

GREEN HYDROGEN DIRECTORY

German Green Hydrogen Companies with Interest in the Indian Market

As a federally owned enterprise, GIZ supports the German Government in achieving its objectives in the field of international cooperation for sustainable development.

Published by:
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

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Layout:
peppermint werbung berlin gmbh, Berlin

The International Hydrogen Ramp-up Programme (H2Uppp) of the German Federal Ministry for Economic Affairs and Climate Action (BMWK) promotes projects and market development for green hydrogen in selected developing and emerging countries as part of the National Hydrogen Strategy.

Delhi, Tübingen February 2024

1 INTRODUCTION

The increasing demand for clean energy solutions has led to a growing interest in green hydrogen as a versatile and environmentally friendly energy carrier. Unlike conventional hydrogen production methods that involve carbon-intensive processes, green hydrogen is generated through the electrolysis of water using electricity from renewable sources, ensuring a carbon-neutral outcome. Green hydrogen has diverse applications across industries, including transportation, industrial processes, and energy storage.

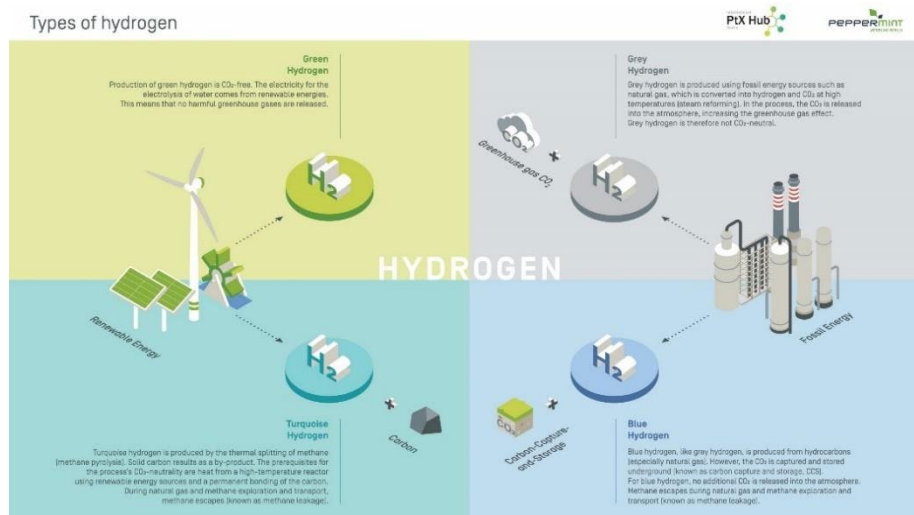


Figure 1 Types of Hydrogen

Source: PTX Hub (www.ptx-hub.org)

2 GREEN HYDROGEN PRODUCTION PROCESS

Green hydrogen is made by using clean energy from sources like the sun, wind, or water to split water into hydrogen and oxygen. This process, called electrolysis, produces hydrogen without emitting carbon dioxide. The hydrogen can then be stored and used as a clean fuel for various applications, contributing to a sustainable and environmentally friendly energy solution.

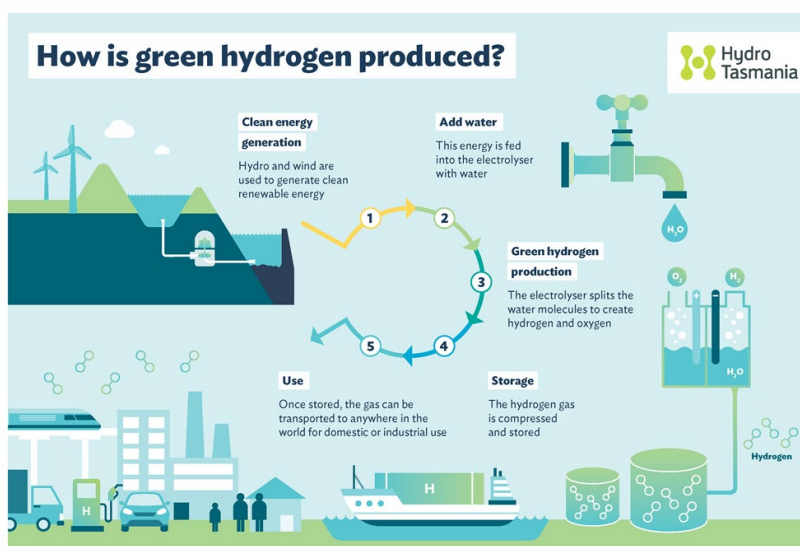


Figure 2 Green Hydrogen Production Process.

Source: Hydro Tasmania (www.hydro.com.au)

3 GREEN HYDROGEN VALUE CHAIN

The green hydrogen value chain comprises a sequence of stages in the production and utilization of hydrogen generated through electrolysis powered by renewable energy. Beginning with the generation of clean energy from sources like wind or solar, the electricity is then employed in the electrolysis process, where water is split into hydrogen and oxygen. The produced hydrogen undergoes purification and may be compressed and stored for transport to end-users, facilitated by distribution infrastructure. Upon reaching consumers, green hydrogen finds application in various sectors, including transportation, industrial processes, energy storage, and power generation through fuel cells. The success of the green hydrogen value chain is influenced by supportive policies, ongoing research and development efforts, and consumer awareness, collectively contributing to the global shift toward sustainable and low-carbon energy systems.

Despite the promising prospects of green hydrogen, challenges persist in its widespread adoption, including issues related to infrastructure development, the intermittency of renewable energy sources, and policy frameworks. The exploration of these challenges, along with proposed solutions, offers valuable insights into the future role of green hydrogen as a crucial player in the global energy landscape's decarbonisation.

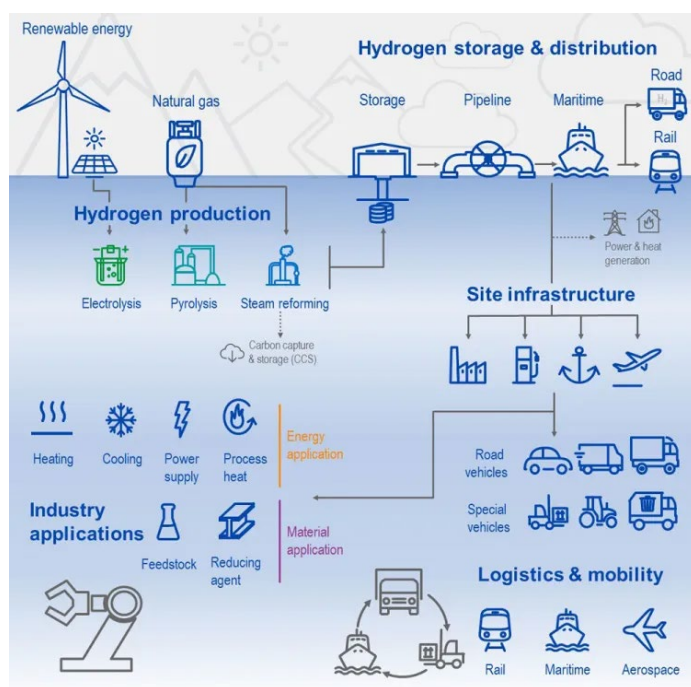


Figure 3 Green Hydrogen Value Chain

Source: TUV SÜD (www.tuvsud.com)

4 MARKET SURVEY DESIGN

On behalf of Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, the Export-Akademie Baden-Württemberg carried out a market survey targeting on German companies in the green hydrogen (GH2) value chain. The aim is to identify potential collaborators and companies showing interest in the Indian market. To identify relevant German companies the following market survey process was implemented:

1. Compilation of an initial list of over 450 companies working the green hydrogen value chain through internet research.
2. Online survey from November 2023 to January 2024.
3. Engagement of German Green Hydrogen Clusters to share the survey with their cluster members.

4. Further identification of German companies working the green hydrogen value chain in the networks of Export-Akademie Baden-Württemberg GmbH and the SUTM Steinbeis Center for Sustainable Technology and Management GMBH.
5. Analysis of 56 survey responses of companies specialising in the hydrogen value chain. In this database companies from abroad as well as companies with no interest in India were included.
6. From 56 companies 52 were identified with interested in the Indian market.
7. In February 2024 these companies were contacted again for verifying the individual matrix and company information.

In the following matrix the profiles of 50 German companies have been summarised. It provides a thorough look at each company, covering aspects like their industry category, unique position in the green hydrogen value chain, and a detailed description of their products or services.

The matrix is divided into 14 primary categories, each subdivided into a total of 62 specific areas. The main categories include:

















1. Service Category
2. Energy & Conversion
3. Energy Storage
4. Conversion H₂O to H₂
5. Storage & Transport
6. Materials & Components
7. Quality, Standards & Norms
8. Infra-structure
9. R & D
10. Training
11. Consulting
12. Cluster
13. Company Size
14. Link to the Indian Market




















6/23













German GH2 Market Overview Matrix of Companies with Interest in the Indian Market (2/2)




















#	Company / Organisation	Service Category			Energy & Conversion	Energy Storage	Conversion H ₂ O to H ₂	Storage & Transport			Materials & Components	Quality, Standards & Norms	Infrastructure	R & D	Training	Consulting	Cluster	Company Size	Links to the Indian Market																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
		Manufacturer	Distributor	Consulting				R&D	Water pre-processing, e.g. desalination	Electrolyzers										Electrolyzer Stacks	Post processing (Liquification)	Other Components (Valves, Compressor)	Automation	Storage	Transport	Pipeline	Distribution	Green Methanol / Ammonia	Green Steel	Green Fuels	Green Chemicals	GH2 Mobility (Fuel Cells, Combustion)	Manufacturers e.g. Green Steel	GH2 Regulations	SDG Assessment	Safety Assessment	Safety Training	Regulatory Bodies	Safety Equipment Manufacturers	GH2 Plants	GH2 Refueling Stations	Underground Storage	Public	Private	Academic	Vocational Training	Training Equipment	Strategy, Business Models	Management	Env Impact Assessment	Financing & Investment	Technology Transfer / Licensing	Legal	Engineering	Energy	Green Hydrogen Industries	Automobile	Small Size (< 50 Employees)	Mid Size (50-250 Employees)	Large Size (> 250 Employees)	Interest in the Indian Market	Export/Import to India (direct/indirect)	Partnership with Indian Companies	Subsidiary/Branch in India	Part of a German GH2 Cluster																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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5 COMPANY PROFILES




		 Industry Type	 Website Link	 Company Description	 Product/Service Description
#	Area	Description			Company Identifier
1			Production, manufacture or distribution of goods		
			https://www.ambartec.de/		
			AMBARtec AG is a technology start-up company in the energy and hydrogen storage business. For our clients, we plan and develop solutions for compact and long-term energy storage for transport, decentralized regeneration with combined heat and power (CHP) and peak shaving, as well as for the future mobility.		
			Efficient hydrogen storage systems are a key prerequisite for the success of the energy transition. AMBARtec has developed an efficient, flexible and safe energy storage process based on hydrogen and iron oxide, which is offered as a 20-foot container and is ideally suited for decentralised energy storage, hydrogen transport - even over very long distances - and for hydrogen propulsion systems for ships.		
2			Digitalisation and AI		
			https://www.arena-innovation.com/		
			ARENA INNOVATION - Dipl.-Ing. IT (FH) Hans Marius Schuster is “2020 Mission Innovation Champion” as representative for Germany in the field of “Renewable and Clean Hydrogen” and creator of the “H2 Metaverse” - the next generation of an AI ecosystem for the low-carbon hydrogen and fuel cell (H2BZ) industry based on the Gaia-X infrastructure for distributed data spaces. This consists of a new trustworthy, secure and decentralized networked data space for gas, LNG, hydrogen and derivatives and fuel cells (in short: H2/H2 Data Space or DRH2/H2DS), which is open to all hydrogen-relevant stakeholders within and outside Europe.		
			An infrastructure for the data-sovereign exchange of hydrogen and fuel cell-relevant data in accordance with European data protection law to the greatest possible extent in order to enable services and concepts for information technology sector coupling in the interoperable data space landscape on the basis of standardized and thus interoperable sub-models of digital twins of Industry 4.0 as well as data-based business models and AI applications. The participant is interested in using the hydrogen data space (H2 Data Space), including the entire data space landscape (H2 Metaverse, including the Mobility & Energy Data Spaces), to offer data or services (e.g. digital twins) or to use data or services from other participants.		
3			Production, manufacture or distribution of goods		
			https://asahi-kasei.eu/de/start/		
			Asahi Kasei is a Japanese technology group with a broad range of highly diversified materials and solutions that not only enrich our modern life but also actively shape the world of tomorrow. Located in the thriving Düsseldorf Harbor area, Asahi Kasei Europe is the operational headquarter of the Asahi Kasei Group in Europe. In addition to serving European markets with performance plastics, synthetic rubber and elastomers, packaging products, performance coating materials, membranes and systems, and acrylonitrile, we also work with our sister company Asahi Kasei Microdevices Europe GmbH for the supply of electronic devices. The		
					

#	Area	Description	Company Identifier
4		Asahi Kasei Europe R&D Center provides technical service to European customers. At the same time, it serves as a driver for the development of products and product grades to open up new businesses and application areas for the European market.	
		Alkaline water electrolyser	
		Production, manufacture or distribution of goods	
		https://www.cryomotive.com/de/	
5		We bring together leading hydrogen storage, fueling and vehicle experts with talented entry-level, transition and sustainable management talent to: <ul style="list-style-type: none"> to develop a disruptive technology platform for the storage and refuelling of green hydrogen to accelerate the transformation to a decarbonised world to create a cleaner and greener future for future generations 	
		Cryomotive GmbH develops tank systems and filling station technology for heavy-duty, aircraft and marine applications.	
		Consulting	
		https://deep-kbb.de/	
6		DEEP.KBB specialises in engineering and geoscientific services for a wide variety of underground projects. The planning, construction and operation of underground energy storage facilities as well as brine and salt production systems are our core competence.	
		Planning, construction and operation of underground energy storage facilities	
		Production, manufacture or distribution of goods	
		https://www.deutz.com/	
7		DEUTZ is one of the world's leading manufacturers of drive systems for the off-highway sector. The company was founded in 1864 and employed around 5,000 people worldwide at the end of 2022. Its core competencies lie in the development, production and sales of drive solutions for off-road applications in the power range up to 620 kW. The current portfolio ranges from diesel and gas to hybrid and electric to hydrogen-based drives. Areas of application for DEUTZ engines include construction and agricultural machinery, material handling applications such as forklifts or lifting platforms, commercial and rail vehicles as well as boat applications for private and commercial use. In addition, DEUTZ offers a comprehensive range of digital and analogue services with over 800 sales and service partners in more than 130 countries.	
		GH2 combustion engines for heavy vehicles and off road	
		Consulting	
		https://www.dreso.com/de/	


















#	Area	Description	Company Identifier
8		What sets the partner-led consulting company Drees & Sommer SE apart is that they advise on and implement sustainable, innovative and economic solutions for real estate, industry, energy and infrastructure – or even offer clients both services from a single source. Interdisciplinary teams working on over 5,000 projects worldwide pursue the goal of creating a livable future and uniting apparent opposites: tradition and future, analog and digital, efficiency and well-being. As entrepreneurs within the company, the personally responsible partners at Drees & Sommer are committed to this mission.	
		Supporting customers in the development and implementation of H2 projects along the H2 value chain	
	 	Manufacturer Consulting Training Research & Development https://dse-technology.com	
		<ul style="list-style-type: none"> DSE is a consortium of German technological leaders in the green hydrogen field. DSE started developing a comprehensive localization concept for the entire value chain for green hydrogen production in Africa. DSE builds leading-edge breakthrough technologies which changes the economics of sustainable production solutions. DSE invests directly in the developing countries creating a significant number of direct and indirect sustainable jobs and creating substantial impact in the reduction of greenhouse gas emissions. DSE stands for integrity, dependability, respect, and equality, closely aligned with the United Nations SDGs criteria. DSE cares about its people and customers, the future generations, its environment, and its partners. DSE stands for global teamwork, passion to achieve game-changing results, and open minds. 	
9		DSE is a solution provider for green energy and green products along the industrial value chain	
	 	Consulting https://www.efficientics.com	
		The subject of Efficientics' business activities is the provision of services in the fields of hydrogen technologies. The special focus is on considering and improving the safety and efficiency of hydrogen systems with regard to occupational safety and explosion protection.	
		<ul style="list-style-type: none"> HAZOP, FMEA Explosion protection documents and risk assessments for hydrogen systems Preparation of documents regarding occupational safety and plant safety Strategic management consulting Consulting and coaching Training (trainings), online and in presence Creation of training materials Expert opinions and statements Preparation of CE certifications for products Advice on training requirements for employees Search for suitable products Tender procedure Creation and submission of funding applications, implementation of funding projects 	







#	Area	Description	Company Identifier
		<ul style="list-style-type: none"> Assessment of funding applications 	
10		Production, manufacture of goods	 Empowering a sustainable world
		https://elogenh2.com/en/	
		We are the French leader in proton exchange membrane (PEM) electrolysis, specialised in the design and assembly of electrolyzers for producing green hydrogen. We leverage our innovative spirit and cutting-edged technological know-how to serve the industry and energy markets in France and around the world.	
		Elogen, a technology expert at the service of green hydrogen. Elogen develops advanced technologies for the design and manufacture of PEM (Proton Exchange Membrane) electrolyzers to open up new applications for hydrogen in the mobility, industrial and energy storage sectors. Elogen, a company of the GTT technology group, relies on powerful research and development and a robust manufacturing process to provide its customers with competitive, reliable systems tailored to their needs. The technological solutions developed by Elogen, particularly suitable for renewable energies, are characterized by high efficiency and competitiveness.	
11		Consulting	
		https://emcel.com/de/	
		EMCEL creates sustainable solutions to reduce emissions and costs with a focus on hydrogen, fuel cells and electric mobility as well as on the connection to renewable energies in the context of energy transition.	
		Consulting, development work, conceptual design, project planning (e.g. potential analyses, feasibility studies, detailed concepts, implementation concepts, support in the acquisition of funding, etc.). Common themes: Hydrogen infrastructure, hydrogen quality measurement, sector coupling, e-mobility, electrification of commercial vehicle fleets.	
12		Production, manufacture or distribution of goods	
		https://www.ensingerplastics.com/en/	
		The Ensinger Group is engaged in the development, manufacture and sale of compounds, semi-finished materials, composites, technical parts and profiles made of engineering and high-performance plastics. Further development of proven production techniques, new applications and international expansion have earned this family-owned enterprise a place among the leaders in its field.	
		Various manufacturing technologies for customised high performance plastic parts for hydrogen applications like electrolyser or fuel cell stacks, BOP and storage.	
13		Production, manufacture or distribution of goods	
		https://www.fischer-group.com	
		The Fischer group is the world's leading supplier of longitudinally welded stainless steel tubes as well as components and assemblies made from them.	

#	Area	Description	Company Identifier
		Longitudinally welded stainless steel tubes and assemblies for hydrogen production and processing	
14		Consulting, Research and Development	
		https://www.ise.fraunhofer.de/	
		The Fraunhofer Institute for Solar Energy Systems ISE in Freiburg is the largest solar research institute in Europe. With around 1400 employees, we are committed to a sustainable, economical, safe and socially just energy supply based on renewable energy sources. We contribute to this with our research focus on energy supply, energy distribution, energy storage and energy use. The Institute develops materials, components, systems and processes in the fields of photovoltaics, energy-efficient buildings, solar thermal power plants and industrial processes, hydrogen technologies and electrical energy storage as well as power electronics, grids and intelligent systems. We have an excellent laboratory infrastructure at our disposal for this purpose. We also carry out analyses, studies and consultations and offer our customers testing and certification procedures	
		R&D for energy supply (across the entire value chain of PV technology), energy distribution, energy storage	
15		Research and development	
		https://www.grs.de/	
		<p>The Society for Plant and Reactor Safety (GRS) GmbH has been Germany's central specialist organisation in the field of nuclear safety since 1977.</p> <p>At our headquarters in Cologne and the locations in Berlin, Braunschweig and Garching near Munich, our experts research, develop and assess in the following areas:</p> <ul style="list-style-type: none"> • Reactor safety • Decommissioning & dismantling • Intermediate storage • Final storage • Backup • Radiation protection <p>Environment & Energy</p>	
		Licensing and technical guidelines for power-to-gas plants and H2 grid infrastructure	
16		Production, manufacture or distribution of goods	
		https://www.globefuelcell.com/	
		<ul style="list-style-type: none"> • It all started in 2019 in the heart of the fuel cell research department as well as the innovation area of Mercedes-Benz. The founding team around Steffen Bäuerle and Dr. Bernhard-Wienk Borgert wanted to make a difference. Specifically, something meaningful that has the green power to change the globe. Today, GLOBE is an independent company in the portfolio of 1886Ventures and has set itself the task of accompanying the industry on its way to a CO2-neutral future with hydrogen-powered fuel cell systems. 	

#	Area	Description	Company Identifier
		Fuel cells for intralogistics	
17		Consulting & Green Business Development	
		https://greensinnergy.de/	
		GreenSinnergy is committed to actively decarbonise the global economy. We contribute to the goal of achieving sustainability through the provision of worldwide modern and agile consulting services and green business development with a socio-environmental mindset.	
		<ul style="list-style-type: none"> • Green business development: opportunity assessment, strategic planning, partnership management, sustainable financing, implementation and scaling, selection of suitable technology • Market studies and strategic roadmaps • Environmental studies • CO₂ management • Energy efficiency • Waste management • Corporate consultancy • Water management • Sales force outsourcing • Pre-feasibility / feasibility studies and basic engineering • Capacity Building 	
18		Production, manufacture or distribution of goods, R&D	
		https://www.handtmann.de/	
		Cutting-edge technology, innovations and a focus on people are the focus of the Handtmann group of companies. Strategic, dynamic, authentic - this is how our work is known worldwide. The origin of the whole thing can be found in Biberach, Swabia. The Biberach Handtmann family of entrepreneurs has been running the family business for five generations: modernity and tradition, fascinating technology, business and social responsibility create an inseparable whole.	
		Solutions for the production of green hydrogen for local and decentralized on-site applications; power electronics, in particular for electrochemical processes and batteries for (short-term) energy storage	
19		Production, manufacture or distribution of goods	
		https://www.hartmann-valves.com/?lang=en	
		Hartmann Valves GmbH is one of the leading manufacturers of ball valves, pigging valves and wellheads. A worldwide presence in the fields of mineral oil, natural gas, petrochemicals, power plant technology, geothermal energy and other renewable energies – these are our references. Design, assembly and tests are carried out solely in our factories in Celle and Burgdorf-Ehlershausen. We foster active dialogue with our customers, fulfil special requirements and are seen, with our many years of experience, as a proficient partner.	
		Ball valve and wellhead	













#	Area	Description	Company Identifier
20		Production, manufacture or distribution of goods, Consulting	 Hydrogen Energy Era
		https://www.hee-technologies.com/	
		Our goal is to contribute to a self-sustaining hydrogen economy. Therefore, we develop and produce hydrogen fuel cell systems for decentralized production of heat & power.	
		Production of stationary fuel cell systems for electricity and heat supply. Planning and implementation of complete H2 chains (production, storage, reconversion to electricity), e.g. for island supply.	
21		Production, manufacture or distribution of goods	 Precious Metals
		https://www.heraeus-group.com/en/	
		The Heraeus Group is a broadly diversified and globally leading family-owned technology company, headquartered in Hanau, Germany. Your competitive advantage is our priority. In all our businesses our people combine material expertise with technological know-how. With this professional knowledge, we look into your processes, challenges and markets and develop high quality solutions that strengthen your competitiveness in the long term.	
		Components for stacks and fuel cells, membranes	
22		Production, manufacture or distribution of goods	 Pollet Water Group
		https://www.hercowater.com/de/	
		In Freiberg am Neckar we develop, design and manufacture your water treatment plants for the production of green hydrogen. Tailor-made to your needs - whether on a frame or as a container solution. Modular, compact and reliable: German engineering for 75 years - Made in Germany.	
		Water treatment for the production of green hydrogen	
23		Consulting, research and development	
		https://hyentec.com/	
		The planning and implementation of projects in the area of innovative technologies for the generation, conversion and storage of energy, as well as intelligent energy systems.	
		HyEnTec develops projects along the entire H2 value chain	
24		Production, manufacture or distribution of goods	
		https://www.hyenergy.de/	










#	Area	Description	Company Identifier
		<ul style="list-style-type: none"> We, the engineering team at Hynergy GmbH, are committed to the goal of developing technical solutions at the interface of renewable energy generation and emission-free mobility. We are convinced that, in addition to the short-term storage of electricity in batteries, hydrogen will play a key role as electricity storage and fuel in the future. In implementing our vision of being able to generate, store and consume hydrogen from renewable electricity in a decentral manner (e.g. from the summer electricity surpluses from a domestic rooftop solar system), we are building on decades of experience in hydrogen technology: We know how hydrogen can be used efficiently and safely as a storage and fuel. We promote and support the development of hydrogen vehicle technology in projects with strong partners from the automotive industry worldwide. We drive several hydrogen electric vehicles as well as battery electric vehicles ourselves and understand their advantages and challenges. 	
		Green Hydrogen production and distribution; Electrolyser controls and plant monitoring; Refueling station design; Hydrogen supply systems	
25		Consulting, Research and development, Other	
		https://iinovis.com/	
		iinovis is very well positioned for future growth and will benefit from the increasing demand from OEMs and Tier X customers, particularly in the development area of electrification (battery and fuel cell technology).	
		Today, iinovis is organised into five business units: Vehicle / Motorcycle Development, eDrive & Electrics / Electronics, Simulation, Testing and Prototyping / Small Series Production.	
26		Production, manufacture or distribution of goods, R&D	
		https://www.inhouse-engineering.de/	
		The inhouse engineering GmbH offers you up-to-date and efficient automation- and energy management systems and fuel cell CHP systems for an efficient and cost effective building.	
		PEM fuel cell CHP for MFH and smaller commercial enterprises (4.2 kW electrical output + 4.3 kW thermal output)	
27		Consulting	 inopitas®
		https://www.inopitas.com/	
		At inopitas, we focus on managing strategic challenges of the energy transition and support companies and institutions from the energy or hydrogen sector and beyond. We manage and realise projects and offer our clients holistic solutions – from analysis and conception to successful operationalization and implementation.	
		Techno-economic studies and analyses; conception of ecosystems or model regions; design of business cases and their operationalization incl. procurement of funding; project steering and realization; technical trainings	
















#	Area	Description	Company Identifier
28		Consulting	
		https://lbst.de/	
		Ludwig-Bölkow-Systemtechnik GmbH (LBST) is a consulting company for energy supply, hydrogen, mobility and sustainability. With our expertise in technologies, economics and politics, we support national and international clients from industry, the financial sector, politics and associations in questions of strategy, feasibility, regulation and markets. Thanks to our many years of experience, we are a globally recognized and leading consultant for hydrogen and fuel cells.	
		Our broad spectrum of services ranges from technology and system studies to strategy and policy consulting and project management	
29		Production, manufacture or distribution of goods	
		https://www.maximator-hydrogen.de/home	
		We build hydrogen filling stations with passion and thus drive the future. Our mission is to make hydrogen usable on a large scale and to help infrastructures become climate neutral.	
		Manufacturer of complete hydrogen filling stations	
30		Consulting, Other	
		https://www.mrplan-group.com/en/	
		With the procedural expertise of our customers as well as our experience and know-how from a wide range of industries, we are our customers' reliable partner in everything from strategic considerations to project implementation. Our customers appreciate that we are serious, socially competent and ultimately long-term partners who think, plan and act holistically. Our engineering services make our customers excellent.	
		We offer companies and local authorities feasibility studies to turn initial ideas into well-founded visions. Then we get involved with funding advice and support with the acquisition of funding. Once funding is available, we can move on to detailed technical planning. We provide support from strategic planning through to the technical implementation of the project on the construction site.	
31		Research and development, other	
		https://www.novis.me/	
		<ul style="list-style-type: none"> • We generate added value from residual materials through bio-based technologies. • Our specialty is biogas plants with substrates that are difficult to ferment. • We recycle various types of residual materials through smart upgrading and recycling . • We develop innovative and sustainable products. 	
















#	Area	Description	Company Identifier
		We take CO2 from combustion and liquefy it for further use	
32		Engineering, Research and Development	
		www.obrist.at	
		The OBRIST team is a committed group of individuals with strong backgrounds in all major technical disciplines. Frank Obrist, Founder & President, together with Christian Schmälzle, CEO Obrist Engineering, Martin Graz, CEO Obrist Powertrain, and Oliver Obrist, CEO of Obrist DE, heads a team of experienced engineers and experts.	
		R&D/Engineering/Licensing of Technologies in the fields of Automotive, thermal management, powertrains, green methanol, CCS and Direct Air Capture	
33		Production, manufacture or distribution of goods	
		https://ohs.energy	
		Company offer solutions for decentral hydrogen production, storage and utilization. Core is their modular electrolyzer.	
		Complete local hydrogen solutions consisting of electrolysis, H2 compressor, high-pressure H2 storage, fuel cell or H2 CHP unit	
34		Consulting, research and development	
		https://www.res-institute.net/en/	
		RES in general stands for the research institute founded in 2016 to publish ongoing research and product developments of Friedrich Grimm. In a more specific sense RES is a short form for Renewable Energy Systems and may as well indicate Revolutionary Energy Supply systems. The website is a contact forum and a “market place” to get in touch with persons and companies engaged in the field of renewable energy systems and interested in innovations concerning solar systems, turbines, e-mobility, light and building systems and to find partners to realise the inventions presented here. The corporate objective of the RES-Institute is to sell or license the inventions of Friedrich Grimm to partners in industry and economy active in the field of renewable energy systems. The RES-Institute is the sole copyright holder of all patents presented on this website and is looking forward to license these patents to industrial partners in Germany, Europe and abroad.	
		Research and development Hydrogen production and storage	
35		Production, manufacture or distribution of goods	
		Advancing the energy transition with hydrogen! Bosch Global	
		Our GH2-headquarters is at the Bosch location in Stuttgart-Feuerbach, our sphere of activity is the wide world. Because the energy transition can only be achieved together and in a network with all actors who are committed	

#	Area	Description	Company Identifier
36		to advancing climate protection. We are currently in the pilot phase with the Bosch PEM electrolysis stack and the SOFC system - we are working hard to prepare for series production.	
		From generation, storage and transport to a multitude of possible applications of hydrogen as an energy carrier: We take a holistic approach to imagining and shaping the new energy world. Our expertise lies in developing innovative applications and offering customized solutions along the entire value chain - complemented by ready-to-operate plants and smart services	
		Production, manufacture or distribution of goods	
37		https://www.swffn.de/	
		At SWF, we produce and sell technical and medical gases, as well as high-purity gases for research and development. We develop medical products and manufacture them in our factories.	
		Core business = production of technical and medical gases including food gases. Technical gases include hydrogen, which we will produce using our own electrolysis in future.	
38		Production, manufacture or distribution of goods	
		https://www.schaeffler.com/en/technology-innovation/hydrogen-technology/	
		The Schaeffler Group has been driving forward groundbreaking inventions and developments in the field of motion technology for over 75 years. With innovative technologies, products, and services for electric mobility, CO ₂ -efficient drives, chassis solutions, Industry 4.0, digitalisation, and renewable energies, the company is a reliable partner for making motion more efficient, intelligent, and sustainable – over the entire life cycle.	
38		Schaeffler is the consortium lead for the sub-project “Stack Scale up – Industrialization PEM Electrolysis” of the H2Giga hydrogen flagship project, founded by BMBF. This project aims to develop components, scalable technologies and production processes for PEM-low-temperature electrolysis stacks. Schaeffler’s expertise in production technology is a decisive success factor in this growing market. Electrolyser stacks based on PEM technology are already today part of Schaeffler’s product portfolio for the rapidly growing market for green hydrogen production and R&D applications.	
		PEM electrolyser stacks and key components for PEM fuel cell.	
		Production, manufacture or distribution of goods	
38		https://schmid-group.com/	
		The SCHMID Group is a world-leading global solutions provider for the high-tech electronic, photovoltaics, glass, and energy systems industries, with its parent company Gebr. SCHMID GmbH is based in Freudenstadt, Germany. Founded in 1864, today it employs more than 800 staff members worldwide, and has technology centers and manufacturing sites in multiple locations including Germany and China, in addition to several sales and service locations globally. The Group focuses on developing customized equipment and process solutions for multiple industries including electronics, renewables and energy storage. Further information is available at: www.schmid-group.com	

#	Area	Description	Company Identifier
		PV manufacturing, battery storage and poly silicon plants	
39		Consulting	
		https://www.sek-consulting.de/	
		SEK Consulting is a dynamically growing strategy consultancy for the energy and mobility industry. We develop effective strategies, business models and projects for our customers in the areas of sector coupling. To achieve this, we bring together economic expertise, technical know-how and in-depth market intelligence in our teams. From market studies to project development, we support our customers in developing innovative business models.	
		Since 2012 we support our clients from industry and the energy sector in the planning and development of hydrogen projects. Our expertise ranges from strategy development to concrete project development with financial modeling, partnering, technology concept development, supplier management, funding applications and approval planning.	
40		Production, manufacture or distribution of goods	
		https://www.siemens-energy.com/global/en/home.html	
		Siemens Energy is one of the world's leading energy technology companies. The company works with its customers and partners on energy systems for the future, thus supporting the transition to a more sustainable world. With its portfolio of products, solutions and services, Siemens Energy covers almost the entire energy value chain – from power and heat generation and transmission to storage. The portfolio includes conventional and renewable energy technology, such as gas and steam turbines, hybrid power plants operated with hydrogen, and power generators and transformers. Its wind power subsidiary Siemens Gamesa makes Siemens Energy a global market leader for renewable energies. An estimated one-sixth of the electricity generated worldwide is based on technologies from Siemens Energy. Siemens Energy employs around 97,000 people worldwide in more than 90 countries and generated revenue of €31 billion in fiscal year 2023.	
		Steam turbines and green hydrogen plants	
41		Production, manufacture or distribution of goods	
		https://www.solarlite.de/	
		Solarlite develops, produces and builds decentralized solar thermal parabolic trough power plants (concentrated solar power) to generate electricity or process heat for industrial use. The company is using direct evaporation commercially in a power plant for the first time in the world.	
		Solarlite 5770 is the second generation of highly efficient parabolic trough collectors. The product was developed for operation up to 500°C and heat storage with salts	
42		Consulting Training Research & Development	
		SUTM Steinbeis Center GmbH	

#	Area	Description	Company Identifier
		<ul style="list-style-type: none"> SUTM Steinbeis Center for Sustainable Technology & Management GmbH is a sister company of Steinbeis University and is focussing on international study and research programs. SUTM is offering job-integrated master courses with emphasis on green technologies, digitisation and leadership according to the IMLead® Heptathlon concept. One main focus is on master courses for the whole value chain of green hydrogen. Further, certified courses in green technology transfer, global marketing & sales, digital leadership and idea & innovation management are offered. Research and development projects are focusing on the new role of Hidden CTOs and on green technology transfer world-wide. Centres of excellence in green technologies and digitisation are established in: Windhoek (Namibia), Hyderabad (India), Vijayawada (India), La Plata (Argentina), Taschkent (Uzbekistan), Almaty (Kasachstan), Lubumbashi (Democratic Republic of Congo), Johannesburg (South Africa), Beijing (China). Also, the activities of the Steinbeis institute “Forschungszentrum für Nachhaltige Ressourcennutzung & Energiebewirtschaftung Tübingen (nReEn)” are coordinated by SUTM. One main focus of the nReEn Institute is on research projects in the areas digitisation, smart farming, resource management and renewable energies. The institute is operating world-wide. 	
		<ul style="list-style-type: none"> Consulting for entire GH2 value chain Academic and Vocational trainings on green technologies R&D in the field of sustainable technologies 	
		Consulting, Others	
43		https://thost.de/	THOST. PROJEKTMANAGEMENT
		<ul style="list-style-type: none"> Projects are our world. And this world is on the move. The dynamic development in technology and communication and the accompanying global networking is our chance to develop superior solutions and to decisively shape the future. We deliver complex services in the management of demanding projects, processes and organisations. And our clients, whether private or public, domestic or international, are always at the heart of any of our actions. It is our task to lead your project safely to successful completion. Requirements for this are clear targets and priorities. And the skillful handling of risk and constant change. 	
		Complete project management from setup to close out	
44		Production, manufacture or distribution of goods	
		https://tox.com/de-de	TOX®
		<p>TOX ® PRESSOTECHNIK was founded in 1978 by Eugen Rapp. Since then, the company has continuously developed to meet customer requirements and different market structures around the world. Today, the large product range, comprehensive know-how, global subsidiaries and over 1,400 employees demonstrate the success of visionary thinking and above-average commitment.</p> <p>With our systems, presses and joining modules, like our electromechanical servopress TOX® ElectricDrive Core with integrated process monitoring, we supply solutions e.g. for battery cells, electrolyzers, fuel cells - also cleanroom is no problem - for applications like pressing, joining, measuring including the quality control by using our modern TOX® Software with the quality data.</p>	

#	Area	Description	Company Identifier
		TOX® PRESSTECHNIK is your competent partner for innovative products, solutions and technology development in the field of sheet metal joining, for press drives, presses and special machines.	
45		Consulting, Engineering, Training, Testing, Inspection, Certification	TÜVNORDGROUP
		For Consulting, Engineering and Training: www.hydrohub.de/en	
		For Testing, Inspection, Certification: https://www.tuev-nord.de/en/company/energy/hydrogen/	
		The declared aim of the TÜV NORD GROUP is to make a significant contribution to the sustainable energy transition with all its technical and safety expertise. The energy carrier hydrogen presents itself here as a viable option for the future, which can be developed into an important key to the energy landscape worldwide through optimized and safe technologies and processes. With 150 years of experience in identifying, assessing and controlling technical hazards, the TÜV NORD GROUP is positioning itself as an expert in safety and sustainability.	
		We protect lives and goods and natural resources. Our different operational units offer services ranging from consulting, engineering, and training up to testing, inspection, and certification.	
46		Production, manufacture or distribution of goods	VAKO Vakuumbehälter- und Apparatebau GmbH & Co. KG
		https://www.vako.net/	
		Since our founding in 1968, the family company VAKO in Kreuztal (near Siegen) has been a top address for the high-quality production of containers of all kinds. Since 1980, we have specialized in hydrogen containers for production and storage, which are located on an area of around 25,000 square meters large area including large storage areas.	
		Hydrogen storage tank type 1 up to 330 bar	
47		Production, manufacture or distribution of goods, R&D	 WASSERSTOFF ENERGIECLUSTER MECKLENBURG-VORPOMMERN
		https://www.wasserstoffenergiecluster-mv.de/	
		Mecklenburg-Vorpommern (MV) is the most important generating region for green electricity in the whole of Germany. Due to the accelerated expansion of renewable energies, far more electricity is now being generated in MV (2017: 15.8 TWh) than consumed (6.7 TWh). Electricity generation from renewable energies alone exceeded the country's electricity requirements by around 70 percent in 2017. Compared to other locations in Germany, Mecklenburg-Vorpommern has enough green electricity to produce large quantities of "green hydrogen". From Schwerin to Stralsund, there is a wide range of expertise and experience in the field of hydrogen technology. This applies to scientific competence as well as to concrete implementation at company level.	
		Our 85 members supply all components along the entire value chain	

#	Area	Description	Company Identifier
48		Production, manufacture or distribution of goods	
		https://www.wattkraft.com/kontakt/	
		The Wattkraft Group was founded in 2012 as a company trading in photovoltaic components. Today we are active as a general distributor in Europe in the distribution and product integration business areas for major global corporations. Wattkraft is a successfully growing distributor with headquarters in Hanover and specializes in inverters, photovoltaic modules and electrical accessories.	
		PV panels and inverters	
49		Production, manufacture or distribution of goods	
		www.wlt-international.com	
		WLT International AG is a highly innovative company, founded 2022 and headquartered in Basel, Switzerland. WLT maintains an office in Heiningen, Germany for communication and research and development. (WLT Deutschland GmbH)	
		WLT products are based on a Fraunhofer IGB basic research of atmospheric water generation technology (AWG). Our product series are designed for absolute scalability at highest purity even in driest regions	
50		Production, manufacture or distribution of goods, R&D	
		https://wsreformer.de/	
		WS Reformer is a private company based in the high-tech region of Stuttgart, Germany, with a strong focus on research and development. It is part of the WS Group with the independent companies WSwärmeverfahrenstechnik GmbH (www.flox.com), e-flox GmbH (www.e-flox.com), Rollmod GmbH (www.rollmod.de), TPC GmbH (www.tpcgmbh.de) and btx energy GmbH (www.btx-energy.de). WS Reformer was founded in 2003 and has won various awards for its hydrogen technologies.	
		Steam reformer systems for the production of green hydrogen from biogas, primarily fed by organic residues	



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The International Hydrogen Ramp-up Programme (H2Uppp) of the German Federal Ministry for Economic Affairs and Climate Action (BMWK) promotes projects and market development for green hydrogen in selected developing and emerging countries as part of the National Hydrogen Strategy.