Program Introduction

Dana Huff, P.E.

Program Chair & Moderator

Vice President, Tighe & Bond
Quantum Biopower – Connecticut’s First Anaerobic Digester Facility

Brian Paganini, P.E.
Vice President and Managing Director
Quantum Biopower
Anaerobic Digestion of Food Waste
Quantum Biopower

Founded in 2013, privately owned – Design/Build/Construct/Operate

Integrator of advanced waste & recycling to energy systems. Owners of the Southington, CT digestion facility.
Quantum’s Mission is to Develop and Own Anaerobic Digestion Facilities

We successfully built and are operating the most technologically robust merchant digester in the United States.

We know the technology
- Spent years on technology diligence both in Europe and in the U.S.
- Performed deep technology dives with 15 of the 25 digester technology companies in the U.S.
- Partially engineered, constructed, and operating a one-off facility in Southington, CT
- Also performed significant diligence with various pyrolysis and gasification firms

We are well funded and our business partners believe in our mission
- Quantum’s ownership includes over 100 years of combined experience in the food distribution and civil construction/land clearing operations; combined gross revenues of $2.5BB annually across their businesses.
- Our owners have financed Quantum well to propel us through the project development runway.
- Quantum is currently establishing a project finance fund to meet our growth and development needs

There is no one like Quantum in the U.S.
- We don’t own technology, but rather sign agreements to utilize technology platforms
- Unlike other AD developers, we deeply understand the project dynamics that make projects successful
- We can assume the construction risk for projects, saving costly margin and time
Time’s Are Changing

Waste Management → Material Recovery
CT's 2015 Waste Characterization Report found:

- CT manage $2,300,000$ tons of garbage in CT
- $22\%$ of CT's garbage is food waste; $500,000$ tons of food waste generated per year
- Food waste is the largest portion of CT's waste and the least recycled

In 2013 the State made a goal to reach $60\%$ by 2024. Recycling Food Waste alone will achieve CT's goal
Food Waste Recycling Mandates are Here

CT & MA have both adopted food recycling mandates that call for separating food out of the waste stream for recycling

Connecticut
- 104 tons/year, 2 tons/week
- Separate organics out of the garbage
- Gets more aggressive in 2018, 52 tons/year

Massachusetts
- 52 tons/year, 1 tons/week
- Separate organics out of the garbage
- MA EPA hiring “enforcement agents”
Food waste is a leading contributor of landfill pollution. States are adopting waste diversion goals. Food waste is the target of all U.S. diversion programs.
Anaerobic Digestion is The Answer

AD offers a natural way to recycle food waste, creating energy and reusable products.

**BIOGAS SYSTEM**

*The Basics*

**DIGESTER TANK**

**ORGANIC MATERIAL:** Animal Waste, Food Waste, Agricultural Waste, Wastewater sludge.

**BIOGAS:** for electricity, heating vehicles, pipeline.

**CO-PRODUCT:** Livestock bedding, compost, fertilizer, nutrients.
Quantum’s Diligence
We spent many months understanding the AD technology space and deploying the right project for Southington, CT

Decision Tree
- Feedstock flexible
- Proven technology
- Scalability – capacity to run at minimal/maximal conditions
- Closed loop, continuous system design
- Cost
- Efficiency

Germany
Austria
France
Switzerland
Netherlands
Sweden
UK
Finland
Turkey
Primary Operations of the Digester Project

Decontamination/De-packaging
Pulp & emulsify food waste/contamination removal (8-12% solid)

Digestion/Biogas Creation
2-stage digester, biogas collection sphere

Biogas Conditioning & Combined Heat and Power
Drying & H2S removal & energy creation

Nutrient Recovery & Removal
2-stage digester, biogas collection sphere
Our Process

1. **Food Waste Processing**
   - 40,000 Tons/Year
   - Fats/Oils/Greases
   - Meats
   - Produce
   - Packaged products
   - Bakery Items

2. **Methane Production**
   - Natural process
   - Heat and Mixing
   - Methane created

3. **Sustainable Energy**
   - 1.2 MW of electricity
   - 1 MM BTU's of heat
   - Southington, CT

4. **Compost**
   - 10,000 tons/year
   - Organic compost
   - Farms & Growers in CT
Facility Operations
Growing the future of operational security for digesters

• Not Wastewater
• AD operations is a science and art
• Connecticut has the “right stuff” for future AD operators
• Quantum created an operations team – process & mechanical ops
• 60% of design load
• Couple bumps along the way
Reception

- Ease of operation
- Continuous
- Minimal vector attractants/fugitive emissions
- Minimal truck weight times
- Minimal rehandling/reprocessing
- High contamination removal
Environmental & Economic Benefits of Quantum’s Facility
Quantum facility will generate 420,000 ft³/day of biogas equivalent to 5,080 tons/yr of CO2 avoidance

1,073 Cars  775 homes  572,000 Gallons
FOOD WASTE

PRE/POST CONSUMER

PACKAGED WASTE

FATS/OILS/GREASES

DAIRY

BEVERAGE
The Future of Diverted Materials
Quantum is developing projects in four market segments – all with their unique project needs

- Energy from Waste (EfW)
- Wastewater Treatment Plants
- Merchant Digesters
- Agriculture

Material Diversion
Regulatory Adherence
Energy Production
Carbon Offset
Nutrient Recovery/Reduction
Co-Digestion?
The Future of Diverted Materials

Achieving ideal food waste diversion in mixed waste streams

Modification of the SSO Mandate?
Technology Implementation
Diversion & QUALITY Proof!

MSW  →  Food Waste  ←  SSO
Thank You

Brian Paganini
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2017 Connecticut Legislative Update: Budget (Yet Again) and …?

EBC Connecticut Chapter Solid Waste Management Update

Christopher P. McCormack
October 17, 2017
2017 “Long Session”: Civics Version
2017 “Long Session”: Budget Reality
2017 Solid Waste Bills Passed
What Did They at Least Try?
Beneficial Reuse of Tires


- Joint Favorable from Environment Committee

- Hauler license - deliver tires to facilities that handle in manner that protects the public health and environment, no illegal dumping

- Beneficial end use: DEEP to report to Legislature re: options for recycling in state rather than exporting and burning; use of recycled scrap tires in pedestrian and bicycle paths and trails and as construction material, such as roofing shingles.

- PASSED HOUSE JUNE 3, 2017 AS AMENDED BY “HOUSE SCHEDULE A”
Beneficial Reuse of Tires

- **HB 6352 House Amendment “A”**

“This bill redefines a ‘commercial kennel’ as a place maintained for boarding or grooming dogs or cats, including a veterinary hospital that boards or grooms dogs or cats for nonmedical purposes. By law, a kennel is a pack or collection of dogs bred for show, sport, or sale, and kept under one ownership at a single location.”
Beneficial Reuse of Tires

… But crumb rubber for playgrounds or athletic fields?

- Not with state bond funds, you don’t
  - HB 5800
  - HB 5892
- Is that a problem?*

Single-Use Plastic/Paper Bags

HB 6313: Don’t *ban* them – *tax* them.

- … and use revenue for environmental purposes and to encourage use of reusable bags
- Committee bill: deposit revenue in state park “maintenance, repair and improvement account” under Conn. Gen. Stat. §23-15b
Bottle Bills and Glass Recycling

Conventional/Incremental:

- HB 5618, HB 6348: Increase handling fee for redemption centers
- HB 5877: *Expand* the bottle bill “to include juices, teas, sports drinks and any other noncarbonated beverages”
- HB 5880: *Ditto* – include wine bottles
- HB 6330: Expand to tea, juice and sports drinks, *and* increase the deposit amount, *and* dedicate revenues to state parks
- SB 56: Allow return of containers to retailers whether or not containers were purchased from that retailer
Outliers and Eccentricities

- SB 823: *Exempt* beer bottles sold for consumption on premises of alcoholic liquor establishments
Bottle Bills and Glass Recycling

Unconventional/Innovative:

- HB 5859: Require *minimum recycled content* for glass containers
- SB 996: Establish recycling fee *in lieu of deposit/refund*, collect curbside, use revenue to support reuse of bottles
- SB 1000: Evaluate commercial uses for recycled glass, develop recommendations for best collection methods to support same
Recycling at Retail Food Establishments

- HB 5847: Require retail food establishments to have recycling bins for beverage bottles and cans
Paint Stewardship

- HB 5619: Pay fees to municipalities where paint is recycled
Paint Stewardship

- SB 505: Audit program revenue and expense to determine whether administrative expenses exceed 4% of revenue
Consumer Packaging Task Force

- **SA 16-6: Task Force**
  - Recommendations to reduce consumer packaging 25% by 2024
  - Report by 1/1/17
  - Disband by *later of report or 1/1/17*
  - *Task Force first meeting February 2017*

- **SB 518: Extend report date to 1/1/18**
Waste Management Facilities

HB 7065 “to facilitate permitting of waste conversion facilities”

- Amend Conn. Gen. Stat. 22a-207 to *add definition* distinct from “resources recovery facility”
  - "Resources recovery facility" means a facility utilizing processes to reclaim energy from municipal solid waste that combusts municipal solid waste to generate electricity;
  - "Waste conversion facility" means a facility that uses thermal, chemical or biological processes to convert solid waste, including, but not limited to, municipal solid waste, into electricity, fuel, gas, chemical or other products and that is not a facility that combusts mixed municipal solid waste to generate electricity;

- Eliminate certain requirements applicable to RRF permitting (e.g. need, will not result in excess capacity)
Waste Management Facilities

SB 999: Pilot program “for the harnessing of cow power”

- Facilitate the permitting of waste conversion facilities
- Educate farmers on benefits of using digestate from anaerobic digestion facilities
- Facilitate use of cow manure in anaerobic digestion facilities
- Pilot anaerobic digesters not larger than 500 kW at three Connecticut dairy farms
Waste Management Facilities

SB 863: Mandate for study of trash-to-energy facilities as component of comprehensive energy strategy

- Already under study in context of waste strategy as part of CMMS
Not Just for Kennels

- HB 5874: An Act Requiring the Licensing of Cats
- Amend the General Statutes “to require the licensing of cats in a similar fashion to the licensing of dogs”
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Update – Resource Rediscovery
Modernizing the Connecticut Solid Waste
System Project

Lee Sawyer & Peggy Diaz

CT Department of Energy and
Environmental Protection
RFP Overview

10.17.17
An Aging Dinosaur

The Connecticut Solid Waste System Resource Recovery Facility (CSWS RRF) (formerly called the Mid-Connecticut RRF), has operated since 1988 with a permitted capacity to process 888,888 tons of Municipal Solid Waste (MSW) per year. The CSWS RRF is approaching the end of its service life and must be upgraded or replaced. The facility is at the hub of a “hub and spoke” system of facilities owned and managed by MIRA (formerly Connecticut Resources Recovery Authority or CRRA).

This facility alone handles 1/3 of the state’s MSW.
An Aging Dinosaur
Photo Source: https://westhartfordrecycles.wordpress.com/
An Aging Dinosaur

- RRF plant exceeding design life.
  - Aging equipment difficult and expensive to maintain
  - Plant shutdowns cause backups in processing trash
  - Maintaining the current facility will require major capital investments, with costs passed along to member towns, including Hartford

- Process to receive and grind trash into "RDF" fuel is inefficient.

- Newer waste conversion technologies can increase efficiency and decrease environmental and community impacts (greater energy production, lower emissions, etc.).

- Current system built with expectation of steady supply of trash. Today, the state seeks to recycle more and decrease trash.
The State Responds

In 2013 the state’s Resources Recovery Task Force heard concerns about community impacts of the South Meadows RRF.

The Task Force recommended the state move to bring more innovative technologies into the state to replace aging RRFs.

In 2014, the legislature established a process to seek a developer for the CSWSP (P.A. 14-94).
The RFP Process

• Public Act 14-94 requires that DEEP conduct a solicitation to identify a developer to modernize the Connecticut Solid Waste System Project (CSWSP).

• The “CSWSP” includes 6 facilities throughout CT
  • The MIRA recycling center and Trash Museum at 211 Murphy Rd., Hartford
  • The Connecticut Waste System Resource Recovery Facility (RRF), South Meadows, Hartford
  • 4 transfer stations: Ellington, Essex, Torrington, Watertown
Stakeholder Engagement

• Multiple meetings with the Hartford Advisory Committee on the Environment
• 10/15/15 Hartford Info Session
• Public Comment Period on draft RFP
• Briefings to MIRA board, MDC officials, Councils of Governments, Solid Waste Advisory Council
• Two Pre-Bid Conferences
• Meetings with Mayor Bronin, City Staff
• Presentation to the Climate Stewardship Council
• 6/13/17 Presentation to ACOTE
• 9/28/17 Public Meeting
• Public Comments on Proposals
• Listserv and website (ct.gov/DEEP/ResourceRediscovery)
Key Stakeholder Input

• Hartford ACOTE members and advocates (Sharon Lewis, Dr. Mark Mitchell and others) expressed support for process if emissions, truck traffic, and other community and environmental impacts are central to decision-making.

• Cynthia Jennings and others want to ensure strong local hiring commitments in final project.

• Mayor Bronin and others want a strong host-benefit agreement

• The RFP and follow-up communications to potential bidders have emphasized these expectations.
What are the Project Goals?

**INCREASE:**
- Materials Diverted
- Efficiency of Energy Recovery
- Quality Jobs

**DECREASE:**
- Emissions
- Residuals for Disposal
- Negative Community Impacts
- Amount of Trash Incinerated
Goal: 60% Diversion

• 35% of discarded materials are currently diverted through recycling and composting before they ever enter the MSW stream.

• This project will use processes to **reclaim an additional 25% or more of materials for higher uses.** This could include conversion to compost, fuels, gases, or other chemical products, and the recovery of recyclable materials. Residual materials that are disposed by combustion or in a landfill are not considered diverted.

• This diversion can be accomplished anywhere in the system – not necessarily in Hartford.
Other Project Goals

• Provides cost-effective service to municipal customers.
• Makes use of existing collection systems.
• Decreases emissions and other environmental impacts.
• Adaptable to future changes in waste composition and generation.
• Benefits host communities.
Outcomes that are Not Acceptable

• Unmanageable / noncompetitive costs for service to Hartford and other communities.
• Technologies that lack an environmental track record.
• A 100% mass burn or RDF process without modern recycling/waste conversion add-ons.
• A proposal that “locks in” current waste composition and does not account for increased recycling.
• Proposals that can not receive permits and/or necessary local approvals.
• Developers unable to finance and complete project.
• The status quo.
Selection Process So Far

• Phase I was issued in November 2015 and 8 initial proposals were received.

• Phase I review committee included DEEP, MIRA, City of Hartford, and Capitol Region Council of Governments.

• Phase I required proposers provide services to design, permit, construct, operate, and maintain the proposed facilities for a 30 yr. term, including marketing of products and disposal of residue.

• 3 developers deemed technically, managerially and financially qualified to continue to Phase II: Covanta, Mustang, Sacyr Rooney.

• Phase II issued in March 2017 -Three finalists invited to respond to a supplemental RFP by July 31, 2017.
## Scoring Phase II

<table>
<thead>
<tr>
<th>Proposal Attribute</th>
<th>Relative Weight in Final Score</th>
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<tbody>
<tr>
<td>Technical Proposal</td>
<td>25%</td>
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<tr>
<td>Firm Prices for Services and Conformity to Contract Principles</td>
<td>25%</td>
</tr>
<tr>
<td>Feedstock Acquisition and Product Marketing Plan</td>
<td>15%</td>
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<tr>
<td>Environmental Impacts and Greenhouse Gas Mitigation Plan</td>
<td>15%</td>
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<tr>
<td>Operation and Management Plan</td>
<td>10%</td>
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<tr>
<td>Transportation Plan</td>
<td>5%</td>
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<tr>
<td>Community Relations Plan</td>
<td>5%</td>
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Phase II Dates

- DEEP issues Phase II RFP: March 31, 2017
- Informational Meeting between Proposers and City of Hartford: June-July 2017
- Deadline for questions: June 9, 2017
- Final proposals due: July 31, 2017
- Public Presentations of proposals: September 28, 2017
- Proposer interviews w/ DEEP: October 30-31, 2017
- Status Report to GA – (Env. and E&T): October 2017
- Public Comments Due: October 2017
- Selection by the Commissioner: December 31, 2017
- Target date for contract execution: June 1, 2018
Covanta proposes to close the entire Waste Processing facility and convert the existing single-stream Recycling facility on Murphy Road into a transfer station. Waste and recyclables would be handled at other existing Covanta-contracted facilities or elsewhere in the region. Covanta would pilot – and fund – curbside organics collection in the Hartford area, with that material going to the Quantum Anaerobic Digestion facility in Southington. If sufficient waste was under contract, Covanta would seek to expand its Bristol Waste Processing facility. Covanta’s proposal is different than the others because it does not rely on guaranteed contracts and seeks to utilize other infrastructure in place or that may be developed. It would also have the effect of increasing waste to out-of-state landfill.

Total Estimated Diversion of Incoming MSW in system: ≈20% higher than current practice
Mustang proposes a system that would close the existing combustion facility. Organics would be extracted from the Municipal Solid Waste in the Waste Processing facility for treatment on site via Anaerobic Digestion and enclosed composting boxes. Remaining waste is sorted to extract recyclables, and then processed into a process engineered fuel for use off site in a cement kiln in New York State, including the direct incorporation of the pelletized waste residue into the cement product. A portion of residual material would be sent to a landfill. The existing single-stream Recycling facility on Murphy Road would continue to manage source-separated recyclables.

Total Estimated landfill Diversion Rate of ≈ 70%
Sacyr Rooney proposes to refurbish the existing combustion facility, extract recyclables through new onsite sorting lines for Municipal Solid Waste and extract organics from the waste at the Waste Processing facility for treatment in onsite, enclosed, aerobic composting facilities and landfilling residue, including ash. The existing single-stream Recycling Facility on Murphy Road would continue to process source-separated recyclables. The Anaerobic Digestion facility will make renewable natural gas for fueling trucks and other vehicles.

Total Estimated landfill Diversion Rate of ≈ 49%
Other Details

**Single Stream Recycling**
Covanta proposes to convert the existing single-stream Recycling Facility on Murphy Road into a Municipal Solid Waste transfer station by shifting the processing of single stream recyclables to other nearby waste facilities.

Mustang proposes that the existing single-stream Recycling Facility on Murphy Road would continue to manage source-separated recyclables.

Sacyr Rooney proposes to use the existing single-stream Recycling Facility on Murphy to process single stream recyclables, and would include a modernized glass recovery system. As an alternative, single stream recyclables could also be sorted at a new mixed waste processing facility (including separate “clean” and “dirty” sorting lines) co-located at the site of the Waste Processing facility.

**Transfer Stations**
Under all three proposals, the existing MIRA-owned transfer stations will continue to operate for the management of Municipal Solid Waste and source-separated recyclables.
Other Details

Site Use

• Covanta proposes closing the Resource Recovery Facility altogether, maximizing potential for redevelopment.

• Mustang proposes closing the power block portion of facility, opening potential for riverfront development.

• Sacyr Rooney would utilize most of the existing site, with some space reserved for a potential co-location of an industrial use.
Other Details

**Education and Community Relations**

The three Finalists all described a commitment to an enhanced education program they are willing to support to help disseminate information regarding recycling and source separating food waste/organics from the waste line.

Mustang also proposes enhancing the existing (but currently closed) Trash Museum on Murphy Road.

Sacyr Rooney also proposes constructing a new visitors/welcome center/museum in the north part of the existing Power Block facility.

Developers were asked to assume a **minimum $4m annual host benefit fee** to Hartford (more than 4x current payment), as well commitments to local jobs.
State's Role in Project

• Select a qualified developer.

• Final project will be subject to DEEP permitting and MIRA’s oversight (MIRA will remain the owner).

• NOTE: This is an RFP for a developer and approval of technologies. Many of the terms are still under discussion and things may change between selection and final concept that are outside of DEEP’s direct control.
State's Role in Project

• DEEP will “direct” MIRA to enter into an agreement with the selected developer. Some terms will be prescribed to ensure adherence to the statutory goals of the project, but much may be subject to negotiation between MIRA and the developer, as well as other stakeholders.

• If MIRA and the developer cannot close an agreement in a timely fashion, DEEP has reserved the option of selecting another developer.
RFP Takeaways

• We are at a major transition point
• Unique opportunity for a more sustainable manner to how we approach waste management and recycling
• RFP has produced strong interest from serious competitors in the waste management industry
• Projects demonstrate optimal material recovery and necessary improvements to the plant, land and potential for further synergies and economic development
• Together we can work with the developer to maximize the benefits of the project to meet the needs of the state and our communities
Learn More

Email [DEEP.RFP@ct.gov](mailto:DEEP.RFP@ct.gov)
Wheelabrator’s Putnam Ash Residue Landfill – Past History & Future Developments

Donald Musial, P.E.

General Manager, WTI Ash Landfills

Wheelabrator Technologies
Putnam Ash Residue Landfill
History & Long-Term Developments

Environmental Business Council
October 17, 2017
Introduction

Donald W. Musial, P.E.
General Manager
Topics

- Facility overview
- Recyclable metals recovery
- Expansion development
- Value to Connecticut
Facility Overview
The “Quiet Corner”
Current Ash Disposal Footprint (60 acres)

Town’s Capped MSW Landfill (15 acres)

Metals Recovery Operation

Barnes Sand & Gravel

Transmission Lines

Killingly Power Plant & Industrial Park
Original Facility Purpose

- Reliable long-term residue disposal needs of Connecticut’s resource recovery facilities
  - Designed for a minimum life of 20 years
- Opened in 1999
  - 7-year development effort
- CT’s only active double-synthetic lined landfill
Present Facility Purpose

- Reliable long-term residue disposal needs of Connecticut’s resource recovery facilities
  - Plans for another 20 years
- Advanced recovery of recyclable scrap metals
  - Centralized location
  - Pioneering technology
Capacity Usage

• Original permitted capacity: 8.5M cy
• Between 2015 and 2016, managed residue from every resource recovery facility in Connecticut
  • ~700,000 tons received annually

• Remaining permitted capacity: 2.5M cy
• Expansion potential: 5M to 8M cy
Recyclable Metals Recovery
Metals 101

• Ash with **NO** recyclable metals recovery effort at WTE plant
Metals 101

• Typical ash received at landfill
Metals 101

- Two primary categories
  - Ferrous metal
    - Iron-based
    - Extracted by magnets
  - Non-Ferrous metal
    - Non-magnetic (Cu, Al, Zn, etc.)
    - Extracted by eddy current separators
Principal of Advance Metals Recovery

Inashco Technology Recovery

Traditional Metals Recovery

Size (mm)
Putnam-Specific

• Began in 2012 with demonstration projects
  • Series of short-term projects with several companies
• Current system on-line in December 2014
  • Partnered with Dutch company, Inashco
  • 1\textsuperscript{st} stage of a two-stage system
    • 2\textsuperscript{nd} stage presently taking place overseas

>25,000 tons of recyclable metals recovered
Ongoing Activities

• Awaiting CTDEEP permits for long-term operation
• Install 2\textsuperscript{nd} stage system
• Construct other controls
• Continue exploring ash reuse
Southern Expansion
Expansion Potential
- Current land: 190 acres
- Current footprint: 60 acres
- Several additional parcels controlled by Wheelabrator
Expansion Potential

- Current land: 190 acres
- Current footprint: 60 acres
- Several additional parcels controlled by Wheelabrator
- Added land: 180 acres
- Added footprint: 40-50 acres
- 5M to 8M cy new capacity
Ongoing Permitting

- Host community agreement in-place
- 1-year hydrogeologic study
- File CTDEEP applications in 2018
Facility Value to Connecticut
Value to Connecticut

• Reliable long-term in-state ash disposal
  • Cost-effective for CT resource recovery facilities
• Recyclable metals recovery
  • Direct impact on statewide scrap metals recycling rate
  • Potential domestic reuse of high-value metals
  • Adding new long-term jobs
• Significant financial benefits to local community
• Big step towards beneficial ash reuse
Panel Discussion

Moderator: Dana Huff, Tighe & Bond

Panelists:

• Peggy Diaz, CT DEEP
• Robert Isner, CT DEEP
• Christopher McCormack, Pullman & Comely LLC
• Donald Musial, Wheelabrator Technologies