

Large Scale Hydrogen (& Derivatives) Project Capability Overview

Capability Statement

Focus on Hydrogen Services

Engineering Services

From Concept to Commissioning

Consulting Services

Enabling your transition for a new hydrogen energy economy

Technology Services

Trusted technical and regulatory knowledge with R&D



Investing in global research to realise zero emissions clean hydrogen energy future

About DHT

DHT is a well-established industrial project engineering and consultancy company serving the world and headquartered in Canada. DHT's engineers collectively have hundreds of years of experience in the Hydrogen, Chemical, Petrochemical, and power generation industries, DHT's engineering team originates from ex Air Products, ex Fluor, ex L&T, ex Siemens and ex BP personnel. DHT has evolved into a fully integrated engineering, consultancy and supply chain company with diverse capabilities, including cutting-edge solutions for the emerging hydrogen industry.



We provide:

- Experienced in providing cost-effective solutions
- Skilled in developing and optimizing process systems
- Flexible engineering and project management solutions
- Expertise in piping and instrumentation diagram (P&ID) development
- Manufacturing electrolyzers & related equipment
- Proficient in front-end engineering and design (FEED) studies
- Utilize advanced software and technology for accurate and efficient results
- Dedicated to delivering high-quality services on time and within budget
- Working across key hydrogen sectors to decarbonise power generation, transportation, and industrial applications.
- Partnering with universities and hydrogen industry bodies

Decarbonisation with Hydrogen

Our Expertise in Decarbonisation Solutions

At DHT, we recognize the urgent need for decarbonization and are proud to offer innovative solutions that help our clients reduce their carbon footprint. Through our front end engineering services for hydrogen combustion in industrial settings, we work closely with clients to design custom solutions that enable them to meet their sustainability targets without sacrificing productivity or profitability.

Our team of experts has extensive experience in the design and implementation of green hydrogen systems for a variety of industrial applications, including ammonia production, refining, steel production, power generation, and more. By utilizing clean, renewable energy sources like wind and solar power, we can help our clients replace traditional fossil fuels with green hydrogen, significantly reducing their carbon emissions while ensuring their operations remain efficient and cost-effective.

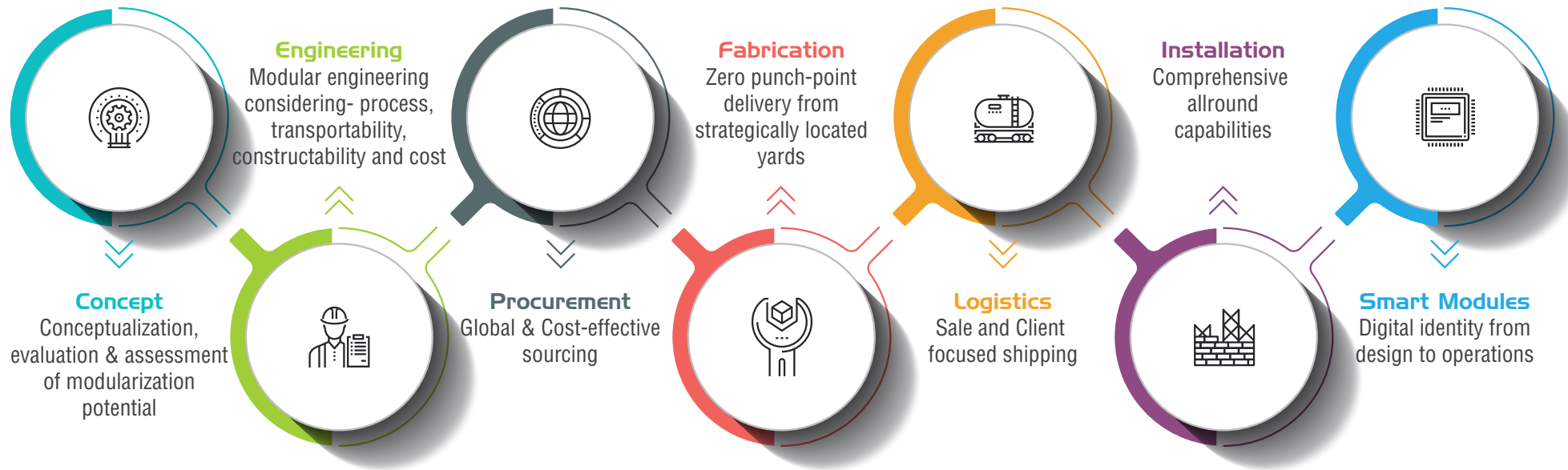
At DHT, we believe that sustainable, low-carbon industrial processes are key to a leaner, healthier future for all. Contact us today to learn more about how we can help you achieve your decarbonization goals through green hydrogen combustion.

Switching to Combustion

A Hydrogen Alternative to Fossil
Fuels

Green Ammonia

The Sustainable Chemical Solution of the
Future



Project Engineering Services

Team of experienced engineers and technical experts

At DHT we specialize in providing comprehensive Industrial Project Engineering Services to our clients. Our team of experienced engineers and technical experts work together to deliver high-quality solutions that meet the unique needs of each project.



Concept Design

Initial stage of design, developing a conceptual plan.



Feasibility Studies

Analyzing project viability, assessing risks, and identifying optimization opportunities.



Basic Engineering

Engineering Developing detailed design drawings, equipment specs, and process flow diagrams.



Feed Engineering

Detailed planning identifying project requirements and preparing cost estimates.



Detail Engineering Services

Bringing together previous stages into a comprehensive blueprint for project execution.

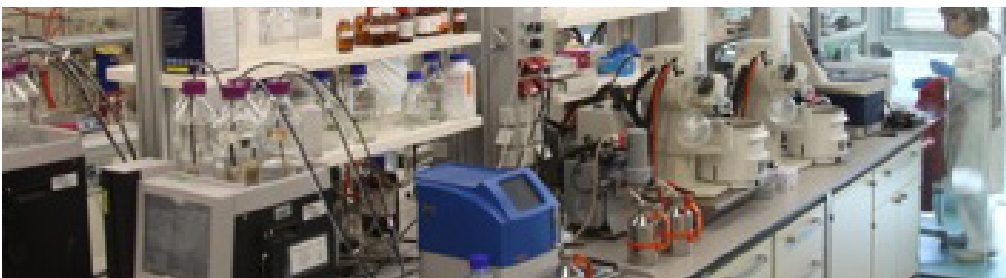


Driving Innovation in Hydrogen

Our team has a proven track record of delivering exceptional engineering services and solutions to clients in a variety of industries.

We pride ourselves on our expertise in electrolysis technologies including in alkaline electrolysis. We are proud to offer world class supply chains related to electrolyser technology and production capability.

With our extensive experience in system sizing, balance-of-plant systems design, and system integration, we are confident in our ability to provide best-in-class services to meet the unique needs of our clients.



Reçu du dépôt électronique / Receipt of electronic submission

Office de la propriété intellectuelle du Canada
Place du Portage, Phase I
50, rue Victoria
Gatineau (Québec) K1A 0C9
Canada

Canadian Intellectual Property Office
Place du Portage, Phase I
50 Victoria Street
Gatineau QC K1A 0C9
Canada

Office récepteur canadien / Canadian Receiving Office

Votre demande a été transmise avec succès à la direction des brevets.
Your application has been successfully submitted to the Patent Branch.

Détails de soumission / Submission details

Numéro de demande internationale / International application number
CA2024050076

Nom du paquet des fichiers / Package file name
A8148153WO

Titre de l'invention / Invention title
ELECTROCHEMICAL SYSTEMS WITH MAGNETIC ELECTRODES AND/OR ADDITIONAL EXCITATIONS
AND METHODS RELATING THERETO

Date de réception / Date of receipt
2024-01-23

Sommaire de la soumission / Submission digest
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Demandeur(s) / Applicant(s)
DHT ENERGY CORP.;

1GW annual manufacturing capacity for alkaline electrolyzers for year 2025 and over 2GW for 2026, that we have JV's in place with established highly competitive manufacturing facilities in India and China, India focused on small scale projects in our China factory focused on large scale projects.



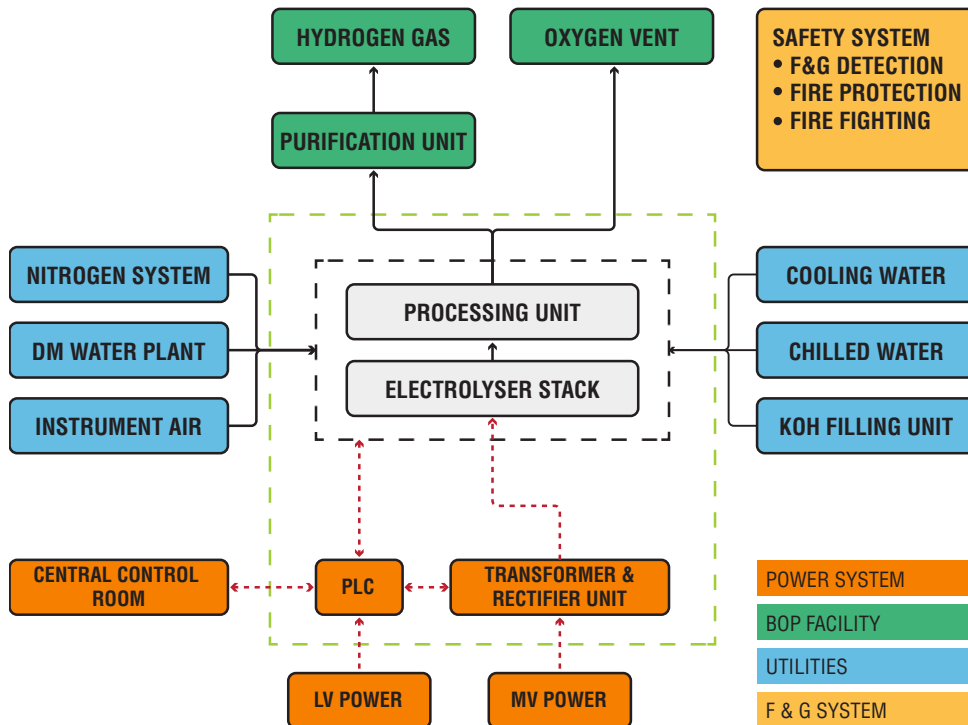
From Concept to Completion

Our end-to-end hydrogen engineering services

At DHT, we offer end-to-end hydrogen engineering services that cover every aspect of your project, from concept to completion.

Our team of experienced engineers will work closely with you to understand your specific needs and develop customized solutions that meet your requirements.

With a focus on quality, safety, and efficiency, we are committed to delivering projects on time and within budget.



- Technical reports** - Detailed information on DHT's solutions with a focus on development and testing.
- Case studies** - Showcasing previous projects with challenges faced and solutions provided by DHT.
- Process flow diagrams** - Visual representation of hydrogen engineering project steps and processes.
- Safety manuals** - Describing DHT's safety protocols and procedures to ensure a safe working environment.
- Training materials** - Providing training to clients and staff on equipment use, operation, and maintenance.
- Compliance documents** - Ensuring compliance with industry standards, regulations, and certifications.

Providing Clarity in a Complex Industry

Our feasibility studies and technical expertise

At DHT, we understand that documentation is critical in the hydrogen industry. That's why as part of our feasibility studies and technical expertise, we offer various types of documentation to support your project.

We can provide pre-feasibility reports to help you determine the viability of your project before committing significant resources. Our pre-feasibility reports typically include market analysis, technology assessment, regulatory compliance, and high-level cost estimates.

For more detailed analysis, we offer comprehensive feasibility studies. These studies provide a detailed analysis of the proposed project, including an in-depth evaluation of technical, economic, and financial factors. Our feasibility studies typically include risk assessments, environmental impact assessments, detailed financial projections, and a roadmap for project implementation.

In addition to these reports, we also offer other types of documentation, such as technical reports, engineering designs, procurement specifications, and project management plans. Our team of experts works closely with you to develop customized documentation that meets your specific needs and helps you achieve your goals.

At DHT, we are committed to providing our clients with the highest quality documentation and technical expertise possible. Contact us today to learn more about how we can help you navigate the complexities of the hydrogen industry and achieve success with your projects.

Pre-feasibility Reports

Early stage analysis of a potential Hydrogen projects.

Feasibility Reports

Comprehensive analysis of technical, economic, and financial factors to determine the viability of a Hydrogen project.

Hydrogen Technology Consulting & Feasibility Studies

Expert Consulting to Navigate Hydrogen Technologies and Market Trends

At DHT, our Hydrogen Technology Consulting & Feasibility Studies service provides comprehensive support for hydrogen projects, guiding you from the initial concept phase to detailed feasibility analysis. Our expert consulting team delivers cutting-edge insights into the latest hydrogen technologies, market developments, and regulatory frameworks, helping you make informed decisions that drive your projects toward success.

Comprehensive Feasibility Studies

Every hydrogen project needs a solid foundation. Our feasibility studies thoroughly assess the technical, economic, and regulatory factors involved in your hydrogen initiatives. By analyzing the latest technologies and market conditions, we provide clear recommendations and strategic plans that enhance the likelihood of success.

- **Technical Feasibility:** Our technical experts evaluate the practicality of integrating hydrogen technologies into your existing systems, focusing on the most advanced solutions like electrolyzer systems and energy efficiency innovations. We provide detailed assessments to ensure your project's technical robustness.
- **Economic Feasibility:** Hydrogen projects require a significant financial commitment. We help you determine the economic viability of your projects by performing cost-benefit analyses, calculating potential returns on investment (ROI), and identifying opportunities for cost savings.



- **Regulatory Compliance:** Navigating the regulatory landscape can be challenging. We ensure that your project adheres to the latest hydrogen industry regulations, providing consulting on environmental standards, safety protocols, and permitting processes.

Market Trends and Strategic Planning

Staying ahead in the fast-evolving hydrogen industry requires strategic foresight. At DHT, we keep you informed on the latest market trends and innovations, ensuring that your projects are not only feasible but positioned for long-term success. Our strategic planning services guide you through potential market shifts, helping you stay competitive in an increasingly green energy landscape.

- **Global Collaboration and Funding:** We assist in securing financial backing and partnerships for your projects through our expertise in global collaboration and funding opportunities. With our global network, we help you leverage resources for project success.

Why Choose DHT for Hydrogen Consulting & Feasibility?

- **Expert Knowledge:** Our team of hydrogen specialists brings deep industry expertise to your projects, offering practical solutions based on the latest technological advancements.
- **Tailored Feasibility Studies:** Every project is unique, and our consulting services are fully tailored to meet the specific requirements and goals of your hydrogen initiative.
- **End-to-End Support:** From the initial concept through to project implementation, DHT provides continuous support to ensure your project stays on track.

Get in touch with DHT to explore how our hydrogen technology consulting and feasibility services can empower your hydrogen projects and help you meet your sustainability goals.



Example Hydrogen Projects that Need Consulting

1 Green Hydrogen Production Facility

A company planning to build a large-scale green hydrogen production facility powered by renewable energy sources such as wind or solar would benefit from DHT's consulting services. DHT can assist with project management, ensuring smooth execution from concept through completion, and provide basic and detailed engineering to design efficient and cost-effective electrolyzer systems. Additionally, feasibility studies on integrating renewable sources and optimizing hydrogen production processes are key.

For similar projects, exploring global hydrogen technology trends and developments through external sources like Hydrogen Council's market outlook ([external link](#)) can provide insights on scaling green hydrogen production.

2 Hydrogen Fueling Stations for Transportation

A project aimed at developing a network of hydrogen fueling stations for public transportation, trucks, or logistics fleets requires thorough technical feasibility and risk assessments. DHT can offer support in process piping design for the safe and efficient transport of hydrogen within fueling infrastructure. Our team can ensure the project meets all safety protocols and regulatory standards for hydrogen distribution systems.

For broader industry standards, referring to International Energy Agency's (IEA) hydrogen fueling infrastructure guidelines ([external link](#)) can enhance strategic planning

3 Industrial Hydrogen Integration for Decarbonization

Manufacturing or chemical companies looking to integrate hydrogen into their industrial processes to achieve decarbonization goals can rely on DHT's procurement services to source high-quality hydrogen technologies and equipment. Additionally, we can provide detailed engineering and consulting on process integration to ensure that hydrogen utilization is optimized within existing industrial setups.

For further insights on industrial hydrogen applications, external guidance from Hydrogen Europe's reports ([external link](#)) can offer valuable benchmarks.

4 Hydrogen Power Plant for Grid Stabilization

Utility companies planning to build hydrogen-powered grid stabilization plants require comprehensive feasibility studies and robust project management. DHT can provide end-to-end support in managing hydrogen energy projects, ensuring they meet technical and financial targets. We also offer preparation of as-built projects to ensure that all designs and installations are accurately documented and maintained.

For further reading on how hydrogen can contribute to grid stabilization, World Economic Forum's reports on hydrogen's role in energy grids ([external link](#)) could be beneficial.

5 Hydrogen-Powered Public Transportation System

Cities or municipalities transitioning their public transport fleets to hydrogen-powered buses can leverage DHT's full suite of consulting services. Our project management services ensure efficient implementation from planning through deployment, while our basic and detailed engineering solutions help design robust fueling and refueling systems.

6 Hydrogen Blending in Natural Gas Networks

Utility companies exploring hydrogen blending with natural gas to reduce emissions can benefit from DHT's expertise in process piping design for safe and effective integration of hydrogen into existing gas networks. We also support procurement of specialized equipment through our industrial procurement services, ensuring access to the highest quality components needed for hydrogen blending.

7 Hydrogen Production from Waste Biomass

Projects aiming to produce hydrogen from waste biomass can leverage DHT's full range of consulting services, including feasibility studies and as-built project preparation to ensure precision throughout the project lifecycle. Our support includes evaluating hydrogen production technologies suited for biomass feedstock and ensuring compliance with environmental regulations.



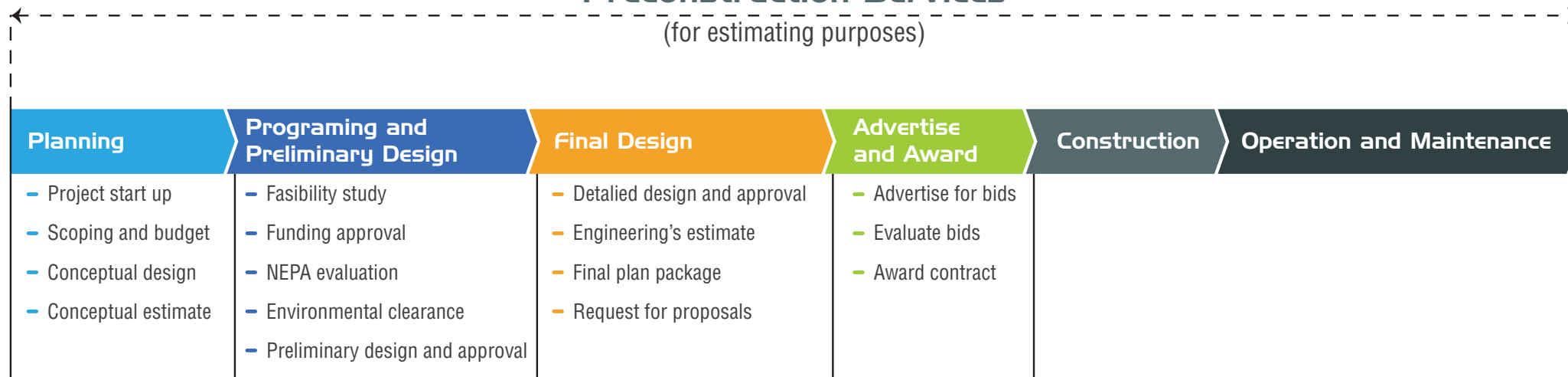
Pre-Project Services

At DHT, we recognize the importance of a solid foundation for any successful project. Our Pre-Project Services provide comprehensive support, helping clients navigate the critical decisions that define the techno-financial parameters of their projects.

From project bidding to conceptual design, our team delivers tailored solutions that align with your industry-specific needs, setting the stage for successful project execution.

Preconstruction Services

(for estimating purposes)



What We Offer:

1 Project Bidding Support

DHT leads clients through the project bidding phase, offering pre-project planning activities such as evaluation studies, pre-bid engineering, bid evaluation, and plant system design. Our support ensures that clients have the necessary insights to make well-informed decisions during the bidding process.

For a smooth transition into execution, discover how our Project Management Services support successful project outcomes.

2

Preliminary Concept and Design

We work closely with our clients to develop early-stage concepts and designs that meet project objectives. This stage includes a review of enquiry drawings and relevant documents to establish key parameters.

3

Data Collection and Site Assessment

Our team collects critical data from the project site, enabling accurate planning and engineering estimates. We conduct thorough site assessments, ensuring that every aspect of your project is optimized from the start.

4 Engineering Effort Estimates

DHT provides comprehensive estimates for the engineering work required to implement your project. Our approach ensures clients are equipped with the financial and operational clarity they need to move forward with confidence.

5 Project Evaluation and Alternative Methods

We evaluate the project scope and propose alternative methods or solutions to enhance efficiency. By exploring different approaches, we help optimize outcomes while minimizing costs.

6 Conceptual Design and Bill of Quantities

Our team develops detailed conceptual designs and prepares a bill of quantities, offering a clear understanding of project requirements and costs.

For detailed engineering support, explore our Basic and Detail Engineering services.

7 Maximization of Existing Resources

DHT identifies opportunities to utilize existing resources, equipment, and materials to minimize costs and improve project efficiency.

Why Choose DHT for Pre-Project Services?

- **Industry Expertise:** With a specialized focus on industries like Green Hydrogen, Refinery, Chemical, Petrochemical, Oil & Gas, and Steel, DHT brings unmatched expertise to every project.
- **Tailored Solutions:** We customize our pre-project services to meet the specific needs of each client, ensuring successful project initiation and planning.
- **Global Reach, Local Focus:** DHT works with clients worldwide, bringing global best practices to local projects.

Partner with DHT

Start your project on the right foot with DHT's comprehensive pre-project services. From initial concepts to detailed engineering, our experienced team ensures every aspect of your project is meticulously planned and managed.

Reference projects undertaken by the talented members of the the DHT Team

Hydrogen & Derivatives

- Active fortune 500 type engagement for Green Hydrogen and Ammonia in Colombia 100TPD GH₂/570 TPD GNH₃ - JV, final terms being finalized now.
- Pending fortune 500 type engagement for Green Hydrogen in Chile, large scale project - DHT scope under discussion.
- Southeast Asia, providing project planning, modelling and engineering and equipment to a major Southeast Asia gas company for a 2.4MW (1.7MW hydrogen turbine and 700kW steam) co generation hydrogen fired (3.5MW of hydrogen, blended with natural gas) electricity generation using a Kawasaki hydrogen turbine. project planning led by DHT with support from Kawasaki, a DHT strategic partner.
- DHT CEO Troy MacDonald has provided project business advisory on several additional green hydrogen, ammonia and urea projects to date. Australia, North America, Latin America, Africa, Vietnam, Europe, Asia.
- Responsible for the business deal of providing a complete solution of hydrogen refueling for the first Hydrogen locomote in northern Chile for the company FCAB railway.
- Leading the development of large green hydrogen projects involving ammonia and liquid hydrogen production, Capex in the range of USD\$4 to 5 Bn.
- Consultancy in Mining Electromobility, BEV and FCEV. Prospection studies to develop Green Hydrogen as an energy source for the Salmon Farming and Mining industries in Chile.
- Managing of feasibility studies Green Hydrogen & Ammonia Project (Hydrogen, Ammonia, Wind, Solar, BESS and OHTL) Master plan development, front end engineering design for; 1.1GW hydrogen alkaline electrolysis plant with total output of 220,000 Nm³/h for 55nos (20MW each) & 325 TPD Arica Green Hydrogen Prj. – Chile & 100 TPD Aysen Green Hydrogen Prj.– Chile.
- 55,000-Nm³/h air separation unit with cold box (70m height)
- 0.760-mmtpa (million metric tonnes per annum) green ammonia plant

Engineering Projects Handled

- 100 TPD Green Hydrogen project, Pre-Engineering Designed for 20 MW (Phase 1), 150 MW (Phase 2), 300 MW (Phase 3) for Colombia Green Ammonia Project.
- 55 MW green hydrogen project Phase-1 planning for a Latin American project.
- 110 MW IOCL Project in India (AWE Technology)
- SNCL 2 MW project in India, (AWE Technology)
- 3.5 MW green hydrogen project for a major asian gas company.
- 1 MW green hydrogen pilot project (Containerized Type) for fortune 500 Asian Client.
- 7KTPA & 10 KTPA IOCL Project in India, (AWE Technology)
- 2200 MTPD Nueces green ammonia plant in Texas.
- Executed the India's First Green Hydrogen pilot plant and successfully commissioned at L&T Hazira. The plant capacity of 800 kw comprises both Alkaline and PEM technologies. The plant is powered by a rooftop solar plant of 990kW peak DC capacity and a 500kWh Battery Energy Storage System (BESS).

Hydrogen plant designed to produce 200 Nm³/hr of Green Hydrogen & Alkaline technology 1 MW stack & EPU for 400 Nm³/hr hydrogen production.

- Designing & Engineering of EPU ML-400 includes selection of instruments, logic preparation, IO assignment, schematic wiring drawing, hook-up drawing, tray layout.
- Executed FAT/SAT, commissioning & successful operation of plant.
- PLC/SCADA system IO's and C&E checking, commissioning & operation of plant.
- Installation, configuration, calibration & troubleshooting of instruments.
- Design & Engineering of Stack assembly Robotic Automation line.

- Design & Engineering of Stack Tilting device.
- Smart factory Digitalization 4.0 preparation & implementation stage wise.

Hydrogen plant designed to produce 126 Nm³/hr of Green Hydrogen.

- Alkaline technology 380 kW stack & EPU for hydrogen production.
- Solar/BESS system installed for power utilization during non-solar availability.
- Executed FAT/SAT, commissioning & successful operation of plant.
- Design & execution of Logic for electrolysis plant.
- PLC/SCADA system IO's and C&E checking, commissioning & operation of plant.
- Installation, configuration, calibration & troubleshooting of instruments.

Other Projects

- DHT CEO & Engineering Team: Green Molecule Project Planning , Advisory and active offtake contract negotiation for an A rated (Investment Grade) Latin American Nation, scope includes fuel solutions for the Military/Navy, State Owned Mining Company & the establishment of new manufacturing facilities.
- Sugarcane Waste to SAF, project 600 TPD, Latin America, lead advisor helping to secure 3 bankable investment grade offtake LOI's & arranging the technology/equipment supply chain & financing
- UK 33MW wind + 99MW BESS, DHT CEO Troy MacDonald arranged investment grade offtake PPA with Engie, OEM supply chain via Nordex, M&A interest from Total & Qualitas, presently at term sheet stage
- 2000 TPD WtE project, Los Angeles, DHT CEO Troy MacDonald is the lead funds arranger and financial advisor. Arranged funding support from Keybank Capital Markets for \$600m, assisted developer in negotiating waste supply contracts with the city of los angeles and off-taking to the same.
- 150MW & 50 Wind Philippines, lead financial advisor, funds & M&A arranger. DHT CEO Troy MacDonald secured acquisition interest from Total Energies and DD and financial underwriting ongoing
- 75MW Solar project South Africa, DHT CEO Troy MacDonald, lead funds arranger, secured 63m USD term sheet from Standard Bank
- 500MW Pumped Hydro Storage Philippines, DHT CEO Troy MacDonald, leads funds arranger, secured financial commitment from a leading Scandinavian developing nations fund
- 14.7MW ROR Hydro Philippines, DHT CEO Troy MacDonald, leads funds arranger, secured financial commitment from a leading Scandinavian developing nations fund
- Black Pellet Biomass Project Canada, DHT CEO Troy MacDonald acting as project advisor, created an investment grade offtake opportunity for the project with a 450MW coal fired powerplant to switch to wood pellets, a use case for 1.1 million tons of pellets per day, exceeding initial production capacity of the project by more than 2x
- 1GW Solar Panel Manufacturing Facility, created a JV alliance on a \$120m project, between a growing Indian Solar Panel Manufacturing Company and an investment grade rated indigenous nation in the USA to expand the Indian company into the USA

Engineering Projects Handled

- BHP Minerals Americas (Chile), Portfolio management of operational projects, Capex of the portfolio \$1.3B USD
- Jaypee Nigrie Super Thermal Power Project, Nigrie (2 x 660 MW)
- Mahagenco Super Thermal Power Project, Koradi (3 x 660 MW)
- Rajpura Super Thermal Power Project, Punjab (2 x 700 MW)
- NTPC Bulk Pre-Engineering (2 x 800 MW, 2 x 660 MW & 11 x 660 MW)
- Shree Shingaji Thermal Power Project stage-II (2 x 660 MW)
- RRVUNL Super Thermal Power Project, Rajasthan (2 x 660 MW)
- NTPC Tanda Super Thermal Power Project stage-II (2 x 660 MW)
- TELANGANA super thermal power project Phase-I (2 x 800 MW)
- PUDIMADAKA Super Thermal Power Project stage-I (4 x 1000 MW)
- ENDESA: Chilean 220/110kV National Northern Chilean Grid creation for Edelnor (SAESA).
- ENDESA: Public Electrical Transportation in Santiago intrapreneur innovative development.
- ENDESA: Power Electricity Sales to Distribution, Mining and other Industrial companies.
- EEPA: 110kV power transmission and distribution system (600k clients utility), operation and commercialization.
- Siemens: Flexible AC 375kV Series Compensation System for AES (at 3000 m.a.s.l.).
- Siemens: 60MW Power frequency rotating convertor (60 to 50Hz) for Electroandina (Engie)/ SQM.

- Pacific Hydro: 2x160MW run of river HPP outcome PPA sales negotiation and execution under IFC project financed.
- Voith: 2x82MW 335m + 2x89MW 699m + 2x140MW 1141m + 2x140MW +2x139MW 478m + 3x100MW 600m seawater Pump Storage + 1x49MW 31m HPPs M&E WtW & HSW Lump Sum several new plants contracts sales, negotiation & supervision of project management execution, for PHL/SNPower, ENEL, AES, Valhalla Energy, Statkraft.
- Santerno: Several 100 to 500MW EPC Photovoltaic plants quotation & strategic planning for ENEL, Engie final clients.
- ISA: 1023MW Synchronous Condenser Project in Northern grid for ISA.



Thank you for considering DHT's Hydrogen Capability Statement. We are dedicated to providing exceptional solutions to our clients in the hydrogen industry. At DHT, we have a team of highly experienced experts who specialize in all aspects of hydrogen production, storage, transportation, and utilization. If you have any questions or would like to discuss how DHT can assist you with your hydrogen needs, please do not hesitate to contact us. We look forward to hearing from you.