NAWA
ENERGY INFRASTRUCTURE INTELLIGENCE

WHEN A GREEN HYDROGEN PROJECT LOOKS VIABLE - BUT SHOULD STILL BE REJECTED

Decision-grade investment case study | Hypothetical 100 MW electrolyser project | Saudi Arabia

INVESTMENT DECISION	NO-GO AT CURRENT TERMS

The base case clears an accounting-style LCOH test but fails the investment test: negative project NPV, sub-hurdle equity return, weak debt-service resilience, and no evidence of a bankable buyer willing to pay the required price for 15-20 years.

Prepared by NAWA Advanced Research Team
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Important: This is a hypothetical screening case, not an appraisal of a named project. Values labelled 'model assumption' are not claimed as observed Saudi project data. Detailed proprietary modelling logic is intentionally excluded.

1. Decision first

Reject capital commitment now; preserve the option to proceed only after the commercial structure changes.

NO-GO	$4.52/kg	$4.54/kg	10.4%
Current decision	Base LCOH	Project NPV break-even price	Base levered equity IRR

Why the apparent viability is misleading

At the assumed 60% utilisation, $27.5/MWh delivered renewable electricity, and $215m installed CAPEX, the project produces about 9.9 million kg/year at a levelised cost of $4.52/kg. That may look close to a plausible premium market. But at the base selling price of $4.50/kg the project NPV is $-3.7m, levered equity IRR is only 10.4%, and minimum debt-service coverage is 1.22x. LCOH proximity is therefore not investability.

The market evidence reinforces the financing concern. The IEA reports that only 20% of low-emissions hydrogen offtake signed in 2024 was firm, while ACER estimates average European renewable-hydrogen production cost at about EUR 8/kg in 2024 - four times conventional hydrogen. These are not proof that a Saudi buyer will pay a specific price; they show that a durable green premium cannot be assumed.[1][2]

Key findings

Finding	Decision relevance
Economics	The base $4.50/kg case destroys value. The all-capital project break-even is about $4.54/kg; a 12% equity hurdle requires about $4.64/kg.
Commercial	No unconditional price assumption above $4.50/kg is accepted. A higher price counts only if embedded in a creditworthy, take-or-pay contract or matched support.
Debt	70% leverage magnifies weak operating economics; it does not repair them. Base minimum DSCR is 1.22x.
Option value	An upside configuration can work, but it depends on simultaneous CAPEX, power, utilisation and price improvements. That is a development target, not a bankable base case.

Investment-committee instruction: do not authorise FID, issue full EPC notice to proceed, or lock non-refundable equipment deposits. Authorise only bounded development expenditure tied to the conditions on page 9.

2. Case definition and configuration

The project is intentionally plausible, but not claimed to be an existing asset.

Research brief	Definition
Core question	Does a 100 MW Saudi green-hydrogen project merit capital commitment under realistic commercial conditions?
Geography	Saudi Arabia; industrial demand located near the plant. Export conversion and shipping are excluded.
Technology	100 MW alkaline electrolyser system; delivered renewable PPA/grid connection; compression to industrial delivery pressure; short-duration buffer storage.
Horizon	20 operating years; nominal USD model; 2-year development/construction period abstracted into installed CAPEX.
Audience	Investment committee, project developer, lender and strategic offtaker.
Decision rule	GO only if contracted economics clear project NPV and equity hurdle with financeable downside resilience.

Technical configuration

Element	Base-case specification	Classification
Electrolyser	100 MW alkaline; modular trains; 53 kWh/kg system electricity consumption	Model assumption; benchmarked to contemporary system ranges
Operation	60% annual utilisation; 0.5% annual output degradation	Model assumption; requires hourly simulation and OEM guarantee
Power	Delivered renewable electricity/PPA at $27.5/MWh; certificates and compliance costs included only at screening level	Model assumption; not an observed tariff
Output	9.9 kt H2/year before degradation; approximately 15 L treated-water input per kg	Calculation / model assumption
Delivery	Compressed gaseous H2 at plant gate; limited buffer storage	Model boundary; export carrier conversion excluded
Availability	Utilisation is an economic dispatch outcome, not electrolyser nameplate availability	Methodological distinction

Engineering judgement

The plant is technically feasible, but the operating concept is not yet validated. A 60% load factor cannot be inferred from Saudi solar capacity factor alone. It requires a shaped renewable portfolio, grid access, storage, or overbuild. Each route changes cost, emissions attributes and certification. IRENA notes that variable operation is often constrained by auxiliaries such as compression and processing, even where stacks can respond quickly.[3]

Critical unknowns before FEED: hourly renewable profile and curtailment rights; grid-tariff exposure; electrolyser turndown and degradation under cycling; compressor/storage duty; water source and brine disposition; land and interconnection; product purity and delivery pressure; replacement schedule; and eligibility under the buyer's certification regime.

3. Cost base and LCOH

All major cost values are explicit model assumptions - not disguised as verified project data.

CAPEX component	USDm	Basis / status
Electrolyser package and rectifiers	105	Model estimate
Balance of plant, cooling and controls	38	Model estimate
Compression and buffer storage	22	Model estimate
Water treatment and utilities	8	Model estimate
Grid/interconnection and site works	17	Model estimate
Owner's cost, EPC contingency and development	25	Model estimate
Total installed CAPEX	215	Base-case assumption

Annual base OPEX	Value	Treatment
Electricity	$14.5m	53 kWh/kg x $27.5/MWh x output
Fixed O&M;	$5.5m	Model estimate including labour, service and site costs
Water and other variable cost	$0.16/kg	Model estimate
Major replacement	$12m in year 11	Model estimate; separate cash outflow

LCOH interpretation

Screening LCOH is $4.52/kg at an 8.5% nominal discount rate. It includes installed CAPEX, electricity, fixed and variable OPEX, and a discounted replacement allowance. It excludes export conversion, long-distance transport, corporate overhead, financing fees, working capital, and unquantified certification costs. It is therefore a plant-gate production metric, not a delivered-customer price.

IRENA identifies electricity as the largest renewable-hydrogen cost driver and notes that sub-$20/MWh renewable power could support hydrogen below $2.50/kg in favourable future conditions. That is a directional benchmark, not evidence that this project has secured such power.[3]

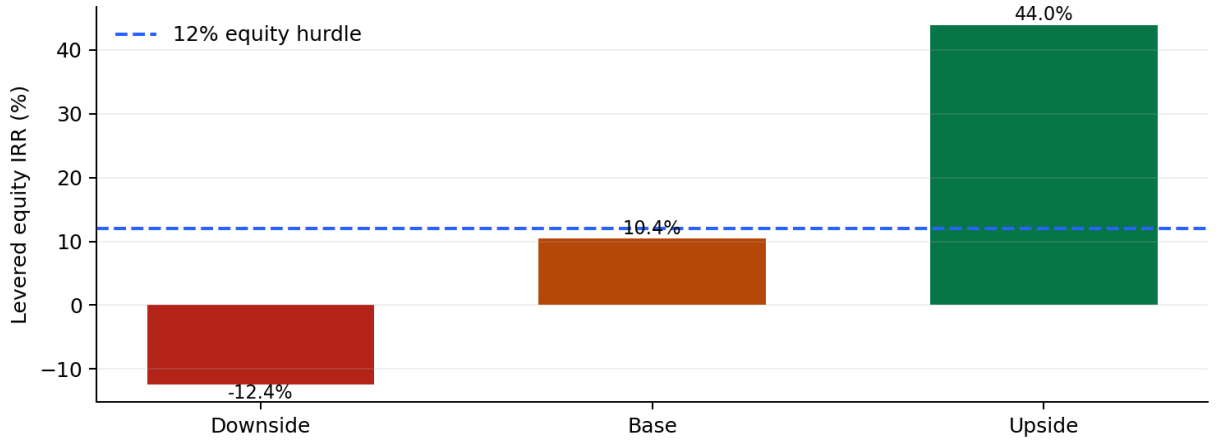
The base power bill alone contributes about $1.46/kg. A $10/MWh power-price movement changes cash production cost by roughly $0.53/kg before second-order effects. This is why an unhedged or re-openable power contract is incompatible with the base investment case.

Model boundary warning

Comparisons with project announcements must be normalized. The $8.4bn NEOM Green Hydrogen Company financing includes a much larger integrated renewables-to-green-ammonia system and associated facilities; its 30-year offtake and $6.1bn non-recourse financing demonstrate the importance of contracted revenue and integrated scope, not a directly comparable $/kW benchmark.[4]

4. Returns, financing and the false comfort of leverage

Metric	Downside	Base	Upside
H2 output (kt/y)	7.0	9.9	12.6
LCOH ($/kg)	7.14	4.52	2.96
Selling price ($/kg)	4.00	4.50	5.00
Project NPV (USDm)	-192.6	-3.7	234.0
Project IRR	-5.7%	8.3%	21.5%
Equity IRR	-12.4%	10.4%	44.0%
Min. DSCR	0.38x	1.22x	3.23x
Equity payback	>20y	13	3



Base financing assumption

70% senior debt / 30% equity; 7.0% nominal interest; 12-year level debt service; 12% equity discount rate. This is a screening structure, not a lender term sheet. Financing fees, reserve accounts, sculpting and covenant cure rights are excluded.

Leverage diagnosis

At $4.50/kg, project cash generation is too weak to support the proposed debt robustly. Minimum DSCR of 1.22x is below a prudent infrastructure cushion and deteriorates sharply under utilisation or power-price stress. Reducing leverage may improve DSCR but does not turn a negative project NPV into value creation; it merely reallocates risk from lenders to equity.

Decision implication: concessional debt can help only if its economic value is real, committed, and not offset by restrictive conditions or additional capital cost. Debt is not a substitute for a viable margin.

5. Offtake reality and break-even price

No selling price is treated as 'market' unless a buyer can be identified, the delivery basis is defined, and the obligation is financeable.

Price point	Meaning	Decision interpretation
$4.00/kg	Downside realised price	Severe value destruction; not financeable
$4.50/kg	Base model assumption	Still negative NPV and sub-hurdle equity return
$4.54/kg	Project NPV = 0 at 8.5%	Minimum economic break-even, not an approval threshold
$4.64/kg	Equity NPV = 0 at 12%	Approximate price needed to clear sponsor hurdle under base financing
$5.00/kg	Upside price paired with lower CAPEX/power and higher utilisation	Potentially viable only as a bundled improved case

What current evidence supports - and does not support

IEA 2025: low-emissions hydrogen remains below 1% of global production; new 2024 offtake fell to 1.7 Mtpa and only 20% was firm. The IEA also finds the cost gap likely to remain larger in the Middle East where natural gas is cheaper. This weakens the assumption that local incumbent users will voluntarily pay a durable green premium without regulation, subsidy, export value, or strategic customer need.[1]

ACER 2025: average European renewable-hydrogen production cost was about EUR 8/kg in 2024, around four times conventional hydrogen. This indicates a large support/affordability gap, but it is a European production-cost statistic - not a Saudi offtake price and not a buyer willingness-to-pay quote.[2]

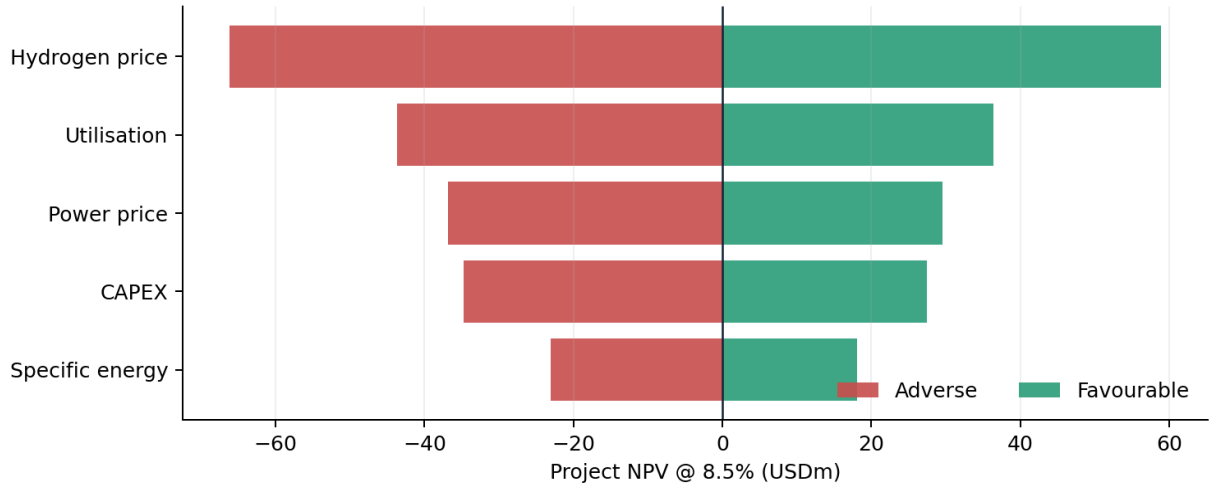
European Hydrogen Bank auctions award a production premium rather than prove an unsubsidised commodity price. The second auction attracted 61 bids seeking more than EUR 4.8bn, while subsequent awards support selected projects. Auction premiums therefore cannot be added silently to an assumed customer price; support must be separately contracted and eligibility verified.[5][6]

Commercial conclusion

The project should not rely on a merchant forecast above $4.50/kg. To reach CONDITIONAL GO, the sponsor needs a creditworthy take-or-pay arrangement whose combined customer price plus legally committed support yields at least $4.64/kg equivalent in the base case, with indexation aligned to electricity and availability risk. A headline memorandum of understanding is insufficient.

Unknown: a transparent, directly comparable Saudi plant-gate market price for certified renewable hydrogen was not identified in the public evidence reviewed. That absence is itself decision-relevant and must not be filled with a plausible-sounding number.

6. Sensitivity and decision thresholds



The project is price-led, then utilisation/power/CAPEX dependent. None of those variables is independently safe.

Variable	Base	Approximate decision-change threshold	Required proof
Net realised H2 price	$4.50/kg	>=$4.64/kg equivalent to clear 12% equity NPV	Binding take-or-pay; credit support; volume, purity and delivery terms
Utilisation	60%	About 63% at $4.50/kg, all else equal	Hourly dispatch model, power shape, grid access, OEM limits
Delivered power	$27.5/MWh	About $24.8/MWh at $4.50/kg, all else equal	Executed PPA and complete tariff/shape/certificate stack
Installed CAPEX	$215m	About $202m at $4.50/kg, all else equal	Fixed-price EPC, contingency, owner cost and interface allocation
Leverage	70%	Not a value-creation threshold	Lender sizing, DSCR covenant and downside case
Equity hurdle	12%	Base project does not clear it	Sponsor-approved return policy

Threshold interaction

The one-variable thresholds above are diagnostic, not promises. They assume every other base input holds. In practice, lower electricity prices may require inflexible delivery; higher utilisation may require grid purchases or storage; cheaper equipment may reduce guarantees; and a higher hydrogen price may shift performance or certification risk back to the producer. The bankable threshold must therefore be demonstrated through an integrated hourly, contractual and financing case.

7. Scenario logic and commercial risks

Scenario	Configuration	Outcome	Decision
Downside	$250m CAPEX; 45% utilisation; 56 kWh/kg; $35/MWh power; $4/kg H2; 55% leverage	LCOH $7.14/kg; project NPV $-192.6m; equity IRR -12.4%	NO-GO
Base	$215m; 60%; 53 kWh/kg; $27.5/MWh; $4.50/kg H2; 70% leverage	LCOH $4.52/kg; project NPV $-3.7m; equity IRR 10.4%	NO-GO
Upside	$180m; 72%; 50 kWh/kg; $20/MWh; $5/kg H2; 65% leverage	LCOH $2.96/kg; project NPV $234.0m; equity IRR 44.0%	GO economics; evidence not yet secured

Risk register

Risk	Failure mechanism	Mitigation / gate
Offtake / credit	Buyer will not pay green premium or contract is non-bankable	No FID before executed take-or-pay, parent/LC support and termination compensation
Power shape	Headline PPA price excludes shaping, grid or imbalance cost	Hourly delivered-cost simulation; cap pass-through and curtailment exposure
Utilisation	Renewable profile cannot sustain assumed operating hours	Independent yield study and dispatch validation
EPC / interfaces	Electrolyser, compressor, water and grid packages do not integrate	Single-point performance wrap or explicit liquidated damages/interface matrix
Technology performance	Efficiency and degradation miss guarantee under cycling	OEM curve, reference-plant data, acceptance test and long-term service terms
Certification	Product fails buyer/EU renewable criteria	Pre-FID legal opinion, metering design and traceability system
Infrastructure	Storage, pipeline, port or customer tie-in arrives late	Condition precedent and aligned schedule/LD regime
Water / permitting	Source, discharge or land constraints delay COD	Permits, water balance and environmental approvals before NTP

Market context: the IEA's 2025 review attributes pipeline contraction to cancellations and delays, while its 2026 summary continues to identify uncertain demand, costs, regulation and infrastructure as persistent barriers. The case therefore treats schedule and offtake as core investment variables, not narrative risks.[1][7]

8. Red-team challenge and gates to reconsider

Assume the current recommendation is wrong. What would have to be true?

Challenge	How it breaks the case	Evidence that would change the conclusion
The $27.5/MWh power assumption is incomplete	Tariffs, shaping, imbalance or certificate cost adds >$10/MWh	Executed all-in PPA/tariff schedule and hourly settlement model
60% utilisation is physically unavailable	Solar-led supply or grid rules reduce full-load hours	Bankable resource study and independently reviewed 8,760-hour dispatch
$4.50/kg is not obtainable	Buyer compares against low-cost incumbent fossil H2	Signed take-or-pay at or above threshold, or committed support paying the gap
CAPEX omits scope	Compression, interconnection, storage or owner's costs emerge after FEED	Class 3 estimate, fixed-price EPC, 15% contingency and interface closure
LCOH is mistaken for return	Break-even ignores debt, tax, timing and risk premium	Full project-finance model and investment-committee hurdle test
Export optionality is overstated	Ammonia conversion, shipping and reconversion erase margin	Delivered-market netback with logistics contracts and certification
Policy support is assumed	Rules change or support is delayed	Awarded, enforceable support with legal diligence and no double-counting

Conditions for CONDITIONAL GO

Gate	Minimum condition
Revenue	Creditworthy take-or-pay for >=80% of output; combined realised value >=$4.64/kg equivalent in base case; indexation and termination protection
Power	All-in delivered cost <=$22/MWh or equivalent hedge; hourly volume and imbalance treatment fixed
CAPEX	Total installed CAPEX <=$190m with fixed-price/performance-backed EPC and adequate contingency
Operations	Independently validated >=68% utilisation at <=52 kWh/kg initial system consumption, with degradation and replacement guarantees
Finance	Lender downside DSCR >=1.30x; base >=1.45x; no reliance on uncommitted refinancing
Permits / infrastructure	Land, water, grid and customer tie-in substantially secured; certification route confirmed
Returns	Positive project NPV at IC WACC and >=12% equity IRR after fees, reserves, tax and downside contingencies

A GO may be reconsidered only when all gates are satisfied simultaneously in an integrated model. Meeting the price gate alone is explicitly insufficient.

9. Investment-committee recommendation and audit

Recommendation: NO-GO for FID; CONDITIONAL GO for limited de-risking expenditure only.

Do not commit construction capital under the current base case. The project has credible technical architecture and a potentially attractive strategic location, but it does not currently earn its cost of capital. The required return depends on a hydrogen price above the uncontracted base assumption and on operating conditions that have not been validated together. Raising the assumed selling price would conceal, not solve, the problem.

Authorise a time-boxed development phase focused on four proofs: (1) bankable revenue, (2) all-in shaped power cost, (3) Class 3 installed CAPEX and performance guarantees, and (4) an independently reviewed hourly model linked to lender covenants. Return to the committee only with executed or near-executable documents and a reconciled model.

Independent research auditor note

Audit area	Finding	Decision
Evidence integrity	External market claims are cited; project-specific inputs remain labelled as assumptions.	PASS WITH LIMITATIONS
Quantitative integrity	Units, LHV-style kWh/kg convention, MW/MWh distinctions and financing basis checked at screening level.	PASS WITH LIMITATIONS
Market reality	No public Saudi spot/contract price was invented. European cost/support evidence was not mislabelled as Saudi offtake.	PASS
Reproducibility	Decision-critical assumptions and outputs are visible; proprietary implementation logic is excluded.	PASS WITH LIMITATIONS
Publication	Suitable as a decision case study, not as lender-grade due diligence or a named-project valuation.	PASS WITH LIMITATIONS

Finding confidence

Finding	Confidence	Reason
Technical feasibility	High	Conventional configuration; site-specific design remains open
Base screening economics	Medium-High	Arithmetic is reproducible; inputs are hypothetical
CAPEX / power assumptions	Medium	Benchmarked directionally; not tendered
Offtake price availability	Low-Medium	Sparse transparent contract pricing; absence of evidence is not evidence of no buyer
NO-GO at current terms	High	Negative value and missing bankable revenue persist across reasonable challenges

Final publication status: PASS WITH LIMITATIONS. No material objection overturns the NO-GO recommendation. The analysis must be revised before application to a real project using site data, vendor bids, tax/legal advice, hourly dispatch and executed commercial terms.

Sources, methods and definitions

Public sources accessed 04 September 2026

[1] International Energy Agency (2025), Global Hydrogen Review 2025, Executive Summary and Demand. https://www.iea.org/reports/global-hydrogen-review-2025

[2] EU Agency for the Cooperation of Energy Regulators (2025), European Hydrogen Markets Monitoring Report. https://www.acer.europa.eu/monitoring/European-hydrogen-markets-2025

[3] International Renewable Energy Agency, Electrolyser Costs. https://www.irena.org/Energy-Transition/Technology/Hydrogen/Electrolyser-costs

[4] NEOM Green Hydrogen Company / Air Products (22 May 2023), Financial close announcement: $8.4bn investment, $6.1bn non-recourse financing and 30-year offtake. SEC-filed release: https://www.sec.gov/Archives/edgar/data/2969/000119312523149976/d431193dex991.htm

[5] European Commission (2025-2026), European Hydrogen Bank. https://energy.ec.europa.eu/topics/eus-energy-system/hydrogen/european-hydrogen-bank_en

[6] European Commission DG Climate Action (7 March 2025), Second auction received 61 bids requesting >EUR4.8bn. https://climate.ec.europa.eu/news-other-reads/news/over-subscribed-european-hydrogen-bank-auction-receives-61-bids-innovation-fund-support-including-8-2025-03-07_en

[7] International Energy Agency (2026), Global Hydrogen Review 2026, Executive Summary. https://www.iea.org/reports/global-hydrogen-review-2026/executive-summary

[8] IRENA (2025), Renewable Power Generation Costs in 2024. https://www.irena.org/Publications/2025/Jun/Renewable-Power-Generation-Costs-in-2024

[9] IRENA (2024), Green Hydrogen Strategy: A Guide to Design. https://www.irena.org/Publications/2024/Jul/Green-hydrogen-strategy-A-guide-to-design

Model definitions

LCOH: discounted annualised cost divided by first-year hydrogen output, adjusted with a discounted replacement allowance. Project NPV: unlevered after-tax operating cash flow discounted at 8.5% (9.5% downside; 7.5% upside). Equity IRR/NPV: levered cash flow after debt service and tax, measured against 12% equity hurdle. DSCR: cash available after tax divided by scheduled debt service. Values are nominal USD; 20% tax is a screening assumption and not Saudi tax advice.

Evidence labels

Verified fact: directly supported by cited public evidence. Model assumption: selected for this hypothetical case. Calculation: derived mechanically from stated assumptions. Estimate: analyst judgement with uncertainty. Unknown: insufficient evidence. NAWA analytical inference: conclusion derived from combined evidence and modelling, not stated by a source.

Limitations

No vendor quotation, PPA, offtake term sheet, hourly weather file, grid study, FEED package, tax opinion or certification opinion was available. The report excludes export-carrier conversion and transport. It is intentionally decision-grade screening rather than bank-grade due diligence.

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