NATIONALER WASSERSTOFFRAT

STATEMENT **2022-12-09**

Assessment of the Inflation Reduction Act

STARTING POINT

The current economic situation and the outlook for economic development in the United States and in Germany could not be more different. The Russian war of aggression against Ukraine is eroding the foundations of the German economic model. German industry is confronted with the serious risk of energy shortages and is currently paying for this with horrendous price premiums. This is significantly narrowing the financial scope of the German economy and will not change fundamentally in the foreseeable future. Due to the relative cost disadvantages in the energy supply, it is therefore to be expected that the competitiveness of German industry will be structurally and sustainably jeopardised by the rising energy prices in a worldwide comparison.

In contrast, the United States recorded the strongest economic recovery in 40 years, growing 5.7 per cent last year. With that said, as with all world economies, the US economy is suffering from the negative supply shock caused by Russia's attack on Ukraine, the upheavals in global supply chains and the resulting bottlenecks in various goods and primary products during the pandemic. Nevertheless, no structural cuts are to be anticipated, as they put the German economy at risk. In addition, under the current government, the United States is focusing on the significant and sustainable reduction of energy prices to combat inflation via what is known as the *Inflation Reduction Act* (IRA), which is expected to result in the increased international competitiveness of US industry.

INFLATION REDUCTION ACT

US Congress has recently passed the IRA, a bill that provides $369 billion in climate change funding over the next decade. This funding builds on more than $110 billion in climate and energy funding that was approved at the end of 2021 with the *Infrastructure Investment and Jobs Act*, which includes the creation of six to ten physical hydrogen hubs in the form of direct grant funding.

In principle, the IRA is intended to pursue three objectives.

1. Reduce greenhouse gas emissions.

2. Combat current inflation in the United States.

3. Create and establish value chains for future technologies in the United States.

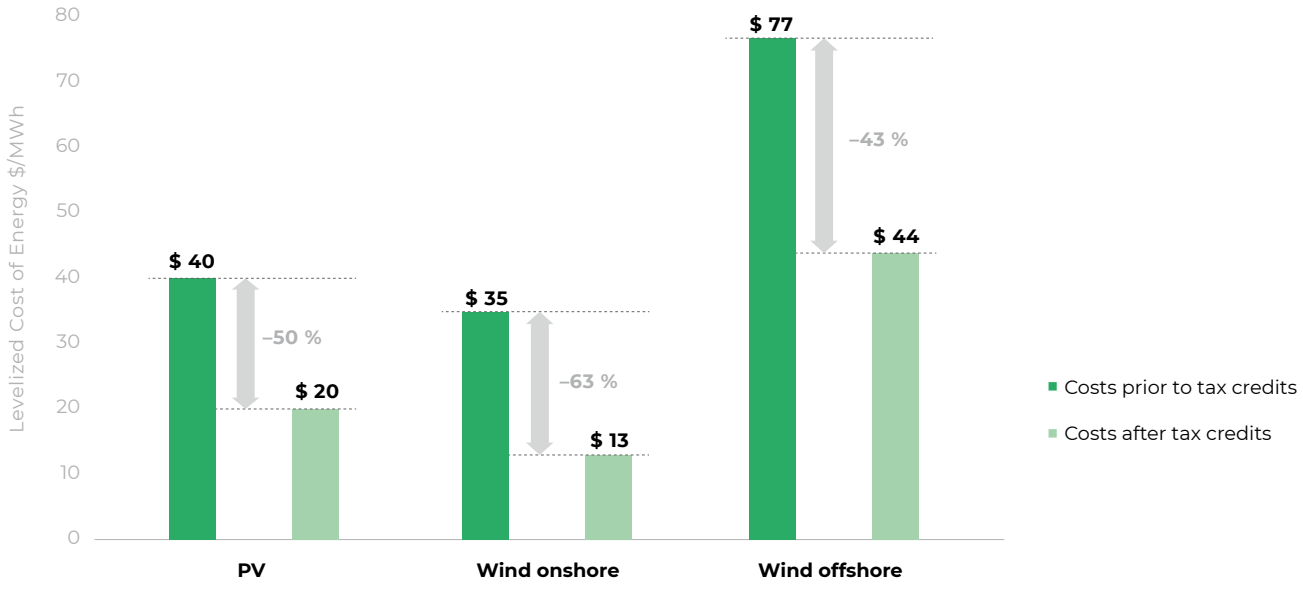
According to forecasts, the IRA will now permit a reduction in US CO_2 emissions by 40 per cent by 2030 compared to 2005. Promoting renewable energies and their resulting cost reduction, coupled with their low operating costs, should reduce inflation in the United States in the long term. In addition, key environmental industries are to be located in the United States to significantly reduce import dependency in these future industries. According to the Department of Energy, the global hydrogen economy alone has a global sales potential of $2.5 billion per year. If environmentally-friendly hydrogen can be used on a large scale, this will also create 30 million jobs and a potentially reduce global CO_2 by 20 per cent by 2050[1].

The tried-and-tested Production Tax Credits are being utilised as a central funding instrument in the IRA, both for the development of climate-neutral energy generation capacities and for the ramp-up of the hydrogen economy. This input-based and production-based funding instrument complements the existing CAPEX-based instruments to fund the hydrogen hubs being created in the US. The consistent interaction of these instruments enables the hydrogen economy to ramp up along the entire value chain.

IMPACT OF THE IRA ON RENEWABLE ENERGIES

Up to 60 per cent of the investment can be reimbursed by setting up Production Tax Credits for renewable energy production. This support rate is linked to wage and qualification programmes, the use of domestic products and support from specific regions, among other things. Analyses show that Production Tax Credits significantly reduce production costs for renewable electricity[2].

Figure 1: Development of renewable energy generation costs based on the IRA. Source: BCG



[1] U.S. Department of Energy: 'DOE National Clean Hydrogen Strategy and Roadmap', Draft September 2022.
[2] BCG Executive Perspectives: 'US Inflation Reduction Act: Climate & Energy Features and Potential Implications', August 2022.

This improvement in the cost-effectiveness of renewable energies will greatly accelerate their expansion in the United States. It is expected that the share of renewable energy in electricity generation will increase to an estimated 65–80 per cent in 2030, compared to a share of around 40 per cent in 2020. To achieve this, the generation capacities will be significantly increased via solar energy, wind and offshore (see figure 2). This creates the basic prerequisite for the production of green hydrogen under economic conditions.

IMPACT OF THE IRA ON HYDROGEN

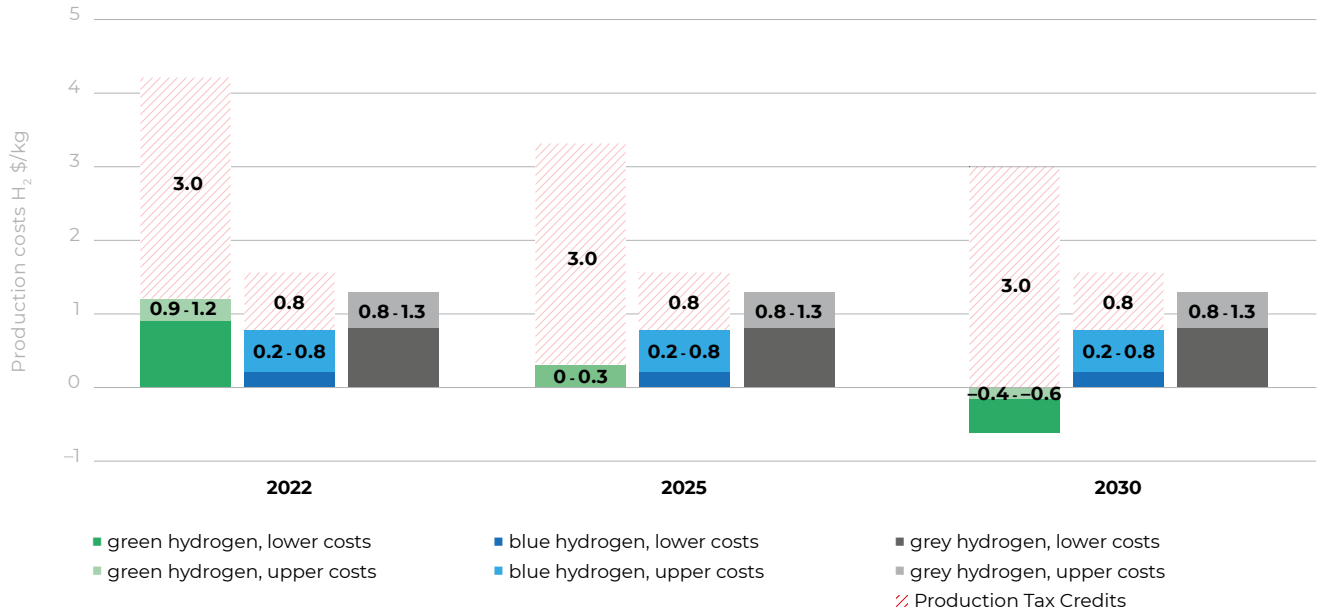
In addition to renewable energies, the ramp-up of the hydrogen economy is also being funded via the instrument of direct support in the form of tax credits. In backing hydrogen, the IRA is focusing on the CO_2 content of the hydrogen produced, but not on the technologies used for this purpose. This means that it is relying on the complete openness of technology. Tax credits are granted in different amounts according to the intensity of CO_2 in the hydrogen.

Table 1:

Grams of CO_2/gram of hydrogen produced	Grams of CO_2/MJ (lower calorific value)	Production Tax Credit per kg of H_2	Investment Tax Credit in %
< 0.45	< 3.75	US $ 3.00	30 %
< 1.5	< 12.50	US $ 1.00	10 %
< 2.5	< 20.84	US $ 0.75	7.5 %
< 4.0	< 33.34	US $ 0.6	6 %

In contrast to the European Union's proposals, which do not provide for double funding for renewable energy and hydrogen, the IRA allows for a combination and sequencing of tax credits. In addition, these tax credits can be used for wind and solar energy. These incentives lead to a significant improvement in the economic efficiency of climate-neutral hydrogen compared to fossil fuels. When the IRA enters into force, green and blue hydrogen will be more economical than grey hydrogen in the United States. As a result of the falling cost of renewable energy, green hydrogen will be the most economical form of hydrogen production in the United States by 2025.

Figure 2: Development of hydrogen production costs based on the Inflation Reduction Act. Source: BCG



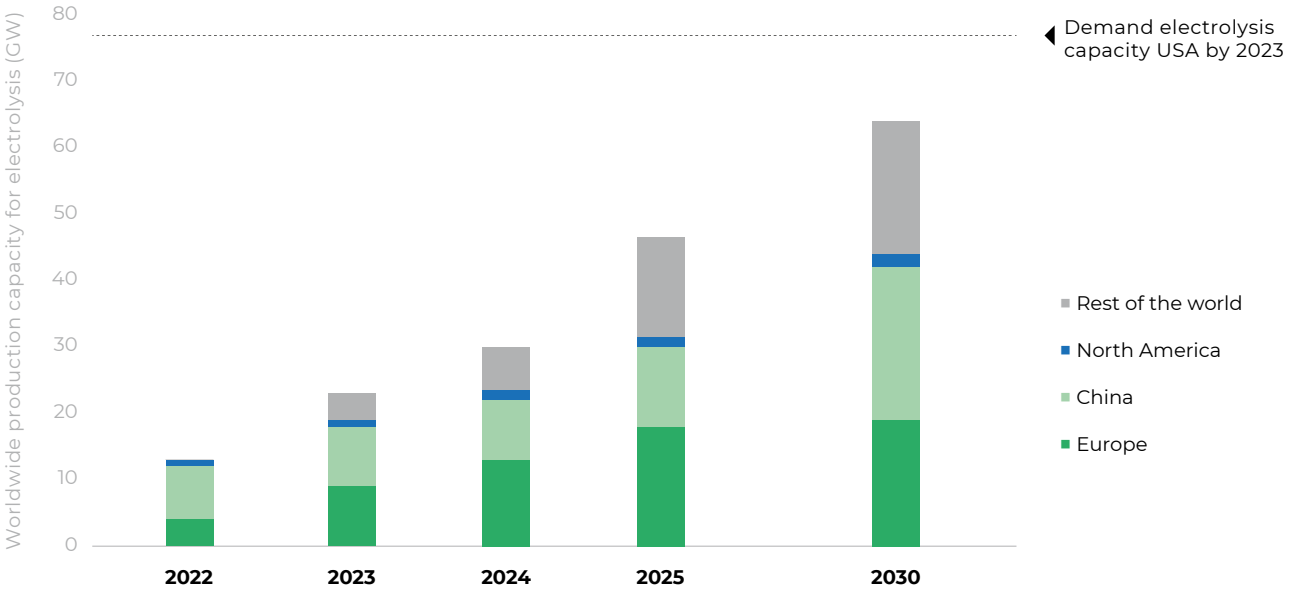
With the entry into force of the IRA, it will be possible to achieve hydrogen generation costs of up to $1.2/kg (about €36/MWh[3]) for green hydrogen and up to $0.8/kg (about €24/MWh3[3]) for blue hydrogen in the United States. This means the United States will be where the world's most economically viable, environmentally-friendly hydrogen can be produced at a cost level forecast for 2050.[4] The cost reduction effects of renewable energy and the manufacturing costs of electrolysers will further reduce these production costs. In comparison, in its bottom-up study on the heating market for 2030, the German National Hydrogen Council (Nationaler Wasserstoffrat, NWR) used wholesale prices for hydrogen in the range of €3 to €4/kg.

In the National Clean Hydrogen Strategy and Roadmap, the Department of Energy has predicted the need for environmentally-friendly hydrogen in the United States. This assumes a hydrogen demand of 10 million tonnes in 2030, 20 million tonnes in 2040 and 50 million tonnes in 2050. This is accompanied by the ambitious goal of lowering the price of one kilogram of hydrogen to below one US dollar within the next decade. This will have an impact on the scaling of the hydrogen value chain and may therefore play a significant role in reducing costs.

Assuming that about two-thirds of the hydrogen demand in 2030 will be met by green hydrogen, the United States will need about 78 GW[5] of electrolysis power. Global production capacities for electrolysers will be ramped up in the coming years, thus meaning they are a limiting factor. It is therefore to be expected that a significant proportion of the annual production volume for hydrogen projects will be established in the United States and that European electrolyser manufacturers will relocate their capacities to the United States due to the investment security in place and the feasibility of rapid implementation that comes with it.

[3] Assumption: Parity between US dollars and euros.
[4] Hydrogen Council: Global Hydrogen Flows: Hydrogen trade as a key enabler for efficient decarbonisation.
[5] Assumption: Efficiency of water electrolysis 70%, full-load hours: 4,000.

Figure 3: Development of worldwide production capacity for electrolysers. Source: IEA, in-house calculations



CLASSIFICATION OF THE INFLATION REDUCTION ACT

With the proposed IRA, it is clear that the United States is taking a fundamentally different path to fund the ramp-up of the hydrogen economy than the European Union and Germany are intending. With Production Tax Credits, the United States is relying on a clear supply-side policy with the instrument of tax credits and subsidies, which are used at multiple points in the production chain to make hydrogen available to the market at an economic price level. The European Union and Germany, on the other hand, are relying on the instruments of CO_2 emissions trading and funding the profitability gap on the demand side. The planned specification of the Production Tax Credits has the following advantages with regard to massively accelerating the ramp-up of the hydrogen economy:

- **Investment security through a well-known and proven funding instrument**
  With the Production Tax Credits, the United States is utilising an instrument that is tried and trusted with investors and that therefore ensures a high degree of investment security along the entire hydrogen value chain. In contrast, the narrow limits of EU state aid law lead to considerable uncertainty and start-up disadvantages in time-critical investment decisions. In addition, the specification of the *Carbon Contracts for Difference* and the investment funding in Germany and the EU has yet to be confirmed. Supply-side instruments such as H_2Global have so far been closely aligned with imports of green derivatives. The extent to which supply and value chains in Germany and Europe are stimulated for climate-neutral hydrogen and its derivatives is still largely unclear. So far, it has also not been clear how to manage the establishment of international H_2 partnerships in a way that is cross-departmental and – in terms of quantity and time – goal-oriented in terms of requirements.

- **Broader approach to the production of environmentally-friendly hydrogen**
  The United States is taking a simple and technology-neutral approach to producing environmentally-friendly hydrogen. The level of funding is based on the CO_2 content of the environmentally-friendly hydrogen. This approach leads, especially in the ramp-up phase, to having an extremely wide range of environmentally-friendly hydrogen by funding all sources of hydrogen that have a positive climate protection effect. On the other hand, the certification requirements at European level, for example in

the context of the delegated acts, are not yet clear and the associated consequences for certifiable hydrogen production are still surrounded by major uncertainty.[6]

- **Applications for hydrogen in all sectors**
  Funding hydrogen production in the United States makes environmentally-friendly hydrogen immediately available at an economic price level in all application sectors. This creates the conditions for leading markets for hydrogen applications to be established in individual sectors. In the European Union as well as in Germany, however, efforts to establish leading markets in the field of industrial applications are only just beginning and progress is slow.

In addition, it should be taken into account that the wide-scale funding of the ramp-up of the hydrogen economy is combined with protectionist elements on the user side. In particular, the granting of tax credits is linked to local content requirements, such as for steel products. This means that using hydrogen-based industrial application technologies is also supported on the demand side, and the fact that international competition is distorted is consciously accepted. In Germany, on the other hand, the competitiveness of exports from hydrogen-based industrial applications is expected to be significantly weakened if exports are not included in the carbon border adjustment.

In addition, preferential settlement of the value chains in the US will subsequently also lead to a shift in innovation activities, since there is no expectation that US-influenced production will be substantially driven by European research and development activities. If, on the other hand, there is no expectation that research and development will have a positive effect on domestic markets, then the question as to whether further funding in Europe is worthwhile will ultimately arise, which could further intensify the negative effect. Bilateral cooperation between US and German research and development activities must therefore be further stepped up in order to mitigate these negative effects and benefit from the investments. In addition, it would also be advisable for Germany to reduce the number of areas, simplify them and increase their level of funding and to focus on particularly promising areas such as electrolysis and safety technologies to avoid losing the technical leadership it is striving for entirely.

As a result of the various funding systems outlined and the high level of ambition that the United States has established, it is to be expected that the United States will adopt a pioneering position in the field of hydrogen technology. This is because the United States has a structural advantage compared to many other industrialised countries. It can meet its high demand for hydrogen through domestic production and also operate as an exporter to other countries. This sees the US as an industrial location securing an energy supply at favourable prices, enabling the development of the entire hydrogen value chain domestically, reducing technological dependence on other countries and increasing the resilience of energy supply as the foundation of industrial value creation in the United States. In addition, the importance of hydrogen in the United States will enjoy cross-party distribution and this fundamental line will most likely continue, even in the event of a change in majority ratios.

[6] Compare the opinion of the National Hydrogen Council on the role and necessary specification of the certification criteria for a fast and effective ramp-up of the hydrogen economy.

EFFECTS OF THE INFLATION REDUCTION ACT ON GERMANY AND THE EUROPEAN UNION

For Germany, the development in the United States carries the risk of structural disadvantages in the ramp-up and development of the hydrogen economy. Firstly, the price level for hydrogen from German production will be structurally higher than that of the United States due to poorer geographical conditions in Germany. This means that the relative cost disadvantages of Europe arising from the need to replace cheap Russian natural gas volumes with more expensive LNG are firmly established and will continue. Secondly, cheaper imported hydrogen will only be available in Germany with a time delay, as the necessary import infrastructure must first be set up. Thirdly – and this is the most important point – the ramp-up in Germany and Europe is being put back in terms of timescale. It can be assumed that due to foreseeable bottlenecks in the value-added and supply chains, in particular for electrolysers, it is extremely difficult to institute a ramp-up in both regions simultaneously and in parallel. These bottlenecks affect the entire supply chain of raw materials, materials and components, but above all also the production capacities of electrolysers and AEL plants, as production is not yet industrialised.[7]

In the field of industrial applications, where there is already a significant investment in hydrogen-based production technologies, even *stranded assets* are at risk to a considerable extent if, as a result of the developments described, hydrogen is only available in the EU with a considerable delay, not in sufficient quantities or not under competitive conditions.

With the Inflation Reduction Act, the US has launched an extensive package of laws that puts the United States at the forefront of hydrogen technology ('Man on the Moon' project for hydrogen) and at the same time has the potential to delay the hydrogen ramp-up in Germany and the EU. This, in turn, would have serious consequences for competitiveness, employment, transformation of industry and the economy as a whole, as well as for the achievement of climate targets. From the perspective of the National Hydrogen Council, the IRA should be seen as a wake-up call to now set the framework conditions at national and European level in such a way that the hydrogen ramp-up significantly accelerates. Europe can no longer afford ongoing discussions regarding additionality or equality in global competition. Europe must come together in response to the IRA for the ramp-up of a liquid hydrogen market and should organise itself within the framework of a hydrogen union. The quantities to be produced in Europe as well as international hydrogen partnerships should be tackled quickly in a systematic and goal-oriented manner. The aim must be to reduce risks for investors in partner countries in order to reliably produce or procure hydrogen.

The top priority must be to quickly make large quantities of cheap hydrogen available to Europe. In addition to resolutely promoting a more ambitious ramp-up of German production, favourable hydrogen imports for Germany in the areas of industry, mobility, heating and electricity in particular must be secured. This requires close European cooperation, which supports intra-European hydrogen projects and the development of the European transport infrastructure. For non-European imports – especially in geographically close regions such as North Africa – European interests should be combined.

In addition, essential areas of action must now be implemented in the short term to bring about a much faster funding instrument in Germany/the EU, to significantly simplify and de-bureaucratise the necessary funding framework and, above all, to significantly reduce the entry requirements and ancillary con-

[7] Elektrolyseure für die Wasserstoffrevolution (Electrolysers for the Hydrogen Revolution) – Stiftung Wissenschaft und Politik (swp-berlin.org).

ditions for claiming funding. In the medium to long term, an adapted and consistent support system is needed, with positive incentives for new technologies instead of punitive systems for existing ones, and a significant simplification and acceleration of approval procedures. Here, it is also necessary to consider relaxing the state aid schemes (KUEBLL) during the ramp-up.

The aim of a European response to the IRA should be a coherent, coordinated overall concept at EU level, which massively simplifies and accelerates the hydrogen ramp-up, eliminates regulatory hurdles instead of creating new ones and thus also opens up the prospect of returning to a permanent pioneering role in hydrogen technologies internationally. As a result, this should strengthen Europe as a location in terms of climate and industrial policy in a sustainable manner. Ultimately, Germany and the EU are faced with the political question of how to organise a sustainable, stable and competitive energy supply, in particular for its key industries in a regional and international context that extends beyond the EU. The European equivalent to the 'Man on the Moon' would be an Energy Union Plus.

The National Hydrogen Council will monitor and analyse the impact of the IRA on the ramp-up and competitiveness of the hydrogen economy in Germany and Europe, as well as its actions in response to the IRA. In the short term, the National Hydrogen Council will use the update of the National Hydrogen Strategy to formulate proposals for a reaction. However, the IRA is expected to have a long-term impact on the global competitive architecture. Therefore, the National Hydrogen Council will set up a monitoring function to illustrate the long-term effects and will derive necessary recommendations for action on the basis of this illustration.

If you are interested in finding out more or have any questions, please contact:
Hydrogen Coordination Office (Leitstelle Wasserstoff)
E-mail: info@leitstelle-nws.de
Website: www.wasserstoffrat.de/en

NATIONALER WASSERSTOFFRAT

THE GERMAN NATIONAL HYDROGEN COUNCIL

On 10 June 2020, the German Federal Government adopted the National Hydrogen Strategy and appointed the German National Hydrogen Council. The Council consists of 26 high-ranking experts in the fields of economy, science and civil society. These experts are not part of public administration. The members of the National Hydrogen Council are experts in the fields of production, research and innovation, industrial decarbonisation, transportation and buildings/heating, infrastructure, international partnerships as well as climate and sustainability. The National Hydrogen Council is chaired by former Parliamentary State Secretary Katherina Reiche.

The task of the National Hydrogen Council is to advise and support the State Secretary's Committee for Hydrogen with proposals and recommendations for action in the implementation and further development of Germany's National Hydrogen Strategy.

Contact: info@leitstelle-nws.de, www.wasserstoffrat.de/en