eFinancialModels

FINANCIAL MODEL CASE STUDY

Green Hydrogen Financial Model Case Study

How we developed one Financial Model that analyses every Green Hydrogen Project powered by Wind



The return of a green hydrogen project depends on tax credits, electricity cost and the sales contract. We prepared one financial model that analyses all of the client's green hydrogen projects, not only one: every project runs through the same approach and method, so projects can be compared and ranked on the same basis. It shows which plant earns the return and what to test before negotiating the Hydrogen Purchase Agreement (HPA).

KEY TAKEAWAYS

- A multinational client's technology team needed the economics of its wind-powered green hydrogen projects. One model analyses all of them, not only one.
- What mattered: tax credits, electricity cost, the transfer price from the wind farm, electrolyser size and the HPA. Every project runs through the same method, so projects compare and rank on one basis before any HPA is negotiated.
- Turning point: a blended IRR (annual return on the capital invested) hides which plant creates the return; splitting wind and hydrogen made the wind farm alone the comparison to beat.
- Outcome: an analysis the team can present and explain, and one method for every project, worldwide.

At a glance

INDUSTRY	Green hydrogen from wind power
CLIENT	Technology team of a multinational company
PURPOSE	Understand the economics of green hydrogen projects, developer view and HPA
APPROACH	One model for all of the client's projects, same method, compared and ranked on one basis
MODEL SCOPE	Wind farm and hydrogen plant, sizing, ITC and PTC tax credits, developer return and sale, IRRs, levelised cost (lifetime cost per kg, all costs spread over all output), HPA length
DELIVERABLES	Financial model and analysis

The situation

The technology team of a multinational client needed to understand the economics of new technologies, and we studied its green hydrogen projects. In a wind-powered project, the electricity feeds electrolysis to make hydrogen, sold under an offtake agreement, the Hydrogen Purchase Agreement (HPA). The client had projects in different jurisdictions, so we built one model that runs each of them through the same method.

What was at stake: Why the model mattered before the HPA and the investment

Anyone investing in such a project asks what it earns, how much depends on tax credits, and what happens if electricity costs more or the HPA is shorter. One return figure cannot answer this, and one project cannot answer it for the next. The integrated model showed the effect of HPA length and, through transfer prices and credit allocation, which plant earns the return, for every project on the same basis.

How green hydrogen is produced and sold, and where the model comes in

A wind-powered hydrogen project turns electricity into a product sold under contract. Each step is a lever, and the model tests every lever the same way for every project.

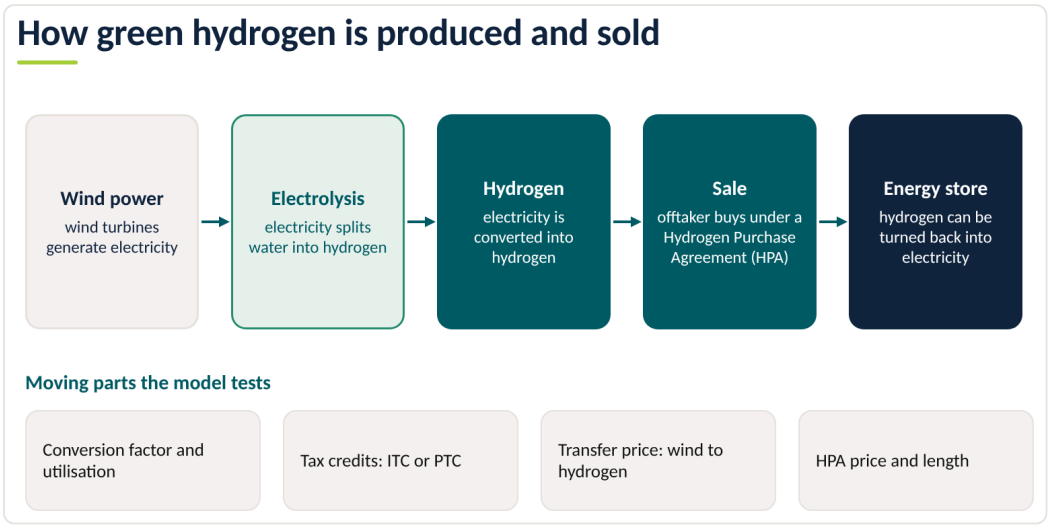
1 Generate
Wind turbines generate the electricity, hour by hour. Solar can do the same elsewhere.

2 Electrolyse
Electrolysis makes hydrogen from water, using power up to the electrolyser's capacity.

3 Hydrogen
The hydrogen output depends on the conversion factor and the capacity utilisation.

4 Sell under the HPA
The HPA: a buyer takes the hydrogen at an agreed price for agreed years.

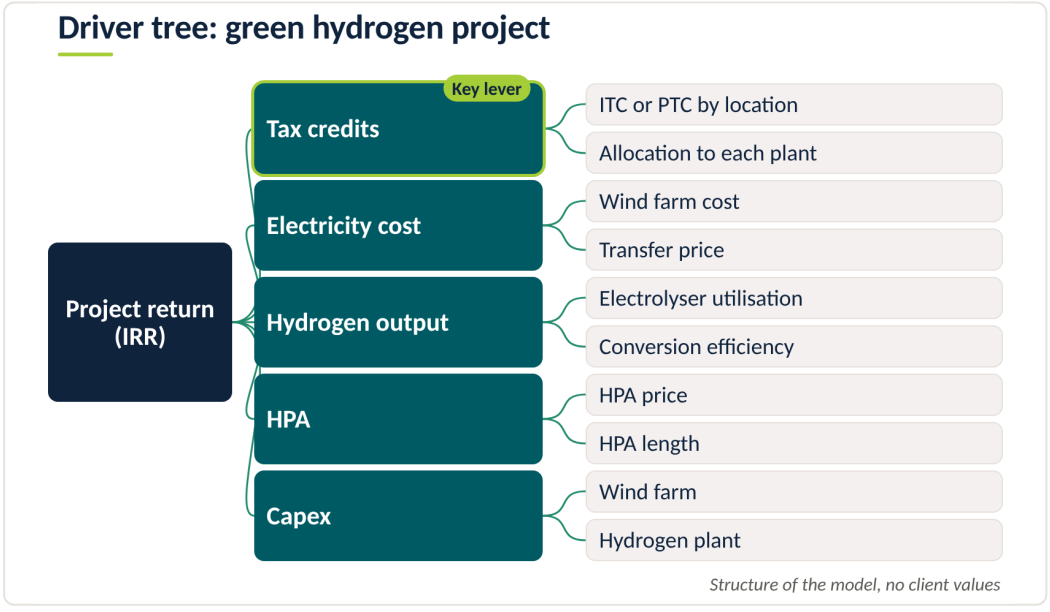
5 Store
Hydrogen can also be turned back into electricity, for example in a fuel cell.



From wind power to hydrogen sold under an HPA: how the project works.

What drives the value?

Tax credits come first: they can decide whether a project earns its return. Electricity cost, electrolyser size and utilisation, conversion efficiency, HPA price and length, and capex then decide what remains as return.



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

What tax credits do
A production credit rewards each kilogram made; an investment credit lowers the capital to earn back. The model shows the return with and without them.

How electricity sets the cost
A kilogram needs a fixed amount of electricity. Fictional: at 50 kWh per kg, +0.010 per kWh adds 0.50 per kg.

What the HPA sets
It fixes the price per kilogram and for how many years. Years without a contract carry the price risk, so the model tests both.

What made it hard to model?

1 Tax incentives in several jurisdictions

DIFFICULTY The return depends on tax credits, so the model treats them in detail. A production credit (PTC) follows kilograms made, an investment credit (ITC) plant cost; jurisdictions differ.

OUR SOLUTION We built the model to handle ITCs and PTCs as needed and to allocate each incentive to the right plant.

2 Wind and hydrogen give a blended IRR

DIFFICULTY A blended IRR cannot say which plant creates the return, and it hides whether building the wind farm alone would earn more.

OUR SOLUTION We modeled IRRs separately for the wind farm and the hydrogen plant, and showed how transfer prices move each IRR.

3 Length of the HPA

DIFFICULTY The HPA is the sale route for the hydrogen, so its duration reaches every year of revenue. A shorter agreement leaves volume to sell without a fixed price.

OUR SOLUTION We showed how the duration of the HPA affects returns, so the risks are clear before it is negotiated.

4 The developer perspective

DIFFICULTY A developer takes the development risk. Once the plant is fully financed and secured, the developer can sell its stake to a buyer who wants to avoid project risk.

OUR SOLUTION We showed the developer's return and what a finished project could sell for.

5 One method for every project

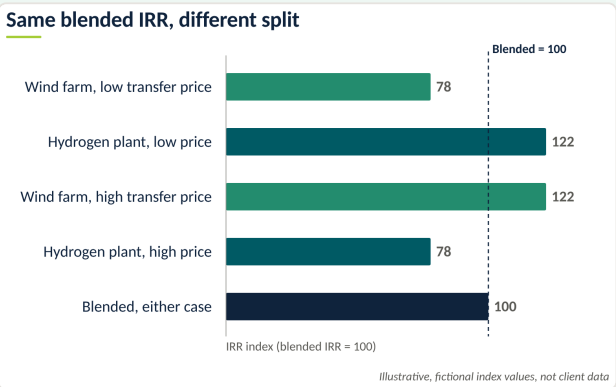
DIFFICULTY Projects differ in wind pattern, electricity cost, credits and contract length, so they only compare if each runs through the same approach.

OUR SOLUTION We built one model for all projects, with the levelised cost of energy and of hydrogen, so projects compare and rank on one basis.

THE TURNING POINT

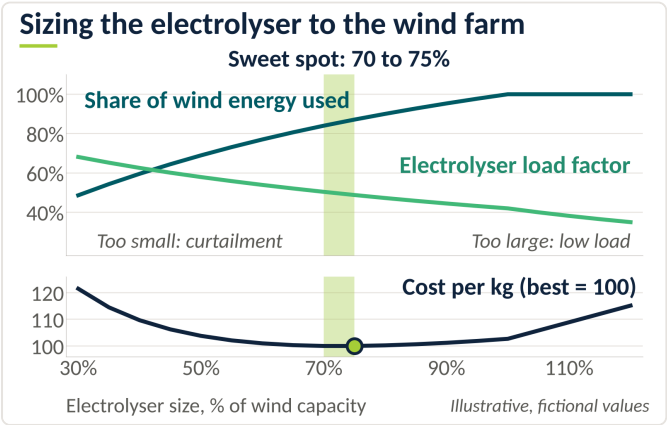
From one blended IRR to a split that shows who earns the return

A blended IRR hides which plant creates the return, so the model splits wind and hydrogen with a transfer price. This shows each plant's contribution and makes building the wind farm alone the comparison the hydrogen plant has to beat.



Illustrative: the transfer price moves return between the plants, the blended IRR stays the same. Fictional index values.

6 Sizing the electrolyser against the wind farm



Illustrative, fictional index values. At 75% the plant wastes 13% of the wind energy yet gives the lowest cost per kg.

The wind farm gives an hourly output pattern, and the electrolyser can only use power up to its capacity. Too small: wind energy is curtailed (wasted). Too large: a low load factor, so fixed cost per kg rises. The model tests a range of sizes on the same hourly profile, with optional storage or grid top-up, and picks the lowest cost per kg or the best return after contract and credit rules.

Electrolyser size, % of wind	50%	75%	100%
Wind energy used	69%	87%	100%
Load factor	58%	49%	42%
Cost per kg (best = 100)	**104**	**100**	**103**

Worked example, fictional: wind farm cost is fixed, electrolyser cost grows with size.

What we built

INPUTS	CALCULATION MODULES	OUTPUTS
Hourly wind output	Wind farm	IRR: wind and hydrogen
Electrolyser size and conversion	Hydrogen plant and sizing test	Developer return and sale value
Tax credit type (ITC or PTC)	Tax credit allocation	Levelised cost of energy and hydrogen
Transfer price	Developer return and sale	Effect of HPA length
HPA price and length	Levelised cost	Best size and project ranking

How we worked together

Step 1

Analyse and discuss

Analysed the material and led the opening discussion with the technology team.

Step 2

Plan

Agreed the plan and the structure of one model for all projects.

Step 3

Build and review

Built the two plants, returns, transfer prices, sizing test and levelised cost, and reviewed them together.

Step 4

HPA and handover

Showed the effect of HPA length and handed over an analysis the team can present and reuse for each project.

What came out of it?

The client received one analysis it can present and explain to its team, and a method that analyses all of its green hydrogen projects on the same basis.

- IRRs for the wind farm and the hydrogen plant, with the effect of transfer prices.
- Levelised cost of energy and of hydrogen, for projects worldwide.
- A sizing test of the electrolyser against the wind farm.
- The developer's return and what a finished project could sell for.
- How the HPA length affects returns, ahead of negotiation.
- One model, one method: projects compared and ranked on the same basis.

Lessons for green hydrogen projects

1. Run every project through one model: the same method lets projects be ranked on one basis.
2. Split the plants first: the wind farm alone is what the hydrogen plant has to beat.
3. Size the electrolyser on the hourly wind pattern and test the HPA length before you negotiate.

What to test before the HPA negotiation: questions the model must answer

1. What return does the whole project earn, and what does the wind farm alone earn as the benchmark?
2. How much of the return depends on tax credits, and what is left without them?
3. Where is the downside: higher electricity cost, a shorter HPA, or an electrolyser too small or too large for the wind farm?
4. What is the upside if the HPA price or the credits turn out better than assumed?
5. How are the funds deployed, and when does each plant start to earn?
6. How does the project turn into profit: HPA price against the levelised cost per kilogram?
7. Does the project pay cash to its owners during the HPA, or keep it in the project?
8. Which project ranks first when all of them run through the same method, and which credits apply to each?

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

Planning a green hydrogen project?

Explore our Green Hydrogen Production from Wind Energy financial model or request a custom financial model.

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