Agricultural Anaerobic Digestion Roadmap for Connecticut

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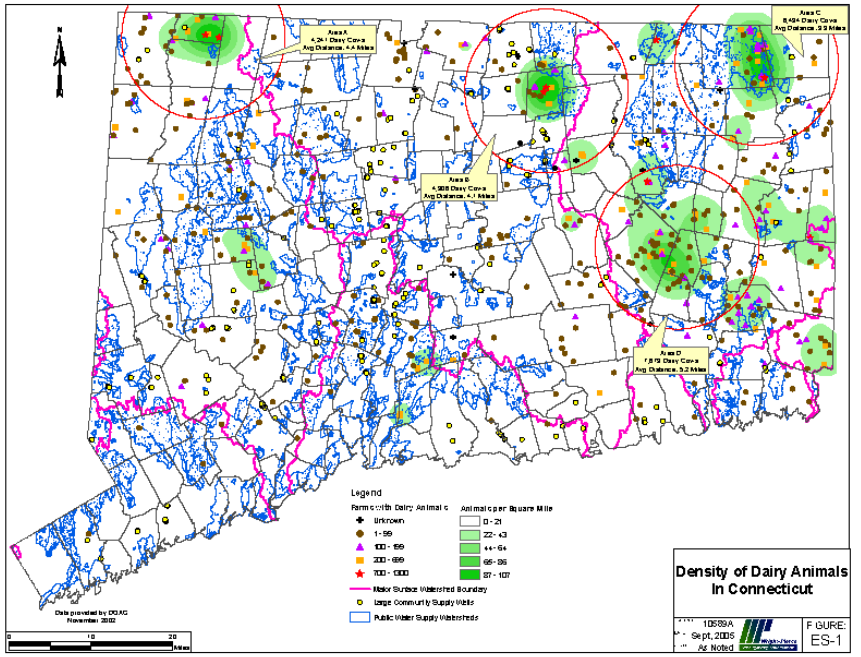
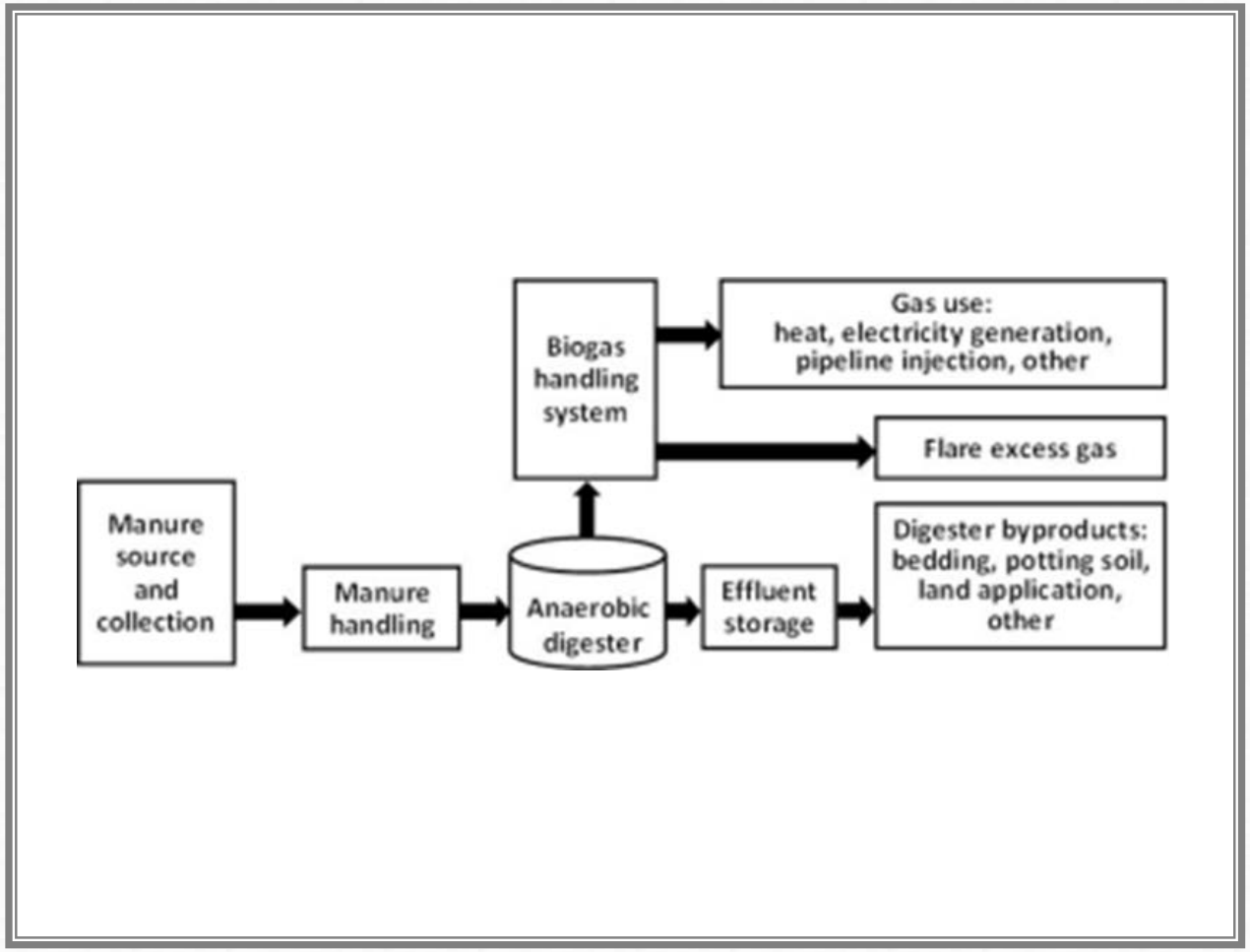
Roadmap Intent

Identify and explain anaerobic digestion technology, cost requirements and incentives available to dairy farms in CT seeking to install anaerobic digester facilities to manage animal manure and produce renewable energy and other coproducts of value

Farm Animal Manure in CT

- There are approximately 30,000 cows in Connecticut and 500,000 hens, producing a combined **638,000 tons** of manure annually
- Some of this manure could be used to create renewable energy (biogas) while achieving other value added benefits, including:
  - Odor reduction
  - Reduce GHG emissions over land application
  - Pathogen reduction
  - Phosphorus reduction to surface water
  - Creates soil conditioners and other marketable products





Anaerobic Digester System Components

- Manure collection systems
- Anaerobic digesters (tanks or covered lagoons)
- Biogas handling systems
- Gas use devices (engine, fuel cell, gas scrubbing equipment for CNG or RNG)
- Effluent storage

Farm Digester Challenges

- Capital costs are high – typically around $5-7 million for a complete mix system
  - Cost variables include integration to the existing manure collection system, adding food waste (dealing with contamination), interconnection costs for energy production
  - Permitting is significant, both time consuming and costly
- Planning for sustainable operations is often underestimated
  - Information from various state's studies and the UDSA indicate that farm projects are often exposed to unexpected costs from complex operations and maintenance planning – the farm comes first, and should come first. But this means the digester requires additional labor and expertise
- Revenue generation opportunities (tipping fees and energy) are limited

Regulatory Path is no Easy Lift

- Comprehensive Nutrient Management Plan – *all farm digesters should start HERE*!
- Permitting
  - Local Zoning
  - Volume Reduction Facility permit from DEEP
  - Water discharge – if wastewater is entering sewers
  - Air Permit (for diesel engine)
  - Siting Council review
- Grid interconnection (with the utility)

Generating Revenue

- Revenue generation opportunities are limited
  - Tipping fees
    - Farms are typically either unwilling to pay any tipping fees or will pay very modest rates
    - Food waste tipping fees are expected to fall within the $40-$60/ton range, depending on contaminant levels
  - Energy Revenue
    - Class I renewable energy programs have largely excluded anaerobic digesters over wind and solar. This may be changing as those technologies have matured as intended by the State's programs over the past several years
  - Digestate end products
    - The markets are very immature and localized for both animal bedding and fertilizer sale (therefore, often assumed to be revenue neutral)

Recognizing Value

- Farm digesters still face a difficult climb to becoming economic in CT, but they provide the one true path to a closed loop system for the state's organic waste
- State policy changes that more properly recognize the value of these projects through their energy and environmental benefits could be enough to make these projects viable
  - Revamped energy incentives, like those that helped wind and solar technologies mature, targeted to anaerobic digestion or digestion specifically on farms
  - Enact a consolidated program for permitting or for an ombudsman position to assist farmer/developer teams with permitting
  - Assist with the maturation of digestate materials market and strengthening partnerships between food waste generators and farms digesters

Access the CT Farm Energy Roadmap at ctfarmenergy.org

http://ctfarmenergy.org/Pdfs/ADRoadmapCT2016FINAL2.pdf