Get a Handle on your Waste Data Before it gets a Handle on You

Waste Reduction Network Quarterly Call

August 16, 2022

Bri Colon

U.S. Department of Energy

Agenda

1. Welcome and Introductions
2. EPA Tools, Jenny Stephenson, EPA
3. Waste Stream Energy Content Calculator, Subodh Chaudhari, ORNL
4. Closing and Q&A

Polls

Waste Team

DOE

- Robert Bruce Lung, BGS LLC, AMO
- John O'Neill, AMO
- Ethan Rogers, AMO
- Hannah Debelius, BTO
- Bri Colon, BTO

Oak Ridge National Lab

- Subodh Chaudhari

ICF

- Clifton Yin

RE Tech Advisors

- Andrea Doukakis

Waste Network Participants

Industrial

- Armstrong Flooring
- AstraZeneca
- Bendix Commercial Vehicle Systems
- Bristol Myers Squibb
- Celanese Corporation
- 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

- Berlin Packaging
- Bozzuto Management Company
- City of Reno, NV
- CommonWealth Partners
- DWS
- Empire State Realty Trust
- Flagstar Bank
- Foundation Communities
- The Hartford Financial Services Group
- Healthcare Realty Trust
- IKEA Retail U.S.
- Iron Mountain Data Centers
- Jamestown, LP
- JBG Smith
- LBNL
- MGM Resorts International
- Montefiore Medical Center
- New Bedford Housing Authority
- Parkway
- Physicians Realty Trust
- PNC
- Shorenstein Properties
- Sprint
- Tenderloin Neighborhood Development Corporation
- The Tower Companies
- University of Maryland Medical Center
- USAA Real Estate
- UW Health
- The West Palm Beach VA Medical Center*
- Welltower

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

Better Buildings, Better Plants Waste Reduction Network

What do Organizations Commit To?

Solutions Track:

Participants are encouraged to contribute in one or more of the following ways:

- Publish a case study on the Better Buildings Solution Center
- Share best practices and lessons learned through peer exchanges
- Document the ways waste management impact other priority areas such as energy reduction, GHG emissions, embodied carbon, the circular economy, and equity

Data Track:

Participants set waste goals and report progress using the following options:

Better Buildings, Better Plants Waste Reduction Network

Waste Reduction Network Activities

- Data Submission
- Bi-Monthly Newsletters
- Resources and Solutions
- Webinars
- Peer Exchanges
- Working Groups

Existing Solutions on the Solution Center

Montefiore Medical Center: Waste Management Program Reduces Ove
Montefiore developed a comprehensive recycling program using waste
and divert waste in operating rooms and throughout their medical camp
View Related Solutions

City of Beaverton: User Testing for Effective Waste Signage Solutions at
The City of Beaverton, OR utilized a user testing process to develop wa
understand.
View Related Solutions

Sprint's Systematic Approach to Waste Management Implementation Mo
Sprint's systematic approach to waste management has resulted in the
each year since 2008.
View Related Solutions

Shorenstein Properties: Improved Waste Diversion with Training and Au
Shorenstein utilized three main components, policy, training and outrea
diversion program.
View Related Solutions

Bristol-Myers Squibb: Application of Principles of Green Chemistry Leads to Significant Reductions in Material Waste
Solutions at a Glance
In an effort to reduce process waste and improve efficiency, staff at Bristol-Myers Squibb (BMS) leveraged the American Chemical Society's (ACS) Principles of Green Chemistry to enhance their sustainability efforts.
View Related Solutions

JBG SMITH's North End Retail Composting Program Solutions at a Glance
JBG SMITH set a goal to hit a waste diversion rate of 60% by 2030. Recognizing that the weight of organic material is a significant portion of the landfill waste stream, the sustainability team started a composting pilot program to divert organic waste from landfills at their North End Retail property in Washington, D.C.
View Related Solutions

Bendix Develops Zero Waste to Landfill Certification Process for Manufacturing Facilities Implementation Model
Bendix Commercial Vehicle Systems LLC developed a "Zero Waste to Landfill" Certification Process for its manufacturing facilities, promoting zero waste to landfill across all plants in 2021.
View Related Solutions

Steelcase's "Hack the Pack" Finds New Ways to Use Materials More Efficiently Solutions at a Glance
The Better Plants partner formed a design-thinking workshop called "Hack the Pack," bringing together a cross-functional team to find ways to change, or "hack," product packaging to benefit dealers, Steelcase, and the environment.
View Related Solutions

Montefiore Medical Center: Waste Management Program Reduces Overall Waste & Cost Solutions at a Glance
Montefiore developed a comprehensive recycling program using waste audits and source generation methods to reduce and divert waste in operating rooms and throughout their medical campuses.
View Related Solutions

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

Resources Page

Our resources page 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:

MAKING THE BUSINESS CASE | DATA ACCURACY & ANALYTICS | SOURCE REDUCTION | EMPLOYEE ENGAGEMENT

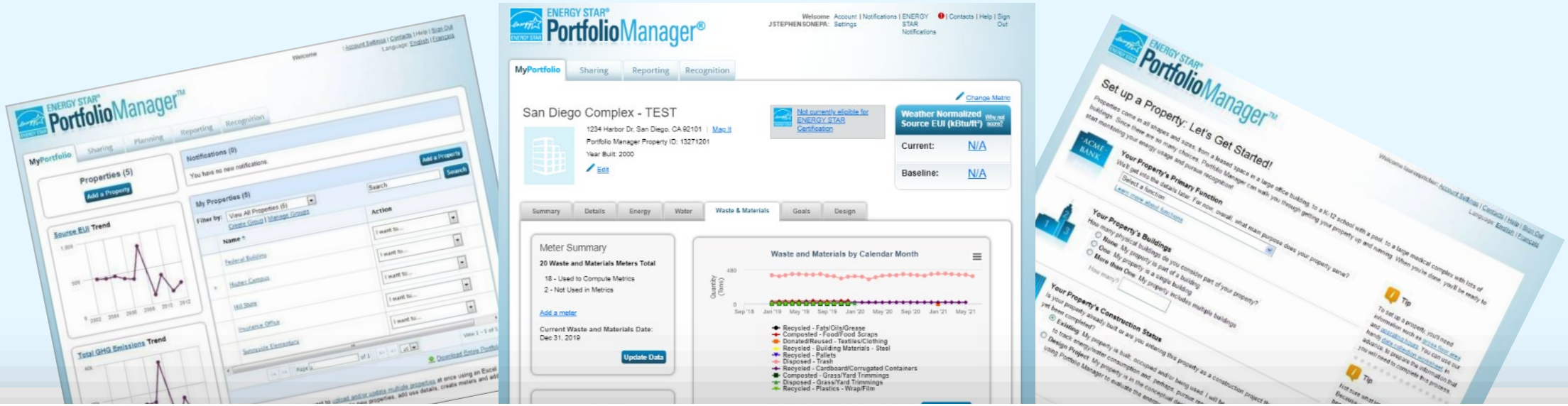
You can learn more about the Waste Reduction Network and how to get involved here.

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

Jenny Stephenson

Environmental Protection Agency

Tracking Waste and Materials in Portfolio Manager®



ENERGY STAR®

PortfolioManager®

Waste Data

- How to get it
- How to enter it
- What to do with it

How to get waste data

Approaches to getting waste data:

- Survey your site to see the size of containers and what materials are collected/hauled
- Examine the waste invoices
- Gather landfill tipping/scale receipts
- Take a tech-based approach

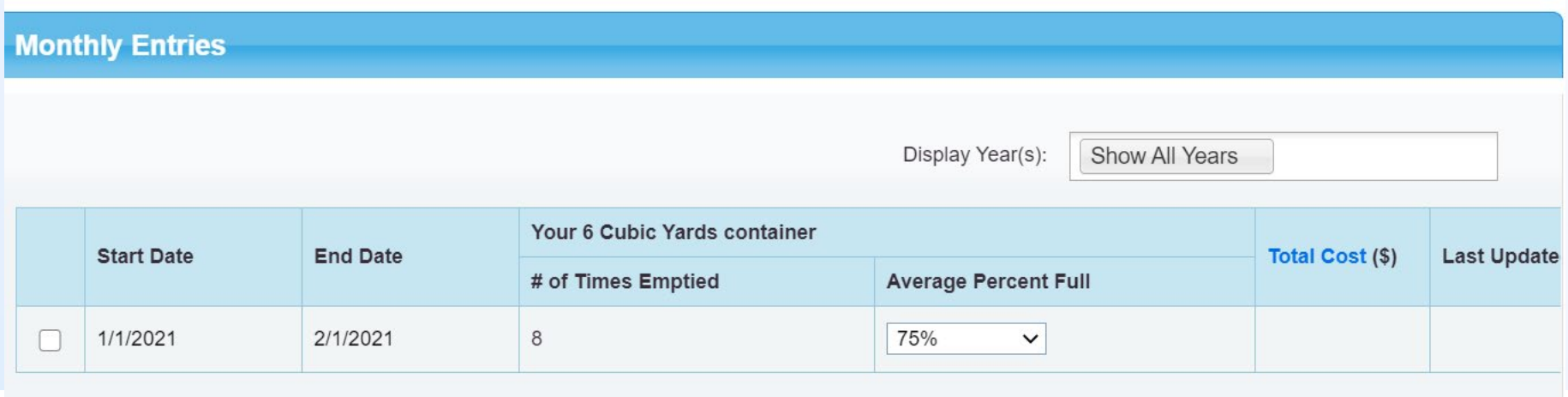
How to get waste data - **Measure Volume**

Determine the size of your containers and how frequently they're pulled/emptied by your waste hauler

- Assess container fullness before they're pulled

Options for Measuring & Tracking

- Use Portfolio Manager. Enter the material type, container size and number of times it was emptied. Portfolio Manager will automatically apply a volume to weight conversion factor to convert to weight.



How to get waste data - **Measure Volume**

Options for Measuring & Tracking

- Conduct a waste sort and apply your own, tailored volume to weight conversion factors
  - In Portfolio Manager, enter it as weight (estimated)

- Use an imaging software service. Examples include:

  - Compology has cameras applied to dumpsters that assess fullness, contamination, and records actual dates/times containers are emptied

  - Zabble is a mobile application that enables staff to snap a picture of the container to assess contamination and record fullness.

  - Universities have created their own programs/software

How to get waste data - **Measure Weight**

Determine the weight of the materials hauled

Options for Measuring & Tracking

- Look at your invoices & talk with your hauler. Typically, with roll-offs and compactors, haulers will be able to provide a weight
- Ask your hauler (through an RFP) to install on-board scales
- Weigh on-site
  - Scales on loading docks
  - Scales on janitorial carts

Bins on scales in the loading area at StopWaste, Oakland, CA

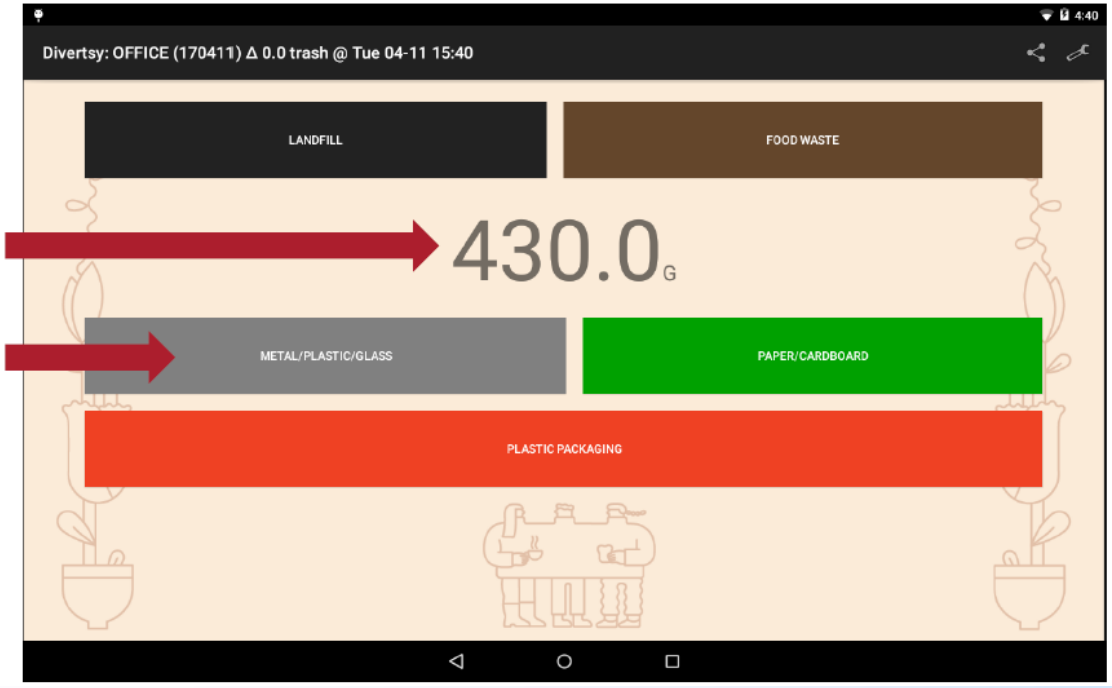
Etsy created an app to record the weight of materials placed on a janitorial cart scale

1. Place item/bag on the scale. the weight will appear on the tablet.

2. Select the stream.

Data is stored automatically!

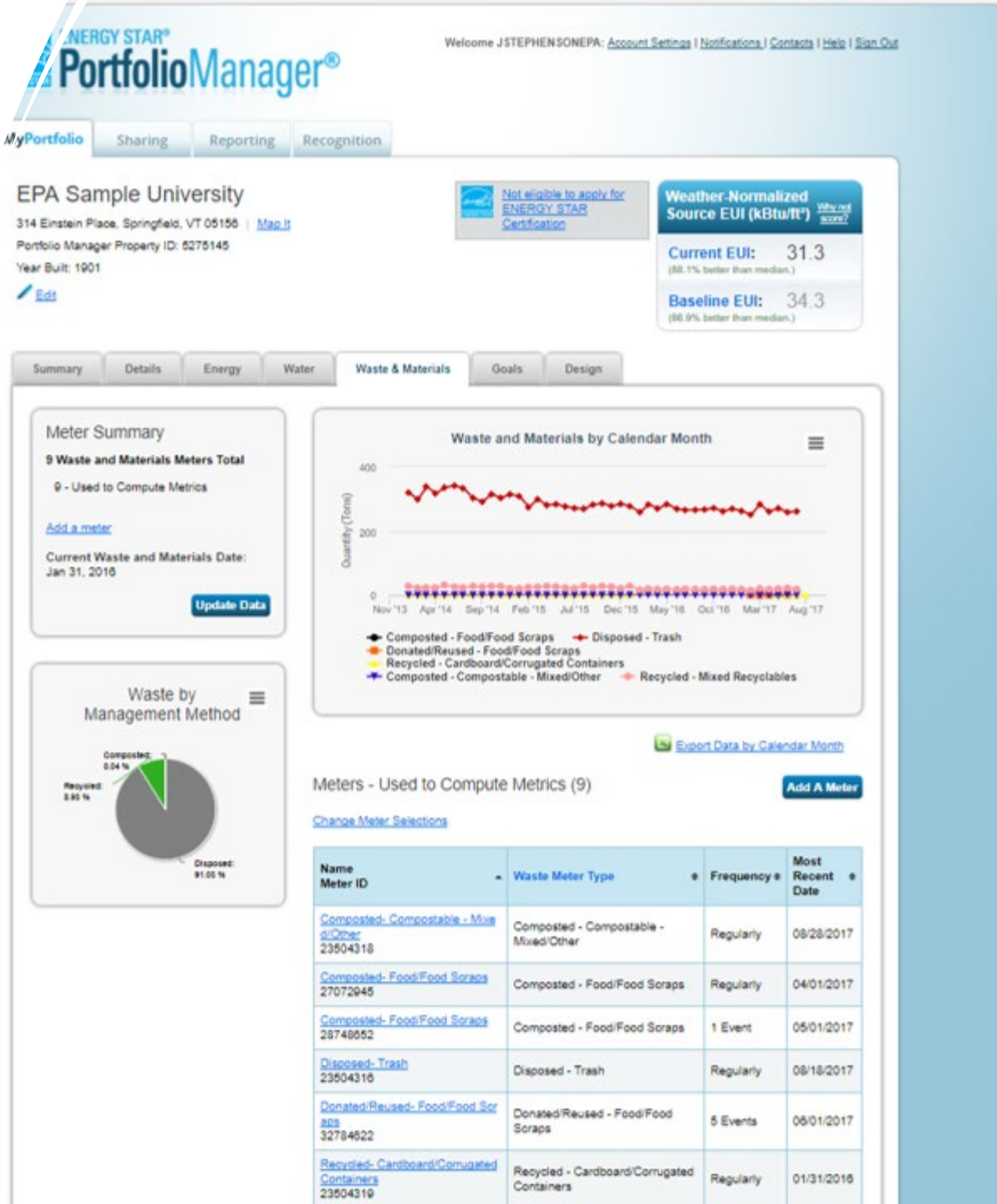
App Interface



How to enter waste data

Upgrade from a spreadsheet. Use Portfolio Manager

Portfolio Manager is designed to support ongoing tracking and management – monthly (or more frequent) data tracking



ENERGY STAR® Portfolio Manager®

EPA's ENERGY STAR Portfolio Manager is a free, secure online platform organizations use to benchmark and track their properties' performance.

ENERGY STAR® Portfolio Manager®

Measurement Tool

Assess whole building energy, water, and materials consumption

Share/report data with others

Track changes in energy, water, greenhouse gas emissions, and cost over time

Create custom reports

Track hundreds of metrics, including: waste intensity and diversion rate

ENERGY STAR® PortfolioManager®

Metrics calculator

Energy use
Source, site, weather normalized, demand

Water use
Water use intensity, Water Score (for Multifamily)

Waste & Materials
Waste intensity, diversion rate

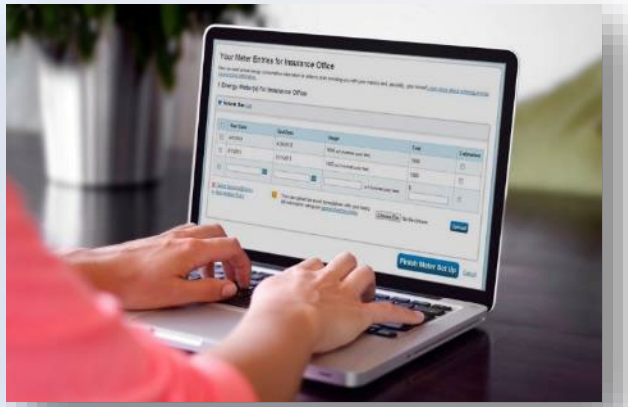
1-100 ENERGY STAR score

GHG emissions
Indirect, direct, total, avoided

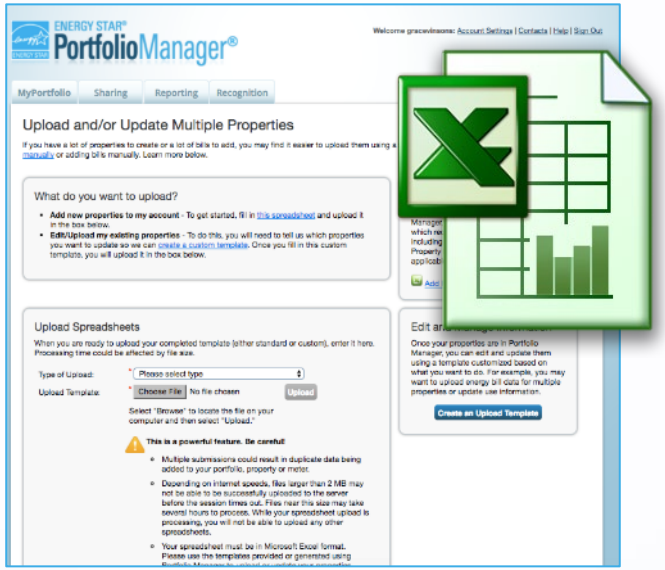
ENERGY STAR Portfolio Manager

3 ways to enter data

Manual entry

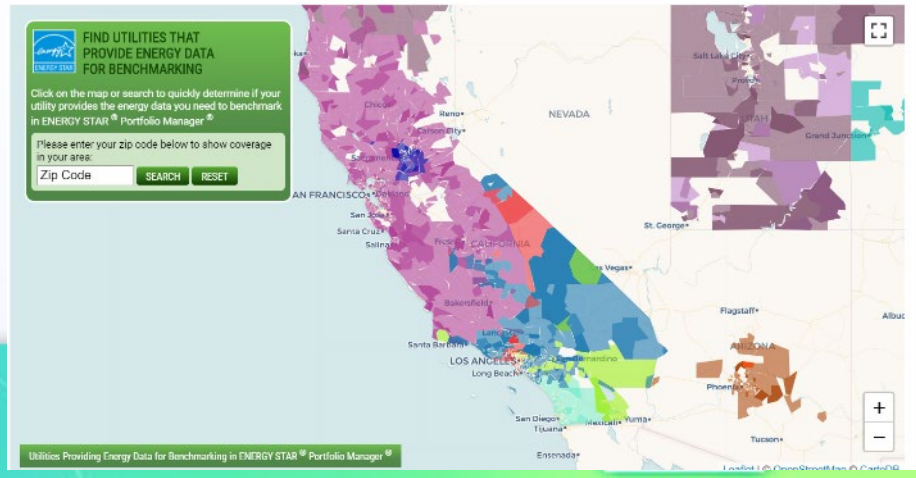


Spreadsheet upload



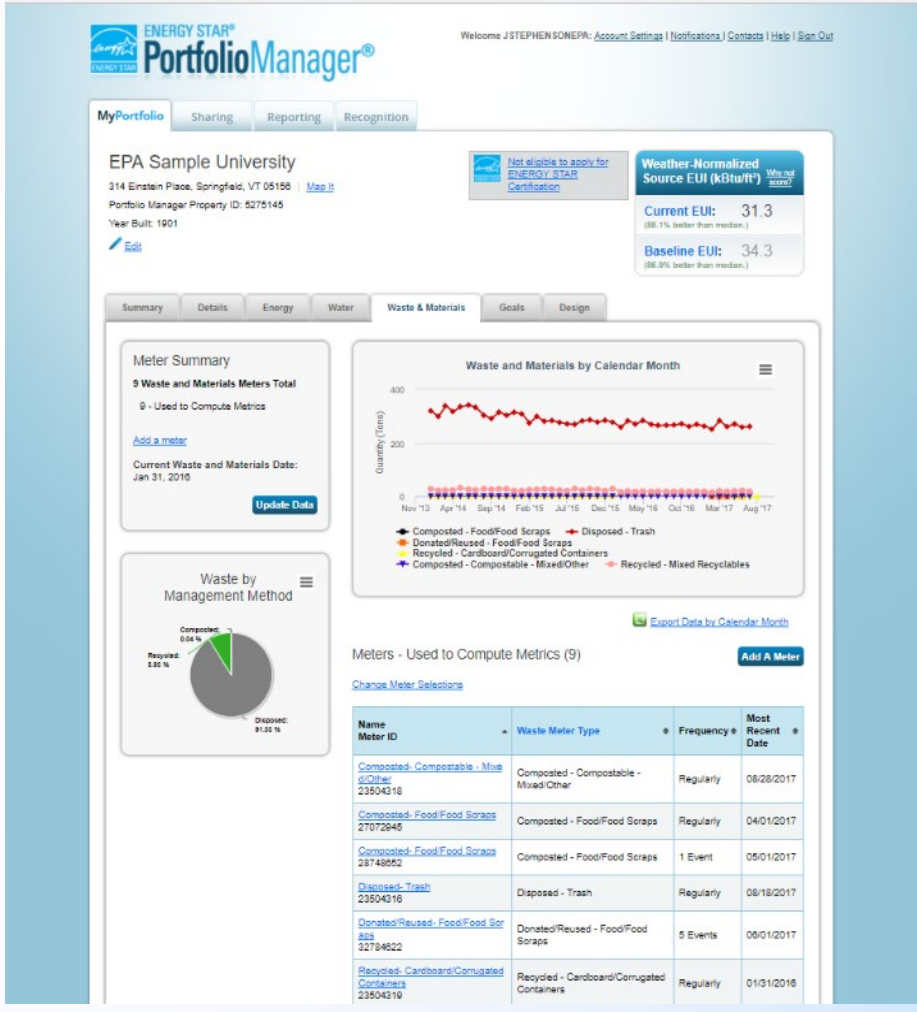
Web services

https://www.energystar.gov/buildings/owners_and_managers/existing_buildings/use_portfolio_manager/find_utilities_provide_data_benchmarking



Portfolio Manager Waste Tracking

- Design allows for flexibility and basic comparative analysis, recognizing that the type and quality of available waste and materials management data vary widely
  - Can track weights (pounds, tons) or volume of container & frequency its emptied (gallons, cubic yards)
  - Volume to weight conversions for most materials
- Within each management option, users can select from a broad list of 29 material categories to identify what they're tracking
- Tracking organized by 4 "management options" – how building operators think about the bins/dumpsters in a building:
  - Donated/Reused
  - Recycled
  - Composted
  - Disposed { Landfilled/ Incinerated/ Waste-to-Energy/ Don't Know



Materials for Tracking

- 29 Material Types
- 4 Methods of Management

Waste/Materials	Disposed	Donated/ Reused	Recycled	Composted
Appliances	x	x	x	
Batteries	x		x	
Beverage Containers (aluminum, glass, plastic)	x		x	
Building Materials - Carpet/Carpet Padding	x	x	x	
Building Materials - Concrete	x	x	x	
Building Materials - Mixed/Other	x	x	x	
Building Materials - Steel	x	x	x	
Building Materials - Wood	x	x	x	
Cardboard/Corrugated Containers	x	x	x	x
Compostable - Mixed/Other	x			x
Electronics	x	x	x	
Fats/Oils/Grease	x		x	
Food/Food Scraps	x	x		x
Furniture	x	x		
Glass	x	x	x	
Grass/Yard Trimmings	x			x
Lamps/Light Bulbs	x		x	
Mixed Recyclables	x		x	
Office Supplies	x	x		
Pallets	x	x	x	
Paper - Books	x	x	x	
Paper - Copy Paper	x		x	x
Paper - Mixed	x		x	
Plastics - Mixed	x		x	
Plastics - Wrap/Film	x		x	
Regulated Medical Waste	x			
Textiles/Clothing	x	x	x	
Trash	x			
Other	x	x	x	x

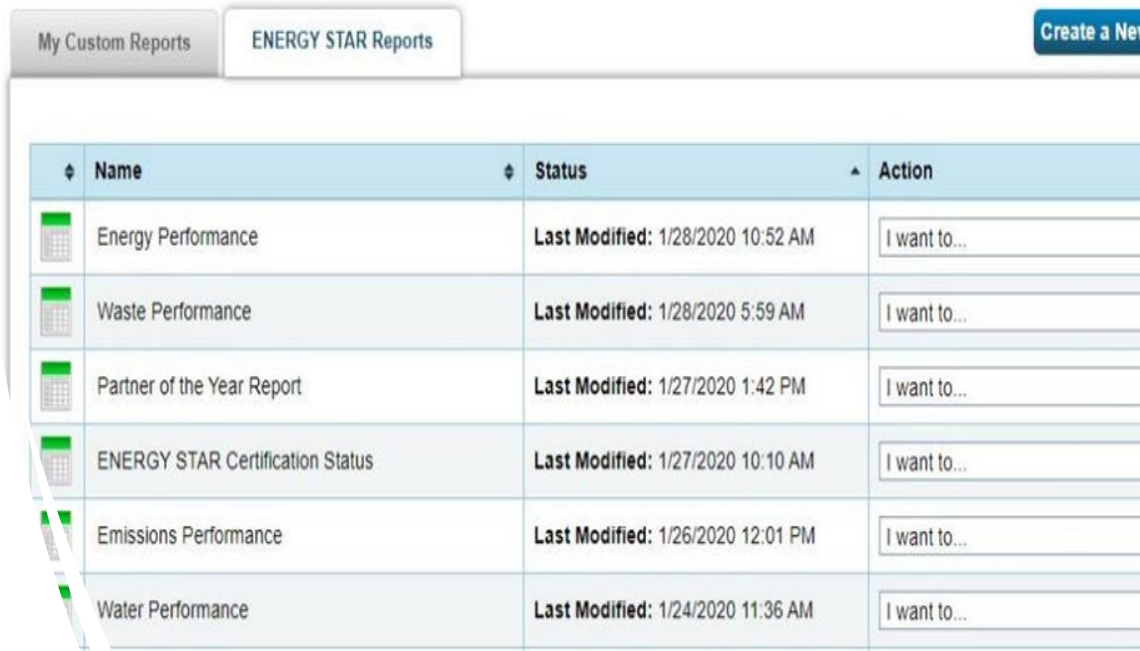
Frequency of Data

- **Regularly** – Meters for materials that are picked up on an ongoing basis (e.g. weekly pickup of trash and recycling). There are two basic paths:
  - Measured – Requires a weight or volume for each entry
    - Can be marked as “estimated” if it is a weight that the you/your customer estimate on your own
  - Container Size – Based on the size of the container
    - You/your customer enters a container size, and specifies the number of times it was emptied and the percent full

- **Intermittently** – Meters for infrequent or 1-time events (e.g. annual donation of electronics, or construction materials).

What to do with waste data

- Share it
- Report it
- Translate it



Easy Data Reporting

Users can easily share and submit data

Sharing

- Grant access to one or multiple properties to colleagues or other external partners
- Customize permissions to specify the view/edit rights
- Allows for ongoing access to the property's data

Reporting

- Submit data by responding to a data request
- Release the information specified by the requestor for the designated time period
- Receive a confirmation email with a receipt and copy of the data submitted

Waste and Material Management Metrics

- **Overall Aggregate Metrics**
  - Total Waste (Disposed and Diverted)
  - Total Diverted Materials
    - Includes: Recycled, Composted, and Donated/Reused Materials Only
    - Does not include: waste-to-energy because in this case the waste is still destroyed
  - Total for each management method (e.g. Disposed, Recycled)
  - Total for each disposal destination (e.g. Landfill, Incineration, Waste-To-Energy)
- **Detailed Metrics each type of waste (e.g. Recycled – Cardboard)**
  - Total Cost and Tons
  - Estimated Data Flag
- **All metrics can be pulled in a custom report and download to Excel**
  - If you want to create different aggregate metrics you can
  - Can perform your own calculations for universal waste, energy recovery, or other areas of interest relative to your sustainability goals.

Waste Reduction Model (WARM)

What it is:

A spreadsheet/downloadable tool that calculates and totals the GHG emissions and energy savings of baseline and alternative waste management practices, including source reduction, recycling, combustion, composting, anaerobic digestion and landfilling

Use it to:

- Quantify the greenhouse gas and energy associated with waste management activities by material type
- Compare GHG impacts of different activities
- Model scenarios

Where to find it:

www.epa.gov/warm

Data needed:

Tonnage of materials (by material type) source reduced, recycled, composted, anaerobically digested, combusted or landfilled

Greenhouse Gas Equivalencies Calculator

What it is:

An online calculator that translates abstract measurements into concrete terms you can understand, such as the annual emissions from cars, households, or power plants

Use it to:

- To make units like $MTCO_2E$ understandable
- Improve your communications on your Tribe's GHG emissions savings

Where to find it:

www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

Data needed:

Any unit of energy or emissions data

Greenhouse Gas Equivalencies Calculator

If You Have Energy Data | If You Have Emissions Data

Amount	Unit	Gas
100	Metric Tons	CO_2 - Carbon Dioxide or CO_2 Equivalent*
	Metric Tons	Carbon or Carbon Equivalent
	Metric Tons	CH_4 - Methane
	Metric Tons	N_2O - Nitrous Oxide
	Metric Tons	HCFC-22 - Hydrofluorocarbon gases
	Metric Tons	CF4 - Perfluorocarbon gases
	Metric Tons	SF_6 - Sulfur Hexafluoride

Calculate

*If your estimated emissions of methane, nitrous oxide, or other non-CO_2 gases are already expressed in CO_2 equivalent or carbon equivalent, please enter your figures in the row for CO_2 or carbon equivalent.

Equivalency Results How are they calculated?

The sum of the greenhouse gas emissions you entered above is of Carbon Dioxide Equivalent. This is equivalent to:

100 Metric Tons

Greenhouse gas emissions from

21.6 Passenger vehicles driven for one year	248,139 Miles driven by an average passenger vehicle

CO_2 emissions from

11,252 gallons of gasoline consumed	9,823 gallons of diesel consumed	110,186 Pounds of coal burned	1.3 tanker trucks' worth of gasoline
11.5 homes' energy use for one year	16.9 homes' electricity use for one year	0.55 railcars' worth of coal burned	232 barrels of oil consumed
4,088 propane cylinders used for home barbeques	0 coal-fired power plants in one year	12,753,222 number of smartphones charged	

EPA

Helpful Resources

Waste FAQs

https://portfoliomanager.zendesk.com/hc/en-us/categories/202589637-Waste-Benchmarking-NEW-Aug-2016

ENERGY STAR Buildings Training Page

https://www.energystar.gov/buildings/training

Additional Waste-Specific resources are being development

Managing and Reducing Wastes: A Guide for Commercial Buildings

https://www.epa.gov/smm/managing-and-reducing-wastes-guide-commercial-buildings

EPA's conversion factors for waste

https://www.epa.gov/smm/volume-weight-conversion-factors-solid-waste

Questions?

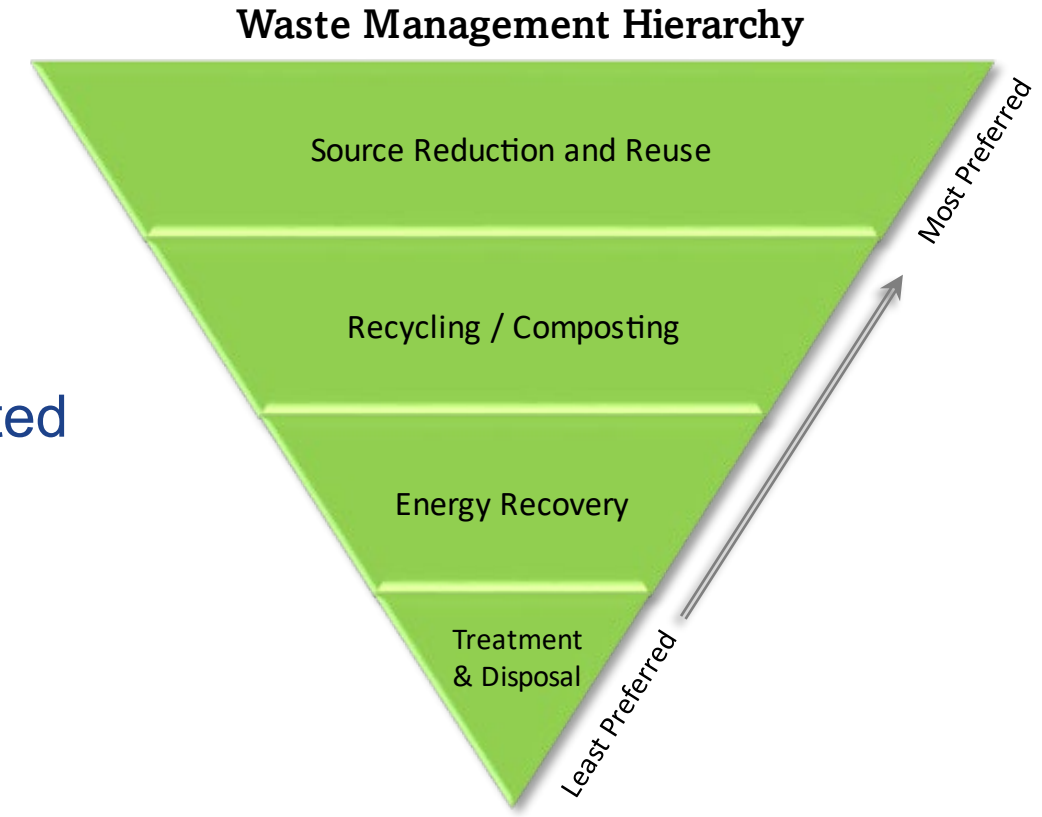
If after this webinar you have any questions on Portfolio Manager, contact me at stephenson.jenny@epa.gov

Subodh Chaudhari

Oak Ridge National Laboratory

Waste Management

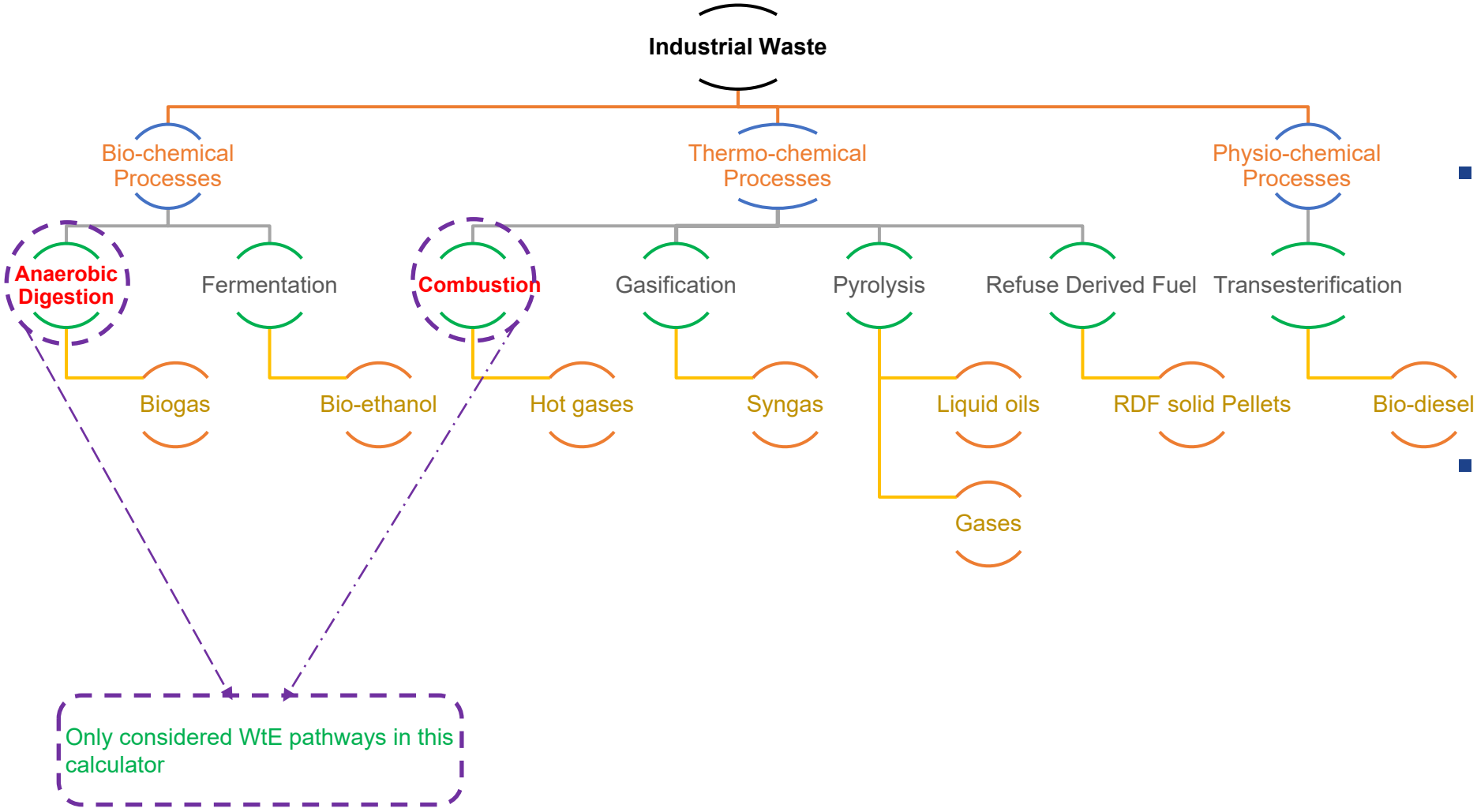
- Waste reduction
- Waste Management and Treatment
  - Hierarchy
  - Not all waste material streams can be eliminated
- Landfill
  - High contamination of soil and water
  - Methane emissions
  - Wildlife



Energy Recovery

- Waste-to-Energy (WtE)
  - Treatment processes that are used to extract energy from non-recyclable waste steams
    - Heat
    - Electricity
    - Gaseous fuels
    - Liquid fuels
    - Solid fuels
- Applicable waste streams
  - Solid wastes – plastic, cardboard, wood dust/shavings, tires, etc.
  - Semi-Solid wastes – food waste, waste-water sludge
  - Liquid wastes – Organic food & beverage waste

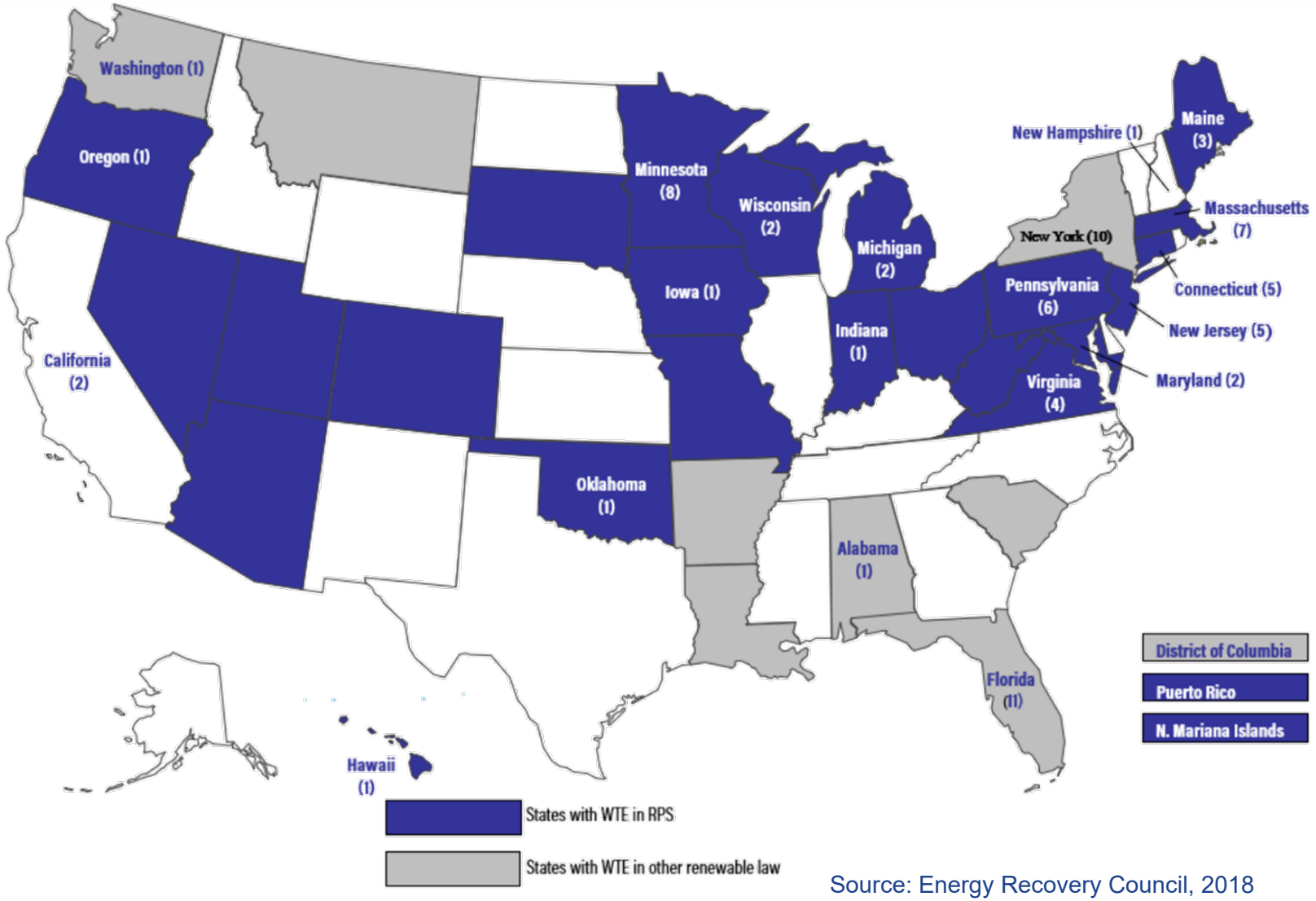
Energy Conversion Pathways for Waste



- 3 main conversion processes
  - Bio-chemical
  - Thermo-chemical
  - Physio-chemical
- Recovered energy
  - Flue gas
  - Methane, Syngas
  - Ethanol, Bio-diesel
  - RDF Pellets

Source: Energy Recovery Council, 2018

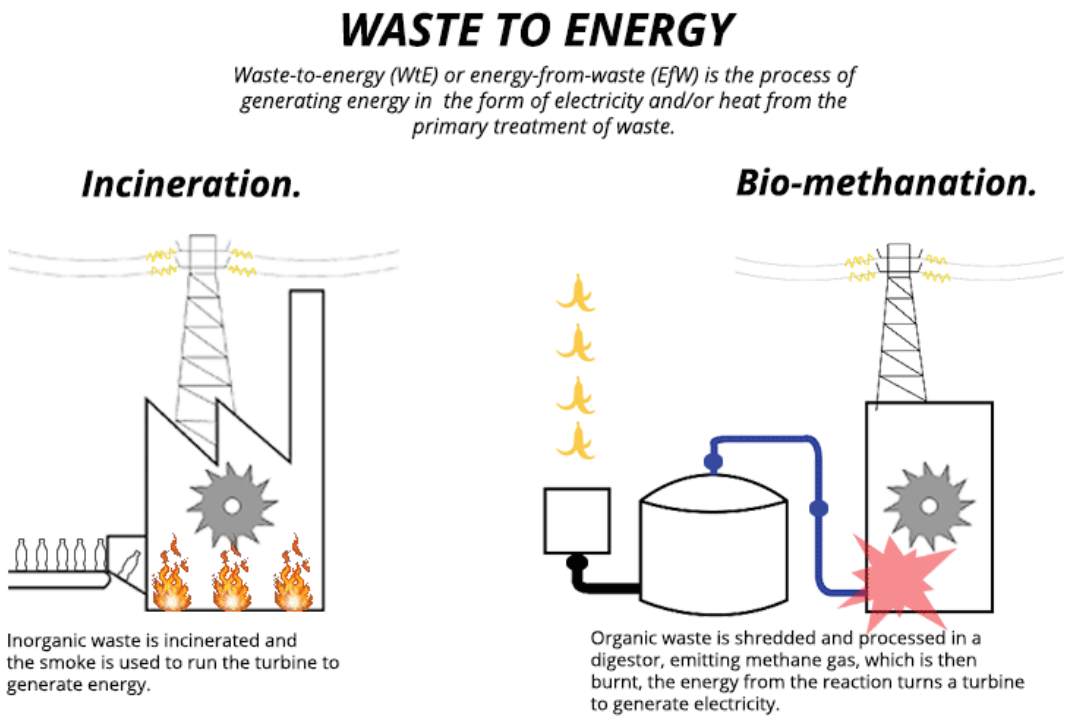
States Defining WTE as Renewable



Source: Energy Recovery Council, 2018

- RPS: Renewable Energy Portfolio Standard
  - RPS is regulatory mandate to increase production of energy from renewable sources such as wind, solar, biomass and other alternatives
- WTE is classified as renewable which enables selling of credits in energy trading markets

Waste to Energy



Source: Pai, N., Swa-oorja : Envisioning a Zero Waste in Pune, VIT, Pune India, 2017

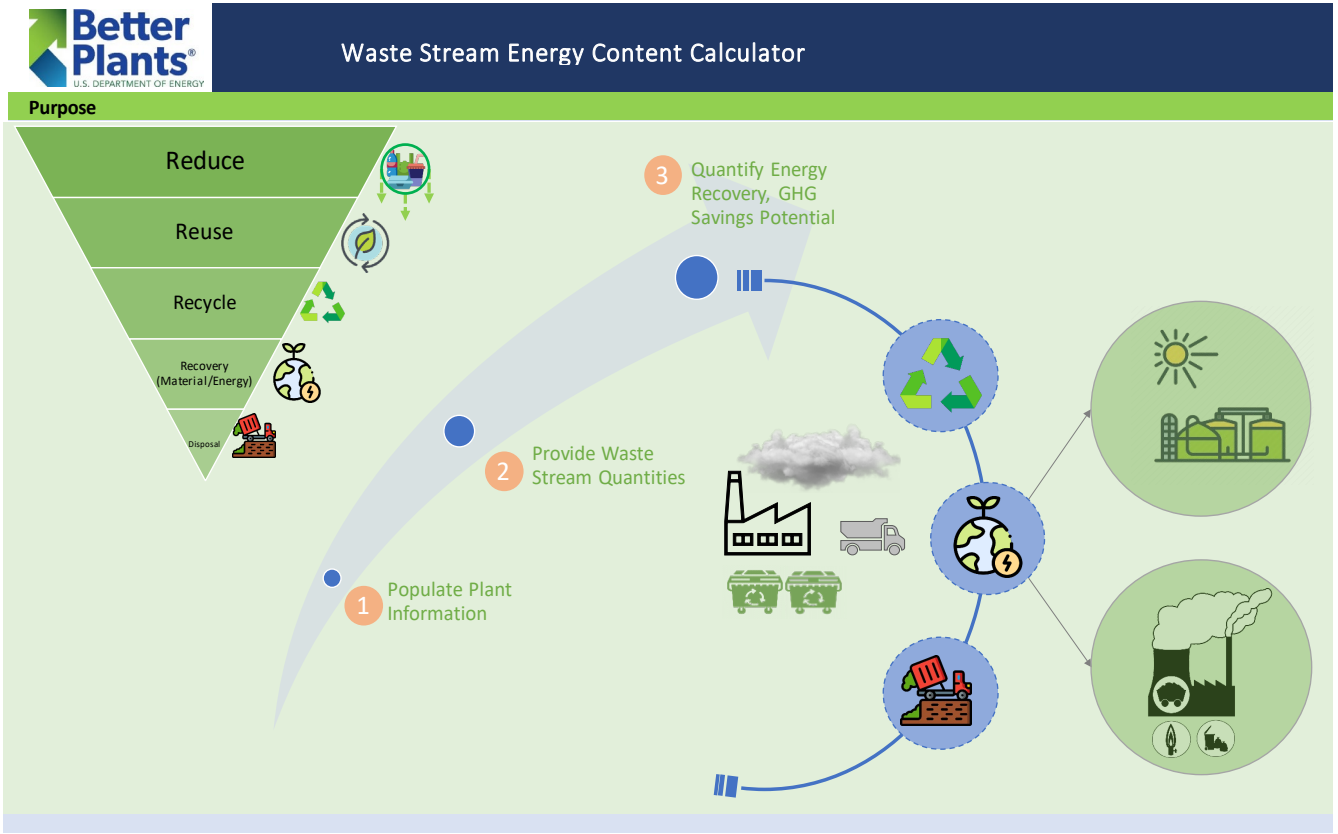
- Two most common pathways for energy conversion
  - Combustion of Waste (Incineration)
    - Mostly inorganic wastes
  - Anaerobic Digestion (Bio-methanation)
    - Mostly organic wastes

Heat contents for select components of municipal solid waste

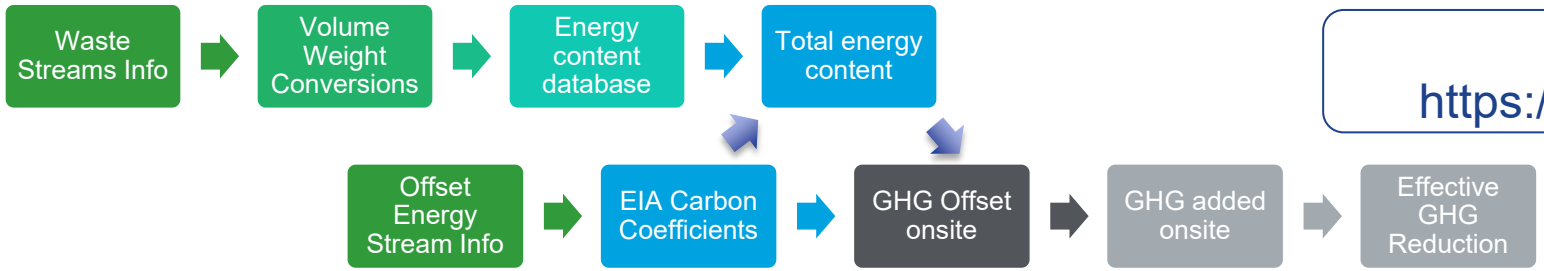
Biogenic	Heat content (MMBtu/ton)	Non-biogenic	Heat content (MMBtu/ton)
Newsprint	16	Rubber	26.9
Paper	6.7	PET (polyethylene terephthalate)	20.5
Containers and packaging	16.5	HDPE (high-density polyethylene)	19.5
Textiles	13.8	PVC	16.5
Wood	10	LDPE/LLDPE (low-density polyethylene)	24.1
Food waste	5.2	PP (polypropylene)	38
Yard trimmings	6	PS (polystyrene)	20.5
Leather	14.4	Other (plastic)	18.1
Average	**11.1**	**Average**	**23**

Source: U.S. Energy Information Administration, based on U.S. Environmental Protection Agency, 2010 MSW Facts and Figures Factsheet.

Waste Stream Energy Content Calculator



- Quick evaluation of energy content from most common waste streams
- Analyzes three scenario pathways for energy generation –
  - Combustion
  - Anaerobic digestion
  - Combination of combustion and anaerobic digestion
- Cost and GHG Impact Analysis
  - CO_2eq. impact on site emissions
  - Cost savings



Find this tool at
https://energyefficiency.ornl.gov/tools-training/

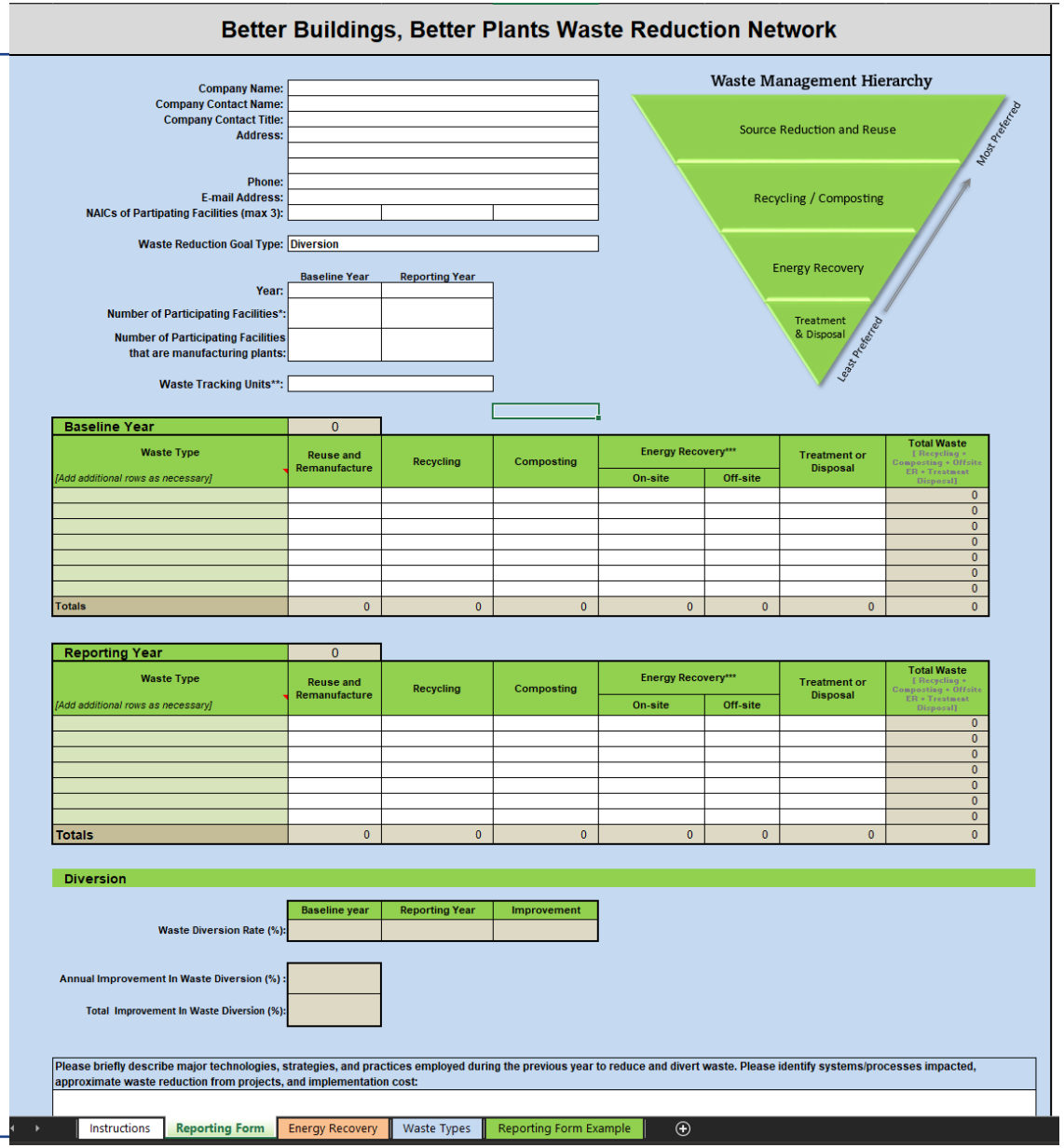
Waste Streams Energy Content Calculator DEMO

Waste Reduction Network Data Report Form

- Provide participants a useful tool to record and share waste data
  - Excel form
  - Streamline the data format
- Allows for partners to track progress on different types of waste reduction goals
- Instructions
- Reporting form (main)
  - Goal type
  - Baseline year
  - Reporting year
  - Progress Calculation – Average Annual and Total progress;
  - Project details
- Energy Recovery (optional)
- Waste Types
- Example reporting form (example)

Reporting Form

- Major changes from last version
  - Goal type
  - Energy recovery column
  - Total waste calculation
  - Different goal types progress calculations
- Other minor updates



Better Buildings, Better Plants Waste Reduction Network

Company Name:
Company Contact Name:
Company Contact Title:
Address:
Phone:
E-mail Address:
NAICs of Partipating Facilities (max 3):

Waste Reduction Goal Type: Diversion

	Baseline Year	Reporting Year
Year:		
Number of Participating Facilities*:		
Number of Participating Facilities that are manufacturing plants:		

Waste Tracking Units**:

Waste Management Hierarchy

Baseline Year: 0

Waste Type [Add additional rows as necessary]	Reuse and Remanufacture	Recycling	Composting	Energy Recovery*** On-site	Energy Recovery*** Off-site	Treatment or Disposal	Total Waste [Recycling + Composting + Offsite ER + Treatment Disposal]
							0
							0
							0
							0
							0
							0
							0
Totals	0	0	0	0	0	0	0

Reporting Year: 0

Waste Type [Add additional rows as necessary]	Reuse and Remanufacture	Recycling	Composting	Energy Recovery*** On-site	Energy Recovery*** Off-site	Treatment or Disposal	Total Waste [Recycling + Composting + Offsite ER + Treatment Disposal]
							0
							0
							0
							0
							0
							0
							0
Totals	0	0	0	0	0	0	0

Diversion

	Baseline year	Reporting Year	Improvement
Waste Diversion Rate (%):			

Annual Improvement In Waste Diversion (%) :
Total Improvement In Waste Diversion (%):

Please briefly describe major technologies, strategies, and practices employed during the previous year to reduce and divert waste. Please identify systems/processes impacted, approximate waste reduction from projects, and implementation cost:

Instructions | Reporting Form | Energy Recovery | Waste Types | Reporting Form Example

Reporting Form DEMO

Q & A