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Equity Research - Plug Power: Plug Into Sustainable Profitability

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Abstract

This individual report is part of the equity research performed on Plug Power, an American-based company that focuses on green hydrogen related products and services. After a thoroughly analysis of the company, the market, and other external and internal factors affecting Plug, we got to a final recommendation to BUY Plug's shares.

Keywords

Green Hydrogen, Plug Power, Fuel Cells, Electrolysers

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This report is part of the “Don´t Pull the Plug just yet!” report (annexed), developed by Diogo Osório and Manuel Fernandes and should be read as an integral part of it.

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Introduction

Our joint report consists of an equity research on the American company Plug Power, a green hydrogen turnkey solutions provider. Our objective for the joint report is to forecast Plug's financials through an extensive analysis of the company's internal structure, its future growth plans, as well as external factors that affect not only Plug, but also the market in which it operates.

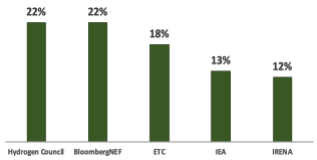
The joint report is divided in 5 major chapter: Company Overview, Industry Overview, Macroeconomic Overview, Business Plan and Valuation. Each one of the main chapters has several subchapters so that our analysis could be even more detailed.

Regarding this individual report, it starts by covering the Industry Overview, more precisely the Green Hydrogen Sector (Challenges, Alternatives, Cost Structure, Fuel Cells, and Electrolysers) and Plug Power's Competitive Landscape. Next, it dives into the Macroeconomic Overview section, with an analysis on the Regulatory Framework: Public Policies (such as the Inflation Reduction Act), and the Carbon Pricing. The last major chapter covered in this individual report is the Valuation, which contains the forecast of Plug's Balance Sheet as well as its Value Drivers, the multiples valuation based on the peers previously identified in the Competitive Landscape part, and the scenario analysis where different assumptions than the ones we have on our Base Scenario are tested, creating a Bear and a Bull Scenarios. The remaining chapters are covered by my colleague Diogo Osório in his individual report, analysing the Company Overview, the Business Plan, and different parts of the Valuation chapter such as the Income Statement Forecast and Value Drivers, the Discounted Cash Flows, and the Sensitivity Analysis.

We conclude the joint report with an investor's recommendation to BUY Plug's shares as we firmly believe that the Target Share Price will be increasing in the future forecasted period, despite the downfall during last year due to investors questioning the future of the green hydrogen industry and Plug's part in it. We end up with a value of $12.29 per share and a total shareholders' return of 30.62%.

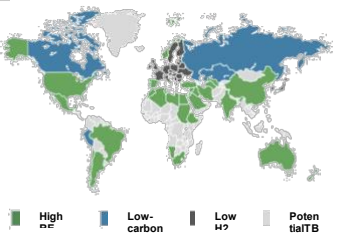
Industry Overview

Exhibit 1: *Forecast of hydrogen demand as the share of total energy worldwide in 2050, by different international agencies, in accordance with the Net Zero assumption*



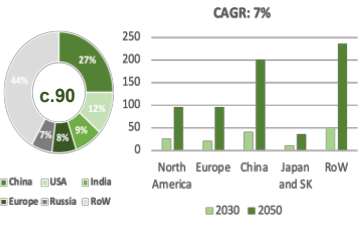
Source: Statista, IRENA

Exhibit 2: *Worldwide clean H2*



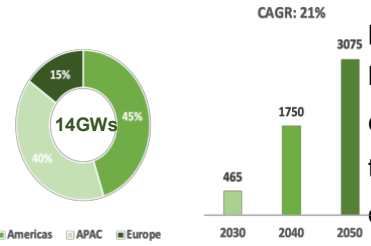
Source: Hydrogen Strategy for Canada

Exhibit 3: *Current global breakdown of H2 consumption and forecasted demand (in Mt)*



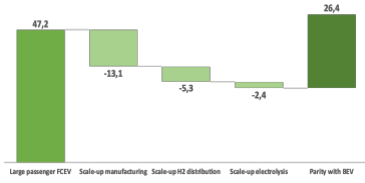
Source: IRENA, Hydrogen Council, McKinsey

Exhibit 4: *Current global breakdown of electrolyser production capacity and forecasted capacity (in GWs)*



Source: BloombergNEF, DNV

Exhibit 5: *Cost of ownership path to parity with BEVs: the case of large passenger FCEVs (in cents/km)*



Source: Hydrogen Council

600k annual production volumes, 2.5x larger H2 refuelling stations and 50 GW electrolysis deployed will enable cost parity with BEVs

Starting by the Net Zero Assumption, the increase of global temperature must be capped to 1.5ºC above pre-industrial levels to prevent the worst impacts of climate change and to preserve the planet. To do so, carbon emissions need to be reduced by 45% till 2030 and reach net zero by 2050 as stated in the Paris Agreement.[1]

Under the Net Zero assumption, and supported by Goldman Sachs studies[2], the green hydrogen market share in global energy could be between 20% and 25% by 2050, which translates into a targetable addressable market (TAM) of c. $10T. Plug Power is exposed to this market through its whole ecosystem: the molecule per se (H2), the production element (electrolysers) and the applications (FCs).

Green Hydrogen Sector

The IEA states that the global molecule consumption in itself represents a $2.5T opportunity by 2050, with the remaining TAM belonging to the associated infrastructure and technology required to produce, transport, and use green H2. The global rising demand for H2 could translate into an eightfold increase by 2050 **(Exhibit 3)**. In the US, for example, demand could grow to 17MMt by 2030, driven largely by the transportation and industrial sectors, with green H2 accounting for a significant portion to reduce greenhouse gas emissions and meet climate targets. By 2050, the average global price of green H2 could fall by up to 75% due to decreasing costs of renewable sources of energy and electrolysers. In 2021, the cost of electricity from Solar PV dropped by 13%, from onshore wind 15% and from offshore wind by 13%[3] with this trend not showing signs of slowing down with several renewable projects on the pipeline. Regarding electrolysers **(Exhibit 4)**, their costs have fell 40% in the US and Europe between 2014 and 2019[4]. The EU has an ambitious plan of reaching 40 GW of electrolyser capacity and 10Mt produced p.a.[5] and plans to invest between €180-470B in clean energy technologies by 2050[6]. By 2040, the Asia-Pacific (APAC) region is expected to account for 40% of global green H2 demand. China will play a crucial role, targeting 1Mt of green H2 production by 2025 and 5Mt by 2030, resulting in a clean H2 share of 13% out of total H2 production, accompanied by 1 million FCEVs on the road[7]. Australia will also be a key player given its abundance of wind and solar sources and targeting $2/kg price target for green H2 production by 2030.

- Challenges

The green H2 market current headwinds fall majorly on its high production costs. The average cost of production from Variable Renewable Energy plants can be at least double the grey hydrogen cost. This naturally passes onto end-users, making its adoption harder given current cheaper alternatives **(Exhibit 5)**. FCEVs and H2 tanks are up to 2 times more expensive than fossil-fuel based substitutes and H2-based fuels for aviation are up to 8 times the cost of fossil jet fuels. Green H2 distribution is affected by the lack of infrastructure. While there are more

[1] (https://www.un.org/en/climatechange/net-zero-coalition s.d.)
[2] Goldman Sachs (2022). Carbonomics - The clean Hydrogen Revolution
[3] (https://unfccc.int/news/renewable-power-remains-cost-competitive-amid-fossil-fuel-crisis s.d.)
[4] BloombergNEF – Hydrogen Economy Outlook – March 30, 2020
[5] IRENA – Innovation trends in electrolysers for hydrogen production
[6] (https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_1257 s.d.)
[7] (https://www.csis.org/analysis/chinas-hydrogen-industrial-strategy s.d.)

than 3.5 million km of natural gas transmission pipelines worldwide, there is only 8,000km of pipeline for green H2, mostly centred in the US, Germany, Netherlands, Japan, and South Korea[8]. The worldwide number of H2 refuelling stations is less than 1,000 compared to more than 200,000 petrol and diesel stations in the US and EU alone. Another barrier corresponds to the energy losses throughout the value chain. The overall average renewable energy input loss throughout the full cycle of production and use is said to be c.62%[9]. Lastly, there is also the need to ensure sustainability in its green impact. In fact, often, electrolysers connected to renewable sources are also grid-connected for higher effectiveness purposes, resulting in CO2 emissions. Plug Power, by building a whole zero-emission ecosystem with cost-effective solutions, is working on educating on the implementation and adoption of green H2.

- ## Alternatives

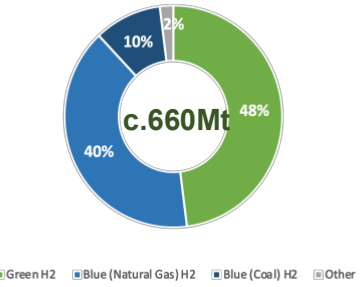
Besides green, H2 can take different colours depending on its sources and production process. The fossil-fuel based grey H2 is mainly obtained from reformation of methane, present in natural gas (NG), resulting in substantial CO2 emissions. With similar downsides, brown H2 is obtained from coal gasification, with both currently accounting for c.80% of global H2 production. Blue H2 follows the same method as grey but with a costly Carbon Capture and Storage (CCS) facility with potential to reduce emissions by up to 90%, still not enough for a Net-Zero transition, but rather a short-term solution. Turquoise H2 is still in its pilot stage, in which the carbon in methane becomes solid through a pyrolysis process, resulting in null or almost null CO2 emissions. Although costly, the process leads to a by-product market for the solid carbon black which can offset costs of production, thus being a promising up and coming technology. Pink H2 is produced using nuclear power as the heat source for steam electrolysis, a process that suggests a low-carbon impact. When comparing thoroughly all the previous described types of hydrogen **(Exhibit 6)**, grey and brown hydrogen are not sustainable options for a world that is aiming to become Net Zero in the future. Even with lower costs, the massive carbon emissions of the two will lead to lower demand. Regarding blue hydrogen, even though its carbon emissions are very low, the CCS facility costs are considerable. Pink and Turquoise hydrogens are still on early phases of development, with the former facing accident risks and high capital costs to nuclear power plants that already delays its competitiveness. On the other hand, green H2 benefits from a proving technology and a potentially positive outlook for its costs' evolution.

Exhibit 6: *Hydrogen spectrum (cost is relative to the US)*

Hydrogen Spectre	Cost $/Kg	Sources	CO2 Emissions
Green	4	Wind and Solar	Null
Grey	2	Natural Gas	High
Blue	4	Natural Gas with CCS facility	Low
Brown	1	Coal gasification	High
Turquoise	Not enough data	Methane pyrolysis	Null/Almost Null
Pink	Not sold yet	Nuclear Power	Low

Source: IRENA

Exhibit 7: *Forecasted breakdown of H2 production in 2050, by technology*

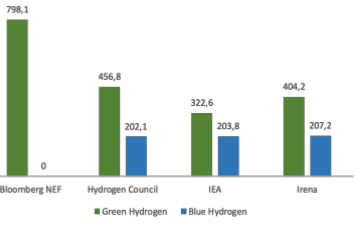


Source: Statista, GECF

- ## Cost Structure Outlook

Starting with hydrogen production, the decreasing costs trend from renewable sources inputs such as wind and solar will continue as their underlying technology and adoption keep on making advancements **(Exhibit 9 and 10)**. Innovation in electrolyser technology will be key in increasing its renewable energy (RE) usage efficiency. The stacks[10] are predicted to become lighter with thinner membranes, more active catalysts, and less critical raw materials. Shifting from the expensive platinum and iridium to the non-precious cobalt, nickel and iron catalysts could reduce the cost of PEM electrolysis by up to 40%[11]. More efficient stacks will reduce the main OPEX of electricity costs. These physical developments shall come in hand with reduced

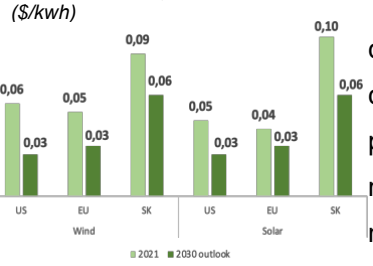
Exhibit 8: *Projected Green and Blue Hydrogen production worldwide in 2050 (in Mt)*



Source: Statista, GECF

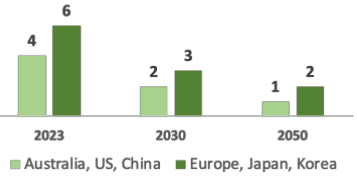
[8] IRENA (2021) – Making the Breakthrough: Green Hydrogen Policies and Technology Costs
[9] (https://www.lexology.com/library/detail.aspx?g=1bf1cbf0-ac2f-4b39-a3de-2df77a9a515e s.d.)
[10] Set of cells present in electrolysers, responsible for the water molecule separation
[11] IRENA (2020), Green Hydrogen Cost Reduction: Scaling up Electrolysers to Meet the 1.5ºC Climate Goal

Exhibit 9: *Average LCOE Outlook ($/kwh)*



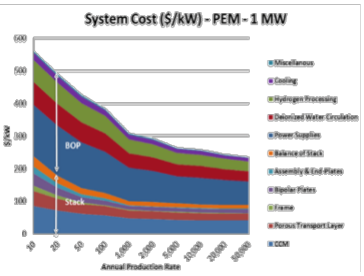
Source: IRENA

Exhibit 10: *Green H2 cost per kg evolution between countries with good access and lower access to renewable sources (in USD)*



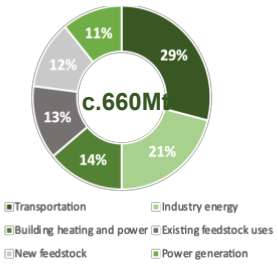
Source: PWC

Exhibit 11: *Economies of scale in electrolysers production*



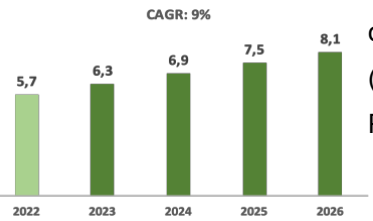
Source: Oxford Institute for Energy

Exhibit 12: *Projected global H2 demand breakdown by end user in 2050*



Source: Statista,

Exhibit 13: *Retail e-commerce sales projections (in Tn USD)*



Source: eMarketeer

required maintenance and no downsides on durability to prevent CAPEX annuity increases. This way, the cost of electrolysers is expected to decline 60% by 2030 **(Exhibit 11)**, thus converging to the current cost of alkaline electrolysers. Water usage footprint must be taken into consideration as scaling continues. Water is utilized in renewable and low-carbon hydrogen production in several parts of the process, beginning in the mining and processing of the materials required to produce hydrogen, to the water molecules split in hydrogen. To put it in numbers, the IEA projects that the energy sector in 2030 will account for a total water consumption of over 72,000 gigalitres, approximately 70 times the estimated level for clean hydrogen[12]. The direct water usage of green hydrogen is approximately 9 kg/kg H2. Another cost issue arises with the need of high-quality water to produce hydrogen in electrolysers, since other types of water can damage the equipment. In order not to increase water stress on the production facilities' regions, water desalination is being studied as a viable solution. This process would increase the marginal costs of green hydrogen production due to extra electricity being required, but this cost increase could be mitigated if cheap renewable power is used. As for infrastructure costs, project finance and government policies will play a significant role. Project Finance can provide the necessary capital for the development of large-scale green H2 production and distribution projects. One of Plug's primary sources of revenue are Power Purchase Agreements (PPAs) related to the company's Genkey solutions, which are a great collateral to use in project finance. PPAs are a long-term source of revenue that provide a degree of certainty around cash flows that will be generated by the project, increasing the willingness to invest or lend from investors or lenders. This type of financing is great for Plug Power because it provides the necessary funding to pursue their projects fully while limiting the company's liabilities in the case of project default, with the lender's recourse limited primarily or entirely to the project's assets[13]. Governments can be seen as major stakeholders in this ndustry since they aim at decarbonizing the economy and, where there's potential, becoming net exporters of energy. Government subsidies, R&D funding and private sector investment incentives are all increasing in trend mechanisms aiming to boost green H2 technologies and projects. An example of future progress is the expected cost of building refuelling stations to be halved by 2030[14].

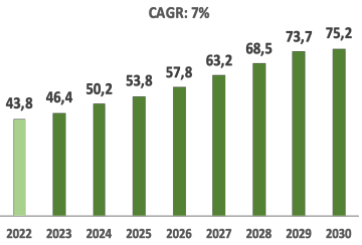
End-users – Decarbonizing the economy

Once the electrolysis process is carried using renewable sources as inputs, the green H2 is transported via shipping, trucks, or pipeline to its end uses: industry (e.g., steel, chemical, refineries), transport, heating, or power generation **(Exhibit 12)**. In addition, the molecule may go under transformation. By chemically combining clean H2 with CO2 sustainably captured from emission streams we may obtain H2-based fuels such as methanol, methane, jet fuels and other hydrocarbons. Also, by combining green H2 with nitrogen (N2) we get green ammonia (NH3). As the underlying sectors continue to develop at a substantial rate, we can confirm that Plug Power has been working on becoming a leader in a rapidly growing H2 and FC industry.

[12] Hydrogen Council – Sufficiency, sustainability, and circularity of critical materials for clean hydrogen
[13] (https://www.investopedia.com/terms/p/projectfinance.asp s.d.)
[14] IRENA – Making the Breakthrough – Green hydrogen policies and technology costs

▪ Fuel Cells

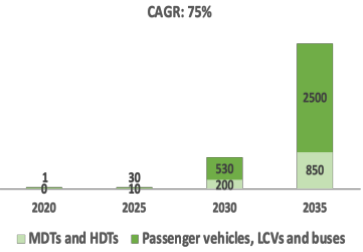
Exhibit 14: *Global Forklift Truck Market Outlook (in Bn USD)*



Source: Statista, Next Move Strategy

The MHE industry growth is largely driven by the disruptive e-commerce industry **(Exhibit 13)**. For each $1B in online sales, c.1.25M sq.ft. of warehouse space is required[15]. A need for automation, space, time, and costs savings in warehouses has exposed the proven GenDrive FCs technology to a global TAM of $30B by 2030. For a typical distribution centre of 200 forklifts, FCs can amount to an average annual savings of $900,000[16]. In the US and Europe, the number of operating forklifts in 2030 is expected to rise 25% to 5 million. Plug Power currently has almost 70,000 active GenDrive FCs which accounts for roughly 2% of the current operating electric forklifts.

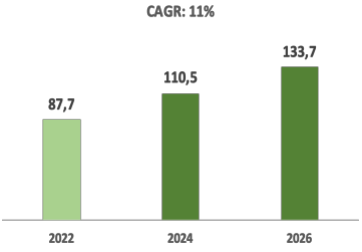
Exhibit 15: *FCEVs in the EU (in thousands)*



Source: McKinsey

The main future driver behind e-mobility FCEV's growth is the heavy-duty and long-range applications in which battery-vehicles' performance struggle and long-haul diesel vehicles accounts for 26% of the US national greenhouse emissions[17]. Plug Power's ProGen solutions are currently mainly targeted to "middle mile" delivery and ground support vehicles. The first segment is aligned with companies' decarbonization targets, and the latter aimed at decarbonizing the highly pollutant ports and airports. In the near future, Plug plans for long-haul trucking (HDTs) solutions, a segment that is expected to be cost competitive with diesel trucks by 2035. In the aerospace segment, there is a great potential for FCs to power unmanned aerial vehicles (UAVs) given its lightweight and long-rage capabilities, outperforming batteries. Drones are commonly used in the military and are in its early stage of disrupting commercial last-mile delivery[18].

Exhibit 16: *Global annual spending on cloud IT infrastructure (data centers) outlook (in Bn USD)*

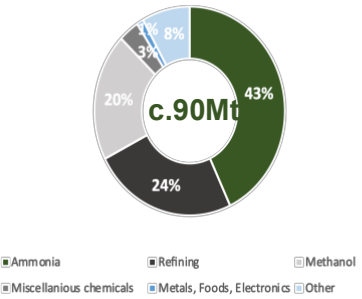


Source:IDC

Regarding the stationary power segment, data centers are one of the fastest growing end-users of stationary power with increasing demand for reliable, high-quality power to support the digital economy **(Exhibit 16)**. Microsoft and Plug Power partnered for a successful 3MW generator prototype using GenSure FCs, in which the trial was described as a "moon landing moment for the data center industry"[19] as the company is working towards eliminating its carbon emissions by 2030. Plug also partnered with telecom company Southern Linc for a 500 FC supply for a 4G cellular network backup. Another use of FCs is to mitigate the impact of natural disasters. Microgrids are stand-alone small-scale power grids available for such events, capturing great interest from governments in FCs. In 2020, 51 GenSure FCs were used during Hurricane Sally, providing more than 1,500 hours for communications equipment for 7 days.

▪ Electrolysers

Exhibit 17: *Global H2 consumption in 2022*



Source: US Office of Energy Efficiency and Renewable Energy

A large portion of the green H2 is used to produce green ammonia **(Exhibit 17)**. More than 85% of ammonia is used in fertilizers and the compound also has energy storage and fuel capabilities. There has been a rising ammonia demand mainly driven by power generation and maritime transport fuels applications. The ammonia industry produces 35% of the chemicals sector, which in itself is accountable for 5% of industrial emissions. Using electrolysed H2 feedstock could reduce ammonia emissions by 90% and using the green ammonia as fuel and

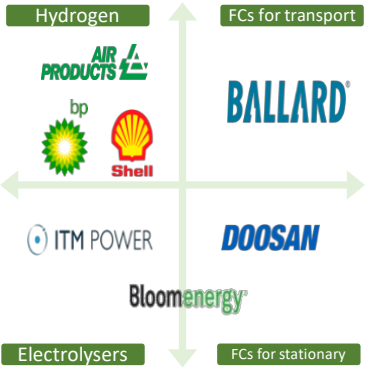
[15] (https://www.cbre.ca/insights/briefs/ecommerces-impact-on-industrial-real-estate-demand s.d.)
[16] (https://www.plugpower.com/fuel-cell-benefits-5-facts-you-should-know/ s.d.)
[17] (https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions s.d.)
[18] (https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/future-air-mobility-blog/drones-take-to-the-sky-potentially-disrupting-last-mile-delivery s.d.)
[19] Stated by Sean James, Microsoft's director of data center research, during Plug Power's 2022 annual Symposium

50% of Plug's electrolyser sales are headed towards the decarbonization of ammonia production

fertilizer could cut farming's emissions also by 90%[20]. PEM electrolysers are also widely used in the decarbonization of refineries and in the production of clean methanol, a green H2-based fuel. With an electrolyser backlog from 2022 of more than 2 GW, Plug's electrolyser business has a sales funnel of more than $25B[21], with about 50% headed towards green ammonia projects. Naturally, the other half is majorly for green H2 fuelling applications.

Competitive Landscape

Exhibit 18: *Competitors diagram*

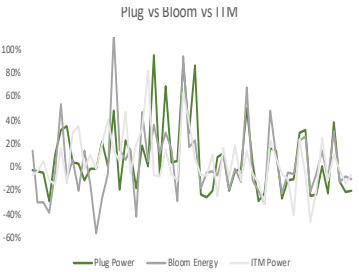


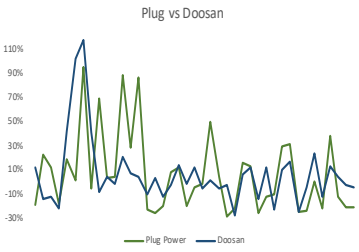
As previously mentioned, Plug is present all over the green hydrogen value chain and there aren't companies that operate in the whole green H2 spectrum like Plug Power. This way, Plug has different competitors in each of their products and services offerings. We focused our competitor analysis on 4 segments: electrolysers, Fuel Cells for stationary power, Fuel Cells for transport and hydrogen (**Exhibit 18)**.

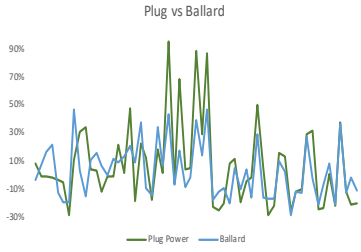
Plug's competitors on the electrolysers market are Bloom Energy (Bloom) and ITM Power (ITM). Bloom are pioneers in using solid oxide technology to produce clean hydrogen, unlike Plug who uses PEM electrolysers. Comparing both systems, the solid oxide technology is far more efficient than PEM, since on average it requires 37.7 kWh per kilogram of hydrogen produced while the PEM system requires 52 kWh per kilogram. On the downside, the solid oxide product requires extremely high operating temperatures to function properly (about 700º - 800ºC, while PEM electrolyzers run on 70º - 90ºC), resulting in longer start-up times and chemical and mechanical combability issues.

ITM is a British company that, like Plug, relies on PEM technology to produce hydrogen. Their focus is on Transport (e.g., heavy-duty vehicles, trains, buses), Energy (e.g., decarbonising heat, grid balancing) and Industry (e.g., refinery hydrogen, green hydrogen for methanation and renewable ammonia).

Exhibit 19: *Comparison of monthly stock returns evolution in the last 4 years*







Source: Yahoo

Evidence of procyclical returns confirms Plug's peers' similar reactions to each sub-industry shocks

Moving on to the stationary power segment, the main competitors are Doosan Fuel Cell (Doosan) and, once again, Bloom. Doosan is a South Korean company that has an American subsidiary. Their primary product is the natural gas fuelled model, but they also provide H2 fuelled ones. Besides providing backup energy to their clients, they are also able to provide heat to households and businesses.

In this segment, Bloom competes with their AlwaysOn Microgrid solutions, protecting their clients against grid outages and extreme weather disruption.

In relation to FCs for transport, the main competitor is the Canadian company Ballard Power Systems (Ballard). The company has particular emphasis on applications related to transportation. Despite being partners and collaborate in some projects (Ballard provides FC stacks to Plug's Gen Drive engines), both companies operate in the transportation industry as competitors. Ballard, just like Plug, produces FC modules for light, medium and heavy-duty vehicles.

Such comparables can be used for the upcoming multiples valuation and beta extraction

Lastly, the hydrogen production segment is growing on competition for Plug. With the Paris Agreement, a lot of companies are targeting to become Net-Zero by 2050, and so, previously diesel fuel productors are now switching to green hydrogen production also. Examples of these competitors are BP, Shell Plc and Air Products.

[20] From Fertilizer to Fuel: Can 'Green' Ammonia Be a Climate Fix? (https://e360.yale.edu/features/from-fertilizer-to-fuel-can-green-ammonia-be-a-climate-fix s.d.)

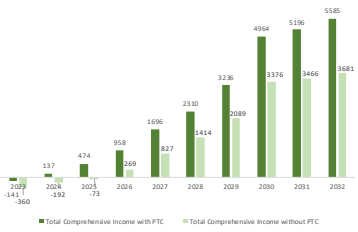
[21] (https://s29.q4cdn.com/600973483/files/doc_presentations/2023/plug_irdeck2023_020323_f.pdf s.d.)

Macroeconomic Overview

Regulatory Framework: Public Policies

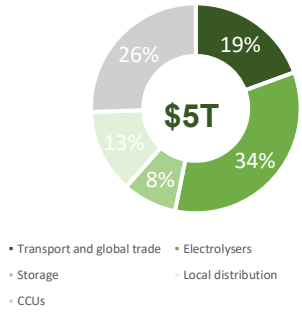
The first public policy that is relevant to Plug Power's business is the Inflation Reduction Act (IRA) that was signed into the United States law on August 16, 2022. The act incorporates new federal spending of $500 billion and several tax breaks that aim to incentivize clean energy, reduce healthcare costs, and increase tax revenues. From that amount, an estimated $369 billion are for the clean energy sector with the objective of significantly reducing the US's carbon emissions for the next 10 years[22]. Regarding the company, IRA's biggest incentive is the Clean Hydrogen Production tax credit (PTC) modification, since it creates a new ten-year incentive for clean hydrogen production that can amount to $3,00 per kilogram of hydrogen produced, depending on the kilograms of CO2 produced in the process. Since Plug produces green hydrogen, the amount of CO2 produced in the end is close to zero, and so the credit value will be the highest possible ($3/kg). The way the PTC works is through direct pay the first 5 years, meaning that clean hydrogen producers can claim a tax refund equal in value to their tax credits. After that, clean hydrogen producers will be able to offset their taxes and also benefit from tax credit transferability where producers with no tax burden will be able to sell their tax credits to a buyer who owes taxes at a 15% discount[23]. The PTC will be one of the main drivers of Plug's profitability, reaching it in 2024 with the PTC instead of 2026 **(Exhibit 20)**. By achieving profitability in an earlier stage, the company will be able to ease pressure on responsibilities towards investors and lenders, and even attract new ones. Secondly, we have the Bipartisan Infrastructure Law (BIL) signed in November 2021, providing more than $1 trillion in public investment. From this, $76 billion is allocated to investments on clean energy-related initiatives, with $10 billion being invested in clean-hydrogen Research and Development.

Exhibit 20: *PTC impact on Plug's profitability (in Mn USD)*



Source: Analysts estimates

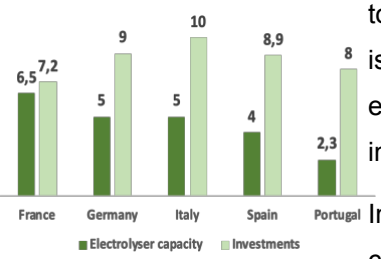
Exhibit 21: *Investments required in the clean H2 supply chain to reach net zero*



Source: Goldman Sachs Global Investment Research

Regarding the European Union where Plug also operates, there is also a hydrogen strategy on course. The strategy aims to develop at least 6 GW of electrolyser capacity by 2024, sufficient to produce 1 million tonnes per year of green hydrogen. On a later stage, by 2030, the objective is to scale up electrolyser capacity to 40 GW in EU countries **(Exhibit 22)**, plus 40 GW of electrolyser capacity in neighbour countries like Morocco, from which the European Union could import the hydrogen.

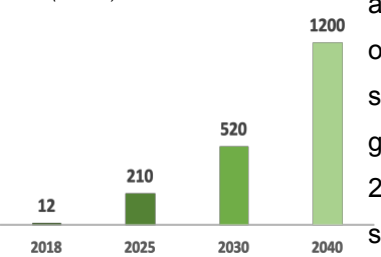
Exhibit 22: *Main electrolyser projects in Europe for 2030 (capacity in GWs and investments in Bn USD)*



Source: Hydrogen Europe

In APAC there is a huge reliance on fossil fuels and the overall energy demand is set to continuously grow. In line with the Paris Agreement, several regions are pushing towards reduction on the emissions of greenhouse gases and one of the main players is green hydrogen. Many APAC countries made hydrogen-related policies to pursue climate change, but the one where Plug is investing in is Korea. In January 2019, the Korean government announced their Hydrogen Economy Roadmap with several goals targeting 2040. The first objective of the roadmap is to increase the number of fuel cell cars to 2.9M by 2040 and will support this growth with 1,200 hydrogen refuelling station installations **(Exhibit 23)**. Another goal is to massively improve the installed capacity of utility-scale and residential fuel cells by 2040 to 15GW and 2.1GW respectively. Korea has been hugely successful implementing this strategy, being a global leader in the transition to hydrogen, owning almost half of the world's nstalled capacity of utility-scale stationary FCs and supplying almost 60% of the world's

Exhibit 23: *Projected cumulative number of H2 fuelling stations in South Korea in SK (in units)*

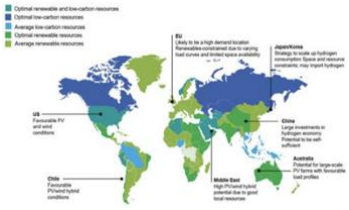


Source: Ministry of Land, Infrastructure and Transport (South Korea)

[22] Can the Inflation Reduction Act unlock a Green Hydrogen economy? (https://theicct.org/ira-unlock-green-hydrogen-jan23/ s.d.)
[23] (https://theicct.org/ira-unlock-green-hydrogen-jan23/ s.d.)

FCEVs. We can conclude that the Korean government's investments in green hydrogen projects will be of great value for Plug Power, proving to be a large efficient market.[24]

Exhibit 24: *Summary of clean H2 potential by geography*

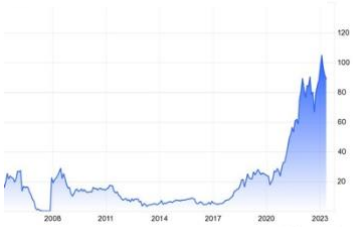


Source: IEA, McKinsey

Carbon Pricing

Starting a few years ago, buying and selling carbon credits on carbon markets became a common practice for several industries. A carbon credit is equal to a tonne of carbon dioxide, or any different greenhouse gas reduced, and it's a way for companies to monetarily compensate the excess of emissions caused by their productive process. In the last 5 years, the price of carbon permits in the European market have been reaching new all-time highs **(Exhibit 25)**, with a ton of carbon in the end of 2021 costing around $80, and in the end of 2022 increasing by 10% to a cost of $88/ton. In February 2023, the price of a carbon credit rocketed to its maximum ever recorded, trading at $105.73/ton[25], and this trend is not expected to be reversed soon since demand is increasing due to the growing number of companies' net-zero commitments[26].

Exhibit 25: *EU Carbon Permits*



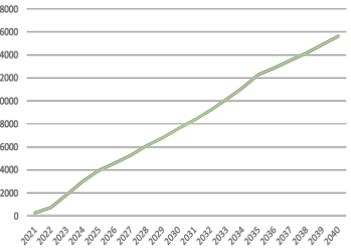
Source: Trading Economics

We believe that, with the trend of increasing carbon pricing, the prices of fossil fuel-based products will follow the same path, as companies will have to incur on extra carbon credits' costs to offset carbon emissions. This is great news for the company because the cost of greenhouse gas emissions will rise, companies will increasingly look for low-carbon energy sources like green hydrogen to fuel their operations.

Valuation

Balance Sheet Value Drivers and Forecasting

Exhibit 26: *PPE Evolution (in Mn)*



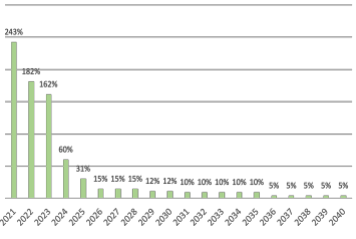
Source: Analysts estimates

With respect to the Balance Sheet, Plug intends to build an end-to-end hydrogen ecosystem and will bet heavily on its operations' expansion, with increasing production, the opening of several hydrogen plants, as well as multiple M&A's and joint ventures. With this being said, it is only natural that one's Balance Sheet will also grow in accordance.

- Core Invested Capital

Starting with the companies' Core Invested Capital (Core IC), the objective of increasing their H2 pipeline and expanding their operations needs massive investment, as we can see as the value of Core IC almost doubling from 2022 to 2023 reaching 3.6 Bn and surpassing the 10Bn mark by 2027.

Exhibit 27: *PPE Growth rate*



Source: Analysts estimates

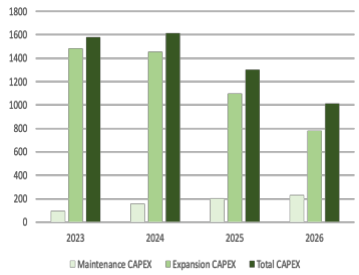
One of the main drivers for this increase in Core IC is the Property, Plant, and Equipment, Net caption (PPE). Plug is currently building several green hydrogen plants across the U.S. and Europe, with multiple other potential locations being studied, and so PPE is expected to grow at an exponential rate at least in the beginning of the forecasted period, as it happens from 2022 to 2025 (**Exhibit 27**), increasing its value to nearly 4 times, and then slowly reaching a steady growth rate as some plants are expected to finish construction and start production during the last year. We projected PPE based on Tons per Year (PPE/TPY) produced as there is no information available on actual cost per plant. We expect the value to stay high in the beginning

[24] Korean Hydrogen Market Update – Australian Government
[25] (https://tradingeconomics.com/commodity/carbon s.d.)
[26] (https://finance.yahoo.com/news/global-carbon-credit-market-analysis-154000110.html s.d.)

but slowly decreasing, since the factories have different dates to start production and so TPY will be increasing as some constructions finish, until finally reaching a steady state.

Regarding Intangible Assets (IA), it is divided in Gross Acquired Technology, Customer Relationship, Backlog and Trademarks and In Process R&D. The first caption is related to M&As, which Plug has been relying on a lot in the last years. Since Plug already has presence in the entire value chain of hydrogen production and distribution, we believe that new transactions will decrease, eventually ending in 2028, with no more acquisitions needed to boost growth and keeping the Gross Acquires Technology value constant over time. Customer relationship and In Process R&D will increase over time at the same rate. Goodwill varies with the total number of M&As performed by Plug, with its value reaching stability as M&As end.

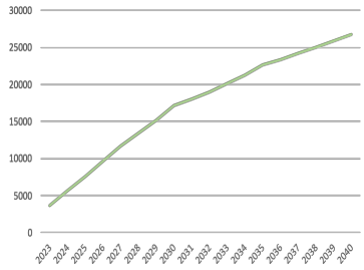
Exhibit 28: *CapEx breakdown 2023-2026*



Source: Analysts estimates

Our CapEx projections are based on the three previous captions: PPE, IA, and Goodwill. We set our maintenance CapEx to equal depreciation from PPE plus amortization from IA, constantly increasing over time. Our Total CapEx is the difference of total PPE, IA, and Goodwill one year to another plus the maintenance CapEx, and the expansion CapEx is the difference between Total and Maintenance CapEx. Expansion CapEx presents higher values in the first years of forecasting (2023-2025) reaching almost 1.5B in the first and second years (**Exhibit 28)**, later achieving stability. The higher early values of Expansion CapEx come in line with Plug's new hydrogen plants being built.

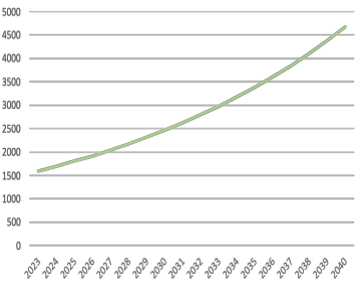
Exhibit 29: *Core IC Evolution (in Mn)*



Source: Analysts estimates

Moving on to Accounts Receivable (AR) and Inventories, the companies' average collection period is set to decrease over time as Plug is not yet profitable but is almost reaching that goal, so there will be increased pressure on clients to pay earlier. The average holding period has almost doubled from 2020 to 2022 due to a materials crisis[27]. The material crisis created a disruption on global supply chains, with shortages of raw materials and increasing lead times. This crisis is not over yet but Plug not only has several sources for their essential materials, but most important, it secured a new partnership with the strategic FC's material supplier Johnson Matthey, and so the company can decrease their average holding period to pre-pandemic values (135). Regarding payables, it is set to be kept at high values such as in 2022. The growth of the company in the industry will bring leverage when dealing with suppliers and ability to keep those values.

Exhibit 30: *Non-Core IC Evolution (in Mn)*



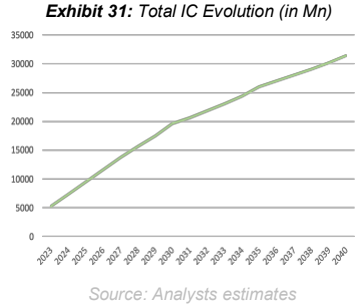
Source: Analysts estimates

To conclude, Core IC for the forecasted period grows at a higher rate in the beginning until 2030 as we see from a higher slope on the graph (**Exhibit 29**), later decreasing that slope. The Core IC ends up at a value of 26.6B in 2040.

- Non-Core Invested Capital

Moving on to Non-Core Invested Capital (Non-Core IC), it won't be changing as much as Core IC, doubling its value only in 2034. The changes are from available-for-sale securities as the rest of the captions are kept constant. This caption provides liquidity to Plug and so it will grow at a constant rate for the forecasted period, and so will Non-Core IC, reaching a final value of 4.6B in 2040. (**Exhibit 30**)

Exhibit 31: *Total IC Evolution (in Mn)*



Source: Analysts estimates

To conclude, Total Invested Capital (Total IC) will be the sum of Core and Non-Core IC, following the same path as Core IC's values, with a higher slope until 2030 meaning higher growth. This goes in line with Plug's objective of expanding its operations since there will be needs for higher investments in early years where construction of plants is in progress. (**Exhibit**

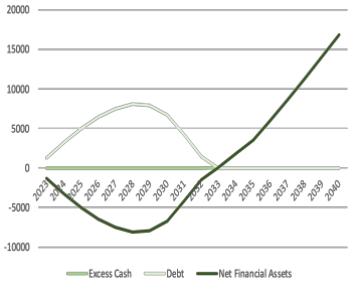
[27] Shortage of electrolyzers for green hydrogen - EY

31)

- Financing

To conclude the Balance Sheet analysis, Plug's ways of financing its operations will change throughout the forecasted period. As the expansion plan of hydrogen plants is in progress, Debt will be the main source of financing, increasing until 2028. From that moment onwards, Debt will start being repaid since Plug's profitability is already on track and increasing Total Stockholder's Equity, to the point that increases in Equity are higher than that year's Total IC. Debt will be fully paid by 2033, where Excess Cash starts to be the way of financing operations. This caption will be increasing from 2033 until the end of the forecasted period due to a decreasing growth rate of Plug. This way, Plug's Net Financial Assets will turn positive in 2033. (**Exhibit 32**)

Exhibit 32: *Net Financial Assets Evolution (in Mn)*



Source: Analysts estimates

Moving on to Total Shareholder's Equity, it was calculated using the principle of clean surplus accounting (**Exhibit 33**)[28] and is growing constantly from 2023 onwards. Regarding Transactions with Shareholders, Plug has never distributed dividends to its investors and does not plan on doing so in the foreseeable future[29], and so according to the principle of clean surplus accounting, previous historical values are Net Equity issued (positive) or bought (negative). These transactions will be kept as a constant percentage of Total Comprehensive Income of -22%, with constant negative values of Net Equity bought from 2024 onwards. For the years with existing Debt (2024-2033), this means that Plug will be using its cash to pay off Debt rather than issue new shares. For the years with Excess Cash (2034 onwards), the company will be repurchasing shares more than issuing them, reducing the number of outstanding shares and increasing its value.

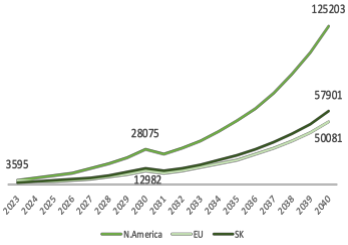
Exhibit 33: *Principle of Clean Surplus accounting*

$$\text{Equity}_{2020} = \text{Equity}_{2019} + \text{Net Income}_{2020} - \text{Dividends}_{2020} + \text{Net Equity Issued}_{2020}$$

Source: Measuring and Managing the value of companies

To conclude, the company is betting on a scale of production for the long run, with massive investment in tangible assets such as PPE. The turning point of profitability allows Plug to ease financial distress by repaying its existing Debt and rely on its own operations' revenues for financing. This growth process will bring value not only to the company but also to its shareholders, as we can see by the Return on Invested Capital (ROIC) always positive throughout the forecasted period and above WACC in every year from 2027 onwards.

Exhibit 34: *FCEVs deployments, in units*



Source: EV Volumes

Multiples Valuation

With the objective of complementing our DCF model, a valuation by multiples was performed, even though we acknowledge its fairness to be questionable since there isn't any company in the industry with a similar fully integrated hydrogen business model as Plug. The peers chosen as comparables are the ones previously analysed in the "Competitive Landscape" section because this way we have a representation of the segments in which Plug operates: Hydrogen, FCs for transport, FCs for stationary and electrolysers.

Exhibit 35: *Comparables' Trading Multiples*

	EV/Sales	EV/EBIT	EV/EBITDA	EV/BVA
Bloom Energy Corp.	2,84x	-40,01x	59,03x	2,15x
Doosan Fuel Cell Co	4,71x	92,54x	49,05x	2,23x
Ballard Systems Inc.	5,21x	-3,46x	-3,82x	0,42x
ITM Power plc	751,64x	-19,08x	-20,47x	3,67x
Fuel Cell Energy Inc.	7,30x	-9,06x	-12,75x	1,05x
Powercell Sweden AB	17,94x	-79,86x	-94,03x	12,70x
Nel ASA	12,55x	-24,81x	-33,04x	2,85x
Median	**7,30x**	**-19,08x**	**-12,75x**	**2,23x**
Average	**114,60x**	**-11,96x**	**-8,00x**	**3,58x**

Source: Bloomberg

In terms of the chosen multiples for the valuation, we decided not to go with the usual EV/EBITDA nor EV/EBIT because most of the companies in the peer group do not have positive values for the earnings captions yet. Instead, we chose to go with a 50-50 weight split between the multiples where Plug is more in line with its peers: EV/Sales and EV/Book Value of Assets. (**Exhibit 35**).

In the end, we got to a Target Share Price of $16.46 using the industry median of the previously

[28] Measuring and Managing the Value of Companies; Seventh Edition
[29] Plug Power 2021 Annual Report

mentioned multiples, a higher value than the current share price, and a Capital Gain of 74.88%, empowering even more our recommendation to BUY.

To conclude, the valuation by multiples goes in line with our DCF Target Share Price of $12.29 and Capital Gain of 30.62%.

Scenario Analysis

This forecasting of Plug's financial performance is based on our understanding of how the world is set to embrace the Green H2 evolution and the Net-Zero by 2050 objective set in the Paris Agreement. It is based on several macro-economic assumptions that carry uncertainty with them, and for that reason we developed two different possible scenarios besides the Base one to account for changes in our assumptions. We developed a Bear case in which our Base Case assumptions do not go as well as we think; and a Bull case where external factors are even more beneficial for Plug and its performance skyrockets.

- Bear Case

In this case we explored four assumptions that could potentially happen in the forecasted period and would be harmful for Plug's activities and profitability.

The first assumption has to do with the cost of production of Green Hydrogen per ton. Many specialists believe that, in a base case scenario, the cost of renewable hydrogen could drop to $2/ton in 2030 becoming competitive with hydrogen from fossil fuels. In this scenario, we diminish the expectations of this price drop and assume that the cost won't be falling at such a fast pace. We do this because there is a chance that the predicted economies of scale regarding electrolysers might not materialize, with costs not decreasing as expected. Also, prices of energy from renewable sources such as solar and wind may not have such a steep decrease as expected in the Base case. This assumption is translated into a rise on overall COGS.

Exhibit 36: *Sensitivity Analysis on Bear Case Target Share Price*

		Change in Gross Profit				
	6,27	-3,00%	-4,00%	-5,00%	-6,00%	-7,00%
Change in Core IC	10,00%	7,94	7,10	6,27	5,43	4,59
	8,00%	8,29	7,45	6,61	5,78	4,94
	6,00%	8,64	7,80	6,96	6,12	5,29
	4,00%	8,99	8,15	7,31	6,47	5,63
	2,00%	9,33	8,50	7,66	6,82	5,98

Source: Analysts estimates

Secondly, there is a chance that Green H2 might not have the expected pivotal role towards Net-Zero. As of now, there are huge expectations regarding renewable hydrogen being in the front line of a sustainable world, but there is still a long way to go until Green H2 becomes 100% reliable and cost-efficient. In the Bear Case we explore the possibility of Green H2 failing to lead the way, with Energy Batteries remaining as the clients' favourites and overshadowing the growth of our source of energy. This way, the demand for Plug's products would see a strong decrease, with revenues going the same way.

Exhibit 37: *Sensitivity Analysis on Bear Case Capital Gain*

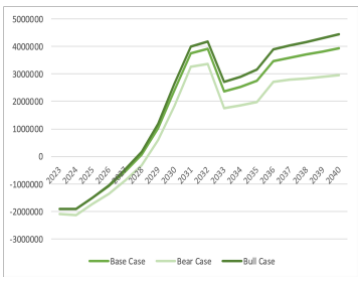
		Change in Gross Profit				
	-33,42%	-3,00%	-4,00%	-5,00%	-6,00%	-7,00%
Change in Core IC	10,00%	-30,00%	-38,89%	-47,78%	-56,67%	-65,56%
	8,00%	-26,07%	-34,96%	-43,85%	-52,74%	-61,63%
	6,00%	-22,13%	-31,02%	-39,91%	-48,80%	-57,69%
	4,00%	-18,20%	-27,09%	-35,98%	-44,87%	-53,76%
	2,00%	-14,26%	-23,15%	-32,04%	-40,93%	-49,82%

Source: Analysts estimates

The first and second assumptions together converge into decreasing Gross Margins for Plug Power.

The third and fourth assumptions are related to the on-going raw materials crisis that arise from the Covid-19 pandemic and got worse with the War on Ukraine. As Plug is pursuing a massive building project of new hydrogen plants, this crisis could mean delays on construction and higher needs for investment to conclude the project, and so the third assumption is an increase of PPE investment. Not only that, but the raw material crisis also affects Plug's product production, with longer supplier lead times than expected and the possibility of not being able to meet demand and not reducing pressure on Plug's inventories. This way, the fourth assumption is a stable pressure on Plug's inventories with constant Average Holding Periods (instead of decreasing).

Exhibit 38: *Scenarios FCF Evolution*



Source: Analysts estimates

The last two assumptions mean an increase on Total Core Invested Capital.

When applying the previous assumptions to the Base case scenario, we ended up with the Bear Case scenario with a -5% change on Gross Profit and a 10% increase on Change in Core Invested Capital. The final Target Share Price was $6.27, which is a Capital Loss of -33.42%. To conclude, we performed a sensitivity analysis on the Bear Case (**Exhibits 36 and 37**) with different percentual changes of Gross Profit and Core Invested Capital, with the average value for the Share Price settling at $6.96 per share, meaning a -39.91% Capital Loss.

- Bull Case

Exhibit 39: *Bull Case Scenario*

Core Result 2041	5696117,1
Unlevered Value of Annuity	32871397
Levered Value of Annuity	3058065
Core Result 2051	7580784
Terminal Value perpetuity	56319235
PV perpetuity	1400558
Enterprise Value	**9938758**
Net Financial Assets	-1283389
Equity Vlaue	**8655369**
# Shares Outstanding	593,39
Target Share Price	**14,59**
Current Share Price	9,41
Capital Gain	55,01%

Source: Analysts estimates

Since we consider our Base case to already have some pretty good assumptions behind it, our Bull Case won't have as many differences from the Base as our Bear Case. In fact, we ran our Bull Case with just one difference that impacts the final results a lot, a change in Corporate Tax Rate.

As the United States presidential elections are around the corner (November 5th, 2024), the former president Donald Trump is one of the runners for the Republican Party and the favourite to go head-to-head against Joe Biden[30]. In the event of the Republican Party winning the next elections and Donald Trump becoming the next U.S. President, it is likely that Trump will decrease the corporate tax rate from the 28% imposed by Biden, to the previous 21% in the start of his mandate on January 20th, 2025. This would come in line with the last time Donald Trump was president, where the corporate tax rate was cut down from 35% to 21% by the Tax Cuts and Job Acts of 2017.[31]

In this Bull Case, the corporate tax rate was established at 21% from 2025 onwards, achieving a final Target Share Price of $14.59 and a Capital Gain of 55.01%, reinforcing the BUY recommendation (**Exhibit 39**).

[30] (https://www.nytimes.com/interactive/2023/us/politics/presidential-candidates-2024.html s.d.)
[31] (https://www.investopedia.com/taxes/trumps-tax-reform-plan-explained/ s.d.)

PLUG POWER, INC.

COMPANY REPORT

INDUSTRIAL MACHINERY

17 MAY 2023

DIOGO OSÓRIO & MANUEL FERNANDES 39363@novasbe.pt / 48344@novasbe.pt

Don't Pull the Plug just yet!

Plug into sustainable profitability

- Plug Power is yet to find profitability from its operations, and for that the company will rely on three value driver pillars: (i.) Government incentives such as the Inflation Reduction Act, (ii.) economies of scale of physical products, and (iii.) scaling of its Green Hydrogen Network.
- Joe Biden's administration has approved a clean hydrogen Post Tax Credit of up to $3/kg of green hydrogen produced that the company will take advantage of in the next 10 years, allowing Plug to achieve profitability in 2024.
- Plug Power's main source of revenue for the last years has been GenDrive, a Fuel Cell for material handling vehicles. Due to economies of scale, electrolysers' costs will diminish, and coupled with the rising demand for green hydrogen production and decarbonizing industries, it will become the new main source of income.
- The company already has an expansion plan in progress, with several hydrogen plants under construction and close to starting production, and with several other plant locations being studied. The current projects' pipeline will lead to an increased electrolyser capacity and tons of green hydrogen produced, growing at a CAGR of c.115% by 2028.
- We initiate Plug Power's coverage with a BUY recommendation, issuing a Target Share Price of $12.29, implying an investor return of 30.62%. We derive these values using a DCF valuation with a WACC of 14.10% and a perpetuity growth rate of 2%.

Company description

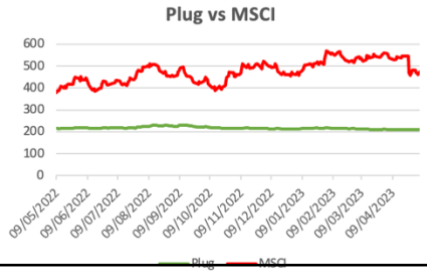
Plug Power in an American-based company that provides green hydrogen turnkey solutions, operating in 4 distinguished segments: hydrogen fuel, fuel cells for transport, fuel cells for stationary power and electrolysers. It is present in the U.S., EMEA and APAC regions, and is aiming to become leader in this emerging market of renewable hydrogen.

Recommendation:	**BUY**
Total Shareholder Return	*30.62%*
Price Target FY23:	**12.29 $**
Price (as of 08-May-23)	**9.41 $**

Reuters: PLUG.OQ, Bloomberg: PLUG:US

52-week range ($)	7.43-31.56
Market Cap ($m)	4702.10
Outstanding Shares (m)	593.39

Source: Bloomberg



Source:Bloomberg; Note: Plug Stock rebased at 200

(Values in $ millions)	2021	2022E	2023F
Revenues	502.3	701.4	1634.2
EBITDA	-413.9	-627.9	-354.9
Net Profit	-171.3	-194.3	-194.3
EPS	-0.82	-1.25	-0.21

Source: Company Data and Analyst Estimates

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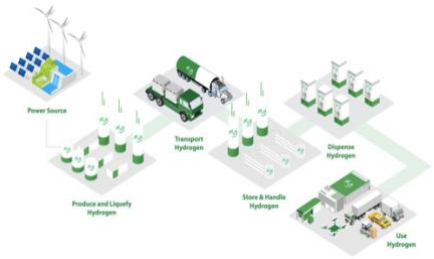
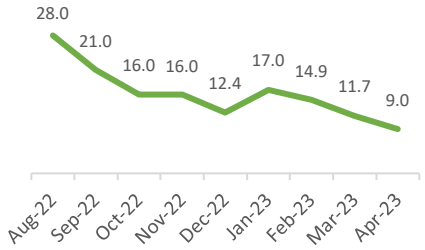
Company Overview

Exhibit 1: *Green Hydrogen Ecosystem*



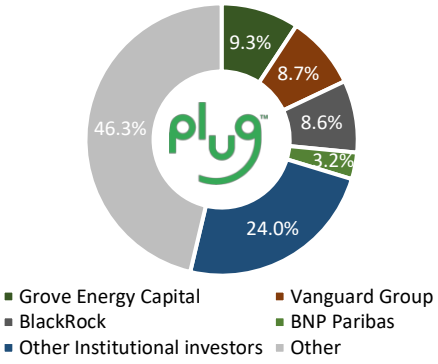
Source: Company data

Exhibit 2: *Stock Performance*



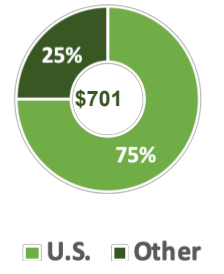
Source: Nasdaq

Exhibit 3: *Shareholder Structure*



Source: Bloomberg

Exhibit 4: *Revenue Breakdown 2022*



Source: Company data

Plug Power (Plug) was born in 1997 with the objective of becoming a pioneer in the energy transition through an end-to-end green hydrogen (H2) ecosystem **(Exhibit 1)**. This ecosystem includes the production of green H2 trough zero-emission processes, its transportation and distribution, storage and handling, and finally its dispensing in fuelling stations for final applications that use fuel cells[1] (FCs) systems. Leading through a fully integrated approach is believed to be the most viable way for a global adoption of green H2. This way, Plug has been able to attain long-term partnerships and customers, to whom it offers solutions in fuel cell systems and the green hydrogen itself. Throughout the last 25 years, Plug has continuously improved its products and services through continuous learning and major strategic acquisitions that allowed an efficient expansion to the different sectors of the ecosystem, and thus providing a crucial role in the decarbonization of the economy. The company first started producing fuel cells for the material handling industry and for backup power solutions. The achieved performance success in the technology expanded the focus to the whole spectrum of e-mobility, power generation and industrial applications. However, financial success hasn't been attained yet since the company has yet to achieve profitability given the nature of the cost structure of such new industry.

Over the last year, Plug's share price dropped more than 65% **(Exhibit 2)** as investors beliefs about the industry's rollout and Plug's part in it have been continuously questioned. This could be due to Plug's ongoing missing targets and promises, which coupled with rising interest rates hindering the required heavy infrastructure investment plans for the industry, have hampered the markets sentiment on the company's viability going forward. As of April 2023, more than 50% of shares are owned by institutional investors **(Exhibit 3)**, with Grove Energy Capital at the top with c.9% ownership, followed by Vanguard and BlackRock with more than 8% each.

Headquartered in Latham, New York, Plug Power's geographic footprint **(Exhibit 4)** currently corresponds mainly to North America, followed by Europe, but with strong plans to expand at a global scale through strategic partnerships.

[1] FCs are electrochemical devices that convert the energy stored in fuels, such as H2, directly into electrical energy

Products and Services

Plug has a variety of products and services available for their clients **(Exhibit 5)**. First of we have GenDrive, the Fuel Cell (FC) product designed specifically for material handling vehicles, from forklifts to AGVs and tuggers. This has been Plug's main sold product for the past years. GenDrive FCEVs have more than 1 billion operating hours globally and more than 70,000 FCs have been deployed **(Exhibit 6)**.

Next, we have the ProGen fuel cell engines designed for e-mobility, providing solutions to all the components of the logistics chains, meaning it is oriented for commercial vehicles rather than passenger ones.

Thirdly, there's Plug's hydrogen FC backup power solution, GenSure. This product provides energy to a facility when grid power is temporarily out of service, unreliable or non-existing at the site. GenSure clients go from Data Centers to telecommunication companies.

Fourthly, GenFuel is the common factor on all previous products. The engines require hydrogen and oxygen to run and when the two components come together, they produce water and energy. This chemical reaction **(Exhibit 7)** occurs in the proton-exchange membrane (PEM) and while we can find the O2 (oxygen) in the air, the H2 needed is fully provided by Plug to their customers. Not only that but plug also assures the construction and maintenance for all the related equipment required to store and dispense hydrogen **(Exhibit 9)**.

Next, we have Plug's PEM Electrolyser. This Electrolyser is used to produce green hydrogen in a cleaner and safer way. The water electrolysis[2] process uses electricity from renewable sources to split water into H2 and O2 **(Exhibit 8)**. The last physical product corresponds to the Cryo Liquifiers. H2 liquefaction is crucial for its storage, transportation and dispense.

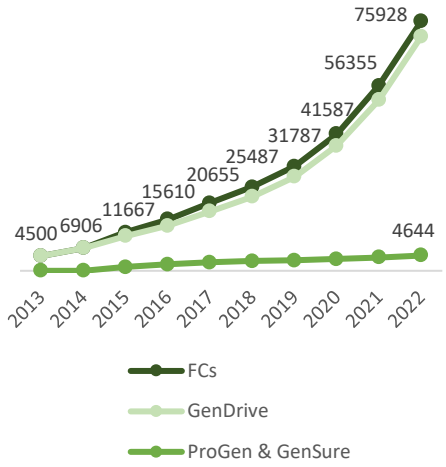
In relation to services, GenCare is an aftermarket continuous maintenance program that provides ongoing technical support, training and intelligent data tracking and recording tools. Plug's final service, GenKey, is a package that links together all solutions for a smooth implementation. This way, Plug's offerings complete their turnkey hydrogen solution, meaning that they have presence in all the value chain of hydrogen: production, liquefaction, and distribution for dispensers and final applications for end-users.

Exhibit 5: *Products and Services offered*

Products/Services	Purpose	% total sales 2022
GenDrive	Material Handling Vehicles	50,03%
ProGen	e-mobility	0,41%
GenSure	Backup power solution	1,62%
GenFuel	Fuel	8,15%
PEM Electrolysers	Produce Green Hydrogen	3,38%
GenCare	Maintenance Service	5,03%
GenKey	Turnkey Hydrogen solution	6,73%
Cryo Liquefiers	H2 Liquefaction	3,21%
H2 Infrastructure	H2 Related equipment	21,0%
Other		0,41%

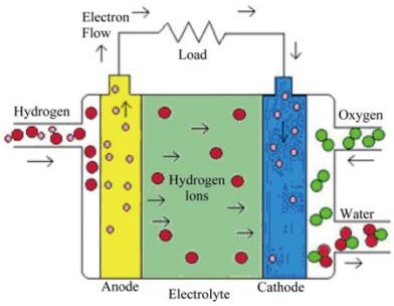
Source: Company info

Exhibit 6: *Cumulative FCs deployments*



Source: Company data

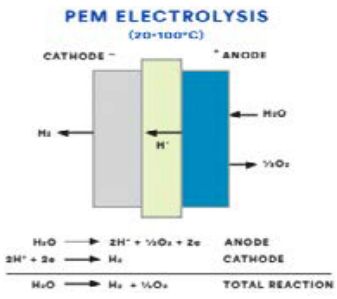
Exhibit 7: *PEM Fuel Cells illustration*



Source: Research Gate

PEM electrolysis is essentially the FC's PEM opposite chemical reaction

Exhibit 8: *PEM Water electrolysis*

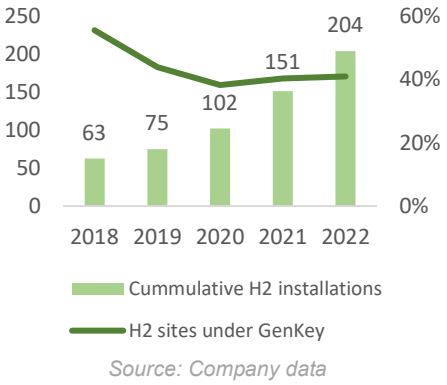


Source: Company info

[2] In the anode, water is oxidized into O2 and H2 protons that reach the cathode trough the PEM, where they are reduced to H2 gas

Long Term Partnerships

Exhibit 9: *H2 sites installations*



Source: Company data

Exhibit 10: Plug Power's main customers

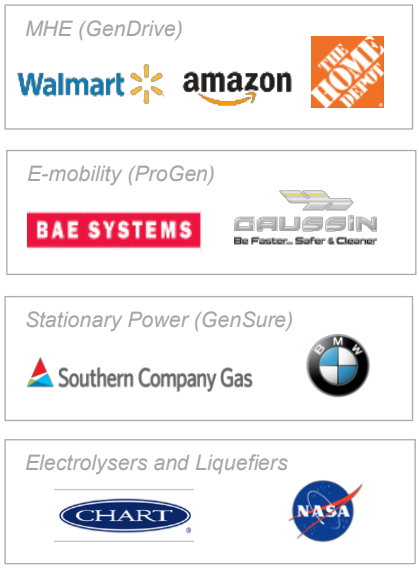


Exhibit 11: Joint Ventures aiming for market expansion

Plug relies heavily on long-term partnerships to foster sustainable growth, whether with customer contracts, partners through joint ventures or acquisitions.

Plug serves a wide range of customers **(Exhibit 10)**, but has some anchor ones, being Amazon the largest. In 2021, Amazon single handily accounted for 40.8% of Plug's total consolidated revenues, while other 34.9% were primarily associated with two other customers, Walmart and Southern Company Gas, amounting to a total of 75.7% in just 3 customers. There are recurring clients amongst the different products/services offered and this reinforces the importance of Plug's fully integrated business model as positive contamination occurs when MHE and e-mobility customers also opt for GenSure FCs to power their facilities. A rise in FCs orders comes in hand with GenFuel and related equipment and services (GenCare and GenKey), and, on the other end, an increase in the demand for Plug's electrolysers will result in an increase of green H2 cryo liquefiers.

Joint Ventures (JV) **(Exhibit 11)** is one of Plug's most used ways to expand their activity, either into new market segments or geographies. HyVia is their 50/50 JV with Renault. The initial plan for HyVia is to produce and sell FC powered electric light commercial vehicles ("FCELCV's") in Europe and support those vehicle's market by supplying hydrogen fuel and fuelling stations. Next, Plug has another 50/50 JV with Spain's largest renewable energy retailer (c.11GW installed capacity) Acciona, called AccionaPlug. The main objective is to develop green hydrogen projects in Iberia. In the first quarter of 2022, Plug announced a JV with SK E&S, named HALO Hydrogen that seeks to accelerate the usage of green hydrogen in Asian markets. This deal also included a $1.6B investment from SK into Plug. More recently, Plug revealed a JV with chemicals company Olin to build a 15 tons per day (TPD) hydrogen plant in Louisiana. Although not a JV, Plug also enrolled in a partnership with New Fortress Energy for a 120MW facility in Texas with the objective to provide clean H2 for industrial applications. This year, the latest announced long-term partnership was with Johnson Matthey, a supplier of precious metals used in catalysts and membranes, which are components of electrolysers and FCs. This strategic partner arises from the need to fix and prevent supply chain issues that were faced in 2022.

Lastly, the company improved their know-how and presence on the green H2 value chain majorly through strategic acquisitions **(Exhibit 12)**. Plug managed to properly establish itself in the material handling market in 2007 after acquiring General Hydrogen, a developer and manufacturer of FC systems specifically for

Exhibit 12: Acquisitions allowed vertical integration

Exhibit 13: *Share price evolution with partnerships*

Year	Acquisition	JV	Share Price	% Change
2007	General Hydrogen		$ 39,50	
2008			$ 10,20	-74%
2009			$ 7,10	-30%
2010			$ 3,70	-48%
2011			$ 2,04	-45%
2012			$ 0,50	-75%
2013			$ 1,55	210%
2014	ReliOn		$ 3,00	94%
2015			$ 2,11	-30%
2016			$ 1,20	-43%
2017			$ 2,36	97%
2018	American Fuel Cell		$ 1,24	-47%
2019	EnergyOr		$ 3,16	155%
2020	United Hydrogen Group and Giner ELX		$ 33,91	973%
2021	Frames and Applied Cryo Technologies	HyVia and Acciona Plug	$ 28,23	-17%
2022	Joule Processing	Halo Hydrogen and Olin	$ 12,37	-56%
2023		Johnson Matthey	$ 9,00	-27%

Source: Yahoo Finance

MHE. In 2014, Plug acquired ReliOn, a FC stack developer, and this technology would later become Plug Power's GenSure products. In 2018, the company acquired American Fuel Cell, a leading developer of Membrane Electrode Assembly[3] (MEA) technology, moving one step closer to the on-road segment. EnergyOr was acquired in 2019, previously a leader in advanced lightweight and compact PEM hydrogen fuel cells now present on today's portfolio of ProGen FCs. In 2020, Plug acquired United Hydrogen Group, a provider of liquid H2 and related infrastructure, thus reinforcing GenFuel capabilities. In that same year, Giner ELX, a developer of PEM electrolyser technology was acquired. Plug's electrolyzers would be developed into larger scale systems after the Frames acquisition in 2021. Frames also had supply chain capacity in Southeast Asia, thus bringing extra cost advantages. Also in 2021, Applied Cryo Technologies was purchased. This way, by entering in the cryo liquefier business, its internal tankers gained capacity and their costs reduced by 50%. Latest acquisition was last year, Joule Processing, which has expertise in the midstream and downstream hydrogen markets, enabling Plug to enhance its capabilities in these areas and reduce logistics costs.

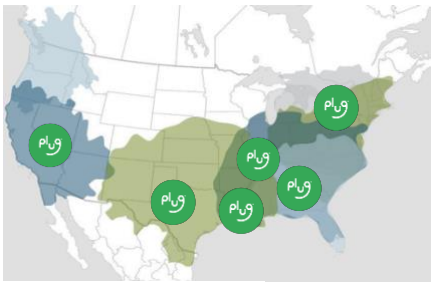
The various acquisitions and JV's allowed Plug to expand its presence geographically by entering the EMEA and APAC markets, while also vertically integrating their products and services portfolio with new acquired technology and expertise. We can see that, more often than not, the share price of Plug has fallen with new partnerships, but on the other hand the gains in years with new partnerships are much more expressive that the losses **(Exhibit 13)**. The highest growth in share price in years with new partnerships was 973%, compared to the biggest loss which was -56%, meaning that these strategic partnerships are more beneficial when the company is doing well than harmful when the company is underperforming.

We consider Plug's partnerships to be of high value to the company since the buy-and-build approach in recent years has enabled the company to continuously expand its integrated product offering as well as its manufacturing capacity and logistics capabilities, crucial to scale up production and drive down the company's cost structure. We don't consider the fall in share price to be related to the acquisitions and JVs, but rather other factors such as continuous overestimation of results and capacity targets.

To conclude, we believe that Plug will continue with this trend in the near future. Plug's growth plan is already in progress, and it is moving very fast, so the only

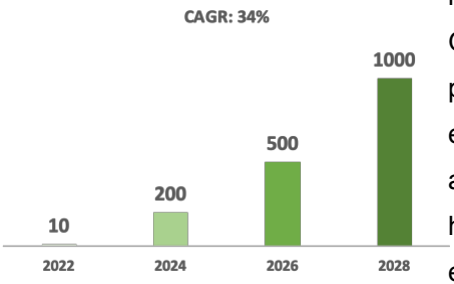
[3] Core component of FCs and electrolysers that contains the PEM that connects both anode and cathode catalyst layers

Exhibit 14: *US Green H2 Network*



Source: Company data

Exhibit 15: *Plug's Green H2 production capacity outlook (in TPD)*



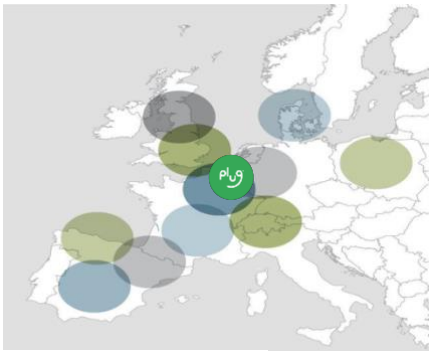
Source: Company data

Exhibit 16: *New Main Plants' Status*

Plant Location	Initial Capacity	Starts Production
Tenessee	10TPD	Already started
Georgia	15TPD	Q2 2023
Louisiana	15TPD	Q3 2023
New York	60TPD	1H 2024
Texas	45TPD	1H 2024
Other Projects	60+TPD	
Total	200+TPD	

Source: Company data

Exhibit 17: *EU Green H2 Network*



Source: Company data

way to keep up with its pace is to bring already existing value through partnerships rather than creating it from scratch.

Green H2 Plant Network

Plug Power has a green H2 production plant in Tennessee producing 10 tons per day (TPD) since 2021 with current expansion works to add 5TPD by the end of 2023. Naturally, this is just the tip of the iceberg since the company is currently developing a network of manufacturing plants **(Exhibit 14)** to reach 500TPD in the US by 2026 and 1,000TPD globally by 2028 **(Exhibit 15)**. This will be a crucial step moving forward by driving down its cost structure since Plug can use it for internal consumption and to gradually decrease its outsourced green H2 for GenFuel to meet the rising demand for its FC products. The Ukraine War has pushed the prices of natural gas to skyrocketing values across the globe, especially in EMEA, with the prices on Grey Hydrogen following the same path and reaching a cost of $6,71/kg in 2022[4]. Since Plug doesn't yet produce enough hydrogen to match its demand, the missing part is outsourced from renewable energy companies but also from industrial gas companies. This way, the company is purchasing hydrogen at a higher price than the $4/kg present cost of producing in-house[5].

In the U.S. they are developing 4 new main plants **(Exhibit 16)**, aiming at a total of 200TPD by the end of 2023. All plants have the capacity to ramp-up to achieve its long-term scaling goals. Firstly, a 15TPD liquid plant in Georgia will start production in Q2 of 2023. A Louisiana site originated by the Olin JV (Hidrogenii) will also account for 15TPD, starting in Q3 of 2023. The venture includes plans to expand sites into other locations. In the first half of 2024, both New York and Texas plants will begin full production with capacities of 60TPD and 45TPD, respectively.

In Europe **(Exhibit 17)**, the current projects aim for more than 100TPD by 2026. Plug is focusing on Nordic countries and the Southwestern region where there is great wind and solar power potential, respectively, both crucial renewable inputs to produce clean H2. The collaboration with Acciona is developing its first plant in Navarra with a 25MW electrolyser capacity to produce 10+TPD of green H2 suited for the local industries (e.g., paper and steel), starting in the second half of 2024. The site will be adjacent to a biomass plant and will be powered by a PV

[4] (https://www.rechargenews.com/energy-transition/ukraine-war-green-hydrogen-now-cheaper-than-grey-in-europe-middle-east-and-china-bnef/2-1-1180320 s.d.)
[5] Plug Power's Presentation (https://s29.q4cdn.com/600973483/files/doc_presentations/2023/plug_irdeck2023_020323_f.pdf s.d.)

plant and a wind farm totalling 50MW of renewable sources. Plug is also building a 35TPD liquid H2 plant with 100MW of electrolysers in the Port of Antwerp in Belgium, a strategic location considered to be a green energy gateway to Europe. The 30-year concession agreement is set to start production in the end of 2024.

In addition to the green H2 production network, Plug Power counts with several manufacturing facilities for the remaining of its product portfolio. Next to its headquarters in Latham, NY, the company produces FCs for its MHE, e-mobility and stationary applications, as well as the related H2 fuelling stations. Plug's electrolysers and liquefiers are manufactured in Spokane Washington, and in Houston. To meet global demand, Plug launched a Gigafactory in Rochester, NY, in 2022 and announced the construction of the VISTA FC manufacturing facility in Slingerlands, NY. The Rochester Gigafactory is focused on the ramping-up of electrolyser capacity towards 1.5GW, adding to an annual total output of 2.5GW. The factory is also an Innovation Center for new products, improved technology and boosting automation and efficiency. The Gigafactory also has the capacity to manufacture more than 2M Bi-polar plates and 7M+ MEAs (FC membranes) p.a. leading to the production of c.60,000 FC stacks ranging 5kW-120kW annually. As for the VISTA Technology Park, it will be more centred on the production of GenDrive, GenSure and ProGen fuel cells, as well as the GenFuel H2 installation infrastructure such as liquid storage tanks, cryopumps and compressors. The 500,000 sq. ft. facility is expected to be ready in the end of 2023 with the possibility to double its size given the rising global demand for its FC products, as the industry keeps on unfolding.

In conclusion, Plug is pursuing a massive growth project that requires building several hydrogen plants and manufacturing facilities to keep up with the increasing demand for their products and services. For all the projects currently being developed, the initial investments have already been done, but the company will still require considerable amounts of Capital Expenditures and, since Plug is still yet to find profitability from its operations, large amounts of external financing as well, whether through public and private offerings such as in previous years, whether through Debt. As the projects start to operate, more money generated through operations will ease the pressure from external financing, with the first projects helping the latter ones to become financially viable.

Competitive Advantages

Plug's early start into the green hydrogen ecosystem has positioned itself as a pioneer, exposed to advantages in the form of early expansion to global markets capturing a higher market share through long-term contracts with big corporations and partnerships, as previously stated. First mover advantages also include the regulatory efforts and public policies' benefits (e.g. Inflation Reduction Act) that aim to boost the early-stage green hydrogen industry into a main component of the global energy transition.

Exhibit 18: *FCEVs and BEVs Comparison*

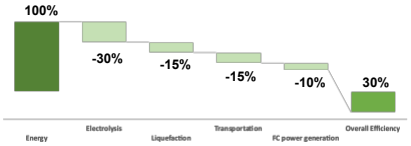
	Hydrogen FCEVs	Battery EVs
Zero carbon-emissions	Yes	Yes
Energy Density	High	Low
Weight	Light	Heavy
Recharging time	3-5 minutes	Hours
Energy Efficiency	30%	75%

Source: Lexology

BEVs have diminishing power and take hours to recharge

Plug's PEM fuel cells are used in material handling equipment (MHE), stationary power and e-mobility. PEM FCs take as inputs H2 and O2, and by separating the electrons and protons trough a circuit produces electricity as the main output and heat and water vapor as the only "wasted" by-products. This type of FCs average c.40% efficiency whereas combustion engines only average 20-35%. When comparing FCEVs and the standard Battery EVs (BEVs) **(Exhibit 18)**, both options contribute with zero-carbon emissions. Plug's products have higher energy density than its battery competitor, meaning that for same energy levels, FCs weight less, thus having a production cost benefit. FCs have charging times similar to diesel of just a few minutes, while battery options usually take several hours. The main drawback for FCs lies on its energy efficiency of only 30% from the time electricity is converted to hydrogen until propulsion. BEVs have the upper hand in here with a considerable 75% efficiency[6] **(Exhibit 19)**. This comparison was made in an unbiased way, with the values and analysis coming from external analysts and not from Hydrogen FCVs nor Battery EVs producers[7]. Another upside for FCs is the H2 global abundance in comparison to the lithium component present in batteries, a natural resource that in the long run will eventually be on the decline. In addition, a better performance under adverse temperatures is obtained under FCs. ProGen FCs have the ability to be retrofitted into existing EVs without the need for new vehicle designs. All in all, a higher product life and lower required maintenance has proved a higher productivity outlook for e-mobility and material handling. In fact, FreezPak, a frozen food player, has claimed to save not only time and space in its warehouses, but also c.32% in electricity since its partnership with Plug in 2014. Regarding backup power, several partners including AT&T and Southern Linc have reported an increase in efficiency from GenSure (vs. diesel and battery) translated into a greater runtime, less frequent maintenance, and thus cost savings through lower

Exhibit 19: *FCEVs efficiency rate waterfall*



Source: Volkswagen Group

[6] Volkswagen Group. "Hydrogen or Battery?". https://www.volkswagenag.com/en/news/stories/2019/08/hydrogen-or-battery--that-is-the-question.html

[7] (https://www.lexology.com/library/detail.aspx?g=1bf1cbf0-ac2f-4b39-a3de-2df77a9a515e s.d.)

costs of ownership. They also have a third-party proven reliability of c.99.6%, 11% more than diesel generators[8].

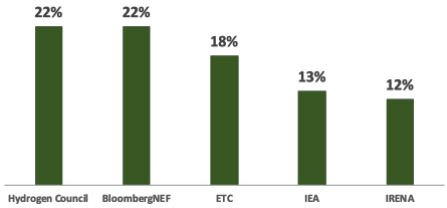
On the other hand, FC generators have higher efficiency than diesel generators

Plug's fully integrated approach is also considered unique among competitors since it offers tailored turnkey solutions in all fronts of the ecosystem and not just parts of it. Tailored infrastructure can be seen throughout all products offering and its positive impact is mainly felt on Plug's PEM electrolysers, where clients' needs are constantly taken into consideration depending on the end usage of the electrolyzed hydrogen, whether it is for refineries decarbonization, ammonia production, fuelling stations or heating for example. This specialized approach reinforces Plug's differentiation and effectiveness in not only its products but services as well. The latter, which includes the "one-stop shopping" turnkey implementation service GenKey and the ongoing aftermarket GenCare monitoring, has been responsible to leverage future long-term customer relationships, a crucial driver for sustainable growth.

Key management:
Andrew Marsh, CEO
Paul Middleton, CFO
Tim Cortes, CTO
Sanjay Shrestha, CSO

Early on strategic acquisitions and partnerships have enabled Plug's specialization in each of the segments it has entered and allowed continuous learning and improvements in order to scale and drive costs down.

Exhibit 20: *Forecast of hydrogen demand as the share of total energy worldwide in 2050, by different international agencies, in accordance with the Net Zero assumption*



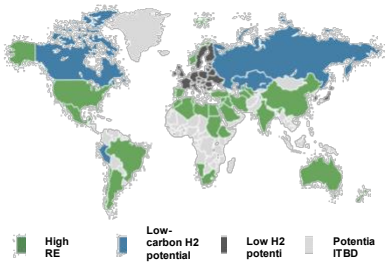
Source: Statista, IRENA

It is safe to conclude that one of Plug Power's major assets is its management team vision, decision making and their engineering talent. Their efforts have played a pivotal role both in the spreading of education regarding green H2 adoption and in the actual performance of Plug's products. For example, HYVIA's H2TECH Van went from being a prototype to going into production in just 1 year. One example of expert decision-making lies in the location of green H2 production sites being next to renewable energy sources sites to solve transportation logistics costs.

Global H2 demand can grow to 145Mt by 2030 and 660Mt by 2050, from the current 90Mt

Industry Overview

Exhibit 21: *Worldwide clean H2*



Source: Hydrogen Strategy for

Starting by the Net Zero Assumption, the increase of global temperature must be capped to 1.5ºC above pre-industrial levels to prevent the worst impacts of climate change and to preserve the planet. To do so, carbon emissions need to be reduced by 45% till 2030 and reach net zero by 2050 as stated in the Paris Agreement.[9]

Under the Net Zero assumption, and supported by Goldman Sachs studies[10], the green hydrogen market share in global energy could be between 20% and 25%

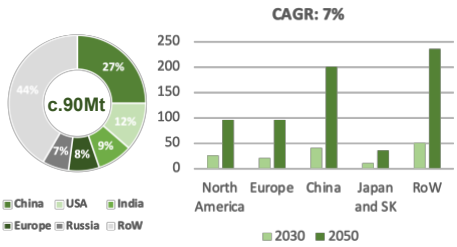
[8] https://www.plugpower.com/faq-from-potential-gensure-fuel-cell-customers/
[9] (https://www.un.org/en/climatechange/net-zero-coalition s.d.)
[10] Goldman Sachs (2022). Carbonomics - The clean Hydrogen Revolution

Green H2 share of global H2 can surpass 15% by 2030 and 50% by 2050, from today's 1%.

by 2050, which translates into a targetable addressable market (TAM) of c. $10T. Plug Power is exposed to this market through its whole ecosystem: the molecule per se (H2), the production element (electrolysers) and the applications (FCs).

Green Hydrogen Sector

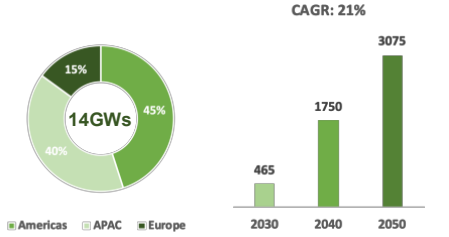
Exhibit 22: *Current global breakdown of H2 consumption and forecasted demand (in Mt)*



Source: IRENA, Hydrogen Council, McKinsey

The IEA states that the global molecule consumption in itself represents a $2.5T opportunity by 2050, with the remaining TAM belonging to the associated infrastructure and technology required to produce, transport, and use green H2. The global rising demand for H2 could translate into an eightfold increase by 2050 **(Exhibit 22)**. In the US, for example, demand could grow to 17MMt by 2030, driven largely by the transportation and industrial sectors, with green H2 accounting for a significant portion to reduce greenhouse gas emissions and meet climate targets. By 2050, the average global price of green H2 could fall by up to 75% due to decreasing costs of renewable sources of energy and electrolysers. In 2021, the cost of electricity from Solar PV dropped by 13%, from onshore wind 15% and from offshore wind by 13%[11], with this trend not showing signs of slowing down with several renewable projects on the pipeline. Regarding electrolysers **(Exhibit 23)**, their costs have fell 40% in the US and Europe between 2014 and 2019[12]. The EU has an ambitious plan of reaching 40 GW of electrolyser capacity and 10Mt produced p.a.[13] and plans to invest between €180-470B in clean energy technologies by 2050[14]. By 2040, the Asia-Pacific (APAC) region is expected to account for 40% of global green H2 demand. China will play a crucial role, targeting 1Mt of green H2 production by 2025 and 5Mt by 2030, resulting in a clean H2 share of 13% out of total H2 production, accompanied by 1 million FCEVs on the road[15]. Australia will also be a key player given its abundance of wind and solar sources and targeting $2/kg price target for green H2 production by 2030.

Exhibit 23: *Current global breakdown of electrolyser production capacity and forecasted capacity (in GWs)*

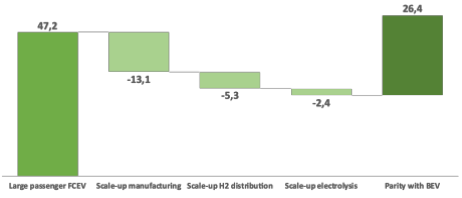


Source: BloombergNEF, DNV

▪ Challenges

The green H2 market current headwinds fall majorly on its high production costs. The average cost of production from Variable Renewable Energy plants can be at least double the grey hydrogen cost. This naturally passes onto end-users, making its adoption harder given current cheaper alternatives **(Exhibit 24)**. FCEVs and H2 tanks are up to 2 times more expensive than fossil-fuel based

Exhibit 24: *Cost of ownership path to parity with BEVs: the case of large passenger FCEVs (in cents/km)*



Source: Hydrogen Council

600k annual production volumes, 2.5x larger H2 refuelling stations and 50 GW electrolysis deployed will enable cost parity with BEVs

[11] (https://unfccc.int/news/renewable-power-remains-cost-competitive-amid-fossil-fuel-crisis s.d.)
[12] BloombergNEF – Hydrogen Economy Outlook – March 30, 2020
[13] IRENA – Innovation trends in electrolysers for hydrogen production
[14] (https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_1257 s.d.)
[15] (https://www.csis.org/analysis/chinas-hydrogen-industrial-strategy s.d.)

substitutes and H2-based fuels for aviation are up to 8 times the cost of fossil jet fuels. Green H2 distribution is affected by the lack of infrastructure. While there are more than 3.5 million km of natural gas transmission pipelines worldwide, there is only 8,000km of pipeline for green H2, mostly centred in the US, Germany, Netherlands, Japan, and South Korea[16]. The worldwide number of H2 refuelling stations is less than 1,000 compared to more than 200,000 petrol and diesel stations in the US and EU alone. Another barrier corresponds to the energy losses throughout the value chain. The overall average renewable energy input loss throughout the full cycle of production and use is said to be c.62%[17]. Lastly, there is also the need to ensure sustainability in its green impact. In fact, often, electrolysers connected to renewable sources are also grid-connected for higher effectiveness purposes, resulting in CO2 emissions. Plug Power, by building a whole zero-emission ecosystem with cost-effective solutions, is working on educating on the implementation and adoption of green H2.

Exhibit 25: *Hydrogen spectrum (cost is relative to the US)*

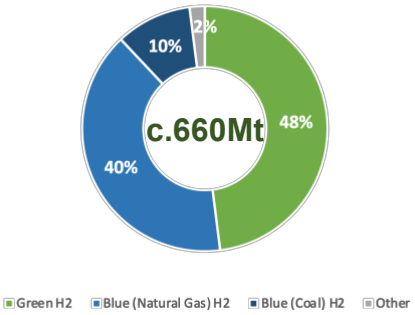
Hydrogen Spectre	Cost $/Kg	Sources	CO2 Emissions
Green	4	Wind and Solar	Null
Grey	2	Natural Gas	High
Blue	4	Natural Gas with CCS facility	Low
Brown	1	Coal gasification	High
Turquoise	Not enough data	Methane pyrolysis	Null/Almost Null
Pink	Not sold yet	Nuclear Power	Low

Source: IRENA

- Alternatives

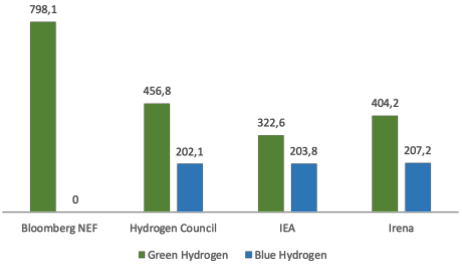
Besides green, H2 can take different colours depending on its sources and production process. The fossil-fuel based grey H2 is mainly obtained from reformation of methane, present in natural gas (NG), resulting in substantial CO2 emissions. With similar downsides, brown H2 is obtained from coal gasification, with both currently accounting for c.80% of global H2 production. Blue H2 follows the same method as grey but with a costly Carbon Capture and Storage (CCS) facility with potential to reduce emissions by up to 90%, still not enough for a Net-Zero transition, but rather a short-term solution. Turquoise H2 is still in its pilot stage, in which the carbon in methane becomes solid through a pyrolysis process, resulting in null or almost null CO2 emissions. Although costly, the process leads to a by-product market for the solid carbon black which can offset costs of production, thus being a promising up and coming technology. Pink H2 is produced using nuclear power as the heat source for steam electrolysis, a process that suggests a low-carbon impact. When comparing thoroughly all the previous described types of hydrogen **(Exhibit 25)**, grey and brown hydrogen are not sustainable options for a world that is aiming to become Net Zero in the future. Even with lower costs, the massive carbon emissions of the two will lead to lower demand. Regarding blue hydrogen, even though its carbon emissions are very low, the CCS facility costs are considerable. Pink and Turquoise hydrogens are still on early phases of development, with the former facing accident risks and high capital costs to nuclear power plants that already delays

Exhibit 26: *Forecasted breakdown of H2 production in 2050, by technology*



Source: Statista, GECF

Exhibit 27: *Projected Green and Blue Hydrogen production worldwide in 2050 (in Mt)*



Source: Statista, GECF

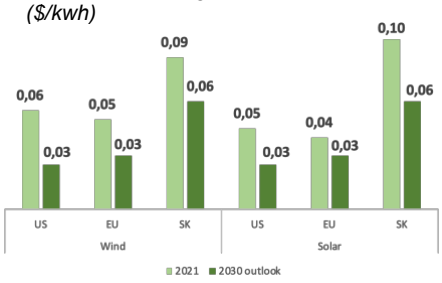
[16] IRENA (2021) – Making the Breakthrough: Green Hydrogen Policies and Technology Costs
[17] (https://www.lexology.com/library/detail.aspx?g=1bf1cbf0-ac2f-4b39-a3de-2df77a9a515e s.d.)

its competitiveness. On the other hand, green H2 benefits from a proving technology and a potentially positive outlook for its costs' evolution.

- Cost Structure Outlook

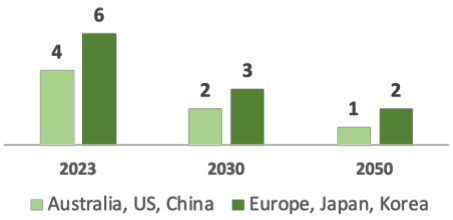
Starting with hydrogen production, the decreasing costs trend from renewable sources inputs such as wind and solar will continue as their underlying technology and adoption keep on making advancements **(Exhibit 28 and 29)**. Innovation in electrolyser technology will be key in increasing its renewable energy (RE) usage efficiency. The stacks[18] are predicted to become lighter with thinner membranes, more active catalysts, and less critical raw materials. Shifting from the expensive platinum and iridium to the non-precious cobalt, nickel and iron catalysts could reduce the cost of PEM electrolysis by up to 40%[19]. More efficient stacks will reduce the main OPEX of electricity costs. These physical developments shall come in hand with reduced required maintenance and no downsides on durability to prevent CAPEX annuity increases. This way, the cost of electrolysers is expected to decline 60% by 2030 **(Exhibit 30)**, thus converging to the current cost of alkaline electrolysers. Water usage footprint must be taken into consideration as scaling continues. Water is utilized in renewable and low-carbon hydrogen production in several parts of the process, beginning in the mining and processing of the materials required to produce hydrogen, to the water molecules split in hydrogen. To put it in numbers, the IEA projects that the energy sector in 2030 will account for a total water consumption of over 72,000 gigalitres, approximately 70 times the estimated level for clean hydrogen[20]. The direct water usage of green hydrogen is approximately 9 kg/kg H2. Another cost issue arises with the need of high-quality water to produce hydrogen in electrolysers, since other types of water can damage the equipment. In order not to increase water stress on the production facilities' regions, water desalination is being studied as a viable solution. This process would increase the marginal costs of green hydrogen production due to extra electricity being required, but this cost increase could be mitigated if cheap renewable power is used. As for infrastructure costs, project finance and government policies will play a significant role. Project Finance can provide the necessary capital for the development of large-scale green H2 production and distribution projects. One of Plug's primary sources of revenue are Power Purchase Agreements (PPAs) related to the company's Genkey solutions, which are a great collateral to use in project finance. PPAs are a long-term source of revenue that provide a degree of

Exhibit 28: *Average LCOE Outlook ($/kwh)*



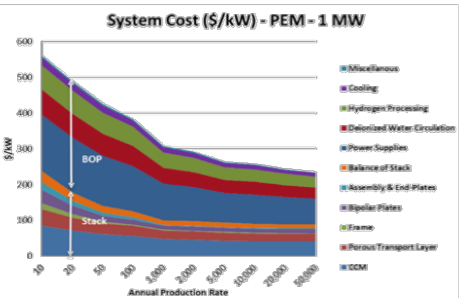
Source: IRENA

Exhibit 29: *Green H2 cost per kg evolution between countries with good access and lower access to renewable sources (in USD)*



Source: PWC

Exhibit 30: *Economies of scale in electrolysers production*

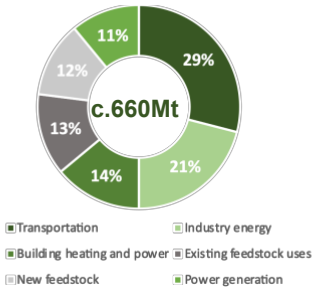


Source: Oxford Institute for Energy Studies

[18] Set of cells present in electrolysers, responsible for the water molecule separation
[19] IRENA (2020), Green Hydrogen Cost Reduction: Scaling up Electrolysers to Meet the 1.5ºC Climate Goal
[20] Hydrogen Council – Sufficiency, sustainability, and circularity of critical materials for clean hydrogen

certainty around cash flows that will be generated by the project, increasing the willingness to invest or lend from investors or lenders. This type of financing is great for Plug Power because it provides the necessary funding to pursue their projects fully while limiting the company's liabilities in the case of project default, with the lender's recourse limited primarily or entirely to the project's assets[21]. Governments can be seen as major stakeholders in this industry since they aim at decarbonizing the economy and, where there's potential, becoming net exporters of energy. Government subsidies, R&D funding and private sector investment incentives are all increasing in trend mechanisms aiming to boost green H2 technologies and projects. An example of future progress is the expected cost of building refuelling stations to be halved by 2030[22].

Exhibit 31: *Projected global H2 demand breakdown by end user in 2050*

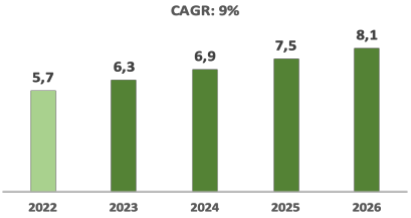


Source: Statista, Airliquide

End-users – Decarbonizing the economy

Once the electrolysis process is carried using renewable sources as inputs, the green H2 is transported via shipping, trucks, or pipeline to its end uses: industry (e.g., steel, chemical, refineries), transport, heating, or power generation **(Exhibit 31)**. In addition, the molecule may go under transformation. By chemically combining clean H2 with CO2 sustainably captured from emission streams we may obtain H2-based fuels such as methanol, methane, jet fuels and other hydrocarbons. Also, by combining green H2 with nitrogen (N2) we get green ammonia (NH3). As the underlying sectors continue to develop at a substantial rate, we can confirm that Plug Power has been working on becoming a leader in a rapidly growing H2 and FC industry.

Exhibit 32: *Retail e-commerce sales projections (in Tn USD)*

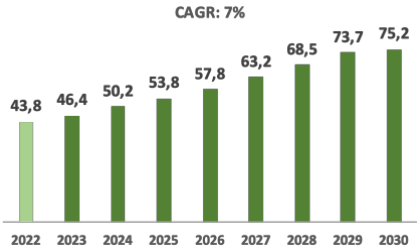


Source: eMarketeer

- Fuel Cells

The MHE industry growth is largely driven by the disruptive e-commerce industry **(Exhibit 32)**. For each $1B in online sales, c.1.25M sq.ft. of warehouse space is required[23]. A need for automation, space, time, and costs savings in warehouses has exposed the proven GenDrive FCs technology to a global TAM of $30B by 2030. For a typical distribution centre of 200 forklifts, FCs can amount to an average annual savings of $900,000[24]. In the US and Europe, the number of operating forklifts in 2030 is expected to rise 25% to 5 million. Plug Power currently has almost 70,000 active GenDrive FCs which accounts for roughly 2% of the current operating electric forklifts.

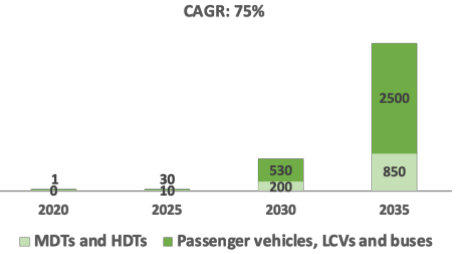
Exhibit 33: *Global Forklift Truck Market Outlook (in Bn USD)*



Source: Statista, Next Move Strategy Consulting

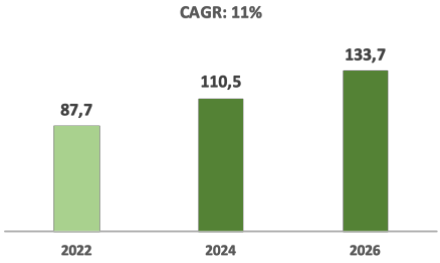
[21] (https://www.investopedia.com/terms/p/projectfinance.asp s.d.)
[22] IRENA – Making the Breakthrough – Green hydrogen policies and technology costs
[23] (https://www.cbre.ca/insights/briefs/ecommerces-impact-on-industrial-real-estate-demand s.d.)
[24] (https://www.plugpower.com/fuel-cell-benefits-5-facts-you-should-know/ s.d.)

Exhibit 34: *FCEVs in the EU (in thousands)*



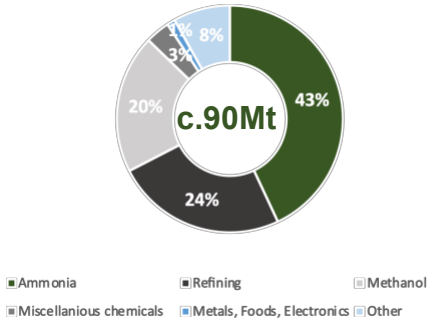
Source: McKinsey

Exhibit 35: *Global annual spending on cloud IT infrastructure (data centers) outlook (in Bn USD)*



Source: IDC

Exhibit 36: *Global H2 consumption in 2022*



Source: US Office of Energy Efficiency and Renewable Energy

50% of Plug's electrolyser sales are headed towards the decarbonization of ammonia production

The main future driver behind e-mobility FCEV's growth is the heavy-duty and long-range applications in which battery-vehicles' performance struggle and long-haul diesel vehicles accounts for 26% of the US national greenhouse emissions[25]. Plug Power's ProGen solutions are currently mainly targeted to "middle mile" delivery and ground support vehicles. The first segment is aligned with companies' decarbonization targets, and the latter aimed at decarbonizing the highly pollutant ports and airports. In the near future, Plug plans for long-haul trucking (HDTs) solutions, a segment that is expected to be cost competitive with diesel trucks by 2035. In the aerospace segment, there is a great potential for FCs to power unmanned aerial vehicles (UAVs) given its lightweight and long-rage capabilities, outperforming batteries. Drones are commonly used in the military and are in its early stage of disrupting commercial last-mile delivery[26].

Regarding the stationary power segment, data centers are one of the fastest growing end-users of stationary power with increasing demand for reliable, high-quality power to support the digital economy **(Exhibit 35)**. Microsoft and Plug Power partnered for a successful 3MW generator prototype using GenSure FCs, in which the trial was described as a "moon landing moment for the data center industry"[27] as the company is working towards eliminating its carbon emissions by 2030. Plug also partnered with telecom company Southern Linc for a 500 FC supply for a 4G cellular network backup. Another use of FCs is to mitigate the impact of natural disasters. Microgrids are stand-alone small-scale power grids available for such events, capturing great interest from governments in FCs. In 2020, 51 GenSure FCs were used during Hurricane Sally, providing more than 1,500 hours for communications equipment for 7 days.

- Electrolysers

A large portion of the green H2 is used to produce green ammonia **(Exhibit 36)**. More than 85% of ammonia is used in fertilizers and the compound also has energy storage and fuel capabilities. There has been a rising ammonia demand mainly driven by power generation and maritime transport fuels applications. The ammonia industry produces 35% of the chemicals sector, which in itself is accountable for 5% of industrial emissions. Using electrolysed H2 feedstock could reduce ammonia emissions by 90% and using the green ammonia as fuel

[25] (https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions s.d.)
[26] (https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/future-air-mobility-blog/drones-take-to-the-sky-potentially-disrupting-last-mile-delivery s.d.)
[27] Stated by Sean James, Microsoft's director of data center research, during Plug Power's 2022 annual Symposium

Exhibit 37: *Competitors diagram*

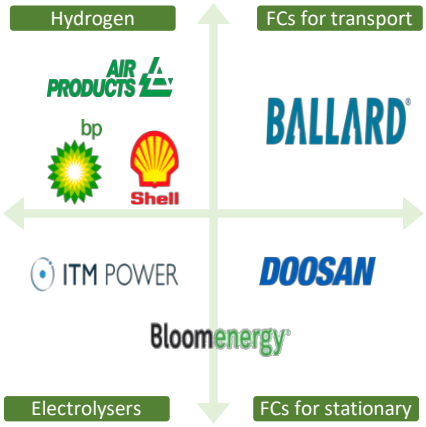
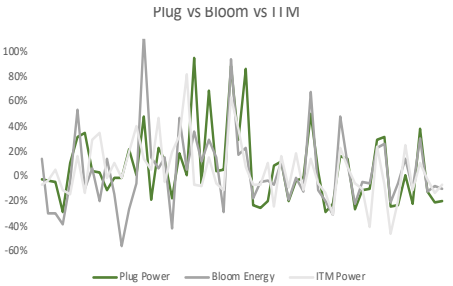
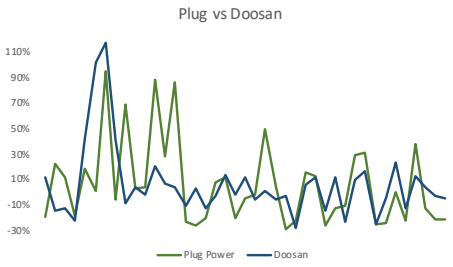
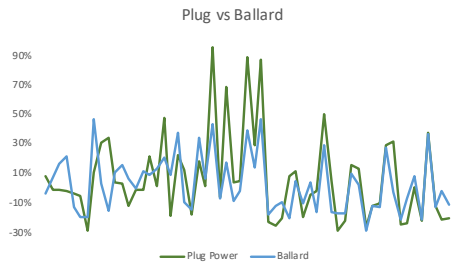


Exhibit 38: *Comparison of monthly stock returns evolution in the last 4 years*







Source: Yahoo Finance

and fertilizer could cut farming's emissions also by 90%[28]. PEM electrolysers are also widely used in the decarbonization of refineries and in the production of clean methanol, a green H2-based fuel. With an electrolyser backlog from 2022 of more than 2 GW, Plug's electrolyser business has a sales funnel of more than $25B[29], with about 50% headed towards green ammonia projects. Naturally, the other half is majorly for green H2 fuelling applications.

Competitive Landscape

As previously mentioned, Plug is present all over the green hydrogen value chain and there aren't companies that operate in the whole green H2 spectrum like Plug Power. This way, Plug has different competitors in each of their products and services offerings. We focused our competitor analysis on 4 segments: electrolysers, Fuel Cells for stationary power, Fuel Cells for transport and hydrogen (**Exhibit 37)**.

Plug's competitors on the electrolysers market are Bloom Energy (Bloom) and ITM Power (ITM). Bloom are pioneers in using solid oxide technology to produce clean hydrogen, unlike Plug who uses PEM electrolysers. Comparing both systems, the solid oxide technology is far more efficient than PEM, since on average it requires 37.7 kWh per kilogram of hydrogen produced while the PEM system requires 52 kWh per kilogram. On the downside, the solid oxide product requires extremely high operating temperatures to function properly (about 700º - 800ºC, while PEM electrolyzers run on 70º - 90ºC), resulting in longer start-up times and chemical and mechanical combability issues.
ITM is a British company that, like Plug, relies on PEM technology to produce hydrogen. Their focus is on Transport (e.g., heavy-duty vehicles, trains, buses), Energy (e.g., decarbonising heat, grid balancing) and Industry (e.g., refinery hydrogen, green hydrogen for methanation and renewable ammonia).

Moving on to the stationary power segment, the main competitors are Doosan Fuel Cell (Doosan) and, once again, Bloom. Doosan is a South Korean company that has an American subsidiary. Their primary product is the natural gas fuelled model, but they also provide H2 fuelled ones. Besides providing backup energy to their clients, they are also able to provide heat to households and businesses. In this segment, Bloom competes with their AlwaysOn Microgrid solutions, protecting their clients against grid outages and extreme weather disruption.

[28] From Fertilizer to Fuel: Can 'Green' Ammonia Be a Climate Fix? (https://e360.yale.edu/features/from-fertilizer-to-fuel-can-green-ammonia-be-a-climate-fix s.d.)
[29] (https://s29.q4cdn.com/600973483/files/doc_presentations/2023/plug_irdeck2023_020323_f.pdf s.d.)

In relation to FCs for transport, the main competitor is the Canadian company Ballard Power Systems (Ballard). The company has particular emphasis on applications related to transportation. Despite being partners and collaborate in some projects (Ballard provides FC stacks to Plug's Gen Drive engines), both companies operate in the transportation industry as competitors. Ballard, just like Plug, produces FC modules for light, medium and heavy-duty vehicles.

Evidence of procyclical returns confirms Plug's peers' similar reactions to each sub-industry shocks

Such comparables can be used for the upcoming multiples valuation and beta extraction

Lastly, the hydrogen production segment is growing on competition for Plug. With the Paris Agreement, a lot of companies are targeting to become Net-Zero by 2050, and so, previously diesel fuel productors are now switching to green hydrogen production also. Examples of these competitors are BP, Shell Plc and Air Products.

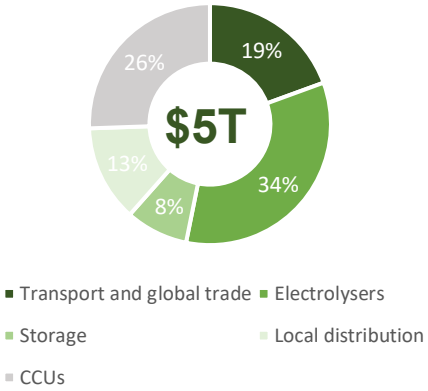
Macroeconomic Overview

Regulatory Framework: Public Policies

Exhibit 39: *PTC impact on Plug's profitability (in Mn USD)*

Source: Analysts estimates

Exhibit 40: *Investments required in the clean H2 supply chain to reach net zero*



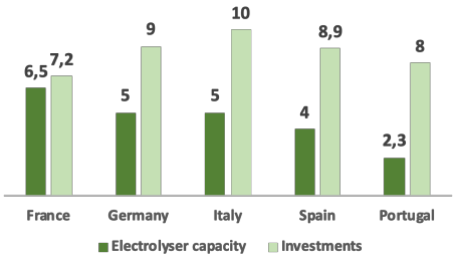
Source: Goldman Sachs Global Investment Research

The first public policy that is relevant to Plug Power's business is the Inflation Reduction Act (IRA) that was signed into the United States law on August 16, 2022. The act incorporates new federal spending of $500 billion and several tax breaks that aim to incentivize clean energy, reduce healthcare costs, and increase tax revenues. From that amount, an estimated $369 billion are for the clean energy sector with the objective of significantly reducing the US's carbon emissions for the next 10 years[30]. Regarding the company, IRA's biggest incentive is the Clean Hydrogen Production tax credit (PTC) modification, since it creates a new ten-year incentive for clean hydrogen production that can amount to $3,00 per kilogram of hydrogen produced, depending on the kilograms of CO2 produced in the process. Since Plug produces green hydrogen, the amount of CO2 produced in the end is close to zero, and so the credit value will be the highest possible ($3/kg). The way the PTC works is through direct pay the first 5 years, meaning that clean hydrogen producers can claim a tax refund equal in value to their tax credits. After that, clean hydrogen producers will be able to offset their taxes and also benefit from tax credit transferability where producers with no tax burden will be able to sell their tax credits to a buyer who owes taxes at a 15% discount[31]. The PTC will be one of the main drivers of Plug's profitability, reaching it in 2024 with the PTC instead of 2026 **(Exhibit 39)**. By achieving profitability in an earlier stage, the company will be able to ease

[30] Can the Inflation Reduction Act unlock a Green Hydrogen economy? (https://theicct.org/ira-unlock-green-hydrogen-jan23/ s.d.)
[31] (https://theicct.org/ira-unlock-green-hydrogen-jan23/ s.d.)

pressure on responsibilities towards investors and lenders, and even attract new ones. Secondly, we have the Bipartisan Infrastructure Law (BIL) signed in November 2021, providing more than $1 trillion in public investment. From this, $76 billion is allocated to investments on clean energy-related initiatives, with $10 billion being invested in clean-hydrogen Research and Development.

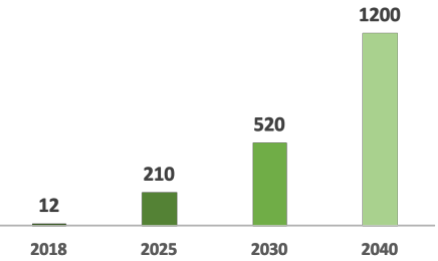
Exhibit 41: *Main electrolyser projects in Europe for 2030 (capacity in GWs and investments in Bn USD)*



Source: Hydrogen Europe

Regarding the European Union where Plug also operates, there is also a hydrogen strategy on course. The strategy aims to develop at least 6 GW of electrolyser capacity by 2024, sufficient to produce 1 million tonnes per year of green hydrogen. On a later stage, by 2030, the objective is to scale up electrolyser capacity to 40 GW in EU countries **(Exhibit 41)**, plus 40 GW of electrolyser capacity in neighbour countries like Morocco, from which the European Union could import the hydrogen.

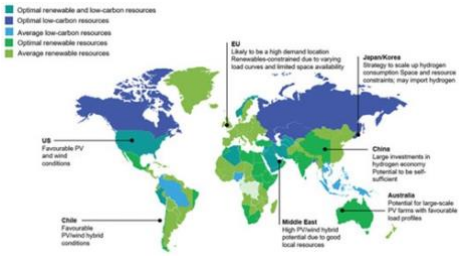
Exhibit 42: *Projected cumulative number of H2 fuelling stations in South Korea in SK (in units)*



Source: Ministry of Land, Infrastructure and Transport (South Korea)

In APAC there is a huge reliance on fossil fuels and the overall energy demand is set to continuously grow. In line with the Paris Agreement, several regions are pushing towards reduction on the emissions of greenhouse gases and one of the main players is green hydrogen. Many APAC countries made hydrogen-related policies to pursue climate change, but the one where Plug is investing in is Korea. In January 2019, the Korean government announced their Hydrogen Economy Roadmap with several goals targeting 2040. The first objective of the roadmap is to increase the number of fuel cell cars to 2.9M by 2040 and will support this growth with 1,200 hydrogen refuelling station installations **(Exhibit 42)**. Another goal is to massively improve the installed capacity of utility-scale and residential fuel cells by 2040 to 15GW and 2.1GW respectively. Korea has been hugely successful implementing this strategy, being a global leader in the transition to hydrogen, owning almost half of the world's installed capacity of utility-scale stationary FCs and supplying almost 60% of the world's FCEVs. We can conclude that the Korean government's investments in green hydrogen projects will be of great value for Plug Power, proving to be a large efficient market.[32]

Exhibit 43: *Summary of clean H2 potential by geography*



Source: IEA, McKinsey

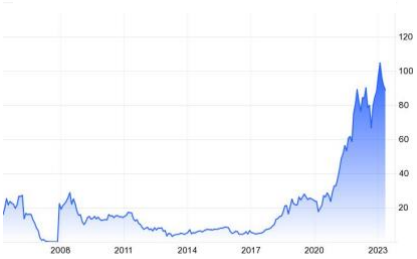
Carbon Pricing

Starting a few years ago, buying and selling carbon credits on carbon markets became a common practice for several industries. A carbon credit is equal to a tonne of carbon dioxide, or any different greenhouse gas reduced, and it's a way for companies to monetarily compensate the excess of emissions caused by their

[32] Korean Hydrogen Market Update – Australian Government

productive process. In the last 5 years, the price of carbon permits in the European market have been reaching new all-time highs **(Exhibit 44)**, with a ton of carbon in the end of 2021 costing around $80, and in the end of 2022 increasing by 10% to a cost of $88/ton. In February 2023, the price of a carbon credit rocketed to its maximum ever recorded, trading at $105.73/ton[33], and this trend is not expected to be reversed soon since demand is increasing due to the growing number of companies' net-zero commitments[34].

Exhibit 44: *EU Carbon Permits*



Source: Trading Economics

We believe that, with the trend of increasing carbon pricing, the prices of fossil fuel-based products will follow the same path, as companies will have to incur on extra carbon credits' costs to offset carbon emissions. This is great news for the company because the cost of greenhouse gas emissions will rise, companies will increasingly look for low-carbon energy sources like green hydrogen to fuel their operations.

Business Plan

Plug Power's strategy plan is based on expanding its activity in Europe and Asia, ramping-up of its production facilities and extending its products' applications. All three fronts have at its core the objective of scaling up in order to drive costs down.

Geographical Expansion

- Europe

Exhibit 45: New Pedestal Customers in Europe

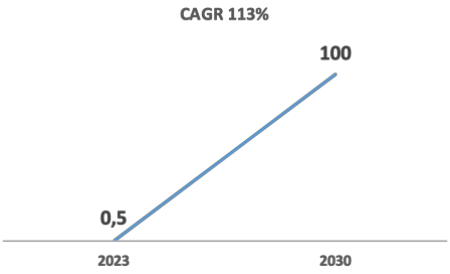
Plug plans to expand its presence in Europe mainly through its JVs with Acciona and Renault, and also by attaining new pedestal customers. Most recently, Plug has announced two new long-term contracts with the large retailers Lidl and ASDA. Lidl has the largest MHE site in Europe and wants to implement Plug's ProGen engines in its delivery truck fleet. The UK retailer ASDA, after a successful trial, wants to convert 30% of its distribution centres into green H2.

In Europe, the objective is to reach 100+TPD capacity by 2026

The 25 MW plant being built in Navarra from the AccionaPlug JV will still have conditions to double its capacity to 50MW, translating into 20+TPD production, depending on the industrial demand in the region. The JV plans on replicating this project to other areas of Spain and Portugal in order to achieve 100 TPD and a 20% market share of green H2 in Iberia by 2030, totalling an investment of over $2B. While plug provides electrolyser, storage and delivery expertise, Acciona will provide clean energy which includes a solar power deal fixed at $20/MW. The

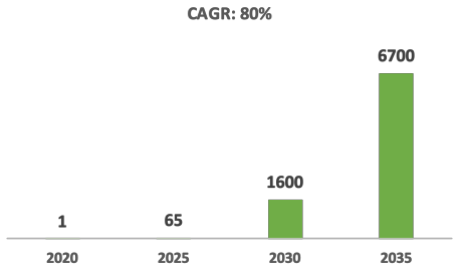
[33] (https://tradingeconomics.com/commodity/carbon s.d.)
[34] (https://finance.yahoo.com/news/global-carbon-credit-market-analysis-154000110.html s.d.)

Exhibit 46: *HYVIA's cumulative shipping plans between 2023 and 2030 (in thousands)*



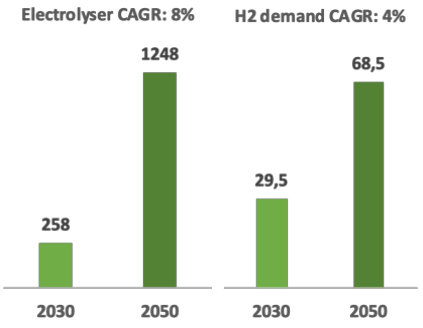
Source: Company data

Exhibit 47: *H2 demand from FCEVs in the EU (in thousand metric tons)*



Source: McKinsey

Exhibit 48: *Forecasted electrolyser capacity (in GWs) and H2 consumption (in Mt) in China*



Source: Statista, DNV, IEA

HYVIA JV with Renault has announced two new light commercial H2TECH vehicles: Renault Master Chassis Cab, essentially being a larger version of the already developed Renault Master Van, and the Renault Master City Bus, which can take up to 15 passengers. While the vans have been successfully tested and adopted by large corporations such as Airbus and Orange, the minibus has great potential for inner city clean transportation. HYVIA's assembly line alone has the capacity to produce 1,000 FCs p.a. and by adding Plug's supply, the partnership is aiming at 30% market share in Europe by 2030[35].

In addition to a $315M investment in a 100 MW H2 production plant included in the deal with the Port of Antwerp for a 30TPD site for 30 years, Plug has selected the Port of Duisburg as its European headquarters and innovation centre. The strategic location, which is one of the candidates for H2 technology capital in Germany, has direct maritime access to the Port of Antwerp, large concentration of transport and logistics clients, and access to highly skilled workforce. To complete its medium-term plans for Europe, Plug is locating areas such as Denmark and Sweden that offer affordable renewable electricity to produce inexpensive green H2 for the Nordic regions.

- APAC

Plug is working on expanding its activity in Asia by firstly focusing on its JV with SK Group in South Korea. The objective is to provide the whole green H2 ecosystem to a country that is keen on betting in the molecule adoption. The South Korean government is pushing the creation of "Hydrogen Cities", with a vision to power 10% of the country's cities with H2 by 2030 and 30% by 2040[36], translating into a $40B H2 economy by then[37]. The $1.6B investment from the third largest conglomerate in South Korea is said to have gone directly to the construction of manufacturing facilities and one Gigafactory with the intent to begin production in the end of 2023. The company will also benefit from SK's chemicals and energy infrastructure expertise. Later, Plug wants to extend this whole product offering to other potential Asian Markets, such as China **(Exhibit 48)**. Although Plug has had already a fallen electrolyser plant project with Fortescue Metals Group in Australia, the companies are still partners and Plug still recognizes great clean solar and wind power potential in the territory.

[35] HYVIA website
[36] South Korea plans to build the first hydrogen society by 2022 (https://www.weforum.org/agenda/2019/11/south-korea-green-energy-hydrogen-future-city-fossil-fuel-renewables/ s.d.)
[37] (https://www.reuters.com/article/us-plug-power-sk-group-jv-idUSKBN29C00N s.d.)

Green H2 Plant Network Outlook

Exhibit 49: *Main Plants' ramp-up plans*

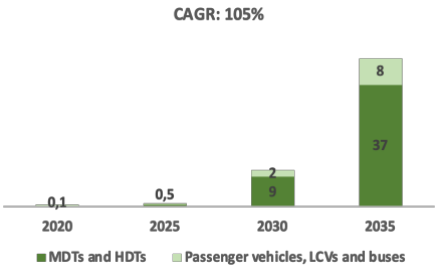
Plant Location	Ramp-up	New Capacity
Georgia	30TPD	45TPD
Tennessee	10TPD	20TPD
New York	15TPD	75TPD
Houston	30TPD	60TPD

Source: Company data

Almost all plants currently in progress also have ramp-up plans forecasted to meet the 1000TPD mark by 2028 **(Exhibit 49)**. The Georgia plant has the potential to triple its capacity to 45TPD and the Tennessee plant to double to 20TPD. The New York Plant can add 15TPD to a new 75TPD production capacity. The FC manufacturing facility in Houston has a vertical integration plan to build H2 liquefaction plants with 30TPD capacity and potential to double it to 60 TPD in the future. Liquid H2 is cheaper to transport, and it will reduce the cost of deliverable H2 to customers. It is important to note that Plug carefully analyses its plants locations taking into consideration opportunity cost. However, investors should remain conservative on Plug's current production and new facilities forecasts since the company has faced permits delays in the past, and, in the last two years, Plug has abandoned three plant projects in Australia, Canada, and Pennsylvania.

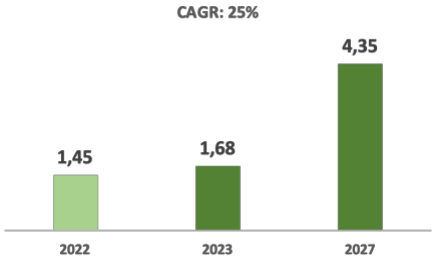
Extending the Product Portfolio Applications

Exhibit 50: *H2 FCEV refuelling market opportunity in the EU (in Bn USD)*



Source: McKinsey

Exhibit 51: *Projected global drone delivery market size (in Bn USD)*



Source: ReportLinker, BRC

Plug is also exploring the expansion of its applications within its product segments. Regarding FCs, after entering the LCV market with HYVIA and the "middle mile" market with its 30kW ProGen engines, Plug is now ready to enter the Heavy-Duty Vehicle scene (HDTs) **(Exhibit 50)** with its 85kW-125kW models. Such power upgrade is possible because the engines have a modular power design that enables tailored power density, meaning they can be used in series and parallel combinations of ProGen FCs. Stacked combinations that surpass 1MW are used in stationary power applications, which brings us to Plug's next focus: continuous power generation for data centres. After the successful 3MW trial with Microsoft, which is moving forward with its decarbonization efforts, Plug has gained attention from other tech giants and is ready to take on the heavily powered and disruptive data centre industry. Lastly, UAVs and drones are in the company's logical progression **(Exhibit 51)**. In fact, on March 2023, the first regional passenger plane flown using H2 FC propulsion was done with ProGen units, thus opening the door to the whole spectrum of aerospace applications.

Valuation

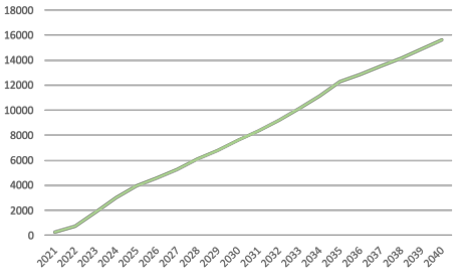
Balance Sheet Value Drivers and Forecasting

With respect to the Balance Sheet, Plug intends to build an end-to-end hydrogen ecosystem and will bet heavily on its operations' expansion, with increasing production, the opening of several hydrogen plants, as well as multiple M&A's

and joint ventures. With this being said, it is only natural that one's Balance Sheet will also grow in accordance.

- Core Invested Capital

Exhibit 52: *PPE Evolution (in Mn)*

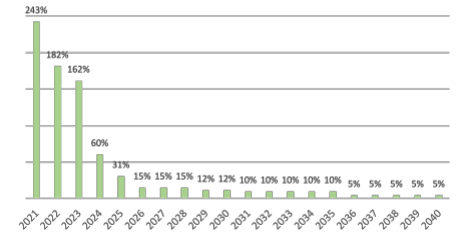


Source: Analysts estimates

Starting with the companies' Core Invested Capital (Core IC), the objective of increasing their H2 pipeline and expanding their operations needs massive investment, as we can see as the value of Core IC almost doubling from 2022 to 2023 reaching 3.6 Bn and surpassing the 10Bn mark by 2027.

One of the main drivers for this increase in Core IC is the Property, Plant, and Equipment, Net caption (PPE). Plug is currently building several green hydrogen plants across the U.S. and Europe, with multiple other potential locations being studied, and so PPE is expected to grow at an exponential rate at least in the beginning of the forecasted period, as it happens from 2022 to 2025 (**Exhibit 53**), increasing its value to nearly 4 times, and then slowly reaching a steady growth rate as some plants are expected to finish construction and start production during the last year. We projected PPE based on Tons per Year (PPE/TPY) produced as there is no information available on actual cost per plant. We expect the value to stay high in the beginning but slowly decreasing, since the factories have different dates to start production and so TPY will be increasing as some constructions finish, until finally reaching a steady state.

Exhibit 53: *PPE Growth rate*

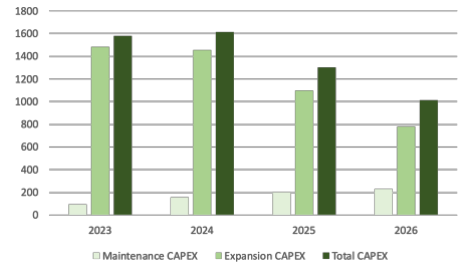


Source: Analysts estimates

Regarding Intangible Assets (IA), it is divided in Gross Acquired Technology, Customer Relationship, Backlog and Trademarks and In Process R&D. The first caption is related to M&As, which Plug has been relying on a lot in the last years. Since Plug already has presence in the entire value chain of hydrogen production and distribution, we believe that new transactions will decrease, eventually ending in 2028, with no more acquisitions needed to boost growth and keeping the Gross Acquires Technology value constant over time. Customer relationship and In Process R&D will increase over time at the same rate. Goodwill varies with the total number of M&As performed by Plug, with its value reaching stability as M&As end.

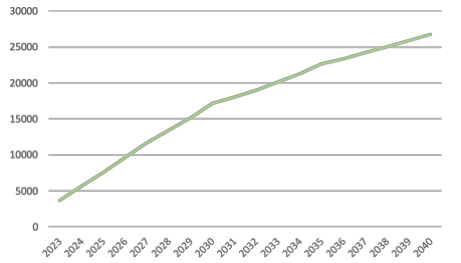
Our CapEx projections are based on the three previous captions: PPE, IA, and Goodwill. We set our maintenance CapEx to equal depreciation from PPE plus amortization from IA, constantly increasing over time. Our Total CapEx is the difference of total PPE, IA, and Goodwill one year to another plus the maintenance CapEx, and the expansion CapEx is the difference between Total and Maintenance CapEx. Expansion CapEx presents higher values in the first years of forecasting (2023-2025) reaching almost 1.5B in the first and second

Exhibit 54: *CapEx breakdown 2023-2026*



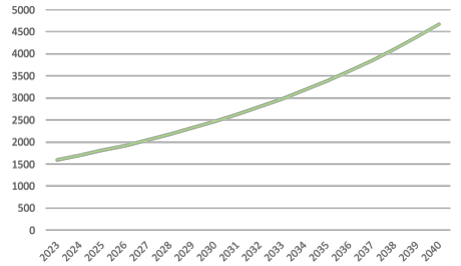
Source: Analysts estimates

Exhibit 55: *Core IC Evolution (in Mn)*



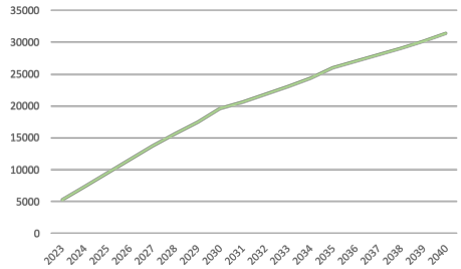
Source: Analysts estimates

Exhibit 56: *Non-Core IC Evolution (in*



Source: Analysts estimates

Exhibit 57: *Total IC Evolution (in Mn)*



Source: Analysts estimates

years (**Exhibit 54**), later achieving stability. The higher early values of Expansion CapEx come in line with Plug's new hydrogen plants being built.

Moving on to Accounts Receivable (AR) and Inventories, the companies' average collection period is set to decrease over time as Plug is not yet profitable but is almost reaching that goal, so there will be increased pressure on clients to pay earlier. The average holding period has almost doubled from 2020 to 2022 due to a materials crisis[38]. The material crisis created a disruption on global supply chains, with shortages of raw materials and increasing lead times. This crisis is not over yet but Plug not only has several sources for their essential materials, but most important, it secured a new partnership with the strategic FC's material supplier Johnson Matthey, and so the company can decrease their average holding period to pre-pandemic values (135). Regarding payables, it is set to be kept at high values such as in 2022. The growth of the company in the industry will bring leverage when dealing with suppliers and ability to keep those values.

To conclude, Core IC for the forecasted period grows at a higher rate in the beginning until 2030 as we see from a higher slope on the graph (**Exhibit 55**), later decreasing that slope. The Core IC ends up at a value of 26.6B in 2040.

- Non-Core Invested Capital

Moving on to Non-Core Invested Capital (Non-Core IC), it won't be changing as much as Core IC, doubling its value only in 2034. The changes are from available-for-sale securities as the rest of the captions are kept constant. This caption provides liquidity to Plug and so it will grow at a constant rate for the forecasted period, and so will Non-Core IC, reaching a final value of 4.6B in 2040. (**Exhibit 56**)

To conclude, Total Invested Capital (Total IC) will be the sum of Core and Non-Core IC, following the same path as Core IC's values, with a higher slope until 2030 meaning higher growth. This goes in line with Plug's objective of expanding its operations since there will be needs for higher investments in early years where construction of plants is in progress. (**Exhibit 57)**

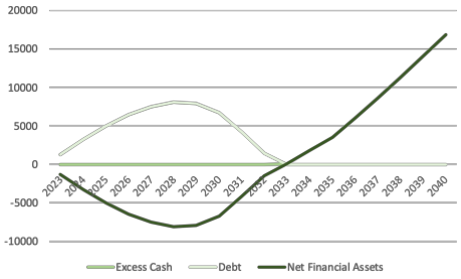
- Financing

To conclude the Balance Sheet analysis, Plug's ways of financing its operations will change throughout the forecasted period. As the expansion plan of hydrogen plants is in progress, Debt will be the main source of financing, increasing until 2028. From that moment onwards, Debt will start being repaid since Plug's

[38] Shortage of electrolyzers for green hydrogen - EY

profitability is already on track and increasing Total Stockholder's Equity, to the point that increases in Equity are higher than that year's Total IC. Debt will be fully paid by 2033, where Excess Cash starts to be the way of financing operations. This caption will be increasing from 2033 until the end of the forecasted period due to a decreasing growth rate of Plug. This way, Plug's Net Financial Assets will turn positive in 2033. (**Exhibit 58**)

Exhibit 58: *Net Financial Assets Evolution (in Mn)*



Source: Analysts estimates

Moving on to Total Shareholder's Equity, it was calculated using the principle of clean surplus accounting (**Exhibit 59**)[39] and is growing constantly from 2023 onwards. Regarding Transactions with Shareholders, Plug has never distributed dividends to its investors and does not plan on doing so in the foreseeable future[40], and so according to the principle of clean surplus accounting, previous historical values are Net Equity issued (positive) or bought (negative). These transactions will be kept as a constant percentage of Total Comprehensive Income of -22%, with constant negative values of Net Equity bought from 2024 onwards. For the years with existing Debt (2024-2033), this means that Plug will be using its cash to pay off Debt rather than issue new shares. For the years with Excess Cash (2034 onwards), the company will be repurchasing shares more than issuing them, reducing the number of outstanding shares and increasing its value.

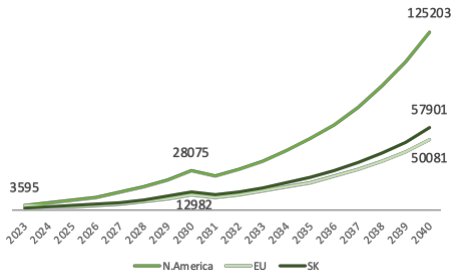
Exhibit 59: *Principle of Clean Surplus accounting*

$$\text{Equity}_{2020} = \text{Equity}_{2019} + \text{Net Income}_{2020} - \text{Dividends}_{2020} + \text{Net Equity Issued}_{2020}$$

Source: Measuring and Managing the value of companies

To conclude, the company is betting on a scale of production for the long run, with massive investment in tangible assets such as PPE. The turning point of profitability allows Plug to ease financial distress by repaying its existing Debt and rely on its own operations' revenues for financing. This growth process will bring value not only to the company but also to its shareholders, as we can see by the Return on Invested Capital (ROIC) always positive throughout the forecasted period and above WACC in every year from 2027 onwards.

Exhibit 60: *FCEVs deployments, in units*



Source: EV Volumes

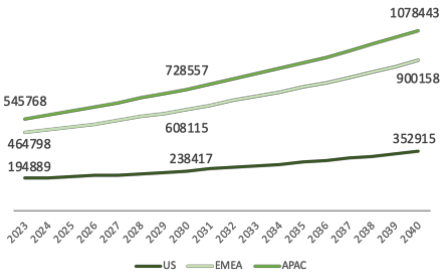
Income Statement Value Drivers and Forecasting

- Revenues

Starting with the sales of FC systems, GenDrive is the company's most mature product line, with its forecasted growth following an increasing trend of material handling equipment electrification, where FCEVs keep on gaining traction over BEVs. Such growth will be leveraged by an already settled presence in the US, with Plug's penetration stabilizing at 20% by 2027. In the EMEA region, Plug's market share will start to pace up in 2025 with the new announced pedestal

[39] Measuring and Managing the Value of Companies; Seventh Edition
[40] Plug Power 2021 Annual Report

Exhibit 61: *Electrification trend in the material handling equipment industry, in*

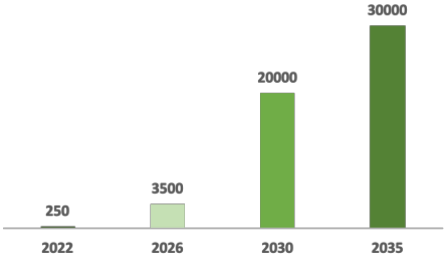


Source: Statista

Exhibit 62: *GenSure deployments (MWs)*

Source: Analysts estimates and company data

Exhibit 63: *Plug's electrolyser capacity*



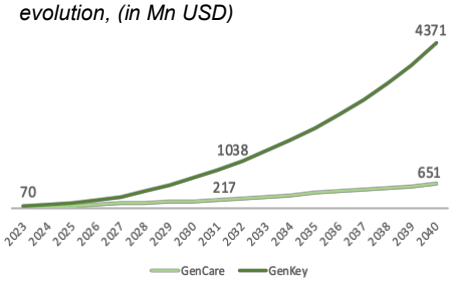
Source: Company projections

customers rollout. As for the APAC, we believe Plug's market capturing will trend towards 5%, mainly driven by the SK JV. GenDrive prices are currently set at $114/kWh and the average energy capacity per fuel cell unit is set to remain constant at 160kWh, since there is less flexibility in the expansion of power requirements in forklifts when compared to on-road vehicles. ProGen prices, on the other hand, will be subject to more than inflation. Firstly, we believe customers will be able to benefit from the expected FC stack cost decrease, at a CAGR of -3%. Then, the current average energy capacity is based on the first commercialized 35kW HYVIA van, which translates into 280kWh. As HYVIA plans on developing more FCEVs and as the FCEV market starts including heavier commercial trucks, average energy capacity is likely to trend towards 400kWh[41], stabilizing the average unit price at around $35,000 in 15 years, compared to c.$25,000 for GenDrive units. In terms of units, we believe Plug's ProGen market share in the US will peak at 40% by 2030 and then shift towards 30% with new market entrants[42]. In Europe, most of Plug's deployments will be related to its JV with Renault, which is targeting 30% market share by 2030 and then by 2035 we expect it to eventually fall close to Renault's market share of c.15% in the electrics segment. As for South Korea, deployments will come from Plug's JV with SK group, so we set its penetration to gradually increase to 30%, which corresponds to the large group's subsidiaries average market share in South Korea. The GenSure FCs are currently targeted for the US and South Korea, with the SK Group deal including a 500MW supply p.a. between 2025 and 2040. As for the US, total installed capacity for green stationary power is set to surpass 4GWs by 2030 and 10 GWs by 2035[43]. In 2024 Plug will experience a large recovery from a 2023 marked with delays due to supply chain issues in the prior year. From 2025 onwards, Plug's share of yearly national deployments is predicted to decrease from around 50% to 30% by 2035, as the industry largely driven by data centres power requirements grows exponentially, attaining new market entrants. The related infrastructure and equipment depend on the number of H2 sites sold and the average price per installation of those sites. The price can be given by a product function of the daily demand of H2 kgs per fleet and the cost per fuelling dispenser. Even though the average size fleet of GenDrive customers is 373 MHE vehicles and for ProGen is of 100 FCEVs, the latter actually consumes 6 times more, on average[44]. The number of H2 sites installed,

[41] While forklifts and LCVs average energy capacities of 15kW and 35kW, respectively, medium-duty trucks and heavy-duty trucks require ProGen engines to have between 85kW AND 125kW power density
[42] Target market shares revealed in Plug's Annual Symposium. However, for Europe and SK, in the long run, we adjusted it according to Renault's BEV segment and SK Group's subsidiaries historical market shares
[43] Fuel Cell and Hydrogen Energy Association (FCHEA)
[44] According to Plug's products Factsheet, the average daily demand for MHE vehicles is 1kg and for FCEVs is 6kg

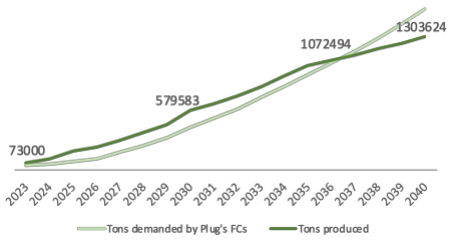
which account on average for 4 fuelling dispensers each, will naturally follow the growth in GenDrive and ProGen deployments.

Exhibit 64: *Services revenues evolution, (in Mn USD)*



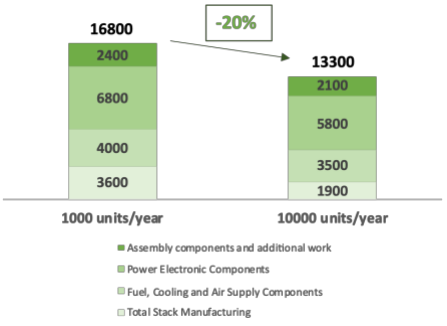
Source: Analysts estimates

Exhibit 65: *Green H2 tons produced evolution*



Source: Analysts estimates and company projections

Exhibit 66: *Economies of scale in FC systems production (in USD)*



Source: Department of Energy

Plug is expected to surpass 10,000 incremental units deployed by 2025

The electrolyser business is on track to become Plug's highest revenue generator segment. The company's incoming giga factories and plant network ramp-up have a roadmap focused on increasing electrolyser production capacity (**Exhibit 63**) to 3.5GWs by 2026, 20GWs by 2030 and 30GWs by 2035. To put into perspective the exponential growth, global PEM electrolyser installed capacity is predicted to reach 1TW in 2035 from the c.1.5GW installed today[45], representing a 65% CAGR over the next 13 years. In 2030, Plug is forecasted to reach more than $8B in electrolyser sales, surpassing the long leading GenDrive segment, and to double those revenues by 2040. As electrolysers costs have the potential to decrease by 60%, we expect the reflection in price per MW to be almost halved to $400,000/MW by 2030, representing a -12% CAGR[46]. Both oil and gas equipment and liquefier sales come in hand with the rise of the electrolyser segment. Since their introduction in 2021, liquefiers revenues have been about 50% of electrolysers and we expect this relationship to remain constant given the need for green H2 producers to liquify its H2 for storage and transportation. However, we maintained a more conservative approach for the oil and gas equipment with a diminishing percentual relationship.

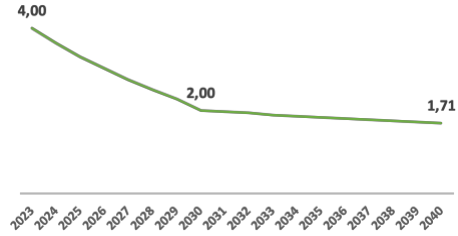
In relation to the services provided, Genkey will continuously outpace GenCare revenues (**Exhibit 64**), as vertical projects implementation trough PPAs gain popularity and FCs systems continuously require less maintenance. Average GenKey sites under PPAs has been historically around 40% of total sites. GenCare revenues are dependent on the number of FCs under maintenance, currently at 30% total FC systems and expected to fall to 10% by 2030, and the average income per GenCare service, which has historically been 10% of FC prices.

Regarding the molecule supplied by GenFuel, our forecasts considered the total H2 tons produced per year and the price charged per ton. Already by this year, Plug's green H2 plant network will enable the company to stop buying green H2 from third parties to meet the current customer's demand. In addition, they will have enough capacity for external non-Plug FC owners that require only the fuel itself, such as oil and gas companies shifting their fuel stations product offering to greener options. Given this demand door opening, we assume all tons produced by Plug will be easily deployed. Their H2 plant network roadmap projects an

[45] IEA (2022), Electrolysers Analysis, https://www.iea.org/reports/electrolysers
[46] IRENA (2020), Green Hydrogen Cost Reduction: Scaling up Electrolysers to Meet the 1.5ºC Climate Goal

annual production capacity of 182,500 tons in 2025, 365,000 tons in 2028 and more than 1 million tons by 2035. Plug currently charges a price of $2/kg, a considerable discount considering the higher cost of production, aimed at securing the product adoption.

Exhibit 67: *Plug's green H2 cost per kg evolution*

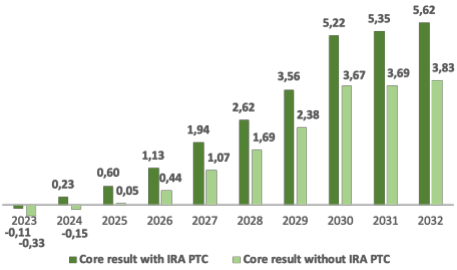


Source: Analysts estimates

- Costs and Core Result

All three FC product lines will benefit from a 20% decrease in production costs in 2025. This will be due economies of scale[47] (**Exhibit 66**), FC stack development and Plug's partnership with precious metal supplier Johnson Matthey. The costs of H2 infrastructure sold will also benefit from scaling with its gross margin stabilizing at 25% from 2030 onwards. For the electrolysers case, its gross margin will stabilize at 45% once its new technology undergoes the fastest improvements out of all products, with its cost expected to fall 60% by 2030. Cryo equipment gross margin will trend towards 30%, slightly below the company's overall margin.

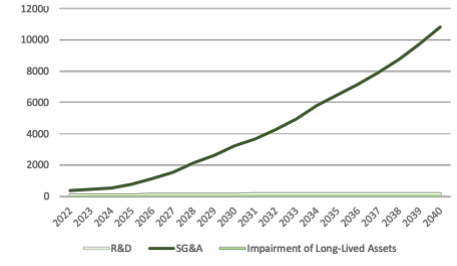
Exhibit 68: *IRA PTC impact on the Core Result (in billions USD)*



Source: Analysts estimates

It is important to realize that FC systems including electrolysers, liquefiers and related equipment haven't been the loss drivers for Plug, but rather the services provided and, more crucially, the fuel delivered which have been consecutively accounting for colossal negative gross margins. GenCare and GenKey will experience know-how development and higher efficiency efforts translated into an annual cost reduction of -5%, allowing GenKey to achieve profitability in 2024. However, the future lower maintenance required for FC products will delay this target for GenCare until 2032. Total gross profit that is currently at almost -30% will surpass the positive 30% mark in 2030 and then stabilize at around 36%.

Exhibit 69: *Forecasted Operating Expenses Breakdown (in Mn)*



Source: Analysts estimates

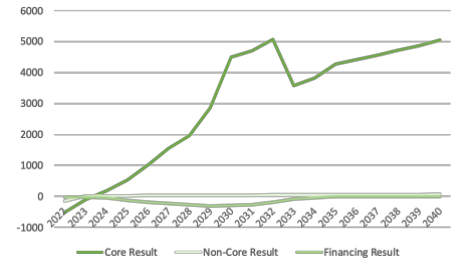
GenFuel COGS will trend towards the industry roadmap average of $2/kg of green H2 by 2030, from the current $4/kg[48] (**Exhibit 67**). In this segment we predict Plug to achieve profitability in 2030. Until then, the company will take advantage of the IRA PTC of $3/kg recorded under tax adjustments. (**Exhibit 68**)

In operating expenses (**Exhibit 69**), R&D costs will be driven by the rise in the number of patents, with an average expense of around $2.7 million. Under SG&A, marketing costs are set at 5% of sales for the long-run, and regarding salaries, the average wage per employee will follow inflation and the number of employees is expected to increase from 3,000 to more than 85,000 by 2040.

[47] US DOE, Manufacturing Cost Analysis of PEM Fuel Cell Systems, https://www.energy.gov/eere/fuelcells/articles/manufacturing-cost-analysis-pem-fuel-cell-systems-5-and-10-kw-backup-power

[48] PWC, Analysing the future cost of green hydrogen, https://www.pwc.com/gx/en/industries/energy-utilities-resources/future-energy/green-hydrogen-cost.html

Exhibit 70: *Forecasted Total Comprehensive Income Breakdown (in Mn)*



Source: Analysts estimates

Exhibit 71: *Peer Group's Betas*

Peers	Country	Beta	Unlevered Beta
Bloom Energy Corp.	USA	2,11	2,04
Doosan Fuel Cell Co	South Korea	1,54	1,49
Ballard Systems Inc.	Canada	1,49	2,19
ITM Power plc	UK	1,32	2,07
Fuel Cell Energy Inc.	USA	1,64	1,71
Power Cell Sweden AB	Sweden	0,83	0,82
Nel ASA	Norway	0,95	0,93
Industry Median		**1,49**	**1,71**

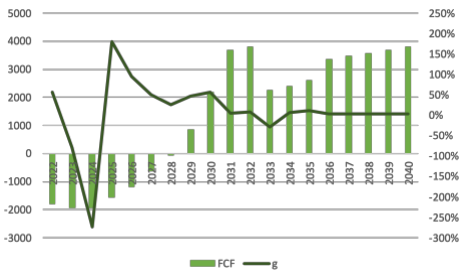
Source: Analysts estimates

Exhibit 72: *Cost of Capital Summary Table*

Cost of Equity	12,14%
Cost of Debt	9,41%
Marginal Tax Rate	28,00%
E/EV	136,69%
D/EV	-36,69%
WACC	**14,10%**

Source: Analysts estimates

Exhibit 73: *FCF Evolution (in Mn) with Growth*



Source: Analysts estimates

Adding all up, with the after-tax IRA adjustment, Plug will be able to achieve a positive core result in the end of 2024 instead of 2025 without the PTC.

- Non-core and Financing result

In the non-core items, interest income comes from investment holdings and money markets accounts so it will evolve as a percentage of the prior year investments under the non-core invested capital. The remaining captions include changes in fair value of securities and realized losses on investments that, given its low relative size in the grand scheme of the income statement, forecasts were based on historical averages. Interest expense is set as a percentage of 4.82% of previous years' Debt.

Discounted Cash Flow

- Cost of Capital

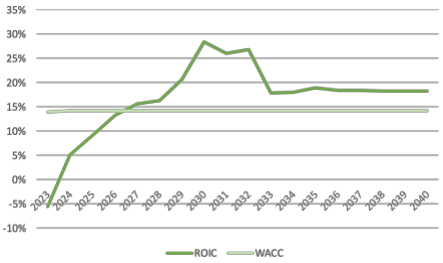
The cost of debt was estimated by adding the weighted average of the 10-year and 30-year US treasury bond rates (3.41%)[49] with Plug's estimated default spread. According to Bloomberg, Plug has a HY2 rating which corresponds to a Moody's B3, translating into an estimated default spread of 6%[50], thus resulting in a 9.41% cost of debt. The cost of equity was computed using the CAPM method with the previously obtained risk-free rate and a market risk premium of 5.7%, which was extracted from a paper survey accounting for 80 countries in 2023[51]. For the equity beta, a set of comparable peers were unlevered according to their capital structure weights, resulting in an industry median unlevered beta of 1.71 (**Exhibit 71**). Such value was then relevered to 1.53 given Plug's current D/E ratio of (-27%) and its debt beta of 1.05. By applying the CAPM, we obtained a cost of equity of 12.14%. Given the assumption that Plug expects to maintain in the long-run its current capital structure, we achieve a WACC of 14.10% (**Exhibit 72**).

- FCF Map, RONIC, ROIC and Growth

When mapping out Plug's Free Cash Flows, we reached a steady state with a growth rate of 3% (**Exhibit 73**). Since Plug is a high growth company, we believe it will go through two steady states. Firstly, this growth will continue until 2050, a date where the majority of the main current climate goals are set to. From 2050 onwards, the growth rate will be set to 2%, a value consistently non superior to

[49] Bloomberg, https://www.bloomberg.com/markets/rates-bonds/government-bonds/us
[50] https://www.researchgate.net/figure/Estimated-default-spreads-by-credit-rating_tbl2_288227112
[51] Pablo Fernández, Diego García and Javier F. Acin (2023), Survey: Market Risk Premium and Risk-free Rate used for 80 countries in 2023

Exhibit 74: *ROIC and WACC*



Source: Analysts estimates

Exhibit 75: *Final Valuation (in thousands except shareprice*

Annuity	2825915
Terminal Value	1294236
Steady states as a % of EV	48%
Enterprise Value	8576741
Net Financial Assets	-1283389
Equity Value	7293352
# shares outstanding (millions)	593
Target Share Price	12,29
Current Share Price	9,41
Capital gain	30,62%
Recommendation	**BUY**

Source: Analysts estimates

Exhibit 76: *Comparables' Trading Multiples*

	EV/Sales	EV/EBIT	EV/EBITDA	EV/BVA
Bloom Energy Corp.	2,84x	-40,01x	59,03x	2,15x
Doosan Fuel Cell Co	4,71x	92,54x	49,05x	2,23x
Ballard Systems Inc.	5,21x	-3,46x	-3,82x	0,42x
ITM Power plc	751,64x	-19,08x	-20,47x	3,67x
Fuel Cell Energy Inc.	7,30x	-9,06x	-12,75x	1,05x
Powercell Sweden AB	17,94x	-79,86x	-94,03x	12,70x
Nel ASA	12,55x	-24,81x	-33,04x	2,85x
Median	**7,30x**	**-19,08x**	**-12,75x**	**2,23x**
Average	**114,60x**	**-11,96x**	**-8,00x**	**3,58x**

Source: Bloomberg

the long-term economic growth of 2.1% [52]. After computing the yearly ROIC, we can observe that, from 2025 onwards, Plug will continuously create value with the ROIC exceeding the WACC (**Exhibit 74**) and the company experiencing positive growth, with the exception of 2033. In 2033, the highly negative growth can be explained by the end of the IRA aid. When reaching the first steady state, ROIC and RONIC will range around 19% and 20% respectively, both superior to the firm's WACC.

- Terminal Value and Valuation Outcome

For the first steady state, an annuity formula was applied to obtain the firm's value between 2040 and 2050 with a growth of 3%. Then, a final terminal value was computed assuming the firm grows at 2% in perpetuity. In the end, the values in both steady states account for c. 48% of the company's Enterprise Value of $8.57B. By adding Plug's current Net Financial Assets, we've obtained an Equity Value that reflects a target price of $12,29 per share. When compared to the current share price of $9,41 (as of May 8th, 2023), the 30.62% expected appreciation leads us to a confident final **BUY** recommendation (**Exhibit 75**).

Multiples Valuation

With the objective of complementing our DCF model, a valuation by multiples was performed, even though we acknowledge its fairness to be questionable since there isn't any company in the industry with a similar fully integrated hydrogen business model as Plug. The peers chosen as comparables are the ones previously analysed in the "Competitive Landscape" section because this way we have a representation of the segments in which Plug operates: Hydrogen, FCs for transport, FCs for stationary and electrolysers.

In terms of the chosen multiples for the valuation, we decided not to go with the usual EV/EBITDA nor EV/EBIT because most of the companies in the peer group do not have positive values for the earnings captions yet. Instead, we chose to go with a 50-50 weight split between the multiples where Plug is more in line with its peers: EV/Sales and EV/Book Value of Assets. (**Exhibit 76**).

In the end, we got to a Target Share Price of $16.46 using the industry median of the previously mentioned multiples, a higher value than the current share price, and a Capital Gain of 74.88%, empowering even more our recommendation to BUY.

[52] (https://www-statista-com.eu1.proxy.openathens.net/statistics/1370777/g7-country-gdp-growth-forecast/ s.d.)

To conclude, the valuation by multiples goes in line with our DCF Target Share Price of $12.29 and Capital Gain of 30.62%.

Sensitivity Analysis

In order to further evaluate our forecasting model on Plug Power, we analyzed the sensitivity of our final valuation to changes in the assumptions of WACC from 2024 onwards and the growth rate of the annuity (between 2041 and 2050), after that the company grows at a constant rate of 2%, a little below the expected economy's long-term growth. Regarding WACC, we performed increments and decrements of 0.5%, while the ones for the growth rate were of only 0.25%.

We computed three sensitivity analysis on Enterprise Value (**Exhibit 77**), Target Share Price (**Exhibit 78**), and Capital Gain (**Exhibit 79**). The first showed an interval between $6.9 Billion (when the WACC was 15.10% and the g was 2.50%) and $10.6 Billion (when WACC was 13.10% and the g was 3.50%). In terms of the other two metrics, the minimum value for this analysis was a Target Share Price of $9.54 with a Capital Gain of 1.39%, and the maximum was a Target Share Price of $15.77 with a Capital Gain of 67.55%.

To conclude, our sensitivity analysis showed that our forecasting model is more sensitive to favorable shocks on our assumptions (lower WACC and higher g) than it is to negative shocks (higher WACC and lower g), since the change in valuation is higher in the first case.

Exhibit 77: *Enterprise Value Sensitivity Analysis*

	8576741	WACC				
		13,10%	13,60%	14,10%	14,60%	15,10%
Growth Rate	2,50%	10304759	9329132	8452030	7660829	6944889
	2,75%	10386083	9399949	8513844	7714905	6992296
	3,00%	10468860	9472018	8576741	7769920	7040517
	3,25%	10553114	9545361	8640739	7825890	7089568
	3,50%	10638872	9620002	8705859	7882831	7139462

Source: Analysts estimates

Exhibit 78: *Target Share Price Sensitivity Analysis*

	12,29	WACC				
		13,10%	13,60%	14,10%	14,60%	15,10%
Growth Rate	2,50%	15,20	13,56	12,08	10,75	9,54
	2,75%	15,34	13,68	12,18	10,84	9,62
	3,00%	15,48	13,80	12,29	10,93	9,70
	3,25%	15,62	13,92	12,40	11,03	9,78
	3,50%	15,77	14,05	12,51	11,12	9,87

Source: Analysts estimates

Exhibit 79: *Capital Gain Sensitivity Analysis*

	30,62%	WACC				
		13,10%	13,60%	14,10%	14,60%	15,10%
Growth Rate	2,50%	61,56%	44,09%	28,38%	14,21%	1,39%
	2,75%	63,02%	45,36%	29,49%	15,18%	2,24%
	3,00%	64,50%	46,65%	30,62%	16,17%	3,10%
	3,25%	66,01%	47,96%	31,76%	17,17%	3,98%
	3,50%	67,55%	49,30%	32,93%	18,19%	4,88%

Source: Analysts estimates

Scenario Analysis

This forecasting of Plug's financial performance is based on our understanding of how the world is set to embrace the Green H2 evolution and the Net-Zero by 2050 objective set in the Paris Agreement. It is based on several macro-economic assumptions that carry uncertainty with them, and for that reason we developed two different possible scenarios besides the Base one to account for changes in our assumptions. We developed a Bear case in which our Base Case assumptions do not go as well as we think; and a Bull case where external factors are even more beneficial for Plug and its performance skyrockets.

- Bear Case

In this case we explored four assumptions that could potentially happen in the forecasted period and would be harmful for Plug's activities and profitability.

The first assumption has to do with the cost of production of Green Hydrogen per ton. Many specialists believe that, in a base case scenario, the cost of renewable hydrogen could drop to $2/ton in 2030 becoming competitive with hydrogen from

fossil fuels. In this scenario, we diminish the expectations of this price drop and assume that the cost won't be falling at such a fast pace. We do this because there is a chance that the predicted economies of scale regarding electrolysers might not materialize, with costs not decreasing as expected. Also, prices of energy from renewable sources such as solar and wind may not have such a steep decrease as expected in the Base case. This assumption is translated into a rise on overall COGS.

Exhibit 80: *Sensitivity Analysis on Bear Case Target Share Price*

		Change in Gross Profit				
	6,27	-3,00%	-4,00%	-5,00%	-6,00%	-7,00%
Change in Core IC	10,00%	7,94	7,10	6,27	5,43	4,59
	8,00%	8,29	7,45	6,61	5,78	4,94
	6,00%	8,64	7,80	6,96	6,12	5,29
	4,00%	8,99	8,15	7,31	6,47	5,63
	2,00%	9,33	8,50	7,66	6,82	5,98

Source: Analysts estimates

Secondly, there is a chance that Green H2 might not have the expected pivotal role towards Net-Zero. As of now, there are huge expectations regarding renewable hydrogen being in the front line of a sustainable world, but there is still a long way to go until Green H2 becomes 100% reliable and cost-efficient. In the Bear Case we explore the possibility of Green H2 failing to lead the way, with Energy Batteries remaining as the clients' favourites and overshadowing the growth of our source of energy. This way, the demand for Plug's products would see a strong decrease, with revenues going the same way.

The first and second assumptions together converge into decreasing Gross Margins for Plug Power.

Exhibit 81: *Sensitivity Analysis on Bear Case Capital Gain*

		Change in Gross Profit				
	-33,42%	-3,00%	-4,00%	-5,00%	-6,00%	-7,00%
Change in Core IC	10,00%	-30,00%	-38,89%	-47,78%	-56,67%	-65,56%
	8,00%	-26,07%	-34,96%	-43,85%	-52,74%	-61,63%
	6,00%	-22,13%	-31,02%	-39,91%	-48,80%	-57,69%
	4,00%	-18,20%	-27,09%	-35,98%	-44,87%	-53,76%
	2,00%	-14,26%	-23,15%	-32,04%	-40,93%	-49,82%

Source: Analysts estimates

The third and fourth assumptions are related to the on-going raw materials crisis that arise from the Covid-19 pandemic and got worse with the War on Ukraine. As Plug is pursuing a massive building project of new hydrogen plants, this crisis could mean delays on construction and higher needs for investment to conclude the project, and so the third assumption is an increase of PPE investment. Not only that, but the raw material crisis also affects Plug's product production, with longer supplier lead times than expected and the possibility of not being able to meet demand and not reducing pressure on Plug's inventories. This way, the fourth assumption is a stable pressure on Plug's inventories with constant Average Holding Periods (instead of decreasing).

The last two assumptions mean an increase on Total Core Invested Capital.

Exhibit 82: *Scenarios FCF Evolution*

Source: Analysts estimates

When applying the previous assumptions to the Base case scenario, we ended up with the Bear Case scenario with a -5% change on Gross Profit and a 10% increase on Change in Core Invested Capital. The final Target Share Price was $6.27, which is a Capital Loss of -33.42%. To conclude, we performed a sensitivity analysis on the Bear Case (**Exhibits 80 and 81**) with different percentual changes of Gross Profit and Core Invested Capital, with the average value for the Share Price settling at $6.96 per share, meaning a -39.91% Capital Loss.

- Bull Case

Since we consider our Base case to already have some pretty good assumptions behind it, our Bull Case won't have as many differences from the Base as our Bear Case. In fact, we ran our Bull Case with just one difference that impacts the final results a lot, a change in Corporate Tax Rate.

Exhibit 83: *Bull Case Scenario*

Core Result 2041	5696117,1
Unlevered Value of Annuity	32871397
Levered Value of Annuity	3058065
Core Result 2051	7580784
Terminal Value perpetuity	56319235
PV perpetuity	1400558
Enterprise Value	**9938758**
Net Financial Assets	-1283389
Equity Vlaue	**8655369**
# Shares Outstanding	593,39
Target Share Price	**14,59**
Current Share Price	9,41
Capital Gain	55,01%

Source: Analysts estimates

As the United States presidential elections are around the corner (November 5th, 2024), the former president Donald Trump is one of the runners for the Republican Party and the favourite to go head-to-head against Joe Biden[53]. In the event of the Republican Party winning the next elections and Donald Trump becoming the next U.S. President, it is likely that Trump will decrease the corporate tax rate from the 28% imposed by Biden, to the previous 21% in the start of his mandate on January 20th, 2025. This would come in line with the last time Donald Trump was president, where the corporate tax rate was cut down from 35% to 21% by the Tax Cuts and Job Acts of 2017.[54]

In this Bull Case, the corporate tax rate was established at 21% from 2025 onwards, achieving a final Target Share Price of $14.59 and a Capital Gain of 55.01%, reinforcing the BUY recommendation (**Exhibit 83**).

[53] (https://www.nytimes.com/interactive/2023/us/politics/presidential-candidates-2024.html s.d.)
[54] (https://www.investopedia.com/taxes/trumps-tax-reform-plan-explained/ s.d.)

Appendix

Forecasted Balance Sheet

in thousands except units and periods	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
CORE IC																					
Operating Cash	-1865	10047	14029	32686	52448	85933	138877	192446	256427	329990	438162	468558	517252	571486	632435	701376	749559	802141	859433	922782	992754
% of revenues	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Accounts receivable	43041	92675	129450	286558	438260	682758	1046334	1370845	1721224	2124594	2700996	2888373	3188542	3522859	3898571	4323554	4620572	4944705	5297876	5688382	6119714
Average Collection Period	47	66	67	64	61	58	55	52	49	47	45	45	45	45	45	45	45	45	45	45	45
Inventory	139386	269163	645636	1013364	1421656	2005982	2823485	3499740	4176224	4862279	5732159	6007867	6504814	7048705	7653621	8328217	8887986	9498735	10165055	10901108	11713346
Average Holding Period	135	146	263	244	227	211	196	182	169	157	146	144	141	139	137	135	135	135	135	135	135
Contract assets	18189	38757	104287	152342	244450	400521	647284	896957	1195166	1538030	2042200	2183875	2410830	2663603	2947676	3269002	3493575	3738650	4005679	4300937	4627064
% of revenues	5%	8%	15%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%
Prepaid expenses and other current assets	28973	59888	150389	228471	366606	600671	970746	1345187	1792418	2306619	3062734	3275206	3615576	3994666	4420697	4902596	5239394	5606937	6007407	6450213	6939312
% of revenues	9%	12%	21%	14%	14%	14%	14%	14%	14%	14%	14%	14%	14%	14%	14%	14%	14%	14%	14%	14%	14%
PPE	74549	255623	719793	1884423	3021729	3955454	4566449	5271823	6086156	6803648	7605724	8366296	9202926	10123219	11135541	12249095	12861549	13504627	14179858	14888851	15633294
Equipment related to PPAs and fuel delivered to customers	75807	72902	89293	110379	142726	191855	268136	372104	495057	626571	774387	903820	1028680	1150421	1269624	1387838	1506271	1626337	1749097	1875757	2007600
Equipment related to leaseback agreements	122740	245031	414029	683148	1093037	1694207	2541310	3255852	3770647	4105910	4311206	4311206	4311206	4311206	4311206	4311206	4311206	4311206	4311206	4311206	4311206
Goodwill	72387	220436	248607	310759	372911	403986	435062	466138	466138	466138	466138	466138	466138	466138	466138	466138	466138	466138	466138	466138	466138
Goodwill per existing M&A	14477	31491	31076	31076	31076	31076	31076	31076	31076	31076	31076	31076	31076	31076	31076	31076	31076	31076	31076	31076	31076
Intangible assets	39251	158208	207725	462779	719270	853973	990654	1125233	1137695	1151676	1167355	1184934	1204634	1223090	1241813	1258922	1277401	1297357	1318910	1342187	1367326
Gross acquired technology	9655	40138	163614	410566	657518	780993	904469	1027945	1027945	1027945	1027945	1027945	1027945	1027945	1027945	1027945	1027945	1027945	1027945	1027945	1027945
Number of existing M&A	5	7	8	10	12	13	14	15	15	15	15	15	15	15	15	15	15	15	15	15	15
New M&A	2	2	1	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Average Acquired technology with M&A		15242	123476	123476	123476	123476	123476	123476	123476	123476	123476	123476	123476	123476	123476	123476	123476	123476	123476	123476	123476
Customer relationship, backlog and trademark	596	89070	10761	13860	17647	22258	27855	33125	39171	46094	54010	63048	73354	83544	93339	100806	108870	117580	126986	137145	148117
# of trademarks	20	22	25	28	31	34	37	40	43	46	49	52	55	58	60	60	60	60	60	60	60
Trademarks pending	2	3	3	3	3	3	3	3	3	3	3	3	3	2	0	0	0	0	0	0	0
Value per single trademark	30	4049	430	495	569	655	753	828	911	1002	1102	1212	1334	1440	1556	1680	1815	1960	2116	2286	2469
Growth rate		13486%	-89%	15%	15%	15%	15%	10%	10%	10%	10%	10%	10%	8%	8%	8%	8%	8%	8%	8%	8%
In process R&D	29000	29000	33350	38353	44105	50721	58329	64162	70579	77636	85400	93940	103334	111601	120529	130171	140585	151832	163978	177096	191264
Growth to continuous investment			15%	15%	15%	15%	15%	10%	10%	10%	10%	10%	10%	8%	8%	8%	8%	8%	8%	8%	8%
Accounts Payable	50198	92307	191895	324195	489553	743528	1126473	1502920	1930406	2419188	3069819	3268276	3594488	3956538	4363920	4823538	5147744	5501478	5887397	6313705	6784137
Average Payable Period	49	50	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78
Accrued Expenses	46083	79237	156430	254716	382421	577324	870560	1215618	1650825	2052242	2576373	2925650	3358927	3865130	4459716	4994299	5506372	6079624	6721456	7442869	8253588
Deferred revenues and other contract liabilities	76285	183090	229898	477167	682087	995579	1433325	1769382	2100284	2407767	2848051	3045629	3362141	3714659	4110827	4558947	4872136	5213917	5586316	5998083	6452898
% of revenues	23%	36%	33%	29%	26%	23%	21%	18%	16%	15%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
Loss accrual for service contracts and other liabilities	49868	179597	227111	460824	655863	952612	1363887	1673159	1972070	2242772	2628970	2811350	3103514	3428916	3794609	4208259	4497357	4812846	5156599	5536692	5956522
% of revenues	15%	35%	32%	28%	25%	22%	20%	17%	15%	14%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%
Total CORE IC	**390024**	**888499**	**1917904**	**3648006**	**5663168**	**7606296**	**9634093**	**11635245**	**13443568**	**15193487**	**17177849**	**18005368**	**19031528**	**20110151**	**21248250**	**22612901**	**23390041**	**24188967**	**25008890**	**25856213**	**26730609**
NON CORE IC																					
Available-for-sale securities	—	1240265	1332943	1426249	1526086	1632912	1747216	1869522	2000388	2140415	2290244	2450561	2622101	2805648	3002043	3212186	3437039	3677632	3935066	4210521	4505257
Growth%			7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Equity securities	—	147995	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836
investments in non-consolidated entities and non-marketable equity securities	1000	12892	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250
Other assets	1675	4047	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694
Total NON CORE IC	**2675**	**1405199**	**1505723**	**1599029**	**1698866**	**1805692**	**1919996**	**2042302**	**2173168**	**2313195**	**2463024**	**2623341**	**2794881**	**2978428**	**3174823**	**3384966**	**3609819**	**3850412**	**4107846**	**4383301**	**4678037**
TOTAL IC	**392699**	**2293698**	**3423627**	**5247035**	**7362034**	**9411989**	**11554089**	**13677547**	**15616736**	**17506682**	**19640874**	**20628710**	**21826408**	**23088578**	**24423073**	**25997867**	**26999860**	**28039379**	**29116736**	**30239514**	**31408646**
FINANCING																					
Excess Cash	1636149	3122147	1535315	0	0	0	0	0	0	0	0	0	0	63289	1749948	3548680	6039292	8613115	11268238	14004741	16828846
Debt, leases, obligations and other debt instruments	561929	810149	898728	1283389	3275970	4983687	6429121	7487882	8069441	7903743	6696715	4158278	1472630	0	0	0	0	0	0	0	0
Net Financial Assets	**1074219,7**	**2311998**	**636587**	**-1283389**	**-3275970**	**-4983687**	**-6429121**	**-7487882**	**-8069441**	**-7903743**	**-6696715**	**-4158278**	**-1472630**	**63289**	**1749948**	**3548680**	**6039292**	**8613115**	**11268238**	**14004741**	**16828846**
Total Stockholders' Equity	**1466919**	**4605696**	**4060214**	**3963646**	**4086064**	**4428302**	**5124968**	**6189665**	**7547295**	**9602938**	**12944159**	**16470432**	**20353778**	**23151867**	**26173021**	**29546547**	**33039152**	**36652494**	**40384974**	**44244255**	**48237492**
Financing	**392699**	**2293698**	**3423627**	**5247035**	**7362034**	**9411989**	**11554089**	**13677547**	**15616736**	**17506682**	**19640874**	**20628710**	**21826408**	**23088578**	**24423073**	**25997867**	**26999860**	**28039379**	**29116736**	**30239514**	**31408646**
Difference	0	0	0																		
Check	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
Financing Drivers Forecast																					
Net transactions with shareholders		3602732	152507	26999	-34226	-95683	-194775	-297669	-379568	-574719	-934143	-985880	-1085711	-782293	-844658	-943175	-976467	-1010223	-1043531	-1078983	-1116435
% of Total Comprehensive Income		-777%	-22%	-22%	-22%	-22%	-22%	-22%	-22%	-22%	-22%	-22%	-22%	-22%	-22%	-22%	-22%	-22%	-22%	-22%	-22%

Forecasted Income Statement – Part 1 and 2

In thousands except units and rates (prices also in thousands for simplicity)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Core																					
FC Systems, related infraestructure and equipment																					
GenDrive revenues	161400	246600	350918	411834	590340	929890	1489718	2110426	2607112	3156403	3737174	3964413	4205434	4461138	4732356	5020098	5325307	5649089	5992559	6356907	6743411
GenDrive units	9418	12806	19284	22632	31558	48497	75799	105070	127253	151043	175328	182342	189635	197221	205109	213314	221846	230720	239949	249547	259529
US trend	183000	186880	190843	194889	199021	203241	207551	211952	220430	229247	238417	247953	257871	268186	278914	290070	301673	313740	326290	339341	352915
Penetration rate US	5%	6%	10%	10%	12%	15%	18%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
EMEA trend	415000	430976	447568	464798	482691	501274	520571	540612	562236	584726	608115	632439	657737	684047	711408	739865	769459	800237	832247	865537	900158
penetration rate EMEA	0,1%	0,2%	0,2%	0,5%	1%	3%	5%	8%	10%	12%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
APAC trend	480000	500991	522900	545768	569635	594546	620547	647685	673592	700536	728557	757699	788008	819528	852309	886401	921857	958732	997081	1036964	1078443
penetration rate APAC	0%	0%	0%	0,3%	0,5%	1%	2%	3%	4%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
GenDrive price	17	19	18	18	19	19	20	20	20	21	21	22	22	23	23	24	24	24	25	25	26,0
AVG energy capacity kwh	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Price Kwh	0,107	0,120	0,114	0,114	0,117	0,120	0,123	0,126	0,128	0,131	0,133	0,136	0,139	0,141	0,144	0,147	0,150	0,153	0,156	0,159	0,162
ProGen revenues	0	2000	2846	14336	30425	64106	137700	246852	371249	419531	582804	500088	574143	671575	779079	925550	1099551	1306268	1551845	1843592	2190187
ProGen units	0	100	142	614	1162	2190	4207	7252	10592	11626	15686	13073	15105	17846	20912	25095	30113	36136	43363	52036	62443
FCEVs US deployments	650	1500	4290	3934	5788	7530	9798	12747	16585	21578	28075	24265	29118	34942	41930	50316	60379	72455	86946	104336	125203
market share		7%	3%	5%	10%	15%	25%	35%	40%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
FCEVs EU deployments	1250	500	1095	3595	2315	3012	3919	5099	6634	8631	11230	9706	11647	13977	16772	20126	24152	28982	34779	41734	50081
market share				6%	8%	12%	16%	20%	25%	25%	30%	25%	20%	18%	15%	15%	15%	15%	15%	15%	15%
FCEVs SK deployments	500	1000	1729	2174	2656	3496	4522	5901	7666	9982	12982	11223	13465	16159	19391	23269	27923	33508	40209	48251	57901
market share				10%	15%	20%	25%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
ProGen price	0	20	20	23	26	29	33	34	35	36	37	38	38	38	37	37	37	36	36	35	35
AVG energy capacity kwh		280	280	291	303	315	328	341	354	368	383	399	400	400	400	400	400	400	400	400	400
Price/kwh		0,07	0,07	0,08	0,09	0,09	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,09	0,09	0,09	0,09	0,09	0,09	0,09	0,09
GenSure revenues	8000	8000	11384	3034	25990	66989	70497	74131	77966	82172	88498	105036	115090	126723	140141	155546	180726	212253	251802	301491	363998
GenSure MWs deployed	92	72	108	30	250	629	645	664	685	708	747	869	934	1008	1093	1189	1355	1560	1814	2130	2521
US deployments	92	72	108	30	250	129	145	164	185	208	247	369	434	508	593	689	855	1060	1314	1630	2021
SK JV deployments						500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
GenSure AVG price MW	84	106	102	101	104	107	109	112	114	116	118	121	123	126	128	131	133	136	139	142	144
H2 infraestructure revenues	63253	103684	147545	193047	284350	461477	762423	1125859	1450069	1723927	2116162	2134387	2317532	2532219	2772834	3066776	3405575	3799345	4258910	4799875	5430716
# H2 sites sold	27	49	53	67	96	152	245	354	447	521	627	620	660	707	759	823	896	980	1077	1190	1320
AVG size fleet GenDrive	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373
AVG size fleet ProGen	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
AVG price per installation	2343	2116	2784	2881	2962	3036	3112	3180	3244	3309	3375	3443	3511	3582	3653	3726	3801	3877	3954	4034	4114
daily H2 demand per fleet (kg)	373	973	973	973	973	973	973	973	973	973	973	973	973	973	973	973	973	973	973	973	973
daily price per fueling dispenser	1,571	0,544	0,715	0,740	0,761	0,780	0,800	0,817	0,834	0,850	0,867	0,885	0,902	0,920	0,939	0,958	0,977	0,996	1,016	1,036	1,057
Electrolyzers revenues	4187	16667	23718	396754	694272	1211345	2113521	2938872	4078533	5660141	8000000	8849290	9788741	10827925	11977431	13248970	13784228	14341111	14920492	15523280	16150420
Global MWs of electrolyzer deployed	62	209	885	4119	3696	6173	10309	17216	28750	48013	80325	76000	104880	144734	199733	275632	380372	524914	724381	999646	1379512
Plug MWs deployed	5	20	250	484	935	1809	3500	5411	8367	12936	20000	21689	23522	25508	27663	30000	30600	31212	31836	32473	33122
market share	8%	10%	28%	12%	25%	29%	34%	31%	29%	27%	25%	29%	22%	18%	14%	11%	8%	6%	4%	3%	2%
Price per MW	837	833	791	820	742	669	604	543	487	438	400	408	416	424	433	442	450	459	469	478	488
price reduction CAGR					-12%	-12%	-12%	-12%	-12%	-12%											
Oil and Gas Equipment/ Liquifiers Revenues	0	15826	22521	355210	586861	963371	1575186	2043368	2835763	3652433	5162321	5267894	5827141	6445757	7130046	7886980	8205614	8537121	8882021	9240855	9614185
Liquefiers	0	8255	11747	196508	343866	599967	1046806	1455594	2020057	2803412	3962321	4382966	4848266	5362964	5932303	6562083	6827192	7103010	7389972	7688527	7999143
as a % of electrolyzers	0%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Oil and gas Equipment	0	7571	10774	158702	242995	363404	528380	587774	815707	849021	1200000	884929	978874	1082793	1197743	1324897	1378423	1434111	1492049	1552328	1615042
as a % of electrolyzers	0%	45%	45%	40%	35%	30%	25%	20%	20%	15%	15%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
GenCare (services)																					
GenCare revenues	26171	27203	35280	50968	58087	81464	96474	141300	148580	200084	174308	216793	261954	310354	360799	412048	452563	508975	556049	603449	650850
AVG # FC systems under maintenance	12417	16987	21704	28438	31527	43137	49839	71425	73632	97212	83028	101240	119931	139304	158771	177768	195247	211058	226057	240517	254323
as a % of total FC systems	30%	30%	30%	30%	25%	25%	20%	20%	15%	15%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
AVG income	2,11	1,60	1,63	1,79	1,84	1,89	1,94	1,98	2,02	2,06	2,10	2,14	2,18	2,23	2,27	2,32	2,32	2,41	2,46	2,51	2,56
as a % of FC prices	12%	8%	9%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Genkey (PPAs)																					
GenKey PPAs revenues	29397	38597	47183	70379	98476	142824	215369	321529	459290	624135	828214	1037870	1268288	1522899	1804538	2117902	2468010	2861086	3303778	3804085	4371468
Cummulative H2 installations	102	151	204	271	367	519	764	1118	1565	2086	2713	3333	3993	4700	5459	6282	7178	8158	9235	10425	11745
AVG Genkey sites	39	61	83	108	147	208	306	447	626	834	1085	1333	1597	1880	2184	2513	2871	3263	3694	4170	4698
as a % of total sites	38%	40%	41%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
AVG GenKey income	754	633	568	652	670	687	704	719	734	748	763	779	794	810	826	843	860	877	894	912	930
Fuel Delivered																					
GenFuel revenues	39091	49542	57196	135143	246757	362527	465064	593868	757600	936495	1159208	1288621	1434466	1598341	1838939	2140104	2454977	2783286	3137940	3540719	3988141
Total H2 tons dispensed	19494	24070	30916	68559	121771	174538	218444	272939	341363	413696	502038	547142	597125	652295	735770	839478	944108	1049378	1159895	1283114	1416916
H2 tons dispensed for Plugs products	19494	24070	30916	39973	53810	71656	103426	150855	212737	284439	371052	454053	542040	637127	735770	839478	944108	1049378	1159895	1283114	1416916
External H2 tons dispensed	0	0	0	28586	67961	102882	115017	122084	128625	129257	130986	93089	55085	15168	0	0	0	0	0	0	0
H2 price charged per ton	2,0	2,1	1,9	2,0	2,0	2,1	2,1	2,2	2,2	2,3	2,3	2,4	2,4	2,5	2,5	2,5	2,6	2,7	2,7	2,8	2,8
H2 price/kg	0,0020	0,0021	0,0019	0,0020	0,0020	0,0021	0,0021	0,0022	0,0022	0,0023	0,0023	0,0024	0,0024	0,0025	0,0025	0,0025	0,0026	0,0027	0,0027	0,0028	0,0028
Other																					
Other revenues	311	789	2849	3571	6819	12673	17903	26070	35204	44183	59392	63525	69832	77366	85581	94850	101423	108520	116262	124844	134305
as % revenues	0,1%	0,2%	0,4%	0,2%	0,3%	0,3%	0,3%	0,3%	0,3%	0,3%	0,3%	0,3%	0,3%	0,3%	0,3%	0,3%	0,3%	0,3%	0,3%	0,3%	0,3%
Total sales	331810	508908	701440	1634278	2622377	4296666	6943856	9622275	12821366	16499504	21908081	23427918	25862620	28574297	31621743	35068824	37477972	40107053	42971658	46139097	49637681
Provision for Common Stock Warrants recorded as a reduction of revenue	-425047	-6566	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Accelerated vesting																					
Total Revenues	**-93237**	**502342**	**701440**	**1634278**	**2622377**	**4296666**	**6943856**	**9622275**	**12821366**	**16499504**	**21908081**	**23427918**	**25862620**	**28574297**	**31621743**	**35068824**	**37477972**	**40107053**	**42971658**	**46139097**	**49637681**
COGS																					
FC Systems, related infraestructure and equipment																					
GenDrive COGS	116807	192845	293864	332805	444572	652455	1045257	1480775	1829274	2214682	2622179	2781620	2950732	3130146	3320446	3522339	3736488	3963669	4204664	4460308	4731497
GenDrive units	9418	12806	19284	22632	31558	48497	75799	105070	127253	151043	175328	182342	189635	197221	205109	213314	221846	230720	239949	249547	259529
COGS per unit	12,4	15,1	15,2	14,7	14,1	13,5	13,8	14,1	14,4	14,7	15,0	15,3	15,6	15,9	16,2	16,5	16,8	17,2	17,5	17,9	18,2
Gross Margin	28%	22%	16%	19%	25%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
ProGen COGS	0	1564	2383	9920	17989	32377	63761	112325	167354	187355	257843	219185	258314	311306	372082	455431	557446	682315	835153	1022228	1251206
ProGen units	0	100	142	614	1162	2190	4207	7252	10592	11626	15686	13073	15105	17846	20912	25095	30113	36136	43363	52036	62443
COGS per unit	0,0	15,6	16,7	16,2	15,5	14,8	15,2	15,5	15,8	16,1	16,4	16,8	17,1	17,4	17,8	18,1	18,5	18,9	19,3	19,6	20,0

Gross Margin	0	22%	16%	31%	41%	49%	54%	54%	55%	55%	56%	56%	55%	54%	52%	51%	49%	48%	46%	45%	43%
GenSure COGS	5790	6256	9533	2564	20467	49151	46931	44908	43064	41382	40636	43974	43931	44104	44470	45003	47675	51051	55220	60282	66359
GenSure MWs deployed	92	72	108	30	250	629	645	664	685	708	747	869	934	1008	1093	1189	1355	1560	1814	2130	2521
COGS per MW	63,2	86,3	88,6	85,5	81,9	78,2	72,7	67,6	62,9	58,5	54,4	50,6	47,0	43,8	40,7	37,8	35,2	32,7	30,4	28,3	26,3
Gross Margin	28%	22%	16%	15%	21%	27%	33%	39%	45%	50%	54%	58%	62%	65%	68%	71%	74%	76%	78%	80%	82%
H2 infraestructure COGS	45777	81082	123556	159926	232869	373310	608711	886333	1124521	1315512	1587122	1600791	1738149	1899165	2079625	2300082	2554181	2849508	3194183	3599906	4073037
#H2 sites sold	27	49	53	67	96	152	245	354	447	521	627	620	660	707	759	823	896	980	1077	1190	1320
COGS per site	1695	1655	2331	2387	2426	2456	2485	2504	2516	2525	2531	2582	2634	2686	2740	2795	2851	2908	2966	3025	3086
Gross Margin	28%	22%	16%	17%	18%	19%	20%	21%	22%	24%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Electrolyzer COGS	3030	13034	19861	267616	455539	775427	1319944	1795885	2443440	3324489	4400000	4867109	5383808	5955359	6587587	7286933	7581325	7887611	8206270	8537804	8882731
MWs deployed	5	20	250	484	935	1809	3500	5411	8367	12936	20000	21689	23522	25508	27663	30000	30600	31212	31836	32473	33122
COGS per MW	606	652	629	553	487	429	377	332	292	257	220	224	229	233	238	243	248	253	258	263	268
Gross Margin	28%	22%	16%	33%	34%	36%	38%	39%	40%	41%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%
Oil and Gas Equipment/ Liquifier COGS	0	12376	18859	284168	457752	732162	1165638	1471225	1985034	2556703	3613625	3687526	4078998	4512030	4991032	5520886	5743930	5975985	6217415	6468598	6729930
Gross Margin		22%	16%	20%	22%	24%	26%	28%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
as a % of revenues		78%	84%	80%	78%	76%	74%	72%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
Services performed on FC systems and related infrastructure																					
GenCare COGS	42524	63729	59365	76617	83071	110821	124837	173897	173892	222692	184493	218213	250744	282511	312331	339210	361386	398464	435317	472425	509534
FCs under maintenance	12417	16987	21704	28438	31527	43137	49839	71425	73632	97212	83028	101240	119931	139304	158771	177768	195247	211058	226057	240517	254323
Cost of maintenance/unit	3,4	3,8	2,7	2,7	2,6	2,6	2,5	2,4	2,4	2,3	2,2	2,2	2,1	2,0	2,0	1,9	1,9	1,9	1,9	2,0	2,0
Purchase Power Agreements																					
GenKey COGS	64640	102417	144696	74928	96886	130236	182017	252593	336056	425331	542500	679830	830759	997536	1182016	1387278	1616606	1874081	2164055	2491768	2863418
cost per site	1657	678	709	694	659	626	595	565	537	510	500	510	520	531	541	552	563	574	586	598	609
Fuel delivered to customers and related equipment																					
GenFuel COGS	61815	127196	194255	274234	443247	578140	658452	748671	852085	939700	1004076	1077104	1157045	1244104	1381280	1551232	1717183	1878687	2043942	2225577	2419073
H2 cost/ton	3,17	5,28	6,28	4	3,6	3,3	3,0	2,7	2,5	2,3	2,00	1,97	1,94	1,91	1,88	1,85	1,82	1,79	1,76	1,73	1,71
cost reduction					-9%	-9%	-9%	-9%	-9%	-9%		-6%	-6%	-6%	-6%						
Provision (benefit) for loss contracts related to service																					
Provisions	35473	71988	26801	26801	26801	26801	26801	26801	26801	26801	26801	26801	26801	26801	26801	26801	26801	26801	26801	26801	26801
Other																					
Other COGS	323	1165	2622	3814	6119	10027	16204	22454	29919	38503	51124	54671	60352	66680	73791	81835	87457	93592	100277	107668	115833
% sales	0,1%	0,2%	0,4%	0,2%	0,2%	0,2%	0,2%	0,2%	0,2%	0,2%	0,2%	0,2%	0,2%	0,2%	0,2%	0,2%	0,2%	0,2%	0,2%	0,2%	0,2%
Total COGS	**376179**	**673652**	**895796**	**1513393**	**2285312**	**3470906**	**5258552**	**7015867**	**9011439**	**11293150**	**14330398**	**15256824**	**16779634**	**18469741**	**20371462**	**22517031**	**24030479**	**25681764**	**27483296**	**29473366**	**31669418**
Accelerated vesting																					
Gross profit	**-469416**	**-171310**	**-194356**	**120886**	**337065**	**825760**	**1685304**	**2606408**	**3809926**	**5206354**	**7577683**	**8171094**	**9082986**	**10104557**	**11250280**	**12551793**	**13447493**	**14425289**	**15488362**	**16665731**	**17968263**
Operating Expenses																					
R&D	27848	64762	99579	77647	85966	94285	102605	110924	119243	127562	135882	144201	152520	160840	166386	166386	166386	166386	166386	166386	166386
# patents	20	22	25	28	31	34	37	40	43	46	49	52	55	58	60	60	60	60	60	60	60
expense/patent	1392	2944	3983	2773	2773	2773	2773	2773	2773	2773	2773	2773	2773	2773	2773	2773	2773	2773	2773	2773	2773
SG&A	79348	179852	363929	449780	515596	755479	1107440	1547032	2132633	2597392	3201554	3674119	4267099	4962660	5780449	6458959	7146581	7913561	8768918	9725250	10794319
#employees	1285	2299	3000	4115,658941	5646,216173	7745,966692	10626,58569	14578,46747	20000	23299,86102	27144,17617	31622,7766	36840,31499	42918,71095	50000	54928,02717	60341,76337	66289,08035	72822,56812	80000	87884,84346
AVG wage per employee	60	62	64	66	68	70	72	73	75	76	78	79	81	82	84	86	87	89	91	93	95
Salaries	77100	142538	192000	272621	384478	540646	760247	1065918	1491565	1772416	2106150	2502723	2973968	3533945	4199362	4705518	5272682	5908208	6620335	7418295	8312435
marketing costs	2248	37314	171929	177159	131119	214833	347193	481114	641068	824975	1095404	1171396	1293131	1428715	1581087	1753441	1873899	2005353	2148583	2306955	2481884
% sales	0,68%	7,33%	24,51%	10,84%	5,00%	5,00%	5,00%	5,00%	5,00%	5,00%	5,00%	5,00%	5,00%	5,00%	5,00%	5,00%	5,00%	5,00%	5,00%	5,00%	5,00%
Impairment of long-lived assets	6430	10224	5218	7291	7291	7291	7291	7291	7291	7291	7291	7291	7291	7291	7291	7291	7291	7291	7291	7291	7291
Total operating expenses	**113626**	**254838**	**468726**	**534717**	**608853**	**857055**	**1217335**	**1665247**	**2259167**	**2732245**	**3344726**	**3825610**	**4426910**	**5130790**	**5954125**	**6632636**	**7320257**	**8087237**	**8942594**	**9898927**	**10967996**
Core Result before taxes	**-583042**	**-426148**	**-663082**	**-413832**	**-271788**	**-31295**	**467969**	**941161**	**1550759**	**2474109**	**4232957**	**4345483**	**4656076**	**4973767**	**5296155**	**5919157**	**6127235**	**6338052**	**6545768**	**6766805**	**7000267**
Statutory Taxes	122439	89491	139247	86905	76101	8763	-131031	-263525	-434213	-692751	-1185228	-1216735	-1303701	-1392655	-1482923	-1657364	-1715626	-1774654	-1832815	-1894705	-1960075
Tax adjustments	0	6190	8412	219000	383250	547500	689807	869102	434213	692751	1185228	1216735	1303701	0	0	0	0	0	0	0	0
IRA PTC				219000	383250	547500	689807	869102	1095000	1335900	1629798	1792778	1972056	0	0	0	0	0	0	0	0
Sale of PTC due to no tax burden				0	0	0	0	0	561669	546677	377885	489636	568101	0	0	0	0	0	0	0	0
Tax from sale of PTC				0	0	0	0	0	-157267	-153070	-105808	-137098	-159068	0	0	0	0	0	0	0	0
Core Result	**-460603**	**-330467**	**-515423**	**-107927**	**187563**	**524968**	**1026744**	**1546738**	**1955161**	**2867717**	**4505034**	**4698021**	**5065109**	**3581112**	**3813232**	**4261793**	**4411610**	**4563397**	**4712953**	**4872100**	**5040192**
Non-Core																					
Change in fair value of contingent consideration	-1160	-11176	16468	16468	16468	16468	16468	16468	16468	16468	16468	16468	16468	16468	16468	16468	16468	16468	16468	16468	16468
interest income	765	4040	37259	22083	23461	31518	28848	31513	34705	35797	38485	41160	43591	46574	49658	52890	56438	60196	64210	68524	73130
% investment holdings	28,60%	0,29%	2,47%	1,38%	1,38%	1,75%	1,50%	1,54%	1,60%	1,55%	1,56%	1,57%	1,56%	1,56%	1,56%	1,56%	1,56%	1,56%	1,56%	1,56%	1,56%
other expense, net	-739	-765	-2303	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Realized loss on investments, net	0	-81	-1395	-492	-492	-492	-492	-492	-492	-492	-492	-492	-492	-492	-492	-492	-492	-492	-492	-492	-492
Change in fair value of equity securities	0	6738	-18159	-5711	-5711	-5711	-5711	-5711	-5711	-5711	-5711	-5711	-5711	-5711	-5711	-5711	-5711	-5711	-5711	-5711	-5711
Change in fair value of common stock warrant liability	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
loss on equity method investments	0	-5704	-20166	-12935	-15000	-5000	12935	12935	12935	12935	12935	12935	12935	12935	12935	12935	12935	12935	12935	12935	12935
other gain	0	159	1168	1168	1168	1168	1168	1168	1168	1168	1168	1168	1168	1168	1168	1168	1168	1168	1168	1168	1168
Non-Core Result before taxes	-1134	-6789	12872	20581	19895	37952	53216	54713	59074	60165	62853	65529	67959	70943	74027	77259	80806	84564	88578	92893	97498
Statutory Taxes	238,14	1425,69	-2703,12	-4322	-5571	-10627	-14901	-15320	-16541	-16846	-17599	-18348	-19029	-19864	-20727	-21632	-22626	-23678	-24802	-26010	-27299
Tax adjustments	-16302	-118564	-161116,178	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Foreign currency translation (loss) gain	1163	-1315	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in net unrealized loss on available-for-sale securities	0	-2668	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-core Result	**-16035**	**-127911**	**-150947**	**16259**	**14324**	**27325**	**38316**	**39393**	**42533**	**43319**	**45254**	**47181**	**48931**	**51079**	**53299**	**55626**	**58180**	**60886**	**63776**	**66883**	**70199**
Financing																					
interest expense	-60510	-43225	-39037	-43305	-61840	-157852	-240139	-309787	-360803	-388826	-380842	-322681	-200366	-70959	0	0	0	0	0	0	0
% Previous-year-Debt		7,69%	4,82%	4,82%	4,82%	4,82%	4,82%	4,82%	4,82%	4,82%	4,82%	4,82%	4,82%	4,82%	4,82%	4,82%	4,82%	4,82%	4,82%	4,82%	4,82%
Gain (loss) on extinguishment of debt	17686	0	-986	-986	-986	-986	-986	-986	-986	-986	-986	-986	-986	-986	-986	-986	-986	-986	-986	-986	-986
Financing Result before taxes	**-42824**	**-43225**	**-40023**	**-44291,17588**	**-62826**	**-158838,49**	**-241124,77**	**-310772,95**	**-361789,30**	**-389811,71**	**-381827,59**	**-323666,95**	**-201352,45**	**-71944,62**	**-986,00**	**-986,00**	**-986,00**	**-986,00**	**-986,00**	**-986,00**	**-986,00**
Statutory taxes	8993	9077	8405	12402	17591	44475	67515	87016	101301	109147	106912	90627	56379	20144	276	276	276	276	276	276	276
Tax adjustments	-84018	28569,72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Preferred stock dividends declared	-26	0	0	-8,7	-8,7	-8,7	-8,7	-8,7	-8,7	-8,7	-8,7	-8,7	-8,7	-8,7	-8,7	-8,7	-8,7	-8,7	-8,7	-8,7	-8,7
Financing Result	**-117874,96**	**-5578,03**	**-31618,17**	**-31898,3**	**-45243,4**	**-114372,4**	**-173618,5**	**-223765,2**	**-260497,0**	**-280673,1**	**-274924,5**	**-233048,9**	**-144982,4**	**-51808,8**	**-718,6**	**-718,6**	**-718,6**	**-718,6**	**-718,6**	**-718,6**	**-718,6**
Total Comprehensive Income (loss)	**-594513**	**-463955**	**-697989**	**-123566**	**156644**	**437921**	**891442**	**1362367**	**1737197**	**2630363**	**4275364**	**4512153**	**4969057**	**3580382**	**3865812**	**4316701**	**4469071**	**4623565**	**4776011**	**4938264**	**5109672**
check	TRUE	TRUE	TRUE																		
inflation			6,50%	3,50%	2,80%	2,5%	2,50%	2,20%	2,00%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%

Free Cash-Flow Map

in thousand	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Core Result	-460603	-330467	-515423	-107927	187563	524968	1026744	1546738	1955161	2867717	4505034	4698021	5065109	3581112	3813232	4261793	4411610	4563397	4712953	4872100	5040192
Operational CF	-460603	-330467	-515423	-107927	187563	524968	1026744	1546738	1955161	2867717	4505034	4698021	5065109	3581112	3813232	4261793	4411610	4563397	4712953	4872100	5040192
Core IC	390024	888499	1917904	3648006	5663168	7606296	9634093	11635245	13443568	15193487	17177849	18005368	19031528	20110151	21248250	22612901	23390041	24188967	25008890	25856213	26730609
NWC	5290	-63701	238457	196519	313496	506821	832482	1144095	1487875	2039543	2853039	2772974	2817944	2836077	2823928	2939703	2967476	2983303	2983681	2972074	2945045
changes in NWC		-68991	302158	-41938	116977	193326	325660	311613	343780	551668	813496	-80065	44970	18133	-12148	115774	27774	15826	378	-11607	-27029
PP&E	74549	255623	719793	1884423	3021729	3955454	4566449	5271823	6086156	6803648	7605724	8366296	9202926	10123219	11135541	12249095	12861549	13504627	14179858	14888851	15633294
changes in PP&E		181074	464170	1164630	1137305	933725	610995	705374	814333	717492	802076	760572	836630	920293	1012322	1113554	612455	643077	675231	708993	744443
Equipment related to PPAs and fuel delivered to customers	75807	72902	89293	110379	142726	191855	268136	372104	495057	626571	774387	903820	1028680	1150421	1269624	1387838	1506271	1626337	1749097	1875757	2007600
changes in Equipment related to PPAs and fuel delivered to customers		-2905	16391	21086	32347	49129	76281	103968	122953	131514	147815	129433	124860	121741	119203	118213	118433	120066	122760	126660	131843
Equipment related to leaseback agreements	122740	245031	414029	683148	1093037	1694207	2541310	3255852	3770647	4105910	4311206	4311206	4311206	4311206	4311206	4311206	4311206	4311206	4311206	4311206	4311206
changes in equipment related to leaseback agreements		122291	168998	269119	409889	601170	847103	714542	514795	335263	205296	0	0	0	0	0	0	0	0	0	0
Goodwill	72387	220436	248607	310759	372911	403986	435062	466138	466138	466138	466138	466138	466138	466138	466138	466138	466138	466138	466138	466138	466138
changes in Goodwill		148049	28171	62152	62152	31076	31076	31076	0	0	0	0	0	0	0	0	0	0	0	0	0
Intangible assets	39251	158208	207725	462779	719270	853973	990654	1125233	1137695	1151676	1167355	1184934	1204634	1223090	1241813	1258922	1277401	1297357	1318910	1342187	1367326
changes in Intangible assets		118957	49517	255054	256492	134703	136681	134579	12462	13981	15680	17578	19700	18456	18723	17109	18478	19956	21553	23277	25139
Changes in Core IC		498475	1029405	1730102	2015161	1943129	2027797	2001153	1808322	1749919	1984363	827519	1026159	1078623	1138099	1364651	777139	798926	819923	847323	874396
Core FCF		**-828941**	**-1544828**	**-1838029**	**-1827599**	**-1418161**	**-1001052**	**-454415**	**146839**	**1117798**	**2520671**	**3870502**	**4038950**	**2502489**	**2675132**	**2897142**	**3634470**	**3764471**	**3893030**	**4024776**	**4165796**
Non Core Result	-16035	-127911	-150947	16259	14324	27325	38316	39393	42533	43319	45254	47181	48931	51079	53299	55626	58180	60886	63776	66883	70199
Non Core IC	2675	1405199	1505723	1599029	1698866	1805692	1919996	2042302	2173168	2313195	2463024	2623341	2794881	2978428	3174823	3384966	3609819	3850412	4107846	4383301	4678037
Available-for-sale securities	0	1240265	1332943	1426249	1526086	1632912	1747216	1869522	2000388	2140415	2290244	2450561	2622101	2805648	3002043	3212186	3437039	3677632	3935066	4210521	4505257
changes in Available-for-sale securities		1240265	92678	93306	99837	106826	114304	122305	130867	140027	149829	160317	171539	183547	196395	210143	224853	240593	257434	275455	294736
Equity securities	0	147995	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836	134836
changes in Equity securities		147995	-13159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
investments in non-consolidated entities and non-marketable equity securities	1000	12892	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250	31250
changes in investments in non-consolidated entities and non-marketable equity securities		11892	18358	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other assets	1675	4047	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694	6694
changes in Other assets		2372	2647	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Changes in non core IC		1402524	100524	93306	99837	106826	114304	122305	130867	140027	149829	160317	171539	183547	196395	210143	224853	240593	257434	275455	294736
Non Core FCF		**-1530435**	**-251471**	**-77047**	**-85513**	**-79501**	**-75988**	**-82912**	**-88333**	**-96708**	**-104575**	**-113136**	**-122609**	**-132468**	**-143096**	**-154517**	**-166673**	**-179706**	**-193658**	**-208572**	**-224538**
Financing Result	-117875	-5578	-31618	-31898	-45243	-114372	-173619	-223765	-260497	-280673	-274925	-233049	-144982	-51809	-719	-719	-719	-719	-719	-719	-719
Excess cash	1636149	3122147	1535315	0	0	0	0	0	0	0	0	0	0	63289	1749948	3548680	6039292	8613115	11268238	14004741	16828846
changes in Excess cash		1485998	-1586832	-1535315	0	0	0	0	0	0	0	0	0	63289	1686659	1798732	2490612	2573823	2655123	2736503	2824105
Debt, leases, obligations and other debt instruments	561929	810149	898728	1283389	3275970	4983687	6429121	7487882	8069441	7903743	6696715	4158278	1472630	0	0	0	0	0	0	0	0
changes Debt, leases, obligations and other debt instruments		248220	88579	384661	1992581	1707717	1445434	1058761	581559	-165697	-1207029	-2538437	-2685648	-1472630	0	0	0	0	0	0	0
Changes in Net Financial Assets		1237778	-1675411	-1919976	-1992581	-1707717	-1445434	-1058761	-581559	165697	1207029	2538437	2685648	1535919	1686659	1798732	2490612	2573823	2655123	2736503	2824105
Transactions with Shareholders	0	3602732	152507	26999	-34226	-95683	-194775	-297669	-379568	-574719	-934143	-985880	-1085711	-782293	-844658	-943175	-976467	-1010223	-1043531	-1078983	-1114635
Financing CF		**2359376**	**1796299**	**1915076**	**1913112**	**1497661**	**1077040**	**537326**	**-58506**	**-1021090**	**-2416096**	**-3757366**	**-3916341**	**-2370021**	**-2532036**	**-2742625**	**-3467798**	**-3584765**	**-3699373**	**-3816204**	**-3941259**
Check		TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
Total FCF		**-2359376**	**-1796299**	**-1915076**	**-1913112**	**-1497661**	**-1077040**	**-537326**	**58506**	**1021090**	**2416096**	**3757366**	**3916341**	**2370021**	**2532036**	**2742625**	**3467798**	**3584765**	**3699373**	**3816204**	**3941259**
ROIC			-58%	-6%	5%	9%	13%	16%	17%	21%	30%	27%	28%	19%	19%	20%	20%	20%	19%	19%	19%
RR			-269%	-372%	-3380%	3019%	1449%	938%	752%	688%	530%	381%	383%	376%	562%	557%	531%	530%	530%	531%	531%
g			56%	-79%	-274%	180%	96%	51%	26%	47%	57%	4%	8%	-29%	6%	12%	4%	3,44%	3,28%	3,38%	3,45%
Value creation			NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES	YES
RONIC			-37%	40%	17%	17%	26%	26%	20%	50%	94%	10%	44%	-145%	22%	39%	11%	20%	19%	19%	20%
RRNC			-97%	-954%	922%	384%	189%	131%	102%	63%	39%	42%	16%	29%	28%	27%	31%	17%	17%	17%	17%
g			36%	-378%	158%	64%	49%	34%	21%	32%	36%	4%	7%	-41%	6%	11%	3,4%	3,3%	3,2%	3,3%	3,3%
Value creation			NO	NO	YES	YES	YES	YES	YES	YES	YES	NO	YES	NO	YES	YES	NO	YES	YES	YES	YES
WACC	**14,10%**																				

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Report Recommendations

Buy	Expected total return (including expected capital gains and expected dividend yield) of more than 10% over a 12-month period.
Hold	Expected total return (including expected capital gains and expected dividend yield) between 0% and 10% over a 12-month period.
Sell	Expected negative total return (including expected capital gains and expected dividend yield) over a 12-month period.

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