Hydrogeninsight

Is the LCOH the right tool to assess green hydrogen ptx project viability?

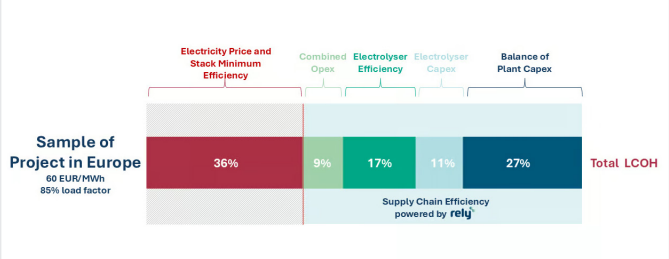
Rely explores their forward thinking approach to the energy sector through investment decisions focused around innovation development.

In today's rapidly evolving energy landscape, the push towards sustainable and low-carbon solutions has spotlighted hydrogen as one of the key drivers for the global energy transition, decarbonising "hard-to-abate" sectors starting with heavy industry. However, widespread hydrogen investment is slow to come, due to challenges in assessing the economic viability of various production methods and building an accurate business plan.

To evaluate projects, the green hydrogen industry compares the Levelised Cost of Hydrogen (LCOH), a metric that evaluates the total expense per unit of hydrogen produced. It provides a standardised way to compare costs across different production methods, representing the minimum selling price of hydrogen (or "break-even" price) to have a profitable project.

Not one answer, but many possibilities

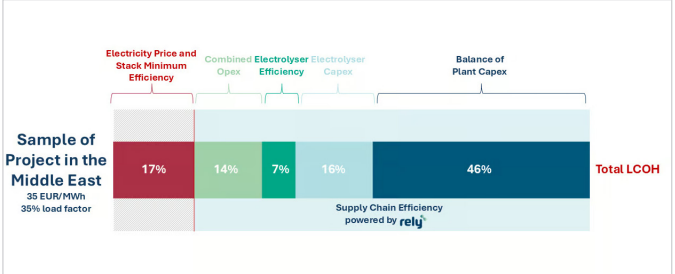
Yet, Rely believes that this conventional approach is too simple. The traditional LCOH formula produces a static figure that is heavily influenced by the cost of electricity in a market and does not indicate the competitiveness of green hydrogen production solutions that can lead to the most optimised project configuration for projects.



To illustrate this, we may look at the breakdown of LCOH.

In Europe, an on-grid project with a 60 euro/MWh electricity price and load factor of 85% results in an LCOH where 36% of the price represents the minimum theoretical price of hydrogen, ie the power cost with the maximum theoretical efficiency of the electrolysis system and a theoretical CAPEX of 0. The remaining 64% of the price is linked to the supply chain efficiency, including the overall efficiency of the system, the CAPEX competitiveness, and the other OPEX costs. While power cost is most often discussed, Rely sees more impact from controlling the remaining components through standardised solutions. Rely has evaluated the elements of supply chain efficiency to develop the most optimised trade-off, delivered through Rely's productised plant the Clear100+ as configured for the European market. However, having an accurate LCOH is not as simple as creating one most optimised solution.

As an example, this European configuration is not relevant for other geographies, as illustrated the below figure.



Applying this configuration to an off-grid project in the Middle East with 35 euro/MWh electricity price and a 35% load factor results in a much higher LCOH– making this project uncompetitive. In this case, the CAPEX becomes the most prominent cost element at 46% of the total LCOH price. So, to reduce LCOH of such project, different trade-offs on the supply chain are needed. At Rely, we are currently developing a configuration that is specific to this geography with trade-offs to reduce cost by 30-40%.

Rely is uniquely the only player on the market that can influence the full supply chain due to Rely's end-to-end ecosystem of technology, engineering, project execution, and operations & maintenance (O&M) capabilities. Rely uses a product approach to standardise solutions to support scalability, but also leaves room for adaptation for the specific needs. Beyond the core product, Rely also offers an ecosystem of solutions ranging from project conception to O&M, providing clients with levers to adjust the trade-off between CAPEX and OPEX.

This positioning makes it crucial for Rely to develop a tool for analysis, so clients may visualise the value brought by adjusting different levers. Rely's tool allows clients to evaluate their supply chain and achieve the most competitive LCOH for their market.

Developing the formula for CAPEX efficiency

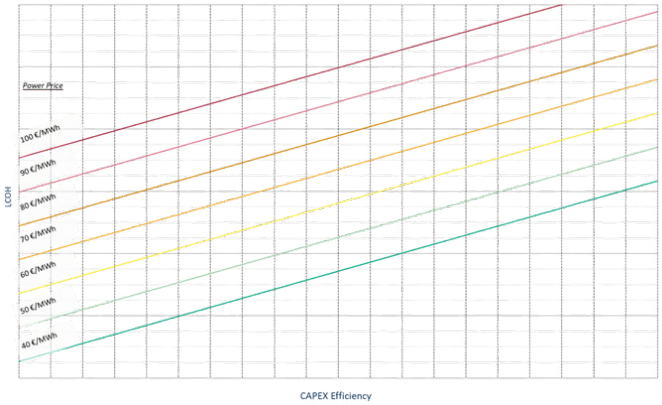
Instead of a static LCOH figure, Rely rearranges the LCOH formula into a more dynamic form that includes double linearity which can be used to perform sensitivity analysis. To achieve this, Rely introduces a parameter called "Capex efficiency". Capex Efficiency is evaluated in M€ per ton of hydrogen produced by the hour. Rather than offering one fixed LCOH calculation, supply chain efficiency parameters can be adjusted through a visual representation that analyses trade-offs between different cost components and their impact on LCOH.

Key differences

- **Detailed CAPEX and OPEX Breakdown:** Rely emphasises a granular breakdown of costs. This is especially key for accurate comparison as different electrolyser technologies offer different availability and performance levels. Rely incorporates the stack efficiency of the plant into the CAPEX, because the efficiency of the initial investment influences the resulting performance of the plant and thus the production level and operating costs.
- **Incorporation of Intermittency and Load Factors:** Rely places additional focus on the cost impact of managing intermittency and load factors, especially relevant for renewable energy sources like wind or solar. We can see a trade-off between off-grid and on-grid power, in which we may see that more intermittent power can still lead to a lower LCOH.
- **Visualisation of different levels of risk.** The formula helps to visualise different discount rates, ie different levels of risks

This method helps in better anticipating the weight of the different main factors such as CAPEX, OPEX, power cost, and load factor so that the real relative impact of improving these parameters on LCOH can be anticipated, which better accounts for "hidden costs". With this approach, Rely can bridge the gap between electricity price, CAPEX, and OPEX and how they impact the LCOH.

The power of dynamic visualisation



In Rely's Capex efficiency analysis, a graph can be produced for a specific economic environment, providing a visual representation of all the possible cases under this environment. The graph represents the trade-offs between parameters such as intermittency and power price, allowing decision-makers to quickly and visually anticipate and compare different options without individually computing the different options.

Thus, quick optimisation decisions can be made based on whether an adjustment drives the LCOH down or not. As a technology-driven company, Rely's approach allows for innovation to be at the centre of decision-making; rather than being constrained by electricity prices, Rely chooses to look at investment decisions from the angle of technological development.

Get in touch with Rely at for further analysis to evaluate trade offs between electrolyser types, electricity prices, risk profiles and more.

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