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DECENTRALIZED HYDROGEN PRODUCTION FROM AMMONIA


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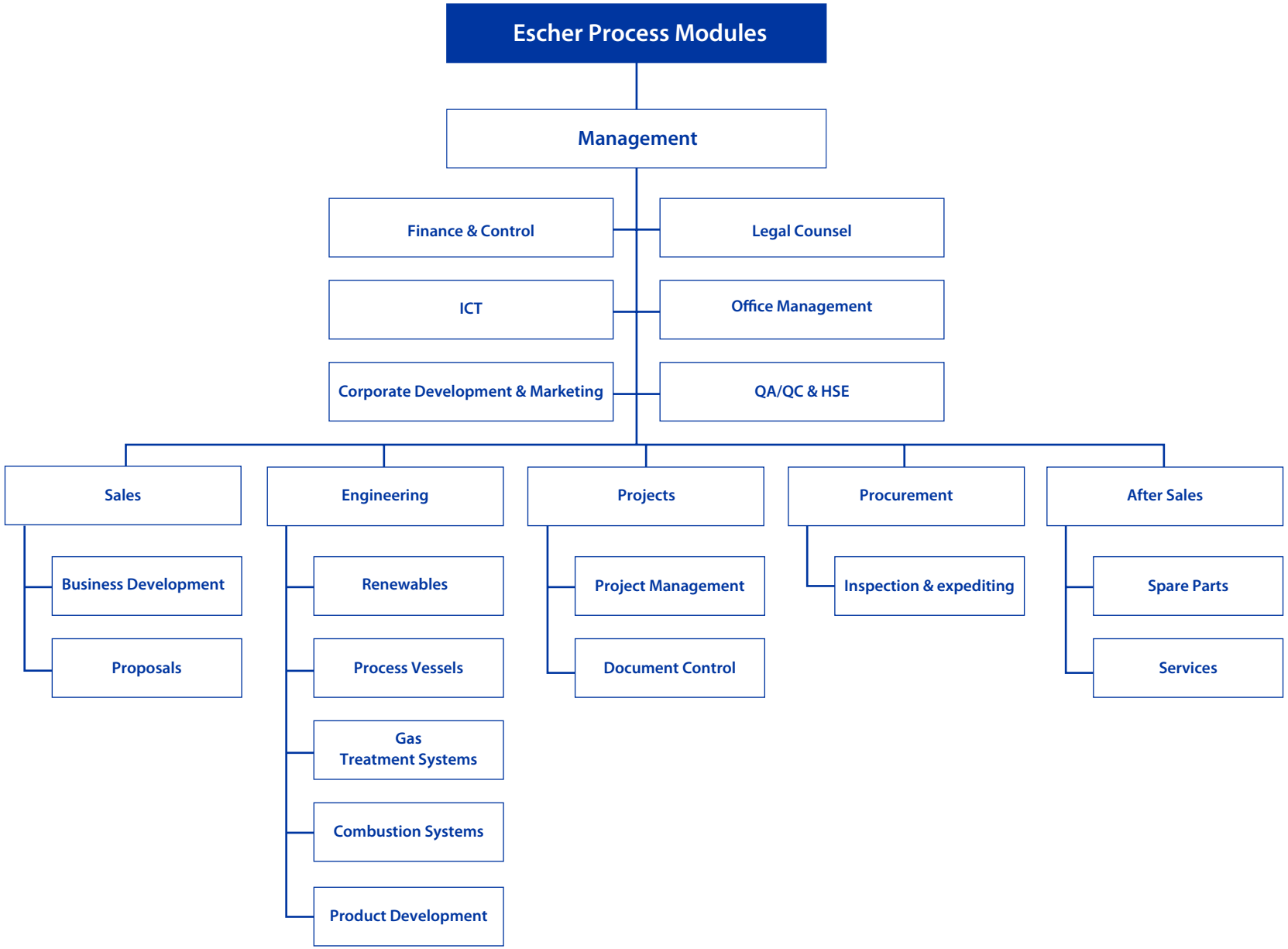
Escher Process Modules

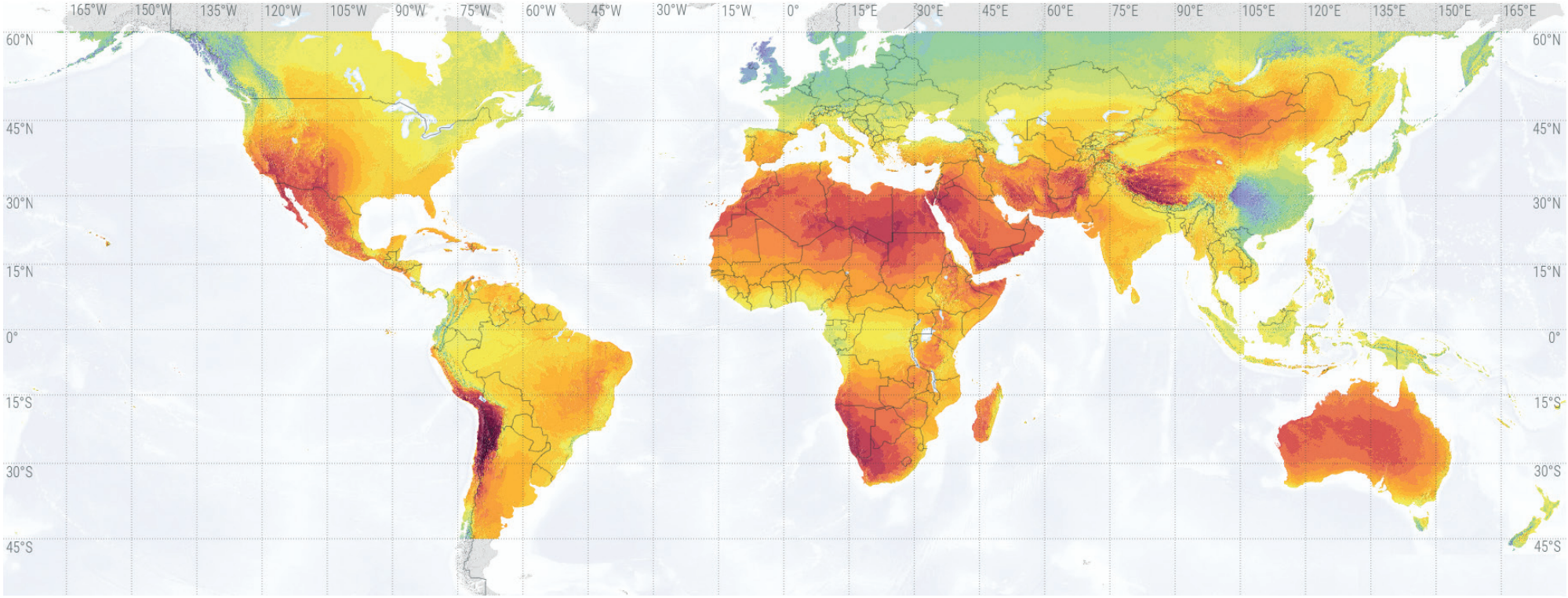
Escher Process Modules is a leading global Process Technology House and provider of process solutions since 1925. Being part of Iv, a worldwide operating engineering company listed in the top 10 of Dutch engineering companies.

Escher has all disciplines in-house for complete project execution. Our strength is our genuine passion for technology which results in unique and specialist know-how of the markets in which we operate, and enables us to be constantly at the forefront of advanced process solutions. We design and engineer process vessels in accordance with industry design codes to meet the quality and efficiency requirements of our customers. Our product range includes:

- Renewable systems (such as Ammonia Cracking, Hydrogen Treatment, and Carbon Capture)
- Process Vessels (such as Separators and PX Crystallizers)
- Gas Treatment Systems (such as CO_2 and Gas Dehydration, and Fuel Gas Treatment)
- Combustion Systems (such as Flare and Vent systems)

Our engineers are technicians of the highest level who think outside the box and translate even the most complex issues into solutions that meet the strictest criteria of product integrity and safety. In each project we strive to exceed the expectations of our clients where possible. Escher is recognised for its adherence to SHE and QMS systems (ISO 9001 & ISO 14001), highlighting our reliability, capability and commitment to social responsibility.


Escher Process Modules
Management
Finance & Control
Legal Counsel
ICT
Office Management
Corporate Development & Marketing
QA/QC & HSE
Sales
Engineering
Projects
Procurement
After Sales
Business Development
Proposals
Renewables
Process Vessels
Gas
Treatment Systems
Combustion Systems
Product Development
Project Management
Document Control
Inspection & expediting
Spare Parts
Services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Global Green Energy Potential

Hydrogen, the cornerstone for green energy, faces challenges in cost-effective production and distribution. Hydrogen can be produced almost anywhere. However, doing it cost effectively and getting it where it is needed can be very challenging. Escher sees a big opportunity to solve these challenges and to accelerate the energy transition by using ammonia.

Ammonia, a molecule that is made out of hydrogen and nitrogen, can be used as an energy carrier. It can be sustainably produced from nitrogen from the air and green hydrogen in areas with abundant renewable energy sources like solar, wind, and water. Large parts of Africa, the west coast of America, Australia and the Middle East have an extremely favorable climate for this.

A global supply chain infrastructure is already in place for the production, transportation and utilization of ammonia at a large scale. This allows regions with abundant renewable energy to export ammonia to end-users across the globe, where it can be converted back to hydrogen to contribute to the decarbonization of industry and mobility.

100 MWH ENERGY EQUIVALENT

23.000 L AMMONIA

130.000 L COMPRESSED HYDROGEN

The Product

Escher developed an innovative technology for the cracking of ammonia by means of a reactor and membranes separation. The ammonia will be separated into pure green hydrogen and nitrogen, the nitrogen can be vented directly back into the atmosphere. The unit is a standardized plug-and-play solution enabling the decentralized production of green hydrogen.

This method is able to produce hydrogen with 99.999% purity, suitable for fuel cells (ISO 14687). Moreover, it requires significantly less energy, only a twelfth of what electrolysis demands for the same amount.

Decentralized production of hydrogen is essential to bring supply and demand efficiently together. Transporting the equivalent amount of energy of ammonia in the form of compressed hydrogen would require 10 times as much transport movements, making the transportation of ammonia as energy carrier far more efficient.

In short decentralized hydrogen production from ammonia brings down the energy consumption and number of transport movements, which also means fewer emissions.


NO SMOKING

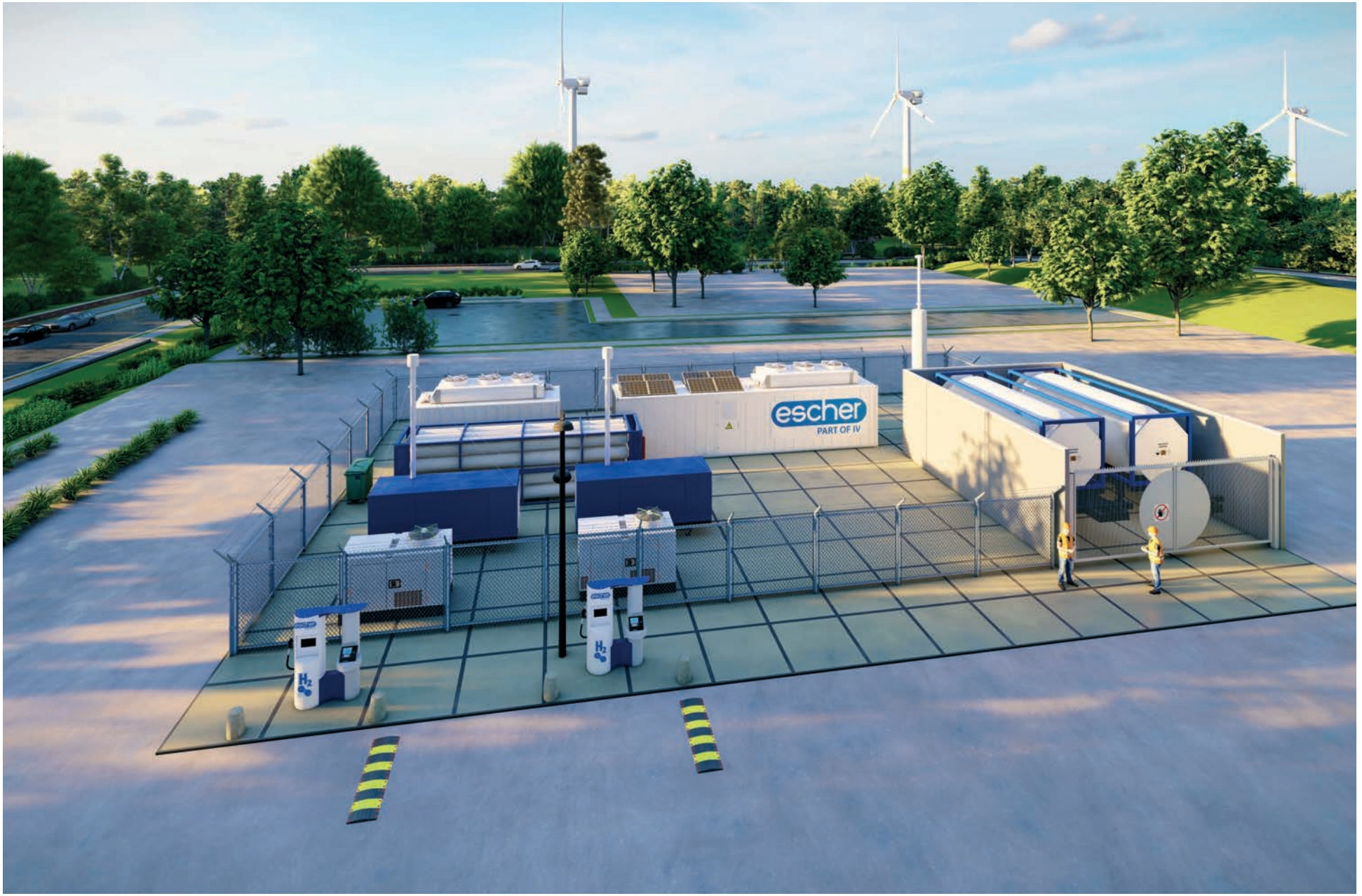
Key Benefits

Advantages of ammonia

- One-way carrier
- Use of (exsting) LPG tankers
- Liquid at 7 bar(g) or -33° Celsius
- High energy density
- Less energy losses during transport
- Decentralised hydrogen production
- Only nitrogen and hydrogen required
- No carbon sources required

Efficient on it's own

- Global supply chain infrastructure is already in place
- Enabling decentralized green hydrogen production
- Scalable up to daily production rates of 10.000 kg H_2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H2
H2

Main Components

System components

- Ammonia storage and unloading
- Ammonia to hydrogen membrane reactor
- Filtration and scrubbers
- Electrical heaters and heat integration
- Control and automation
- Safety precautions

Optional System Components

- Hydrogen compression system up to 350 bar(g)
- Hydrogen storage up to 350 bar(g)
- Hydrogen dispensing system up to 850 bar(g)


H_2

Scope of Supply

- Detailed Design
- Engineering
- Procurement
- Construction
- Testing
- Transportation
- Installation Supervision
- Operational Support
- Maintenance Services
- Spare Parts

Operational Support

Escher provides life cycle support and around-the-clock assistance, ensuring the quick delivery of essential spare parts to minimise potential downtime. We cover everything from spare parts to support during commissioning, start-up, and normal operations. Upon request, Escher can facilitate Warehouse Services, keeping dedicated critical spares in stock, ready for your immediate needs. Our other services include inspections, maintenance support, and lifetime extension programmes for optimal performance.

For any queries or urgent needs, reach us at **aftersales@escher.nl** or **+31 88 943 3600.**

Would you like to know more about the possibilities?

Our specialists will be pleased to share ideas and thoughts about the Decentralized Production of Green Hydrogen from Ammonia.

E-mail Maarten Brandenburg and/or Martijn In der Maur:
sales@escher.nl or call **+31 88 943 3600.**

Contact

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