

U.S. DEPARTMENT OF  
**ENERGY**

Office of  
**ENERGY EFFICIENCY &  
RENEWABLE ENERGY**

# DOE Women Leading Sustainable Energy Collaborations

Earth Day Webinar

April 16, 2020



# DOE–EERE’s Earth Day Webinar

- Earth Day celebrates its 50<sup>th</sup> year
- Webinar hosted by BioComms in collaboration with the U.S. Department of Energy’s (DOE’s) Office of Energy Efficiency and Renewable Energy (EERE)





# DOE Women Leading Sustainable Energy Collaborations



**Dr. Valerie Reed**  
Deputy Director, Bioenergy  
Technologies Office (BETO)



**Valri Lightner**  
Deputy Director, Advanced  
Manufacturing Office (AMO)



**Alison Hewett**  
Senior Research Analyst, Water  
Power Technologies Office  
(WPTO)

# Dr. Valerie Reed

Deputy Director, Bioenergy Technologies Office (BETO)



# Dr. Valerie Reed, Deputy Director, BETO

# SCIENCE IS EVERYWHERE





# BETO and the Bioeconomy

## The Bioeconomy Concept

### Round Wood and Woody Energy Crops

#### Woody Residues



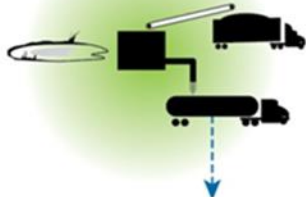
#### Solid Urban Residues and Municipal Solid Wastes



### Herbaceous Residues and Energy Crops



### Algae and Other Microcrops



#### Hydrolysis and Fermentation



#### Combustion



#### Gasification



#### Refining



#### Liquid Fuels



#### Chemicals



#### Ethanol



#### Electricity



#### Heat & Steam

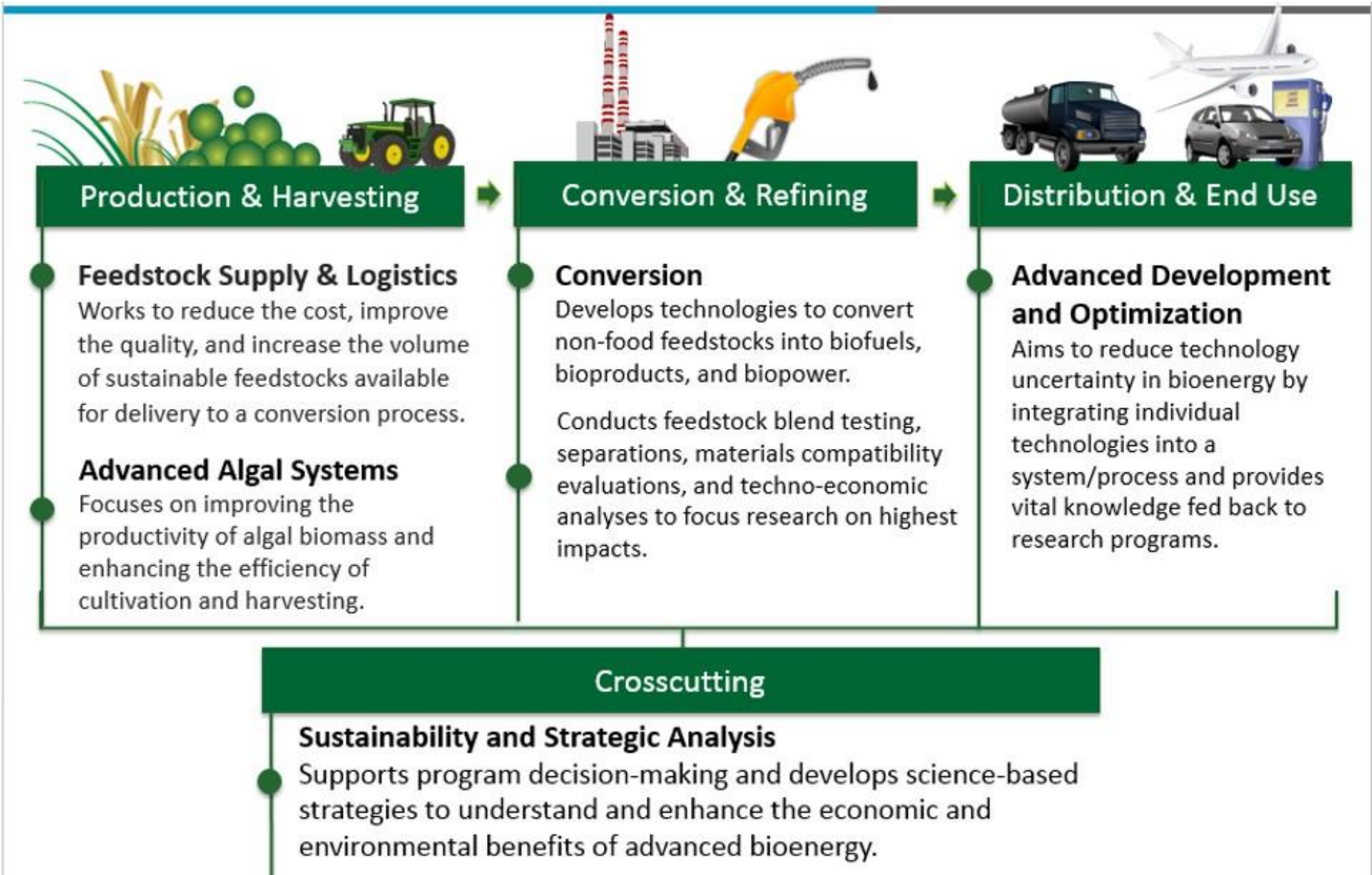
- Revenue and economic growth
- Broad spectrum of new jobs
- Rural development
- Advanced technologies and manufacturing
- Reduced emissions and environmental sustainability
- Export potential of technology and products
- Positive societal changes
- Investments and new infrastructure

# Biomass Research & Development (BR&D) Board

- The Biomass Research and Development Act of 2000 established the Interagency **Biomass R&D Board**, the **Technical Advisory Committee**, and the **Biomass R&D Initiative (BRDi)**
- The BR&D Board facilitates coordination among federal government agencies that affect the research, development, and deployment (RD&D) of biofuels and bioproducts
- Along with Co-Chairing the Board with the U.S. Department of Agriculture, DOE's role is fundamental through applied RD&D to reduce cost and risk of investment in the bioeconomy



# BETO's Critical Program Areas







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# Thank you –

for additional information and to subscribe  
to the BETO newsletter:

[energy.gov/eere/bioenergy](https://energy.gov/eere/bioenergy)



# Valri Lightner

Deputy Director, Advanced Manufacturing Office (AMO)





# Valri Lightner: Career Path Advanced Manufacturing Office



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Leverage a range of experience in a leadership role

Broaden experience to include multiple technical areas

Manage a technology-specific project portfolio

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Work at a manufacturing facility for a hands-on foundation



# Why Advanced Manufacturing?

AMO works to increase energy and material efficiency in manufacturing to drive energy productivity and economic growth.

MANUFACTURING

Uses roughly 25% of the nation's primary energy



Represents nearly 80% of energy use in energy-intensive sectors



Generates 11% of the U.S. GDP and 13 million jobs



Incurs \$200 billion in energy costs annually

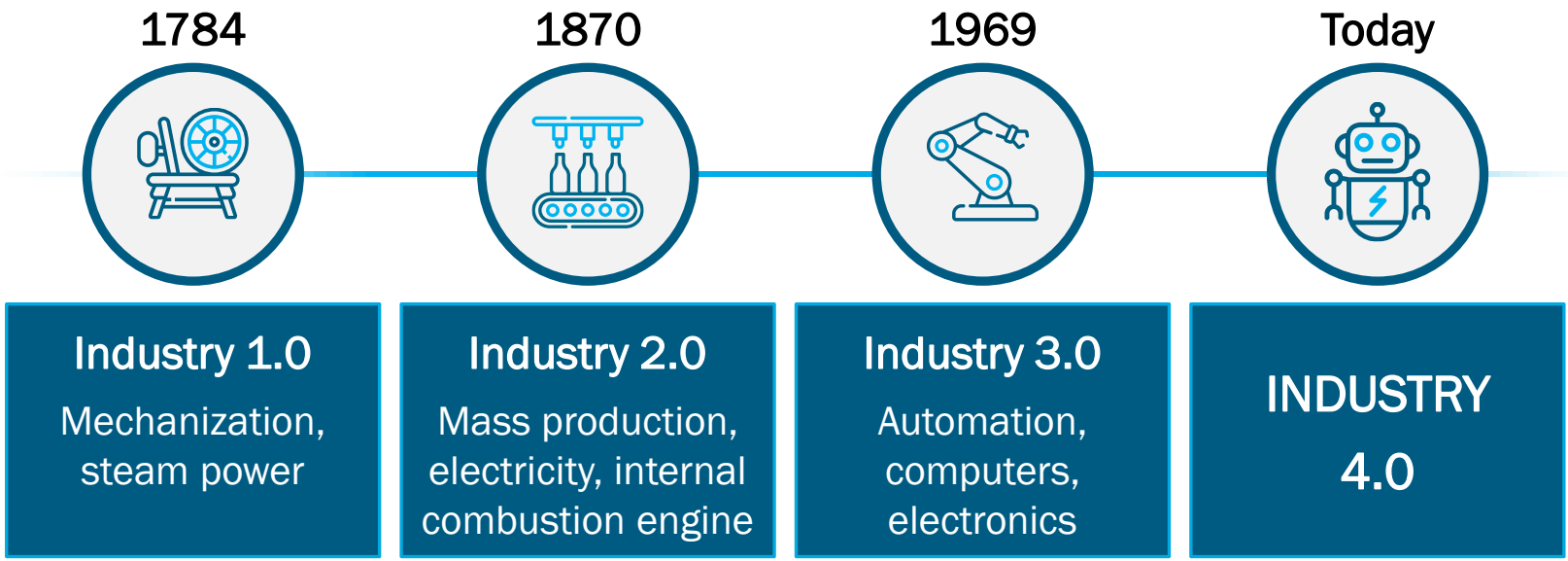


AMO FOCUS AREAS

Additive Manufacturing  
Chemical Manufacturing R&D  
Circular Economy  
Combined Heat and Power  
Critical Materials  
Dynamic Catalyst Science  
Energy Storage  
Industrial Decarbonization  
Materials for Harsh Service Conditions  
Water Security

# Future of Manufacturing: AMO Legacy

INDUSTRIAL  
REVOLUTIONS



## THE AMO ROLE

Support innovation for the **productivity, competitiveness, energy efficiency, and security** of U.S. manufacturing and its workforce

## FUTURE CHARACTERISTICS

Data Driven ♦ Artificial Intelligence-Informed  
Distributed Manufacturing ♦ Internet of Things  
Circular Economy ♦ Additive Manufacturing



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# Thank you –

for additional information and to subscribe  
to the AMO newsletter:

[energy.gov/eere/amo/advanced-manufacturing-office](https://energy.gov/eere/amo/advanced-manufacturing-office)





# Alison Hewett

Senior Research Analyst, Water Power Technologies Office (WPTO)



# About Alison Hewett

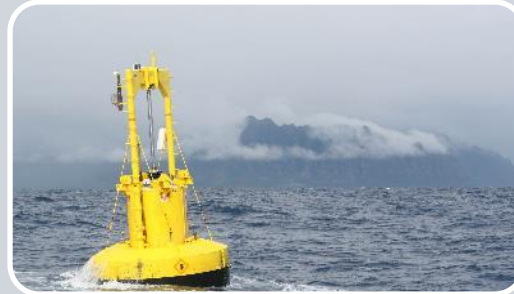


# About the Water Power Technologies Office (WPTO)

WPTO enables research, development, and testing of emerging technologies to advance **marine energy** and **next-generation hydropower** and **pumped storage systems** for a flexible, reliable grid.



WPTO invests in early stage research to accelerate development of innovative water power technologies, while ensuring that long term sustainability and environmental issues are addressed.



WPTO supports efforts to validate performance and grid reliability for new technologies, develop and increase accessibility to necessary testing infrastructure, and evaluate systems level opportunities and risks.



WPTO aggregates, analyzes, and disseminates relevant, objective, and technical information on water power technologies and related issues to stakeholders and decision makers.



# Many Different Opportunities in Water Power

## Hydropower



Upgrades for Existing Hydropower



Non-Powered Dams and Conduits



New Low-Impact Projects



Pumped Storage

## Marine and Hydrokinetics (MHK)



Wave



Tidal



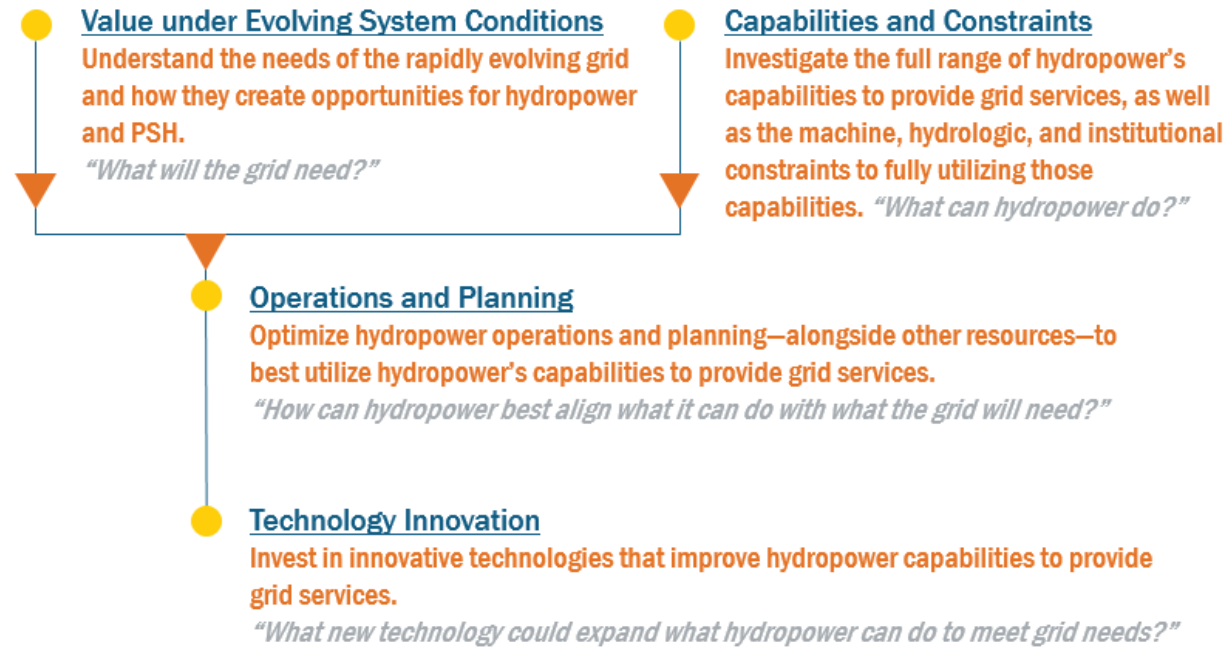
River Current



Ocean Currents

# Key WPTO Initiative: HydroWIRES

- **Hydropower and Water Innovation for a Resilient Electricity System (HydroWIRES)** aims to understand, enable, and improve hydropower and PSH’s contributions to grid reliability, resilience, and integration in a rapidly evolving electricity system.



# Key WPTO Initiative: Powering the Blue Economy

- Potential market opportunities where marine energy may hold a unique value proposition to meet the energy needs of the blue economy.
- These markets can be broadly organized into two themes:
  - Providing power at sea to support offshore industries, science, and security activities
  - Meeting the energy and water needs of coastal and rural island stakeholders in support of resilient coastal communities







# Thank you –

for additional information subscribe to the WPTO newsletter:

## Subscribe to The Water Wire

The Water Power Technologies Office e-newsletter brings funding opportunities, events, publications, and activities directly to your inbox.

Visit our website for more information:

- [energy.gov/eere/water/water-power-technologies-office](https://energy.gov/eere/water/water-power-technologies-office)
- [energy.gov/eere/water/water-wire](https://energy.gov/eere/water/water-wire)

Email questions to:

- [Alison.Hewett@ee.doe.gov](mailto:Alison.Hewett@ee.doe.gov)




# Collaborations

# Dr. Valerie Reed, BETO





# The Plastics Problem

 BBC News

## Plastic pollution: 'Hidden' chemicals build up in seabirds

Plastic pollution can build up in the bodies of seabirds, adding to the threats they face in the wild, according to a new study. Researchers fed plastic pellets to ...

1 week ago



 Mother Jones

## Today's Special: Grilled Salmon Laced With Plastic

Nearly 50 years ago, scientists studying the North Atlantic Ocean started noticing that tiny fragments of plastic were turning up in their plankton ...

Sep 12, 2019



 NPR

## Plastics: What's Recyclable, What Becomes Trash — And Why

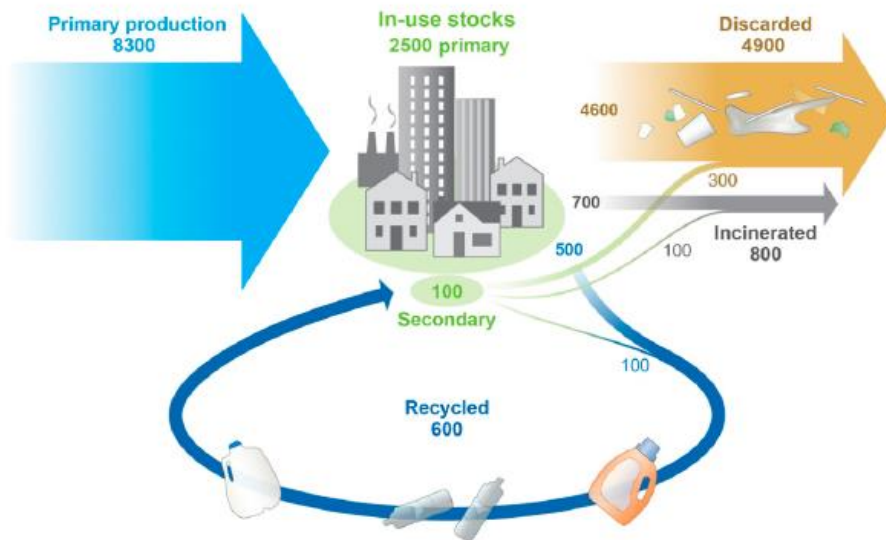
Every year, the average American goes through more than 250 pounds of plastic waste, and much of that comes from packaging. So what do ...

Aug 21, 2019



# Challenges and Opportunities for Polymer Upcycling

- Current recycling strategies are not cost-effective for many common plastics, providing little incentive for collection and remanufacture
- There are technical challenges that, if solved, could:
  - Provide more energy efficient and cost-effective pathways to use recycled plastics
  - Promote higher recycling rates by increasing the value of recycled plastics
  - Polymer upcycling:
    - Energy-efficient processes for converting plastics to high-value products
    - Represents an opportunity to address the Plastics Innovation Challenge



Source: Geyer et al. Science Advances 2017

## The Plastics Innovation Challenge:

- To make domestic processing of plastic waste economically attractive and energy efficient, presenting an opportunity to keep valuable carbon as a secondary feedstock.
- Basic and applied research is required to design new approaches for upcycling discarded plastic.

# Plastics Innovation Challenge (PIC)

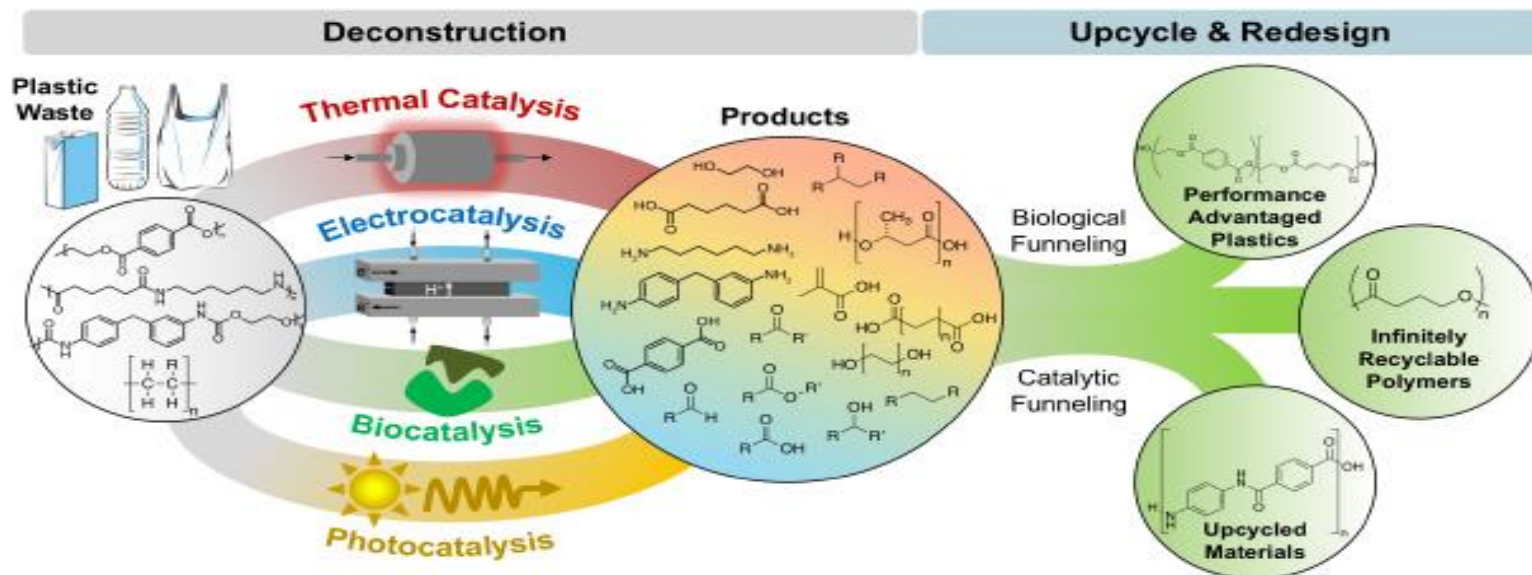
In November 2019, DOE launched the Plastics Innovation Challenge (PIC) to dramatically reduce plastic waste and position the United States as a leader in advanced plastic recycling technologies.

- PIC goals are for the United States to reach the following by 2030:
  - **Collection:** Develop novel collection technologies
  - **Deconstruction:** Develop biological and chemical methods for deconstructing plastic waste into useful chemical streams
  - **Upcycling:** Develop technologies to upcycle waste chemical streams into higher-value products
  - **Design for recyclability:** Develop new plastics that are recyclable-by-design and can be scaled for domestic manufacturability
  - **Commercialization:** Support a domestic plastics upcycling supply chain for U.S. companies to scale and deploy new technologies

**AMO, BETO, and WPTO will use a variety of funding opportunities, partnerships, and other programs to achieve PIC goals.**



# Plastics Innovation Challenge Alignment with BETO, AMO, WPTO



# Valri Lightner, AMO



# Energy Storage Grand Challenge

GOAL

U.S. global leadership in energy storage utilization and exports with a secure domestic manufacturing supply chain independent of foreign sources of critical materials.

DOE FOCUS

Accelerate scale-up of **emerging manufacturing processes**



Improve **critical materials supply chain resilience**

Address **technical barriers** in production and manufacturing

## FIVE INTEGRATED TRACKS

**TECHNOLOGY DEVELOPMENT**  
Office of Electricity

**TECHNOLOGY TRANSITION**  
Office of Technology Transitions

**POLICY AND VALUATION**  
Office of Energy Efficiency and Renewable Energy

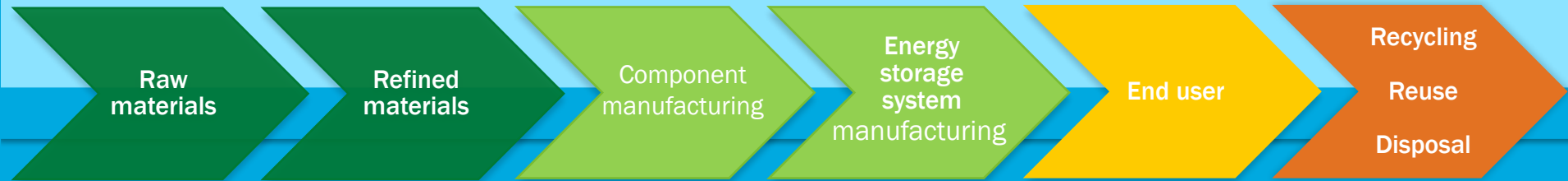
**DOMESTIC MANUFACTURING AND SUPPLY CHAIN**  
Office of Energy Efficiency and Renewable Energy

**WORKFORCE DEVELOPMENT**  
Office of Science



# Energy Storage Technologies and Supply Chains

Pursuing integrated research and technology development across the manufacturing supply chain.



## R & D AREAS

- Manufacturing process intensification
- Critical materials use and sourcing
- Roll-to-roll manufacturing capabilities
- Membrane manufacturing processes
- New materials and manufacturing processes for harsh service environments
- Water desalination and purification
- Combined heat and power systems

## POTENTIAL TECHNOLOGIES

- Flow batteries
- Thermal energy storage
- Lithium-based batteries
- Non-lithium-based solid-state batteries
- Hydrogen generation and storage
- Compressed air energy storage
- Pumped hydro
- Synthetic fuels (e.g., synbiogas)
- And others

# On the Energy Storage Grand Challenge Horizon

## Stakeholder Workshops

- **March 16:** Virtual manufacturing specific workshop
- Additional workshops to be scheduled throughout the remainder of 2020

## Upcoming Announcements

- Request for Information
- Energy Storage Grand Challenge Roadmap

## Opportunities to Learn More

- Visit: <https://www.energy.gov/energy-storage-grand-challenge/energy-storage-grand-challenge>

# Alison Hewett, WPTO







Advance transformational technology and innovation through U.S. manufacturing leadership to meet the global need for safe, secure, and affordable water.

By 2030:

1. Launch desalination technologies that deliver cost-competitive clean water.
2. Transform the energy sector's produced water from a waste to a resource.
3. Achieve near-zero water impact for new thermoelectric power plants, and significantly lower freshwater use intensity within the existing fleet.
4. Double resource recovery from municipal wastewater.
5. Develop small, modular energy-water systems for urban, rural, tribal, national security, and disaster response settings.



Waves to Water Prize

up to \$2.5 million in prizes

in progress  
enter by 03/13/2020



Water Resource Recovery Prize

\$1 million in prizes

open  
enter by 04/28/2020



Solar Desalination Prize

millions in prizes

coming soon

[energy.gov/eere/water-security-grand-challenge](https://energy.gov/eere/water-security-grand-challenge)



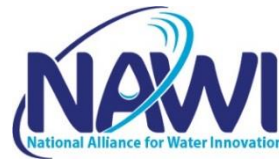


**Project Goals** – Execute an integrated, early-stage applied research program along four topic areas:

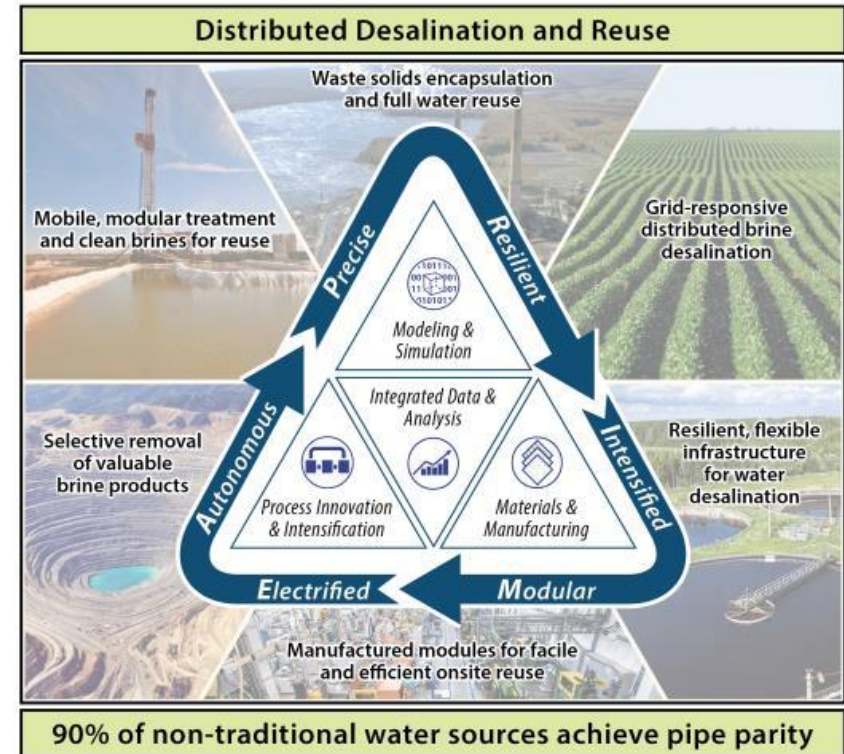
1. Integrated Data and Analysis
2. Modeling and Simulation
3. Process Innovation and Intensification
4. Materials and Manufacturing

**Technology Summary** – Distributed desalination and water use enabled by **A-PRIME** water treatment technologies:

- Autonomous,
- Precise,
- Resilient, Process-
- Intensified,
- Modular and
- Electrified



**Impact:** 90% of non-traditional water sources achieve pipe-parity



**Announced:** September 2019

**Lead:** Lawrence Berkeley National Laboratory

**DOE Funding (5 years):** \$100 Million

(pending appropriations)

**National Alliance for Water Innovation (NAWI)**

**Cost Share (5 years):** \$34 Million

# WPTO's Waves to Water Prize



**WATER SECURITY  
GRAND CHALLENGE**  
*Abundance Through Innovation*



- **Purpose:** To accelerate the development of small, modular, wave-powered desalination systems
- **Goal:** Provide potable drinking water in disaster relief scenarios and remote coastal locations
- **\$2.5 million** in total cash prizes
- **Four stages** from concept to testing:
  - CONCEPT winners announced on November 14, 2019: 60 entries, 20 winners of \$10K each
  - DESIGN stage closed March 13, 2020 winner announcements coming soon!



<b>Propose a Wave Powered System</b> Up to 20 Winners (\$200,000 Cash Prize Pool)	90 days
<b>Develop Detailed Plan and Model</b> 10-20 Winners (\$800,000 Cash Prize Pool)	120 days
<b>Demonstrate Working Principles</b> Up to 10 Winners (\$500,000 Cash Prize Pool)	150 days
<b>Test &amp; Demonstrate in the Ocean</b> Grand Prize up to \$500,000; and individual Metrics Prizes up to \$500,000	180 days



# WPTO's Other Prizes and Competitions



## Marine Energy Collegiate Competition (closed)

- Collegiate teams submit a preliminary technical design and a business plan to explore opportunities for marine energy
- \$15K to each selected team
- 17 teams of over 70 students



## Ocean Observing Prize (open)

- Integrate marine renewable energy with ocean observation platforms
- \$3 million in total cash prizes
- DISCOVER stage: \$10k to 10 winners, \$25k to 1 grand prize winner



## FAST Commissioning for Pumped-Storage Hydropower Prize (closed)

- For next-generation pumped-storage hydropower development and the encouragement of exploration for new use cases of PSH
- \$550k combined cash prizes and voucher support
- 9 finalists, 4 grand prize winners



## Fish Protection Prize (open)

- New solutions, designs, and strategies to prevent fish from swimming into water infrastructure
- \$700k combined cash prizes and voucher support for up to 10 finalists

# Questions

Email: [eere\\_bioenergy@ee.doe.gov](mailto:eere_bioenergy@ee.doe.gov)