U.S. DEPARTMENT OF
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U.S. DOE Industrial Efficiency and Decarbonization Office Stakeholders' Workshop: Decarbonization Challenges and Priorities across the U.S. Food and Beverage Industry

The Hampton Inn Tropicana –4975 Dean Martin Drive, Las Vegas, NV 89118; Main Session: Salon A

Thursday, August 31, 2023

AGENDA

8:00 AM – 8:30 AM	
9:10 AM – 9:25 AM	**Welcoming Remarks and IEDO Program Overview** ***Isaac Chan**, Program Manager, U.S. DOE Industrial Efficiency and Decarbonization Office*
9:25 AM – 9:30 AM	**Questions and Answers**
9:30 AM – 9:45 AM	**Energy and Emissions Intensive Industries Subprogram: Food and Beverage Investment Portfolio Overview** ***Yaroslav Chudnovsky**, Senior Technology Manager, U.S. DOE Industrial Efficiency and Decarbonization Office*
9:45 AM – 9:50 AM	**Questions and Answers**
9:50 AM – 10:05 AM	**Cross-Sector Technologies Subprogram: Drying; Steam Generation; and Low-Carbon Fuels, Feedstocks, and Energy Sources (LCFFES)** ***Keith Jamison**, Technology Manager, U.S. DOE Industrial Efficiency and Decarbonization Office*
10:05 AM – 10:10 AM	**Questions and Answers**
10:10 AM – 10:25 AM	**Technical Assistance and Workforce Development: Better Plants and a Look Into the Controlled Environment Agriculture Accelerator** ***Kimmai Tran**, Fellow, U.S. DOE Industrial Efficiency and Decarbonization Office*
10:25 AM – 10:30 AM	**Questions and Answers**
10:50 AM – 11:05 AM	**DOE Decarbonization Roadmap Overview** ***Joe Cresko**, Chief Engineer, U.S. DOE Industrial Efficiency and Decarbonization Office*
11:05 AM – 11:10 AM	**Questions and Answers**
11:10 AM – 11:25 AM	**Reimagining Proteins** ***Tessa Hale**, Director of Corporate Engagement, Good Food Institute*
11:25 AM – 11:30 AM	**Questions and Answers**
11:30 AM – 11:45 AM	**Global Food Traceability Center** ***Blake Harris**, Technical Director, Institute of Food Technologists*
11:45 AM – 11:50 AM	**Questions and Answers**
11:50 AM – 12:00 PM	**Breakout Session Instructions**

1:00 PM – 4:30 PM (Break: 3:00 PM – 3:30 PM)	**Breakout Sessions** Session #1: Proteins – Room: *Bora Bora A* • ***Kathy Nunez,*** Tyson Foods, *"Cutting Cost with Decarbonization"* • ***Sanjay Sethi,*** Plant Based Foods Industry Association, *"Plant Protein Cluster: Catalyst for Decarbonizing the Food Chain"* Session #2: Grains and Oilseeds – Room: *Bora Bora B* • ***Olexiy Buyadgie,*** Wilson Engineering Technologies, Inc., *"Energy Efficiency and Decarbonization for Grain and Oilseeds Industries as Elements of Circular Economy"* • ***Zhongli Pan,*** University of California, Davis, *"SmartProbe Technology for Reducing Food Loss and Chemical Use"* Session #3: Baking and Snacks – Room: *Tahiti* • ***Jerry Barnes,*** BABBCO Tunnel Ovens, *"CleanBake Multi-Fuel Zero Emissions-Capable Tunnel Oven"* • ***Joseph Zaleski,*** Reading Bakery Systems, *"U.S. Department of Energy Goals for the Food and Beverage Las Vegas Workshop"* Session #4: Dairy Products – Room: *Fiji* • ***Mike Aquino,*** International Dairy Foods Association, *"Dairy's Decarbonization Journey"* • ***Eric Hassel,*** Innovation Center for U.S. Dairy, *"Dairy Processing Decarbonization Efforts"* Session #5: Fruits and Vegetables – Room: *Salon B* • ***John Larrea,*** EcoEngineers Session #6: Beverages, Sugar and Confectionary, and Tobacco – Room: *Salon A*
5:00 PM – 5:30 PM	**Breakout Session Report Outs –** Room*: Salon A*
5:30 PM – 5:45 PM	**Closing Remarks** ***Yaroslav Chudnovsky****, Senior Technology Manager, U.S. DOE Industrial Efficiency & Decarbonization Office*
5:45 PM	**Adjourn Workshop**

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The Decarbonization Challenges and Priorities in the Food and Beverages Industry

Purpose of workshop is to identify and prioritize Research, Development, Demonstration and Deployment (RDD&D) needs to increase energy efficiency, reduce greenhouse gas (GHG) emissions, and ensure competitiveness and long-term viability of the U.S. Food and Beverage Industry.

The U.S. Department of Energy (DOE) has a long history of partnership and collaboration with the industrial sector to develop innovative technologies and improve efficiency of operations through a variety of RDD&D and Technical Assistance programs. Stakeholder engagement, including workshops and roundtables, provide a direct interface between government and industry. This permits insight into the industry's priorities and the challenges regarding decarbonization that guide the Industrial Efficiency and Decarbonization Office's (IEDO) Energy and Emissions Intensive Industries (EEII) and Cross-sector Technologies (CST) subprogram objectives. Stakeholders' engagement activities will also serve as a mechanism to evaluate the DOE's RDD&D technology priorities, metrics, and targets. Communication with industry is critical to ensure that funding opportunities for specific areas of interest address the most critical technical challenges that preclude industrial energy and GHG emissions reduction.

Workshop Objectives:

The objectives of the workshop are to solicit industry feedback:

1. To inform IEDO's RDD&D goals and metrics to accelerate the transition towards a more secure and decarbonized Food and Beverage industrial sector.
2. To identify the barriers and challenges to transformative, low-carbon technology innovations.
3. To identify opportunities to provide technical assistance that will support the sector in implementing industrial decarbonization and circular economy technologies and practices.

Workshop Approach:

The workshop approach will be to understand the current state of energy consumption, efficiency and GHG emissions, along with viable decarbonization pathways. This includes:

- Reviewing the current energy consumption, efficiency, and GHG emissions profile of the industry.
- Reviewing DOE goals for industrial decarbonization of the U.S. industrial manufacturing sector.
- Gaining an understanding of food and beverage subsectors' goals and sustainability plans for improving environmental compliance.
- Discussing and prioritizing viable options and approaches (decarbonization pathways) to reduce energy consumption and GHG emissions.

RDD&D priorities for the U.S. DOE to facilitate industrial transformation should provide maximum value return, high mitigation impact, and minimum elapsed time to enable net-zero industrial GHG emissions by 2050. This includes identifying the following:

- Areas of alignment between industry and government goals by gauging interest in collaboration.
- Barriers to technological innovations where existing knowledge, technology, and processes are inadequate.
- Strategies to address technical barriers that include specific targets and metrics for improvement.

Technology areas of interest will include but are not limited to:

- Improving Energy Efficiency and Increasing Material Efficiency
  - Innovative Process Technologies
  - Heating, Cooking and Drying
  - Waste Heat Recovery, Process Intensification, and System Optimization
  - Reduction of Product Loss and Cost-effective Recycling
  - Cooling, Refrigeration and Freezing
  - Smart Manufacturing and Advanced Controls
- Fuel Switching (Low Carbon Fuels, Feedstocks, and Energy Sources - LCFFES) and Electrification
- Carbon Capture, Utilization and Storage (CCUS)

Industry Snapshot:

The food and beverage industry is a critical component of the U.S. economy and includes all facilities involved in transforming raw agricultural goods into consumer food products, ranging from fresh and processed foods to beverages and packaged snacks. The industry employs 1.7 million workers to produce and ship nearly $950 billion worth of products as of 2018. The industry accounted for an estimated 1,935 TBtu of energy (10% of total energy use for U.S. manufacturing) and 96 MMT CO_{2e} of GHG emissions (10% of total energy-related emissions for U.S. manufacturing) in 2018. The overall energy and GHG emissions footprint of the food (NAICS 311) and beverage (NAICS 312) industrial sector is shown in the Table 1 and diagrams below based on the 2018 Manufacturing Energy and Carbon Footprints.

Table 1: Food and Beverage Sector Total and Categorical Energy Consumtpion

U.S. Food and Beverage Manufacturing, 2018	
Category	**Energy (TBtu)**
Total primary energy	1,935
Offsite losses	673
Onsite Energy	1,262
Onsite losses	716
Steam generation and distribution	93
Electricity generation	3
Process energy	431
Non-process energy	81
Energy for all purposes	1,952
GHG emissions	**MMT CO_2e**
Total	95.7
Combustion emissions	95.7
Offsite combustion emissions	50.6
Onsite combustion emissions	45.1
Process emissions	0.0

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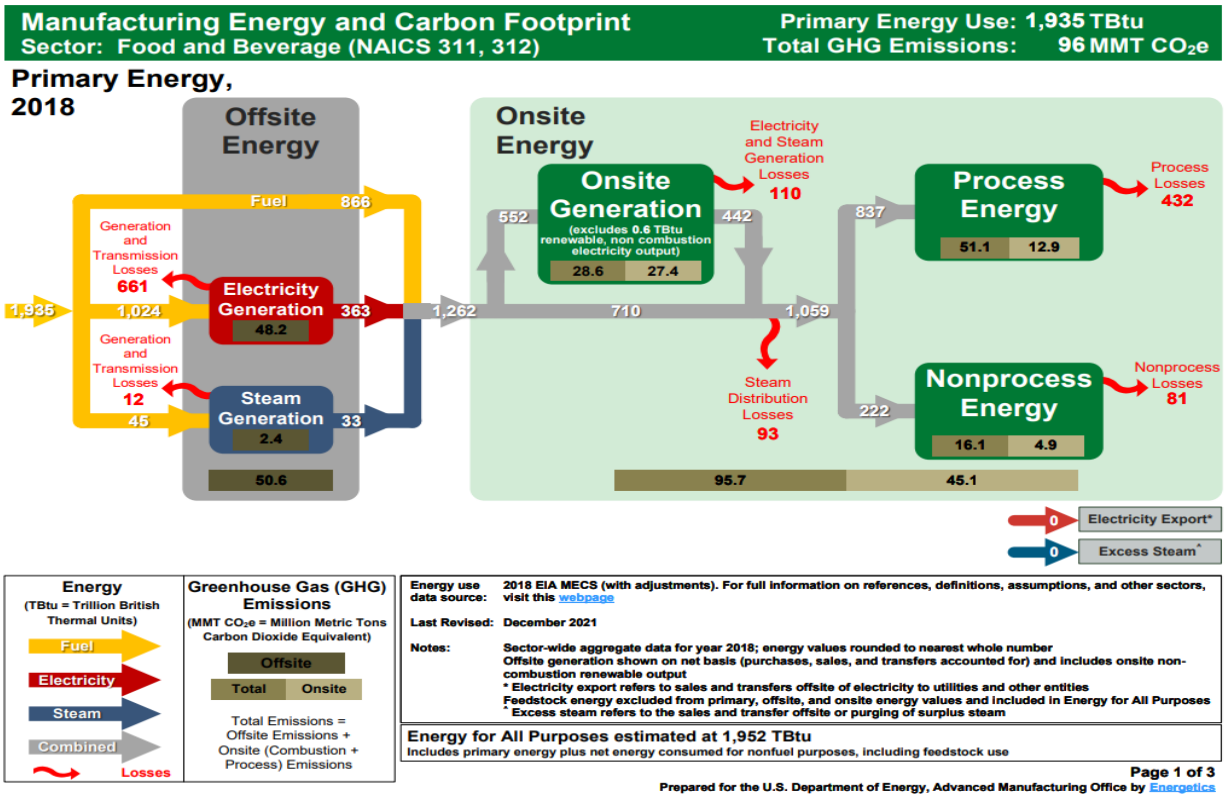
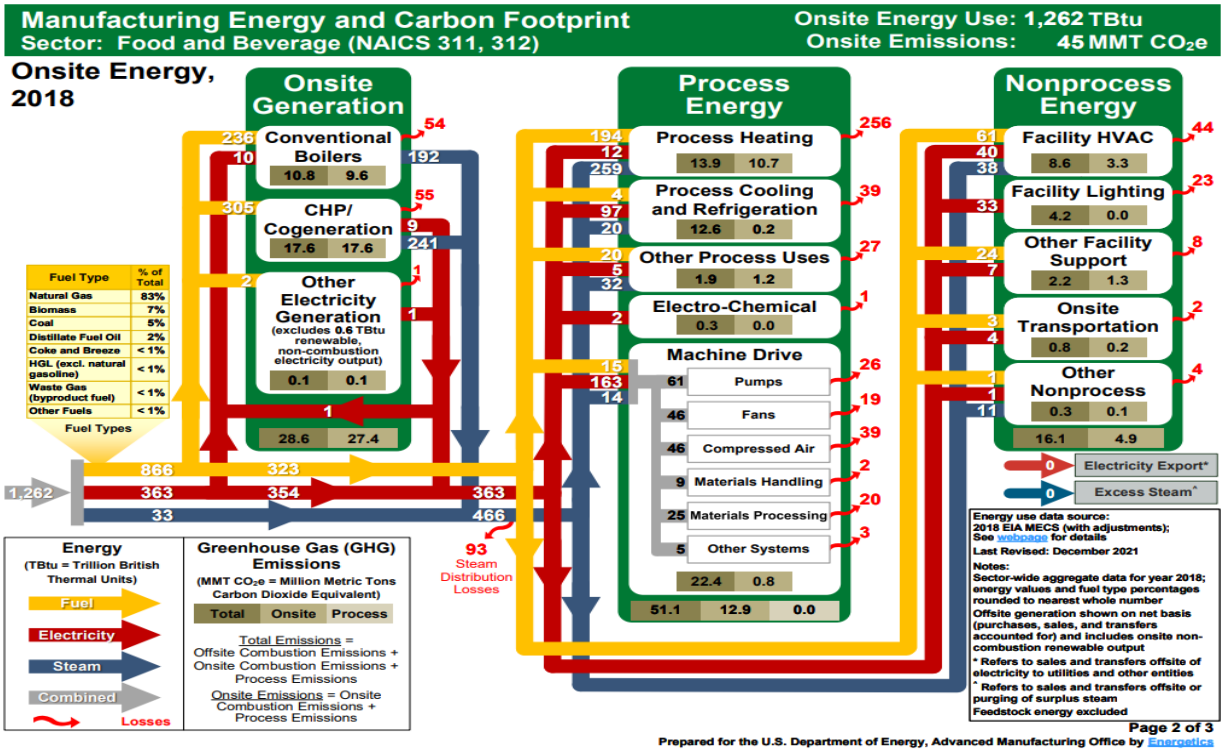
Food and Beverage Manufacturing Energy and Carbon Footprints





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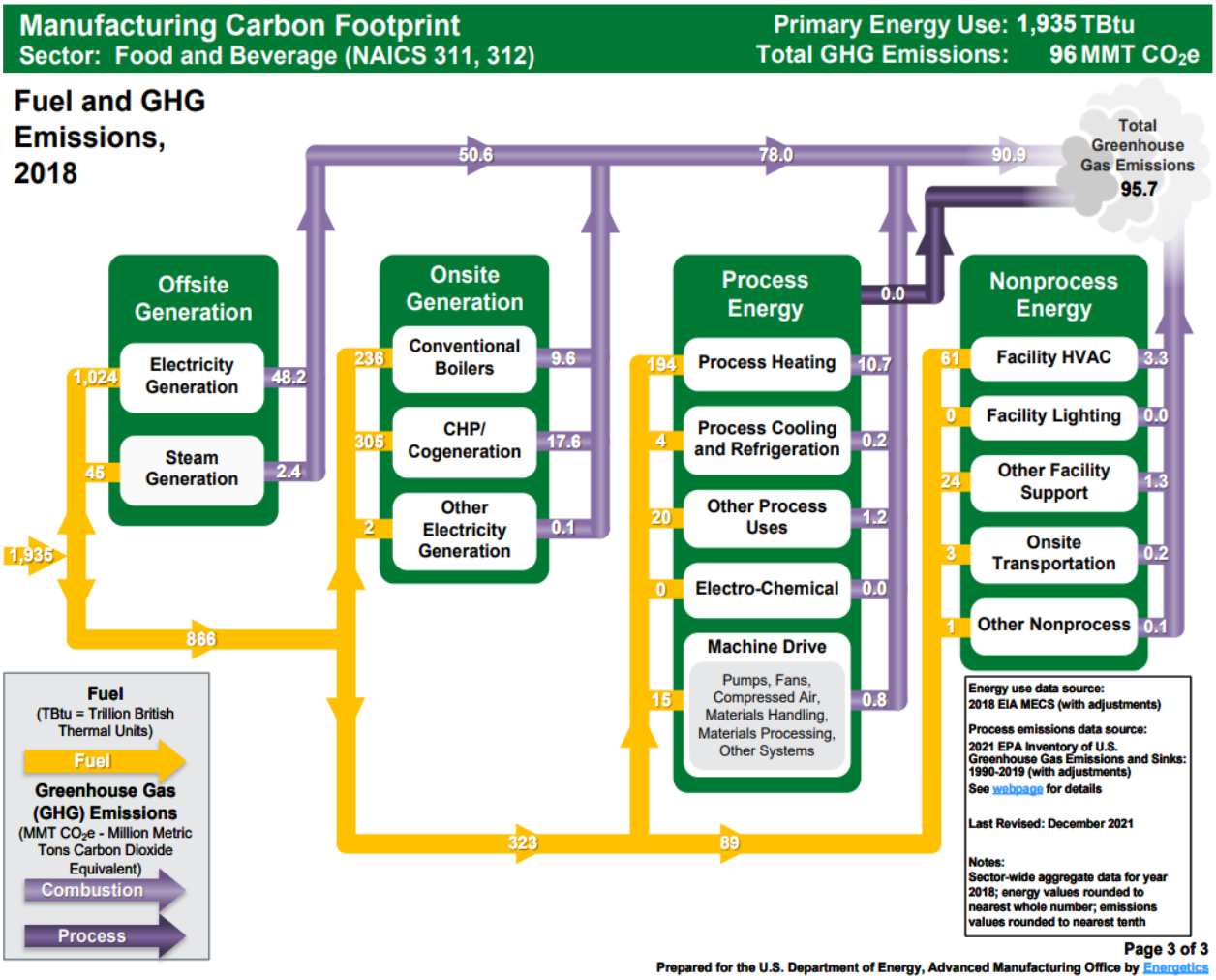

Additional Reading Materials

1. IEDO Food and Beverage Products: https://www.energy.gov/eere/iedo/food-and-beverage-products
2. Industrial Decarbonization Roadmap: https://www.energy.gov/sites/default/files/2022-09/Industrial%20Decarbonization%20Roadmap.pdf
3. Bandwidth Study U.S. Food and Beverage Manufacturing: https://www.energy.gov/eere/iedo/articles/bandwidth-study-us-food-and-beverage-manufacturing
4. Decarbonizing the food and beverages industry: A critical and systematic review of developments, sociotechnical systems and policy options: https://www.sciencedirect.com/science/article/pii/S1364032121001507
5. Electrifying U.S. Industry: https://static1.squarespace.com/static/5877e86f9de4bb8bce72105c/t/6018bf7254023d49ce67648d/1612234656572/Electrifying+U.S.+Industry+2.1.21.pdf