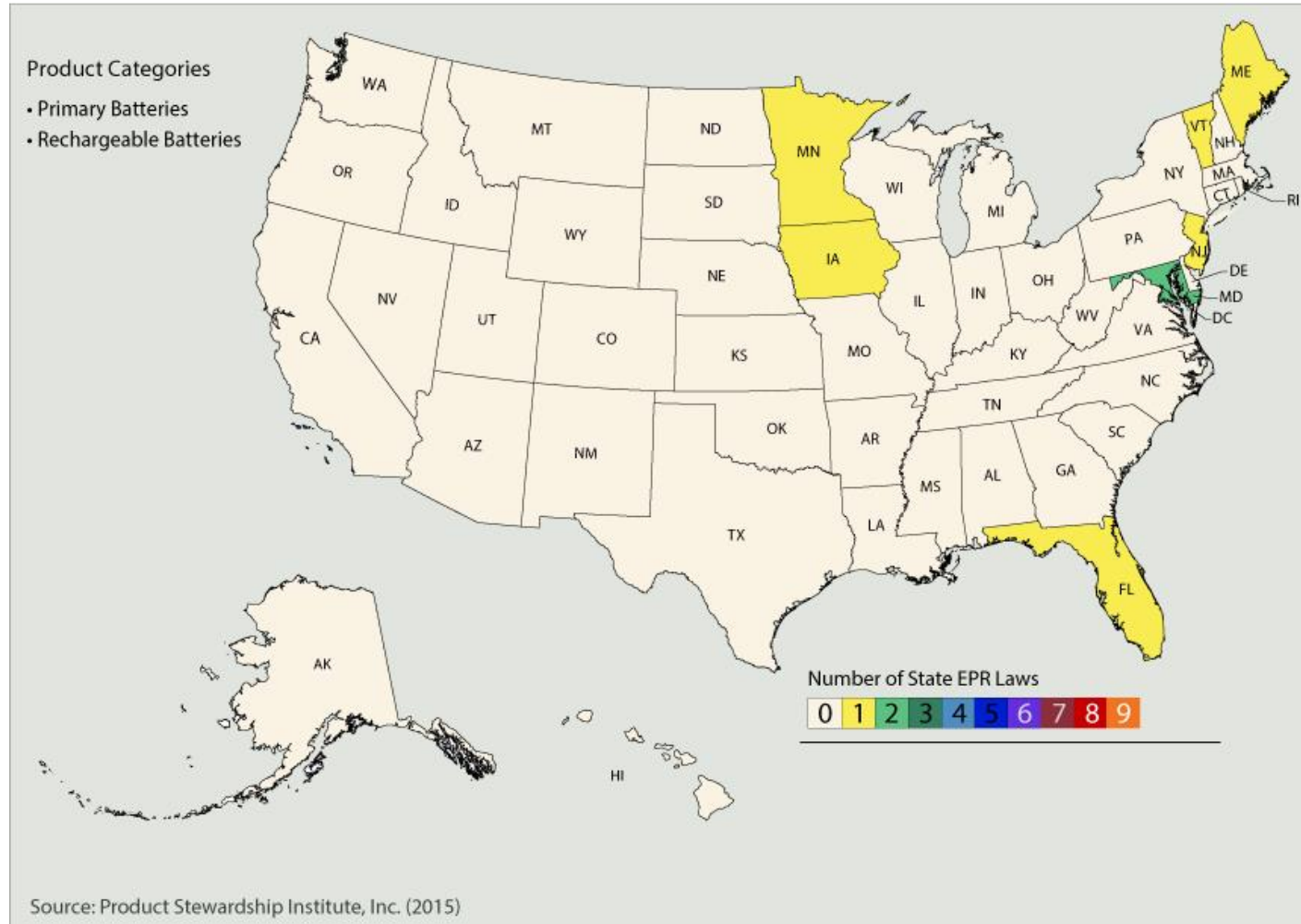


Pesticides

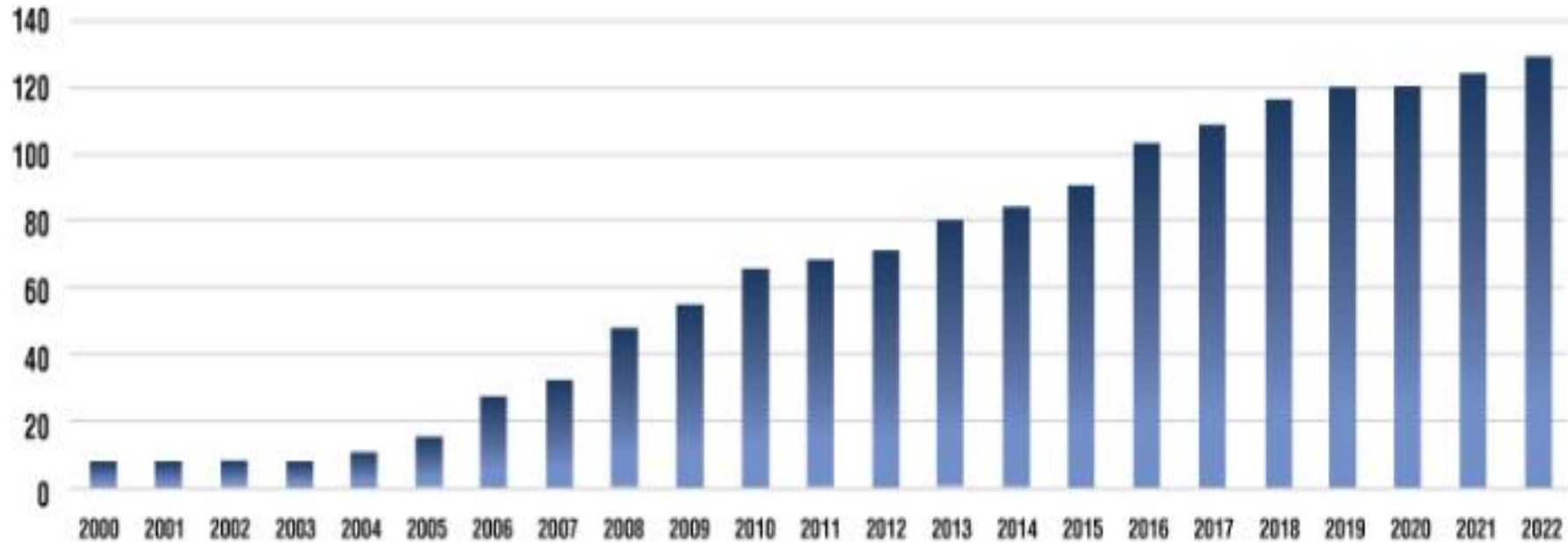


Tires

EPR Laws in the U.S. in 2000



EPR Laws in the U.S. Since 2000



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U.S. Packaging EPR Momentum

4 State Laws in 2 years

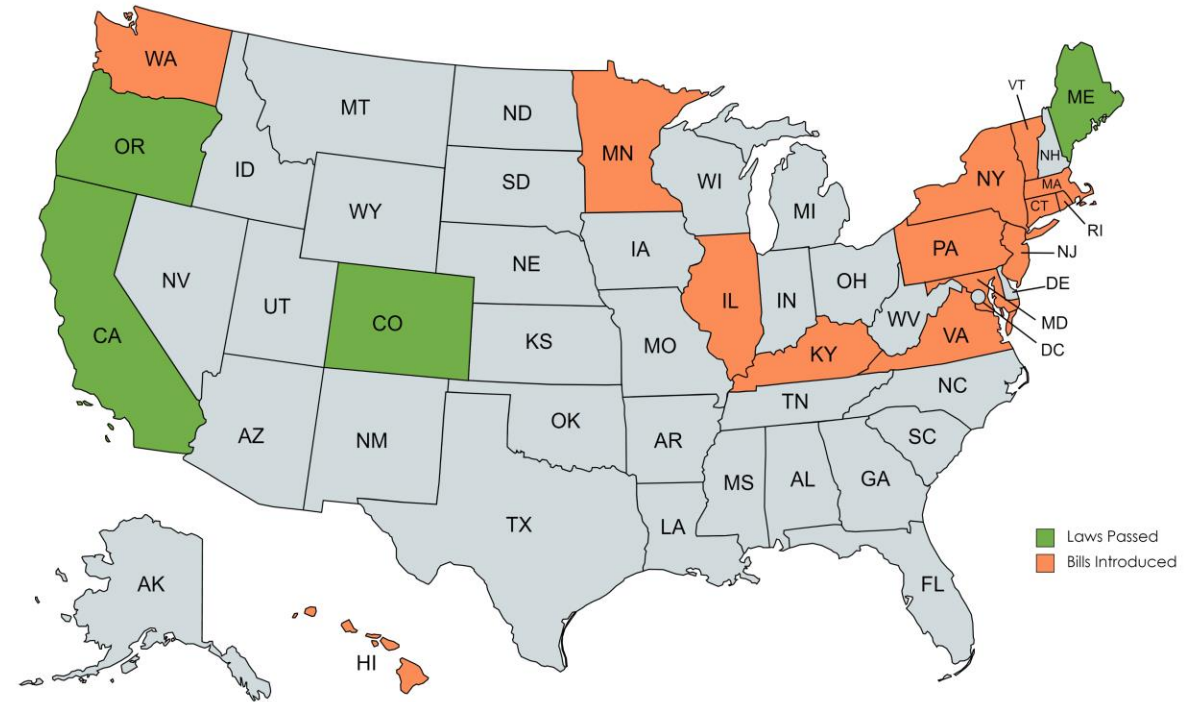
2021: **OR + ME**

2022: **CO + CA**

Dozens of Active States

22 proposed bills in 16 states in 2022

PSI model EPR bill





Sticky Issue: “Chemical Recycling”

- **What does this even mean?**
- **What should count as recycling?**
- **Should EPR funds be spent on it?**

Key Drivers

- Only 5-6% plastics recycled on average
- **Emerging PCR content requirements:
Need food-grade recycled resin**
- ACC, others pushing laws to classify “CR” as *manufacturing*: 20 state laws so far
- **EPR momentum used as opportunity for investment**



California

- Plastic beverage containers (CRV only) → 50% PCR

Washington

- Plastic trash bags → 20% PCR
- Plastic beverage bottles → 50% PCR
- Plastic bottles for household cleaning, PCP → 50% PCR

New Jersey

- Rigid plastic containers → 50% PCR
- Plastic carryout bags → 20% PCR
- Plastic trash bags → 10% - 40% PCR
- Glass containers → 35% PCR

Key Issues

- **Outputs: fuels vs plastics (sometimes both)**
- **Environmental & human health impacts**
- **Politically: strong opposition to *all* “chemical recycling” from environmental sector**
- **Commercial Viability: long time-to-scale, many failed investments**

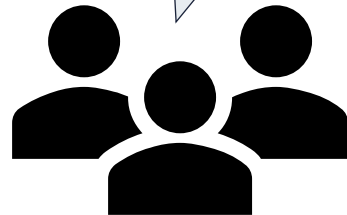


Confusing Terms

“Chemical Recycling”
It’s about chemistry

“Advanced Recycling”
It’s new & fancy

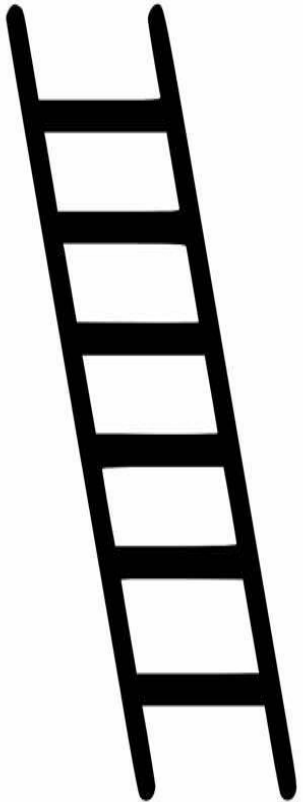
“Molecular Recycling”
*It’s about breaking
down plastics*



*It’s all the
same!*



3 Technology Types



- **Purification:** Plastics dissolved in chemical solvents to recover virgin-grade resins, free from additives & dyes.
- **Depolymerization:** Breaks the molecular bonds of plastics to recover building blocks (monomers) that can be reconstructed into “like-new” resins.
- **Conversion:** Converts plastics into refined hydrocarbons and petrochemicals.
 - **Pyrolysis** and **gasification** produce fuels or fuel intermediaries, which *could* be reprocessed into plastics.

Processing Efficiencies

Technology Type	Avg. Processing Efficiency (Plastics-to-Plastics)	Avg. Non-Pellet Outputs
Purification	91%	N/A
Mechanical Recycling	83%	N/A
Depolymerization	75%	18%
Conversion	42%	17%

Average processing efficiency of each technology type, based on Closed Loop Partners independent research on a small sample of each technology type. Purification n=2; Depolymerization n=4; Conversion n=3.

Regulatory Context

- **Status Quo:** State & federal permitting requirements
 - *20 states reg. as manufacturing vs. waste management*
 - less stringent emissions controls
- **Now:** 2021 US EPA announced formal rulemaking process on pyrolysis, gasification
- **Key Permitting Considerations:**
 - Potential impacts on state and/or local GHG emissions reduction targets
 - Transparent and thorough environmental justice & environmental impact reviews
 - Robust community engagement & transparency
 - Financial assurance in the event of site failure(s), especially if cleanups needed



EPR Policy Options

Definition of “recycling”:

- *Growing consensus: plastics-to-fuel is NOT recycling.*
- *Growing consensus: mechanical before chemical recycling.*
- **All 4 Pkg EPR Laws:** “Recycling” does NOT include waste-to-fuel, incineration, energy recovery, or other disposal.
- **OR, CO:** “Mechanical recycling” does not break molecular bonds → *Includes purification?*
- **Certain proposals (none yet passed):** No “high-heat or chemical treatment processes,” no pyrolysis or gasification



EPR Policy Options, Continued



Transparency :

- **OR, CO:**
 - Include LCA & other info for materials *not* managed through mechanical recycling;
 - Compare to incineration, disposal & other recycling options.

Investments:

- **ME:** State approval needed for all infrastructure investments.
- **CA:** Pyrolysis = Disposal; no PRO funds invested.

Proposed Criteria:

Can “chemical recycling” technologies support a sustainable circular economy?

Criteria #1: Proper Inputs

- Only source inputs that need to be disposed; don’t have reusable or mechanically recyclable alternatives (e.g., plastics from medical waste, e-waste, textiles, and construction waste).
- Don’t perpetuate unsustainable production of problematic or unnecessary materials, such as single-use cutlery and straws.

Criteria #2: Transparent Outputs

- All fuel outputs should be transparently reported, including wastes, emissions, and final products.
- Only plastics outputs count as recycling.
- Third-party certification/independent verification should support all claims.

Criteria #3: Reduced Climate Impacts and Fossil Fuel Extraction

- Outputs should have lower life-cycle impacts than virgin feedstocks, including GHG emissions.
- Account for full scope of each technology: collection, pre-processing through to end market, and end-of-life management.

Proposed Criteria (Cont'd):

- **Criteria #4: Minimal Harm**
- Minimize emissions & pollutants.
- Adhere to Clean Air/Water Act or more stringent state standards.
- Do not add to cumulative pollution impacts in overburdened communities.
- Siting process must include robust community engagement and transparency.
- Prioritize domestic management over global exports. If exported, no harm to environment or communities.

Criteria #5: Widespread, Convenient Collection

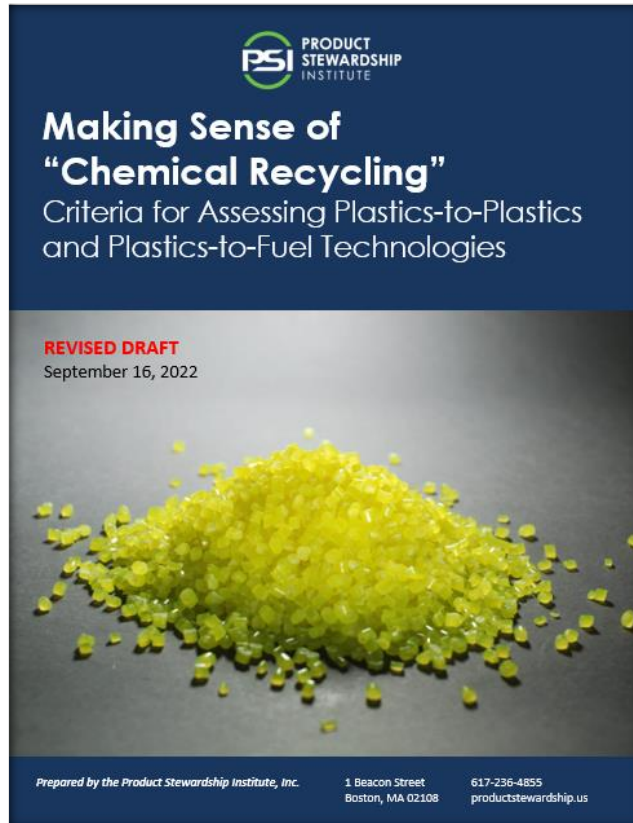
Provide a convenient, equitable, accessible way for waste generators to provide materials.

Do not increase contamination in mechanical recycling streams or increase consumer confusion.

Criteria #6: Operates at Scale Without Public Subsidy. Be commercially viable within realistic time frame.

Reduce financial burden on taxpayers; do not depend on public subsidies.

Recording Available!



PSI whitepaper



The webinar announcement features the PSI logo and the Expra logo in the top right corner. The main title "EPR MASTERCLASS CHEMICAL RECYCLING" is written in large, bold letters, with "CHEMICAL RECYCLING" in green. A list of speakers is provided in white text. The date and time "FREE WEBINAR NOVEMBER 17 11:30 - 1:00 EST" are highlighted in green. The host information "Hosted by The Product Stewardship Institute and presented by EXPRA" is at the bottom.

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EPR MASTERCLASS CHEMICAL RECYCLING

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- Paula Luu, Closed Loop Partners
- Tom Metzner, CT Dept. of Energy & Environmental Protection
- Veena Singla, Natural Resources Defense Council (NRDC)
- Helmut Schmitz, Duales System Deutschland (DSD)
- Cheryl Coleman, Institute of Scrap Recycling Industries (ISRI)

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Learn More: www.productstewardship.us

Thank You!

www.productstewardship.us

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