Clean Energy Innovation Hub

Sam Lee Mohan | Head Innovation Projects

ATCO Clean Energy Innovation Hub

Outline…

1 | Who is ATCO

- Australia – Gas Distribution

2 | ATCO Clean Energy Innovation Hub

- Why Hydrogen
- What is ATCO Clean Energy Innovation Hub

3 | Why test hydrogen…a technical perspective

- What will we be testing

4 | Major Milestones

- How will the project unfold

Global capabilities

Approx. **7,000 employees** and assets of **$22 billion**

19
POWER PLANTS WITH A COMBINED GENERATING CAPACITY SHARE OF 2,517 MW*
*megawatts **cubic metres per day ***petajoules

87,000 KMS
ELECTRIC POWER LINES

7
MODULAR BUILDING MANUFACTURING FACILITIES
(2 CANADA, 2 U.S., 2 AUSTRALIA, 1 CHILE)

85,200 M^3/D
WATER INFRASTRUCTURE CAPACITY**

52 PJ
NATURAL GAS STORAGE CAPACITY***

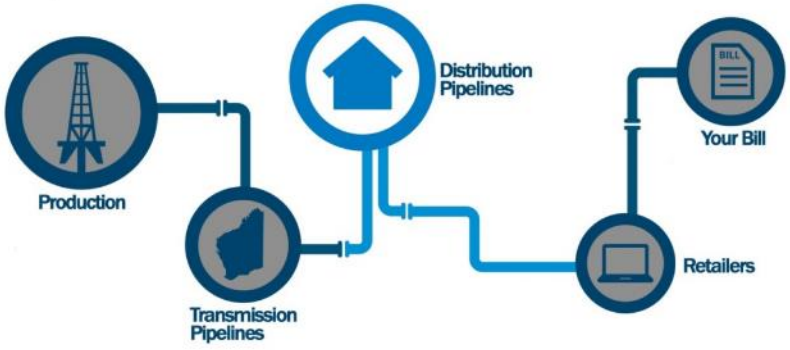
64,500 KMS
NATURAL GAS PIPELINES

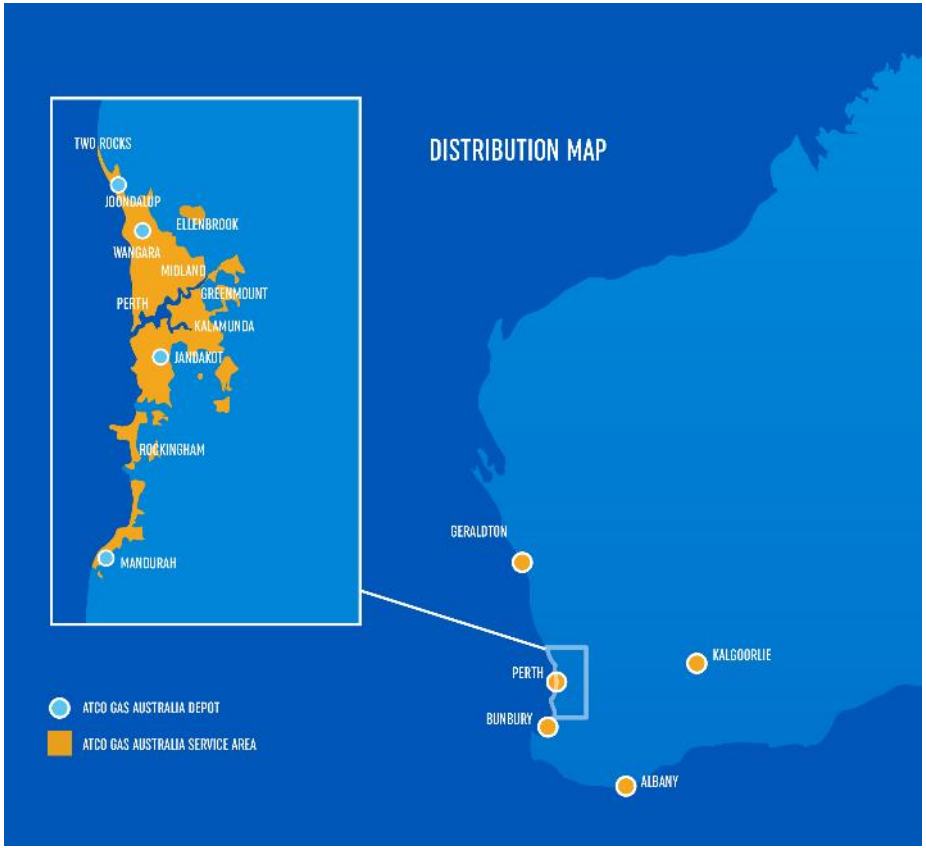
200,000 M^3
HYDROCARBON STORAGE CAPACITY

2M+
GLOBAL CUSTOMERS

Australia - Gas distribution

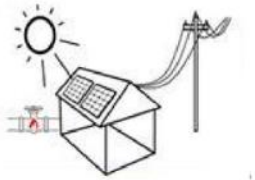
- Own, operate and maintain WA's largest gas network
- More than **14,000km** of pipelines
- **750,000** connection points
- Regulated and unregulated networks
- More than 300 employees





ATCO’s pathway to a cleaner energy future

Path from current to future reality

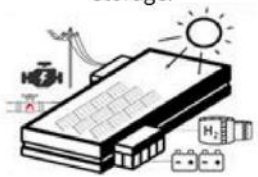


Phase 1
Urban Systems

Can gas with existing supply infrastructure provide a better outcome than batteries and grid solutions alone in balancing PV self generation?

Phase 2
Commercial

Can this concept be built into the C&I space? This includes tackling the issue of process heat and potentially gas creation using excess PV and storage.



Phase 3
Further carbon reduction

What is the long term pathway – how can the utility and storage potential of gas and its infrastructure evolve and continue to reduce its carbon footprint further?

Vasse Residential Hybrid Energy System

For nine selected houses with rooftop solar PV systems, ATCO has installed:

- Natural gas generator
- Smart inverter
- Battery storage
- Communication system

Pilot plant:

- Pre-installation test in Jandakot
- To raise and resolve technical problems
- To train staff to install the system
- Showcase for stakeholders

Why hydrogen?

Enable the renewable energy system → Decarbonize end uses

Enable **large-scale renewables integration** and **power generation**

Distribute energy across sectors and regions

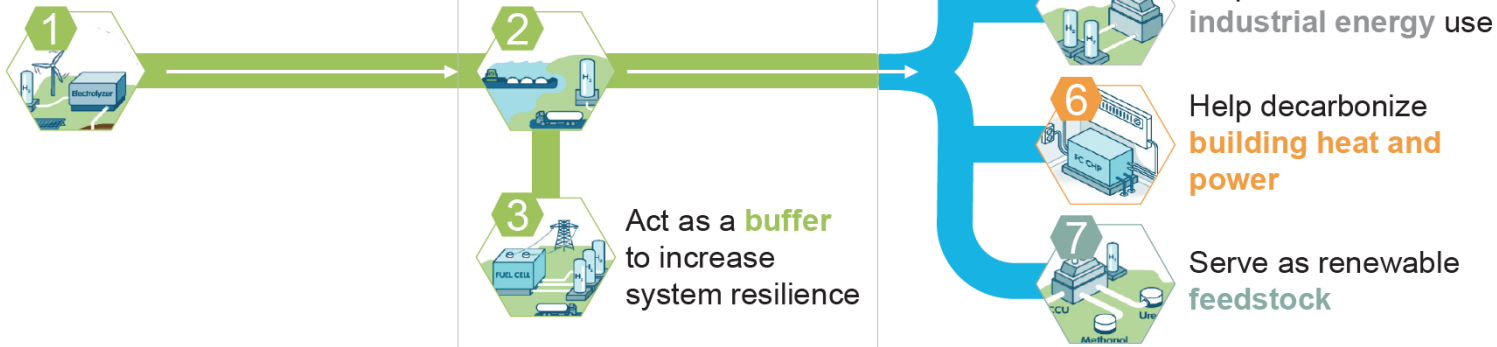
Act as a **buffer** to increase system resilience

Help decarbonize **transportation**

Help decarbonize **industrial energy** use

Help decarbonize **building heat and power**

Serve as renewable **feedstock**

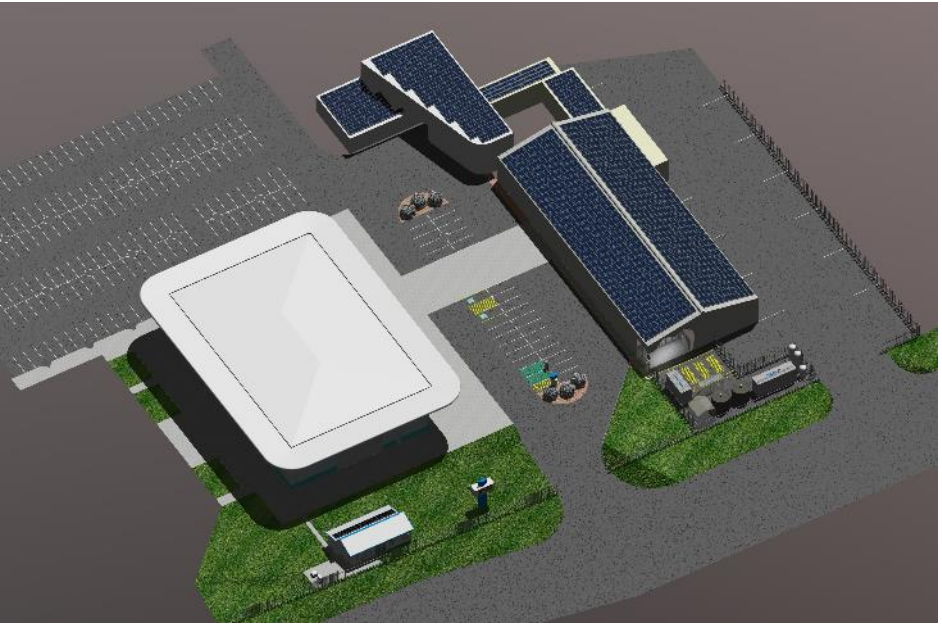


* *"Hydrogen, Scaling Up"*. Hydrogen Council report, Nov 2017.

ARENA

Australian Government
Australian Renewable Energy Agency

Clean Energy Innovation Hub



$3.6M total investment

$1.6M grant from the ARENA

WHAT IS ATCO CLEAN ENERGY INNOVATION HUB

An Australian first that will integrate hydrogen production plus fuel cell technology with natural gas electricity generation from excess **clean renewable energy** in a “living lab” micro-grid setup.

CEIH builds on **ATCO’s residential Hybrid Energy System (HES)** demonstration adding “green” hydrogen generation capacity from water electrolysis.

A **showcase R&D facility** that leads innovation in reliable, affordable and sustainable energy solution.

ATCO

Clean Energy Innovation Hub

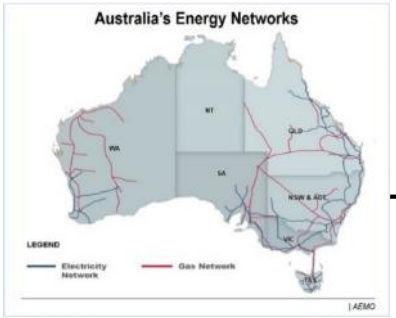
1. Research facility to investigate the potential role of hydrogen in the future energy mix

2. Test bed for microgrids enabled by gas technology, integrating with solar and batteries

Why is ATCO getting involved?

- The impact of hydrogen on our distribution network assets, downstream appliances and safety standards.
- Meeting customer needs for low emission fuels and maintaining affordability.
- The potential role of hydrogen for deep decarbonisation of the gas grid and an ideal complement to intermittent renewable energy of wind and solar.
- Important step to optimise the investment in the existing infrastructure.

Integrating technology solutions



ATCO Operations Centre

Renewable Resources

Customer Microgrid

Integration of Variable Generation

Grid Disconnect

ATCO

Dispatch

Load Shedding and Shutoff

Customer Site

Natural Gas Generator

Electric Storage

ATCO'S CLEAN ENERGY INNOVATION HUB

The Clean Energy Innovation Hub (CEIH) will produce approximately **550,000 kWh** OF CLEAN ENERGY PER YEAR, generated by **1,100** SOLAR PANELS, which is enough to fill nearly **40,000** POWERWALL BATTERIES

1. Solar panels convert sunlight into electricity
2. The clean energy is used to power the Jandakot facility

The CEIH will have approximately **400 kWh** OF BATTERY STORAGE which is enough to power **20 HOMES** FOR A DAY IN SUMMER

3. Excess energy is stored in batteries for use when the sun isn't shining

BATTERY STORAGE

4. The remaining energy powers an electrolyser

ELECTROLYSER

The CEIH will produce **4** TONNES OF HYDROGEN PER YEAR

5. The hydrogen is stored

HYDROGEN STORAGE

HYDROGEN IS THE MOST ABUNDANT CHEMICAL ELEMENT IN THE UNIVERSE

6. Hydrogen is piped into our Hybrid Modular Home

HYBRID MODULAR HOME

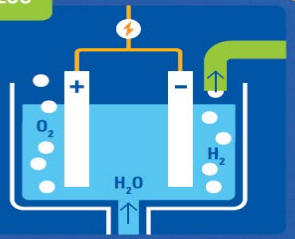
7. Hydrogen also fuels a fuel cell to provide backup power

FUEL CELL

8. The rest is blended with natural gas for testing within the CEIH

THE ELECTROLYSIS PROCESS

- Clean water is pumped into the electrolyser
- The water is split by an electric charge into hydrogen and oxygen
- The oxygen is released into the atmosphere
- The hydrogen is captured



DID YOU KNOW HYDROGEN can be blended with **NATURAL GAS?**

ATCO

Major milestones

- 300kW of solar photovoltaics installed in November 2018.
- Micro grid installed in June 2019.
- Clean Energy Innovation Hub producing hydrogen by July 2019.

Thank You