



Waste Reduction pilot

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Better Buildings, Better Plants

- What is **Better Plants**? A free, voluntary, partnership program for **manufacturers** and industrial organizations
- Through Better Plants:
 - Partners set long-term efficiency goals
 - Receive **technical assistance, networking platforms, recognition, access to innovation**
- Manufacturers have two opportunities to engage in Better Plants:
 1. Broader-based **Program** level
 2. Higher-level **Challenge**



Productivity. Cost Savings. Competitiveness.

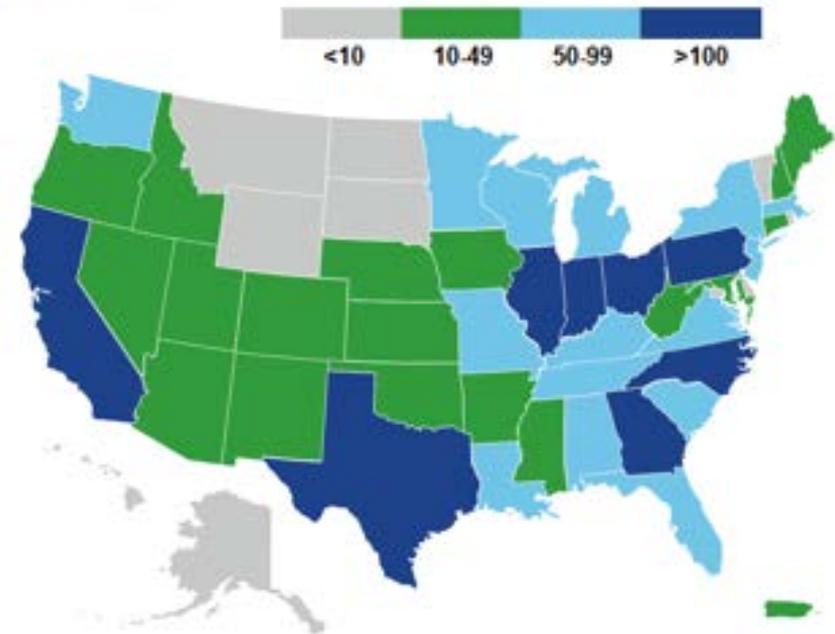
Better Plants Overview

Energy savings and program footprint continue to grow

Better Plants Snapshot

Accomplishments	Total
Number of Partners	223
Approximate Number of Plants	3,200
Percent of U.S. Manufacturing Energy Footprint	12%
Reported Savings	
Cumulative Energy Savings (TBtu)	1.35
Cumulative Cost Savings (Billions)	\$6.7
Cumulative Avoided CO ₂ Emissions (Million Metric Ton)	77.8
Average Annual Energy Intensity Improvement Rate	2.6%

Regional Distribution of Better Plants Facilities



60 goal achievers total, 7 this year

Where we are Today

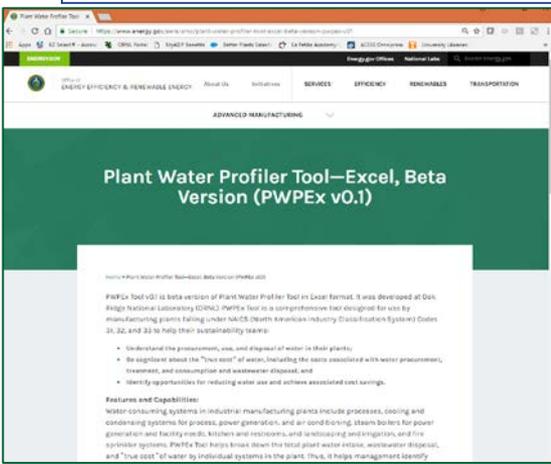
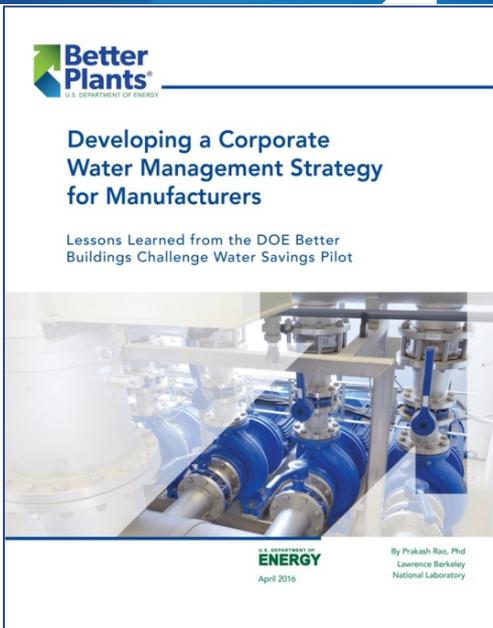
Better Buildings, Better Plants Challenge:

- Energy efficiency
- Water efficiency

What is the next leadership challenge?

Past Efforts to Engage Partners: Water Pilot

- 2014:Pilot with 20+ partners across BBBP
- 2016:Open to all partners
- Now:
 - > 40 partners in Better Buildings, Better Plants
 - 10 Goal achievers already
 - ~100 water efficiency solutions
 - Plant Water Profiler tool
 - <https://www.energy.gov/eere/amo/plant-water-profiler-tool-excel-beta-version-pwpex-v01>
 - Water management guidance document
 - Webinar: How to start a water management program
 - Water Efficiency In Plant training



Solid Waste in the U.S.

- Manufacturing generates 2.7B tons of non-hazardous industrial solid waste annually
- Municipal solid waste roughly 260 million tons/year
- Energy is required to transport and dispose of waste
- Large volumes of waste prevent achievement of the circular economy



Why Waste Reduction?

- Supports the DOE's national energy performance goals. Because energy is used to manufacture commodity products, waste reduction measures in manufacturing can lead to reduced energy intensity.
- Waste reduction can serve as an important resilience strategy as some raw materials or intermediate goods can become scarce due to natural disasters or supply chain instability. Materials recycling also generally leads to energy savings as less energy is required to process secondary materials relative to primary materials.
- Since energy is required to transport and treat waste, reducing waste saves energy.
- Aligns with REMADE objectives, therefore can serve as a field validation and recruitment mechanism for this institute.



Ex: Additive Mfg. results in less material demand

Shifting to waste-minimizing circular economy could unlock \$4.5 trillion in GDP growth by 2030.

Sample Waste Reduction Opportunities Across Sectors

- Textiles – computer programs determine how to cut fabric to minimize scrap.
- Aluminum & steel reuse in-plant scrap.
- Pulp & paper sector has increased the ratio of recycled paper in the feedstock mix. Due to these efforts the “utilization rate” of recovered paper (the ratio of recovered paper consumption to total production of paper and board) grew from 22.8% in 1970 to 38.5% in 2001.
- Petroleum refining has recycled & reused feedstocks and has steadily increased the amount of residual wastes that are recycled from 26% in 1985 to 62% in 1997.
- Chemicals sector on-site recycling of feedstocks increased by 12% between 1995 and 1996 and energy recovery increased by nearly 6% in that period.

Partner Interest is Strong

- Within Better Plants, at least 24 challenge partners and 1 program partner have waste reduction goals
- Many Better Buildings partners have waste reduction goals
- Average improvement rate is around 4.8%/year
- Some partners have different goals for different business units & processes
- Many partners have 10-year goals, which can align with Better Buildings/Better Plants

Partner Examples

- **Procter & Gamble** achieved zero waste status in more than 80% of their facilities around the world and are working on new innovations to fully achieve zero waste to landfill in the remaining facilities.
- **Toyota's** North American facilities reduced, reused or recycled 96 percent of their non-regulated waste in 2015 — totaling over 900 million pounds. It now has 27 North American facilities that meet the council's definition of a zero-waste site, including 10 manufacturing plants.
- **3M** set goals to reduce manufacturing waste by an additional 10%, indexed to sales, and to achieve “zero landfill” status at more than 30% of manufacturing sites. They continue to drive ‘zero waste’ thinking with their product designs and process technologies, as well as waste reduction work at their manufacturing operations.



TOYOTA

3M

Waste Pilot

- Launched at 2019 Better Buildings/Better Plants Summit
- 27 partners across Better Buildings/Better plants
 - 16 Industrial partners
 - 11 Buildings partners
- Pilot partner statements indicate:
 - 100% want to learn/share best practices from other partners
 - 50% hope to access innovation from DOE
 - 80% use a waste intensity metric
 - 40% want help with waste data
 - 60% use 3rd parties to help recycle/divert waste from landfills

Waste Pilot Structure & Goals

- Cohort approach across programs & sectors
- Partners each set goal
- Annual tracking and reporting to understand energy implications
- Quarterly webinars to share best practices/resources

By end of pilot, goals are:

- Better understanding of leadership in waste reduction
- Appropriate goals for partners moving forward
- Guidance/Summary of solutions for others
- Develop resources for metrics, tracking, reporting, assistance
- Identify technology gaps that can inform R&D

Waste Metrics Determined (thus far)

Measurement

- Material (lbs., KG, tons, cubic feet/yards)
- Waste water (gallons, liters, cubic yards, etc.)

Context/Normalization

- Units of production
- Volume of sales
- Production hours
- Patient days (healthcare facilities)

Example:

Lbs. of waste to landfill/unit of production

Waste Pilot Resources (thus far)

Taxonomy of Waste

- Define waste streams
- Identify solutions

Circular Economy

- REMADE roadmap
- AMO white paper

Preliminary Sector Analyses

- Iron & Steel
- Aluminum
- Paper
- Yogurt
- Glass

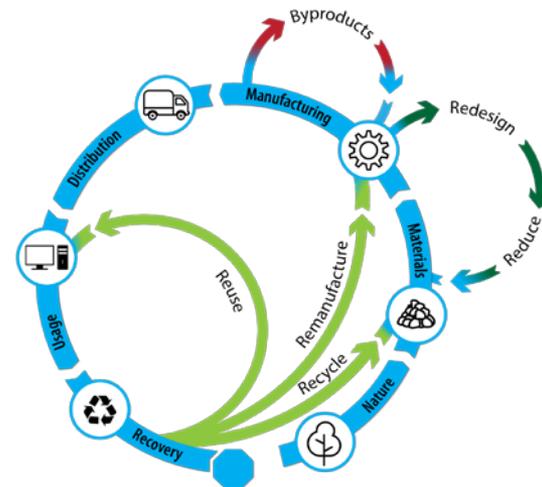
Waste Streams and New Solutions

Waste Streams

- Production wastes
- Office wastes
- Food wastes
- Incoming packing
- Product packaging
- Return products/end of life
- Construction wastes
- Waste water
- Agricultural wastes

Solutions

- Redesign product
- Redesign process
- Remanufacture
- Conversion (turn into new product)
- Recycle for parts
- Recycle for raw material
- Energy recovery (on-site/off-site)
- Incineration (on-site/off-site)
- Landfill



Waste Pilot Partners

Partner Name

Program

Schneider Electric	Better Plants
VHA - West Palm Beach Medical Center	Data center accelerator
Jamestown LP	Buildings
Electrolux	Better Plants
The Hartford Company	Buildings
Commonwealth Partners	Buildings
Shorenstein	Buildings
LADWP	Better Plants
Beaverton, OR	Buildings
UW Health	Buildings
NSK Americas	Better Plants
Martin Guitar	Better Plants
LBNL	Lab accelerator
Tower Company	Buildings
Flowers Foods	Better Plants
Parkway Properties	Buildings
Harbec	Better Plants
Volvo Group	Better Plants
FMC	Better Plants
Sugar Creek Packing	Better Plants
PPC Online	Better Plants
JCI	Better Plants
Bristol Myers Squibb	Better Plants
Nissan	Better Plants
Tenderloin Neighborhood Development Corporation	Buildings
UTC	Better Plants

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