



**FUTURE
ENERGY
EXPORTS**

Cooperative Research Centre



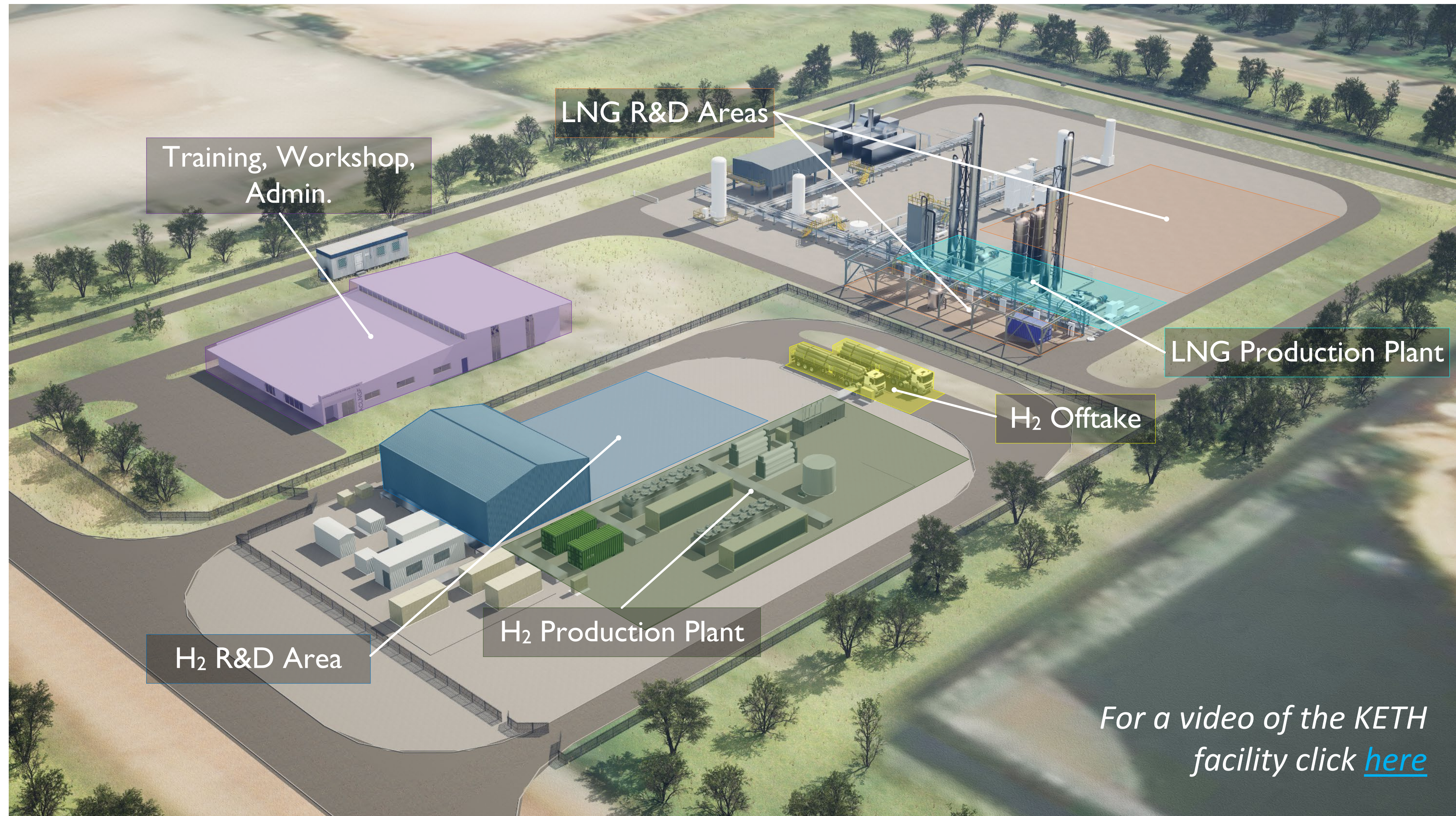
Kwinana Energy
Transformation Hub

Overview of Use Cases for the Kwinana Energy Transformation Hub:

LNG, H₂ and CO₂ Technologies

[Management Version – August 2022]

Main Areas of the KETH Facility



For a video of the KETH facility click [here](#)

How KETH Supports R&D



KETH features a H₂ plant producing 800 kg H₂ gas per day via PEM electrolysis, and an LNG plant producing 10 tonnes LNG per day.

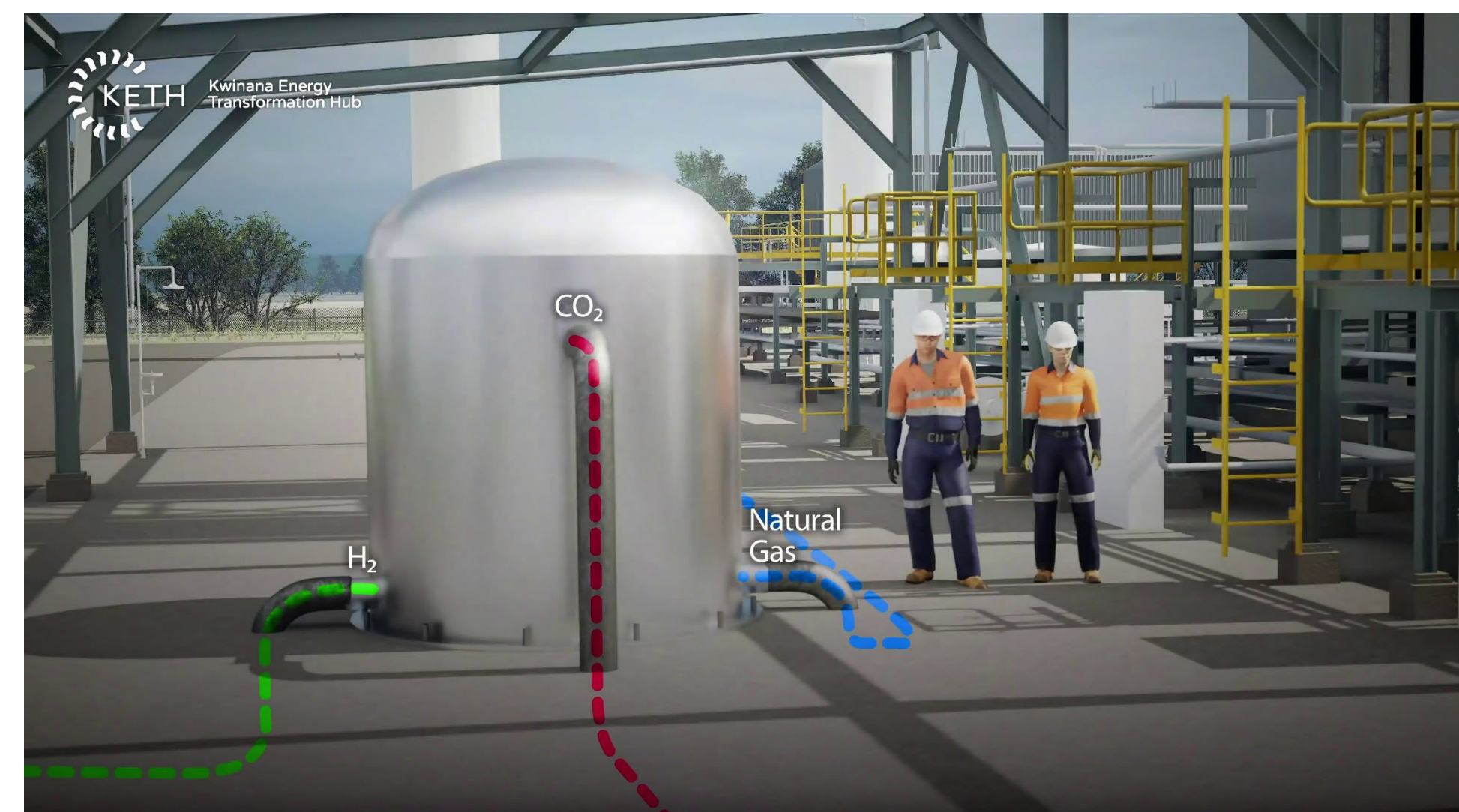
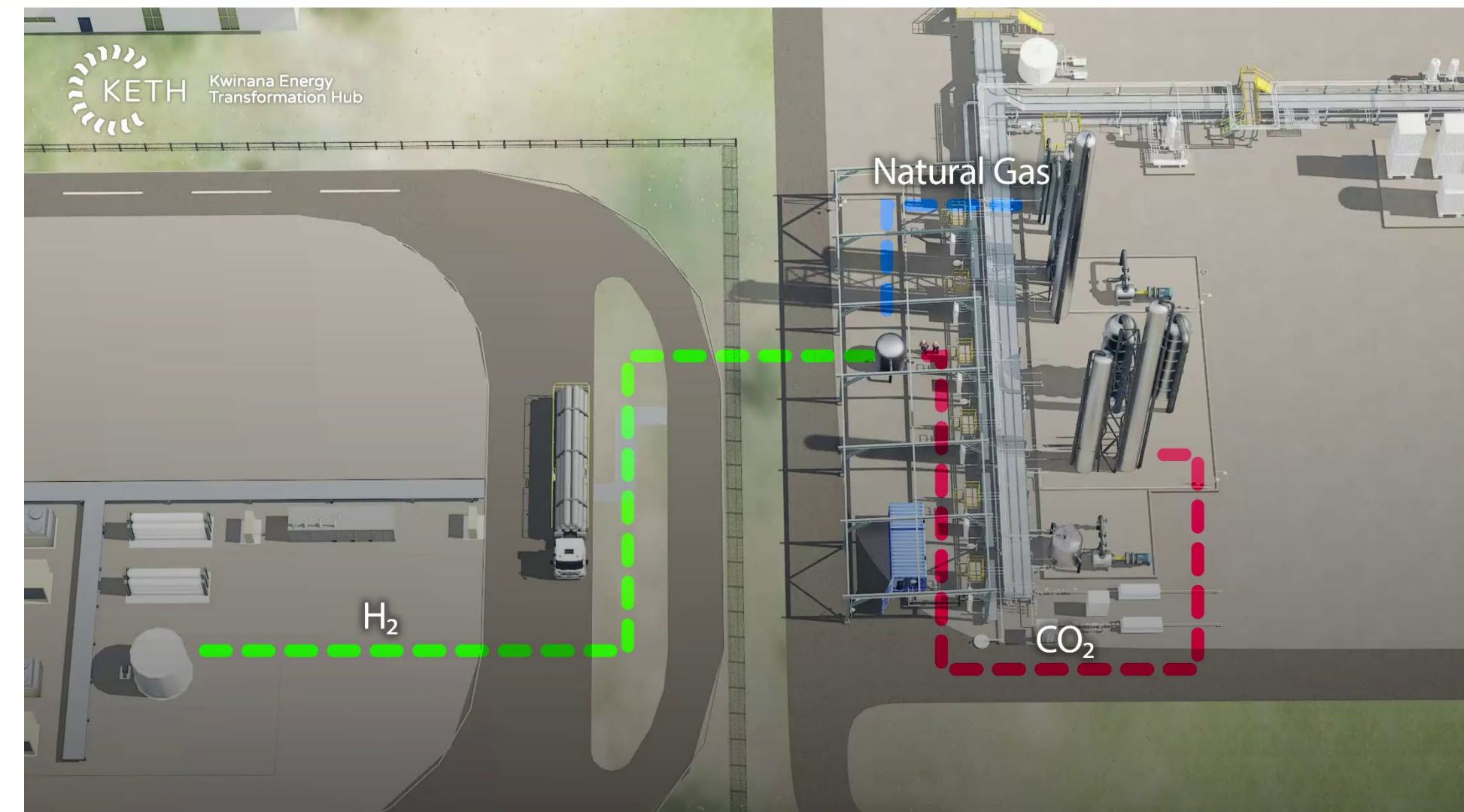
Industry-standard process technologies have been selected where possible (e.g. BASF aMDEA solvent for CO₂ removal) so that R&D activities at KETH are relevant to commercial plants.

The following R&D activities are supported:

- Demonstration of a fully electrified LNG plant, powered by renewable energy and producing negligible combustion CO₂ emissions.
- Connection of entire process units into the H₂ and LNG plants (e.g. a new H₂ liquefaction unit).
- Installation of instruments (e.g. sensors) in the H₂, LNG plants.
- Study of KETH LNG train performance under varying pressures, temperatures, and compositions, utilising the inlet compressor and recycle streams.
- Study of KETH H₂ plant performance under varying feed water quality, renewable power availability, and feed H₂ quality (for H₂ plant fuel cells).

Images show the LNG R&D area, where R&D modules can be located and connected to process streams (e.g. H₂, natural gas, CO₂) to trial technologies in a real plant environment.

*Snapshots taken from KETH marketing animation, available from:
keth.com.au or [youtube.com/watch?v=vcHvNmm33CY](https://www.youtube.com/watch?v=vcHvNmm33CY)*



Highlighted Use Cases

H₂ LIQUEFACTION

Install and operate new H₂ liquefaction units to prove technical readiness. Such trials of new units will lead to refined designs with lower energy consumption and better operability. Data acquired during trials will feed into process models to improve designs and simulations. Energy companies can witness operating units before commercial deployment.

CO₂ METHANATION

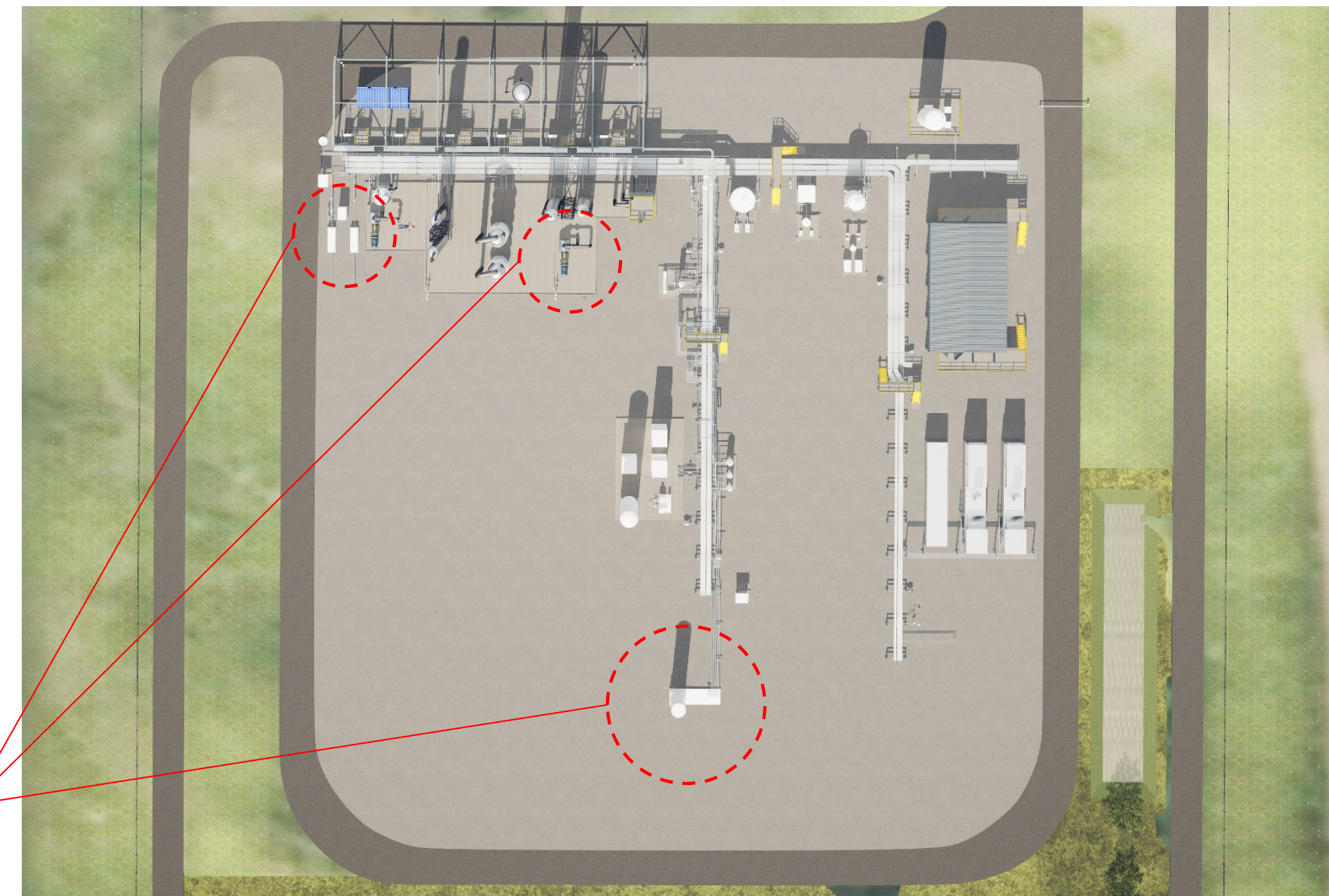
Qualify methanation technologies to reduce scope 1 emissions and increase LNG production. Long-term trials at KETH will improve understanding of operability issues and operator craft around methanation.

FUGITIVE EMISSIONS

Trial new low-cost methods to estimate fugitive emissions. KETH can also be used to trial plant modifications that substantially reduce fugitive emissions.

KETH enclosed ground flare (warm-wet, cold-dry, and sour burners) and rotating equipment (inlet compressor, MR compressor) provide fugitive emission sources for testing measurement technologies and new low emissions modifications.

CO₂ methanation plant (Falkenhagen, Germany)



Highlighted Use Cases



REDUCTION OF COMBUSTION EMISSIONS

Blend H₂, natural gas, and N₂ streams at KETH and feed into different gas engines temporarily installed on site. Such trials will provide real plant data to support commercial decisions to switch to blended fuels.

TRAINING PROGRAMS

Provide trainee operators with real plant experience before starting work, leading to fewer incidents and better operator craft in industry. Training programs at KETH will span H₂ and LNG operations, maintenance, and shutdowns.

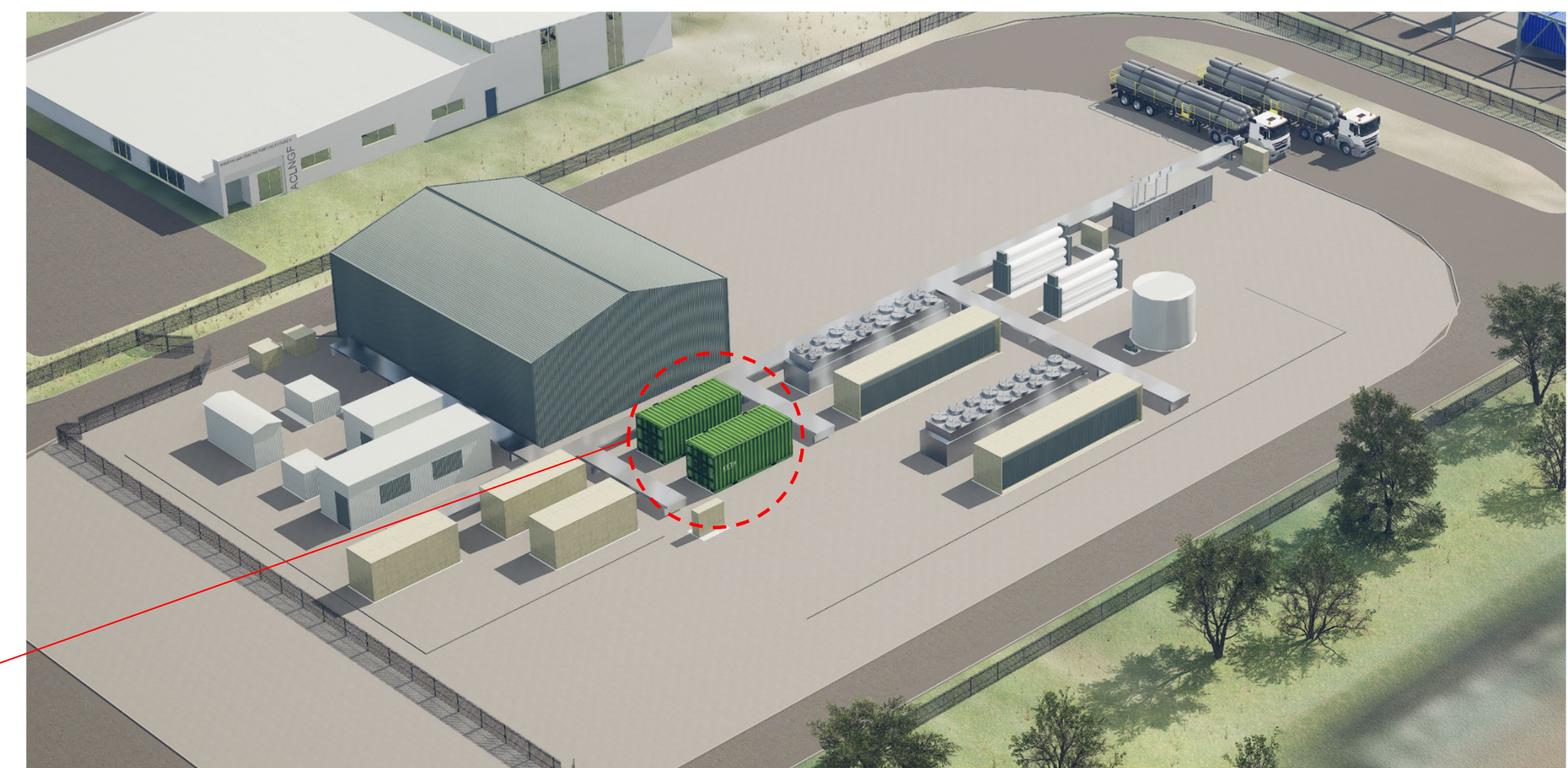
H₂ BATTERY FOR THE PROCESS INDUSTRIES

The KETH H₂ production plant includes fuel cells to power the LNG plant when renewable power is not available. This arrangement uses high pressure H₂ storage as a 'battery'. Users can modify the storage technology within this arrangement and run operational trials to identify the best storage design and process control strategy for powering process plants with renewable power and H₂ as a battery.

KETH will be the only live H₂ and LNG training facility in the southern hemisphere. Programs will be run by a registered training organisation (RTO).

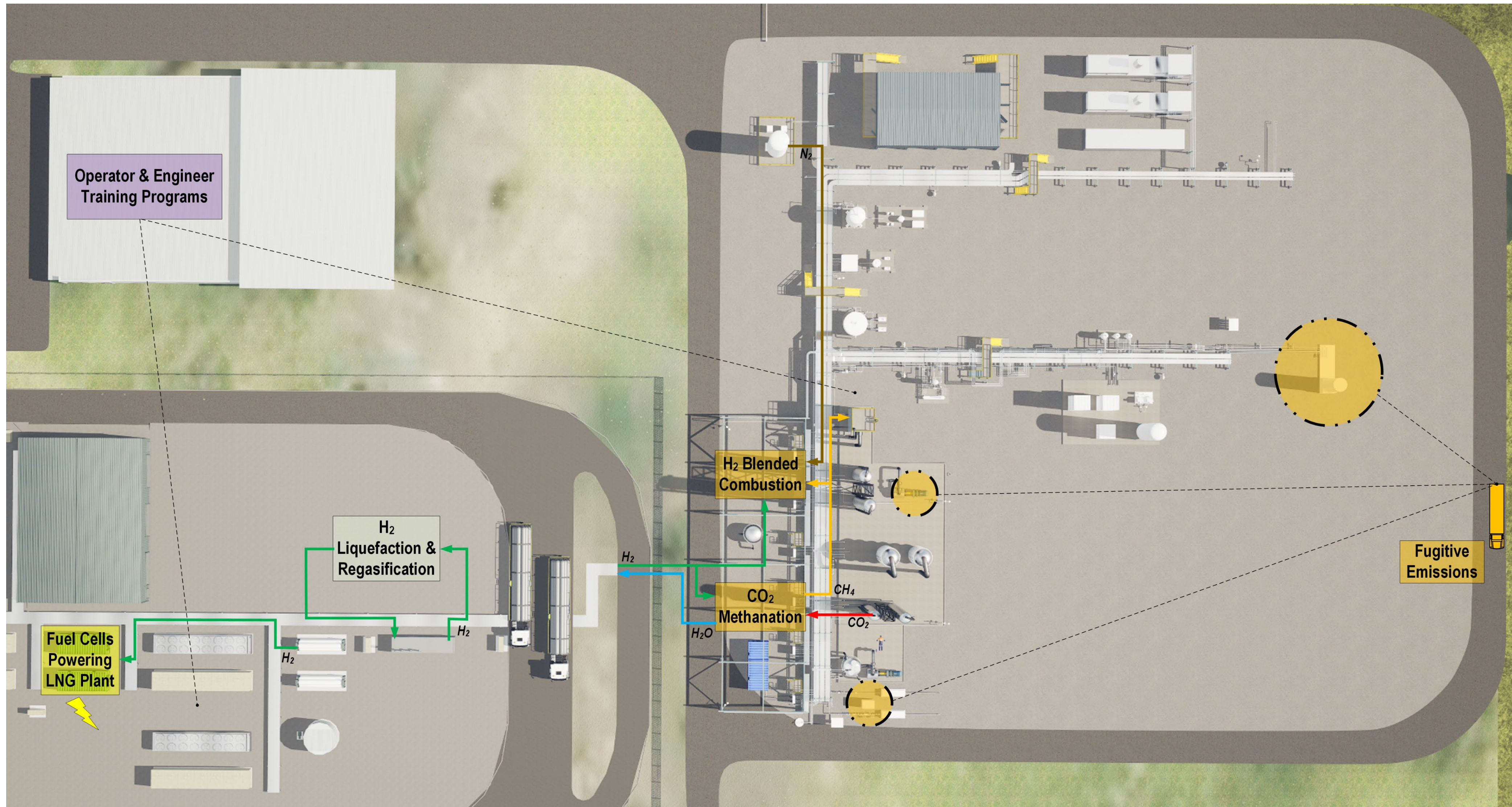


New hydrogen and LNG training programs to support the energy transition



KETH hydrogen fuel cells capable of powering the KETH LNG train. The fuel cells are fed via a pressure-reduction panel connected to 700kg of stored high-pressure hydrogen.

Highlighted Use Cases at a Glance

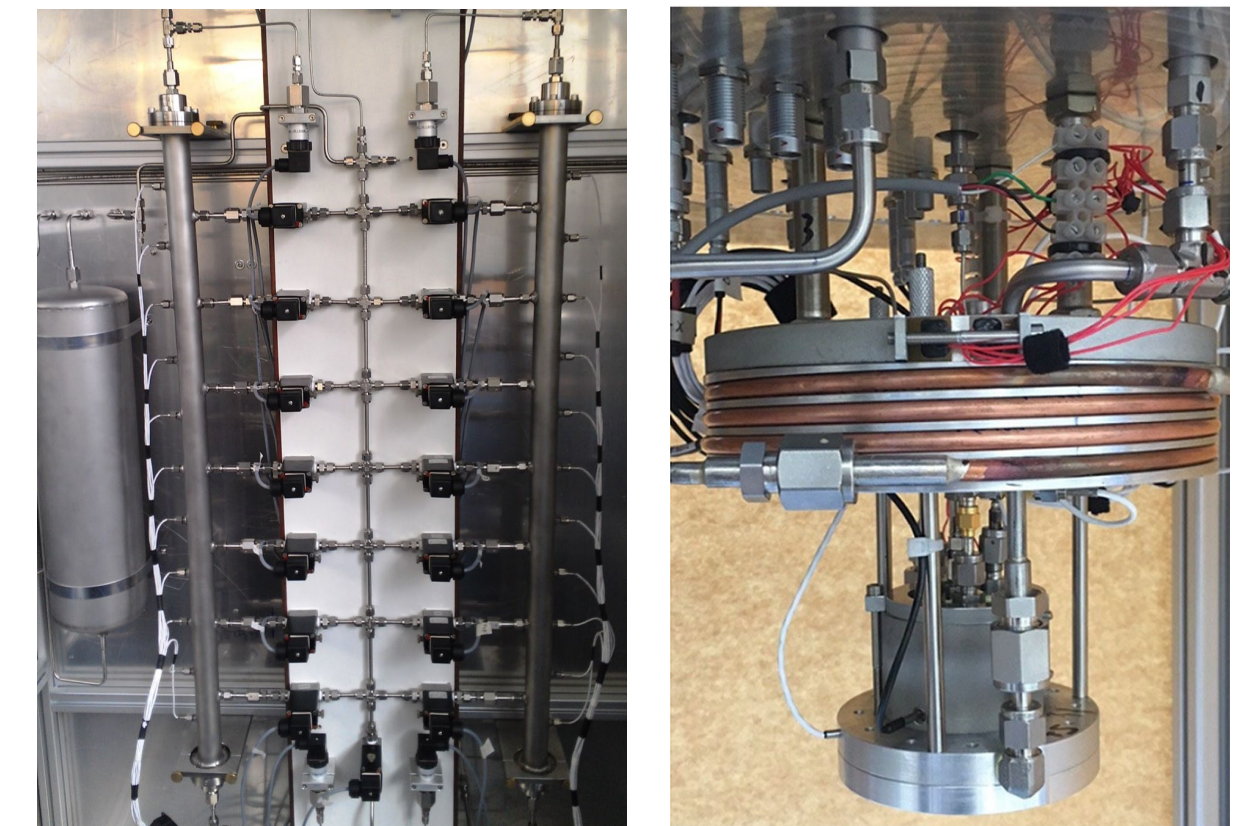
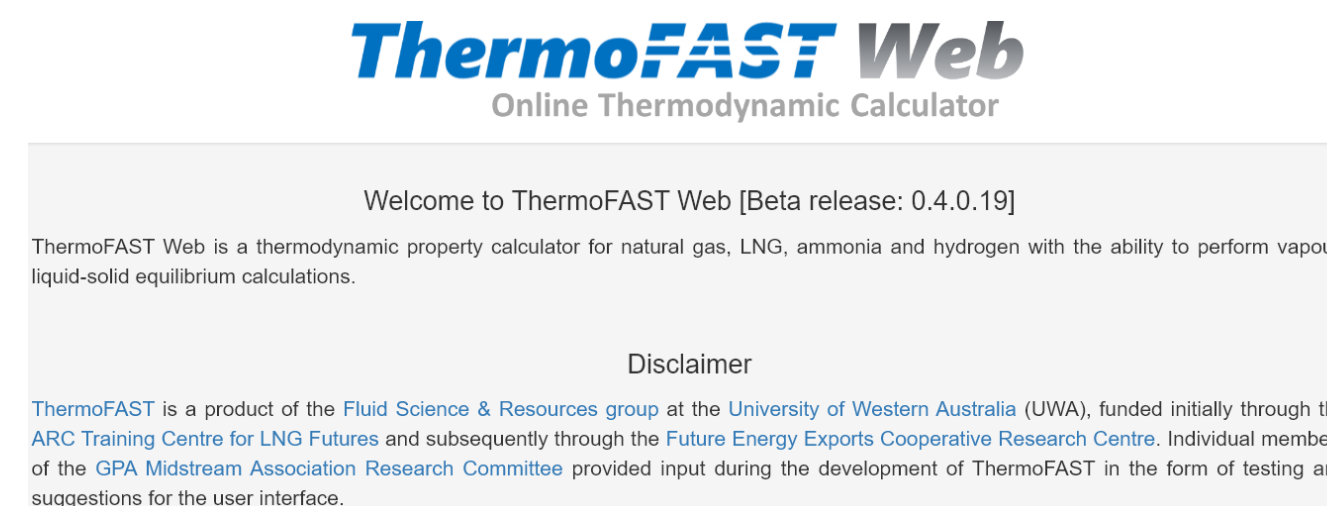


The Value of R&D at KETH



Engagement with industry and academia since 2018 has produced a longlist of **28** H₂ and natural gas R&D use cases in the following categories:

- Next Generation Plant
- Shutdown Prevention
- New Value Streams
- Operation Optimisation
- Process Safety Testing
- Data Analytics
- Maintenance



Many technical solutions to important problems in LNG and H₂ production are in development. Field testing at KETH, leading to commercial deployment, will deliver significant value to the energy sector.

(Images courtesy FSR group, UWA)

Many use cases are technical solutions in the prototype phase, awaiting field testing at industrially relevant scale. KETH provides this field environment, lowering the barriers of access, cost, and risk that leave many innovations at laboratory scale.

Valuation of nine LNG R&D use cases estimated \$700m p.a. uplift to LNG production, for the scenario of all nine R&D cases achieving deployment at one 4.6 MTPA LNG train and 250,000 m³ LNG carrier. Alongside LNG R&D, which aims to maintain competitiveness of Australia's LNG industry, H₂ R&D supports growth of the nascent H₂ industry as well as decarbonisation of natural gas production.