Engineering an Effective Permitting Process for Commercial Food Waste AD Facilities

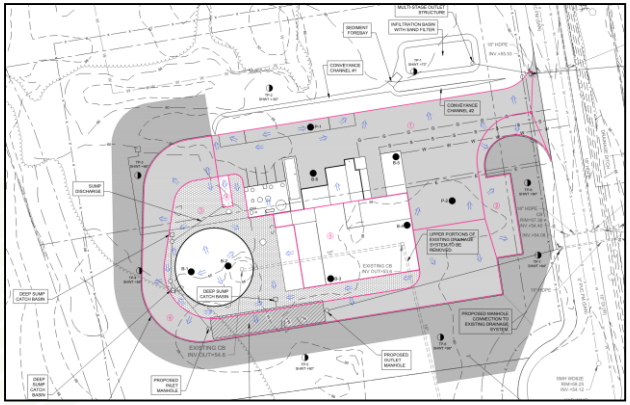
Eian Lynch, P.E. – Director of Engineering

Presentation Overview

1. **Project experience with permitting**
2. **NEO Energy Overview**
3. **Permitting prep for food waste AD facilities**
4. **Permitting specifics**
    1. Air
    2. Solid Waste
    3. Wastewater
    4. Stormwater
    5. Building Permits
5. **Lessons Learned**

Project Experience

- **NEO Energy**
  - » North Kingstown, RI - LSAD & fertilizer production
  - » Fall River, MA - LSAD & fertilizer production
- **Harvest Power**
  - » Project Delivery
    - Orlando, FL - LSAD co-digestion facility
  - » AD System Troubleshooting
    - Richmond, BC - HSAD facility
    - London, ON – LSAD Facility
  - » Project Development
    - Bourne, MA - LSAD Facility
    - Tulare, CA – staged LSAD/HSAD hybrid
    - Palo Alto RFP
- **Brown and Caldwell**
  - » Organics pre-processing
  - » Municipal co-digestion facilities & nutrient removal systems



Overview of NEO Energy

Energy / Renewables / Project Development

BayCorp HOLDINGS, LTD.

- Frank Getman, President & CEO
- Tony Callendrello, COO
- Originated as a public company owning 15% of the Seabrook Nuclear Plant
- Taken private in 2005 by Joe Lewis - Tavistock Group
- Focused on energy related investments
  - Operate two hydro electric facilities in Vermont
  - Partner in 100 MW biomass facility in Florida
  - Created NEO Markets, an online energy commodities exchange
  - Various oil & gas assets
  - Founded NEO Energy in 2010

Waste Recycling

Robert Nicholson

- Bob Nicholson, President of NEO Energy
- Founded UniWaste in 2002 which specializes in recycling of scrap electronic equipment and mercury
- Sold to Hendricks Holdings Corp in 2008
- Following acquisition, Bob grew the company to $40mm in sales

Sustainable Solution

NEO ENERGY™ GreatBay FERTILIZER

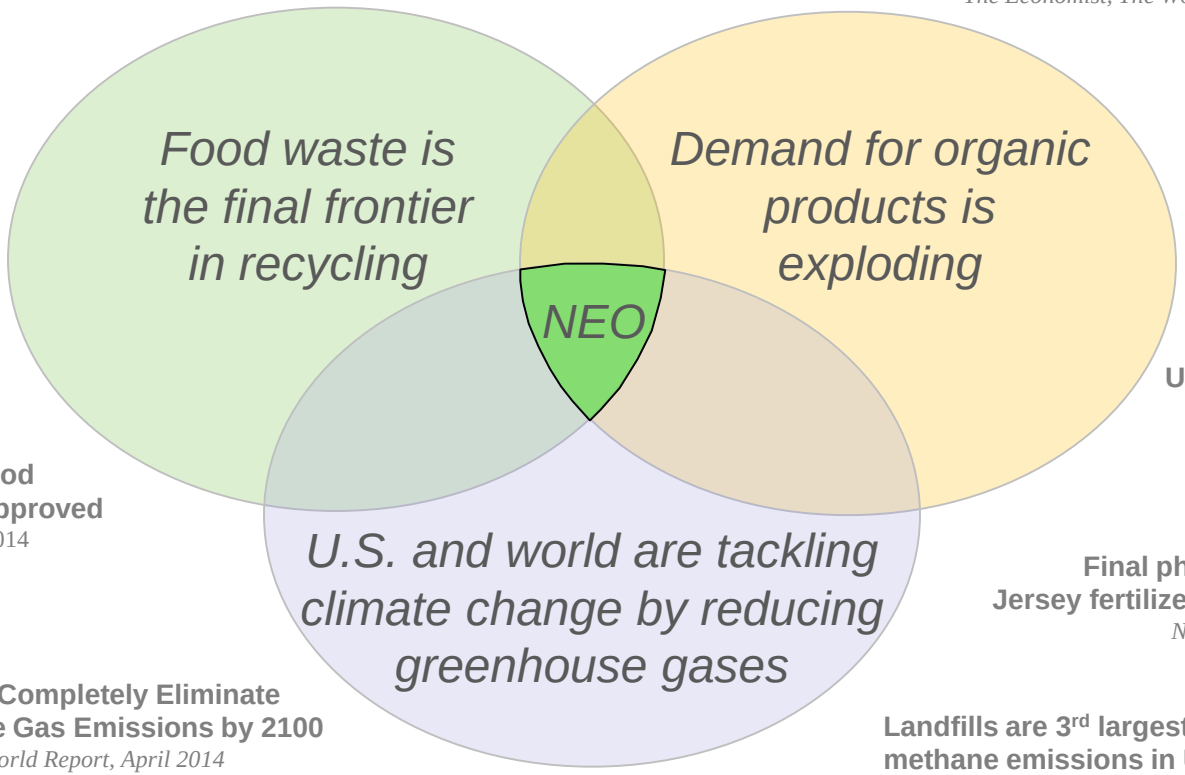
- Current staff includes:
  - Chief Agronomist
  - Director of Engineering
  - Director of Sales & Marketing
  - Director of Business Development & Finance
  - Director of Project Development
  - Pilot Plant Manager
- Back office support from BayCorp

NEO's Vision – Future of the AD and Organics Market

Food Waste Is Becoming Serious Economic and Environmental Issue, Report Says
NY Times, February 2015

"Waste not, want not" - Massachusetts is leading the way in recycling organic waste
The Economist, The World in 2014, November 18, 2013

A Food Waste Reduction Movement Gathers Steam
Forbes, July 24, 2013



American appetite for organic products breaks through $35 billion - sales jump nearly 12% in 2013 to a new record
Organic Trade Association

36 million tons of food waste generated in 2012 with only 5% diverted from landfills
U.S. EPA

USDA Announces Record Number of Organic Producers in U.S.
USDA, April 15, 2015

Bill mandating some food waste recycling in RI approved
Providence Journal, June 20, 2014

Final phase of strict New Jersey fertilizer law takes affect
NJ.com, January 5, 2013

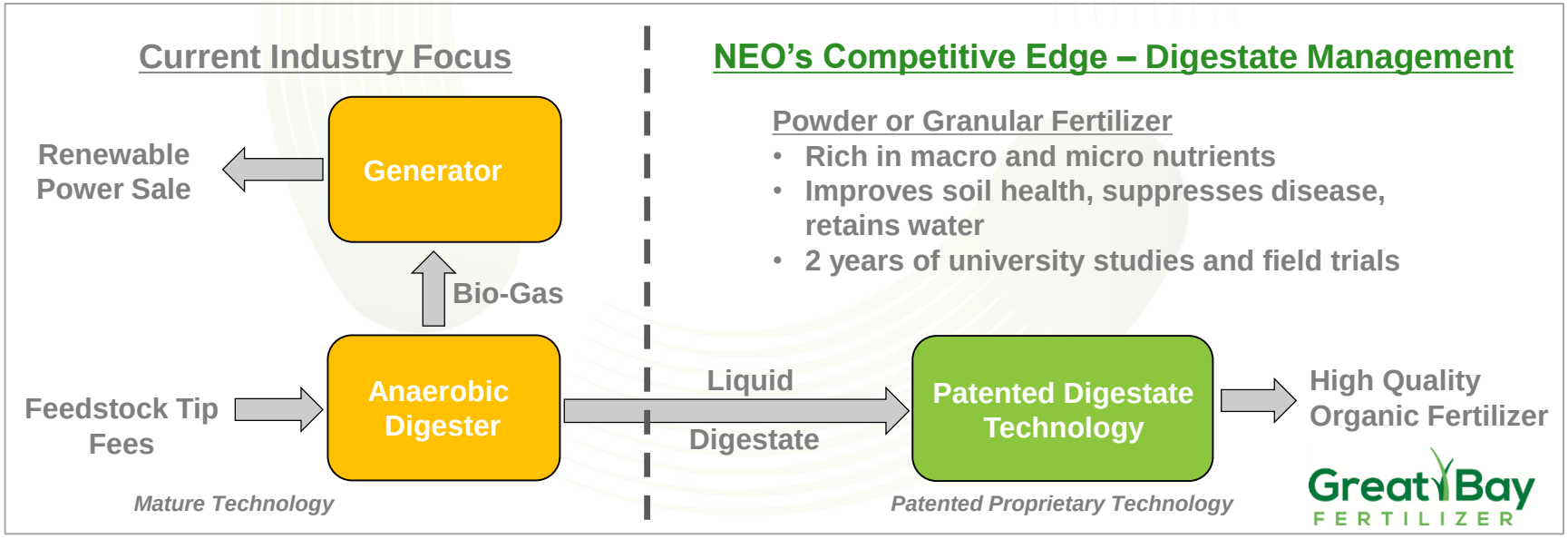
U.N. Panel: Completely Eliminate Greenhouse Gas Emissions by 2100
U.S. News & World Report, April 2014

Landfills are 3rd largest source of methane emissions in US
US EPA Overview of Greenhouse Gases

Obama Administration Releases Biogas Roadmap
EESI, August 8, 2014

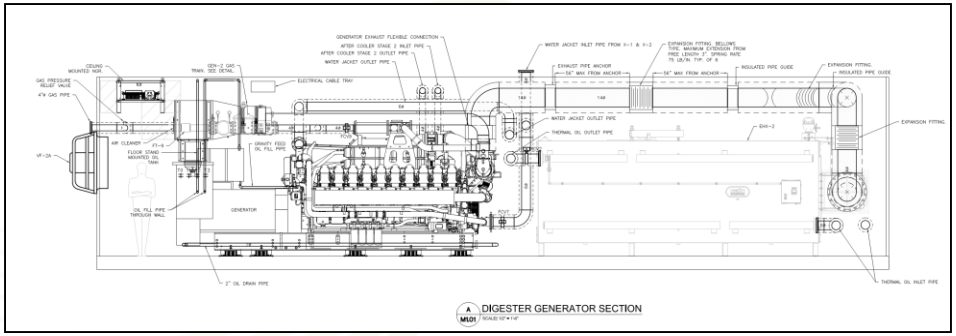
NEO's Differentiator – Digestate Management

- Technically address current industry fatal flaws with proprietary digestate process
- Converts liquid digestate by-product into dry fertilizer
  - Increases revenues through the sale of fertilizer product
  - Fertilizer product was developed over multiple years
  - Patented NEO digestate processing technology
- Provides opportunities for existing AD Facilities
  - NEO can "bolt-on" digestate management system
  - Pilot facility allows testing of digestate samples from several existing AD Facilities in NA



Permitting Organics AD Facilities

- **Environmental permits**
  - Air
  - Solid waste
  - Stormwater management & control
  - Wastewater discharge
- **Local - Site Control/Lease**
  - Consistency
  - Odor control plan & modeling
  - Site closure plan
- **Construction**
  - Building Permits
    - General & subtrades
    - Design-build vs full design
    - Earthwork/foundation
  - Occupancy permit



Permitting – Be Prepared

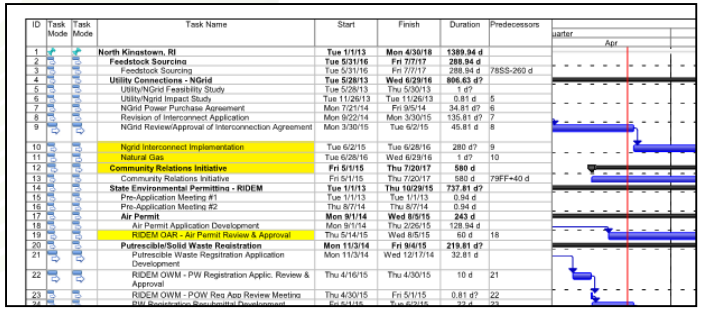
- **Learn to accept & deal with how it is**
  - Few decision makers are familiar with AD & organics recycling
  - Local and state regulatory agencies are understaffed
  - Complexity requires clarity
  - Consultants don't have all the answers

- **Be the shepherd**
  - Understand all aspects of your facility
  - Do as much engineering as you can
  - Pre-application meetings
  - Understand the intents and find mutual ground

- **Schedule accordingly**
  - Permitting will take 6 months +/- 3 months
  - Prep, application, review, negotiation

Project Name: RI Digester
Engine: CG132-12, 1800rpm, 25C Air Inlet, 31m
Fuel gas: Customer gas analysis

Reference O2 at mg/m3 [%] (Europe)	5			
Reference O2 at ppm [%] (USA)	15			
				INPUT
Dry exhaust gas volume [mn³/h]				1966
Engine mechanical power [kW]				519
Genset electrical power [ekW]				500
Exhaust volume flow dry O2 [%]				9.00
Emission [mg/mn3] at	5	%O2	NOx	475.00
Emission [mg/mn3] at	5	%O2	CO	993.00
Emission [mg/mn3] at	5	%O2	THC	1831.00
Emission [mg/mn3] at	5	%O2	NMHC (VOC)	92.00
Emission [mg/mn3] at	5	%O2	HCHO	154.00
Emission [mg/mn3] at	5	%O2	PM 2.5	5.00
Emission [mg/mn3] at	5	%O2	PM 10	5.00
				OUTPUT
Emission [ppm] at	15	%O2	NOx	86.89
Emission [ppm] at	15	%O2	CO	297.90
Emission [ppm] at	15	%O2	THC	549.30
Emission [ppm] at	15	%O2	NMHC (VOC)	48.18
Emission [ppm] at	15	%O2	HCHO	48.13
Emission [ppm] at	15	%O2	Particles	
Emission [ppm] at	15	%O2	SO2	9.43



Getting Started

- **Before you do anything, understand the basics of what you need**
  - » System configuration - front to back
    - Mass & energy balance
    - Process flow diagram (PFD)
    - Characterize all discharges (air, wastewater, solid waste)
  - » Site plan
    - Mechanical layout with emissions locations
    - Site survey, geotechnical data & analysis

- **Know the application process**
  - Know what regulators are looking for
  - Acceptable vendor information
  - Logistics on revenue streams

- **Do your homework on consultants**
  - » Relationships and applicable experience are key
  - » Maximize in-house work to lower cost

Environmental Permits - Air

- **Objectives**
  - Minor vs major source
  - Determine BACT, set emission limits, testing and reporting requirements for all non-exempt sources

- **Major components**
  - Application, AERMOD results
  - Draft permit
- **Impact to facility costs**
  - CAPEX: emissions controls, stack height & location
  - OPEX: chemical or media costs, operational limits, stack testing
- **Engineering needed**
  - Site plan, stack heights & locations, PFD
  - Emissions data from equipment vendors, stack testing or other reference
  - Detailed emissions calcs, mass balance, air modeling

Environmental Permits – Solid Waste

- **Objectives**
  - Set design, operational, and reporting requirements to prevent harm to public health and environment from facility startup to closure
- **Major components**
  - State specific, depending on landfill ban
  - Operations plan, closure plan & financial assurance
- **Impact to facility costs**
  - CAPEX: receiving building, feedstock treatment, odor control, storage
  - OPEX: odor control, staffing, lab work
- **Engineering needed**
  - Site plan, mechanical layouts (plan & section), truck traffic flow
  - Mass balances for feedstock throughput and solid waste generation
  - Operations plan including digestate management, odor control, houskeeping/vector control
  - Site cleanup & closure plan with cost estimate

Environmental Permits – Wastewater

- **Objectives**
  - Ensure safe conditions in collection system & WWTP
  - Regulate wastewater discharge to ensure WWTP meets NPDES
- **Major components**
  - Application
  - Wastewater characterization – flow and load calcs, lab data
- **Impact to facility costs**
  - CAPEX: wastewater storage and/or treatment, solids handling
  - OPEX: wastewater treatment, sampling & analysis, offsite disposal
- **Engineering needed**
  - Site plan, mass balance, PFD
  - Wastewater treatment design drawings, performance, equipment specs

Environmental Permits – Stormwater

- **Objectives**
  - Erosion control and runoff management during construction
  - Control runoff & sediment from new & existing impermeable surface, storage prior to discharge and ensure system maintenance
- **Major components**
  - Stormwater system design layout, equipment specs, design calculations
  - Operations and maintenance plan
- **Impact to facility costs**
  - CAPEX: final grading and surface type, runoff capture and conveyance, treatment and storage system
  - OPEX: system maintenance, solids removal, erosion prevention
- **Engineering needed**
  - Survey, geotechnical data and analysis
  - Stormwater flow, loading, capacity calculations
  - Design for final grading, stormwater system drawings (plan & section)

Construction Permits – Building & Inspections

- **Objectives**
  - Ensure code compliance for design and construction of new facilities
  - Inspection to confirm construction meets approved design
- **Major components**
  - PE-stamped design drawing packages for earthwork, structural, architectural, proc/mech, electrical, subtrades (plumbing, HVAC), fire
  - Equipment specs, wind-load calcs for structures
- **Impact to facility costs**
  - CAPEX: code compliance for buildings, wind/snow load, piping materials, fire protection, permit fees, detailed engineering
  - Schedule delays for approvals & inspections
- **Engineering needed**
  - PE-stamped detailed engineering drawings
  - Equipment specifications (PE stamp?)
  - Construction affidavits from discipline leads

Lessons Learned & Conclusions

- **Every project is different in it's own way**
- **Plan for delays and play nice to minimize**
- **Work to simplify everything for regulators**
- **Negotiate what is required at application vs conditional for construction and operation**
- **Educate all stakeholders on the plans and be consistent**
- **Know how permit decisions impact facility design & operation**
- **QA/QC EVERYTHING!**

Questions?

Eian Lynch, P.E. (MA)

- Dir. Eng., NEO Energy
- elynch@neoenergyusa.com
- (603) 294-4850
- 1 New Hampshire Dr., Portsmouth, NH 03801