**MEC3040 Module 9 HW: Introduction to AD**

*This assignment asks you to read the articles referenced and linked below and answer questions about each article.*

**Questions about Erbentraut’s 2015 article, ‘Farmers are generating renewable energy and making money thanks to cow poop.’**

<https://www.huffpost.com/entry/cow-manure-renewable-energy-anaerobic-digesters_n_55c8f450e4b0f1cbf1e5d38c>

1. Erbentraut’s story cites a story Agence France-Presse that discusses a 3,400 cow-dairy that produces 70,000-gallons per day of manure that fuels a digester that powers 1,000 homes in Indiana.

(a) How much manure is produced per cow per day on this farm?  
(b) How many cows are required to power one home?  
(c) What’s the average electric use in Indiana homes?  
(d) So how many kWh per cow?

1. According to the Erbentraut story, why don’t more US dairy farms use AD?
2. According to the Erbentraut story, how many US dairy farms are large enough make AD pay?
3. According to the Erbentraut story, how many AD plants are operating in Germany as of 2014?

**Questions about Mark Linehan’s 2014 article, “Morally questionable – is anaerobic digestion really working?”**

<https://www.theguardian.com/environment/2014/mar/14/morally-questionable>

1. Why does the article by Mark Linehan Guardian 2014) question the morality of AD?
2. According to the Linehan article, what is the global economic cost of food waste?
3. According to the Linehan article, what is the global CO2 impact of food waste?
4. Linehan quotes a study of the quantities of food now wasted by the Institution of Mechanical Engineers.

(a) How much food does the study find is wasted?

(b) If we could avoid wasting that resource, how could the rescued food impact our efforts to feed the growing global human population?

**Questions about the USDA’s 2011 report, “Climate change policy and adoption of methane digesters on livestock operations”. The report is the first item in the search linked here:**

<https://www.google.com/search?client=firefox-b-1-d&q=Climate+change+policy+and+adoption+of+methane+digesters+on+livestock+operations>

1. The USDA released a report on in 2011. Among its “major findings” are factors that influence digester profitability if the US developed a carbon offset market. List those factors.
2. According the USDA report, what carbon price would be needed to increase use of AD in the US?
3. Briefly, describe the nature of the carbon offset market suggested by the USDA report.

**Questions about Mingle’s article in Yale E360, ‘Could renewable natural gas be the next big thing in green energy?’**<https://e360.yale.edu/features/could-renewable-natural-gas-be-the-next-big-thing-in-green-energy>

12. Vanguard Renewables has built a number of AD projects. What is different about this one?

13. Where is biogas likely to expand in the US? What particular markets or niches?

14. What factors are creating a ‘tipping point’ that may finally get AD off the ground?

15. The ‘Biogas Opportunities Roadmap’ investigated the potential of AD in the US.

(a) How many AD facilities does the report suggest could be built?

(b) How many homes could be powered by all US potential biomass?

(c) What percentage of heavy trucking could be fueled by this biogas?

16. How widely is AD used in Europe?

17. What US official is now working for the Danish AD industry, and why?

18. What is California’s LCFS and what effect is it having in California?

19. What is the business model for most new CA AD plants?

20. What is ‘Smithfield’ and why is it critical to discussion of the future of AD?

21. Who owns Smithfield?

22. AD technology isn’t new but US investment in AD technology on a large scale is. So what factor(s) is/are responsible for recent implementation of AD policy?

23. What makes AD in Vermont more challenging than AD in CA or NC?