

acatech COOPERATION

HySupply

Building the groundwork for an Australian-German hydrogen bridge

acatech/BDI (Eds.)

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Hydrogen produced from renewables – German-Australian feasibility study

Our energy future must be **climate neutral**. With ambitious energy transition targets the need for climate friendly energy sources is increasing rapidly. **Green hydrogen** will be a key energy carrier for a future CO₂-neutral energy supply.

While Germany is one of the leaders in hydrogen technologies, it will need to import a large part of its energy demand. On the other hand, Australia possesses immense potential for electricity generation from renewable sources as well as the know-how and the infrastructure for the export of hydrogen and raw materials. For these reasons, an Australian-German cooperation presents a win-win situation for both countries: exporting hydrogen technologies offers significant economic potential for Germany while at the same time providing Australia with the opportunity of creating additional value by exporting hydrogen.

The war of aggression in Ukraine has increased the need to act now to secure reliable energy partnerships and to build up the infrastructures for the future energy system.

HySupply – a unique project funded by the German and Australian governments

HySupply is a **unique cooperation project**: a team of leading German and Australian experts from science and industry investigated the feasibility of the German-Australian supply chain for hydrogen produced from renewables including hydrogen-based energy carriers (derivates).

The project is funded by the Departments of Foreign Affairs and Trade (DFAT) and Industry, Science, Energy and Resources (DISER) of Australia and the Federal Ministry of Education and Research (BMBF) of the Federal Republic of Germany. For Germany, HySupply is coordinated by acatech – National Academy of Science and Engineering in cooperation with the Federation of German Industries (BDI), while the University of New South Wales (UNSW) is leading the Australian consortium.

The project ran over two years and published six milestones laying the groundwork for a joint commitment for collaboration on renewable hydrogen between Australia and Germany.

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Exchange and two delegation trips: the foundation for a successful partnership



Figure 1: Destinations of the delegation trip, May 2022 (source: acatech)

In 2019, a delegation by acatech – National Academy of Science and Engineering and the Federation of German Industries (BDI), supported by the Federal Ministry for Education and Research (BMBF), went on a fact-finding mission to Australia with the aim to meet leading institutions and industry from the energy sector. The main insight from that trip: Germany and Australia are well suited for a long-term hydrogen partnership which provided the basis for the 2020 **Joint Declaration of Intent (JDOI)** on HySupply.

During the whole project, HySupply was characterized by a continuous and intense exchange, both in Germany and Australia and between the experts from both countries. The projects teams organised several internal and external workshops and projects meetings.



Figure 2: German Federal Minister of Education and Research Bettina Stark-Watzinger (second from the left) and Minister for Regional Development; Agriculture and Food; Hydrogen Industry of Western Australia Alannah MacTieman (in the middle) together with high-ranking German and Australian representatives during the delegation visit in Perth (photo: BMBF)

Highlight of HySupply was a **delegation trip** to Australia from May 25 to 31, 2022, led by **Bettina Stark-Watzinger**, the German Federal Minister of Education and Research. A group of approx. 25 experts from science, industry and politics visited the cities of Perth, Sydney, Brisbane, and Adelaide.

The trip aimed at deepening the previous work on the project, to further develop existing cooperation and to initiate new partnerships to support the realisation of supply chain for renewable hydrogen. At the outset of the trip in **Perth** the potentials of green hydrogen in Western Australia have been discussed during the round table with approx. 60 participants followed by the visit to Woodside Energy and Fortescue Future Industries. In **Sydney**, the German delegation met the Australian partners of HySupply from the University of New South Wales. There, experts discussed financing opportunities of hydrogen projects. In **Brisbane**, the key focus was set around the development of hydrogen export projects in the state of Queensland as well as the visit to the research institution CSIRO to learn more about the groundwork in ammonia cracking. At the final stop in **Adelaide**, participants discussed the development of hydrogen supply chains along with the transformation of heavy industry.

Six milestones laying the ground for the German-Australian hydrogen partnership



Figure 3: HySupply studies and other publications (source: acatech)

- The **first milestone** was the working paper from the German project group **"A Meta-Analysis towards a German-Australian Supply Chain for Renewable Hydrogen"**. It elaborates on Germany's future demands for hydrogen and its need for imports. The study focuses on various transport vectors such as liquid hydrogen (LH₂), liquid organic hydrogen carriers (LOHC), ammonia (NH₃), and methanol (MeOH). The paper shows that the long-distance transport of hydrogen and its derivatives between Australia and Germany is technically feasible with renewable ammonia and methanol being overall the most mature pathways.
- The **second milestone**, the report **"The Case for an Australian Hydrogen Export Market to Germany: State of Play Version 1.0"** of the Australian consortium, demonstrates Australia's leadership opportunity to export renewable hydrogen in the future. The report shows that already today, Australia's best locations can produce renewable hydrogen at 2–6 €/kg.
- The **third milestone** was HySupply-Germany's legal study which investigated the **"Regulatory Framework for a German-Australian Hydrogen Bridge"** of previously analysed transport options. The results confirm that the import of renewable hydrogen from Australia to Europe is legally feasible. However, depending on the transport options, some legal hurdles occur which can impede timely implementation.
- The **"Certification Report"**, the **fourth milestone** of the project, describes key characteristics and 'good design' principles of certification schemes as well as existing and emerging certification schemes that are potentially applicable to a bilateral trade of renewable hydrogen between Germany and Australian.
- The **fifth milestone** was introduced by **"Australia's Supply-Side Roadmapping Exercise"** which identified key barriers and opportunities across five topic areas and formulated strategic next steps to realise Australia's hydrogen export potential.
- Finally, the **"Demand-Side Action Plan"** published in October 2022 provides an update on Germany's evolving hydrogen economy and formulates actions that need to be implemented within the next 24 months to allow for renewable hydrogen imports from Australia by 2030.

Demand-side action plan

HySupply-Germany consulted more than **50 experts** including current and potential future offtakers, technology providers and subcomponent suppliers, trading firms, port authorities, leading scientists, industry associations, and representatives of the Federal Government. The purpose of this stakeholder consultation was to get a collective understanding of the key challenges and opportunities alongside the hydrogen supply chain between Australia and Germany. As part of this process, HySupply-Germany carried out a delegation trip to Australia in May 2022 which was led by Germany's Federal Minister of Education and Research and

accompanied by some 25 experts from the German industry and academia.

The views obtained through the stakeholder consultation were clustered into five action fields that each contain key actions to implement the German-Australian hydrogen supply chain, especially from the perspective of the demand side. Since the project development including planning and approval processes, procurement of equipment, and the construction of facilities and infrastructures will take several years, the actions of the **next 24 months** will determine whether Germany can realise renewable hydrogen or derivative imports from Australia by 2030.

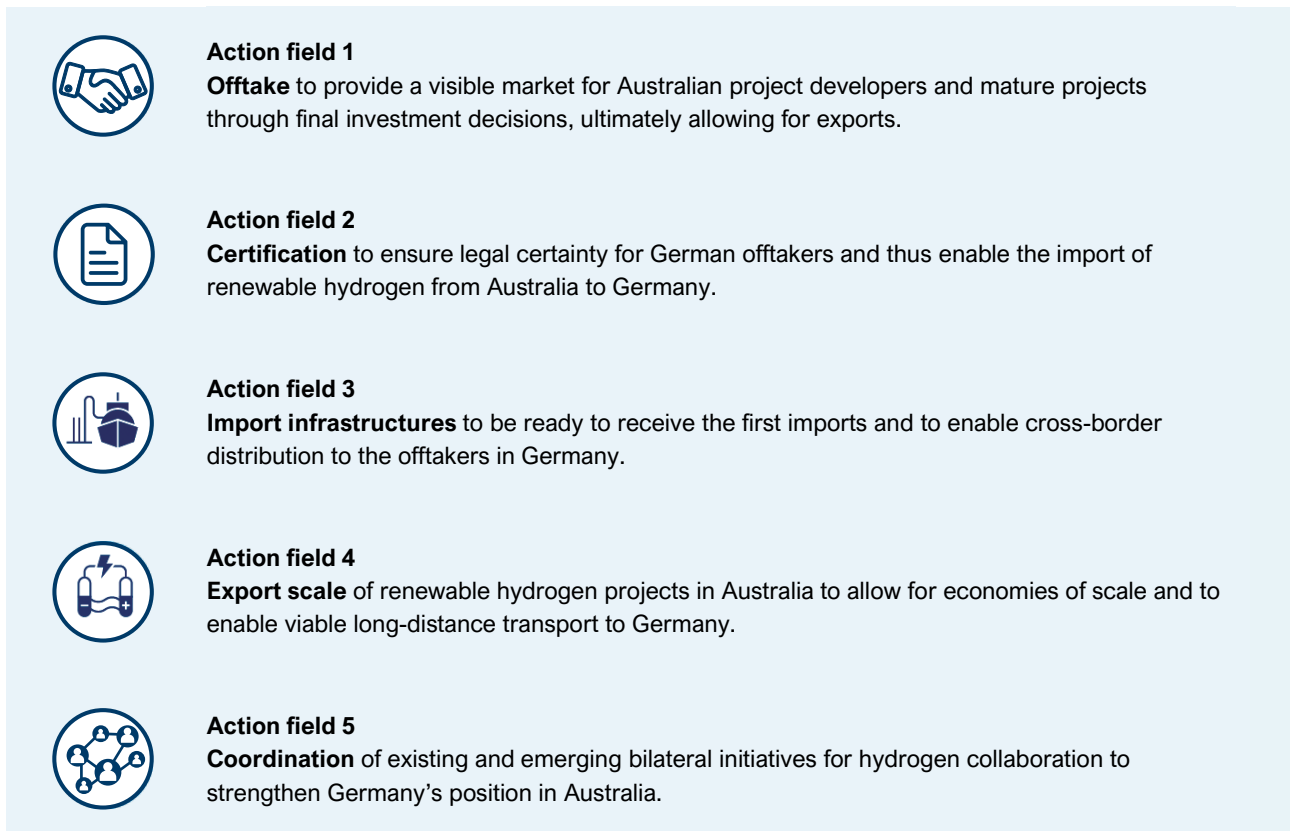


Figure 4: Demand-side action fields (source: HySupply-Germany's Demand-Side Action Plan, 2022; Icons: vecteezy.com, Ellery Studio)

From fact-finding to fact-making

This Action Plan has demonstrated **key actions** that are decisive for the implementation of the German-Australian hydrogen supply chain from the perspective of the demand side. Together with **HySupply-Australia's Supply-Side Roadmap**¹, German and Australian policymakers and legislators as well as industry are provided with a set of actions that will deliver on the promise of the bilateral hydrogen bridge.

Moving forward, the German-Australian partnership needs to build on the current momentum and **fast-track the feasible solutions of today** to realise the hydrogen bridge of tomorrow. To achieve the desired outcome, the implementation of the actions should be guided by the principles below.

- **Act fast:** Speed will be crucial if Germany and Australia want to implement the bilateral supply chain and capitalise on this massive opportunity within this decade. Any delay in the implementation of the supply chain increases the risks that financial capital, manufacturing capabilities, and skilled workforce shift to other markets, especially Asia, North America, and the Middle East.
- **Be pragmatic:** Both countries should follow a pragmatic approach that prioritises implementing the second-best solution now while quickly transitioning towards the best netzero solution soon after. The first-mover risk in the supply chain must be turned into a first-mover advantage as emissions reduction and green investments should be encouraged not sanctioned. An accelerated and pragmatic implementation of the German-Australian supply chain for renewable hydrogen could also act as a blueprint for other green supply chains around the world.



Figure 5: The Way Forward (source: HySupply-Germany's Demand-Side Action Plan, 2022; Icons: vecteezy, Ellery Studio)

- **Think big:** Additional feasibility studies will not help to drive down the costs of electrolysers and renewable hydrogen. Instead, large-scale demonstrators such as the proposed joint hydrogen innovation hub are needed to showcase the feasibility, enable innovation, and provide green growth opportunities. The potential for low-cost renewable hydrogen production in Australia and the projected future demands in Germany and Europe are too big to be restricted by small approaches.
- **Play as a team:** A supply chain for renewable hydrogen has never been realised before and no single market player is able to implement it alone.² If this endeavour is to be successful it will require the combined and coordinated efforts of German and Australian industry, research, and politics.

1 | For more information see: HySupply-Australia's Supply-side Roadmapping Exercise, 2022.

2 | HySupply has compiled an exclusive stakeholder catalogue of 35 German and Australian companies that have expressed an explicit interest in contributing to the development of the supply chain for renewable hydrogen. The catalogue can be used by the leading ministries of both countries and the participating companies as a foundation for implementing the hydrogen bridge and strengthening the partnership.

Editors:

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