



FREEBIRD CONSULTING ENGINEERS

Contracting Expert Engineers & Scientists
for the Process Industry & Green Hydrogen

Updated Oct. 2025

Freebird Consulting Engineers – on one page



Why choose FCE?



Hands-on Expertise – we know your needs & constraints, have hired & supervised Engineers in the Process Industry



Deep Industry Insight – we understand the skills & mindset required to make projects succeed, as well as your technology



Tailored Talent Matching – we offer experts, who did the job before, who fit to your technical scope & project culture



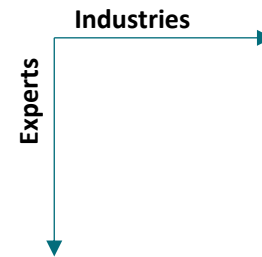
Full Project Lifecycle Coverage – we cover all phases from R&D and Pilot Development to large-scale EPC Deployment

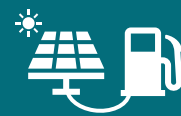


Trusted by Innovators – we support companies in Green Hydrogen, Power-to-X, Chemicals, Oil & Gas and the Energy Industry



Our „Expert Contracting“ Core Offer



					
		Green Hydrogen, Power-to-X ₁	Chemicals	Oil & Gas	Energy
A	R&D, Product Development	☒	–	–	–
	Process Industry Project Experts ₂	☒	☒	☒	☒

1 | Power-to-X: Technologies such as „Power-to-Ammonia“, „Power-to-Methanol & E-Fuels“ etc. 2 | Pre-EPC and EPC Engineers

A Category „A“ / „B“ details see following pages

Our R&D and Product Development Experts (Cat. A) cover all Technology Readiness Levels of H₂ Electrolyzer Stacks



Research



Development



Deployment

TRL₁



TRL₁
explained

1	2	3	4	5	6	7	8	9
Basic principles observed	Technology concept formulated	Experimental proof of concept	Technology validated in lab	Technology validated in relevant environment ₂	Technology demonstrated in relevant environment ₂	System prototype demonstration in operational environment	System complete and qualified	Actual system proven in operational environment ₃

Exemplary tasks for H₂ Electrolyzer Stack

- Fundamental electrochemical research (membranes, catalysts & electrode coatings)
- Lab-scale stack design & testing (single cell)
- Basic material screening for seals, bipolar plates, frame
- Initial process flow diagrams
- Scale-up of stack modules (tens to hundreds of cells)
- Prototype manufacturing & assembly methods
- Durability testing & lifetime prediction
- Development of processing units: water purification, gas separation, safety systems
- Integration with BoP₄
- Full-scale electrolyzer stacks (MW-class) and complete plant systems
- Factory production line design & optimization
- Construction, commissioning & performance review
- Certification, compliance, and safety approvals
- Renewable power, pipeline & end-user Integration

A

Experts we offer

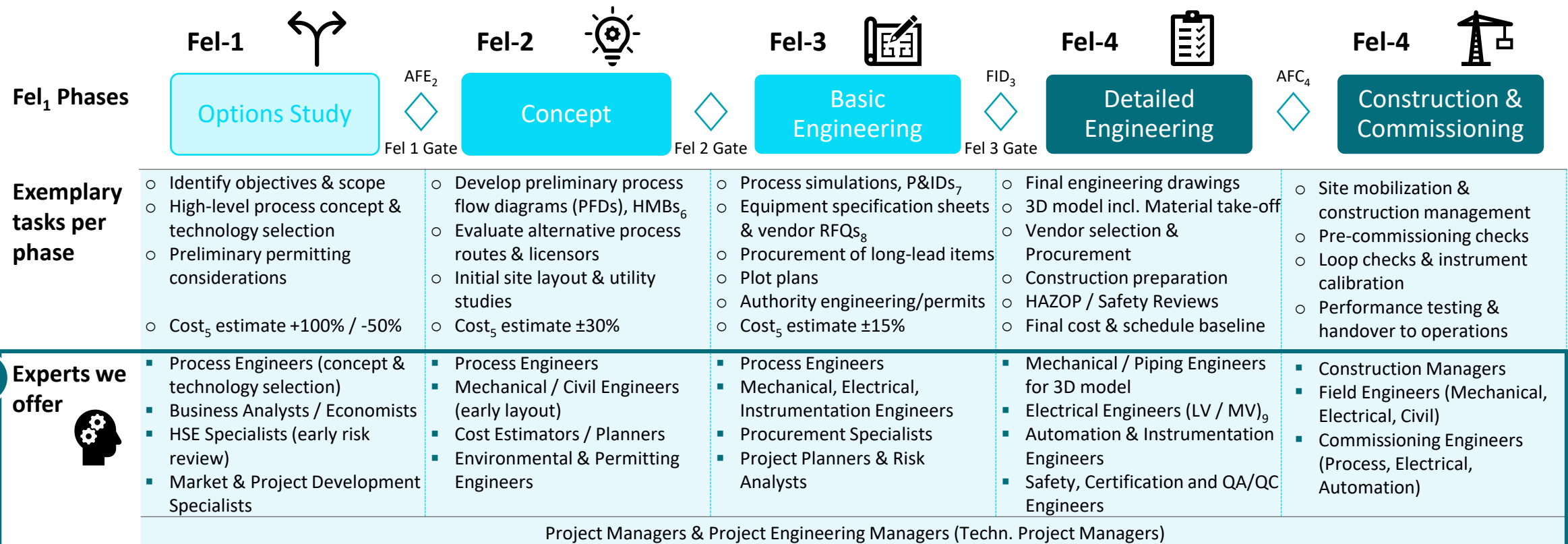


- Electrochemical Engineers / Electrochemists
- Materials Scientists
- Chemical Engineers (early process concept)
- Research Technicians / Lab Scientists
- Mechanical Engineers (stack design, frame)
- Testing & Validation Scientists
- Process Engineers (BoP₄, flowsheets, simulations)
- Electrical/Automation Engineers (controls, sensors)
- Manufacturing Engineers (scale-up processes)
- Product Development Engineers Stack & BoP₄
- Operations & Maintenance Specialists
- Integration / Electrical Modelling Specialists
- EPC Engineers (see next slide under phase „Fel 4“)

R&D Managers, Product Development Managers, TRL Roadmap Developers₆, LCOH Analysts_{6,7}

1 | TRL (Technology Readiness Level): 9-step scale from NASA, adapted by the EU. 2 | “Industrially relevant environment” for key enabling technologies. 3 | “Competitive manufacturing” for key enabling technologies or space. 4 | BoP (Balance of Plant): all electrolyzer unit components (pumps, piping, heat exchangers, etc.). 5 | TRU (Transformer-Rectifier Unit): stack power supply. 6 | Typically starts at TRL 4. 7 | LCOH (Levelized Cost of Hydrogen): total lifecycle cost per kg of H₂.

Our Process Industry Project Experts (Cat.B) cover the entire Front-End-Loading process (Fel₁)



1 | FEL (Front-End Loading): staged project planning (FEL 1–4) with decision gates. 2 | AFE: Authorization for Expenditure (advance funding). 3 | FID: Final Investment Decision (full funding). 4 | AFC: Approved for Construction. 5 | Cost estimate accuracy is indicative, based on TIC (Total Installed Cost). 6 | HMB: Heat & Mass Balances. 7 | P&ID: Piping & Instrumentation Diagram. 8 | RFQ: Request for Quotation. 9 | LV/ MV LV = Low Voltage (plant equipment), MV = Medium Voltage (substations & TRUs)

Overview – Available Experts & Exemplary Projects



Our available Experts - Summary

Cat.	Department	Available Experts
A	R&D	Electro-Chemical / Chemical / Simulation / Material Engineers Lab Scientists
A	Product Development	Stack / Process Unit Development Engineers (Process / Mechanical / Electrical / Automation) Dev't. Engineering Managers
B	Process Industry Project Experts	Process / Mechanical / Automation & Electrical Engineers Quality & Certification Specialists Construction & Commissioning Project Engineering Managers Project Managers



Examples of our Experts on Client Projects



Electrochemical Engineer for the R&D department of an electrode manufacturer – Target: Increase system knowledge of cell package & stack and derive conclusions for component manufacturing



Project Engineering Manager for a FEED of a +100MW Green Hydrogen owners engineering - Target: compare technical options, coordinate all technical disciplines & suppliers until reception of FID incl. authority engineering and operational permit approval



Automation Engineer for the cold- and hot- commissioning of a 4MW Alkaline electrolysis plant – Target: Successful startup & useful step-chains implemented



Head of Project Engineering for an Electrolyzer OEM – Target: Lead 6 Teams and 30+ Engineers, setup a reliable capacity forecast, implement quality metrics and handover & coach the future permanent position holder



Electrical Expert & Lab Technician to support a University Laboratory an external test campaign on Alkaline Electrolyzers

Let's talk



FREEBIRD
CONSULTING ENGINEERS

Nils Hamann

Managing Director

Freebird Consulting Engineers GmbH i.G.
Alsterdorfer Str. 7
D-22299 Hamburg, Germany
Tel. +49 172 / 9047006

Nils.Hamann@freebird-consulting.com

 [Connect via linkedin](#)



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