Burrows Hall, a sprawling 450-acre farm in rural Williamsburg County, has a pedigreed past as a winter playground for the storied Pulitzer family. The home burned decades ago, leaving an icehouse and ruins of the family swimming pool as reminders of glory days gone by.
Today, the property thrives as a well-run hog farm with an owner more interested in making history than reliving it.

In addition to raising hogs, farmer Duffy Connolly is also raising electricity. Specifically, and in a first for South Carolina, he is contracting with Environmental Fabrics Inc. (EFI) of Columbia to capture the methane gas associated with hog waste and use it as a fuel source for 180 kilowatts of power, power that Santee Cooper is buying as part of its renewable energy portfolio.

It’s a fairly simple concept, amped up by modern technology. The waste is stored in a covered lagoon, where its heat speeds up the bacterial decomposition of the waste that in turn gives off the methane gas. The gas is piped into an engine and snap, crackle, pop, out comes electricity.

Called anaerobic digestion, the decomposition process is faster and more complete than non-heated lagoons, and—the developers hope—more profitable.

Connolly has always looked to operate his farm as a sustainable venture. When he first read about Santee Cooper building a Green Power generating station using methane gas at landfills, the proverbial light bulb (energy efficient of course) went off in his head. Hog farms yield methane gas too, as a byproduct of waste treatment. Why not turn a corner of his farm into a renewable power producer too?

In short, the answer was: because we’d never done it before. But Connolly found a receptive audience with Santee Cooper, which was busy building additional landfill generating stations and solar arrays, and researching offshore wind energy.

“Santee Cooper has been generating renewable power for a decade, using sustainable South Carolina resources,” says Steve Spivey, renewable energy director for the utility. “We are eager to explore any project that is good for our environment and cost-effective for our customers.”

Duffy Connolly, owner of Burrows Hall farm.
And Santee Cooper had a willing group of organizations interested in lending brain power.

While Santee Cooper has successfully generated competitively priced electricity from landfill gas, the utility had never tackled turning animal waste into power. The model for landfill generation is economically sustainable: large, mature landfills give off enough methane gas to make generation a viable enterprise. The model for animal waste also looked to large operations, but South Carolina’s livestock farms weren’t large enough to use that business model.

Top: The covered lagoon captures waste from the hog houses beyond and serves as a mixing ground for the methane gas that then becomes electricity. Bottom: An access door to the lagoon, which can hold about 1 million gallons.
Santee Cooper turned to Clemson University’s Institute for Energy Studies (SCIES) to help craft a plan that would work in South Carolina. Using a grant administered by the South Carolina Energy Office and funded by the South Carolina Department of Agriculture, SCIES helped define the project and then evaluated more than 20 different companies and approaches to completing it.

Enter EFI, which had been building digesters for years and has more than 600 digester installations operating all over the world—everywhere except South Carolina (and the Southeastern United States). EFI certainly had the track record to build successful digesters. The challenge now was to scale down and engineer a setup that would work on a smaller footprint. The opportunity was bigger: If successful, the digester built at Burrows Hall could potentially be replicated at farms across South Carolina, creating another revenue...
stream for the state agriculture industry.

EFI proposed an insulated, covered lagoon system that produces methane-rich biogas as bacteria break down the organic matter. Construction began early last year and the digester was in test mode by late fall, with conditions being optimized so the bacteria in the lagoon could multiply. The engine’s waste heat is used to warm up the lagoon by a heat exchange, which accelerates bacterial growth. The warmer the temperature, the quicker the digestion and the more electricity that’s produced.

“You’re dealing with Mother Nature,” says Dennis Shanklin, CEO of EFI. “It’s a biological system. It takes time.”

And it shares a certain synergy with the agricultural industry. “Instead of feeding pigs, we’re feeding bacteria,” Shanklin says.

The covered lagoon that serves as the big methane gas laboratory takes up about a quarter-acre on a back corner of Connolly’s farm. It holds about 1 million gallons, and is covered by an impermeable floating membrane that several
grown men can walk across at one time. Metal plates located at various points offer access to mixers that keep the process moving.

A pitched-roof scrubber, about the size of a doghouse, stands beside one edge of the lagoon. Pipes carry the gas into the scrubber and then into the engine house beyond, where it feeds an engine with a capacity of 180 kilowatts.

That engine feeds electricity to a power line that Connolly already had on his farm—and that’s another reason this project seemed viable. In terms of power generation, 180 kilowatts is small potatoes, and so the cost to connect that engine to an electrical distribution system
would be prohibitive. (EFI builds projects that are 10 to 15 times larger.) Because Connolly’s line already existed, the connection here could be upgraded instead of built from scratch.

Methane gas is a greenhouse gas 21 times more harmful than carbon dioxide, and Connolly and Shanklin both note the environmental benefits to the Burrows Hall Renewable Energy Facility.

"It’s not all about making a profit,” Connolly says of his decision to push this project through. “If it will clean the air, and you can afford it, you do it.”

Another cost benefit lies in the technology Shanklin and EFI incorporated into the design. Much of the work is controlled remotely. “We can go weeks without actually visiting this plant,” Shanklin says. He says the plant is on track to become commercially operational later this year.

EFI will continue to own and operate the generating station, and Connolly will supply the fuel. Santee Cooper is purchasing the electricity that the digester produces, and Santee Electric Cooperative, which is the source of the power for the farm, is distributing the power via its distribution system. With the involvement of Clemson and the state energy and agriculture departments, the Burrows Hall Renewable Energy Facility truly represents a model public-private partnership where we all win.

Shanklin takes special pride in his involvement. “I’ve built these all over the world, and learned a lot about how to make them more viable in my 25 years in the business,” he says. “But this is a homegrown project. This is my first in South Carolina.”