Animal Waste Technology Projects

Got Any Bright Ideas?
RFP Eligibility Requirements

- Proven technology (not research)
- Farm partner/s identified and on board
- Site identified and secured
- Technologies must address nitrogen & phosphorus reduction or improve manure management on MD animal operations
- Proponent or subcontractors must have 3 years experience with technology
- Commits to complete installation in one year (MDA option for no cost extension of additional year)
- Agree to third party monitoring
# Animal Waste Technology Projects

<table>
<thead>
<tr>
<th>2014 projects</th>
<th>ANIMAL TYPE/LOCATION</th>
<th>MDA FUNDING</th>
<th>TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass Heating Solutions Inc. (BHSL) Annapolis, MD</td>
<td>Poultry Murphy Farms/Dorchester County</td>
<td>$970,000</td>
<td>Fluidized bed (Thermo-chemical)</td>
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<tr>
<td>Green Mountain Technologies, Inc. (GMT) Bainbridge Island, WA</td>
<td>Horse Days End Farm / Howard County</td>
<td>$150,790</td>
<td>In vessel composter/turnkey</td>
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<tr>
<td>Green Mountain Technologies, Inc. (GMT) Bainbridge Island, WA</td>
<td>Dairy Cattle Iager Farm /Frederick County</td>
<td>$237,520</td>
<td>In vessel composter/turnkey</td>
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<tr>
<td>Planet Found Energy Development (PFED) Berlin, MD</td>
<td>Poultry Millenium Farms/Worcester County</td>
<td>$676,144 (+ $900,000 grant from MEA)</td>
<td>Mesophilic Anaerobic digestion with nutrient separating system</td>
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</tbody>
</table>
In vessel composting (storage & curing of manure contained)

System monitored on & off-site: temperature, moisture etc

Reduce nutrient solubility and volume & nutrient content 50-60%

End product uses- bedding or sale as nursery planting medium, landscaping medium, or crop production fertilizer input
Technologies processing poultry litter
Biomass Heating Solutions (BHSL)

- Utilize poultry litter from 8 poultry houses (2500 tons/yr)
- Combustion process result in hot water & electricity
- Heating 2 poultry houses /2 act as controls during demo
- European facilities - heat accelerated bird growth & improved bird health
- Sell excess electricity to grid
- By-product is high phosphorus (w/potash) ash (potential market for fertilizer product blending) – approx 8% of manure volume
- In process of registering ash as soil amendment
Status: Biomass Heating Solutions

- Instrumentation of two poultry houses for technology conditions
- Calibration, testing energy ctr, 1 house intermittent system heat - early November, 2016 - February, 2017; 2 houses for Feb-April
- UMD 3rd party monitoring for bird health, bird & system performance and nutrient budget impacts
- Environmental Finance Center contract - economic analysis of system in farm context, life cycle analysis
Biomass Heating Solutions (BHS)

Murphy Farm, Maryland USA
Manure Shed-Conveyer System
Energy Ctr

Fluidized Bed Combustion (FBC) Unit

FBC Unit
Electrical Generator  Hot Water Tank
Planet Found Energy Development

- Mesophilic Anaerobic Digester linked with Nutrient Capture System
- Poultry litter from 6 houses turned into slurry
- Slurry processed through anaerobic digester to produce methane for heat & electricity
- Particulate fraction treated with struvite to extract phosphorus and nitrification/denitrification system removes ammonia
- Solids dried – 4:1 or 5:1 projected N:P ratio
Methane used to heat and run system and excess capacity to supply energy to farm
Partitioned nutrient by-products will be marketed/used on farm as fertilizer products
Dried solids considered slow release fertilizer product w/improved N:P ratio
Planet Found Energy Development

[Diagram showing the energy development system with various components and their nutrients]

- **Combined Heat & Power Generation**
- **Nutrient Capture System**
  - 0.81 tons litter
  - 0.037 tons N
  - 0.016 tons P
  - 0.029 tons K

- **Stage One Digestion Tanks**
  - 0.022 tons N
  - 0.009 tons P
  - 0.017 tons K

- **Stage Two Digestion Tanks**
  - trace NH₃ lost in gas

- **Litter from Barn**
  - 0.037 tons N
  - 0.016 tons P
  - 0.029 tons K

- **Poultry Litter Slurry Pit**
  - 0.41 tons litter
  - Initial Solid Separation
    - 0.015 tons N
    - 0.007 tons P
    - 0.012 tons K

- **Recycled Water Storage**
- **Nutrient Capture Staging Tank**
  - 0.39 tons litter
  - 0.022 tons N
  - 0.009 tons P
  - 0.017 tons K
Status: Planet Found

- Nutrient Capture System (NCS) redesigned and increased capacity - summer 2016
- Anaerobic Digestion (AD) Tanks installed - August, 2016
- Commissioning of AD ongoing since November
- Nutrient Capture System connection - April, 2017
- Anticipated fully operational June, 2017
## FY2016 Projects

<table>
<thead>
<tr>
<th>2016 projects</th>
<th>ANIMAL TYPE/LOCATION</th>
<th>STATE FUNDING</th>
<th>TECHNOLOGY</th>
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<tbody>
<tr>
<td>Veteran Compost</td>
<td>Livestock/Anne Arundel County</td>
<td>$350,302</td>
<td>Aerated Static Pile Composting</td>
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<tr>
<td>Chesapeake Bay Renewables</td>
<td>Poultry Litter/Somerset County</td>
<td>$1,400,000</td>
<td>Thermophilic AD w/Nutrient Recovery</td>
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</table>
Clean Bay Renewables

- Demonstrate thermophilic anaerobic digestion linked to nutrient recovery system separating nutrient constituents in byproducts
- Generate electricity-capacity 48 megawatt hours per day
- 90% electricity sold to grid, 10% used for parasitic load
- Regional facility, processing 80 tons/day poultry litter
- Litter purchased & sourced through manure broker
- Accept both cake and full house cleanout
- Ground-breaking planned June, 2017
- Currently going through PSC approval process
Primary Digester Tank (example)
Louise Lawrence, Chief Resource Conservation, MDA louise.lawrence@maryland.gov
Status: Green Mountain Technology: Days End Farm, Horse Rescue Howard County

- System installed 9/15
- Project extended to December, 2016
- Operation & monitoring ongoing since November, 2015
- Using compost for bedding
- Environmental Finance Center – draft economic analysis of system in farm context
- USDA, ARS conducting 3rd party monitoring, system performance, nutrient budget & pathogen fate
Construction completed 10/15
Operation & monitoring ongoing since December
Project monitoring through May, 2017
Environmental Finance Center - economic analysis of system in farm context, life cycle analysis
USDA, ARS conducting 3rd party monitoring of system performance and nutrient budgets
Veteran Compost

- Demonstration Aerated Static Pile composting
- Three scales:
  - 30-50 cubic yards/yr
  - 100-250 cubic yards/yr
  - 1500-3000 cubic yards/yr
- Public outreach & operator training
- Establishment of web-based Compost Cooperative: marketing compost
- Energy source solar – available for remote sites
- Contract execution late October, 2016
Small & Large Compost Units