Better Buildings Summer Webinar Series

We'll be starting in just a few minutes….

Tell us…

What topics are you interested in for future webinars?

Please go to **slido.com** and use event code **#DOE** to submit your responses.

Better Buildings®
U.S. DEPARTMENT OF ENERGY

Waste Reduction:
Lessons Learned and What Comes Next

August 3, 2021
3:00 – 4:00 pm ET

U.S. DEPARTMENT OF ENERGY

Hannah Debelius

Building Technologies Office, U.S. Department of Energy

U.S. DEPARTMENT OF ENERGY

Waste Reduction Pilot

About the Pilot

- The Pilot showcased market leadership, explored the link between waste and energy, and researched metrics, benchmarking, & data analysis techniques for waste.
- The more than 40 participants received recognition from DOE, access to resources, peer exchange opportunities, case study development, and more.

Findings

- Nearly half of all commercial sector partners have a diversion rate of 50% or more.
- In 2020, commercial partners diverted 26,000 tons from landfill.
- Many commercial partners saw reductions in their waste due to COVID-19 and reduced occupancy at many commercial and government buildings.
- Commercial partners utilized tenant engagement, signage campaigns, and composting and recycling programs to increase diversion and reduction, but often have less control over waste brought on-site.

https://betterbuildingssolutioncenter.energy.gov/special-initiatives/waste-reduction-pilot

Thank you, Waste Pilot Participants

Industrial

- Armstrong Flooring
- AstraZeneca
- Bristol Myers Squibb
- Cooper Standard
- Cummins
- Electrolux
- The Estée Lauder Companies
- Flowers Foods
- FMC Chemicals
- General Motors
- Gibraltar Industries
- Graham Packaging
- HARBEC
- Honda North America
- Johnson Controls
- KYB Americas Corp.
- Los Angeles Department of Water and Power
- Lockheed Martin
- Martin Guitar
- Nissan North America
- NSK Americas
- PaperWorks Industries
- PPC Online
- Raytheon Technologies
- Schneider Electric
- Steelcase, Inc.
- Sugar Creek Packing Co.
- Valmont Industries
- Volvo Group North America

Commercial

- Bozzuto Management Company
- City of Beaverton, OR
- City of Reno, NV
- CommonWealth Partners
- Cuyahoga Metropolitan Housing Authority
- DWS
- Empire State Realty Trust
- Foundation Communities
- Gary Housing Authority
- The Hartford
- Iron Mountain Data Centers
- Jamestown, LP
- LBNL
- Montefiore Medical Center
- New Bedford Housing Authority
- Parkway
- PNC
- Shorenstein Properties
- Sprint
- Tenderloin Neighborhood Development Corporation
- The Tower Companies
- Trinity Housing Corp. of Greeley, CO
- USAA Real Estate
- UW Health
- The West Palm Beach VA Medical Center*
- Welltower
- Wyndham Hotels & Resorts

*(part of the U.S. Dept. of Veterans Affairs' Sunshine Healthcare Network)

New Resources Page

Created a new resources page that highlights solutions for organizations looking to increase waste diversion, decrease source generation, recover energy and create financial savings.

RESOURCES FOR WASTE DIVERSION AND REDUCTION

This page highlights solutions and resources for organizations looking to increase waste diversion, decrease source generation, and create financial savings. The resources are organized into the following categories:

- Policies, Audits, and Making the Business Case
- Data Availability, Accuracy, and Analytics
- Source Reduction
- Employee Outreach and Engagement

You can learn more about the Waste Reduction Pilot and how to participate here.

https://betterbuildingssolutioncenter.energy.gov/special-initiatives/waste-reduction-pilot/resources

Working Groups

Participated in working groups on the following topics:

Best practices on **plastic waste reduction and recycling** and exploring software tools and other advances from DOE's Advanced Manufacturing Office R&D Consortia.

Outreach and engagement strategies, including key best practices related to outreach and engagement in the Commercial building sector. Read more in the factsheet, here.

Data and measurement barriers and solutions, covering issues like data availability, accuracy, and analytics in the Commercial sector.

Please go to www.slido.com

using your mobile device, or by opening a new window

Enter Event Code

#DOE

Polls

We want to learn more about you!

Please go to www.slido.com and enter code **#DOE** to respond

Today's Presenters

Jarrod Bridge
Office of Resource Conservation and Recovery - EPA

Scott Nicholson
Grid Planning and Analysis Center - NREL

Jarrod Bridge

Office of Resource Conservation and Recovery - EPA

11

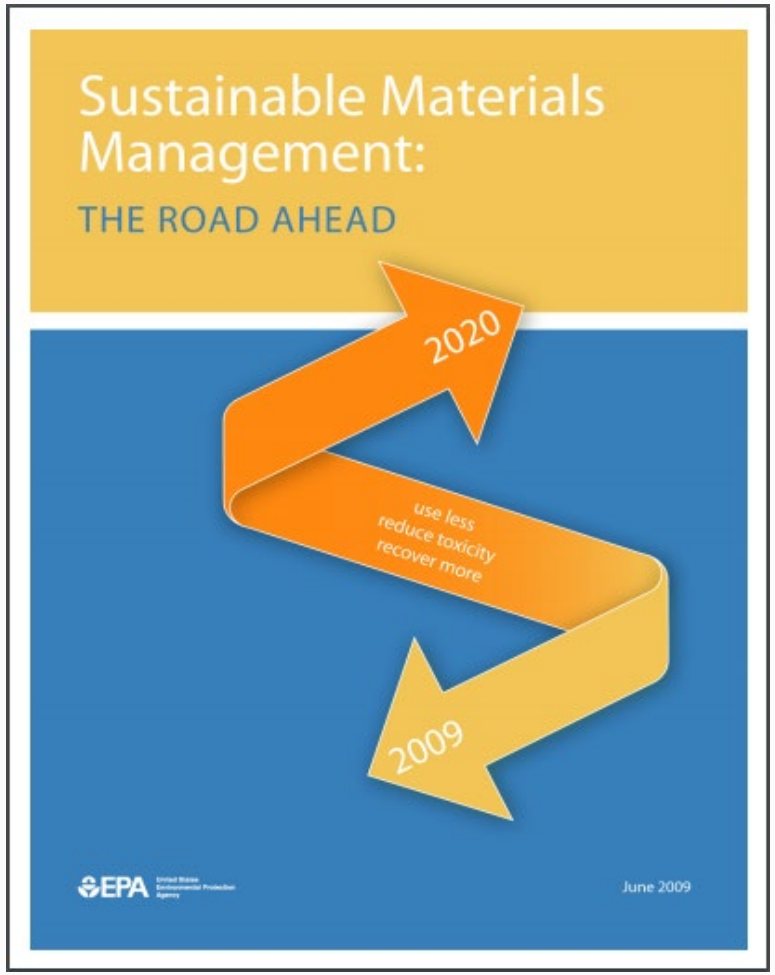
EPA's Waste Reduction Model (WARM)

Jarrod Bridge, Physical Scientist, US EPA

NREL Webinar

August 03, 2021

From Waste Management to Sustainable Materials Management



https://www.epa.gov/smm

WARM Overview

- WARM was created in 1998.
- **WARM version 15 is now available (updated November 2020).**
- WARM calculates **GHG emissions** and **energy use (BTU)** of baseline and alternative waste management practices, including **source reduction**, **recycling**, **combustion**, **composting**, **anaerobic digestion** and **landfilling.**
- WARM calculates the **economic impact** of some management practices.
- WARM has **60 materials** modeled (commonly found in MSW and C&D debris from paper to plastic to organics and building materials).

Who are the WARM stakeholders?

Municipal and state government employees

- How to plan, track, and make decisions about solid waste management

Students and educators

- Anywhere from elementary school to PhD

Industry groups

- Commodity/material specific groups provide data and use the tool

Waste reduction and waste management groups

- Composting council, recycling organizations, etc.

How to use WARM

Version 15

Waste Reduction Model (WARM) -- Inputs

Use this worksheet to describe the baseline and alternative waste management scenarios that you want to compare. The blue shaded areas indicate where you need to enter information.
Please enter data in short tons (1 short ton = 2,000 lbs.)

1. Describe the baseline generation and management for the waste materials listed below.
If the material is not generated in your community or you do not want to analyze it, leave it blank or enter 0. Make sure that the total quantity generated equals the total quantity managed.

2. Describe the alternative management scenario for the waste materials generated in the baseline.
Any decrease in generation should be entered in the Source Reduction column.
Any increase in generation should be entered in the Source Reduction column as a negative value.
Make sure that the total quantity generated equals the total quantity managed.

Material Type	Material	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Tons Generated	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested
Paper	Corrugated Containers				NA	NA	0.00					NA	NA
	Magazines/Third-class Mail				NA	NA	0.00					NA	NA
	Newspaper				NA	NA	0.00					NA	NA
	Office Paper				NA	NA	0.00					NA	NA
	Phonebooks				NA	NA	0.00					NA	NA
	Textbooks				NA	NA	0.00					NA	NA
	Mixed Paper (general)				NA	NA	0.00					NA	NA
	Mixed Paper (primarily residential)				NA	NA	0.00					NA	NA
	Mixed Paper (primarily from offices)				NA	NA	0.00					NA	NA
Food Waste	Food Waste	NA					0.00		NA				
	Food Waste (non-meat)	NA					0.00		NA				
	Food Waste (meat only)	NA					0.00		NA				
	Beef	NA					0.00		NA				
	Poultry	NA					0.00		NA				
	Grains	NA					0.00		NA				
	Bread	NA					0.00		NA				
	Fruits and Vegetables	NA					0.00		NA				

WARM Analysis

1. Describe the baseline generation and management for the waste materials listed below.
If the material is not generated in your community or you do not want to analyze it, leave it blank or enter 0. Make sure that the total quantity generated equals the total quantity managed.

2. Describe the alternative management scenario for the waste materials generated in the baseline.
Any decrease in generation should be entered in the Source Reduction column.
Any increase in generation should be entered in the Source Reduction column as a negative value.
Make sure that the total quantity generated equals the total quantity managed.

Material Type	Material	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Tons Generated	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested
Paper	Corrugated Containers				NA	NA	0.00					NA	NA
	Magazines/Third-class Mail				NA	NA	0.00					NA	NA
	Newspaper		100.00		NA	NA	100.00		100.00			NA	NA
	Office Paper				NA	NA	0.00					NA	NA
	Phonebooks				NA	NA	0.00					NA	NA
	Textbooks				NA	NA	0.00					NA	NA
	Mixed Paper (general)				NA	NA	0.00					NA	NA
	Mixed Paper (primarily residential)				NA	NA	0.00					NA	NA
	Mixed Paper (primarily from offices)				NA	NA	0.00					NA	NA
Food Waste	Food Waste	NA					0.00		NA				
	Food Waste (non-meat)	NA					0.00		NA				
	Food Waste (meat only)	NA					0.00		NA				
	Beef	NA					0.00		NA				
	Poultry	NA					0.00		NA				
	Grains	NA					0.00		NA				
	Bread	NA					0.00		NA				
	Fruits and Vegetables	NA					0.00		NA				
	Dairy Products	NA					0.00		NA				
Yard Trimmings	Yard Trimmings	NA					0.00	NA	NA				
	Grass	NA					0.00	NA	NA				
	Leaves	NA					0.00	NA	NA				
	Branches	NA					0.00	NA	NA				
Mixed Plastics	HDPE				NA	NA	0.00					NA	NA
	LDPE	NA			NA	NA	0.00		NA			NA	NA
	PET				NA	NA	0.00					NA	NA
	LLDPE	NA			NA	NA	0.00		NA			NA	NA

WARM Emissions Factors

Per Ton Estimates of GHG Emissions for Baseline and Alternative Management Scenarios

Material	GHG Emissions per Ton of Material Produced ($MTCO_2E$)	GHG Emissions per Ton of Material Source Reduced ($MTCO_2E$)	GHG Emissions per Ton of Material Recycled ($MTCO_2E$)	GHG Emissions per Ton of Material Landfilled ($MTCO_2E$)	GHG Emissions per Ton of Material Combusted ($MTCO_2E$)	GHG Emissions per Ton of Material Composted ($MTCO_2E$)	GHG Emission per Ton of Material Anaerobically Digested ($MTCO_2E$)
Corrugated Containers	5.58	(5.58)	(3.14)	0.18	(0.49)	NA	NA
Magazines/third-class mail	8.57	(8.57)	(3.07)	(0.43)	(0.35)	NA	NA
Newspaper	4.68	(4.68)	(2.71)	(0.85)	(0.56)	NA	NA
Office Paper	7.95	(7.95)	(2.86)	1.13	(0.47)	NA	NA
Phonebooks	6.17	(6.17)	(2.62)	(0.85)	(0.56)	NA	NA
Textbooks	9.02	(9.02)	(3.10)	1.13	(0.47)	NA	NA
Mixed Paper (general)	6.07	(6.07)	(3.55)	0.07	(0.49)	NA	NA
Mixed Paper (primarily residential)	6.00	(6.00)	(3.55)	0.02	(0.49)	NA	NA
Mixed Paper (primarily from offices)	7.37	(7.37)	(3.58)	0.11	(0.45)	NA	NA
Food Waste	3.66	(3.66)	NA	0.50	(0.13)	(0.12)	(0.04)
Food Waste (non-meat)	0.76	(0.76)	NA	0.50	(0.13)	(0.12)	(0.04)
Food Waste (meat only)	15.10	(15.10)	NA	0.50	(0.13)	(0.12)	(0.04)
Beef	30.09	(30.09)	NA	0.50	(0.13)	(0.12)	(0.04)
Poultry	2.45	(2.45)	NA	0.50	(0.13)	(0.12)	(0.04)
Grains	0.62	(0.62)	NA	0.50	(0.13)	(0.12)	(0.04)
Bread	0.66	(0.66)	NA	0.50	(0.13)	(0.12)	(0.04)

WARM Analysis

1. Describe the baseline generation and management for the waste materials listed below.
If the material is not generated in your community or you do not want to analyze it, leave it blank or enter 0. Make sure that the total quantity generated equals the total quantity managed.

2. Describe the alternative management scenario for the waste materials generated in the baseline.
Any decrease in generation should be entered in the Source Reduction column.
Any increase in generation should be entered in the Source Reduction column as a negative value.
Make sure that the total quantity generated equals the total quantity managed.

Material Type	Material	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Tons Generated	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested
Paper	Corrugated Containers				NA	NA	0.00					NA	NA
	Magazines/Third-class Mail				NA	NA	0.00					NA	NA
	Newspaper		100.00		NA	NA	100.00		100.00			NA	NA
	Office Paper				NA	NA	0.00					NA	NA
	Phonebooks				NA	NA	0.00					NA	NA
	Textbooks				NA	NA	0.00					NA	NA
	Mixed Paper (general)				NA	NA	0.00					NA	NA
	Mixed Paper (primarily residential)				NA	NA	0.00					NA	NA
	Mixed Paper (primarily from offices)				NA	NA	0.00					NA	NA
Food Waste	Food Waste	NA					0.00		NA				
	Food Waste (non-meat)	NA					0.00		NA				
	Food Waste (meat only)	NA					0.00		NA				
	Beef	NA					0.00		NA				
	Poultry	NA					0.00		NA				
	Grains	NA					0.00		NA				
	Bread	NA					0.00		NA				
	Fruits and Vegetables	NA					0.00		NA				
	Dairy Products	NA					0.00		NA				
Yard Trimmings	Yard Trimmings	NA					0.00	NA	NA				
	Grass	NA					0.00	NA	NA				
	Leaves	NA					0.00	NA	NA				
	Branches	NA					0.00	NA	NA				
Mixed Plastics	HDPE				NA	NA	0.00					NA	NA
	LDPE	NA			NA	NA	0.00		NA			NA	NA
	PET				NA	NA	0.00					NA	NA
	LLDPE	NA			NA	NA	0.00		NA			NA	NA

WARM Results

Waste Reduction Model (WARM) -- Results

Total GHG Emissions from Baseline MSW Generation and Management ($MTCO_2E$):	(84.61)
Total GHG Emissions from Alternative MSW Generation and Management ($MTCO_2E$):	(270.83)
Incremental GHG Emissions ($MTCO_2E$):	(186.21)

$MTCO_2E$ = metric tons of carbon dioxide equivalent

Waste Reduction Model (WARM) -- Results

Total Energy Use from Baseline MSW Generation and Management (million BTU):	6.75
Total Energy Use from Alternative MSW Generation and Management (million BTU):	(1,648.60)
Incremental Energy Use (million BTU):	(1,655.35)

BTU = British thermal unit

WARM Results

Waste Reduction

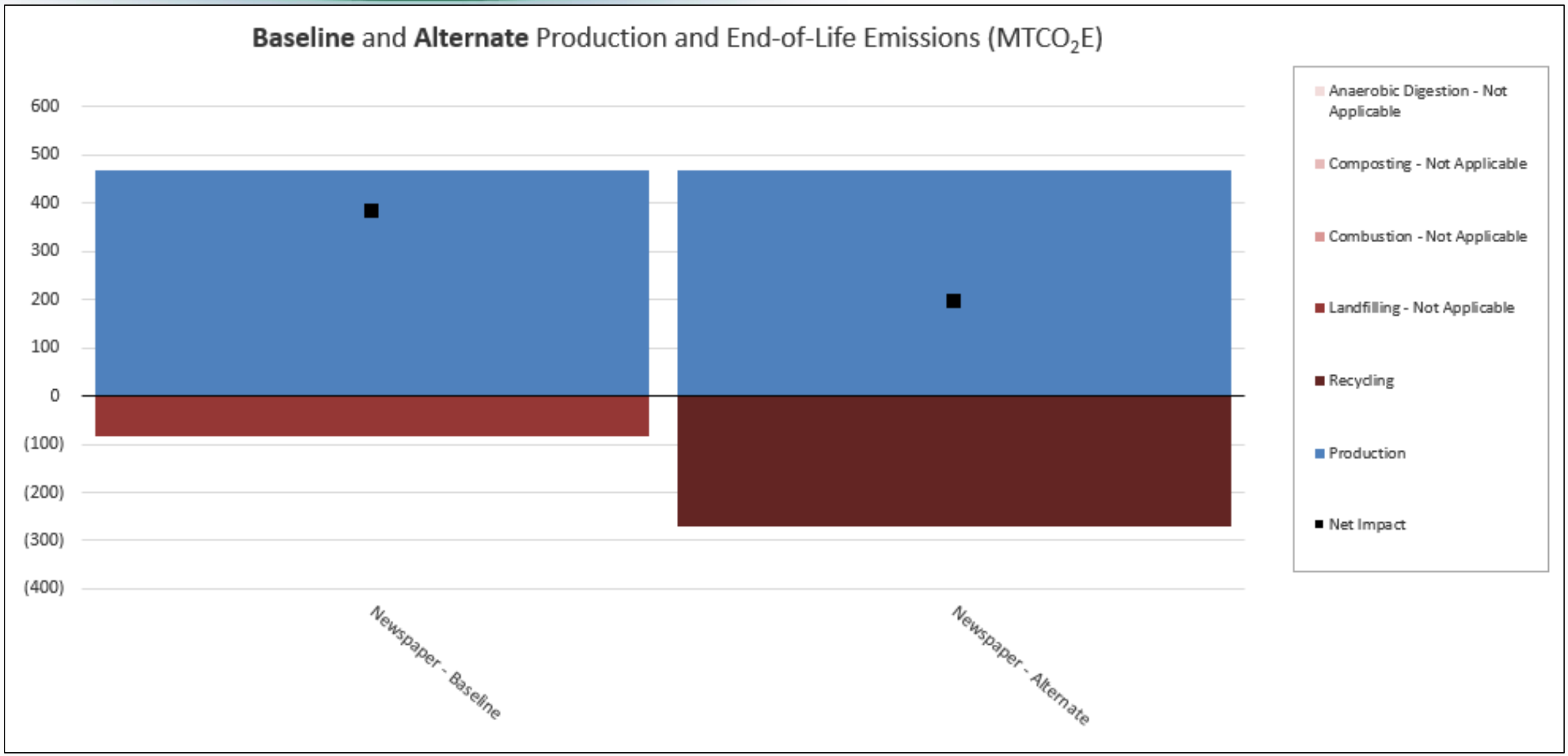
Total Employment from Baseline MSW Generation and Management (Labor hours):	137
Total Employment from Alternative MSW Generation and Management (Labor hours):	725
Incremental Employment (Labor hours):	588

Waste Reduction Model (WARM) -- Results

Total Wages from Baseline MSW Generation and Management ($):	$4,615.00
Total Wages from Alternative MSW Generation and Management ($):	$21,814.06
Incremental Wages ($):	$17,199.06

Waste Reduction Model (WARM) -- Results

Total Taxes from Baseline MSW Generation and Management ($):	$1,712.00
Total Taxes from Alternative MSW Generation and Management ($):	$6,537.93
Incremental Taxes ($):	$4,825.93


Baseline and Alternate Production and End-of-Life Emissions ($MTCO_2E$)
600
500
400
300
200
100
0
(100)
(200)
(300)
(400)
Newspaper - Baseline
Newspaper - Alternate
Anaerobic Digestion - Not Applicable
Composting - Not Applicable
Combustion - Not Applicable
Landfilling - Not Applicable
Recycling
Production
Net Impact

Next Steps on WARM

Future WaRM Enhancements:

- Model improvements
  - Wood flooring, soil carbon storage, food waste
- Economic impacts update
- Web-based user interface
- Addition of more environmental impact categories

https://www.epa.gov/warm

Thanks! Questions?

Jarrod Bridge
Bridge.jarrod@epa.gov

https://www.epa.gov/smm

https://www.epa.gov/warm

Scott Nicholson

Grid Planning and Analysis Center - NREL

25

Utilizing Waste Materials in Industrial Supply Chains

Scott Nicholson

Better Buildings Webinar on Waste Reduction

August 3, 2021

Some Background

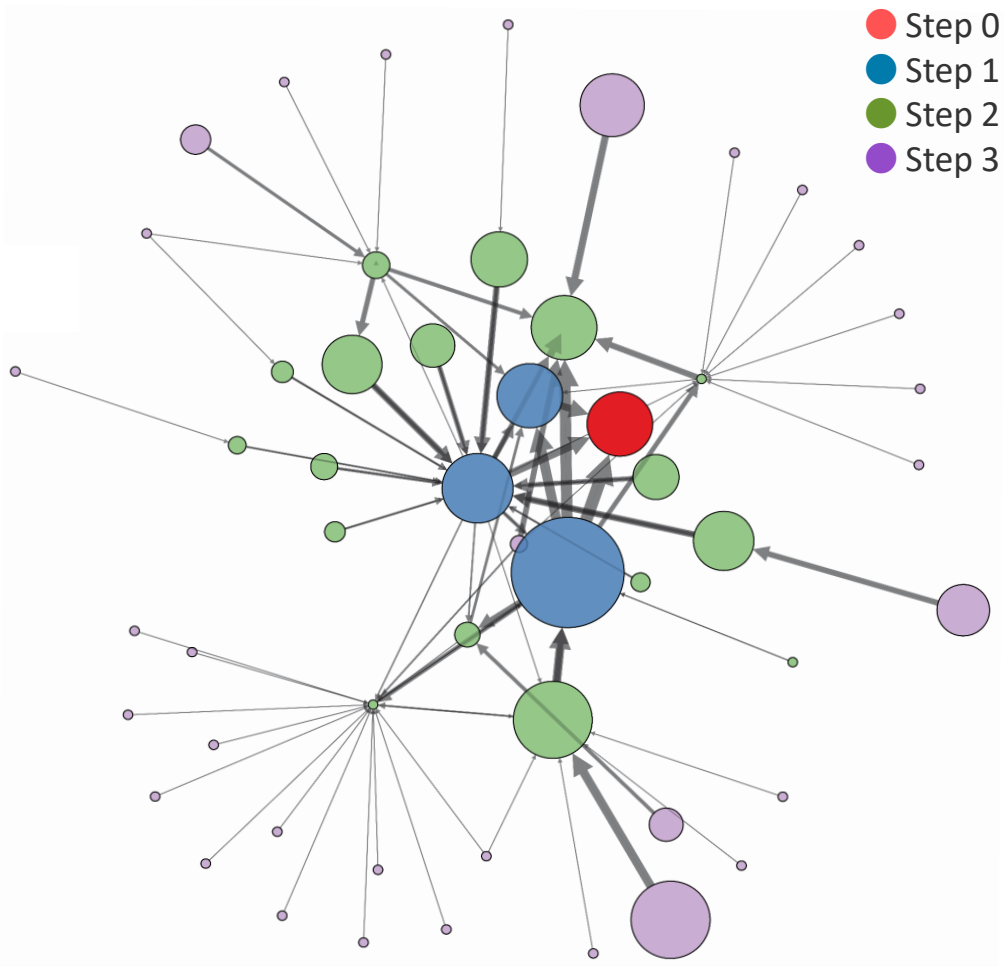
- **Current analysis focus**: plastic waste utilization technologies
- **In the toolbox:**
  - Technoeconomic analysis through Aspen+
  - Supply chain / life cycle modeling through the Materials Flows through Industry (MFI) tool
  - Broader economic impact analysis through the Bio-based Environmentally-extended Input-Output Model (BEIOM)
- **Recent analysis efforts targeting reductions in landfilled PET plastic**
  - Enzymatic depolymerization– bottles
  - Glycolysis depolymerization (VolCat) – bottles, carpet, textiles

MFI Background and Assumptions

MFI is a supply chain modeling tool funded by the Advanced Manufacturing Office created to identify and analyze opportunities to reduce the energy and carbon intensities of the U.S. industrial sector.

- Linear network model of U.S.-based supply chains
- Approx. 800 industrial, bulk commodities
- Approx. 2000 recipes (unit processes)
  - Material inputs (kg input per kg product)
  - Energy/Electricity inputs (MJ or kWh per kg product)
  - "Default" recipe weightings reflect current U.S. industrial practice
- Sources: proprietary databases (ecoinvent, IHS PEP) and publicly available LCA literature
- Scope: Mine-to-materials (cradle to gate) is default; extendable to add use-phase or end-of-life
- Differences from traditional LCA
  - U.S.-specific industrial practice "snapshot" captured using process weightings
  - Combination of multiple database sources
  - Identification of impact "hotspots"
  - Categorization of energy/GHG by type
- Publicly available web app! mfitool.nrel.gov

Conventional PET Polymer Supply Chain Network

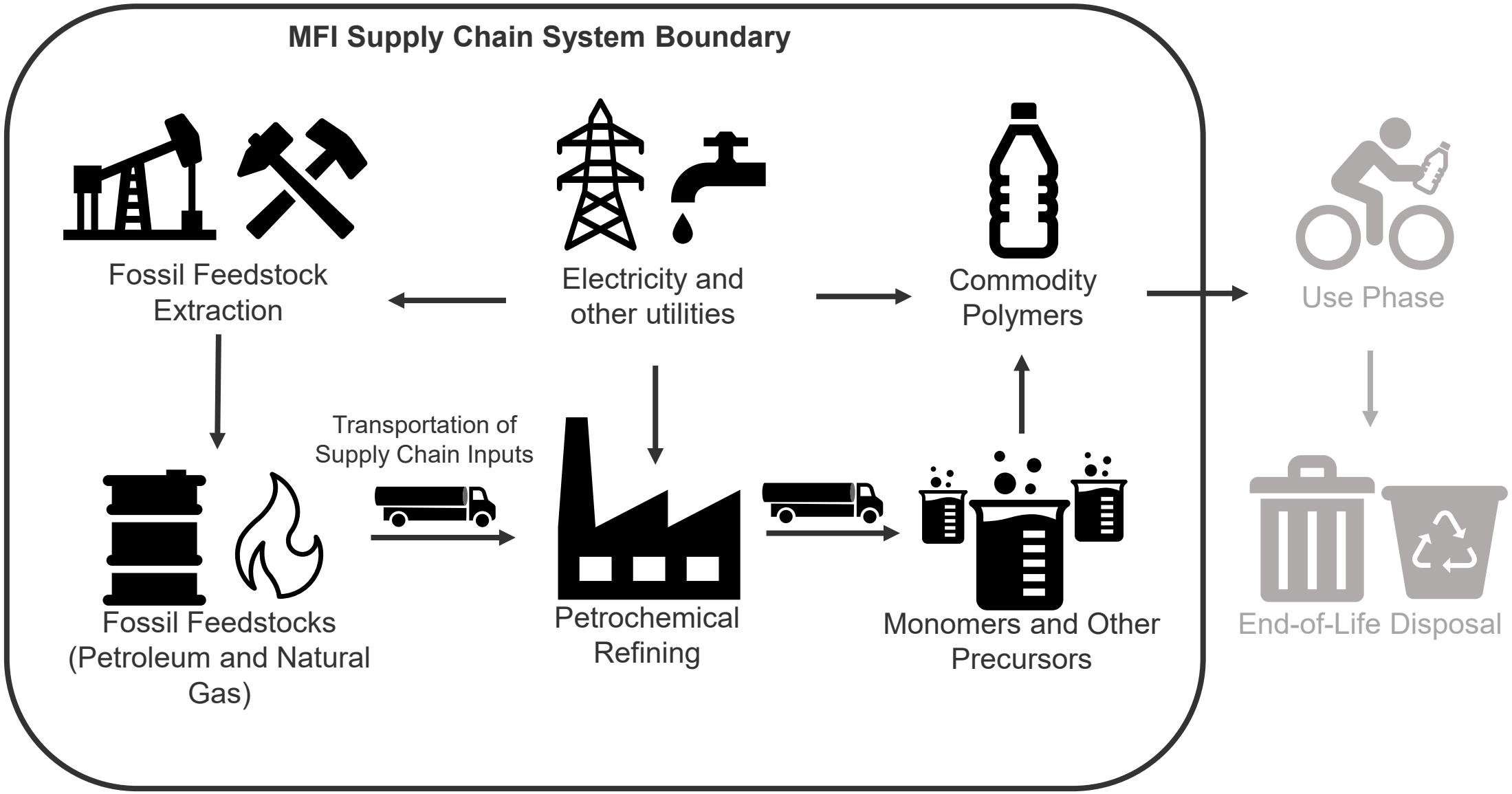


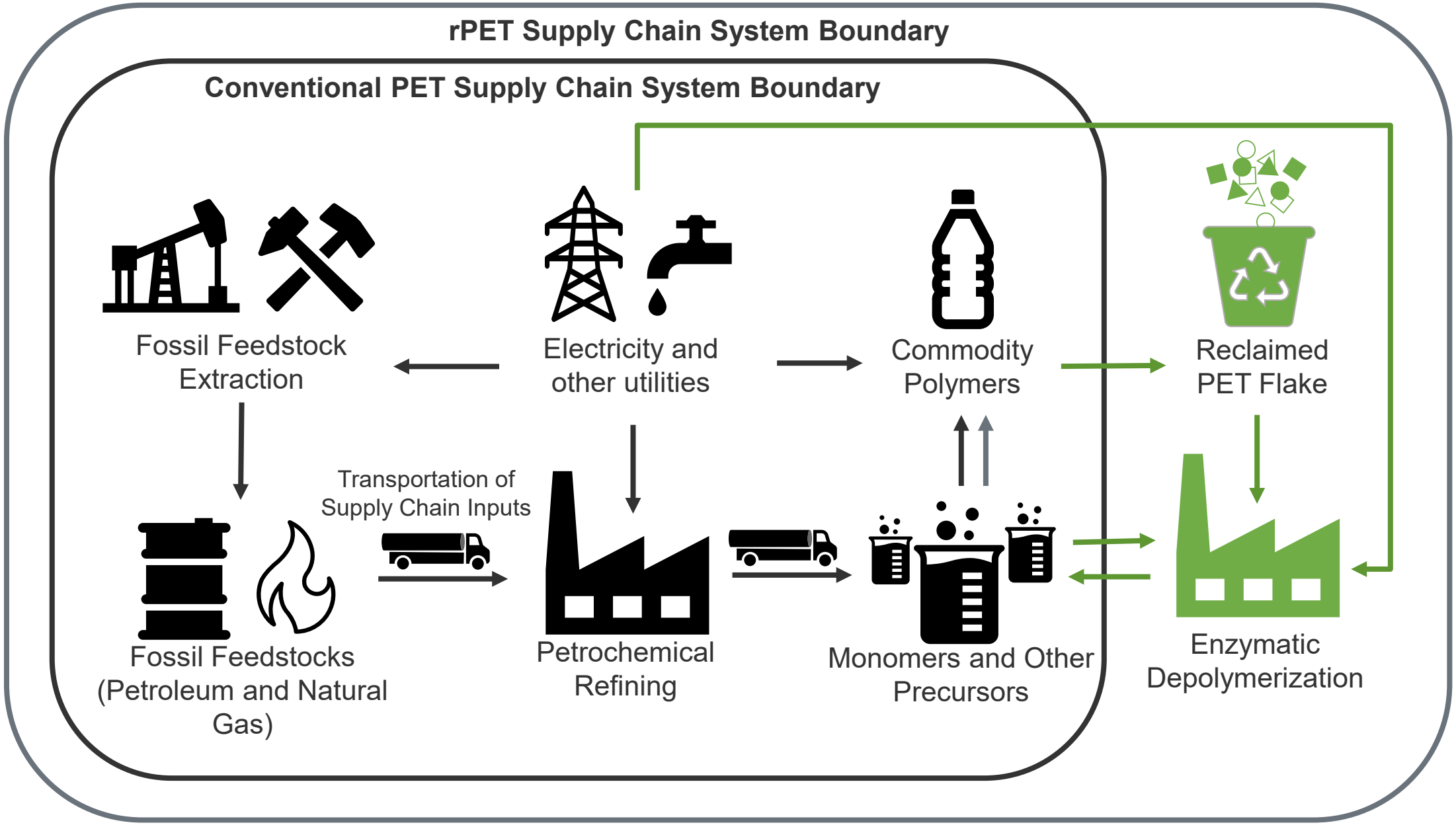
Example 1: Enzymatic Depolymerization of PET

Just published!

Singh, Avantika, et al. "Techno-economic, life-cycle, and socioeconomic impact analysis of enzymatic recycling of poly (ethylene terephthalate)." *Joule* (2021).

https://doi.org/10.1016/j.joule.2021.06.015


MFI Supply Chain System Boundary
Fossil Feedstock Extraction
Electricity and other utilities
Commodity Polymers
Use Phase
Transportation of Supply Chain Inputs
Fossil Feedstocks (Petroleum and Natural Gas)
Petrochemical Refining
Monomers and Other Precursors
End-of-Life Disposal


rPET Supply Chain System Boundary
Conventional PET Supply Chain System Boundary
Fossil Feedstock Extraction
Electricity and other utilities
Commodity Polymers
Reclaimed PET Flake
Transportation of Supply Chain Inputs
Fossil Feedstocks (Petroleum and Natural Gas)
Petrochemical Refining
Monomers and Other Precursors
Enzymatic Depolymerization

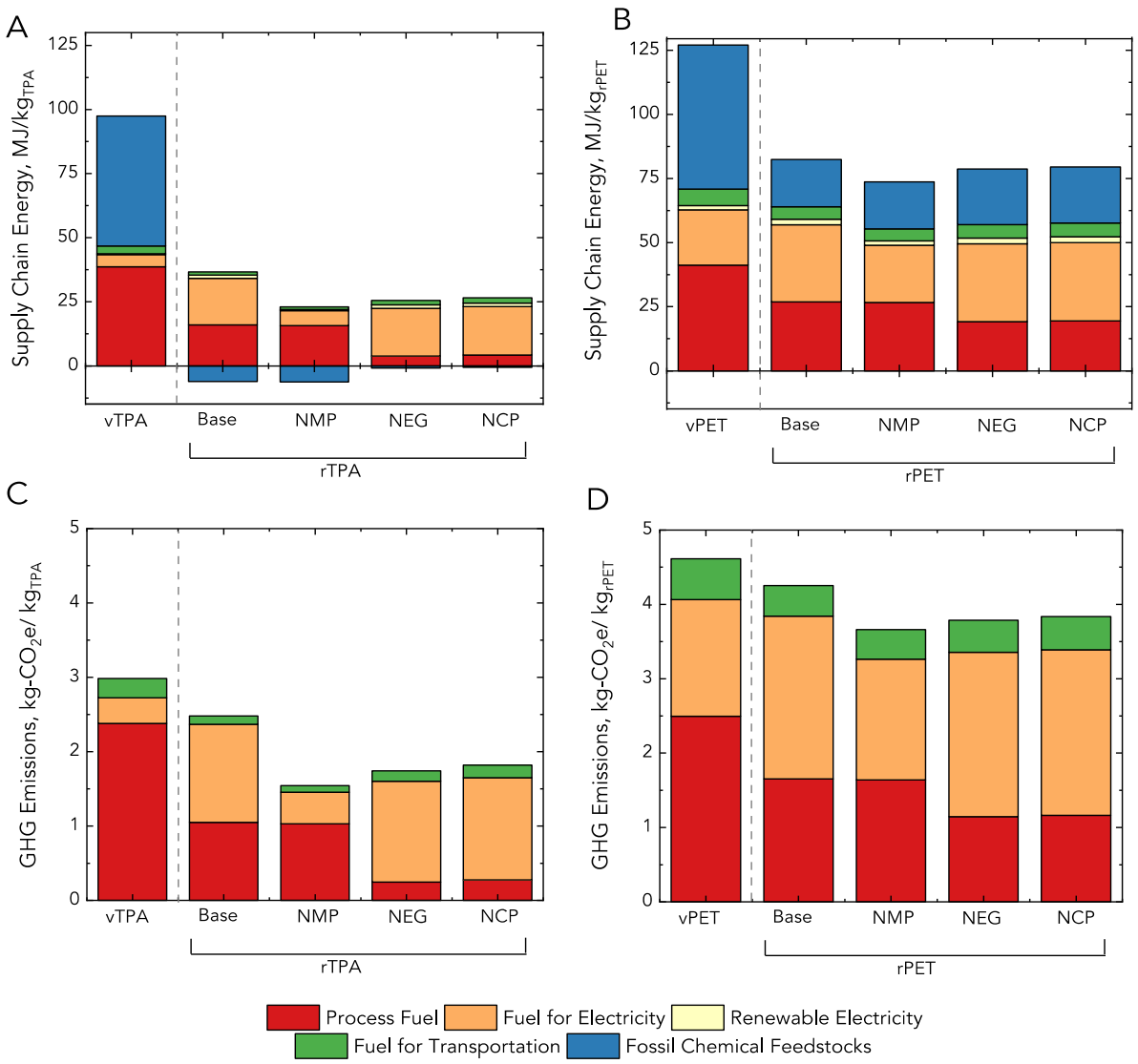
Conventional vs. Waste PET Feedstock Supply Chains

Supply Chain Energies:

- Conventional manufacturing supply chain for PET bottles ~127 MJ/kg,
- Enzymatic depolymerization supply chains = 74-82 MJ/kg
- Reduction of 35%–72% across the 4 cases

GHG Emissions:

- Base case and the NMP case are estimated to emit 8% and 21% lower GHG emissions per kg of PET
- Feedstock is not combusted, but converted into products



Example 2: VolCat Process

IBM’s VolCat: Selective Digestion of PET

Output (BHET)

Feedstock (mixed waste)

PET Glycolysis (VolCat)

Goals:

- Determine key drivers for VolCat PET depolymerization
- Provide base model to compare glycolysis-based approaches for PET recycling to chemo-catalytic and thermal methods

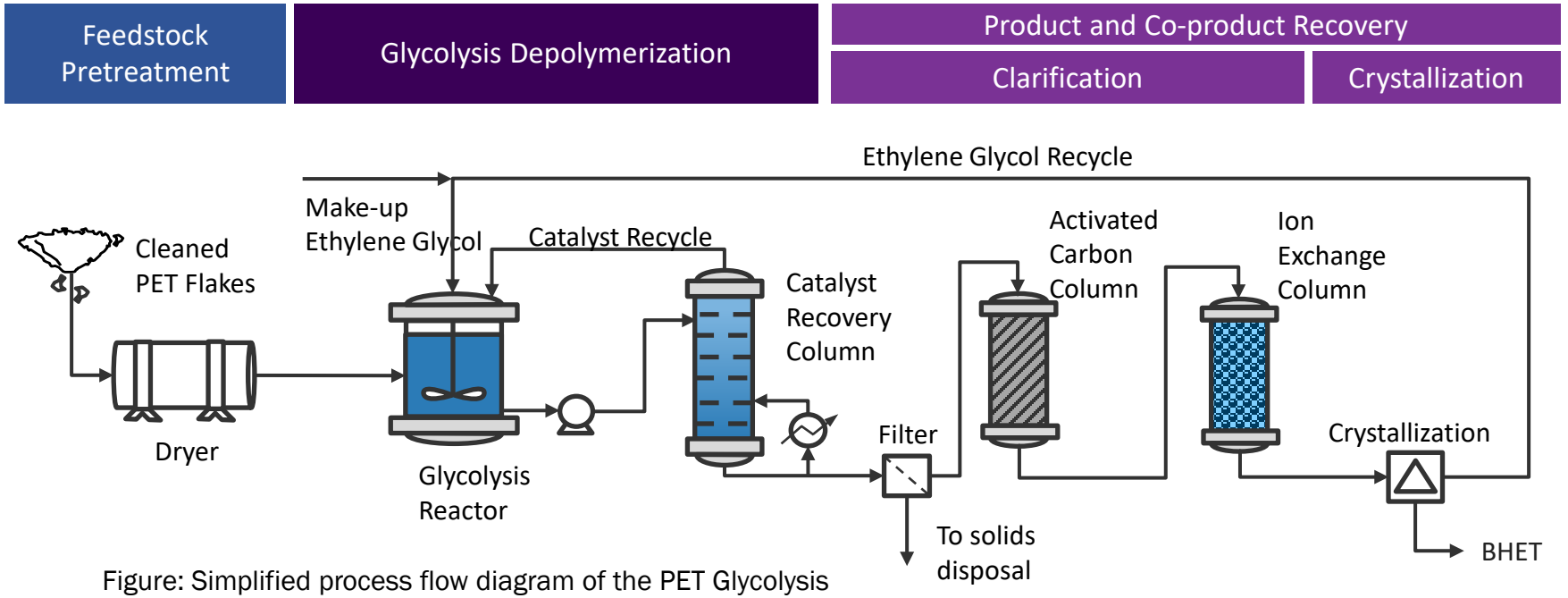


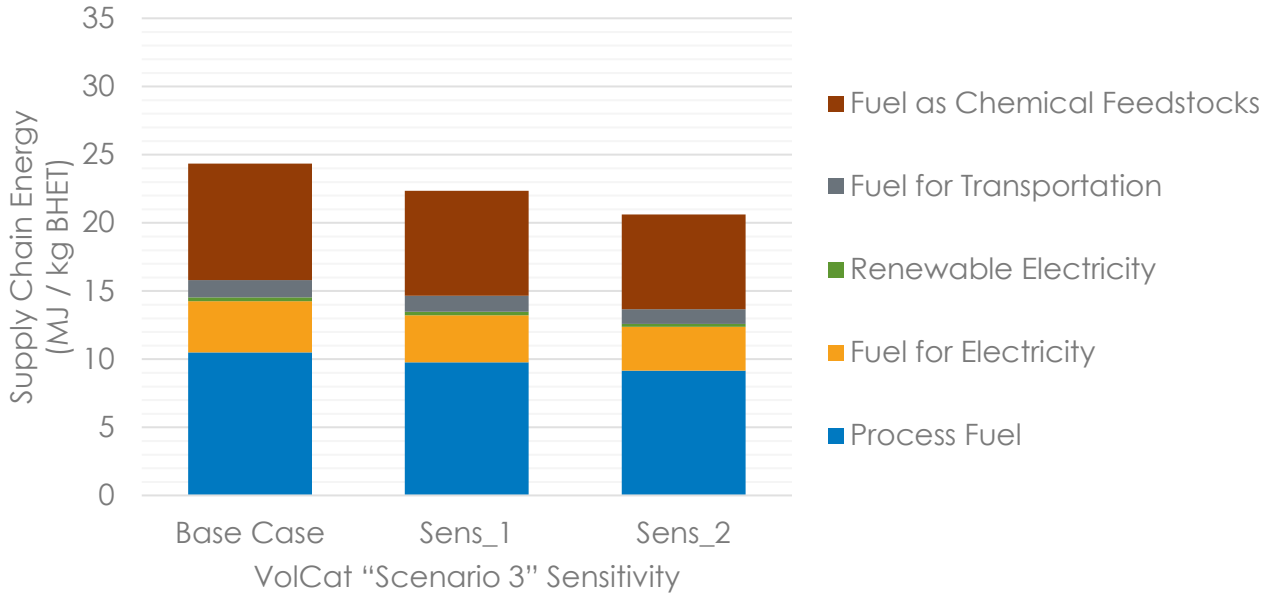
Figure: Simplified process flow diagram of the PET Glycolysis depolymerization process

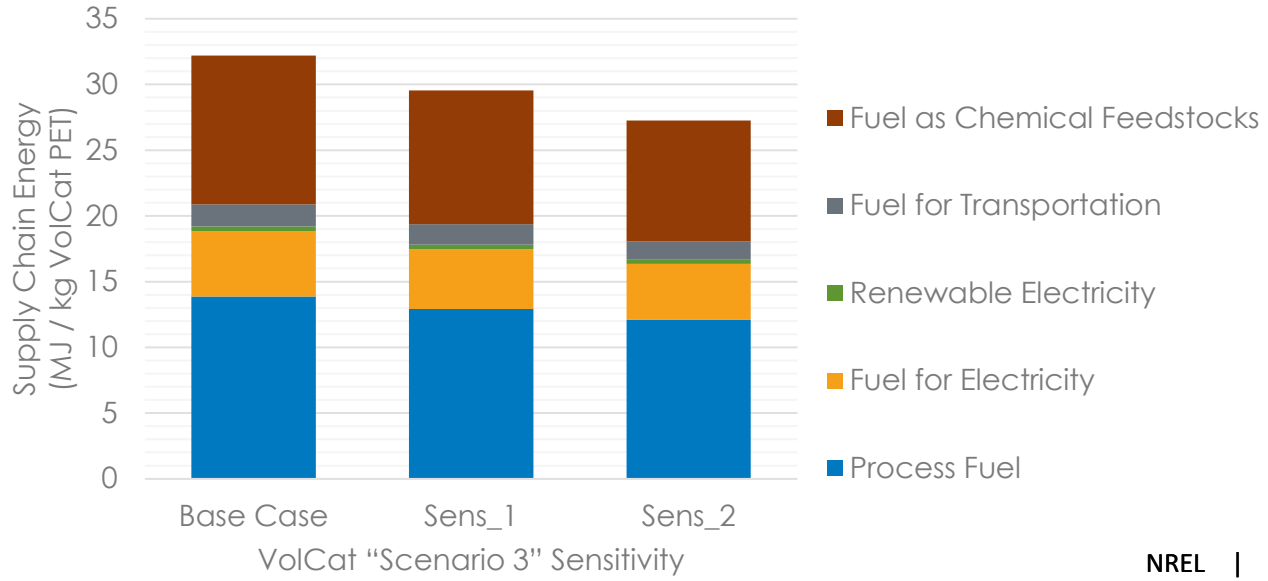
Methods:

- Process data from IBM/NREL researchers and peer-reviewed literature
- TEA and MFI results are preliminary– final process is still being developed

MFI Results – Energy Requirements

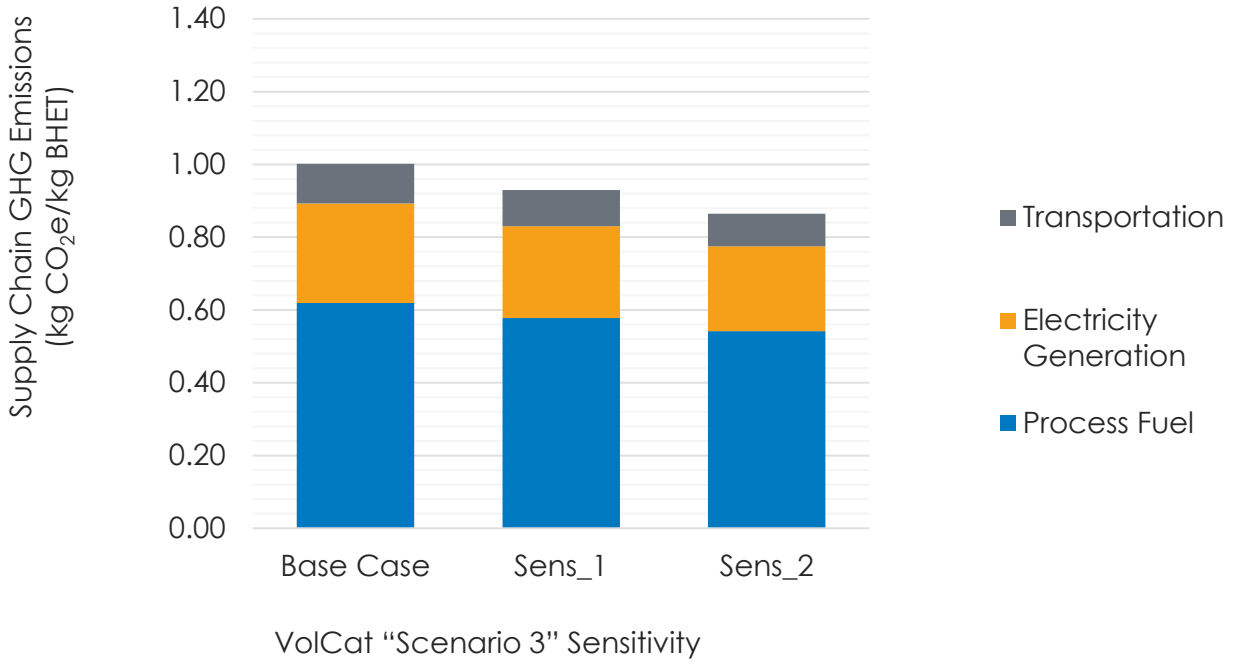
- MFI estimates of energy requirements for PET production via VolCat are similar to those estimated by traditional LCA (about 20-25 MJ/kg)
- **75-80% less energy** requirement than virgin PET production (MFI estimates this at about 107 MJ/kg)
- Primary contributors to energy requirements are **process** (e.g. process heating) and **fossil feedstock** energy (latter still required for e.g., ethylene glycol production)
- Transportation of supply chain inputs has a relatively modest energy impact

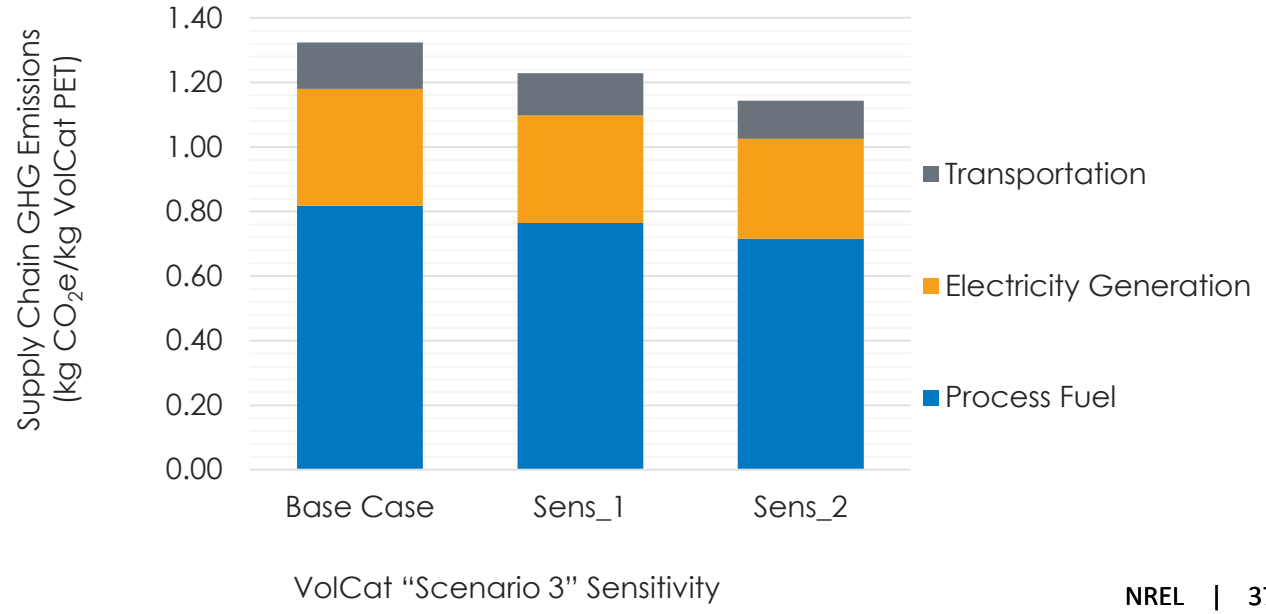




MFI Results – GHG Emissions

- MFI estimates of GHG emissions for PET production via VolCat are similar to those estimated by traditional LCA (approx. 1 – 1.3 kgCO2e/kg PET)
- **60-65% lower GHG emissions** than virgin PET production (MFI estimates this at about 3.2 kg CO_2e/kg PET)
- Primary contributing categories to GHG emissions are **process** (e.g. process heating) and **electricity** generation
- Transportation of supply chain inputs has a relatively modest GHG impact





Summary

- Utilizing waste as a feedstock resource is a promising method of reducing plastics in landfills and the environment
- Two examples of how waste PET can be depolymerized and then converted back to PET– enzymatically and via glycolysis
- Both estimated to have reduced energy and GHG impacts relative to conventional PET production from fossil sources.
- Open questions for future MFI tool development
  - What would be the best metric(s) to capture and compare existing supply chain waste impacts?
  - In what other sectors can we apply this waste utilization analysis?

Thank You

www.nrel.gov

Questions/Feedback:
scott.nicholson@nrel.gov

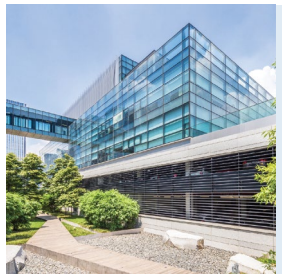
This work was authored by the National Renewable Energy Laboratory, operated by Alliance for Sustainable Energy, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC36-08GO28308. Funding provided by U.S. Department of Energy Office of Energy Efficiency and Renewable Energy Advanced Manufacturing Office. The views expressed in the article do not necessarily represent the views of the DOE or the U.S. Government. The U.S. Government retains and the publisher, by accepting the article for publication, acknowledges that the U.S. Government retains a nonexclusive, paid-up, irrevocable, worldwide license to publish or reproduce the published form of this work, or allow others to do so, for U.S. Government purposes.

Q & A

Submit Questions
www.slido.com event code **#DOE**

U.S. DEPARTMENT OF ENERGY

Better Buildings: Summer Webinar Series



ELECTRIFYING OUR BUILDINGS: CHALLENGES AND SOLUTIONS

June 8

WATCH RECORDING

BECOMING ESPC-READY

June 15

WATCH RECORDING

BOOSTING INDUSTRIAL AND MANUFACTURING EFFICIENCY AND RESILIENCY WITH CHP

June 17

WATCH RECORDING

FINANCING IN HIGHER EDUCATION

June 22

WATCH RECORDING

WHAT'S HOT WITH HEAT PUMPS

June 29

WATCH RECORDING

HOW TO IDENTIFY CHP PROJECTS THAT FIT YOUR GOALS

July 1

WATCH RECORDING

ESPC IN THE EXPRESS LANE: NEW PROJECT TRACKING TOOLS

July 13

WATCH RECORDING

WORKPLACE EVOLUTION: SUPPORTING OCCUPANT HEALTH WHILE ACHIEVING ENERGY EFFICIENCY

July 20

WATCH RECORDING

ENERGY-SAVING SUCCESS STORIES: 2021 BUILDING ENVELOPE CAMPAIGN RECOGNITION

July 27

WATCH RECORDING

WASTE REDUCTION: LESSONS LEARNED AND WHAT COMES NEXT

August 3

VISUALIZE YOUR ENERGY FUTURE WITH THE STATE AND LOCAL PLANNING FOR ENERGY PLATFORM (SLOPE)

August 10

REGISTER TODAY

2021 Summer Webinar Series

VISUALIZE YOUR ENERGY FUTURE WITH THE STATE AND LOCAL PLANNING FOR ENERGY PLATFORM (SLOPE)

Tue, August 10, 2021 | 3:00 - 4:00 PM ET

REGISTER TODAY

Dispersed, unintegrated, and sometimes inaccessible data can make data-driven energy planning too expensive or time-intensive for many state and local governments to pursue. To confront this issue, the State and Local Planning for Energy (SLOPE) Platform integrates and delivers data on energy efficiency, renewable energy, and sustainable transportation into an easy-to-access online platform, helping enable data-driven state and local energy planning. Join this webinar to learn how New Mexico is using SLOPE to identify clean energy opportunities to inform its Grid Modernization Roadmap Project, and learn how SLOPE's new transportation data can help your jurisdiction.

ON-DEMAND BETTER BUILDINGS WEBINARS

Through Better Buildings webinars, experts discuss a variety of topics from Air Management to Zero Energy. These webinars are helpful resources on key subject areas in energy efficiency, water efficiency, resilience, and more. Below are webinars we have held over previous years. For each webinar, you can watch the video recording and follow along with the slide deck. To sign up for an upcoming live webinar, click here.

EXPLORE BY TOPIC

Building Envelope | Communications & Engagement | Data Centers | Energy Data Management | Financing | Green Leasing | Health & Wellness | Industrial | K-12 Schools | Lighting | Multifamily | Plug & Process Loads | Refrigeration | Renewables Integration | Resilience | Smart Labs | Space Conditioning | Treasure Hunts | Waste Reduction | Water & Wastewater | Workforce Development | Working with National Labs | Zero Energy Buildings

Indicates the session was a part of the 2020 Virtual Summit. To view a full list of the Summit Sessions, click here.

BUILDING ENVELOPE

A building's envelope (walls, windows, roof, and foundation) accounts for approximately 30% of the primary energy consumed in residential and commercial buildings. Explore all previously recorded webinars on this topic by pressing MORE.

- Unsealed: The Building Envelope Campaign (2020)
- Sneak Peek of the Building Envelope Campaign (2020)
- Addressing the Envelope: Recognizing Building Enclosure Improvements (2020)
- Innovative Wall Technologies for Commercial Buildings (2019)
- Energy Savings Impact of Airtightness in U.S. Commercial Buildings (2019)
- Building Envelope/Enclosure Commissioning and Retro-commissioning (2017)

Discover online learning opportunities today.

- Explore popular topics
- Watch recordings
- Follow along with slides

Additional Questions?

Please Contact Us

Follow us on Twitter
@BetterBldgsDOE

Better Buildings Solution Center
https://betterbuildingssolutioncenter.energy.gov/

General Inquiries
BetterBuildings@retechadvisors.com

Program Support
mschatz@retechadvisors.com

Jarrod Bridge
Environmental Protection Agency
bridge.jarrod@epa.gov

Scott Nicholson
National Renewable Energy Laboratory
scott.nicholson@nrel.gov

Hannah Debelius
U.S. Department of Energy
hannah.debelius@ee.doe.gov