

Helping Massachusetts Municipalities Create a Cleaner Energy Future

COMMONWEALTH OF MASSACHUSETTS

Deval L. Patrick, Governor
Richard K. Sullivan, Jr., Secretary
Mark Sylvia, Commissioner



Clean Energy via Anaerobic Digestion

Webinar
November 14, 2012
1:00 PM





The webinar will start in a few minutes...

1

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- **Lisa Capone**, Deputy Director, DOER Green Communities Division
- **James Doucett**, Deputy Director, Business Compliance Division, MassDEP's Bureau of Waste Prevention
- **Amy Barad**, Manager, MassCEC's Commonwealth Organics-to-Energy Program
- **Bram Claeys**, Renewable Energy Policy Director, DOER

2

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Introduction: Green Communities Division

Lisa Capone
Deputy Director
Green Communities Division



3

Green Communities Division
Serves as the hub for all Massachusetts cities and towns on energy matters




4

Green Communities Division Programs & Resources for Municipalities

- Green Communities Grant and Planning Assistance Program
- MassEnergyInsight energy tracking and analysis tool
- Municipal Energy Efficiency Program
- Energy Management Procurement Assistance
- ARRA stimulus funding
- Website filled with tools & resources for municipalities www.mass.gov/energy/greencommunities
- Email updates – **Sign up today** on the Green Communities web page (lower right of the screen)




5

Outreach - Regional Coordinators

- Regional Coordinators act as direct liaisons with cities and towns on energy efficiency and renewable energy activities
- Located at each of the DEP Regional Offices:

SERO – LAKEVILLE: Seth Pickering
Seth.Pickering@state.ma.us

NERO – WILMINGTON: Joanne Bissetta
Joanne.Bissetta@state.ma.us

CERO – WORCESTER: Kelly Brown
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WERO – SPRINGFIELD: Jim Barry
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6

Recording & Presentation

- Type in questions through your webinar screen – we will address those after the presentations.
- The webinar is being recorded, and will be available, with the slides, on our website in approximately 48 hours at: www.mass.gov/energy/greencommunities
- Websites are also listed at end of presentation




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Linking Good Environmental and Energy Policy

- January 2007 – Gov. Patrick put the state’s energy and environmental agencies under one secretariat, recognizing that good energy policy is good environmental policy, and that both make good economic policy.
- November 2011 – Clean Energy Results Program (CERP)
 - State environment and energy agencies collaborate to reduce barriers to clean energy development
 - Ideal vehicle for promoting responsible siting of AD
- AD perfectly illustrates the energy-environment connection: a “win-win” from multiple perspectives
 - renewable energy
 - solid waste management
 - reduction of greenhouse gas emissions
 - can cut energy and generate revenue for municipalities




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Poll Question 1

We would like to know our audience, are you a:

- Municipal official
- Local Energy Committee member or volunteer
- AD Developer/Business
- Potential AD development site (e.g. wastewater treatment plant, farm)




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MassDEP



Massachusetts Department of Environmental Protection



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Solid Waste Master Plan Two Major Goals for Organics:

- Divert substantially more organics from disposal facilities
- Generate clean power using Source Separated Organics (SSO)




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Solid Waste Master Plan Goals

- Reduce total disposal by 2 million tons/year by 2020 (30 percent reduction in disposal tonnage)
- Capture additional 350,000 tons per year of food waste (about 35% of generation)
- Develop at least 250,000 – 300,000 tons per year of processing capacity and supporting collection infrastructure for food waste




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Related Goals and Opportunities

- Increase percentage of energy produced by renewable sources
- Reduce GHG emissions
- Support farms by providing:
 - additional energy for farm operations
 - additional source of revenue
 - manure management option
 - fertilizer supplement




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Food Waste: Need/Opportunity

- Why focus on food waste?
- Food waste about 15-20% of disposal – just over 1 million tons/year from Massachusetts
- Has value first as food
- Can be used to create compost, soil amendment, fertilizer, and clean, renewable energy
- Other organics also:
 - Leaf and yard waste
 - Agricultural wastes




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Existing Capacity for Organics

- Farm-based and commercial food waste composting capacity (100,000 tons per year)
- 2010 – 70 composting operations registered with Dept. of Agricultural Resources
- 200 additional leaf and yard waste compost sites – municipal and private
- Six active POTW digesters
- Two farm-based digesters
- Three industrial AD's in operation




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Capacity Under Development

- 4 farm anaerobic digesters under development
 - 3-5 year timeline to develop
 - 220-600 kw generators
 - Generate fertilizer and bedding material as well as heat and power from digestion of manure and SSO
- Significant commercial and wastewater facility proposals




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 Manager of MassCEC's
 Commonwealth Organics-to-Energy Program



17

Composting (aerobic decomposition)

Advantages	Disadvantages
<ul style="list-style-type: none"> ● Familiar ● No major structures req'd ● Low-tech, forgiving ● Relatively low cost ● Produces valuable soil amendments ● Can be sited in agricultural or commercial settings 	<ul style="list-style-type: none"> ● Requires lots of space ● Slow ● Potential for odor, especially if food wastes are used ● Not suitable for liquid feedstocks ● No energy recovery (usually)




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Anaerobic Digestion (AD) is...

...a biological process in which micro-organisms break down organic matter in the *absence of oxygen*




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Materials that can be digested



- Food remains
- Food processing byproducts
- Yard waste
- Sewage sludge
- Livestock manure



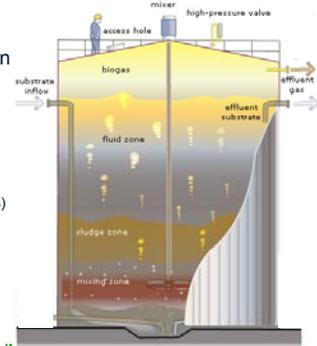
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AD at Wastewater Treatment Plants




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Anaerobic Digester Anatomy

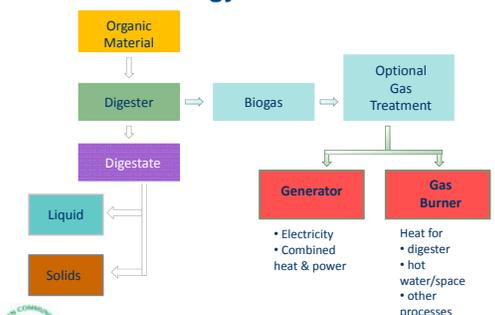


- Enclosed system
- Decomposition within weeks
- Design variations
 - Temperature
 - Feedstock type
 - o Wet (<15% solids)
 - o Dry (25-40% solids)
 - Digester setup
 - o Continuous
 - o Batch



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Anaerobic Digestion with Energy Generation



```

    graph TD
      OM[Organic Material] --> D[Digester]
      D --> DG[Digestate]
      D --> B[Biogas]
      D --> L[Liquid]
      D --> S[Solids]
      B --> OGT[Optional Gas Treatment]
      OGT --> G[Generator]
      OGT --> GB[Gas Burner]
      G --> G1[Electricity]
      G --> G2[Combined heat & power]
      GB --> GB1[Heat for digester]
      GB --> GB2[hot water/space]
      GB --> GB3[other processes]
    
```



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Biogas and its uses

- ~60% methane (natural gas), ~40% CO₂
- Fuel for heat and/or electricity
- CNG for vehicle fuel
- Pipeline gas
- Flare (burn off)




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Applications: Dairy Farm

- Better manure management
- Generate renewable heat and electricity
- Produce animal bedding and liquid fertilizer



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Co-Digestion at Farms or WWTPs

- Mix "source-separated organics" with manure or sewage sludge
- Leverage existing WWTP infrastructure
- Increase gas production
- Tipping fees = additional revenue



Jordan Dairy Farm, Rutland, MA



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Applications: Commercial Food Processor



Gills Onions, Oxnard, CA



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Applications: Institution



University of California at Davis

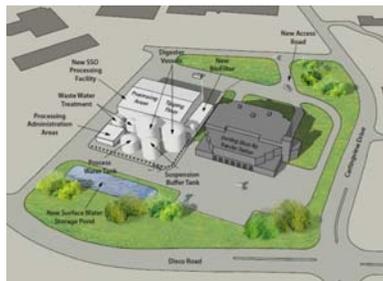


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Stand-Alone AD or Multi-Tech Facilities

Disco Road, Toronto Ontario



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Benefits of Anaerobic Digestion

- Renewable energy
- Valuable products for agriculture
- Reduced greenhouse gas emissions as compared to
 - Landfilling organic matter
 - Manure management via lagoons
- Reduced odor



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Assistance for Communities

- Mass. Dept. of Environmental Protection
- Mass. Clean Energy Center
- Mass. Dept. of Energy Resources

- MassDevelopment (brownfields)
- Mass. Dept. of Agricultural Resources (town farms)



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Technical & Financial Assistance Programs

Project Stage	Sited on Public Property	Private Enterprises	Agricultural Enterprises
Planning: Site Assessment	\$\$??	
Planning: Feasibility	\$\$	\$\$	\$\$
Design	??	\$\$	
Project Review	\$	\$	\$
Construction	\$\$	\$\$\$?
Operations	?	\$	\$



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Centralized Information Source

www.mass.gov/dep/energy/funding_organics.htm



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Mass DEP Programs

- **Sustainable Materials Recovery Program**
technical and financial assistance for **public and private** entities involved in the collection, processing, composting and recovery of organic materials
- **Recycling Loan Fund**
flexible lending programs for working capital, refinancing and real estate acquisition, purchasing of machinery and equipment and acquisition financing with reduced interest rates for projects involved in the collection and processing of organic material
- **Revolving Loan Fund for Clean Water (SRF)**
Low interest loans to assist **municipalities** for planning and construction of projects, which may include AD systems at WWTPs



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Mass Clean Energy Center Commonwealth Organics-to-Energy Grants

- Technical support for municipalities
 - Assistance with development of muni-sponsored project
 - Assistance with review of projects proposed by private developers
- Feasibility Studies – public or private
- Construction Projects – public or private




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Poll Question 2

Are you considering siting/development of an AD facility?

a) Yes
b) No



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DOER



37

DOER Grants

- Green Communities Grants (103 communities currently eligible)
Wide range of energy and greenhouse-gas reduction activities possible
- Qualified Energy Conservation Bonds
 - Federally funded; state makes allocations
 - Solicitation for public projects planned for 2013



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Current Production Based Incentives

- Renewable Energy
 - Renewable Energy Credits market
 - AD = eligible
- Combined Heat and Power
 - Alternative Energy Credits market
 - NEW: useful thermal energy can be heating of digester tank
- On site power generation
 - Net Metering Credits at set rate
 - AD only eligible when "agricultural" (for now)



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39

Qualified MA AD in RPS Class I

Plant - Unit	City/Town	MW
Deer Island	Boston	18 + 1.1
Jordan Dairy Farm	Rutland	0.3
Pine Island Farm	Sheffield	0.2



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40

Energy Bill

S. 2395, "An Act Relative to Competitively Priced Electricity in the Commonwealth."

- Net metering
 - AD becomes eligible technology on its own
 - Caps increase and small projects get exempt from counting towards caps – creating more room under cap
- Long term contracts
 - 10% carve out for MA distributed generation
 - Newly developed, small, emerging or diverse
 - Below 6 MW
 - Not net metering



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41

Poll Question 3

What do you see as the biggest benefit of AD?

- Environmental – reduce greenhouse gas emissions, manage solid waste
- Energy – generate clean, renewable electricity
- Economic – benefits to municipalities and other AD host sites
- Odor control



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42

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43

What Problems Are We Solving?

- Current regulations inadequate to address technologies other than recycling and composting
- Are these other technologies solid waste facilities?
- Are they recycling or composting activities?
- What is appropriate permitting pathway?
- No certainty for developers, MassDEP or other parties
- Banging a square peg in a round hole
- What are the appropriate standards to apply?



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Goal

Establish levels of MassDEP review and oversight commensurate with environmental and public health issues



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Site Assignment Exemptions

- Conditional exemptions
 - Operations and activities that do not need MassDEP oversight
 - Notification required for some activities
- General permits
 - Operations that are generally limited in size and/or have limited potential for nuisance conditions
 - Annual compliance certification will be required
- RCC permits
 - Larger operations requiring more direct MassDEP oversight
 - Permit application and review



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Site Assignment Exemptions

- 2 types of exempt activities:
 - Very small operations handling solid waste
 - Small operations handling recyclables or organic materials
- These operations manage pre-sorted recyclables and source separated organics
- Expanded the list of exempt activities beyond those in existing regulations
 - Activities at agricultural units – regulated by MDAR
 - Municipal food material collection drop-off <1 tpd



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General Permits

For larger recycling and composting activities

- Recycling operations <250 tons per day, not including paper
- Composting operations:
 - Receiving no more than 105 tons per week and 30 tons per day of putrescibles
- Aerobic or anaerobic digester receiving no more than 100 tons per day of organics from on or off site



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General Permits - Recycling

Must submit annual certification that operation meets requirements established in the regulations, including:

- No unpermitted discharges
- Recyclable materials not contaminated by toxics
- Products are marketable
- Residuals do not average more than 15% (single stream) or 10% (other recycling facilities)



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General Permits - Composting

Must certify that operation meets requirements established in the regulations, including:

- No unpermitted discharges
- Maintains proper temperatures (if composting)
- Implements an odor control plan and a vector control plan
- Is located at least 250 feet from existing well
- Ensures quality of organic materials coming in and products produced
- No more than 5% residuals generated



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RCC Permits

- Added a number of application details and possible permit conditions
- Application and permit review includes:
 - Plans to address control of toxics coming in
 - Site information
 - Design and operation information
 - Vector and odor control plans
 - Contingency plans to address management of materials and products
 - Information on products and residuals



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RCC Permits

- Only recyclable or organic materials may be processed or converted
Organic materials must be source separated (SSO)
- Design and operation must be feasible
- Public review and comment period on draft permit



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Waste Ban Development

Organics disposal ban proposed for summer 2014

- Food waste and vegetative material
- Wastewater management – does not apply
- Commercial/institutional organics – generators > 1 ton/week
- Estimate – 3,000 businesses/institutions

Working Schedule

- Draft regulations and guidance – early 2013
- Final regulations and guidance – summer 2013
- Effective date – summer 2014



53

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Q&A



54

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Presenters & Resources

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Clean Energy Results Program (CERP) anaerobic digestion:
<http://www.mass.gov/dep/energy/cerpanaerobicdigestion.htm>

MassDEP's Task Force on Building Organic Capacity:
<http://www.mass.gov/dep/public/committee/adtf.htm>



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THANK YOU!

- The webinar was recorded and will be available for viewing at your convenience on our website at:
www.mass.gov/energy/greencommunities
- The slide presentation will also be posted at:
www.mass.gov/energy/greencommunities



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56