Community Waste Management Technical Assistance Forum: *Exploring Solutions to Convert Waste to Energy and Products*

Presenters: Beau Hoffman, Shelby Best, Breanne Johnson, Thomas Swarr, Lance Larsen, and Rob Davies
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About the Bioenergy Communicators (BioComms) Working Group

Sponsor:
• U.S. Department of Energy (DOE) Bioenergy Technologies Office (BETO)

BETO & DOE National Laboratory Members:
• Bioenergy communicators, laboratory relationship managers, BETO tech team, and education and workforce development professionals

Purpose:
• Communications strategy for BETO-funded bioenergy research and development

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Today's Agenda

I. Beau Hoffman: Overview of DOE-BETO-NREL Waste-to-Energy Technical Assistance for Local Governments Program

II. Thomas Swarr: Hartford Solid Waste

III. Rob Davies and Lance Larsen: Odyssey Renewables and Jo-Carroll Depot Local Redevelopment Authority

IV. Shelby Best: Region 1 Planning Council

V. Breanne Johnson: North Central Texas Council of Governments
Today's Presenters

Beau Hoffman
DOE BETO
Moderator

Shelby Best
Region 1 Planning Council; Rockford, IL

Breanne Johnson
North Central Texas Council of Governments; Arlington, TX

Thomas Swarr
Hartford Solid Waste Task Force, Hartford, CT

Lance Larsen and Rob Davies
Odyssey Renewable Energy / Jo-Carroll Depot Local Redevelopment Authority; Savanna, IL
Beau Hoffman
Technology Manager
DOE BETO
Moderator for Today’s Forum
Overview of DOE-BETO-NREL Waste-to-Energy Technical Assistance for Local Governments Program

November 4, 2021
Acknowledgements

National Renewable Energy Laboratory (NREL) Subject Matter Experts:

Anelia Milbrandt  Alex Badgett  Jacq Streur  Ling Tao  Jenny Heeter  Edward Settle  Bob Baldwin  Kim Magrini  

Jennifer Daw  Yimin Zhang  Steve Decker  Michael Resch  David Greene  Sherry Stout  Otto Van Geet  Shanti Pless
About our FY21 Cohort of Partnerships

17 Communities from 13 states

Program was launched in March 2021

- Application phase: late March – early April
- Review phase: late April
- Announcements made: April-May
- All projects have “kicked off” at this point
About Our FY21 Cohort of Partnerships

What types of assistance were most requested?

- Cost-benefit analysis
- Navigating policies and incentives
- Evaluation of options for treating difficult-to-manage streams
- 3rd party support in briefing other local decision makers and officials

What other themes emerged?

- Urgent need for new resource/energy recovery strategies (i.e., due to landfill or incinerator closure)
- Food waste and municipal wastewater residues are a priority
- Further assistance is welcomed
What’s New in 2022...? (and what’s not)

Under consideration for 2022*:
- Longer application window
- County-level participation
- Two ‘phases’ of technical assistance available:
  - New partnerships
  - Follow-on assistance for previous participants

What’s staying the same:
- Length of application (short!)
- Staying focused on organic waste fractions
- Any stage of community planning is welcomed
- NREL subject matter experts

*Subject to appropriations
Other Opportunities

12–18 month technical assistance program on a variety of areas of Planning and Development:

- Clean Energy
- Energy Efficient Buildings and Electrification
- Clean Transportation
- Carbon Capture / Storage
- Energy Site Reclamation and Critical Materials Processing
- Community Resilience Microgrids
- New / Enhanced Manufacturing

Application window opened on 10/25, due 12/17/21

$2.5M prize pool

- Increase participation in clean energy and climate-smart job training
- Fund activities to help disadvantaged communities become aware of, apply into or secure DOE funding (or other funding)
- Enable the development of replicable clean energy transitions

Application window opened in September 2021, due 2/25/22
Other Opportunities

Sustainable Wastewater of the Future (SWIFt) Accelerator

Customized Toolkit Training
DOE is offering customized training on the use and implementation of the Wastewater Energy Management (SWIFt) Toolkit to help more facilities set and achieve their energy efficiency goals. Get access to resources, networking, technical support, and recognition.

For more information:
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Chelsea Mervenne
Chelsea.Mervenne@ee.doe.gov
Questions / Feedback / How to Stay in Touch?

Be sure to reach out so that we can include you with future announcements!

Also subscribe to the Bioenergy Technologies Office newsletter:
energy.gov/eere/bioenergy/beto-newsletter
Thomas Swarr
Hartford Solid Waste
Task Force
Hartford, CT
Hartford, CT - Finding a Sustainable & Just Solution for Solid Waste

Thomas Swarr
Co- Chair Hartford Solid Waste Task Force
4 November 2021
A Looming Crisis

- Proposal to refurbish failing trash-to-energy plant rejected - 30 yr. commitment @$145/ton
- Plant scheduled for shutdown by 30 June 2022
- City seeking to recover riverfront property for potential economic development
- Regional authority (MIRA) obligated to provide waste disposal services through FY 2027
- Strong opposition to any waste operations in Hartford due to past environmental injustices
- State will resort to transferring waste to out-of-state landfills
CT Coalition for Sustainable Materials Management

- >80 CT municipalities joined
- Working groups
  - Food scraps / Organics collection & diversion
  - Increase recycling
  - Unit-based pricing
  - Extended producer responsibility
- No substantive discussion of new disposal infrastructure
  - Anaerobic digestion / composting of food scraps
Hartford Solid Waste Task Force

- Original focus on opposing redevelopment of MIRA trash-to-energy facility
- Moving from NIMBY to YIMBY
  - Mixed waste processing plant 100,000 to 200,000 tons per year to sort raw municipal solid waste (MSW) to recover organics & potentially recyclable materials
  - Smaller, distributed plants to address environmental justice concerns, reduce truck transport, & associated emissions
  - Reduces, but does not solve need for additional disposal capacity
- Public support? Political support?
Goals for NREL Technical Assistance

- Instigate more robust discussion of long-term solution for Connecticut waste management
- Reframe problem from waste that needs to be disposed in most cost-effective manner to potential resource stream to be processed into more valuable outputs
- Highlight need for public policy reform to make recovery of fuels/materials financially feasible
Acknowledgements

- Solid Waste Task Force
  - Thomas Swarr, Co-Chair
  - Clarence Corbin, Co-Chair
  - Sam King
  - Mark Mitchell, MD
  - William Diaz
  - James Sandler, Esq.
  - Councilman James Sanchez

- City Staff
  - Mayor Luke Bronin
  - Mike Looney
  - Mike Zembruski
  - Haylee Green - Ortiz

- MIRA
  - Thomas Kirk
  - Peter Eagan
  - Thomas Gaffey
  - David Bodendorf
  - Roger Guzowski

- Gershman, Brickner & Bratton
  - Steve Simmons
  - Harvey Gershman

- And many more!
Lance Larsen
Odyssey Renewable Energy

Rob Davies
Jo-Carroll Depot Local Redevelopment Authority
Savanna, IL
Landfill Diversion and Rural Economic Development via Anaerobic Digestion of Organic Waste Streams
Overview of the Project

- Public-Private Partnership between Savanna Industrial Park and Odyssey Renewable Energy
- Absence of natural gas service due to prohibitive cost of pipeline
- Missed opportunities for development, job creation
- Proposal to generate renewable natural gas (RNG) through anaerobic digestion (AD) fills the energy gap for industrial development
- Impetus to establish public intermodal / waterside port facility
- June 2021: NREL Technical Assistance Grant
What is Anaerobic Digestion?

Anaerobic Digestion is a natural, biological process that breaks down organic matter without oxygen. The by-products of the process are biogas and nutrient-rich digestate. The biogas can be upgraded into a substitute (RNG) for fossil natural gas, while digestate can enhance soils.

MSW = municipal solid waste
Organic Waste Streams

**Food waste** - single largest solid waste stream reaching landfills
- Industrial / Manufacturing
- Stillage / dried distillers grain
- Organic portion of MSW

**Agricultural waste**
- Corn stover
- Industrial Hemp - Develop into rotational commodity

**Slaughterhouse waste** and **Deadstock**
A growing number of states and municipalities are implementing organic waste bans or mandates.

- **24 States on Yard Waste**: Arkansas, Delaware, Florida*, Georgia*, Illinois, Indiana, Iowa*, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska*, New Hampshire, New Jersey, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, South Dakota, Vermont, West Virginia, Wisconsin. (*Allow garden waste disposal if the landfill generates energy)
- **8 States on Food Waste**: California, Connecticut, Maryland, Massachusetts, Oregon, Rhode Island, Vermont, Washington. (Also of note: New York City, Seattle)

*Municipalities that do not proactively seek to minimize and sustainably manage organic waste streams will likely face fiscal challenges in the form of rising tipping fees and transportation costs.*
Rural Economic Development

- The Project will spur economic development along a disinvested area of rural NW Illinois
  - Encourage development of productive infrastructure
  - Renewable fuels for transportation
  - Advantage of sourcing feedstock via rail and barge
- Communities and social impact
  - Job training and workforce development
  - Community engagement and outreach, social uplift
  - Youth programs, rural-urban connection
- Environmental Conservation and Sustainability
  - Reduce chemical and nutrient runoff into local watersheds
  - Offer farming inputs that are sustainable and regenerate soils to support a healthier and overall more productive output
Shelby Best
Region 1 Planning Council
Rockford, IL
Community Waste Planning in Northern Illinois

Addressing barriers and opportunities for waste management

11/4/21
WHO, WHERE, WHY

- Region 1 Planning Council is a special-purpose, regional government agency located in Northern Illinois.

- We collaborate and convene with local governments, addressing regional issues on a long-term horizon.

- R1 is currently working on an updated Solid Waste Management Plan for Boone and Winnebago Counties.
WASTE CHALLENGES IN NORTHERN ILLINOIS

- The region has multiple landfills that are running out of space.
- The Chicago Rockford International Airport is one of the fastest growing cargo airports in the world.
- We need to prepare for an increase in economic activity as a result of a growing airport and economy.
<table>
<thead>
<tr>
<th>Percent</th>
<th>Value</th>
<th>Community Survey Results (Boone &amp; Winnebago Counties)</th>
<th>Most Materials Recycled</th>
</tr>
</thead>
<tbody>
<tr>
<td>96.3</td>
<td></td>
<td>Household items like newspaper, bottles, cans, glass, or magazines</td>
<td></td>
</tr>
<tr>
<td>53.2</td>
<td></td>
<td>Yard waste, curb-side</td>
<td></td>
</tr>
<tr>
<td>14.7</td>
<td></td>
<td>Composting food waste, at home</td>
<td></td>
</tr>
<tr>
<td>14.7</td>
<td></td>
<td>Composting food waste, drop-off</td>
<td></td>
</tr>
<tr>
<td>3.7</td>
<td></td>
<td>Yard waste, drop-off</td>
<td></td>
</tr>
<tr>
<td>50.5</td>
<td></td>
<td>Electronic items like computers, televisions, or cell phones</td>
<td></td>
</tr>
<tr>
<td>45.9</td>
<td></td>
<td>Household hazardous waste (HHW) items like paint, lawn chemicals, and automotive</td>
<td></td>
</tr>
<tr>
<td>24.8</td>
<td></td>
<td>Building materials from home repair or remodeling</td>
<td></td>
</tr>
<tr>
<td>20.2</td>
<td></td>
<td>Plastic bags</td>
<td></td>
</tr>
<tr>
<td>3.7</td>
<td></td>
<td>Bulk items (furniture, mattresses, etc.)</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td>Other (Please list)</td>
<td></td>
</tr>
</tbody>
</table>

Which of the following materials does your household recycle (either curb-side or at drop-off facility)? (Check all that apply)
NEEDS & OPPORTUNITIES
Organic Waste Generation & Diversion Potential (Credit: University of Illinois Chicago Unpublished)

Organic Waste Generation (2000-2040)

Boone County

Winnebago County

Reference Diversion Rates

<table>
<thead>
<tr>
<th></th>
<th>Food</th>
<th>Non-food</th>
<th>Total Organic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinois state (2009)</td>
<td>0.0%</td>
<td>28.0%</td>
<td>14.0%</td>
</tr>
<tr>
<td>Illinois state (2015)</td>
<td>1.3%</td>
<td>29.8%</td>
<td>14.3%</td>
</tr>
<tr>
<td>U.S. Average (2018)</td>
<td>31.3%</td>
<td>70.2%</td>
<td>46.0%</td>
</tr>
</tbody>
</table>

Estimated Diversion Potential (tons/year)

- 30% for food and 70% for non-food organic waste

<table>
<thead>
<tr>
<th></th>
<th>Boone</th>
<th>Winnebago</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>7,255</td>
<td>41,460</td>
<td>48,714</td>
</tr>
<tr>
<td>2040</td>
<td>8,584</td>
<td>41,001</td>
<td>49,585</td>
</tr>
</tbody>
</table>
NREL TECHNICAL ASSISTANCE PROGRAM
Cost Benefit Analysis of Food Waste

Nonresidential food waste (NREL) - 26,204 t/y

Residential food waste (NREL) - 56,177 t/y

Total food waste (NREL) - 82,381 t/y

ASP = aerated static pile | CHP = combined heat and power | CNG = compressed natural gas | LCFS = low carbon fuel standard | NPV = net present value | O&M = operations and maintenance | PNG = pipeline natural gas | REC = renewable energy credits | RIN = renewable identification numbers | t/y = tons per year
FUTURE PLANS
Plans for a zero-waste region

MOVING FORWARD

- Complete the Regional Solid Waste Management Plan.
- Continue to explore Waste-to-Energy technology options and feasibility, particularly as it relates to organic waste.
- Engage the community throughout the planning process.
Breanne Johnson
North Central Texas Council of Governments
Arlington, TX
Organic Waste to Renewable Natural Gas: Regional Efforts in North Texas

U.S. Department of Energy Bioenergy Technologies Office

Community Waste Management Technical Assistance Forum: Exploring Solutions to Convert Waste to Energy and Bioproducts

November 4, 2021
Large Region and Growing

- Quasi-governmental, voluntary association of local governments
- Assists local governments in:
  - Planning for common needs
  - Cooperating for mutual benefit
  - Recognizing regional opportunities
  - Resolving regional problems
  - Making joint decisions
- No regulatory authority
- 4th largest metropolitan region in the United States – centered around cities of Dallas and Fort Worth
- Population: 7.7 million people currently (larger than 37 states in population); projected 11.3 million in 2045
- Area Served: 12,797 sq. miles – larger than nine states in area
Challenges and Opportunities Driving Change in North Texas

- Waste capacity – landfills are filling up
- Organic waste – above national average food waste
- Biosolid management is increasingly difficult issue
- Zero-waste and other materials management goals
- Long-term greenhouse gas emission reductions – climate goals
- Production of biogas (renewable energy) and renewable fleet fuel – energy resilience

Need for New Approaches to Address Challenges!

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North Central Texas has ~36 years of remaining landfill capacity.¹

50% of NCT waste stream is organic waste; 31% is food waste.

RNG use accounted for 25% of GHG emissions reductions from DFW fleets in 2019.²
North Central Texas Organic Waste to RNG Opportunities

EPA Funded North Texas Organic Waste to Renewable Natural Gas

DOE Technical Assistance Opportunity

Evaluate Organic Waste Supply Feedstocks (food waste/biosolids)
Identify Regional Feedstock Collection Models
Evaluate Existing and Future Demand RNG Vehicle Fuel
Identify Potential AD Locations Based on Costs/Benefits and Emissions Reductions

Evaluate Potential Location Along SH121 Corridor
High-Level Screening/Feasibility Analysis of Food Waste Pathways
Provide Cost-benefit Analysis for Potential Anaerobic Digestor Location
- Process Dewatered Sludge
- Process Food Wastes
Evaluate Potential Energy/Biogas Produced

Moving Forward

Complete Regional Organic Waste to Renewable Natural Gas Study – Summer 2022
Continue Growing Partnership Opportunities Based on Outcomes of DOE Technical Assistance
Look For Potential Funding to Move a Project Forward
The large amounts of residential and nonresidential food waste in surrounding counties help AD systems maximize economies of scale, and make them less sensitive to changes in waste availability.

Multiple possible pathways to managing food waste via AD exist and could be economically viable solutions.

Waste-to-energy systems and incentives such as RINs and LCFS could represent significant revenue streams, but depend on accessing appropriate markets and managing products effectively.

Understanding how biogas systems scale to the large digester sizes shown here is a key opportunity for future work to consider.
Contacts

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NCTCOG Organic Waste to Renewable Natural Gas Regional Study Website:
Thank you!

Waste-to-Energy Technical Assistance for Local Governments
nrel.gov/bioenergy/waste-to-energy-technical-assistance.html
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