Decarbonisation

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Agenda

- Introduction to Wood
- Calculating carbon emissions is the first step!
- Low Carbon Solutions (Hydrogen, P-to-X, Renewables)
- What does the “Future Energy” market look like?
- Revolution of Digital Technologies for Energy Transition
- Final remarks

We are a world leading consulting and engineering company across energy and materials markets.

160+
year history

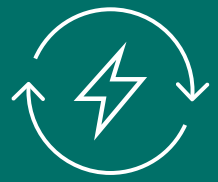
c35,000
people

60+
countries

c$5.5bn
revenue

Unlocking solutions to critical challenges. Areas of expertise:

Energy Security



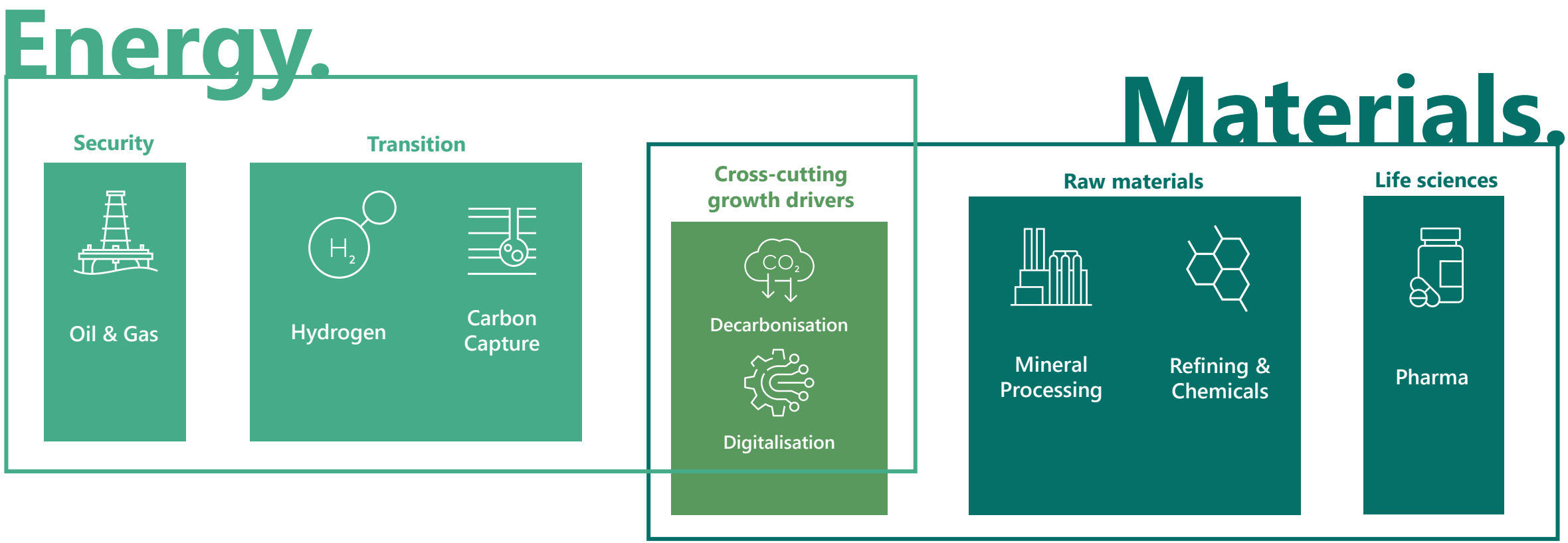
Energy Transition

Decarbonisation

Digital Delivery

Circular Economy

At the heart of Wood's growth strategy



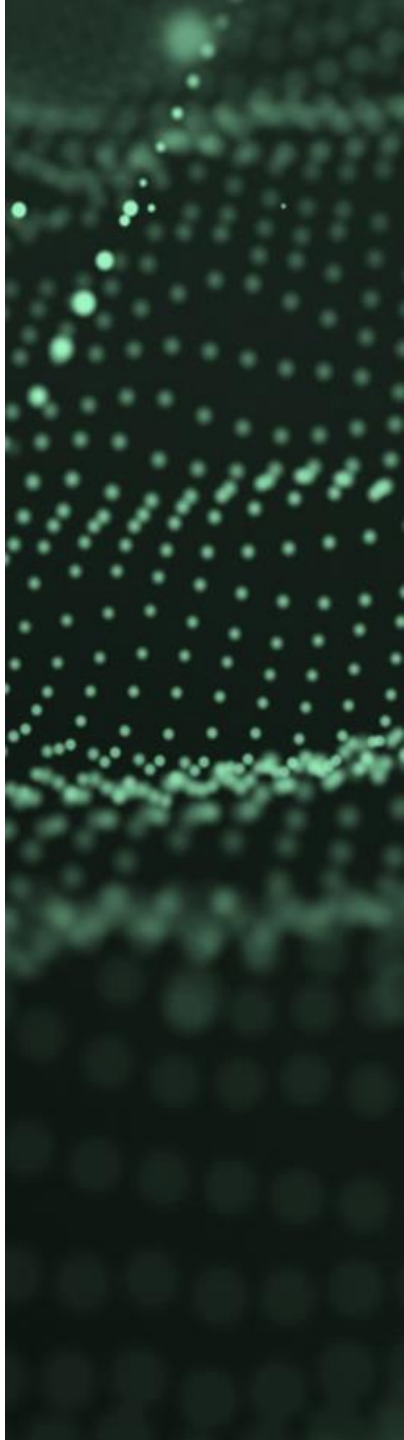
Many of our clients are fully committed to decarbonising their assets

- Achieve **net zero emissions from operations** (Scope 1 & 2) by or before 2050
- Achieve near **zero upstream methane emissions** from operations by 2030
- **Eliminate routine flaring** by 2030
- Double the rate of **energy efficiency improvements**
- **Accelerate development of low emissions technology** including low-carbon hydrogen and CCS
- Work towards industry **best practices in emissions reduction**

ADNOC · saudi aramco · CEPSA · TotalEnergies · ExxonMobil · ecopetrol · equinor · bp · PETRONAS · Woodside Energy · INPEX

Challenges to address in the energy transition

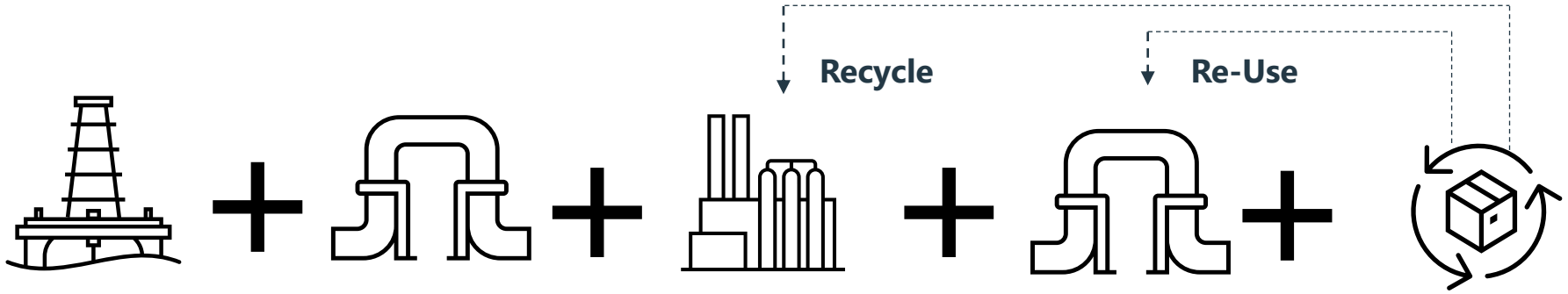
- Policy and Regulation
- Finance and cost of capital for clean energy projects
- Diversity of energy vectors
- Enabling data led decision making
- Driving energy efficiency improvements
- Delivering emissions reduction
- Geopolitics and Energy Security
- Accelerating lower-carbon systems and technologies



Carbon Accounting and Emission Reduction

Helping clients chart a path towards a net zero future

The first critical step is understanding your life cycle emissions and product carbon intensities.



Emissions from Extraction and Processing of Crude

Emissions from Crude Oil Transportation

Emissions from Refining and Further Downstream Processing

Emissions from Product Storage and Transportation

Emissions from Use and End-of-Life Treatment

Life Cycle Carbon Intensity

Our Role.

Assisting clients achieve their climate change ambitions.

Supporting companies contribute to the world's transition to net-zero carbon.

Embed decarbonisation across the entire project life cycle.

Supporting our client's journey to a lower carbon intensity future.

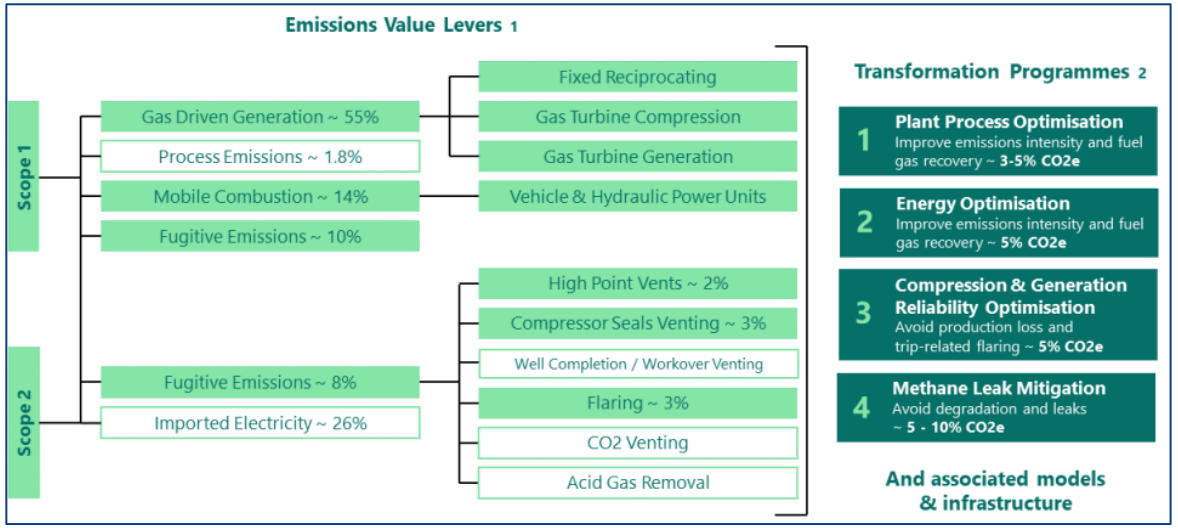
wood.

There are multiple opportunities to reduce CO_2 - we have an excellent track record

Optimise

- Process optimisation
- Energy efficiency improvements
- Methane abatement
- Flaring / venting
- Circular carbon economy
- Repurpose infrastructure
  - Hydrogen pipelines

'Our experience working on integrated gas facilities has shown that with the right interventions, it's possible to reduce Scope 1 & 2 emissions by 20% in two years.'



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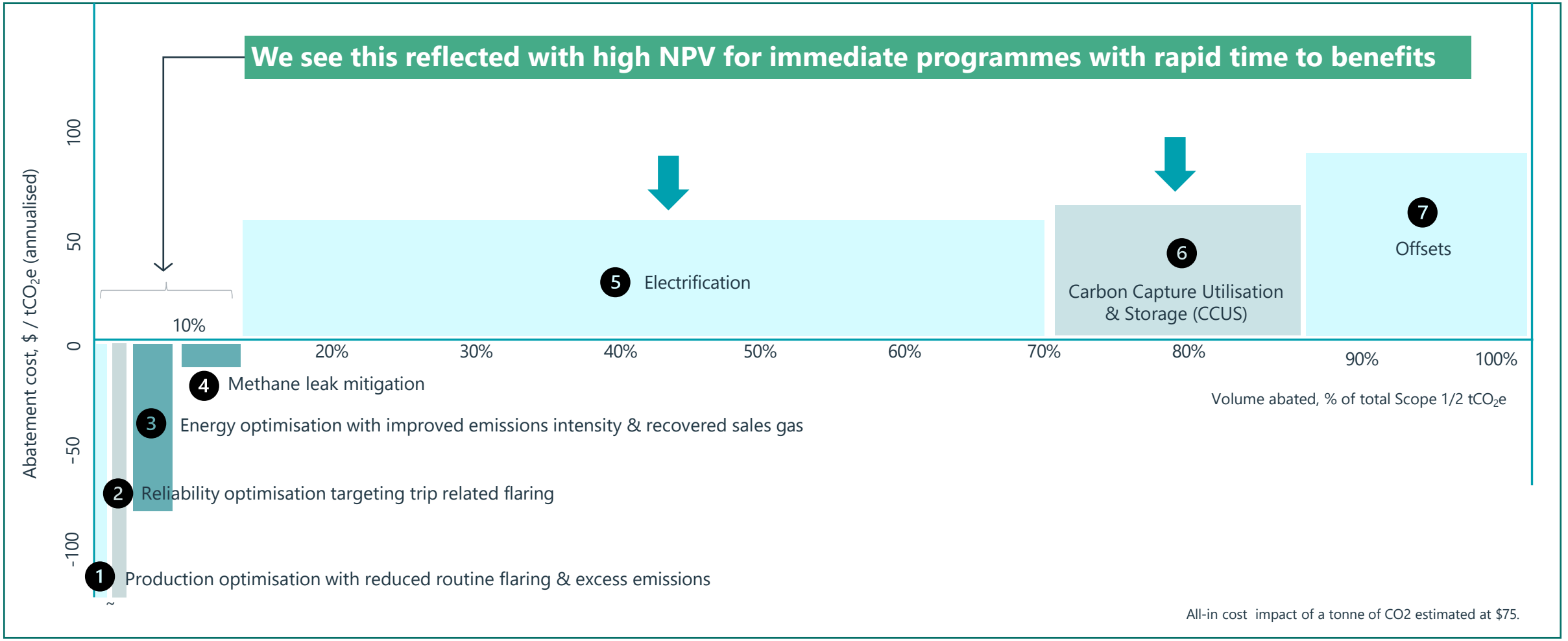
Some of the near-term opportunities are value accretive



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Optimising assets to reduce emissions and drive economic returns for clients

decarbAI

1. **Strategy**
2. **Monitoring**
3. **Change**

- Client set target to reduce GHG emissions intensity of operated assets by ~50% by 2025
- We developed a 5-year roadmap with 10 emissions reduction initiatives prioritised and taken forward
- The program would deliver a 13% reduction in Scope 1 emissions, with six of the initiatives cash generative
- In total, we will save 225,000 tons of CO_2 over the field life and generate US$30m added value for the client

Managing data to provide a clear, auditable and accurate view of emissions

ENV.

A digital solution that provides real-time insight on emissions, can be integrated into existing systems and scaled across a portfolio of assets.

- We deployed a GHG monitoring and reporting tool on five of BP's operating facilities in North America
- Over 1.2m pieces of data were collected and mapped
- The automated workflow in our tool resulted in an 80% reduction in manhours required to monitor, analyse and generate reports
- Having automated and auditable reports is a key first step in then defining emissions reduction opportunities

Delivering one of the world's largest flare reduction programmes

- Repairing and modernising aging infrastructure and driving operational efficiencies
- Program of work over last decade is helping to save over 10m tons of CO_2 a year
- Improvements enable the client to capture gas that would otherwise be flared
- As well as environmental benefits, sale of captured gas also supports economic and social development

Low Carbon Solutions

Hydrogen, P-to-X, Renewables & Electrification

Wood's excellent track record

Substitute

- Renewables integration
  - Solar / Wind
- Electrification
- Hydrogen
  - Ammonia / LOHC
- Power-to-X
- Fuel switching
  - Biofuels / SAF / E-fuels

- **60+ years of H_2 experience** with both users & off-takers.
- Designed and built **130+ H_2 plants** in over 40 countries.
- Involved in **Europe's largest blue ammonia plant** and the **largest green hydrogen project** in South America.

- **650+ wind** projects
- Delivered **120GW** capacity globally.
- **200+ solar** projects
- Delivered **35GW+** capacity solar PV projects.

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Integrating solar to replace gas power at a large industrial facility in Oman

Oman

- First utility-scale, PV solar project in Oman – 25MW plant with over 80,000 solar panels
- We provided owner's engineer services throughout the pre-construction, construction and delivery phases
- The solar plant supplies renewable electricity to a large ferrochrome production facility in Northern Oman – this displaced the equivalent gas-fired power generation
- Project has saved over 25,000 tons of CO_2 a year.

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Integrating renewables to save 200k tons of CO_2 a year

North Sea

Performed partial electrification two operating platforms, to help make sustainable hydrocarbon production possible in the Norwegian North Sea.

Our role:

- 11 floating wind turbine generators (WTG) placed in the Norwegian continental shelf.
- Installed in a ring configuration, normally with six WTGs connected to the A tension leg platform and five connected to the A bottom-fixed platform.
- The world's second full-scale floating wind farm (after Hywind Scotland) and the largest to date.
- Wood performed the EPCI for the brownfield modifications.
- Successful integration of the wind-generated power, overcoming significant challenges on the power management and control, working with two different OEMs, who had provided legacy equipment on the respective platforms.

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Developing the concept to deliver the world's largest blue ammonia project

Low-Carbon Hydrogen Program

- Assess and optimise development plans for large-scale blue ammonia and urea project in the region
- Will produce 10m MTPA of blue ammonia to support the downstream investments and boost food security
- On Phase 1, we assessed the technical feasibility, developed the scope for the project and supporting infrastructure, and advised on how to manage delivery risks
- On Phase 2, we completed a range of studies, led on technology selection and licensor selection, developed the HSE and contracting strategy and implementation schedule
- More opportunities as project moves to engineering phase

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Digitally Enabled Energy Transition

Accelerating the transition

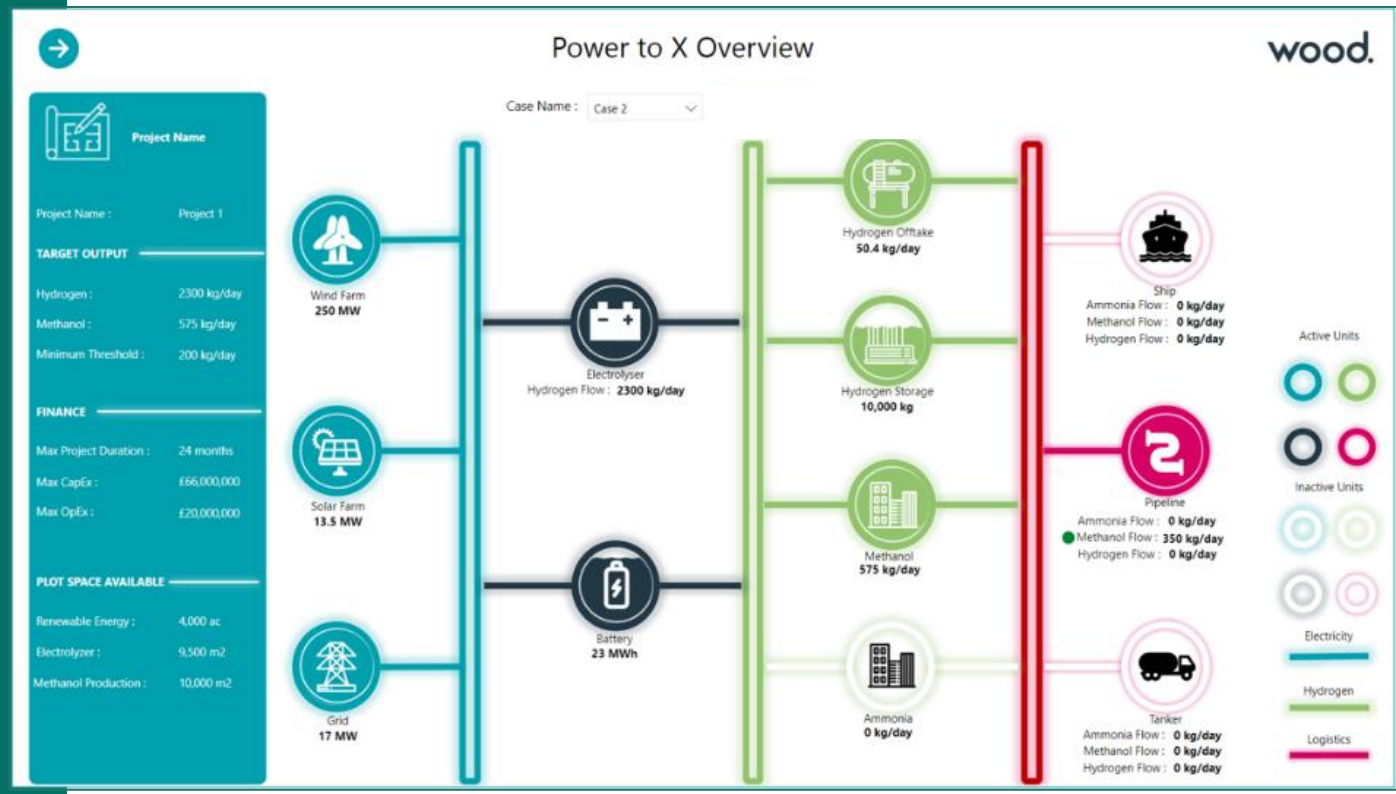
Building a lower-carbon, digitally enabled energy system

- As the **global economy** transitions to a lower-carbon future, infrastructure and industry will need to service a more diverse energy mix.
- We have a goal to achieve net-zero emissions by 2050, but **renewables alone will not be able to meet rising global energy demand.**
- There will be **an enduring role for hydrocarbons** - net zero will not happen without **significant investment in CCUS.**
- In the interim phase, digital solutions will play a key role in **minimising emissions and optimising the performance of existing assets**.
- **Integrated energy hubs** where low-carbon and conventional solutions are deployed together will be more common.

Case study - Digital asset of the future (Design)

Confidential client, Europe:

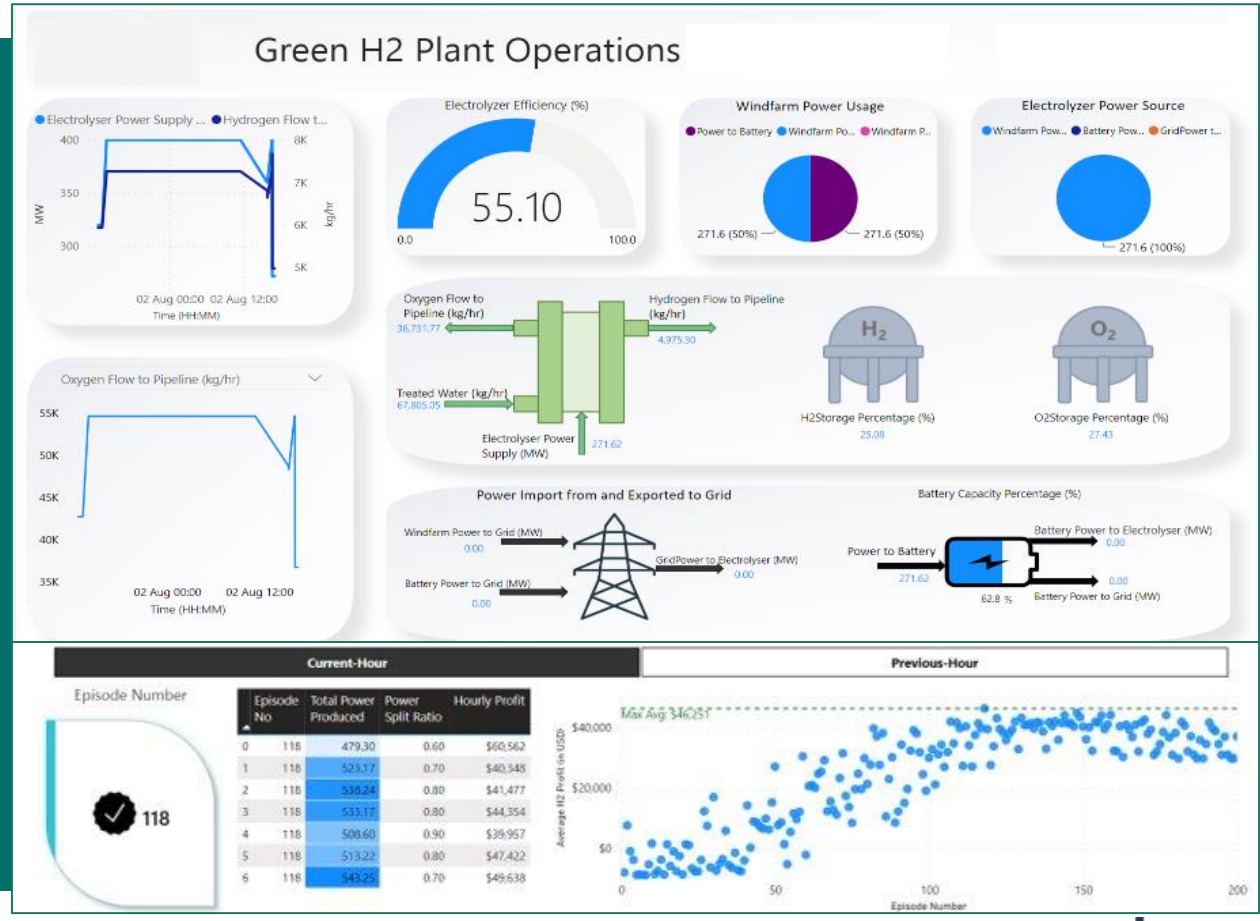
- Options for implementing green hydrogen production, green ammonia production, green methanol production, and green synthetic methane production facilities
- Reduce greenhouse gas emissions whilst capitalising on the Baltics region's vast renewable energy supply, supporting the transition to a low-carbon energy future
- Carbon lifecycle analysis, comparative product transportation assessment, and determining the minimised levelized costs of production for all configurations studied.



Case study - Asset of the future (Operate)

Realtime solution using AI that models, simulates, monitors, and optimises plant operations.

- **Data collection** – import current hour and forecast for the next 6 hours of power generated by wind farm
- **Process model** – use simulator tool to generate multiple scenarios based on different combinations of power split ratios. This determines the % of power to be supplied to the electrolyser for hydrogen production and to the grid
- **Economic analysis** – calculate total profit generated per hour
- **Decision making** – identification of optimal configuration to maximise profitability, considering factors such as electricity and hydrogen prices and operational costs



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Final remarks

- Investment and deployment of **low-carbon alternatives** has already started and **will only accelerate**.
- The **renewables industry is already mature** – the **focus now is on scale** (tripling capacity to 11,000GW by 2030).
- **Hydrogen will underpin** future low-carbon industries – we have **a strong offer and a 60+ year heritage**.
- **Low-carbon fuels and products** (biofuels, SAF, e-Methanol) will **grow in importance** for many of our existing clients.
- **Integrated energy hubs** where low-carbon and conventional solutions are **deployed together** will become more common.

To deliver a net zero future, we must **decarbonise** the production of existing energy sources while continuing to **invest capital and curiosity** in advancing low-carbon solutions.


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Design the future.