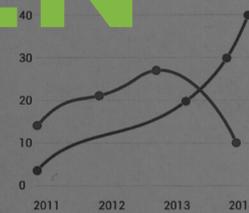


# POST COVID-19 AND THE HYDROGEN SECTOR

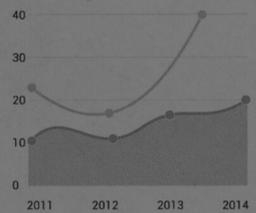
A HYDROGEN EUROPE ANALYSIS

Morris Charts

Line Chart



Area Chart

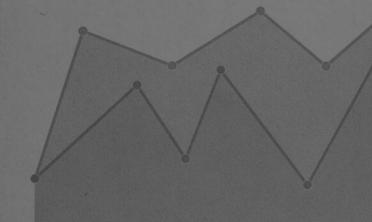


Bar Chart

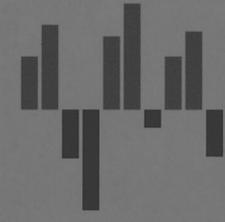


Sparkline Charts

Line Chart



Bar Chart



Easy Pie Charts



# TABLE OF CONTENTS

01	Executive summary
04	Is there a need to take action?
06	Why should action be taken?
09	What can be done?
11	Who should be supported?
14	How much will it cost?
19	What will be the impact?
21	References



# EXECUTIVE SUMMARY



Despite the unprecedented crisis currently unfolding, long-term, climate and environmental challenges remain the major threat to our planet and to humanity as a whole.

The clean hydrogen sector has finally reached the pre-commercialisation phase and is ready to play its essential role in decarbonising our economies. Clean hydrogen is a perfect partner to the European Green Deal, enabling the realisation of its climate, environmental and economic development goals.

The economic crisis following the COVID-19 pandemic may cause a significant delay in the adoption and commercial roll-out of clean hydrogen. It may even permanently endanger the capacity of the clean hydrogen sector to take-up its role as the missing link in the energy transition.

As a result, the clean hydrogen sector faces three major risks:

- in the short term, small, innovative companies which form the backbone of the technology providers are likely to suffer a **major shortage of liquidity** due to a steep drop in revenues which will result in staff cuts or even bankruptcy;
- believing that climate and environmental policy commitments will take a back-seat in economic recovery plans in Europe and elsewhere large companies which were planning **major investments** in clean technology are likely to **abandon or severely scale-down** these plans;
- **investors** may, for the reasons as presented above, be **less inclined** to finance the planned growth of the sector.

A swift, decisive and coordinated action is necessary to address each of these risks and, at least, dampen the negative impact that they may have on the deployment of clean hydrogen technologies and on our transition to a net carbon, yet powerful and wealthy economy.

To stave off the risks presented above, we call upon the European Commission and all other relevant policy actors to:

1. Provide clear and immediate signals that, despite the current crisis, the European climate and environmental objectives will be maintained and even raised. In addition, **provide clear policy support signals for the hydrogen industry**. The impact of this cannot be overstated and its cost is low.
2. **Link bailouts/financial support** provided in the sectors of energy, transport, energy intensive industries and heating and cooling **to strong commitments in terms of decarbonisation** in the short and medium term (5-10 years).
3. Directly support the hydrogen value chain by **compensating for short term revenue loss** in value of **EUR 450-500 million**.
4. Provide **certainty on the continuation** of the European research and innovation **partnership on clean hydrogen** with increased budget and scope.
5. Immediately **unlock first commercial markets for green hydrogen** through market incentives (e.g. increase renewable energy share quotas in the Renewable Energy Directive (RED II), implement quota for clean/green aviation fuels, etc.), regulation (e.g. enable green power supply through grids) and public funding (e.g. ETS Innovation Fund, Important Projects of Common European Interest (IPCEI), Carbon Contracts for Difference, etc.).

These support actions would help protect thousands of highly skilled jobs and will enable to retain the planned portfolio of investment projects, which have been estimated to be at least **EUR 15 billion** and as high as **EUR 130 billion** by 2030.

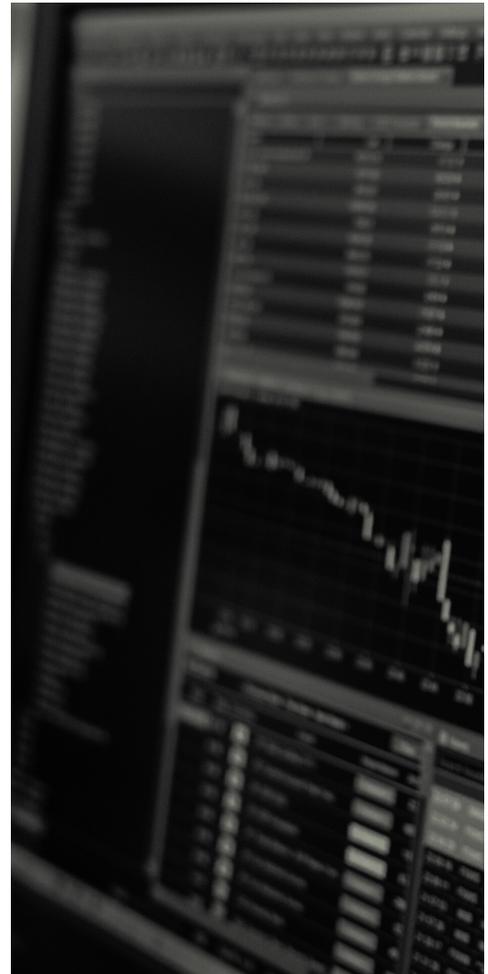
The following document outlines the need for and rationale behind rapid action as a result of the coronavirus impact. The document has been divided into sections:

- **Is there a need to take action?** – describing why the current pandemic will result in significantly jeopardising the hydrogen sector if no action is taken.
- **Why should action be taken?** – underlining the importance of the hydrogen sector to EU's decarbonisation efforts as well as its long-term potential to support sustainable economic growth of the EU.
- **What can be done?** – outlining several potential options for supporting the industry, starting from most obvious monetary support, but including also no less important policy actions that can be taken to restore investors' confidence.
- **How much will it cost?** - containing an estimation of the value of the monetary support needed in order to retain the high skilled workforce and the sector's investment portfolio, followed by an estimation of **what will be the impact** of the action.



# IS THERE A NEED TO TAKE ACTION?

At the end of this crisis, companies will look at their results. They will be very bad. It is already clear that many companies will emerge from the crisis with significantly worse balance sheets – with lower assets and high debt levels. As a consequence, they will have to tighten their spending, even when the health crisis is over. Everything which is not essential for their short-term profitability and core business will be on top of the cuts list. Even if they would like to act differently, company CEOs will not be able to escape that logic due to shareholders pressure. Unless public authorities are able and willing to convince them to act differently by providing support only on the condition that certain climate / future oriented investments are maintained (i.e. a huge climate targeted recovery plan). Similarly, investors are also already fleeing from any risky assets to the safety of cash, gold and other safe assets which is driving the share market down. As a consequence, long term investors, including pension funds, facing big reduction of their asset valuations will be reluctant to invest in risky projects and risky SMEs.



Furthermore, fears of a global economic recession have brought oil and gas prices to their lowest levels in the last two decades. As the economic fallout of Covid-19 could reduce the world's oil demand growth for the year ahead, it is feasible that the oil and gas prices will not rapidly recover, further undermining competitiveness of green investments.

The first signs of this happening are already there with BloombergNEF cutting its predicted growth in new solar installations by 8%, which would mean a decrease in new additions for the first time since the 1980s, with wind also facing a considerable downside risk [1].

“

*If no decisive action is taken, renewable energy and clean technologies industries – with low carbon hydrogen among them – face a considerable downturn risk.*

”

Another key issue is that 70% of the world's clean energy investments are still government-driven, either through direct government finance or in response to policies such as subsidies or taxes [2]. With such low oil and gas prices, the importance of government's role in the energy transition is only going to increase.

Yet, with the economic fallout from the Covid-19 pandemic already predicted to be much more severe as that of the global financial crisis [3], with energy demand contracting by 6% in 2020, the largest in 70 years in percentage terms and the largest ever in absolute terms, the impact of Covid-19 on the energy demand in 2020 would be more than seven times larger than the impact of the 2008 financial crisis on global energy demand.

Governments worldwide will face an immediate challenge of kick-starting their national economies. As recently announced recovery plans show, the value of fiscal measures undertaken by EU countries varies from 1-2% up to 12% of GDP [4], with Germany committing up to EUR 156 billion of fiscal measures and a further stabilisation fund worth EUR 600 billion [5]. When combined with a loss of tax revenues, this will substantially increase the level of public deficit and will almost certainly reduce funding and investments in climate change mitigation and adaptation.

The worst risk is associated with the temptation to abandon climate objectives all together: already the Czech Prime Minister has called for the European Green Deal to be scrapped [6] and a Polish Deputy Minister of State Assets has demanded the EU ETS to be abolished from 2021 [7].

Taking all of the above into consideration, it is clear that, **if no decisive action is taken, renewable energy and clean technologies industries – with low carbon hydrogen among them – face a considerable downturn risk.**

# WHY SHOULD ACTION BE TAKEN?

While it's understandable that in the short term, the measures aimed at fighting the Covid-19 pandemic should take priority, followed up with a focus on propping up the economy, we should not forget that, long term, the climate crisis is still the biggest challenge, and it will still have to be tackled. The International Energy Agency (IEA) estimates that, although global CO<sub>2</sub> emissions are expected to decline by 8% in 2020, **the rebound in emissions may be larger than the decline, unless the wave of investment to restart the economy is dedicated to a cleaner and more resilient energy infrastructure.**

With that in mind, it should be noted that the energy transition in the EU will require hydrogen at large scale. Without it, the EU would miss its decarbonization objectives. Hydrogen represents a versatile, clean, and flexible energy vector.

Hydrogen is not simply a potential contributor to solving the challenges posed by the energy system transition, offering a future solution with a number of advantages, particularly when used in fuel cells but it is a solution without which Europe cannot achieve its 2050 goals on greenhouse gases (GHG) emissions reduction. (1)

Hydrogen is the best (or only) choice for at-scale decarbonization of selected segments in transport, industry, and buildings. Specifically:

- The decarbonization of the gas grid that connects Europe's industry and delivers more than 40% of heating in EU households and 15% of EU power generation requires hydrogen.
- In transport, hydrogen and hydrogen made fuels are the most promising decarbonization options for aviation, ships, trains, trucks, buses, large cars, and commercial vehicles, where the lower energy density (hence lower range), weight, high initial costs, and slow recharging performance of batteries are major disadvantages.

*(1) This does not mean that other technology solutions cannot/should not contribute to these decarbonisation goals. Rather, hydrogen can help solve inherent deficiencies that pose constraints to such solutions becoming enough on their own to achieve these objectives.*

- Industry can use hydrogen to produce high-grade heat, it can use it directly as a chemical feedstock (for example, in steelmaking, substituting coal-based blast furnaces; ammonia production; hydrotreating in refineries in chemical processes and others) or use it as synthetic methane in order to decrease hard to abate CO2 processes (e.g. in the production of cement).

The potential for hydrogen to essentially replace fossil-based energy while at the same time create jobs and increase long term EU industry global competitiveness, has been recognised by identifying hydrogen technologies and systems as one of several **strategic value chains for a future-ready EU industry** [8]. None of this will change because of the Covid-19 pandemic.

Furthermore, although the hydrogen sector is still in its early stage of development – it is growing fast. While the current clean hydrogen technology market is not worth more than EUR 2 billion at the moment, our analysis shows that **EUR 15 billion of investments that have been planned by the sector in the near term may be in jeopardy**.

Over **longer term**, we estimate that there are currently almost 70 projects at varied stage of development that would be at risk if no action is taken (2).

## Enable the renewable energy system → Decarbonize end uses

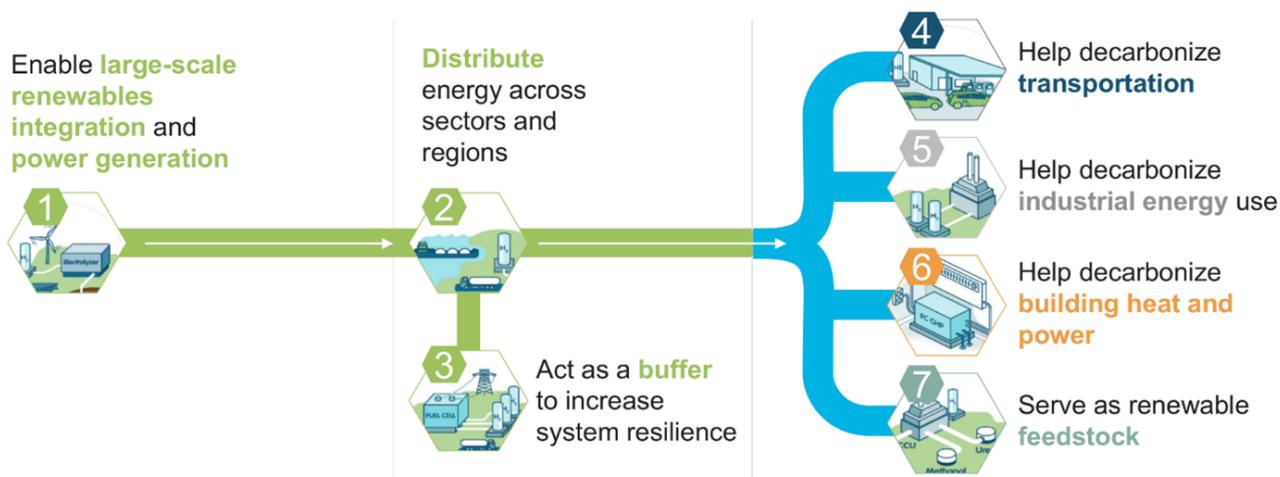


Figure 1. Hydrogen as enabler of the energy transition in Europe.  
Source: Hydrogen Council

The total electrolyser capacity planned for installation in those projects is over 22 GW (equivalent of 15 to 20 nuclear reactors). If these projects do not go through, it would equal to a **loss of revenues for the EU electrolyser manufacturers of over EUR 13 billion over the next 10 years** (taking into account only the end product and dismissing indirect revenues along the supply chain). Considering all additional investments in hydrogen transport, distribution and storage, refuelling stations, vehicles, pipelines, etc. **we estimate that the total value of planned projects that may be affected by the crisis is around EUR 120-130 billion.**



# WHAT CAN BE DONE?

As soon as the immediate health crisis caused by the Covid-19 pandemic will subside, the attention should move to ensure that the EU economies are growing again. Yet, only returning to the status quo is not the way forward. We should learn from the 2008 global financial crisis and make sure that clean hydrogen, **clean energy, clean transport and smart infrastructure are a central part of any stimulus program** [9]. The policies and instruments deployed should ensure that the recovery is durable, i.e. the growth stimulated should be sustainable. Failure to do so might lead only to a temporary recovery in industries that are unsustainable in the long term. **This implies integrating long term concerns even in any short-term policy packages** [10].

The immediate actions can include:

- Compensate companies for coronavirus impact (cover salaries while re-skilling, production disruptions, etc.) with special consideration of more vulnerable SMEs.
- Re-orientate manufacturing (investments for competitiveness and up-scaling).
- Strategic “investment” (any kind of financing, loans, guarantees, and even equity) to ensure EU’s capacities along the hydrogen value chain.
- Protect and support the owners/investors against financial distress, and ensure integrity of the EU value chains.

One other immediate action, whose **impact cannot be overstated**, and one which is cost-free, is an **urgent and clear confirmation of the EU’s commitment to its climate goals and to the green deal**, accompanied by continued and clear policy support signals for the hydrogen industry. This is essential to support investor confidence.

Over medium term, the actions should also include stronger support for R&D in clean technologies - historically R&D investments in the private sector move in parallel to the GDP growth, hence in times of economic downturn it is crucial for increased public funding to cover the gap and ensure at least continuity in strategic research programmes.

In similar ways to investment in high speed broadband communication networks being part of the economic stimulus packages after previous economic crisis, this time a similar place should be reserved for alternative fuels infrastructure and clean energy systems, accompanied by regulatory frameworks which support open access and competition.

At the same time, with onshore wind and solar power already being cost competitive with fossil fuels (and getting cheaper still), addressing the structural and regulatory issues that are preventing increased renewable energy penetration into grids is more likely to bring about a far greater positive long-term effect. Investments in energy storage, interconnections as well as accelerating the decarbonisation of heating, transport and industry should be prioritised over direct support of renewable energy projects. Although, having said that, extending existing tax breaks or support mechanisms for renewables is still advisable.

Furthermore, it should be restated that **misplacing government subsidies to unsustainable business models may undermine the long-term sustainable growth capacity of the European economy**. Even if they would provide short term demand stimulus, they can have a negative effect by postponing needed technology restructuring or fuel switch - thus wasting taxpayer funds in the long run and delaying significantly our fight against climate change. Hence, any **bailouts** that go to airlines, shipping companies, power, oil and gas or energy intensive industries, **should be handed out only on the condition of the public funds recipients agreeing to meeting ambitious decarbonisation goals within the next 5 to 10 years**.

The public should receive a return on its investment measured in avoided CO<sub>2</sub> emissions. It is doubtful whether any bailouts should go to industries or business models that are not in line with decarbonised economy at all.

It should also be noted, that there are a number of measures that can be taken without a need for additional direct public spending, including:

- Removing fossil fuel subsidies and tax breaks, thus **reducing the funding gap of clean hydrogen projects** (and other clean energy projects as well), which is still mostly directly related to the difference versus the fossil fuel benchmark solution.
- **Removing unnecessary regulatory barriers and requirements**, like proving the additional character of renewable electricity imposed in the RED II [11]. Relying on existing market-based instruments, i.e. Power Purchase Agreements (PPAs) combined with Guarantees of Origin (GO) for electricity would not only reflect market reality but would help facilitate a number of green hydrogen investment projects.

Both of those measures, while not directly providing any additional funding to companies active in the sector, will go a long way of ensuring the projects that are planned are actually carried out and not put on hold, or cancelled altogether.

# WHO SHOULD BE SUPPORTED?

The hydrogen sector can be split into two groups of companies:

1) **SMEs focussed on the hydrogen sector**, most as technology providers, some as project developers. These companies usually do not make profit and do not have (yet) a regular business, but they hold a great innovation potential, usually ahead of the game worldwide. They mostly live from the prospect of making money in the future (their current/future/stock value is very much dependent on the vision of the future). Hence their survival is very dependent on:

- The decision of large companies in transport, industry and energy sectors to actually launch and carry out the decarbonisation projects they have announced or planned.
- The willingness of their shareholders to continue bringing equity and let them "burn" cash with the hope of a return in the future.
- The willingness of governments to move forward fast with the policies that will make the hydrogen business viable and inject a level of certainty in their business model and future cash flows projections, therefore reducing risk and easing access capital, including debt.

In the very short term, **they may face serious cash flow (liquidity) (3) issues** that may lead to bankruptcy. In addition, a number of them are in the middle of very large investments to increase their capacity of production. These investments are usually carried out in phases and, if investors panic (in the absence of strong governmental signals), they may be tempted to stop them.

2) **Large companies that will trigger the large deployment in the hydrogen sector**, e.g. the big energy companies, the big industry companies, the transport industry. Dozens (if not hundred) projects have been announced but not yet decided. These projects are normally (1) not profitable and (2) a preparation for longer term business cases when policies will be there and costs lower.

*(3) An early indication provided by industry estimates revenues to fall on average by 40-50% in 2019, with some companies, even in danger of losing their entire business, if investment and R&D projects get canceled.*

First, this brings us back to the general attitude of companies: they are likely to cut everything which is not essential for their immediate profitability and, clearly, projects for which no final investment decision was made (all hydrogen projects basically) will be the easiest to cut, reinforcing the need of a recovery plan to escape this logic.

Second, companies will perceive a higher uncertainty about the arrival or not of tougher climate policies. Hence, the need for governments to give them a strong indication that these policies will come and rather sooner.

The situation is slightly different for some transport OEM and for equipment providers that develop hydrogen equipment in addition to a large existing business (e.g. Plastic Omnium, Bosch, etc). They are not developing “projects” with a high visibility like the energy/industry companies. They rather have internal decisions to develop new products (new tank, new test bench, new vehicle models) which are often less visible.

In total Hydrogen Europe represents:

- 161 industry companies representing the whole value chain, including OEMs and end-users,
- 79 research organisations,
- 21 national associations,
- 4 supporting companies.

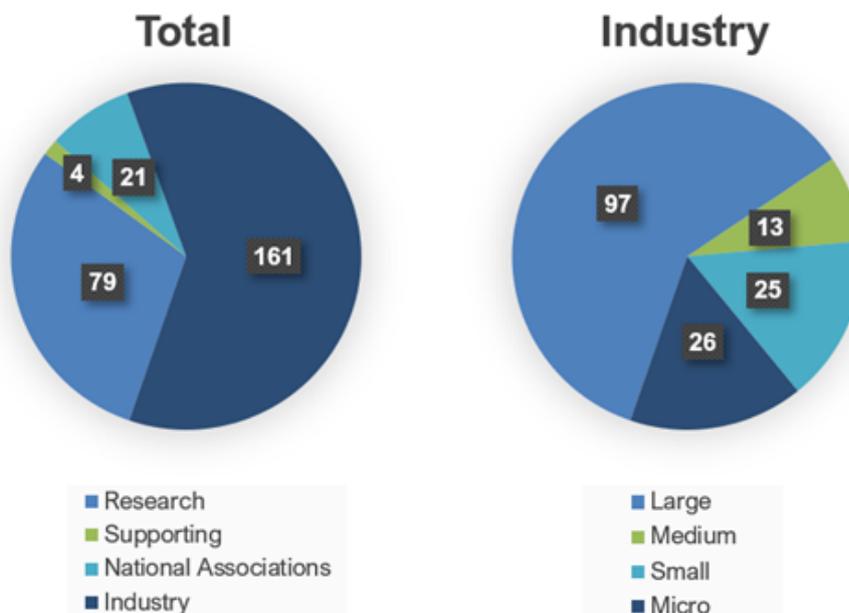


Figure 2. Breakdown of Hydrogen Europe members (including Hydrogen Europe Research) as per March 2020. Source: Hydrogen Europe

Although the whole hydrogen value chain (including potential users of clean hydrogen) is represented within the membership of Hydrogen Europe, obviously not all European companies active in the sector are also members of the association. In reality, the upstream sector contains a disproportionately large number of SMEs.

A recent European hydrogen and fuel cell supply chain analysis report [12], identifies a total of 445 actors, of which 246 are research organisations. Out of the 189 industrial actors, the majority (112) are upstream supply chain actors. There are 68 fuel cell and hydrogen system integrators (e.g. fuel cell system, electrolyser system, hydrogen storage system, HRS) and 27 vehicle integrators.

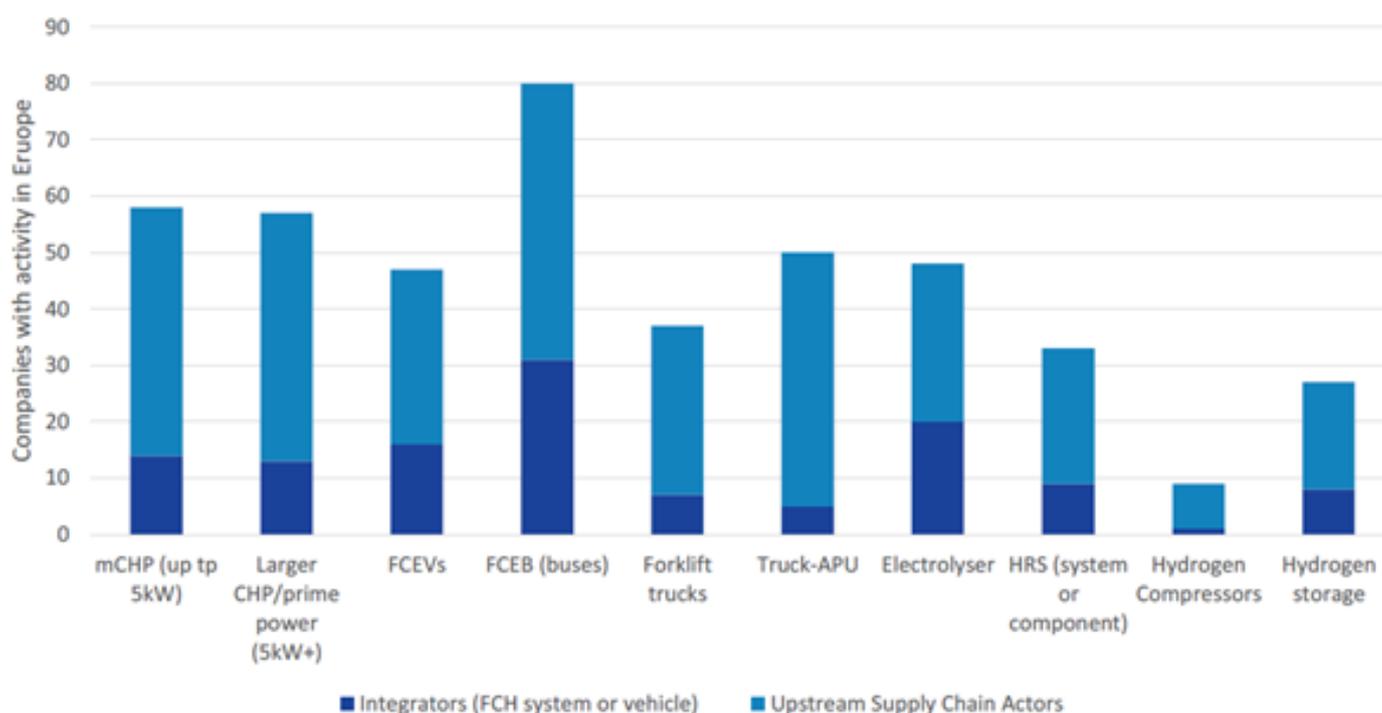


Figure 3. Integrators and supply chain actors across applications (4). Source: [12].

In total we estimate that there are at the very least **around 280 companies actively developing hydrogen technologies in the Europe currently, out of which around 170 are SMEs**. Together the SMEs dedicated to hydrogen and the hydrogen departments of the companies with a broader scope employ around 16.000 people at the moment (with a significant growth potential).

**When it comes to taking actions aiming to overcome the negative economic impact of the COVID-19 pandemic, Hydrogen Europe's position is that the above mentioned actions should cover the whole value chain.**

(4) Some of the actors play more than one of these roles, therefore the sum of the actor types displayed in the chart exceeds the number of individual organisations.

# HOW MUCH WILL IT COST?

The following estimations have been based on the assumption that the total value of financial support will be gauged in a way as to cover the negative impact of the Covid-19 pandemic – without considering any additional funding, that would be needed to scale-up manufacturing capacity etc.

The estimation has been based on an assessment of the value of lost revenues by industrial actors active in the hydrogen sector. The lost revenues have been estimated using two independent approaches:

- **A top-down approach** – based on a survey conducted among companies active in the hydrogen sector, during the week of 30.03.2020 – 03.04.2020.
- **Bottom-up approach** – based on an estimated negative impact, that the economic slowdown will have, on the revenues of companies active in the hydrogen sector. Calculated to be 30% of the value of the 2020 hydrogen market in the EU (considering only technology manufacturing and excluding the sales of hydrogen itself).

## TOP-DOWN APPROACH

The following results are based on 127 replies received from the companies active in the hydrogen sector (79 of which, i.e. 60% were SME's), representative for the whole value chain.

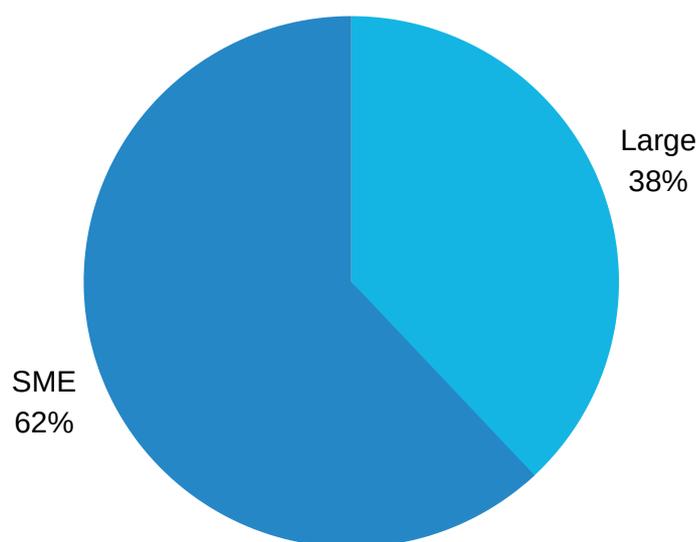


Figure 7. Breakdown of respondents by size of the company. Source: Hydrogen Europe survey results

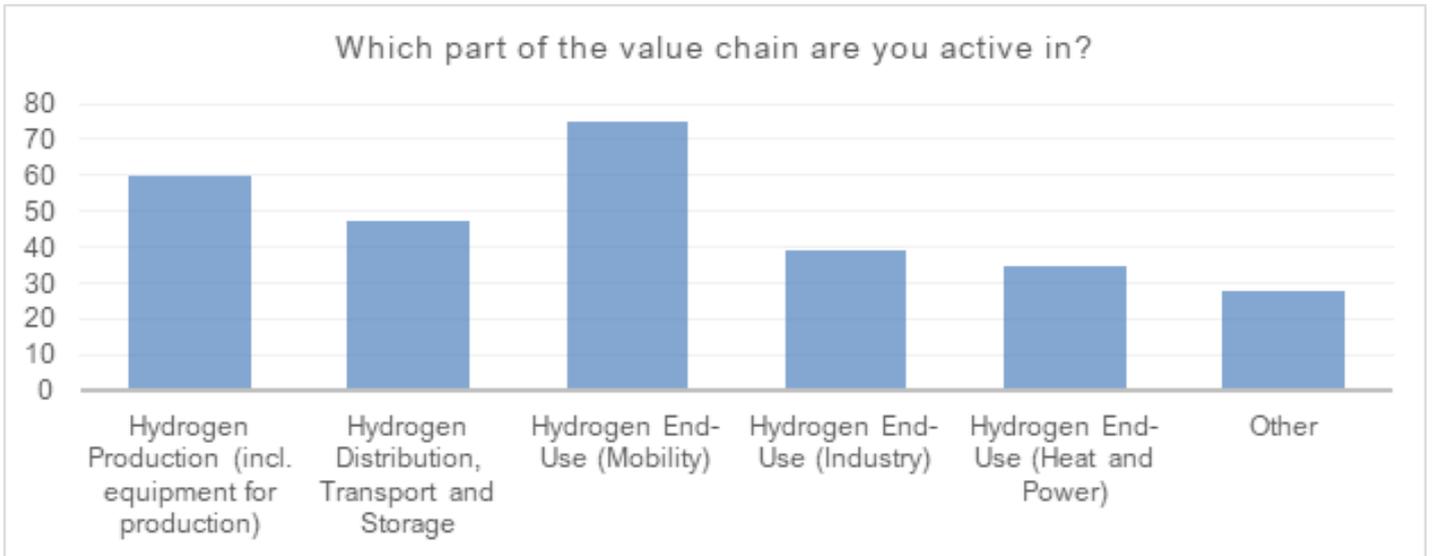


FIGURE 8. BREAKDOWN OF RESPONDENTS BY VALUE CHAIN (5).  
SOURCE: HYDROGEN EUROPE SURVEY RESULTS.

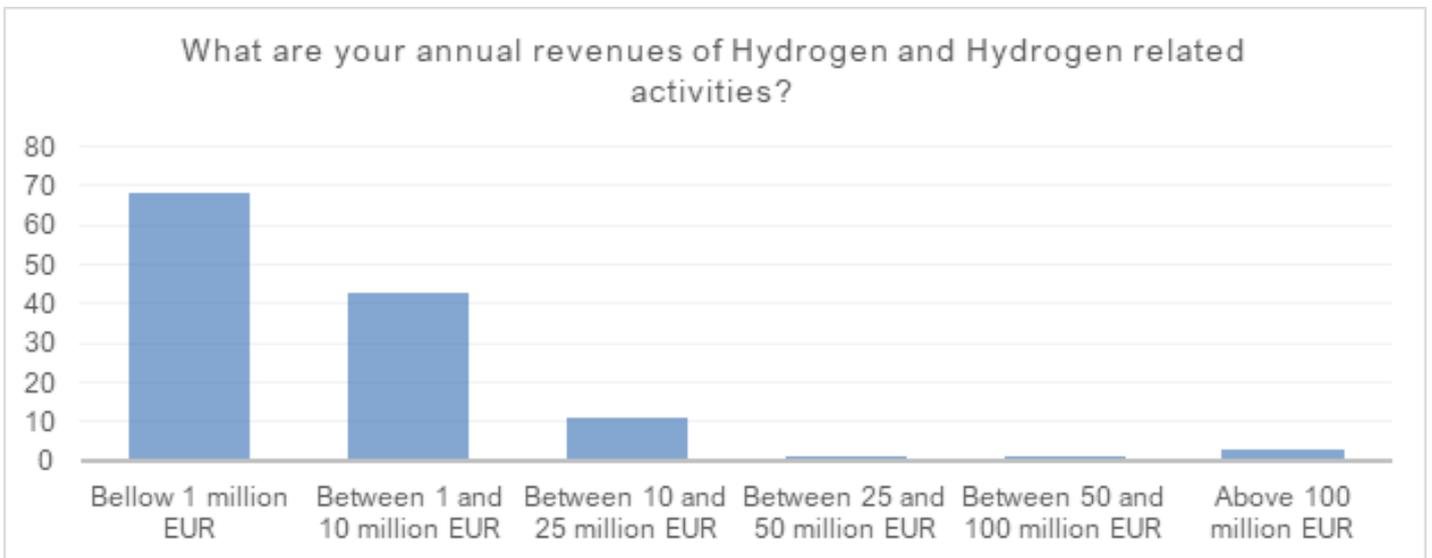


FIGURE 9. BREAKDOWN OF RESPONDENTS BY ANNUAL REVENUES FROM BUSINESS ACTIVITY IN THE HYDROGEN SECTOR. SOURCE: HYDROGEN EUROPE SURVEY RESULTS.

(5) Sum is greater than total number of respondents as some companies are active in more than one field.

On average, the sample believes that, without any economic measures being taken, revenues are set to decrease by 50% in 2020, disproportionately affecting SMEs (decrease of 55%) vs 42% decrease for large companies.

Extrapolating the survey results to the whole sector, of estimated 280 companies, the total financial support needed to preserve the workplaces in the hydrogen sector is around **EUR 450 million**.

However, monetary support was **not the only measure requested by the sample respondents** in order to maintain the current operations and planned projects. Regulatory measures were also requested, such as:

### **RESEARCH and DEMONSTRATORS**

- Significantly more funding for research, innovation and demonstrators (e.g. partnership on clean hydrogen) as private investment will diminish.
- Postponing deadlines for submission of research projects.
- Extend duration of all European funded projects.
- Launch the Innovation Fund in June as planned, IPCEI mechanisms and others.

### **CLIMATE POLICY**

- Clarity towards the commitment to climate goals and the European green deal.
- Continued and clear policy support signals for the hydrogen industry.
- Unlock first commercial markets for green hydrogen through market incentives (increase RES quotas in RED II, implement quota for green aviation fuels, etc.), regulation (e.g. enable green power supply through grids).
- Public funding (e.g. ETS IF, IPCEI, Carbon Contracts for Difference).
- Impose hydrogen/zero emission related programs to polluting sectors, especially if they succeed in postponing the implementation of the rules related to the reduction of CO<sub>2</sub> and pollution.

**PUBLIC PROCUREMENT:** Public procurement of zero-emission hydrogen solutions.

**INVESTMENT:** Invest in infrastructure: hydrogen production plants, HRS, hydrogen pipelines

**FINANCE:** Loan guarantees for project developers.

### BOTTOM-UP APPROACH

Based on experience from previous years and given the current state of the market development, the most conservative estimation made by Hydrogen Europe shows, that, **in normal circumstances the total end products market value in 2020 would amount to at least EUR 650 million.**<sup>(6)</sup>

It needs to be stressed though, that the above value shows only the value of end products. If a portion of those orders is not realised then the loss of revenues will trickle down the supply chain and result in loss of revenues in subcontractors and suppliers. Data provided in [12] and [14] indicates, that, depending on application, the overall indirect sales multiplier is 1.5 to 2.5, which would bring total revenues along the whole value chain up to **EUR 1.5 billion** (see Annex II).

Taking into account the expected duration of the lockdowns in European countries and related slowdown of economic activity, as well as seeing that on average the valuation of stocks of companies active in the hydrogen sector fell by more than 30%, a short-term measure aimed at alleviating the negative impact resulting from the Covid-19 pandemic, should cover at least 25-35% of estimated annual revenues of the sector, i.e. EUR 375-525 million.

It should be also noted that **the support plan should be treated as investment rather than cost.** As has been demonstrated over the years by the Fuel Cell and Hydrogen Joint Undertaking (FCH JU), the hydrogen sector is willing to follow-up the initial support with its own investments in the field and create EU added value.

Under Horizon 2020 rules, the FCH JU was required to demonstrate a leverage effect of 0.57 (7). This requirement was significantly over-achieved. By the end of 2018, the leverage effect from Hydrogen Europe members alone had reached €1.36 (8). Furthermore certified, reported and planned additional activities (9) over 2014 – 2020 total an amount of €1.218 billion. This means that, taking into account in-kind contributions of private partners, the total leverage effect (in projects and in additional activities) is 2.67.

*(6) Estimated very conservatively and counting only end products i.e. without revenues of subcontractors and suppliers.*

In other words, for every euro of EU contribution for all signed Horizon 2020 FCH JU grant agreements, private partners (members of Hydrogen Europe and Hydrogen Europe Research) will have committed to spend €2.67 either on FCH JU projects or on additional activities.



*(7) Article 4, Council Regulation 559/2014 establishing the Fuel Cells and Hydrogen 2 Joint Undertaking*

*(8) FCH 2 JU Annual Activity report 2018, available at:*

*<https://www.fch.europa.eu/sites/default/files/FCH%202%20JU%20Annual%20Activity%20Report%202018%20-%20%28ID%206079970%29.pdf.pdf>*

*(9) Costs incurred in implementing additional activities outside the work plan of the FCH 2 Joint Undertaking contributing to the objectives of the FCH JU (Art 4.2 b, Regulation 559/2014.*

# WHAT WILL BE THE IMPACT?

Translating the value of the stimulus package into actual jobs on the line, one needs to remember that the impact will be felt both on direct as well as indirect jobs.

**Direct jobs:** the labour contributions to value-added at each level of the supply chain covered by the cost breakdown were translated into an estimate of direct jobs associated with those manufacturing activities. The supply chain covered by the cost breakdowns only extends upstream as far as components and processed materials and does not cover the extraction of raw materials.

**Indirect jobs:** The cost breakdown of each component includes the cost of materials added in that production step. As the supply of these materials is separate from the upstream components explicitly listed in the cost breakdowns, the jobs created in the supply of these materials are estimated as 'indirect' jobs. For the transport applications considered, this included jobs in the supply of the non-FCH elements of the application, namely the rest of the vehicle. Although these jobs are listed as 'indirect', they are still manufacturing jobs that are needed to supply components and materials that go into the FCH applications. This is different and much narrower than the typical usage of an indirect employment multiplier to capture broad vertical and horizontal extensions to the value chain (e.g., demand for services generated by manufacturing employees). The numbers in this category will therefore be smaller than for studies with a broad indirect employment definition.

According to [15] for advanced industries such as machinery and equipment automotive, electricity, and gas supply, roughly ten jobs are created directly and indirectly per EUR 1 million in revenues. For the manufacturing of equipment and end use applications, on average 13 jobs are created per EUR 1 million in revenue. In aftermarket services and new business models, EUR 1 million in revenue generates 15 jobs.

Hence, **a stimulus package of EUR 450-500 million would help protect up approximately to 7,000 highly skilled jobs (existing direct employment only) and help retain (if policy measures are also taken) the planned portfolio of near-term investment projects, which have been estimated to be as low as EUR 15 billion and as high as EUR 130 billion by 2030. Such an investment will ensure the creation tens of thousands of highly skilled jobs in a sustainable industry, one that is in line with European and International climate ambitions.**

Hydrogen Europe would like to warmly thank its members for their fast reactions in providing input to the Hydrogen Europe survey used as the basis of this document.

**Hydrogen Europe** represents the European Hydrogen and Fuel Cell sector, including 160+ industry companies representing the whole value chain, including OEMs and end-users, 78 research organisations and 21 national associations. We bring together diverse industry players, large companies and SMEs, who support the delivery of hydrogen and fuel cells technologies. We do this to enable the adoption of an abundant and reliable energy which efficiently fuels Europe's low carbon economy. We partner with the European Commission in the innovation programme Fuel Cells and Hydrogen Joint Undertaking (FCH JU).

For more information, please visit [www.hydrogeneurope.eu](http://www.hydrogeneurope.eu).

Contact: Grzegorz Pawelec, [g.pawelec@hydrogeneurope.eu](mailto:g.pawelec@hydrogeneurope.eu).

Hydrogen Europe Members as per May 2020



# REFERENCES

[1] R. News, "Coronavirus to hit solar hard in 2020 with 'considerable' risk to wind: BNEF," 12 March 2020. [Online]. Available: <https://www.rechargenews.com/transition/coronavirus-to-hit-solar-hard-in-2020-with-considerable-risk-to-wind-bnef/2-1-772838>.

[2] International Energy Agency, "World Energy Outlook 2018," 2018.

[3] Centre for Economics and Business Research, "A World Recession Is Now Almost A Certainty, With Global Gdp Set To Decline Twice As Much As During The Financial Crisis. The Challenge Now Is To Prevent The Recession From Turning Into A 1930s Style Rout," 22 March 2020. [Online]. Available: <https://cebr.com/reports/a-world-recession-is-now-almost-a-certainty-with-global-gdp-set-to-decline-twice-as-much-as-during-the-financial-crisis-the-challenge-now-is-to-prevent-the-recession-from-turning-into-a-1930s-style/>.

[4] International Monetary Fund, "POLICY RESPONSES TO COVID-19," 2020. [Online]. Available: <https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#D>. [Accessed 30 March 2020].

[5] Reuters, "Factbox: Germany's anti-coronavirus stimulus package," 10 March 2020. [Online]. Available: <https://www.reuters.com/article/us-health-coronavirus-germany-measures-f/factbox-germanys-anti-coronavirus-stimulus-package-idUSKBN21C26Y>.

[6] Reuters, "Europe should forget about Green Deal, focus on coronavirus -Czech PM," 16 March 2020. [Online]. Available: <https://www.reuters.com/article/health-coronavirus-czech-eu/europe-should-forget-about-green-deal-focus-on-coronavirus-czech-pm-idUSP7N29F01L>.

[7] Reuters, "EU should scrap emissions trading scheme, Polish official says," 17 March 2020. [Online]. Available: <https://www.reuters.com/article/us-health-coronavirus-poland-ets/eu-should-scrap-emissions-trading-scheme-polish-official-says-idUSKBN2141RC>.

[8] EC, Strategic Forum for IPCEI, "Strengthening Strategic Value Chains for a future-ready EU Industry," 2019.

[9] E. Zaccai, "'Greening the Crisis': The place of Environmental factors in its Story and Aftermath," in Socioeconomic Outcomes of the Global Financial Crisis, New York, Routledge, 2012, pp. 23-38.

[10] OECD, “Policy Responses to the Economic Crisis: Investing in Innovation for Long-Term Growth,” 2009.

[11] Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources”.

[12] E4Tech, “Study on Supply Chain for Hydrogen and Fuel Cells echnologies,” FCH JU, 2017.

[13] EC, “Annex II; Key Strategic Value chains detailed recommendations,” Strategic Forum for the Important Projects of Common European Interest, 2019.

[14] E4Tech, “Study on Value Chain and Manufacturing Competitiveness Analysis for Hydrogen and Fuel Cells Technologies, Evidence Report,” FCH JU, 2019.

[15] FCH 2 JU, “Hydrogen Roadmap Europe,” 2019.

[16] EC, “Expert Group Report: Interim Evaluation of the Fuel Cells and Hydrogen 2 Joint Undertaking (2014-2016) operating under Horizon 2020,” 2017.

[17] BloombergNEF, “U.S. Airlines Spent 96% of Free Cash Flow on Buybacks,” 16 March 2020. [Online]. Available: <https://www.bloomberg.com/news/articles/2020-03-16/u-s-airlines-spent-96-of-free-cash-flow-on-buybacks-chart>.

[18] E4Tech, “Study on Value Chain and Manufacturing Competitiveness Analysis for Hydrogen and Fuel Cells Technologies; Findings Report,” FCH JU, 2019.



Hydrogen  
Europe

Avenue de la Toison d'or 56-60  
BE-1060 Brussels  
+32 2 540 87 75  
[www.hydrogeneurope.eu](http://www.hydrogeneurope.eu)  
[secretariat@hydrogeneurope.eu](mailto:secretariat@hydrogeneurope.eu)  
 @H2Europe