

RELATED EXPERIENCE (BIOGAS/DIGESTERS/COMPOSTING):

AGreen Energy, LLC (Boston, MA)

- **Barway Farm Biogas (South Deerfield, MA) & Barstow's Longview Farm Biogas (Hadley, MA):** Performed an RFP and feasibility study including interviews and rating & ranking of four Design-Build teams and design/construction review for 2 @ 500 kW biogas systems at the 250 milking cow farms and including food waste and source-separated organics feedstock; Project Manager.
- **Jordan Dairy Farm Biogas (Rutland, MA):** Provided technical assistance for permitting and upgrades from a 300kW to a 500 kW biogas system with manure from a 300 milking cow farm and with food waste and source-separated organics feedstock; Project Manager.
- **Barstow's Longview Farm Biogas (Hadley, MA):** Provided technical assistance for permitting for a new 300kW biogas system with manure from a 250 milking cow farm and with food waste and source-separated organics feedstock; Project Manager.

Benjamin Family- Riverview Farm (Franklin, VT)- (As a sub-consultant to Bio-Methatech)

- Performed RFP, Construction Administration and part-time Construction Observation services, USDA-NRCS certification report and 1603 Treasury Grant commissioning report for a complete mix anaerobic digester facility to handle cow manure from a 450 head dairy farm and food waste and source-separated organics feedstock with biogas that fuels 2@95 kW CHP generator sets and provides process heat and excess heat for surrounding buildings. Also includes a solids separator system that produces animal bedding to replace purchased bedding; FCE Project Manager.

BioWatts (Florida)

- Preparing feasibility study for three Design/Build/Own/Operate collaborative facilities in Central Florida. These will include both Anaerobic Digester and Pyrolysis technologies, which will allow for multiple organic waste streams including pre-consumer and post-consumer food waste, animal waste, wastewater biosolids and yard waste. Outputs and by-products of each project will include 2MW equivalent of BioCNG or BioMethane, agricultural fertilizer and 1,300 tons/year of Biochar soil amendment; FCE Project Manager.

Bonniewiew Farm (Craftsbury, VT)

- Prepared a feasibility study for potential renewable energy options for a sheep dairy with 180 ewes and a cheesemaking facility. Renewable energy options include wind, solar and anaerobic digester/ biogas utilizing sheep manure, cheese whey and other on-farm organic materials; Project Manager.

Boucher Farm Biogas (Highgate Center, VT)

- Participated in an RFP and feasibility study for a 633 kW complete mix anaerobic digester project for this 250 head Vermont dairy farm. This MWK system would utilize cow manure and crop substrates to power a biogas/methane generator to produce electricity as well as heat for the farm residences and nearby utility buildings. Food waste substrates were also considered. Ultimately, with major changes in the crop markets, it was determined that this system was not economically feasible for this application; Project Manager.

City of Burlington, VT

- Construction phase engineering, start-up and operator assistance services for the Main Wastewater Treatment Facility; 5.3 mgd average flow, 13 mgd peak daily flow, 75 mgd CSO vortex separator and up to 200 mgd peak CSO flow; conventional activated sludge wastewater treatment plant (Project Manager) including:
 - Design of numerous unit process components including sludge dewatering (2 @ 2 meter belt filter presses) and associated chemical feed systems.
 - Design and operator training for PLC system and SCADA system.
 - As part of first year services, suggested and helped implement biological phosphorus removal, which provides significant savings in reduced chemical and biosolids disposal costs; Project Manager.

Casella Organics (Rutland, VT/Portland, ME)

- **Grasslands Facility (Chateaugay, NY):** Provided RFP, Construction Administration and part-time Construction Observation services for a Schwing "BioSet" Advanced Alkaline Stabilization Technology system. This system can process 250 wet tons/day (~91,000 wet tons/year) of municipal biosolids, utilizing a controlled exothermic reaction to pasteurize and compost the biosolids. This process produces Class A (PFRP) compost in 45 minutes, compared to 6 or 8 weeks for traditional composting. The work included 128,000 s.f. of new paved composted storage areas and a 16,800 s.f. covered compost storage building; Project Manager.
- **BGreen Energy, LLC (Barstow's Longview Farm Biogas, Hadley, MA):** Prepared a feasibility study for a 300kW complete mix anaerobic digester system with manure from a 250 milking cow farm and with food waste and source-separated organics feedstock; Project Manager.

Town of Castleton, VT

- Construction phase, first year, start-up and operator training services for 0.54 mgd Sequential Batch Reactor WWTF expansion/upgrade including biological phosphorous removal, septage receiving facility and a 400,000 gallon aerobic digester; Project Manager.

Chittenden Solid Waste District (CSWD, Williston, VT)

- **Food Waste Digester Feasibility Study:**
 - Selected as only firm to do a Desktop Feasibility Study for an Anaerobic Digester System for handling ~2,500 tons/year of food waste (pre-consumer and post-consumer, including cafeteria food waste) for all of Chittenden County.
 - Prepared Desktop Feasibility Study which studied three technologies and recommended one complete mix anaerobic digester technology; Project Manager.
- **Biosolids Composting RFP/Feasibility Study:**
 - Prepared an RFP and a Feasibility Study with rating/ranking of biosolids disposal/reuse options.
 - Assisted with implementation regional solution of beneficial reuse via windrow composting of 15,000 tons/year of biosolids; Project Manager.
- **Biosolids Screw Conveyor:**
 - Provided design and construction phase services for a design-build horizontal screw conveyor to handle 15,000 tons/year of biosolids to be distributed in 40 c.y. trailer dump trucks at the central dewatering facility at the main Wastewater Treatment Facility in Burlington, VT; Project Manager.
- **Biosolids Processing Facility, South Burlington, VT:**
 - Peer review and part-time construction inspection of paddle-type sludge drying/pelletizing system for processing 12,000 wet tons/year of biosolids.
 - Expert witness for construction claim mitigation.

Village of Essex Junction, VT

- My previous Company acted as Village Engineer for the 2.0 mgd ADF WWTF, assisting in various upgrades to the facility, which includes anaerobic digesters. This facility has a co-generation system which uses excess methane from the anaerobic digesters to fuel two 30 kW micro-turbines producing ~50% of the electrical energy for the Wastewater Treatment Facility; Project Associate.

Exeter Agri-Energy @ Stonyvale Farm (Exeter, ME)

- Performed design, RFP, construction administration and part-time observation services, USDA Rural Development certification and 1603 Treasury Grant commissioning report for a complete mix anaerobic digester facility to handle cow manure from a 1,000 head dairy farm and source-separated organics feedstock with biogas that fuels a 1.0 MW CHP generator set and provides 3,700,000 btu/hr of process heat and excess heat for surrounding buildings. Also includes a solids separator system that produces animal bedding to replace purchased bedding; Project Manager.

Green Mountain Power, Rutland, VT

- **St. Albans, VT Regional Anaerobic Digester System Peer Review:**

- Performed a Peer Review of a Preliminary Engineering Study to consider a regional anaerobic digester system in St. Albans, VT to handle cow manure and food waste to fuel a CHP generator set and provide process heat and excess heat for nearby buildings. Also includes a solids separator system that produces animal bedding to replace purchased bedding. Options range from:
 - ✦ Two adjacent dairy farms with 1,400 milking cows and 145 dry cows and liquid food waste to produce 580 kW of electrical energy to the grid, 2,200,000 Btu/hour of thermal energy and 4,800 tons/year of animal bedding.
 - ✦ Six nearby dairy farms totaling 2,800 milking cows and 315 dry cows and food waste and source separated organics (SSO) to produce 1.25 MW of electrical energy to the grid, 4,800,000 Btu/hour of thermal energy and 9,200 tons/year of animal bedding.

Town of Greenfield, MA/Massachusetts Clean Energy Center (Mass CEC) (As a subconsultant to BEAM Engineering, Brattleboro, VT)

- Process design team member in preparing a Transfer Station Anaerobic Digester feasibility study to compare several anaerobic digester technologies utilizing nearby municipal wastewater sludge, food waste, fats-oils-grease (FOG) and source-separated organics feedstock to fuel a 300 kW CHP generator set and to provide process heat and excess heat for surrounding buildings. Another option was considered to provide 100 SCFM of BioCNG (Biogas cleaned to natural gas quality and compressed and distributed) for the entire municipal fleet. Includes processing of dewatered digestate to be composted at a nearby compost facility to produce Class A (PFRP) compost. Also considered a Pyrolysis option (including by-products of syngas, synthetic oil and biochar) in lieu of Anaerobic Digestion; FCE Project Manager.

Hi-Vu Acres (Batavia, NY) (As subconsultant to Larsen Engineers, Rochester, NY)

- Providing process design and start-up assistance for partial mix covered lagoon anaerobic digester system to handle cow manure from 1,500 heifers and source-separated organics feedstock with biogas that fuels a 400 kW CHP generator set and provides 1,500,000 Btu/hour of thermal energy for process heat and excess heat for nearby buildings. Also includes a solids separator system that produces animal bedding to replace purchased bedding; Project Manager.

Jasper Hill Farm (Greensboro, VT)

- Assisting with the design of an anaerobic digester system to handle cow manure/separated liquid from 45 dairy cows and on-site cheese whey to produce biogas fueling a biogas boiler to provide ~100,000 btu/hr of process heat for the cheese making. Coordinating with the other project components including solid separator, heat-recovery aerated static pile composting and "Living Machine" biological wastewater treatment system; Project Manager.

Village of Johnson, VT

- Construction phase, first year, start-up and operator training services for 0.27 mgd Sequential Batch Reactor WWTF expansion/upgrade including sludge dewatering and aerobic digester; Project Manager.
- Construction phase, first year, start-up and operator training services for windrow biosolids composting facility; Project Associate/Project Manager.

Magic Hat Brewery (South Burlington, VT)/Purpose Energy

- Part of design team for a combination horizontal plug flow/partial mix and fixed film anaerobic digester for the beer processing facility in South Burlington, VT. This system utilizes the beer process by-products to produce biogas to fuel boilers for the beer process heat and for their facility building heat. Excess biogas fuels a 350 kW generator; Project Manager.

- Prepared an RFP, rating and ranking and assisted in the selection of the design/build team; Project Manager.

Maple Meadow Farm (Salisbury, VT)

- Preparing a feasibility study for a anaerobic digester/biogas system with a ~150 kW CHP unit for this chicken farm with 65,000 laying hens. Possible substrates include cheese whey, beer waste and cider waste as well as possible crop substrates from on the farm; Project Manager.

Town of Milton, VT

- Construction phase, first year, start-up and operator training services for 1.0 mgd Sequential Batch Reactor WWTF expansion/upgrade including biological nutrient removal, centrifuge sludge dewatering, sludge distribution conveyor and aerobic digester; Project Associate/Project Manager.

City of Newport, VT

- Construction phase, first year, start-up and operator training services for 1.0 mgd Conventional Activated Sludge WWTF expansion/upgrade including septage receiving, sludge dewatering and anaerobic digester additions and upgrades; Project Associate/Project Manager.

Town of Plainfield, VT

- Construction phase, first year, start-up and operator training services for 0.125 mgd Sequential Batch Reactor WWTF expansion/upgrade including aerobic digesters; Project Associate/Project Manager.

Town of Plymouth, MA/Massachusetts Clean Energy Center (Mass CEC) (As subconsultant to BEAM Engineering, Brattleboro, VT)

- Process design team member in preparing a Wastewater Treatment Facility Anaerobic Digester feasibility study to compare several anaerobic digester technologies utilizing on-site municipal wastewater sludge, off-site food waste, fats-oils-grease (FOG) and source-separated organics feedstock to fuel a 400 kW CHP generator set, to provide 50 SCFM of BioCNG (compressed biogas) to fuel the municipal fleet and to provide process heat and excess heat for surrounding buildings. Also includes an on-site compost facility to produce Class A (PFRP) compost from the digestate. Also considered a Pyrolysis option (including by-products of Syngas, Synthetic Oil and Biochar) in lieu of Anaerobic Digestion; FCE Project Manager.

City of Portland, ME

- Construction project management and chief of engineering for construction of a 15.2 mgd ADF (60 mgd peak) conventional activated sludge wastewater treatment plant and of a \$2,200,000 wastewater pump station; Sludge processing including: sludge thickener tanks, gravity table thickeners, air flotation thickeners, aerobic digesters, belt filter presses and "Zimpro" sludge heat treatment system; Senior Project Engineer/Chief Engineer.

Village of Poultney, VT

- Construction phase, first year, start-up and operator training services for 0.5 mgd Sequential Batch Reactor WWTF expansion/upgrade including biological phosphorus removal and aerobic digester expansion/upgrade; Project Associate/Project Manager.

Village of Sheldon, VT

- Construction phase, first year, start-up and operator training services for 0.1 mgd WWTF expansion/upgrade including aerobic digester; Project Associate/Project Manager.

Town of Springfield, VT

- Construction phase, first year, start-up and operator training services for 1.4 mgd Conventional Activated Sludge WWTF expansion/upgrade including anaerobic selectors for biological nutrient removal, sludge dewatering and anaerobic digester additions and upgrades; Project Associate/Project Manager.
- Construction phase, first year, start-up and operator training services for upgrades to the aerated static pile composting facility including solid waste full certification; Project Associate/Project Manager.

Spruce Haven Farm, Fleming, NY (As subconsultant to Larsen Engineers, Rochester, NY)

- Providing process enhancements and start-up assistance for partial mix covered lagoon anaerobic digester system to handle cow manure from 1,660 milking cows, 1,500 heifers and 200 dry cows with biogas that fuels a 500 kW CHP generator set and provides 1,700,000 Btu/hour of thermal energy for process heat and excess heat for nearby buildings. Also includes a solids separator system that produces animal bedding to replace purchased bedding and a sand separation system to remove the sand from the manure for the digester feed and to reuse the sand bedding; Project Manager.

Town of Stowe, VT

- Process design team member at Value Engineering Workshop for new 1.0 mgd SBR wastewater treatment facility with tertiary filtration, UV disinfection, autothermal thermophilic aerobic digestion (ATAD) and centrifuge sludge dewatering; Project Manager.

City of Taunton, MA/Mass DEP

- Source-Separated Organics/Food Waste Anaerobic Digester and Composting Feasibility Study
 - Prepared a feasibility study for a complete mix anaerobic digester facility to handle 360 tons/day (130,000 tons/year) of source-separated organics/food waste and to produce 3.5 MW of energy and ~10,000,000 btu/hr for process heat and for heat for nearby buildings; Project Manager.
 - Prepared a feasibility study for an aerated static pile compost facility to handle 360 tons/day of dewatered source-separated organics/food waste digestate and 170 tons/day of yard waste to produce valuable compost products; Project Manager.

University of Vermont (UVM), Burlington, VT

- UVM Miller Farm Anaerobic Digester Feasibility Study- Looked at cow and horse manure plus food waste (from the UVM cafeterias) and other on-campus organics to feed an anaerobic digester to provide heat for adjacent buildings and to power a 100 kW generator.
 - Phase I- Selected as one of two firms hired for feasibility studies to each study three technologies and prepared report with rating and ranking of three technologies; Project Manager.
 - Phase II- Selected as only firm to prepare Phase II feasibility study on overall selected technology and prepared report describing the layout, costs and feasibility of the selected technology; Project Manager.

City of Vergennes, VT

- Construction phase, first year, start-up and operator training services for 0.660 WWTF expansion/upgrade including tertiary filtration and aerobic digester; Project Associate/Project Manager.

Vermont Technical College (Randolph, VT) - (As a sub-consultant to Bio-Methatech)

- Provided initial technical assistance and contractor and supplier RFP/selection services for a complete mix anaerobic digester facility to handle cow manure from the VTC dairy farm, source-separated organics, cafeteria food waste and crop feedstock with biogas that fuels a 375 kW CHP generator set and provides process heat and excess heat for the VTC heating plant. Also includes a solids separator system that produces animal bedding to replace purchased bedding; FCE Project Manager.

Town of West Rutland, VT

- Construction phase, first year, start-up and operator training services for 0.45 mgd Sequential Batch Reactor WWTF expansion/upgrade including biological phosphorous removal and aerobic digester; Project Associate/Project Manager.

Westminster Farms (Westminster, VT)

- Prepared a feasibility study for the USDA Rural Development Grant/Loan application for upgrades from a 225 kW to a 450 kW modified plug flow anaerobic digester facility to handle cow manure from 100 additional (700 vs. 600) dairy cows and material handling and feeding of additional food waste and source-separated organics feedstock; Project Manager.

Related Biogas Site Visits-

- Visited six biogas sites in Austria with complete mix anaerobic digesters ranging from 100 kW to 1.1 MW with cow, chicken or pig manure and crop waste, food waste and/or glycerin substrates.
- Visited six biogas sites in Ontario, Canada with complete mix anaerobic digesters rated at 500 kW each with cow manure and crop waste, food waste, grease trap and/or glycerin substrates.
- Visited one biogas site in New Brunswick, Canada with a complete mix anaerobic digester system rated at 600 kW with cow manure (120 dairy cows) and food waste substrates.
- Visited one biogas site in Massachusetts with a complete mix anaerobic digester system rated at 300 kW with cow manure and source-separated organics and food waste substrates.
- Visited four biogas sites in Vermont with plug flow digesters rated at 15, 20, 150 and 450kW with mostly cow manure and some food waste feedstocks.
- Visited one biogas site in Ohio with mixed plug flow and complete mix digesters rated at 1.8 MW treating 60,000 tons/year of wastewater biosolids and including 5@ 3 meter belt filter presses, 3 centrifuges and a paddle-type sludge drying/pelletizing system.