
Animal Manure and Related Biomass Feedstock Market
Assessment and Preliminary Feasibility Study for a Papermill
Biomass/CoGen Facility

Task 2 Summary Report

for

**Southern States Energy Board
SERBEP Program**

with

South Carolina Energy Office

Submitted by:

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Linpac Paper
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Task 2 Summary Report

Industry Standards and Regulatory Environment

Task 2 Summary:

The Task 2 workscope involved documenting the state and local regulatory industry standards pertaining to the Biomass/Cogen facility, for reference and incorporation into later project work task requirements. The work was performed to provide a review and evaluation of key regulatory and permitting concerns. Initial findings are positive and an adequate documentation of regulatory standards has been obtained. The work results provide a good representation of the regulatory environment and permit considerations. A list of significant documents describing the regulatory framework is given in Appendix A.

Preliminary review of the information indicates that regulatory barriers to a biogas power generation facility in South Carolina are reasonable and readily surmountable. Air permitting appears to be the most important hurdle in biogas power generation. Under S.C. Code of Regulations 61-62, there are eight air quality standards which may apply to facilities. Land use permits are typically issued at the county or municipal level. The project is large enough that a public hearing for proposed land use would likely be required. Appropriate permitting steps and project implementation care will need to be taken to assure protection of air, water and soil quality during construction and operation of the biopower facility as well as distribution of the facility products and by-products. A review of safety requirements and regulations showed that with proper equipment safeguards, and training in Standard Operating Procedures and Job Safety Analysis (SOP/JSA) for staff, a Biomass/Cogen facility based on the CCI/BTA technology should be capable of meeting all facility and operational safety requirements in the state of South Carolina.

A key area of concern for the Biomass/Cogen facility is the biomass residuals and planned compost product(s). Solid organic residuals of the quality expected from the CCI/BTA technology, resulting from feedstocks such as animal manure, animal renderings and parts, food processing wastes and agricultural residues, should be able to meet compost product standards for South Carolina. Initial permitting of compost product(s) may be achieved under a Research, Development and Demonstration permit or equivalent, and later under a more permanent high quality compost classification. The compost should be marketable in most other SERBEP states, with the possible exception of Mississippi, which has extremely stringent compost quality requirements. Based on initial production of the CCI Newmarket facility, biogas and residual solids compost from the CCI/BTA technology are expected to meet high standards of quality in South Carolina and most other SERBEP and southeast regional states, given appropriate attention to environmental safeguards. A partial list of composting standards for several states in the southeastern U.S. is given in Appendix B.

The Biomass/Cogen facility is being designed to provide Linpac's linerboard mill with steam and power, accomplished using the biogas as fuel. However, based on deregulation, it may be advantageous to split the components, for instance providing steam to the mill to offset natural gas prices, while providing electricity to the grid as a premium green power product. South Carolina tends to have low electricity prices by national standards, so the sale of electricity locally on the grid would not be at a premium price, unless sold as "green energy". It is reasonable to expect that electrical power generated from biogas could be sold at a premium as green energy to the power grid. Typically this is accomplished with the electric utility service the area to buy the electricity and market it as green energy. It may be possible to eventually market and sell the energy to a higher

green energy demand region of location via the grid, resulting in a higher selling price for the electricity. Alternatively, there is a potential for direct sale of electricity or steam to businesses or industry in the vicinity of the biogas plant.

The facility will also have many marketable residuals that can add value to the project. For instance, plant residuals can be sent to existing recycled resin intermediate processors or in some cases processed on site for sale directly into the recycled resin industry. Glass, metals, and aluminum all have traditional markets for placement of the respective materials. Sand and grit can be used for asphalt or concrete production although the disposition in this market would not provide a revenue source.

This preliminary review of the regulatory framework in South Carolina indicates that it is reasonable to assume the permitting of a Biomass/Cogen facility based on the CCI/BTA technology can be achieved. The work in Task 2 will be continued for site specific concerns in Task 6.

South Carolina State Regulatory Framework

Overview

Like most states, South Carolina has implemented the federal Clean Air Act and Clean Water Act with state-specific versions. Air permitting is carried out through S.C. Code of Laws (COL) Title 48 and Code of Regulations (COR) 61-62. Water permitting is carried out via S. C. COR Title 61-9. These aspects are treated in detail in the subsections COR 61-9.504 on industrial sludge and COR 61-9.505 on land application. Solid residuals are regulated as solid waste under COR 61-107.

Disposition of Liquid Residuals

The choice of feedstocks, and the moisture content each may contain, can have a significant effect on the water balance in the facility. The CCI/BTA process strips most organic loading from the process water and typically has low heavy metal or contaminant loading. Inorganic dissolved solids can be concentrated in the process for removal and disposition, potentially allowing for closed loop zero effluent operations in the Biomass/Cogen facility. This liquid residual material has found value in European operations as a valuable liquid fertilizer. Land application of liquid residuals appears to be treated primarily through the water quality regulations, as materials applied to land potentially could leach toxic components (if they are present) into the groundwater. The facility's liquid fertilizer product should be compared against other liquid fertilizer product offerings to determine the necessary standards and permit requirements. A federal NDPEs permit may be required for land application or septage of liquid residuals, which may be applicable to the liquid fertilizer from the CCI/BTA process. In the case of land application, COR 61-9.504 and 505 would be in force, with limits on heavy metals and pathogens. If sewer is available at the plant location, the liquid residual may be discharged without an NDPEs permit, if it falls within acceptable limits for biochemical oxygen demand, toxic substances, and the like. Currently, CCI Newmarket discharges residual liquid to sewer without special permits, despite rather stringent requirements for effluent. If sewer is not available and the feedstock mixture's moisture content results in an overloading of water a effluent treatment facility may be required as part of the plant. This would require a formal NDPEs permit for the facility for discharging into a waterway.

Disposition of Solid Residuals

With appropriate feedstocks for the biogas plant, the solid organic residuals from the anaerobic digestion process will be suitable, with some additional preparation, for resale as a soil amendment or compost product(s). After anaerobic digestion (or "composting") has been completed, the dewatered solids are typically combined with some sort of organic drying and bulking agent (e.g., sawdust) and aerobically composted for a short period of time. If this material is considered as an

“industrial sludge,” the dewatered residual from an industrial process, the South Carolina water pollution regulations for disposition of industrial sludge indicate that the composted material would be dealt with under regulations for solid waste:

61-9.504.4 Relationship to other regulations.

(b) The disposal of industrial sludge involving the composting or co-composting of the industrial sludge with yard trash, land-clearing debris, or a combination of yard trash and land clearing debris shall comply with the requirements established by the Department in R.61-107.4 [Solid Waste Management: Yard Trash and Land-Clearing Debris; and Composting]. The submission and information requirements shall be determined by the Department.

(c) The disposal of industrial sludge utilizing an innovative and experimental solid waste management technology or process shall be permitted under R.61-107.10. [Solid Waste Management: Research, Development and Demonstration Permitting].

South Carolina Code of Regulations Section 61-107 specify how solid waste is to be handled and disposed of. For disposal as compost, see a partial list of requirements given in Appendix B in the column for South Carolina. Other solid plant residuals such as plastic, glass, metals, aluminum, sand and grit can be moved into existing recycled material markets as raw materials.

Cogeneration Facility Operation

Air permitting appears to be the most important hurdle in biogas power generation. Under S.C. Code of Regulations 61-62, there are eight air quality standards which may apply to facilities. In the case of a biogas cogeneration system of less than 20 megawatts located in a lightly polluted area such as Cowpens, at least two standards are applicable. Standard 1 governs fuel burning operations. In particular, smoke from stacks must have minimal opacity, limited particulates and sulfur dioxide. Standard 8 governs toxic air pollutant emissions for any facility that emits more than 1000 lbs per month of a toxic pollutant. Given the clean burning nature and low toxic contents of biogas, these air quality standards should pose only small hurdles.

Piping of biogas will be regulated by the federal Office of Pipeline Safety (Dept. of Transportation), if the pipes must leave the property of the biogas plant or cogeneration facility.

Safety would be overseen by the South Carolina Office of Safety and Health Administration, which implements the federal OSHA standards with minimal changes.

Construction of Biogas and Cogeneration Facilities

In addition to meeting state permitting requirements for environmental protection of air and water, building permits will be required for construction of a biogas or power generation facility. Land use permits are typically issued at the county or municipal level. The project is large enough that a public hearing for proposed land use would likely be required. Building permits would require following standard building codes for structures, electrical, plumbing and mechanical installations.

Sale of Electrical Energy

In 1978, the federal Public Utilities and Regulatory Policies Act (PURPA) was passed to encourage development of cogeneration and renewable energy sources. South Carolina has not formally implemented PURPA in its regulatory structure, but has accommodated it through the existing structures. If a facility meets requirements for a Qualifying Facility (by meeting size, ownership, efficiency and/or energy source criteria), it gains certain beneficial guarantees of pricing and purchase from public utilities. Pricing agreements between seller and utility are approved by the Public Service Commission, Utilities Department. The actual benefits of Qualifying Facility status depend on how details and definitions in PURPA have been understood in precedent-setting cases.

Alternative Markets for Cogeneration of Steam and Power

It is reasonable to expect that electrical power generated from biogas could be sold at a premium as “green energy” to the power grid. One possibility is for the electric utility servicing the area in which the electricity is generated to buy the electricity and market it as “green energy.” However, it may be possible to sell energy directly to a utility in a higher demand location, such as New York, using only the access to the grid provided by the local utility, resulting in a higher selling price for the electricity. South Carolina tends to have low electricity prices, by national standards, so sale of electricity locally on the grid would not be at a premium price, unless the demand for “green energy” is quite high.

Depending on the stability of the energy supply from the biogas plant to the grid, the amount and quality of the power, the biogas power supplier and the utility would come to agreement on the purchase price for the electricity. The Public Utilities Regulatory Policies Act (PURPA) and its successors are intended to ensure that small electricity generators and renewable power sources get advantageous pricing for their power. These policies are not yet built into the South Carolina regulatory structure, but regulators are aware of PURPA. Randy Watts of the Public Service Commission, Utilities Department indicated that his department would approve rates agreed upon by the biogas power generator and purchasing utility.

Alternatively, there is potential for direct sale of electricity or steam to nearby businesses or industry in the vicinity of the biogas plant.

Final Product Standards Evaluation, Use Requirements.

Compost generated from solid residuals of the biogas generation process are the most likely to be subject to product standards. South Carolina and adjoining states have quality standards for compost roughly equivalent to those given under the federal sewage sludge rule 40 CFR 503. “Class A” compost meets the 503 regulation limits for heavy metals, pathogens and limits the amount of manmade inert material. Compost which meets these standards is eligible for distribution and land application with very few restrictions. It may be sold in bulk or in bags. In the case of “Class B” compost, limits for contaminants, especially pathogens, are somewhat relaxed. In turn, this lower quality compost is allowed only limited uses, typically only for non-agricultural applications where likely human contact is somewhat limited.

Current production of solid residuals at CCI Newmarket appears to have low enough contaminant levels to easily meet Class A type compost standards in South Carolina, Georgia or North Carolina. The quality may be high enough to meet stricter requirements in states such as Michigan, which has developed contaminant limits based on leaching availability of the toxic material from soil into water as well as other potential paths to human ingestion. (See Michigan DNR references in Appendix A for more details). However, the state of Mississippi currently has such restrictive standards for compost that CCI residuals will probably not meet them. Further pilot test data will be required on this issue, but the prospects are promising for a highly marketable compost product.

Alternative Markets for Facility Residuals

The facility will also have many marketable residuals that can add value to the project. The residuals the facility will have are heavily dependent on the feedstock type that is brought in. For instance, agriculture or food processing biomass wastes can have packaging that provides for plastics, glass and metals that are removed from the process as a byproduct. The facility residuals can include the following items:

- Organic Biomass Residuals/Compost

- Plastics (LDPE, HDPE, PET)
- Glass
- Ferrous Metals
- Aluminum
- Sand and grit

The highest volume residual, and the most obviously marketable residual from the CCI/BTA process, is the compostable organic solid material. The regulatory framework for composting, detailed in the section below, is a key project area of concern that needs to be addressed. The eventual facility must have a sustainable outlet it can depend on for disposition of the biomass residuals and compost product(s) to allow for successful business operations. If, as expected, the composted material indeed meets Class A compost standards, a number of alternative markets for the material exist, including:

- distribution as a bagged compost product for commercial sale and/or garden use
- bulk compost for use on farms and commercial agriculture
- soil amendment for highway construction and roadside land reclamation
- soil amendment and/or compost soil for application in construction and landscaping
- soil amendment and/or compost soil for silviculture and nursery production
- daily cover and/or soil amendment at landfills

The market need not be restricted to South Carolina. Although adjoining SERBEP states standards vary, they have similar enough compost requirements when compared against the expected compost quality to reasonably assume a wide market application of this product. The compost residual volume typically represents about 20% of the total feedstock volume, and is a major component of the facility residual and by-product disposition that must be addressed with regard to providing a sustainable market customers for the life of the project. Based on the current markets and demand for compost, the assumption that sustainable markets exist to serve the facility is reasonable provided the compost material meets specifications.

Another important residual component, whose volume is more dependent on the feedstocks used, is the residual plastics from the facility. Residual plastics are typically packaging type materials such as LDPE, HDPE, and PET. Residual plastics have a ready market in the recycled resin industrial sector, for use by the industry in product lines such as plastic lumber, molded products and composite materials. The plastic residuals can be sent to existing recycled resin intermediate processors, or in some cases processed on site for sale directly into the recycled resin industry.

Glass, ferrous metals and aluminum all have strong historical markets for placement of these materials. Sand and grit may find disposition in asphalt or concrete production, although the disposition in these markets would typically not provide a revenue source but a cost avoidance.

Regional States Regulatory Framework

Composting standards vary significantly among SERBEP states and other states in the southeastern U.S.. A partial list of compost standards for several states in the southeast is given in Appendix B. Of those states listed, Mississippi has by far the strictest standards for compost products, with restrictions on metals content which may be below actual soil background levels and difficult to attain. Most other states roughly follow the federal guidelines for solids to be land applied, with a few exceptions (e.g., Tennessee is more restrictive, while Alabama and Washington, D.C. appear to have no requirements of their own). Most states require compost product testing at intervals of three to six months. Typically, labels are required which describe appropriate use of the compost as well as amounts of nutrients and toxic constituents.

Adjoining states Georgia and North Carolina initially appear to have regulatory frameworks similar to that of South Carolina, with state-specific implementations of the Clean Air Act and Clean Water

Act, and some kind of solid waste management regulation which includes compost. Compost products sold in these states would need to be permitted, requiring information about the source of the material as well as initial and periodic analyses of the nutrients, pathogens and contaminants in the products. Transport of feedstock materials may be regulated if they are “putrescible.”

In North Carolina, the Department of Environment and Natural Resources (DENR) has a Division of Air Quality, a Division of Water Quality and a Division of Waste Management. The DENR’s regulations contain a section on Solid Waste Compost Facilities (Section .1400 of DENR regulations). The facilities are divided into four classes, depending on the feedstocks. Type 1 is for garden and wood waste. Pre-consumer, meat-free food waste come under the Type 2 heading. Type 3 waste includes manures and other agricultural waste, as well as post-consumer source-separated food waste. Type 4 waste is mixed municipal solid waste.

The compost products are classified by quality, based on a scheme roughly equivalent to the Federal 40 CFR 503 standard for land application of sludge. Class A compost is unrestricted in its uses, and has more strict quality requirements. First, it requires some kind of process to reduce pathogens to an acceptable level. Second, the level of man-made inert materials may not exceed 6% by dry weight. Finally, the material must have metals content below the 40 CFR 503 standard levels.

It is important to note that Section .1402 of the regulations specifies the same quality requirements for compost imported from outside the state as it does for compost manufactured within North Carolina. Testing requirements, for one sample per six months or every 20,000 tons of product, hold in the case of imported as well as in-state products. In addition, detailed labels are required on compost products sold in bags.

In Georgia, under the Department of Natural Resources, Environmental Division, there are regulations for Air Quality Control (391-3-1), Water Quality Control (391-3-6) and Solid Waste Management (391-3-4). The compost regulations give a somewhat looser description of requirements under 391-3-4.16 than for North Carolina or South Carolina. Compost must be “non pathogenic,” “free of offensive odors,” biologically and chemically stable,” “free of injurious components or particles,” and “sustain plant growth.” Presumably this applies to imported compost products as well as in-state products.

Georgia also requires a permit for vehicles transporting garbage and “putrescible wastes.” If feedstock materials for a biogas plant are transported in Georgia, this requirement will apply.

Effect of Industry Standards on Biomass Power Cogen Plant

Probably the most significant effect of industry standards will be the restrictions for contaminants in solid residuals to be marketed as Class A compost. The choice of feedstocks will heavily influence the quality of the solid residuals. Operation of the CCI/BTA process will also affect the solid residual product quality, particularly with regard to chemical/biological stability and pathogen levels. Careful control of this process will result in a stable product which reliably meets standards for high quality compost. A stable product will be required to assure both permitting agencies and potential customers of product usefulness and safety.

In development of a raw material basis, a balance will need to be found between feedstocks of known, stable quality, such as forest residuals and animal manures, and less understood feedstocks, or those of poorer quality that are less understood per their effect on residuals contamination. CCI Newmarket employs an ongoing supplier training program providing quality standards for feedstock acceptance and rejection criteria. This type of program is highly recommended for the new Biomass/Cogen facility to prevent contamination problems for the compost product. More homogenous feedstock such as animal manure, food processing waste, and agricultural waste are likely better biomass feedstocks for the facility to start with. Once feedstocks from poorer quality

streams such as MSW based biomass streams or industrial streams can be shown as safe for use they can be incorporated into the raw material procurement effort.

Conclusion

A review of the regulatory framework in South Carolina indicates that permitting of a CCI/BTA technology based biogas generation facility combined with cogeneration capability could be achieved. Task 2 provides a good baseline of the regulatory environment and permitting concerns for later project work, particularly Task 6 site specific work. Local land use and construction permits would require typical effort, with possible need for public hearings on land use. Environmental permits related to air quality, wastewater and storm water will likely require the greatest effort. Solid organic residuals of the quality expected from the CCI/BTA technology should be able to meet compost product standards for South Carolina,

While most steam from a biogas-based cogeneration facility is expected to be used by Linpac, electricity may be marketed as “green energy” to achieve a greater revenue than if sold at usual wholesale rates. Federal regulations are in place to encourage beneficial pricing for producers of renewable energy and premium markets exist for green power. The compost should be marketable in most other SERBEP states, with the possible exception of Mississippi, which has extremely stringent compost quality requirements. Other facility residuals such as plastics, glass, metals and aluminum have existing markets that provide for disposition and increased revenue opportunities. Residuals such as sand and grit can achieve disposition, however will likely not provide a revenue source but rather a cost avoidance.

Appendix A

Critical Source Materials on Regulatory Framework and Industry Standards

Federal

40 CFR Part 503, United States Federal Sewage Sludge Rule.

South Carolina: see webpage at <http://www.enr.state.nc.us/>

South Carolina State House Network 1999 Code of Regulations 61-9: Water Pollution Control Permits. Of particular interest are subsections 122 (NPDES), 124 (Decisionmaking), 403 (Pretreatment), 504 (Industrial Sludge) and 505 (Land Application).

South Carolina State House Network 1999 Code of Regulations 61-43: Standards for the Permitting of Agricultural Animal Facilities.

South Carolina State House Network 1999 Code of Regulations 61-62: Air Quality Permits. Of most interest is section 61-62.5 (Air Pollution Control Standards), particularly Standard 1 (Emissions from fuel burning operations) and Standard 8 (Toxic Air Pollutants).

South Carolina State House Network 1999 Code of Regulations 61-107: Solid Waste Management. Of particular interest are subsections 61-107.5 (Collection, Temporary Storage and Transportation of Municipal Solid Waste), 61-107.6 (Solid Waste Processing Facilities), 61-107.10 (Research, Development and Demonstration Permit Criteria), and 61-107.15 (Land Application of Solid Waste).

Georgia: see webpage at <http://www.dnr.state.ga.us/dnr/enviro/>

Official Code of Georgia 12-9-1: Georgia Air Quality Act.

Official Code of Georgia 12-8-20: Georgia Comprehensive Solid Waste Management Act of 1990.

Official Code of Georgia 12-5-20: Georgia Water Quality Act.

Georgia Environmental Protection Division Rules 391-3-1 (Air Quality Rules), 391-3-4 (Solid Waste Management Rules, Rev. 1997), 391-3-6 (Water Quality Control).

North Carolina: see webpage at <http://www.enr.state.nc.us/>

North Carolina Department of Environment and Natural Resources Regulations, Section .1400: Solid Waste Compost Facilities

Other references

MERA Operational Memorandum #15: Default Type A Cleanup Criteria, Sept. 30, 1993, Michigan Department of Natural Resources.

Appendix B
Partial List of Compost Standards for Unrestricted Use in the Southeastern States