

eFinancialModels

FINANCIAL MODEL CASE STUDY

Biogas Financial Model Case Study

How we developed a Tailored Financial Model for a Biogas Plant using Cow Manure as Feedstock

A dairy biogas plant earns its money on the price of its gas, not only on the volume. The financial model showed developer and partners that certification decides whether the project works.

KEY TAKEAWAYS

- A US project developer needed to know whether a biogas plant fed with dairy manure is feasible under a deal with partners.
- The gas price, fixed or volatile and for how long, moved the result most, followed by the certification premium.
- Turning point: without certification as biogas, the plant would struggle to be profitable.
- Outcome: a tailored model for different plant sizes and locations, with deal terms and tax credits built in.

At a glance

INDUSTRY	Biogas (renewable energy)
CLIENT	Project developer
REGION	United States
PURPOSE	Financial feasibility of a biogas plant using cow manure as feedstock
MODEL SCOPE	Herd, manure and gas output; plant size; price schemes and scenarios; CI score and certification; revenue share; investment tax credits
DELIVERABLES	Tailored financial model

The situation

A project developer in the United States wanted to know whether a biogas plant fed with cow manure would be financially feasible. The model had to cover the whole chain, from the herd to the revenue, work for different plant sizes and locations, and reflect the envisaged deal structure between the developer and its partners.



How biogas works

Manure from a dairy herd goes into a sealed digester. There, microbes break it down without oxygen and produce biogas, a methane-rich gas that can be used as fuel or to generate power. How much gas a farm can deliver depends on how much manure its herd produces.

What was at stake: Why the model mattered for the deal

Before a plant is built, developer and partners have to agree who gets what. They need the same answers: how much gas, at which price and for how long, whether it qualifies for certification, and what remains after the revenue share and the tax credits. The model puts each answer in one place.

How biogas is made and sold, and where the model comes in

Biogas starts with the cows. Their manure goes into a sealed digester, where microbes produce methane-rich gas that is sold as fuel or turned into power. The price then depends on the carbon intensity of the process, so the model follows the chain from the herd to the revenue.

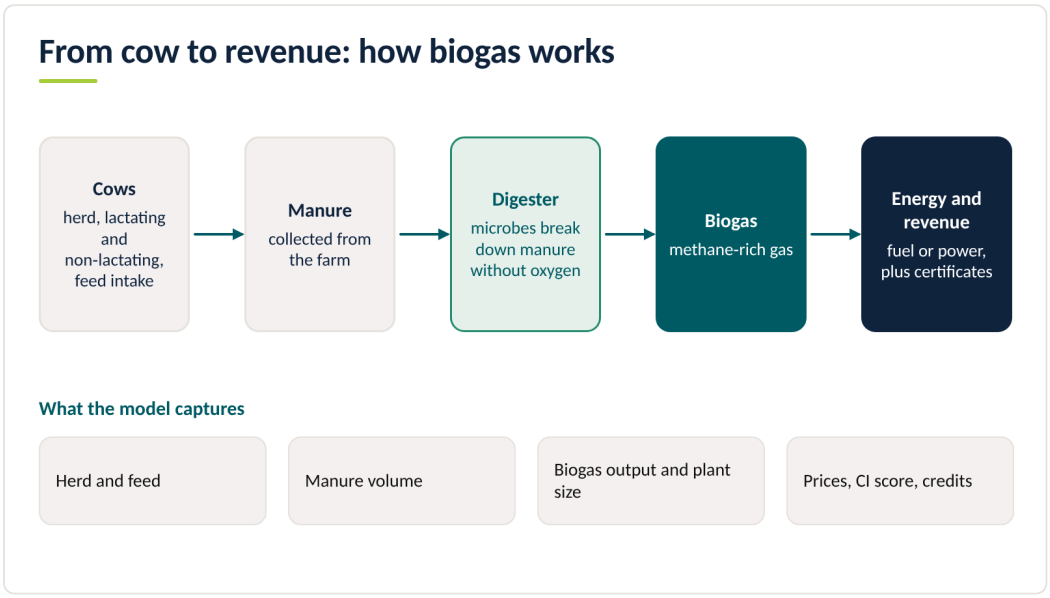
1 Cows
Herd size, cow status (lactating or non-lactating) and feed consumption set how much manure is produced.

2 Manure
The manure is collected on the farm and fed into the digester.

3 Digester
Microbes break the manure down without oxygen. The plant size follows from the manure supply.

4 Biogas
The digester produces methane-rich gas. Its CI score decides whether it qualifies as certified biogas.

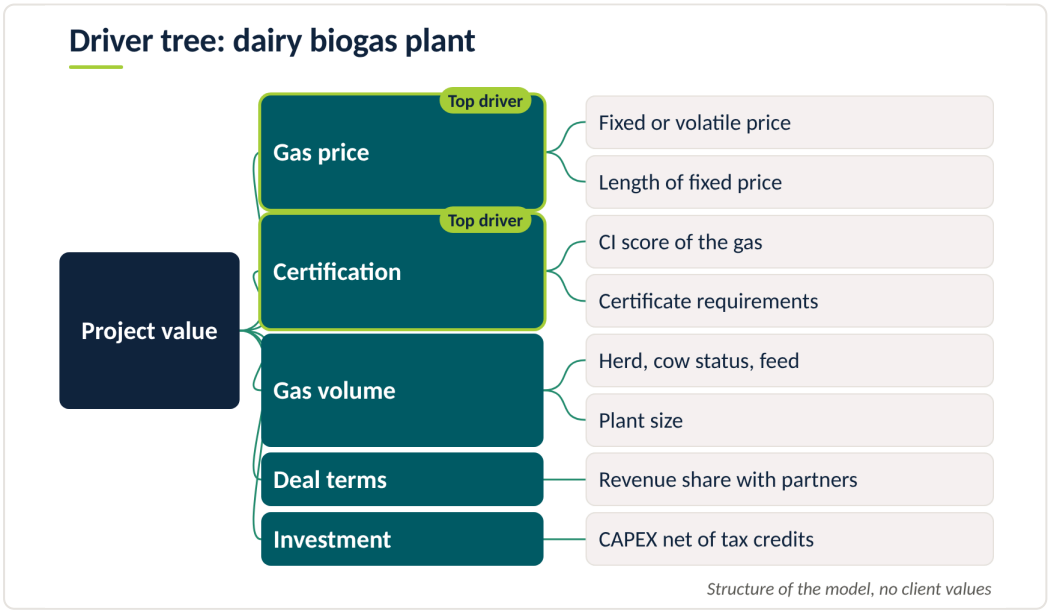
5 Energy and revenue
The gas is sold at a fixed or a market price; certified gas earns a premium.



From cow to revenue: how biogas works.

What drives the value?

In the engagement, the gas price moved the result most, including whether it is fixed and for how long, followed by the price premium for certified gas.



Driver tree: from project value to the inputs (structure only, no client values).

What made it hard to model?

1 From cows to manure to biogas

DIFFICULTY Modeling the biogas output required a detailed understanding of the conversion process from cows, to manure, to biogas, the factors that impact that process, and the calculation of avoided carbon emissions.

OUR SOLUTION We mapped the whole chain and built the model along it, including the factors that drive each step and the calculation of avoided carbon emissions.

2 Manure depends on herd status and feed

DIFFICULTY Manure production depends on the size of the herd, the status of the cows (lactating or non-lactating) and their feed consumption.

OUR SOLUTION We analyzed herd, status and feed in detail and presented the result in an understandable manner.

3 Plant size depends on the whole deal

DIFFICULTY The best plant size is not set by manure supply alone. It depends on the parameters of the whole deal, and those change from location to location.

OUR SOLUTION We built the model to work for different plant sizes and locations, with manure supply, output, prices and deal terms as inputs.

4 Fixed or volatile gas price

DIFFICULTY The gas price can be fixed under a contract for a period or follow a volatile market. Which applies, and for how long, moves the result most.

OUR SOLUTION We modeled fixed and market prices, including how long a fixed price applies, with upside and downside scenarios side by side.

5 Certification decides the price

DIFFICULTY The CI score measures the carbon intensity of the gas and decides whether it qualifies as certified biogas. Only certified gas earns the higher price.

OUR SOLUTION We modeled the CI score from the energy mix and the emissions of alternative electricity, and linked it to certification and the price premium.

6 A revenue share with partners

DIFFICULTY The model had to reflect the envisaged deal structure between the project developer and its partners.

OUR SOLUTION We analyzed the terms of the agreement and modeled additional cost line items to fulfil those terms.

7 Investment tax credits

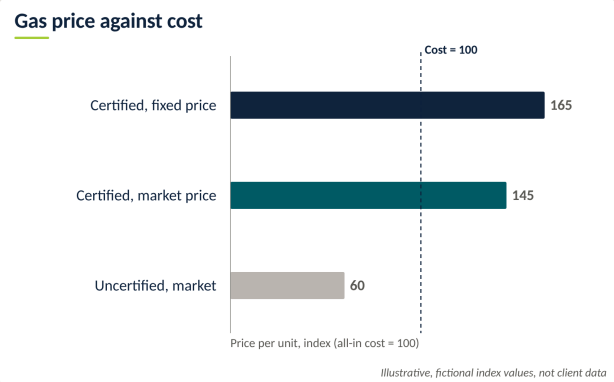
DIFFICULTY Investment tax credits partially pay for the initial capex, which changes the funding need and the returns.

OUR SOLUTION We modeled the investment tax credits and their effect on the initial capex.

THE TURNING POINT

Certification, not volume, decides the case

The first questions about a dairy biogas plant are usually about volume: how many cows, how much manure, how big a digester. The model answered them, and then showed where the value sits. Sold as ordinary gas, the output would leave the plant struggling to be profitable. What makes the difference is certification: if the CI score qualifies the gas as certified biogas, it can be sold at a higher price. From then on, the discussion centred on the gas price, how long a fixed price would apply, and the certification premium.



Price per unit against cost per unit, index with fictional values (not client data).

Why certification gets its own case in the model

Certification is a yes-or-no gate with a large effect on the price: the same gas earns one price without it and a higher one with it. A model that blends both into one average hides the gate. Showing certified and uncertified gas side by side tells developer and partners what the project is worth if certification does not come through.

What we built

INPUTS	CALCULATION MODULES	OUTPUTS
Herd size, status and feed	Herd and manure	Manure and biogas volumes
Plant size and location	Gas output and plant sizing	Revenue by price scheme
Gas price: fixed period or market	Pricing, CI score and certification	Upside and downside scenarios
CI score inputs: energy mix, emissions	Revenue share	Developer and partner cash flows
Deal terms and tax credit rules	Capex and tax credits	Financial feasibility

How we worked together

Step 1

Analyze and discuss

Analyzed how biogas is made and priced, from cows to manure to gas, and led the opening discussion.

Step 2

Build the chain

Built herd, manure, output, pricing and CI score modules.

Step 3

Iterate

Worked through various iterations of the model with the client.

Step 4

Final model

Completed the model with deal terms and tax credits.

What came out of it?

The developer can test any site and deal: plant size, gas price, certification and partner terms in one model.

- A tailored feasibility model for a biogas plant using cow manure, usable for different plant sizes and locations.
- Fixed and market price schemes with upside and downside scenarios, tied to the CI score and certification.
- Manure and gas output built up from herd, cow status and feed.
- The revenue share terms and the investment tax credits reflected in the numbers.

Lessons for Biogas

1. Model certification first. Without the premium for certified gas, the economics of a dairy plant may not hold.
2. Treat the price as a model of its own: fixed or volatile, for how long, with or without the premium.
3. Build for more than one site. The best plant size depends on the deal, and deals change by location.

Questions your model must answer

1. Will the gas qualify for certification, and which CI score does the process reach?
2. What price premium does certified gas earn over ordinary gas?
3. Is the gas price fixed, and for how long, or does it follow the market?
4. How much manure does the herd produce, given cow status and feed?
5. Which plant size fits the deal at this location?
6. How is revenue shared with partners, and which costs does each side carry?
7. How much of the capex do tax credits cover?
8. Does the project still work in the downside price scenario?

Client details are anonymised to protect confidentiality. Charts, schematics and worked examples are illustrative and contain no client data.

Planning a biogas project?

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