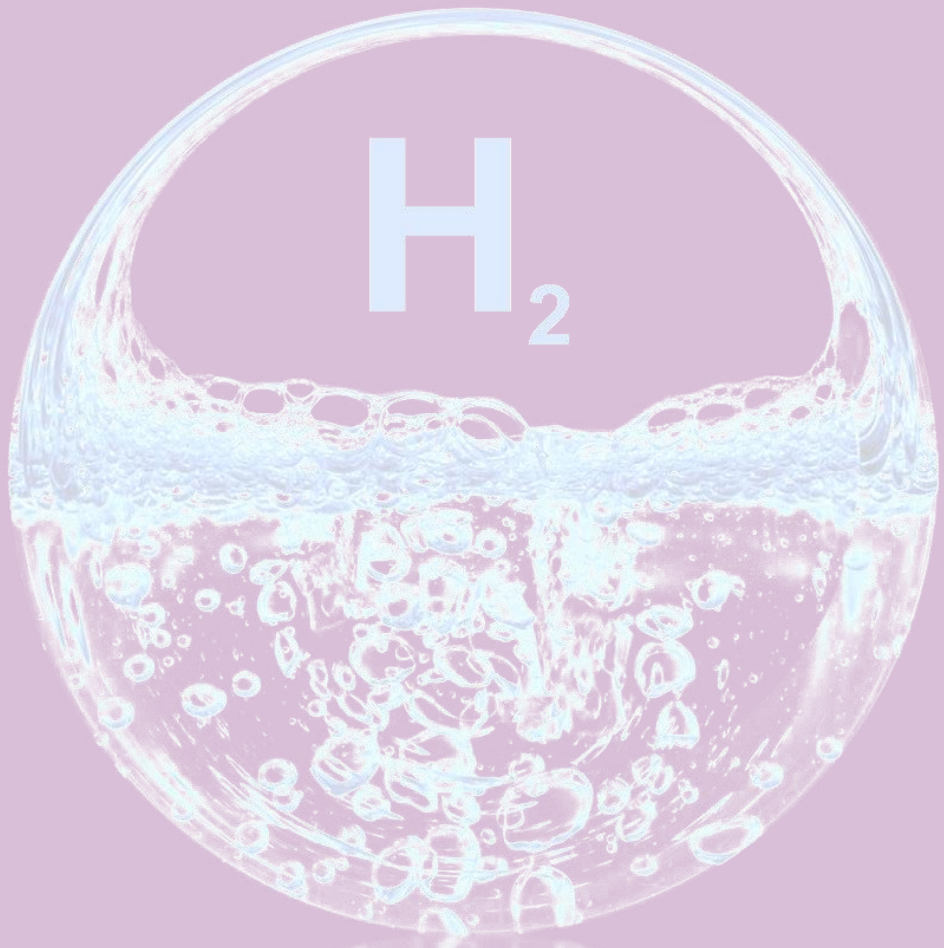
WHITEPAPER



NEL

Next Evolution Level

The crypto project token

We link the two worlds of technology

Hydrogen technology and the blockchain are connected here for the first time with this project and linked to a growing ecosystem in order to combine the advantages of both worlds.

Renewable Energy
The growing demand for power and the global interest in reducing CO2 emissions has stimulated an unprecedented implementation of renewable sources of energy. However, intermittent power disruptions are common when dealing with renewable resources. Energy storage eases intermittent power disruptions by storing excess power generated by renewable resources at times of low demand and distributing the power in periods of heightened demand. This helps to balance the load on the energy grid and reduce reliance on non-renewable resources. Combining grid intelligence with renewable resources and an energy storage solution, provides a dependable environmentally friendly and lower-cost supply of energy.

What is hydrogenation?
Hydrogenation is a chemical reaction between molecular hydrogen and an element or compound, ordinarily in the presence of a catalyst. The reaction may be one in which hydrogen simply adds to a double or triple bond connecting two atoms in the structure of the molecule or one in which the addition of hydrogen results in dissociation (breaking up) of the molecule (called hydrogenolysis, or destructive hydrogenation).
The catalysts most commonly used for hydrogenation reactions are the metals nickel, platinum and palladium and their oxides. For high-pressure hydrogenations, copper chromite and nickel supported on kieselguhr (loose or porous diatomite) are extensively used.

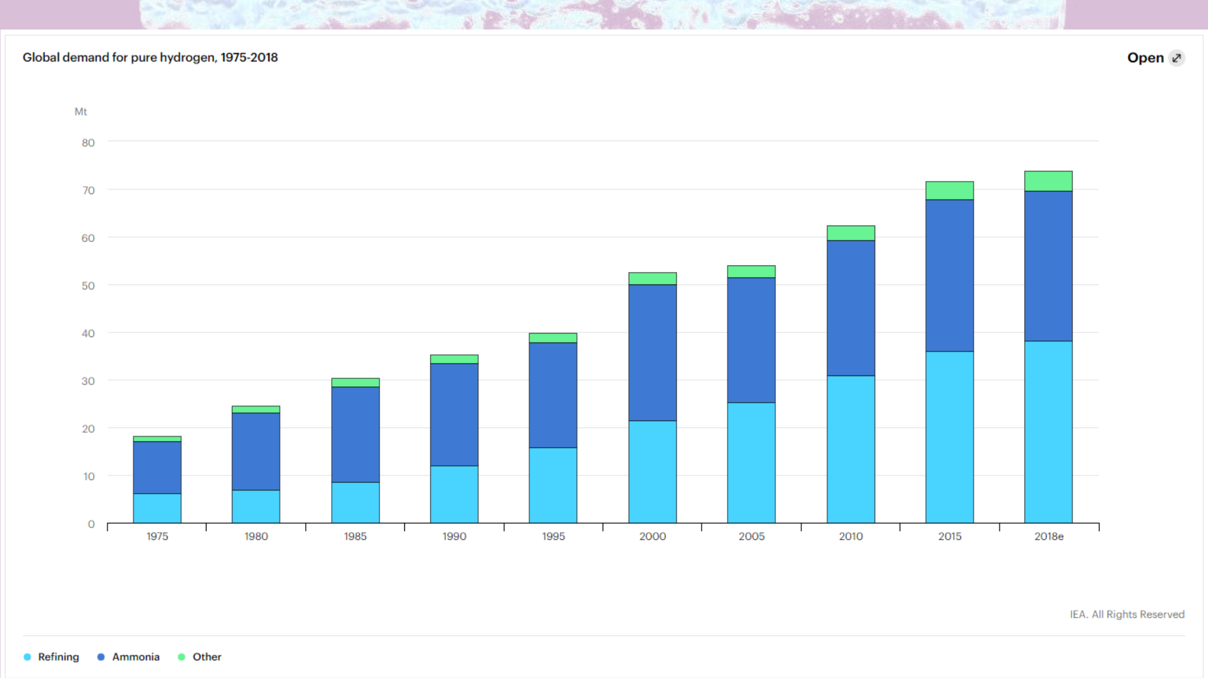
Hydrogen and energy have a long shared history – powering the first internal combustion engines over 200 years ago to becoming an integral part of the modern refining industry. It is light, storable, energy-dense, and produces no direct emissions of pollutants or greenhouse gases. But for hydrogen to make a significant contribution to clean energy transitions, it needs to be adopted in sectors where it is almost completely absent, such as transport, buildings and power generation.
The Future of Hydrogen provides an extensive and independent survey of hydrogen that lays out where things stand now; the ways in which hydrogen can help to achieve a clean, secure and affordable energy future; and how we can go about realising its potential.

„Hydrogen is today enjoying unprecedented momentum. The world should not miss this unique chance to make hydrogen an important part of our clean and secure energy future.“
Dr Fatih Birol

What products are made using hydrogenation?
Hydrogenation is widely used in the industry. Hydrogenation is used to solidify, preserve or purify many products, raw materials, or ingredients. Ammonia, fuels (hydrocarbons), alcohols, pharmaceuticals, margarine, polyols, various polymers and chemicals (hydrogen chloride and hydrogen peroxide) are products treated using a hydrogenation process.
The most commonly hydrogenated product is vegetable oil. Hydrogenation converts vegetable oil from a liquid to a solid or semi-solid fat. D-Sorbitol syrup is made by hydrolysis of starches to make dextrose, the dextrose is then hydrogenated to create sorbitol or sugar alcohol. In the Petroleum Industry hydrogenation is used in a process called hydrocracking which breaks heavy crude's long hydrogen carbon chains into lighter petroleum products like diesel, gasoline and jet fuel.

Demand for hydrogen

Supplying hydrogen to industrial users is now a major business around the world. Demand for hydrogen, which has grown more than threefold since 1975, continues to rise – almost entirely supplied from fossil fuels, with 6% of global natural gas and 2% of global coal going to hydrogen production.
As a consequence, production of hydrogen is responsible for CO_2 emissions of around 830 million tonnes of carbon dioxide per year, equivalent to the CO_2 emissions of the United Kingdom and Indonesia combined.

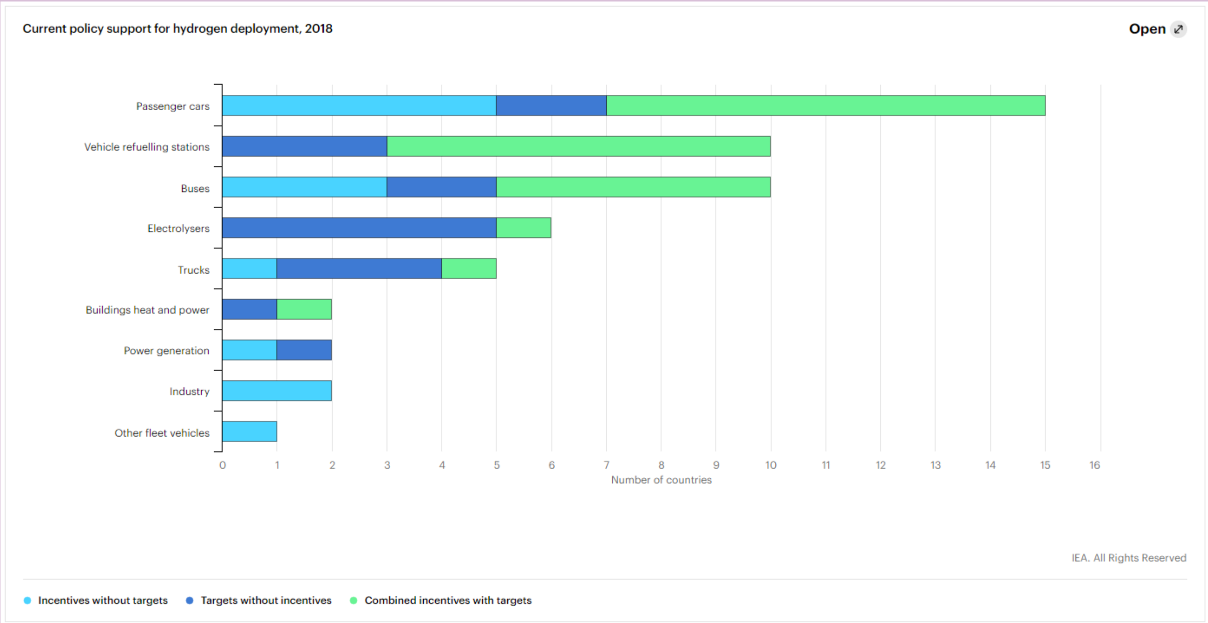


Did you know?
Hydrogen is amazing

- *You can drive up to 130 km with one kg of hydrogen*
- *One kg of hydrogen replaces 10 liters of diesel/petrol*
- *Hydrogen cars emit nothing but pure water*

Growing support

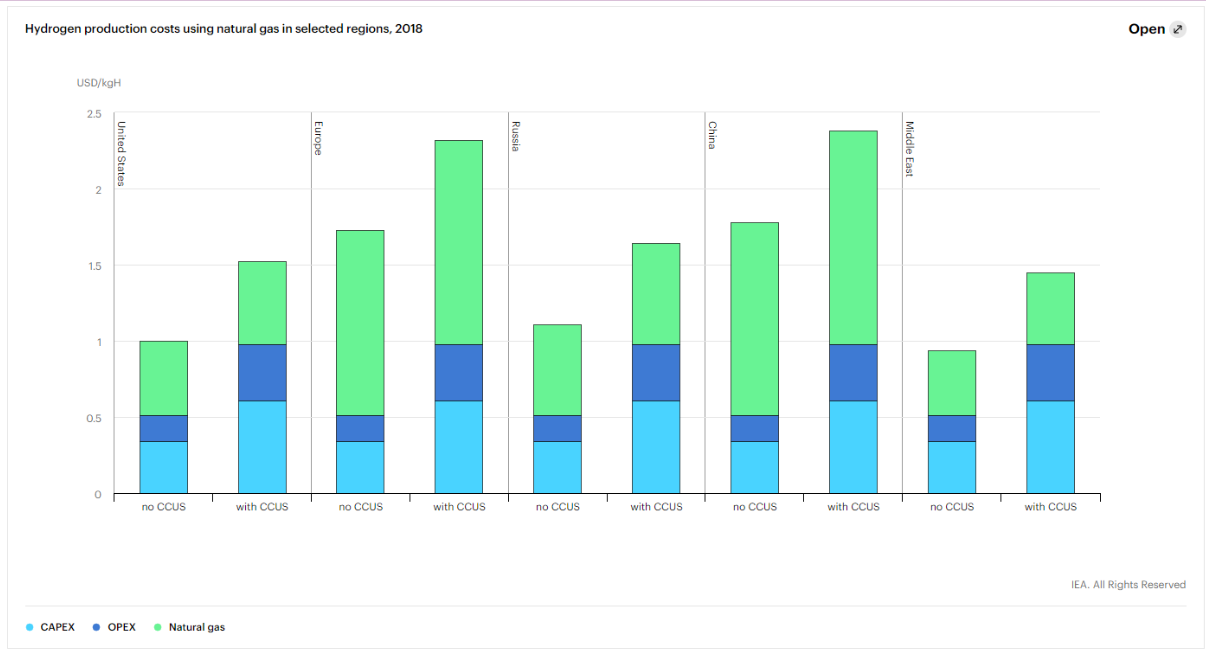
The number of countries with polices that directly support investment in hydrogen technologies is increasing, along with the number of sectors they target.
There are around 50 targets, mandates and policy incentives in place today that direct support hydrogen, with the majority focused on transport.
Over the past few years, global spending on hydrogen energy research, development and demonstration by national governments has risen, although it remains lower than the peak in 2008.



Hydrogen production

Hydrogen can be extracted from fossil fuels and biomass, from water, or from a mix of both. Natural gas is currently the primary source of hydrogen production, accounting for around three quarters of the annual global dedicated hydrogen production of around 70 million tonnes. This accounts for about 6% of global natural gas use. Gas is followed by coal, due to its dominant role in China, and a small fraction is produced from from the use of oil and electricity.
The production cost of hydrogen from natural gas is influenced by a range of technical and economic factors, with gas prices and capital expenditures being the two most important.

Fuel costs are the largest cost component, accounting for between 45% and 75% of production costs. Low gas prices in the Middle East, Russia and North America give rise to some of the lowest hydrogen production costs. Gas importers like Japan, Korea, China and India have to contend with higher gas import prices, and that makes for higher hydrogen production costs.



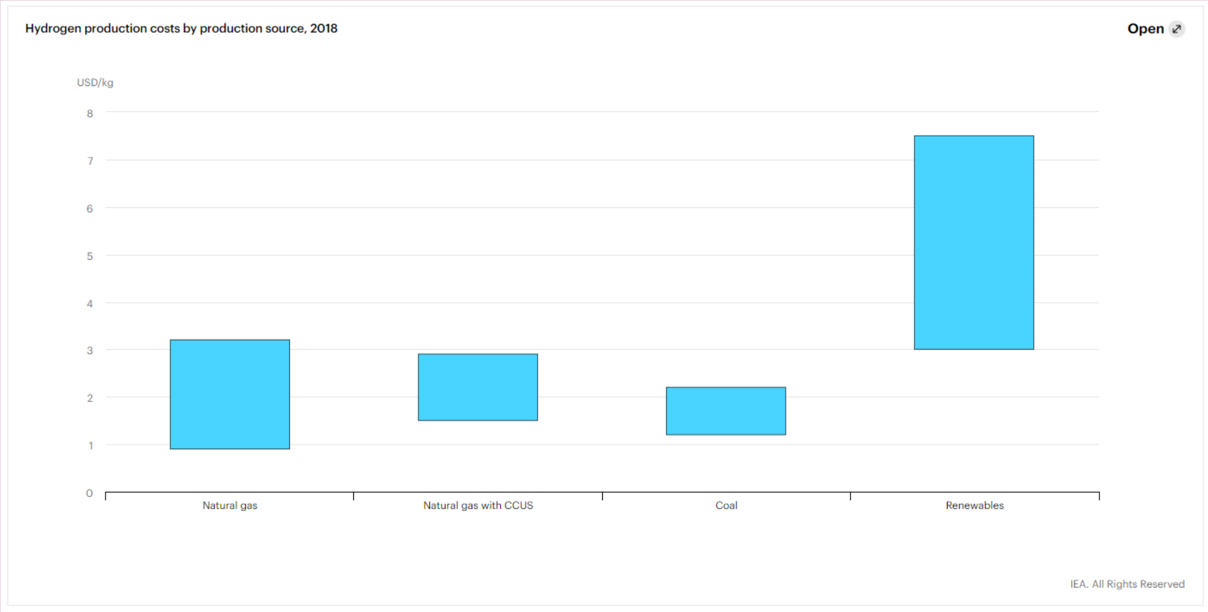
While less than 0.1% of global dedicated hydrogen production today comes from water electrolysis, with declining costs for renewable electricity, in particular from solar PV and wind, there is growing interest in electrolytic hydrogen.

Keeping an eye on costs

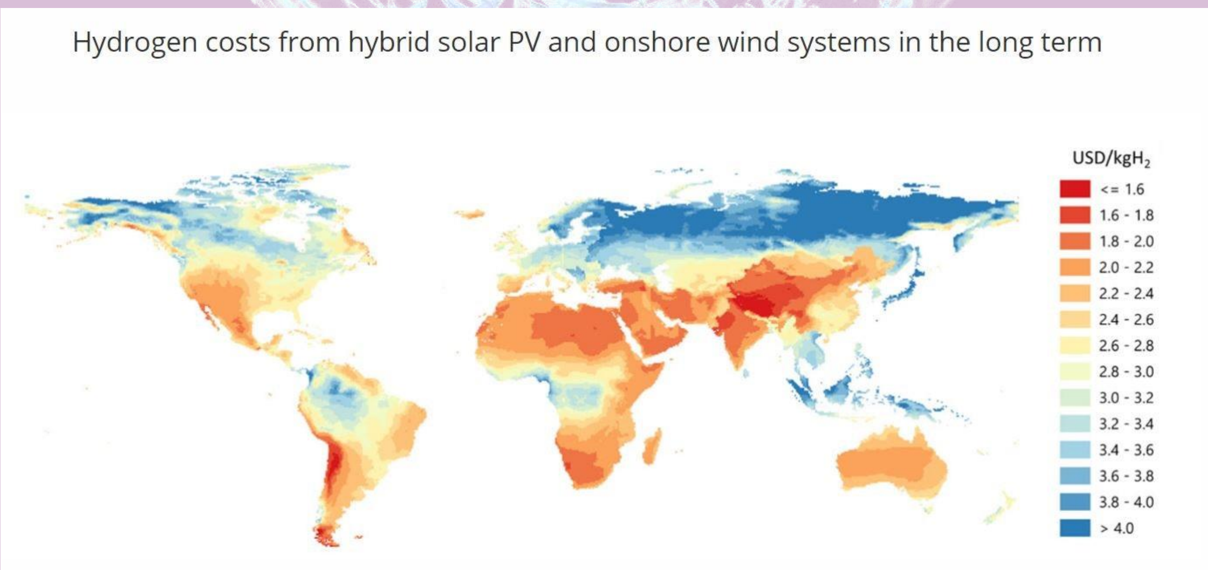
Dedicated electricity generation from renewables or nuclear power offers an alternative to the use of grid electricity for hydrogen production.

With declining costs for renewable electricity, in particular from solar PV and wind, interest is growing in electrolytic hydrogen and there have been several demonstration projects in recent years. Producing all of today's dedicated hydrogen output from electricity would result in an electricity demand of 3 600 TWh, more than the total annual electricity generation of the European Union.

Did you know?
The colour of hydrogen
On the hydrogen emission spectrum we find the colour purple, with a wavelength of 410 nm. Nel is the colour of hydrogen.



With declining costs for solar PV and wind generation, building electrolysers at locations with excellent renewable resource conditions could become a low-cost supply option for hydrogen, even after taking into account the transmission and distribution costs of transporting hydrogen from (often remote) renewables locations to the end-users.



Various uses for hydrogen

- Hydrogen use today is dominated by **industry**, namely: oil refining, ammonia production, methanol production and steel production. Virtually all of this hydrogen is supplied using fossil fuels, so there is significant potential for emissions reductions from clean hydrogen.
- In **transport**, the competitiveness of hydrogen fuel cell cars depends on fuel cell costs and refuelling stations while for trucks the priority is to reduce the delivered price of hydrogen. Shipping and aviation have limited low-carbon fuel options available and represent an opportunity for hydrogen-based fuels.
- In **buildings**, hydrogen could be blended into existing natural gas networks, with the highest potential in multifamily and commercial buildings, particularly in dense cities while longer-term prospects could include the direct use of hydrogen in hydrogen boilers or fuel cells.
- In **power generation**, hydrogen is one of the leading options for storing renewable energy, and hydrogen and ammonia can be used in gas turbines to increase power system flexibility. Ammonia could also be used in coal-fired power plants to reduce emissions.

Near term, practical opportunities for policy action

Hydrogen is already widely used in some industries, but it has not yet realised its potential to support clean energy transitions. Ambitious, targeted and near-term action is needed to further overcome barriers and reduce costs.

The IEA has identified four value chains that offer springboard opportunities to scale up hydrogen supply and demand, building on existing industries, infrastructure and policies. Governments and other stakeholders will be able to identify which of these offer the most near-term potential in their geographical, industrial and energy system contexts.

Regardless of which of these four key opportunities are pursued – or other value chains not listed here – the full policy package of five action areas listed above will be needed. Furthermore, governments – at regional, national or community levels – will benefit from international cooperation with others who are working to drive forward similar markets for hydrogen.

How is hydrogen used in hydrogenation?
Hydrogen is usually used as reducing agent and will lose its electron in a chemical redox reaction. However, it behaves as an oxidizing agent when reacting with metals.

Conclusion The application of green hydrogen from renewably powered electrolysis will be an important contributor to the decarbonisation of ammonia production. As a major emitter of CO2 emissions, the ammonia production process will absolutely need to be a significant focus of climate change initiatives in the industrial sector. In addition, green ammonia offers an additional opportunity to store and transport renewable energy as a hydrogen carrier. The infrastructure for storing and moving ammonia over long distances, including through pipelines, already exists and can be expanded at a low relative cost compared to other bulk hydrogen infrastructure approaches. Ultimately, green ammonia will play a dual role in offering both decarbonised fertilizer and renewable energy storage solutions in support of international climate change objectives. The development of green ammonia business cases will require lower costs for large-scale electrolyser plants, and perhaps some market-based incentives and mandates for the near term, but there is no doubt that renewable electrolysis technology offers a unique opportunity to address these objectives

Executive summary

The time is right to tap into hydrogen's potential to play a key role in a clean, secure and affordable energy future. At the request of the government of Japan under its G20 presidency, the International Energy Agency (IEA) has produced this landmark report to analyse the current state of play for hydrogen and to offer guidance on its future development. The report finds that clean hydrogen is currently enjoying unprecedented political and business momentum, with the number of policies and projects around the world expanding rapidly. It concludes that now is the time to scale up technologies and bring down costs to allow hydrogen to become widely used. The pragmatic and actionable recommendations to governments and industry that are provided will make it possible to take full advantage of this increasing momentum.

Hydrogen can help tackle various critical energy challenges. It offers ways to decarbonise a range of sectors – including long-haul transport, chemicals, and iron and steel – where it is proving difficult to meaningfully reduce emissions. It can also help improve air quality and strengthen energy security. Despite very ambitious international climate goals, global energy-related CO_2 emissions reached an all time high in 2018. Outdoor air pollution also remains a pressing problem, with around 3 million people dying prematurely each year.

Hydrogen is versatile. Technologies already available today enable hydrogen to produce, store, move and use energy in different ways. A wide variety of fuels are able to produce hydrogen, including renewables, nuclear, natural gas, coal and oil. It can be transported as a gas by pipelines or in liquid form by ships, much like liquefied natural gas (LNG). It can be transformed into electricity and methane to power homes and feed industry, and into fuels for cars, trucks, ships and planes.

Hydrogen can enable renewables to provide an even greater contribution. It has the potential to help with variable output from renewables, like solar photovoltaics (PV) and wind, whose availability is not always well matched with demand. Hydrogen is one of the leading options for storing energy from renewables and looks promising to be a lowest-cost option for storing electricity over days, weeks or even months. Hydrogen and hydrogen-based fuels can transport energy from renewables over long distances – from regions with abundant solar and wind resources, such as Australia or Latin America, to energy-hungry cities thousands of kilometres away.

There have been false starts for hydrogen in the past; this time could be different. The recent successes of solar PV, wind, batteries and electric vehicles have shown that policy and technology innovation have the power to build global clean energy industries. With a global energy sector in flux, the versatility of hydrogen is attracting stronger interest from a diverse group of governments and companies. Support is coming from governments that both import and export energy as well as renewable electricity suppliers, industrial gas producers, electricity and gas utilities, automakers, oil and gas companies, major engineering firms, and cities. Investments in hydrogen can help foster new technological and industrial development in economies around the world, creating skilled jobs.

Hydrogen can be used much more widely. Today, hydrogen is used mostly in oil refining and for the production of fertilisers. For it to make a significant contribution to clean energy transitions, it also needs to be adopted in sectors where it is almost completely absent at the moment, such as transport, buildings and power generation.

However, clean, widespread use of hydrogen in global energy transitions faces several challenges:

- **Producing hydrogen from low-carbon energy is costly at the moment.** IEA analysis finds that the cost of producing hydrogen from renewable electricity could fall 30% by 2030 as a result of declining costs of renewables and the scaling up of hydrogen production. Fuel cells, refuelling equipment and electrolysers (which produce hydrogen from electricity and water) can all benefit from mass manufacturing.
- **The development of hydrogen infrastructure is slow and holding back widespread adoption.** Hydrogen prices for consumers are highly dependent on how many refuelling stations there are, how often they are used and how much hydrogen is delivered per day. Tackling this is likely to require planning and coordination that brings together national and local governments, industry and investors.
- **Hydrogen is almost entirely supplied from natural gas and coal today.** Hydrogen is already with us at industrial scale all around the world, but its production is responsible for annual CO2 emissions equivalent to those of Indonesia and the United Kingdom combined. Harnessing this existing scale on the way to a clean energy future requires both the capture of CO2 from hydrogen production from fossil fuels and greater supplies of hydrogen from clean electricity.
- **Regulations currently limit the development of a clean hydrogen industry.** Government and industry must work together to ensure existing regulations are not an unnecessary barrier to investment. Trade will benefit from common international standards for the safety of transporting and storing large volumes of hydrogen and for tracing the environmental impacts of different hydrogen supplies.

The IEA has identified four near-term opportunities to boost hydrogen on the path towards its clean, widespread use. Focusing on these real-world springboards could help hydrogen achieve the necessary scale to bring down costs and reduce risks for governments and the private sector. While each opportunity has a distinct purpose, all four also mutually reinforce one another.

1. **Make industrial ports the nerve centres for scaling up the use of clean hydrogen.** Today, much of the refining and chemicals production that uses hydrogen based on fossil fuels is already concentrated in coastal industrial zones around the world, such as the North Sea in Europe, the Gulf Coast in North America and southeastern China. Encouraging these plants to shift to cleaner hydrogen production would drive down overall costs. These large sources of hydrogen supply can also fuel ships and trucks serving the ports and power other nearby industrial facilities like steel plants.
2. **Build on existing infrastructure, such as millions of kilometres of natural gas pipelines.** Introducing clean hydrogen to replace just 5% of the volume of countries' natural gas supplies would significantly boost demand for hydrogen and drive down costs.
3. **Expand hydrogen in transport through fleets, freight and corridors.** Powering high-mileage cars, trucks and buses to carry passengers and goods along popular routes can make fuel-cell vehicles more competitive.

4. **Launch the hydrogen trade's first international shipping routes.** Lessons from the successful growth of the global LNG market can be leveraged. International hydrogen trade needs to start soon if it is to make an impact on the global energy system.

International co-operation is vital to accelerate the growth of versatile, clean hydrogen around the world. If governments work to scale up hydrogen in a co-ordinated way, it can help to spur investments in factories and infrastructure that will bring down costs and enable the sharing of knowledge and best practices. Trade in hydrogen will benefit from common international standards. As the global energy organisation that covers all fuels and all technologies, the IEA will continue to provide rigorous analysis and policy advice to support international co-operation and to conduct effective tracking of progress in the years ahead.

As a roadmap for the future, we are offering seven key recommendations to help governments, companies and others to seize this chance to enable clean hydrogen to fulfil its long-term potential.

The NEL´s crypto Project 7 key recommendations to scale up hydrogen

1. **Establish a role for hydrogen in long-term energy strategies.** National, regional and city governments can guide future expectations. Companies should also have clear long-term goals. Key sectors include refining, chemicals, iron and steel, freight and long-distance transport, buildings, and power generation and storage.
2. **Stimulate commercial demand for clean hydrogen.** Clean hydrogen technogies are available but costs remain challenging. Policies that create sustainable markets for clean hydrogen, especially to reduce emissions from fossil fuel-based hydrogen, are needed to underpin investments by suppliers, distributors and users. By scaling up supply chains, these investments can drive cost reductions, whether from low-carbon electricity or fossil fuels with carbon capture, utilisation and storage.
3. **Address investment risks of first-movers.** New applications for hydrogen, as well as clean hydrogen supply and infrastructure projects, stand at the riskiest point of the deployment curve. Targeted and time-limited loans, guarantees and other tools can help the private sector to invest, learn and share risks and rewards.
4. **Support R&D to bring down costs.** Alongside cost reductions from economies of scale, R&D is crucial to lower costs and improve performance, including for fuel cells, hydrogen-based fuels and electrolysers (the technology that produces hydrogen from water). Government actions, including use of public funds, are critical in setting the research agenda, taking risks and attracting private capital for innovation.
5. **Eliminate unnecessary regulatory barriers and harmonise standards.** Project developers face hurdles where regulations and permit requirements are unclear, unfit for new purposes, or inconsistent across sectors and countries. Sharing knowledge and harmonising standards is key, including for equipment, safety and certifying emissions from different sources. Hydrogen's complex supply chains mean governments, companies, communities and civil society need to consult regularly.
6. **Engage internationally and track progress.** Enhanced international co-operation is needed across the board but especially on standards, sharing of good practices and cross-border infrastructure. Hydrogen production and

use need to be monitored and reported on a regular basis to keep track of progress towards long-term goals.

7. **Focus on four key opportunities to further increase momentum over the next decade.** By building on current policies, infrastructure and skills, these mutually supportive opportunities can help to scale up infrastructure development, enhance investor confidence and lower costs:

- Make the most of existing industrial ports to turn them into hubs for lower-cost, lower-carbon hydrogen.
- Use existing gas infrastructure to spur new clean hydrogen supplies.
- Support transport fleets, freight and corridors to make fuel-cell vehicles more competitive.
- Establish the first shipping routes to kick-start the international hydrogen trade.

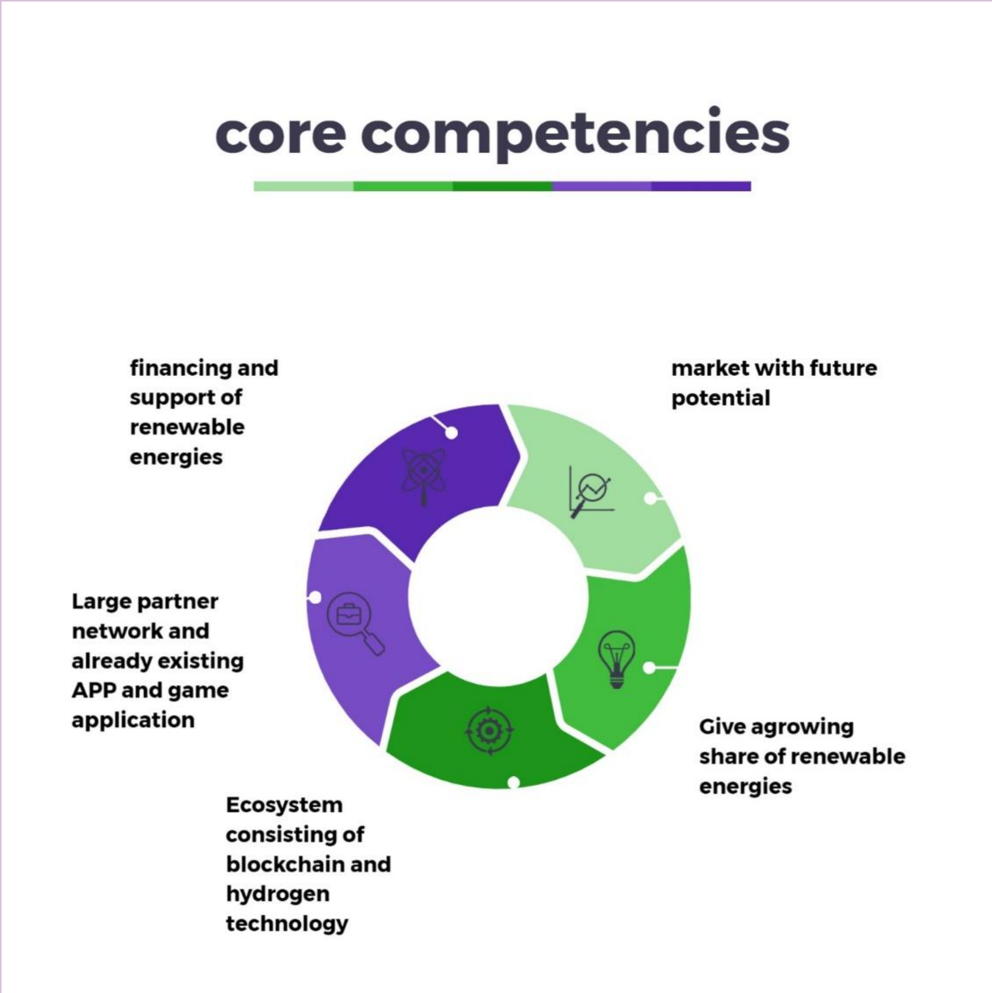
Context

Why we believe renewable hydrogen will be number 1 in the future:

- The world needs a new energy carrier to replace oil and gas
- Hydrogen is the element with the highest energy density
- Through electrolysis hydrogen can be produced from water and renewable energy
- Access to renewable energy is practically infinite
- The electric grids do not have the capacity to handle the entire future energy demand alone
- The demand for stable energy supply diverge from the fluctuating nature of renewable energy production in general
- Large scale introduction of renewable energy is dependent on energy storage solutions

How Nel and the Distribution Algorithm Works

Vektor Protocol aims to solve the problems of prior cryptocurrencies including mining rewards, farming rewards, and liquidity provisioning. Mining equipment can be both costly and harmful to the environment, but mining remains of interest due to the opportunities afforded by it. As an easy alternative to mining rewards, we propose allowing users to participate in a smart contract token reflection to produce tokens inside their own wallet. Another challenge remains to facilitate and maintain liquidity on decentralized exchanges. By nature, decentralized exchanges require liquidity for user participation, thus the responsibility is on the developers to provide it. Historically, developers created incentives aimed at users to provide liquidity which can be outweighed by risk due to the subjectivity of impermanent loss. As a solution, we propose utilizing a smart contract function to automatically capture liquidity to be used on the decentralized exchanges and held in custody independent from user possession. Additionally, a smart contract that provides the capability to burn tokens can promote scarcity by reducing the total supply. Together, the combination of these tokenomics may afford far superior benefits for the community within the decentralized venue. Allowing these functions to be amplified and dependent on volume provides an ideal incentive to expedite adoption and foster new use cases.



1. Introduction

Decentralized finance is made possible by using decentralized exchanges in collaboration with liquidity pool smart contracts. For any token on the smart chain to have an availability to be swapped on a decentralized exchange, it must have an available liquidity pool of tokens for swapping. The challenge remains on how to properly incentivize users to keep such liquidity pools maintained. Recognizing this, developers have attempted to satisfy these conditions by using various tokenomic structures with incentives for the user to supply liquidity into the pools. An automatic liquidity acquisition can be featured as an alternative solution compared against the traditional “farming reward” structure. An automatic liquidity acquisition function where users are offered rewards (via reflection) in lieu of traditional farming rewards. These reflections would act to distribute tokens proportional to volume, and could thus provide a more reasonable incentive for holding. Although reflection and automatic liquidity acquisition may contribute to stability, an inherent burn which can achieve token scarcity with a depreciating token supply. The combination of these tokenomics seeks to eliminate the flaws of various predecessors, while providing useful incentives for use case and adoption. Effectively, any application that is added with these smart contract functions could have the effect of amplifying VEKTOR tokenomics.

2. Automated Liquidity Acquisition fort he support

We understand that liquidity is crucial in any trading environment. By definition, decentralized liquidity is simply the accessibility of tokens operated and controlled by a smart contract--hosted by a decentralized exchange. Historically, market makers have been used to provide a service for buyers and sellers on traditional order book exchanges for a better user experience. The main function of these market maker services was to fill buy and sell orders promptly and reduce overall market volatility caused by large orders. However, traditional order books have long been outdated by newer technology, and have been replaced by liquidity pools in a decentralized venue. Just as market makers are compensated for providing a service in the order book environment, proper incentives for adding liquidity are a key factor in any decentralized environment. Problems arise when the liquidity pool provider loses the incentive to add tokens into the pool, which occurs after the token pair is subjected to impermanent loss resulting from arbitrage. As a solution, Liquidity can be taken as a function of the smart contract using market activity from all swaps and transfers. A portion of these swaps and transfers will be captured by the smart contract and utilized with the function: "_swapAndLiquify". For this to happen, the portion of the 5% fee from swap and transfers can be kept in a standalone pool within the contract itself and automatically converted to the liquidity pool after the token count reaches a threshold, set at 200 billion tokens. Liquidity is then managed by the contract as it is sold and paired accordingly thereby alleviating the users from having to subject themselves to any impermanent loss scenarios. Large liquidity pools act to decrease the volatility of the swap impacts against the overall available supply. Therefore, as the token matures, the auto-liquidity can be attributed toward an ever growing market stability capable of absorbing large market activity.

3. Token Reflection for the hydrogen game

Traditional mining is both costly and inconvenient for the user. Frictionless, static reflection rewards accrue by simply holding your tokens, and features an innovative hold-farming reward structure that stands out from conventional pool-farming rewards. The idea behind this function is to eliminate token dependencies that have created problems in the past, including, but not limited to:

1. Pooling funds in unverified 3rd party smart contracts;
2. External website interfaces;
3. Transaction fees needed to claim rewards.

Earlier models of decentralized finance tokens such as pool farming are costly and rely on user action to manually compound rewards. As a solution, we propose the utilisation of a compounding reward structure that requires no additional fees in a smart contract function, also known as token reflections. To achieve this, reflection must happen without cost or impact to the user. Considering the static rate of reflection set at 5%, the volume of market activity will directly impact the quantity of token reflection based upon the percentage of tokens held by the user relative to the overall supply. With the "_excludeFromReward" function enabled for individual

addresses, accounts such as exchanges, hot wallets, dapps, etc. can be excluded from token reflection, thus granting more rewards to individual holders.

the NEL project hydrogen game

To learn more about hydrogen, we have thought of a playful part that simplifies the complexity and presents it in an appealing way in a game interface.

the player can learn a lot about the chemical and physical process here and even earn NEL tokens.

From a total of 500 NEL you can have the earned tokens on your wallet cash out.
For each successfully completed mission you will receive a reward in NEL tokens.
With each completed level, the level of difficulty increases when parking or the search for a parking space. There are 10 levels in total, each with 80 missions. When all 800 missions have been completed, you can play each mission again individually.

The top 10 players are shown on the homepage (www.nel-hydrogen.com). The top 3 players receive an additional monthly prize for their performance directly on the deposited wallet.

The game will be available for download through the app and directly through the Android and Apple Store be integrated into the HYDROGEN app.

4. Depreciating Supply & Burn Address

In a decentralized smart chain environment, contract functions can be utilized to achieve token scarcity. To do this, we propose also distributing rewards to the burn address, which is publicly verifiable for all participants to see. We can then track the depreciating supply in real-time for added transparency. In our effort to establish a baseline token burn rate, we find that these values are dependent on three important factors: reflection rate, token quantity, and market volume. The rate of reflection rewards is proportional to the total supply in each holder's wallet address. It is important to note that there are two particular variables which will affect our calculations: the increasing scarcity of tokens and the quantity of tokens absorbed into the burn address. It can be reasonably understood that these features will have synergistic effects that can stabilize the burn rate into the future.

The NEL Project Application for Android and IOS

The Alternative Fueling Station Locator app helps you find fueling stations that offer electricity, natural gas, biodiesel, ethanol (E85), propane, and hydrogen.

Use your current location or enter a custom location to find the 20 closest stations within a 30-mile radius. View the stations on a map or see a list of stations ordered by distance from your location. Select your alternative fuel of choice and adjust the custom filters to fit your needs.

Select a station from the map or list to view contact info and other details:

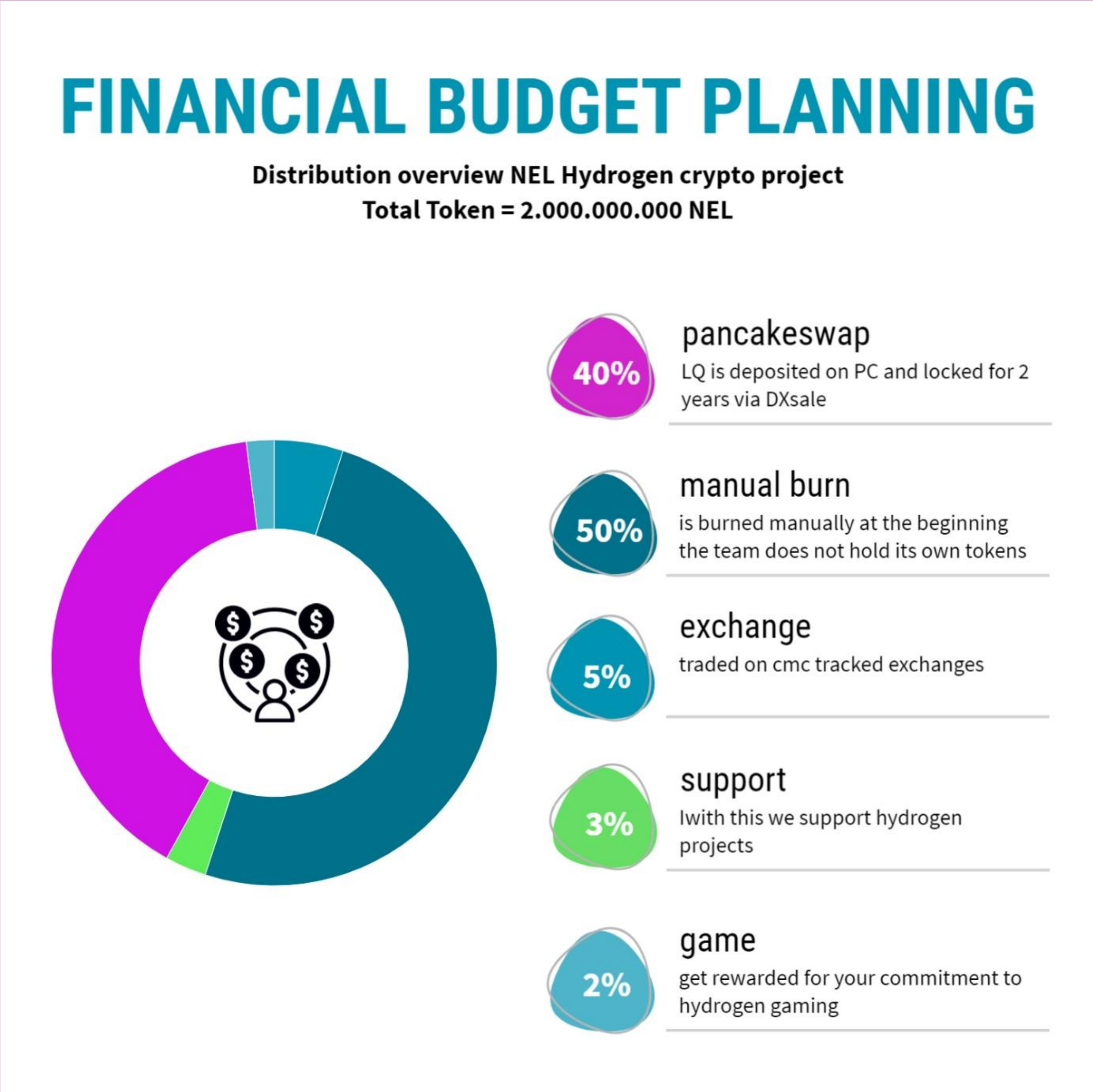
- address, phone number, and hours of operation
- payment types accepted
- public or private access
- special services
- compression (natural gas)
- vehicle size access (natural gas)
- number and types of chargers (electric)
- blends available (biodiesel)
- blender pumps (ethanol)

The app draws information from the U.S. Department of Energy's also the canadian and many more all over the world Alternative Fuels Data Center, which houses the most comprehensive, up-to-date database of alternative fueling stations in the United States. The database contains location information for more than 45,000 (as of April 2022) alternative fueling stations all over the world.

We are building a network of partners who will also accept crypto technology and blockchain as a payment method. So you can not only use our app to find the next gas station for alternative drive types, you can also use the crypto technology to pay.

Here you can now use any cryptocurrency that is accepted, but of course also NEL token, with which you get an additional discount of 10% on the total price of the connected business partner.

Tokenomics



The world needs clean energy solutions. Our purpose at Nel is to speed up that transition. This is what drives us – as humans and professionals. Does it drive you as well?