

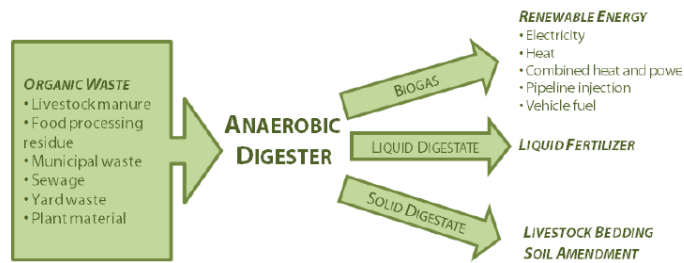
Overview of the problem

Each year, the US produces nearly 500 million tons of dry organic waste, generated from food scraps, animal manure and waste water sludge. Our nation's infrastructure is designed to dispose of this waste in the form of landfills, manure lagoons and water treatment facilities. This approach has dire consequences.

- **GHG:** 50% of US methane emissions (331 tgCO₂) emitted due to organic waste (the same as 80 coal plants).
- **Excessive energy consumption:** Over 7% of US electricity goes to organic waste mgmt.
- **Toxic soil and water:** Carcinogens, pathogens and nitrous oxide found in EPA tested local soil and sludge.
- **Declining rural quality of life:** Odor and toxins drive down rural property values and economy.

These traditional waste management practices fail to take advantage of the significant value potential of this waste.

Biogas as a solution



Anaerobic digestion (AD) is a process by which microorganisms break down organic, biodegradable material in the absence of oxygen. The process outputs biogas and digestate. Biogas consists of methane and carbon dioxide, and if recaptured can create electricity, heat or a natural gas substitute. Solid and liquid digestate is nutrient rich and makes for high quality fertilizer or animal bedding. By installing anaerobic digestion and methane recapture systems, municipalities, farms and processing facilities can harness this value potential – generating revenue, offsetting costs, reducing emissions and improving local quality of life.

Why hasn't it taken off?

Experts estimate that biogas systems can be economically feasible at 7500 dairy and swine farms, 3500 wastewater treatment facilities and 5000 food processing factories. To date, however, biogas systems have been installed in less than 1% of these sites, and the majority of systems are built, owned and operated by small players – individual farmers, municipalities or small businesses. In comparison, Germany – with just 81M citizens – currently has 7500 biogas plants.

Three primary market inefficiencies are stalling the US biogas market, all of which small independent operators are ill equipped to address:

- (1) **Limited expertise in identifying and monetizing biogas facilities:** Fluctuating energy prices, limited US policies that lock-in competitive long-term renewable energy prices, and inconsistent access to the grid all make it challenging to determine the optimal structure and profitability level of an AD sites. Farmers, municipalities and independent owner / operators often lack the expertise and resources to evaluate projects and structure innovative AD models that diversify revenue streams in ways that achieve long-term profitability.
- (2) **Complexity in tapping into diverse capital sources:** Due to a lack of nationwide consistency in renewable energy policies and incentives, successful projects require funding strategies that maximize the complex, evolving landscape of local, state and federal incentives.
- (3) **Fragmented value chain:** Experts, project developers, utilities, farmers and agencies are all critical to the success of a biogas project. Currently, however, collaboration occurs only on a project-by-project basis.

Therefore, a farmer or AD developer/operator interested in installing a facility has to become an expert in biogas revenue streams, government policy, anaerobic digestion technology and grant writing. Navigating this information and partnerships is complex and cumbersome, and takes time and focus away from the farmer's core business.

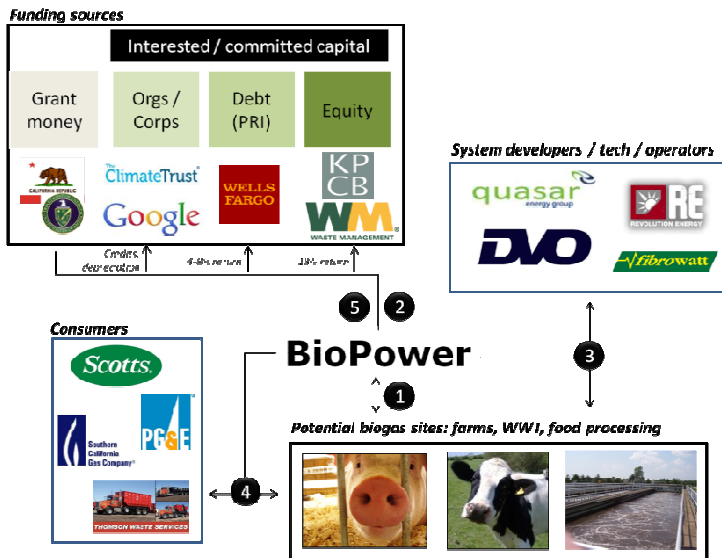
Our solution: BioPower

Loosely modeled after [Clean Power Finance](#), BioPower is the central platform in the biogas landscape, simplifying and facilitating strategic connections between potential AD system owners (i.e. farmers), project developers and operators, and strategic funders and investors.

BioPower's primary core competencies include:

- **Project sourcing:** BioPower establishes in house expertise on local energy policies and market conditions, and the resulting biogas revenue opportunities. Over time, we develop an algorithmic system to quickly evaluate and structure potential projects.
- **Strategic capital sourcing:** BioPower strategically secures funding from a variety of sources, based on the interests and risk appetite of each. We establish partnerships with a diversified base of funders interested in investing in specific project types and specific project returns (e.g. carbon offsets), and secure committed capital from equity investors.
- **Competitive project bidding:** BioPower partners with high performing developers, operators and technology experts, allowing them to bid on viable projects and enabling them to focus on core competencies. We also track performance metrics on all registered projects to provide comparative statistics to buyers and investors and to drive best practices.

Operating model and flow of funds



1. Potential biogas site identified. BioPower leverages in-house expertise and automated decision making tool to assess profitability and structure optimal revenue model. BioPower bundles projects.

2. BioPower first maximizes grant funding such as the Renewable Energy for America Program (REAP), state grants such as California's Public Goods Charge, or foundation grants. Next, we tap our funding partners seeking to investment in specific returns such as carbon credits or depreciation pass-through.. Next we tap into our diverse debt funding partners, including PRI investors, all seeking a 4-8% return. These funding sources should cover at least 60% of the capital structure. The remaining will be funded through our equity fund.

3. Developers and operators bid on projects through BioPower's system, creating a competitive marketplace.

4. BioPower structures and facilitates monetary transactions between sites and consumers (and investors who purchased credits up front), taking in cash flow. Consumers include utilities, trucking fleets interested in

CNG, hauling companies paying for disposal, farms looking for fertilizer or companies seeking carbon or renewable energy credits.

5. BioPower pays back debt investors and facilitates sale of AD systems to the site owners (i.e. farmers, municipalities) or to buyers such as Harvest Power. These systems will have been in operation for several years, and will have achieved a predictable annual cash flow.

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Financials of a single biogas site

There are a variety of "levers" that can be pulled to develop a profitable biogas site. Typical revenue streams include: (1) sale of energy, heat, biomethane, (2) sale of credits, (3) sale of fertilizer, bedding, fibers from digestate, and (4) tipping fees for taking in organic waste. In order for these revenue streams to work, a variety of market and policy factors must be considered such as access to the grid, local electricity and diesel prices and local tipping policies. Finally, project sourcing must also consider opportunities for upfront grants or strategic investments. For example, California's Public Goods Charge helps offset a large percentage of upfront costs. In North Carolina, Lloyd Ray Farms was able to install a biogas facility through an upfront sale of a share of carbon offset credits to Google.

Long term, one of BioPower's competitive advantages will be its unique ability to efficiently evaluate potential sites and structure the right project, based on the various levers and constraints outlined above. However, as we build out our expertise and track record, BioPower will focus on project types with an existing track record of success. The example below has been evaluated in California and Washington state feasibility studies and will be used as BioPower's baseline.

- **Assumptions:** Dairy farm in California with 2000 cows. Biogas system generates revenue from electricity sales to the grid (at \$0.09/kWh), tipping fees (at \$12/ton), digestate output sales, carbon offsets and renewable energy credit sales.
- **Upfront costs:** Total upfront cost of \$4M: 15% grants, 50% debt at a 7% return and 35% equity.
- **Revenue:** Generates annual revenue of about \$840K, half of which comes from sale of electricity and the rest from digestate sales, tipping fees and credit / offset sales.

This system has a payback period of 3 years, and an IRR of 24%. Based on initial market research, there are about 150 dairy farms with similar characteristics that have already been identified.

Social and environmental impact of a single biogas site

This single dairy farm example would produce an annual reduction of about 10K tons of CO2 emissions, equivalent to the electricity emissions for 1100 homes. Additionally, the farm and local community would experience significantly improved water, soil and air quality. Finally, the quality of livestock and nearby crops would also be higher, as traditional fertilizer is replaced by nutrient rich effluent.

Competitive advantage

BioPower's team will have expertise in partnership management, energy policy, AD and farm operations and project structuring and management. By sitting at the center of the currently fragmented value chain and becoming an expert in the nuances of biogas economics, BioPower becomes the critical market maker for the industry. We bring superior project sourcing and site development expertise. We hold partnerships with key utilities, energy departments, corporations and site developer/operators that enable us to develop and monetize sites efficiently. By appropriately structuring and bundling projects and allocating the returns buckets to the right capital sources, we can strategically take advantage of the diverse landscape of interested AD investors. Finally, by overseeing a large portfolio of sites across states, industries and revenue streams, we gain powerful insight into project risk and help lower the cost of capital in this industry.