Bavarian Ministry of Economic Affairs,
Regional Development and Energy

Bavarian Hydrogen Strategy 2.0

Energy Plan Bavaria 2040

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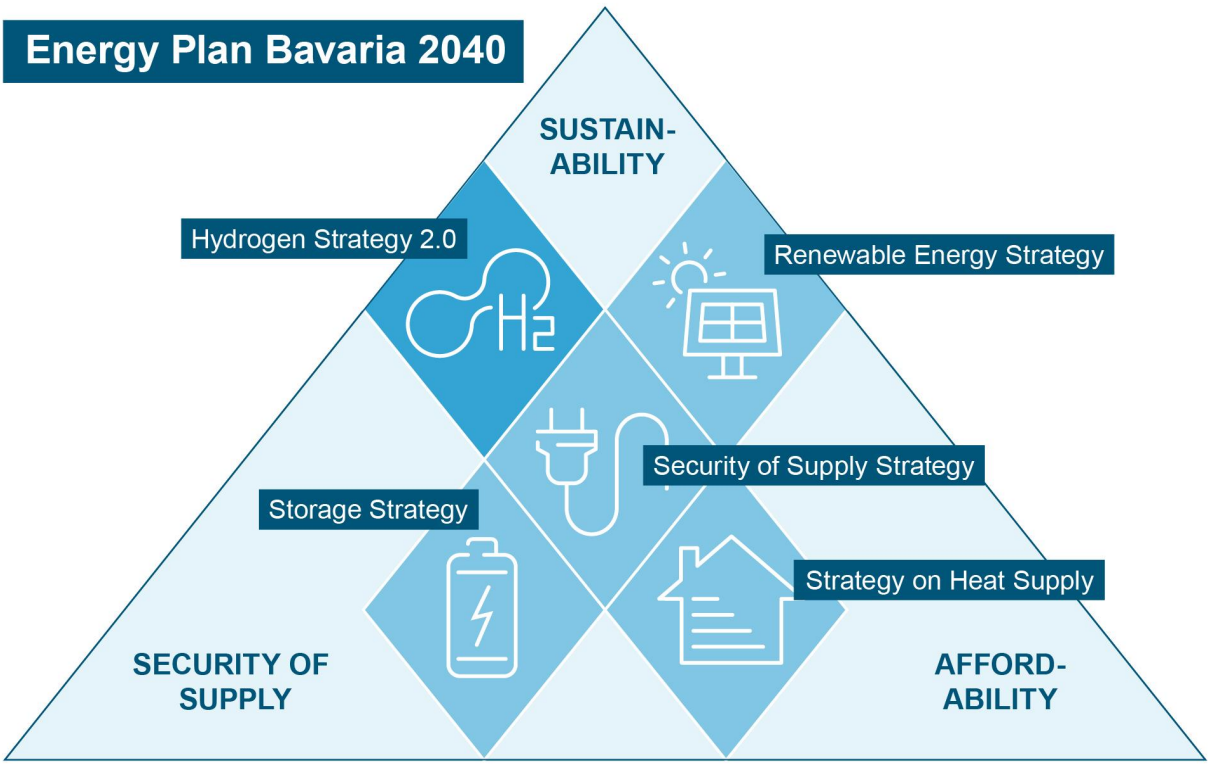
Content

Bavarian Hydrogen Strategy 2.0 – Energy Plan Bavaria 2040

The Bavarian Hydrogen Strategy 2.0 is part of the Bavarian Energy Plan 2040, which, as an overall energy policy concept, shows how the Bavarian State Government intends to achieve the goal of climate neutrality in the area of energy supply by 2040. The guiding principle is the energy policy triangle of security of supply, affordability and sustainability. As part of the Bavarian Energy Plan 2040, the aspects of security of supply, renewable energies, hydrogen, heat supply and energy storage are addressed with specific, harmonised implementation strategies.



1. What has been achieved?

On the path to decarbonisation and defossilisation, the importance of climate-friendly hydrogen as feed-stock and for energy use is no longer in question. It will be an important component in the transformation of industry, mobility and the energy sector. The need to achieve a high level of security of supply and diversification of supply sources on the energy market in light of the war in Ukraine and its consequences has intensified efforts to ambitiously drive forward and accelerate the hydrogen ramp-up even more. However, as the hydrogen sector as a whole, including the market, regulation and logistics, needs to be reorganised, there are still challenges and uncertainties in the current ramp-up phase that need to be addressed pragmatically.

With the Bavarian Hydrogen Strategy adopted in 2020, the State Government has created a suitable framework for action for the concrete design of the hydrogen ramp-up in the Free State of Bavaria. Important steps have been taken meanwhile and projects initiated:

Networking, competence building, implementation in practice

- The Hydrogen Centre.Bavaria (H2.B) is recognised as a proven platform for hydrogen topics in Bavaria and coordinates the activities of the Bavarian Hydrogen Alliance. With currently 370 partners from industry and research, this alliance pools innovative expertise and is a powerful driving force behind the hydrogen economy in Bavaria. In addition, the project management organisations of the funding programmes and other players are engaged as strong competence and consulting partners for the hydrogen ramp-up in Bavaria.
- Since 2020, the Free State of Bavaria has been increasingly promoting research in the field of hydrogen along the entire value chain with the Bavarian Energy Research Programme in 28 projects. These range from production (for example by means of electrolysis or from biomass) to storage (for example as (cryo)compressed hydrogen) and transport (for example using the natural gas network) through to application (for example fuel cells for mobility and stationary applications).
- We are using Bavarian budget funds to support the Important Projects of Common European Interest (IPCEI)[1] in the field of hydrogen - as a significant contribution to the market ramp-up of hydrogen technologies.
- The Hydrogen Technology and Application Centre Pfeffenhausen[2] (WTAZ) will combine research from Bavaria's leading universities and the private sector and be an important partner for suppliers, start-ups and vehicle developers in the areas of testing, inspection, approval, regulation, standardisation and training. The focus is on drive integration, fuelling and refuelling technology. Project responsibility and funding are in the hand of the Federal Government. In addition, the Free State of Bavaria is supporting the project with its own funds, including through project funding.
- Bavarian companies take leading positions in hydrogen technologies, particularly in hydrogen production, fuel cells, the manufacture of fittings and connecting elements and hydrogen logistics. Further competences exist in the production of hydrogen-based chemical products and carriers. More and more innovative products for hydrogen applications, especially in the mobility sector, are reaching market maturity. The research and development of hydrogen technologies in Bavaria benefits from the close co-operation between companies and research institutions.
- So far, fourteen HyLand model regions in Bavaria[3] have built up networks and expertise with local stakeholders, carried out feasibility analyses and explored the possibilities of local value chains. The focus is on mobility.
- In several Bavarian regions with a high demand for hydrogen, initiatives from industry and municipal stakeholders are working to concretise the possibilities of future energy and hydrogen supply (including the H2 clusters Ingolstadt and Burghausen, Hydrogen Alliance Kelheim/Regensburg).
- The H2Direkt pilot project in Hohenwart is gaining initial experience with hydrogen in the local distribution grid and its use by households and a commercial enterprise for heat generation.[4]

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[1] IPCEIs are projects that were initiated by the EU Commission, but whose planning, financing and implementation are the responsibility of the Member States.
[2] The project was awarded the contract by the Federal Ministry for Digital and Transport in 2021.
[3] "HyLand - Hydrogen Regions in Germany" is a competition initiated by the Federal Ministry for Digital and Transport in 2019.
[4] H2Direkt is part of the TransHyDE flagship project, one of three hydrogen flagship projects of the Federal Ministry of Education and Research.

- The "HyStorage" research project at the Bierwang gas storage facility is the first project in Bavaria to investigate the suitability of a porous rock storage system for hydrogen storage.

Infrastructure

- The prospects for the development of a Germany-wide hydrogen core network by 2032 have largely been created at federal level. Bavaria's connections from all directions, important import points and regions with large consumers have been taken into account. The legal foundations for integrated network development planning have been put in place for the further expansion of hydrogen networks.
- The projects of the European hydrogen network that are important for Bavaria have received the status of Projects of Common Interest (PCI), including the southern hydrogen corridor from Italy via Austria to Bavaria. This opens up good hydrogen import options.
- The Bavarian funding programme launched in 2020 to establish a basic hydrogen filling station infrastructure is making an important contribution to the use of hydrogen in the mobility sector. Bavaria is already approaching the home straight in terms of the EU's AFIR (Alternative Fuel Infrastructure Regulation) targets for a europe-wide, publicly accessible infrastructure for alternative fuels along the Trans-European Transport Network, not least thanks to the funding programme, and is expected to exceed the targets by 2030.[5]
- The Bavarian funding programme for the development of an electrolyser infrastructure in Bavaria was successfully launched in 2023 and serves the decentralised production and provision of renewable hydrogen in the regions.

Framework conditions and market

- New regulations for market and incentive regulation for hydrogen and for accelerating hydrogen projects were adopted at EU and federal level. These include, for example, the agreement reached on the EU gas/hydrogen internal market package and the overriding public interest now enshrined in the Energy Industry Act, which simplifies and accelerates the procedures for electrolysers and hydrogen pipelines.
- Preparations for a market for green hydrogen are underway, but are still at a very early stage as the product and its derivatives are not yet available in larger quantities. Future industrial customers in the metropolitan areas and industrial centres have reported their hydrogen requirements, but are still rather hesitant in some regions and with regard to binding purchase commitments.
- International contacts and partnerships with countries that are relevant to hydrogen are being further developed and cultivated.

[5] The AFIR (Alternative Fuel Infrastructure Regulation) is the central political element for the development of refuelling and charging infrastructure at European level and came into force on 13 April 2024. It establishes a binding framework for all EU Member States for the expansion of a europe-wide, publicly accessible infrastructure for alternative fuels along the Trans-European Transport Network (TEN). The aim of the AFIR for hydrogen (cars and lorries) is to provide refuelling infrastructure every 200 kilometres along the TEN transport network and at all urban hubs by 2030.

2. What are our goals?

With the Bavarian Hydrogen Strategy 2.0, we want to further advance the development of the entire hydrogen value chain from production, logistics and storage to its utilisation in various areas of application and firmly establish hydrogen as a flexible option in the energy system. In doing so, we are open to the potential diversity of technologies and applications. So that climate-neutral hydrogen can be used successfully in the long term, a corresponding supply of hydrogen is required on the market. A focus must therefore be placed on the sourcing and supply of hydrogen via the national and international market through imports, as future demand in Bavaria will significantly exceed domestic production capacities. At the same time, the demand side must be willing and able to utilise hydrogen for the various applications. The prerequisites for this are favourable framework conditions and the availability of the necessary infrastructure.

Bavaria is therefore committed to the following priority areas of action and objectives:

Basic principles and framework conditions for hydrogen ramp-up

- Adoption of a consistent and incentivised regulatory framework for the hydrogen ramp-up,
- Securing the financing for the hydrogen infrastructure combined with incentives for rapid expansion,
- Creating the conditions for a functioning hydrogen market (international marketability of hydrogen with standards/certification, favourable market mechanisms and instruments, regulation, market incentives on the supply and demand side).

Availability of hydrogen – supply and procurement

- Development of demand-orientated hydrogen production close to consumption on site, especially as long as there is no adequate connection via pipelines and for the diversification of supply sources (in Bavaria 200-300 MW electrolysis capacity by 2027, 500-1,000 MW by 2032); domestic generation capacities of renewable electricity are taken into account,
- Securing hydrogen imports via different sources of supply, diversification of supply countries and routes: Priority is given to EU countries and third countries with a connection to the European hydrogen network, supplemented by deliveries by ship,
- Development of the network infrastructure with the hydrogen core network by 2032 and simultaneous network development planning for the further expansion in the regions, creation of the necessary connections to the import corridors of the European hydrogen network,
- Systematic integration of distribution grids, which play an important role in supplying the industrial and commercial customers connected to them,
- Establishment of transport and logistics solutions for a non-pipeline-based supply of hydrogen for regions that cannot be connected via pipelines and as a transitional solution or long-term alternative to pipeline supply,
- Availability of sufficient hydrogen storage facilities (see also Bavarian storage strategy),
- Ensuring security of supply, avoiding one-sided dependencies (see also Bavarian security of supply strategy).

Transformation of the economy – customers and needs

- Integration of hydrogen as a flexibility and storage option in the coordinated further development of the energy system,
- Development of broad fields of application for hydrogen for material and energy utilisation in industry, mobility and the energy sector,
- Bavarian companies' innovations and technological leadership in hydrogen,
- Availability of options and incentive systems for the decarbonisation of industry, including SMEs, with hydrogen (e.g. use of CO_2 capture, CCS / CCU, funding programmes, Carbon Contracts for Difference),
- Development of the necessary infrastructure for hydrogen mobility (road, rail, aviation) and availability of incentive systems.

3. How do we want to achieve our goals?

It is important that the players on the hydrogen market are provided with reliable and adequate conditions for the ramp-up of the hydrogen economy by 2030. The Bavarian economy should be given a clear perspective for decarbonisation and defossilisation with hydrogen and corresponding planning and investment security. We want to ensure that hydrogen is available in 2040 at competitive prices, at the right time and in the form that customers need it. This is an essential prerequisite for the Bavarian economy to be successful on the global markets in a climate-neutral way.

Bavaria advocates at federal and EU level for:

1. an active involvement of the federal states (‘Bundesländer’) by the Federal Government in all strategically important hydrogen issues (including implementation of the National Hydrogen Strategy, development of hydrogen networks, import strategy, storage strategy, market design),
2. its interests and concerns and clearly states them in resolutions for committee decisions and statements in consultations (including amendments to the Energy Industry Act, network development planning, Projects of Common Interest, definition of climate-neutral hydrogen),
3. the creation or maintenance and targeted use of federal funding programmes (including research & development, IPCEI, demonstration projects, H2 production, H2 use, decarbonisation, mobility, H2Global and European Hydrogen Bank instruments),
4. a further acceleration of the hydrogen ramp-up,
5. technological openness throughout the hydrogen economy,
6. simple, pragmatic and quickly realisable solutions and alternatives.

In Bavaria we want:

In the area of networks and competences

1. continue and strengthen the Hydrogen Centre.Bavaria (H2.B) and the Bavarian Hydrogen Alliance and initiate an update of the hydrogen roadmap based on the Hydrogen Strategy 2.0,
2. further accentuate the focus on hydrogen research in the Bavarian Energy Research Programme, initiate innovations and thus support Bavarian companies on their way to technological leadership,
3. strengthen alternative hydrogen production processes, such as the production of biogenic hydrogen from residual and waste materials,
4. by investigating a closed hydrogen ecosystem in the Burghausen area, which includes hydrogen production, utilisation and storage, to point the way to a climate-neutral future for the location,
5. continue to actively support the implementation of the WTAZ and IPCEI lighthouse projects initiated by the Federal Government and the EU.

For the hydrogen infrastructure

1. closely accompany and support the fastest possible development of pipeline networks, storage and logistics solutions for hydrogen - with the players in Bavaria, in cooperation with the federal government and internationally together with partner countries,
2. in the Burghausen H2 cluster to achieve the commissioning of a first hydrogen sub-grid at the end of 2025/beginning of 2026,
3. in suitable cases, promote the ramp-up of the hydrogen economy through state equity investment in Bavarian companies in the field of hydrogen infrastructure,
4. coordinate, standardise and accelerate planning and approval procedures for the development of hydrogen infrastructure throughout Bavaria,
5. support the decentralised development of domestic hydrogen production with the Bavarian Electrolysis Funding Programme BayFELI,
6. create good conditions for domestic green hydrogen production, in particular by expanding renewable energies at suitable locations,
7. continue to pursue the development of a needs-based basic infrastructure of hydrogen filling stations on the basis of the projects already underway and the fourth call for funding (Bavarian Hydrogen Filling Station Infrastructure Programme, BayH2T),
8. conducting a study to determine the local storage potential for hydrogen in the geological underground.

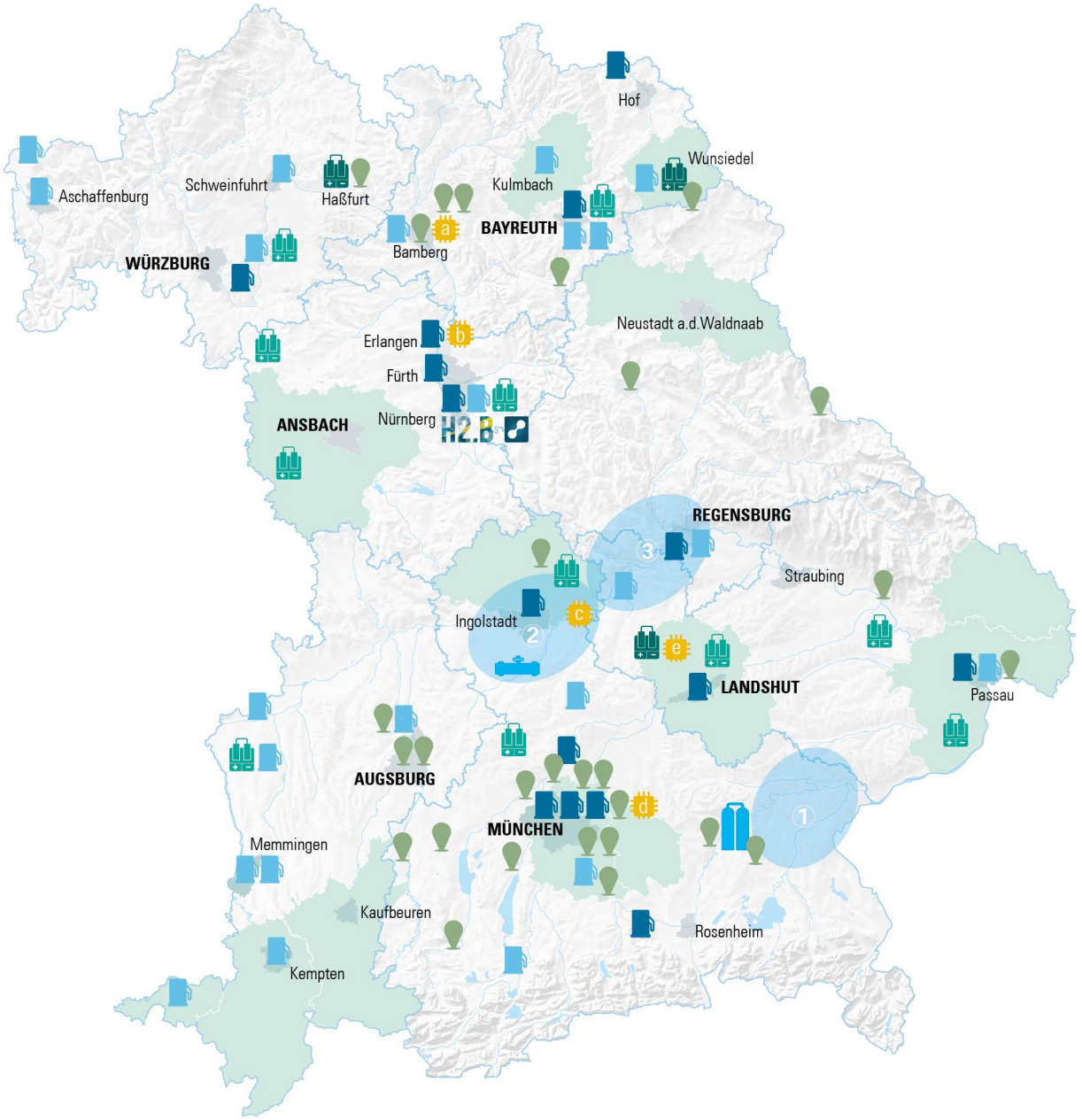
At international level

1. push the Bavarian "Hydrogen International" initiative: establish contacts with hydrogen-producing countries for future hydrogen imports, continue activities to increase the export of Bavarian hydrogen technologies and stimulate international cooperation in hydrogen research through

targeted missions abroad, visits by foreign delegations to Bavaria as well as dialogues and events with a political and technical focus,

2. vigorously push ahead the realisation of the Hydrogen South Corridor with partners in Austria, Italy and North Africa,
3. intensify cooperation with Austria on hydrogen imports and hydrogen storage and initiate joint projects.

Map Hydrogen Activities in Bavaria (selection)



- 14 HyLand - Hydrogen regions (Federal support programme)
- 23 H2 filling stations in planning/under construction/in operation (Bavarian support programme)
- 15 public H2 filling stations in operation
- 11 electrolysers in planning (Bavarian support programme)
- 3 further electrolysers in operation
- 5 large-scale projects being implemented
  a) IPCEI BoschPowerUnits
  b) IPCEI Green Hydrogen @ Blue Danube in preparation
  c) IPCEI BayH2
  d) IPCEI HyPowerDrive
  e) WTAZ Hydrogen Technology and User Centre Pfeffenhausen
- 28 H2 projects Bavarian Energy Research Programme
- 370 partners in the Bavarian Hydrogen Alliance
- 3 H2-Cluster
  1) HyPipe Bavaria – H2-Cluster Burghausen
  2) HyPipe Bavaria – H2-Cluster Ingolstadt
  3) Hydrogen Alliance Danube Region Kelheim-Regensburg
- H2.B H2.B Hydrogen Centre.Bavaria
- Project H2Direkt
- Project HyStorage

Abbreviations:

AFIR	Alternative Fuel Infrastructure Regulation
BayFELI	Bavarian funding programme for the development of an electrolysis infrastructure
BayH2T	Bavarian hydrogen filling station infrastructure programme
CCS / CCU	Carbon Capture and Storage / Carbon Capture and Utilisation
CO_2	Carbon dioxide
EU	European Union
H2	Hydrogen
H2.B	Hydrogen Centre.Bavaria
IPCEI	Important Project of Common European Interest
MW	Megawatt
PCI	Project of Common Interest
TEN	Trans-European Networks
WTAZ	Hydrogen Technology and User Centre Pfeffenhausen

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Costs depend on the network operator

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