



## ENVIRONMENTAL CLEAN TECHNOLOGIES TO COMMENCE PANASONIC HYDROGEN FUEL CELL TRIAL AT BACCHUS MARCH

### Key points:

- Panasonic, a market leader in the development of fuel cells has selected ECT's Bacchus Marsh site for a trial of their hydrogen fuel cell for clean hydrogen use in support of the global rollout of their new generation Hydrogen Fuel Cells.
- The Fuel cell is capable of turning hydrogen into onsite electricity and power
- ECT will provide Clean Hydrogen produced from COLDry to Panasonic as part of a 3-year trial
- Optimal Group Australia is in partnership with Panasonic to install, commission, maintain and provide training to ECT on fuel cell operation
- This is an important milestone for ECT, as it reinforces the company's push to develop clean Hydrogen from its Bacchus Marsh facility
- The trial will commence in December 2022

### Trial Schedule



**Tuesday 15 November 2022:** Environmental Clean Technologies Limited (ASX:ECT) (“ECT” or “Company”) is pleased to announce the signing of a Term Sheet for the field trial of the Panasonic Hydrogen Fuel Cell technology as part of its COLDry Demonstration and Net Zero Hydrogen Project at JBD Industrial Park, in Bacchus Marsh, northwest of Melbourne.

### Developing a Clean Hydrogen Demonstration at Bacchus Marsh

As previously announced, the Company is progressing with its COLDry Commercial Demonstration Project (“Bacchus Marsh Project”) aimed at demonstrating a set of unique solutions, including:

- Clean hydrogen for energy and industrial chemicals from lignite and biomass
- Agricultural char for soil health and food security
- Battery Active Carbon to support the diversification of critical minerals

As part of the Bacchus Marsh Project, ECT will produce hydrogen that can be utilised in several applications, including hydrogen vehicles, fertiliser and formic acid production.

Hydrogen can also be used for stationary electricity production, to power on-site activities or for export to the grid. To achieve this, a hydrogen fuel cell is needed to convert the hydrogen to electricity.

Panasonic has developed the modular plug-and-play 5kW hydrogen fuel cell, which will enter mass production in late 2022.

Panasonic Australia is partnering with Optimal to advance the stand-alone fuel cell in Australia, and ECT has been selected to participate in field trials of the technology.

A successful trial will see ECT install larger numbers of fuel cells to manage the load and despatch of on-site hydrogen production, producing clean electricity for site use and supply to the grid.

ECT Managing Director Glenn Fozard commented:

*“Hydrogen Fuel Cells add flexibility to the despatching of produced hydrogen on-site, reducing our need to seek solutions for storage whilst still allowing continuous production.*

*This is an opportunity for ECT to become a player in the next generation of hydrogen fuel cell technology and demonstrate the transition to a carbon-free world using hydrogen.”*

The attached presentation, approved by Optimal and Panasonic, provides an overview of the technology and trial.

This announcement is authorised for release to the ASX by the Board.

**For further information, please contact:**

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#### **About ECT**

ECT has been developing net-zero emission and hydrogen technologies for over 15 years.

Our solutions aim to transition today’s use of resources to tomorrow’s zero-emission future, delivering immediate financial and environmental benefits.

We are focused on advancing a portfolio of technologies that have significant market potential globally.

ECT’s business plan is currently focusing on two major projects:

- 1) Zero-Net Emission COLDry Commercial Demonstration at Bacchus Marsh, Victoria, Australia
- 2) Zero-Net Emission Hydrogen Refinery Project at the Latrobe Valley, Victoria, Australia

#### **About our Technology Suite**

**COLDry** is the gateway enabler of higher-value applications for waste biomass and lignite.

**HydroMOR** is a simple, low-cost, low-emission, hydrogen-driven technology that enables ‘low value’ feedstocks to produce primary iron. HydroMOR is the transition solution to a “green steel” future.

**COHgen** aims to decouple hydrogen production from CCS, accelerating the race towards <\$2kg production costs with little to no emissions.

CDP-WTE converts low-value resources into higher-value diesel and other valuable by-products.

**About Panasonic**

Established in Japan in 1918, Panasonic is today a global conglomerate with diverse business interests encompassing battery technology, HVAC, renewables, automotive equipment, consumer electronics and business technology solutions. As part of the Panasonic GREEN IMPACT commitment, the company is investing heavily in the development of Green Hydrogen-related technologies to contribute to global decarbonisation.

**About Optimal**

Established in 2012 and privately owned, Optimal Group is an EPC business focusing on energy efficiency and renewable energy solutions. It is the Capstone Turbine Distributor for Australia, NZ and the South Pacific. Optimal entered the green hydrogen market in 2018 and has completed or has current projects in both fuel cells, electrolyzers and H<sub>2</sub>fuelled Microturbines.

**Forward-Looking Statements**

Statements contained in this release, particularly those regarding possible or assumed future performance, revenue, costs, dividends, production levels or rates, prices or potential growth of ECT, are or may be forward-looking statements. Such statements relate to future events and expectations and, as such, involve known and unknown risks and uncertainties. Therefore, actual results and developments may differ materially from those expressed or implied by these forward-looking statements depending on a variety of factors.

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**Panasonic**

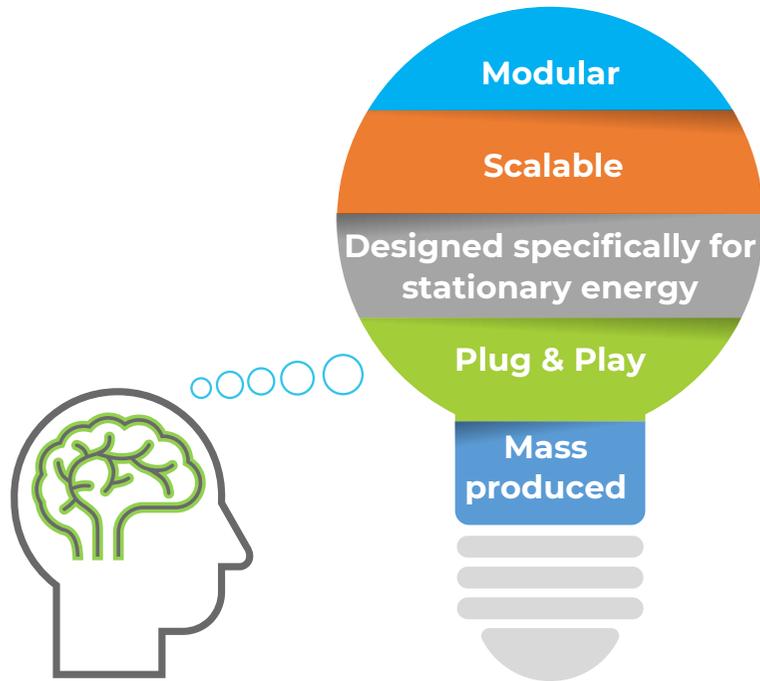
## Hydrogen Fuel Cell Trial @



**ENVIRONMENTAL CLEAN  
TECHNOLOGIES LIMITED**

JBD Industrial Park,  
25 Rowsely Station Rd,  
Maddingley, Victoria

A demonstration of a new scalable modular H<sub>2</sub> fuel cell technology  
designed for stationary energy



Imagine a fuel cell that is...

A hydrogen fuel cell converts hydrogen into clean electricity and can be set up to also provide clean thermal energy. It does this approximately twice as efficiently as a conventional generator running on hydrogen as the fuel and has a much longer life.

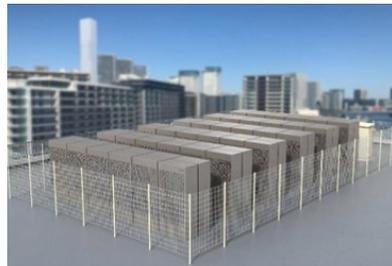


## It's happening right now

Panasonic has developed the modular plug-and-play 5kW hydrogen fuel cell:

Panasonic Australia is partnering with Optimal to advance the stand-alone fuel cell in Australia, and Environmental Clean Technologies (ECT), a future leader in the hydrogen space, has been selected to participate in field trials of the technology.

This is an opportunity for ECT to become a player in the next-gen H<sub>2</sub> FC technology and demonstrate the transition to a carbon-free world using hydrogen.



## The Technology

Panasonic has been producing natural gas fuel cells for many years and, in more recent times, has developed hydrogen versions.

The fuel cell uses PEM technology allowing for flexible on/off cycling.

Each unit has a gas, water and DC output connection for simple integration onto single headers for gas and water and power connection to downstream PCS.

Panasonic has 99 units powering its Kusatsu Fuel Cell Factory.

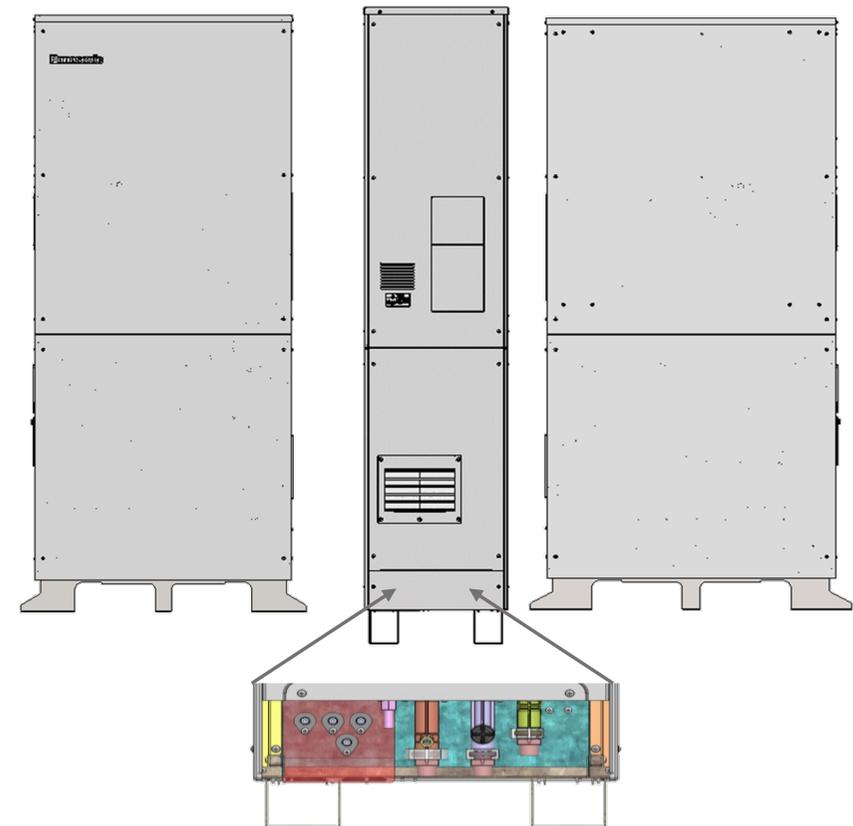
Panasonic is installing fuel cells for the Harumi Flag district in Tokyo (Former Tokyo 2020 Village).



## 5kW Hydrogen Fuel cell Specification

Electrical Output	5 kW (DC)
Thermal output (can be used for cogeneration)	3.48 kW
Electrical Efficiency	56% (LHV)
Thermal efficiency	39% (LHV)
Fuel consumption	0.279 Kg/ Hr
Fuel Spec	H <sub>2</sub> > 99.97% Sulphur < 0.01ppb
Power input	2 W (AC)
Water drain rate	1.2L / hour
Dimensions (H x D x W)	1797x795x396 mm
Weight (dry)	175Kg
Life	90,000 Hours

The fuel cell will be packaged by Optimal onto a skid with the associated PCS, fuel train, cooling / cogen heat exchanger and controller which can be made suitable for outdoor applications.



Connection points

## Compliance

The PH1+ H<sub>2</sub> fuel cell is designed in compliance with International Standard IEC-62282, which is the basis of AS 62282.3.100:2021, recently released for stationary fuel cells.

JIA certification (Japanese certification) was acquired.

The PCS equipment used in the trial will be AS 4777.2 (inverter standard) compliant, allowing for easy grid connection if required.

The system skid and associated wiring will be designed and fabricated to be AS/NZS IEC 60079 (explosive atmospheres equipment) and AS3000 (electrical wiring) compliant.

Australian Standards have indicated a willingness to participate as observers in the trial.



一般財団法人 日本ガス機器検査協会  
Japan Gas Appliances Inspection Association



Australian  
Standard



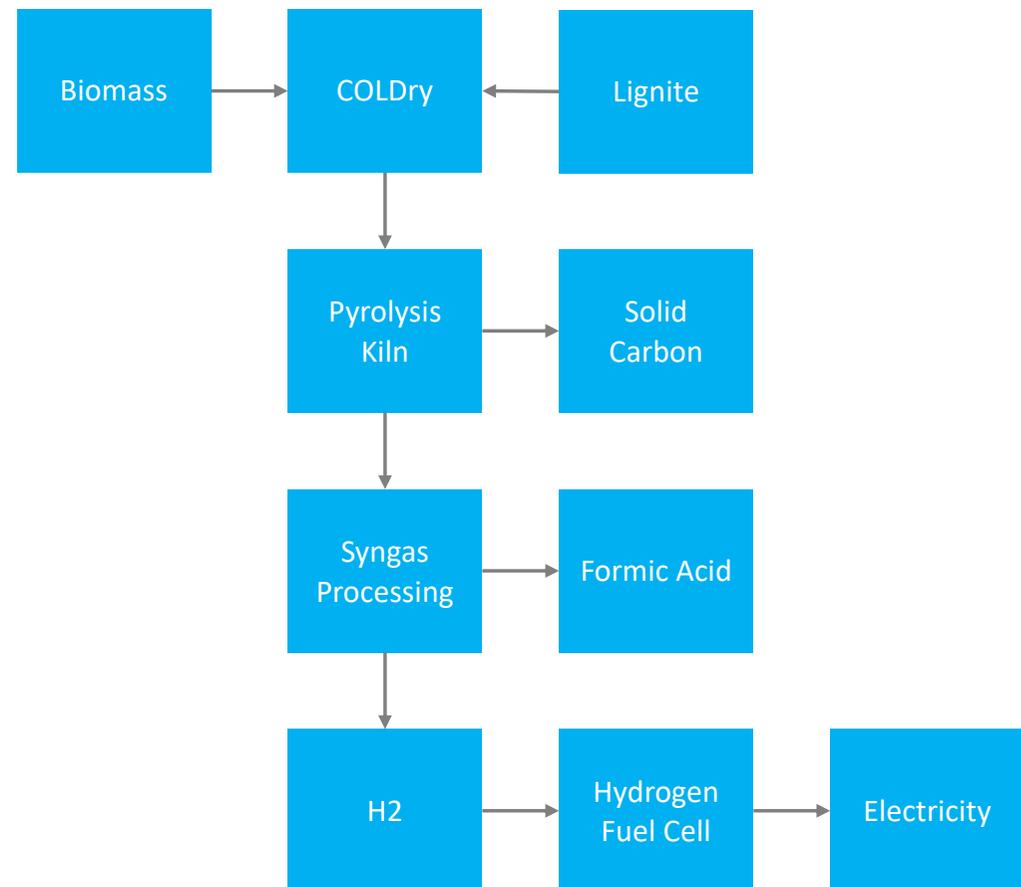
## ECT's Trial @ Bacchus Marsh

Optimal and Panasonic were seeking participants for both on and off-grid applications with single or multiple 5kW FCs.

ECT was selected as 1 of 5 trial participants in Australia and will include:

- Dispatchable power component for JBD Industrial Park's microgrid power.
- Backup to PV & battery systems for low-power remote equipment, e.g. process instrumentation, communications etc.
- Extended low-power UPS for commercial and industrial applications.
- Demonstration of hydrogen in an industrial setting, servicing commercial buildings as a primary or paralleled heat and power source (cogen).
- Power at hydrogen vehicle refuelling points.
- Demonstration of waste heat utilisation to support the zero-emission drying via the COLDry process

Involvement in the trials is anticipated to lead to future commercial opportunities for ECT.



## Fuel

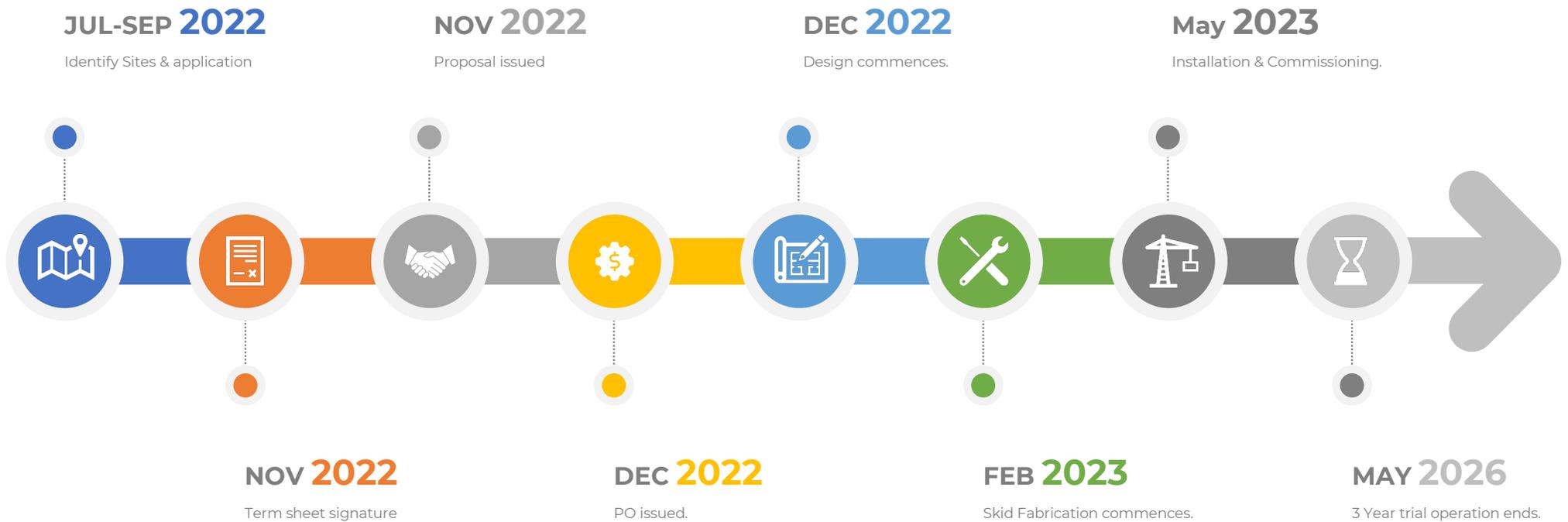
ECT will be responsible for providing hydrogen to the site with sufficient storage for the application, including on-site H<sub>2</sub> production.

The amount of fuel storage will depend on the application and proposed usage patterns etc.

ECT is building a net-zero hydrogen production facility at JBD Industrial Park (Bacchus Marsh, Victoria), which will provide hydrogen fuel to be despatched into fuel cells, vehicle fuelling and production of hydrogen derivatives like formic acid.



## Trial Schedule



## About Panasonic

- Established in Japan in 1918, Panasonic is today a global conglomerate with diverse business interests encompassing battery technology, HVAC, renewables, automotive equipment, consumer electronics and business technology solutions.
- Panasonic first introduced natural gas fuel cells in Japan in 2009 and has since shipped **over 220,000 units**, accumulating considerable know-how and experience in fuel cell technology.
- As part of the Panasonic **GREEN IMPACT** commitment, the company is investing heavily in the development of Green Hydrogen-related technologies to contribute to global de-carbonisation.
- Panasonic Australia Pty Ltd (a wholly owned subsidiary of Panasonic corporation) based in Sydney was established in 1989 and is fully resourced to support the development of the Panasonic Fuel Cell business in the Australian market.

## About Optimal Group Australia

- Established in 2012 and privately owned, Optimal Group is an EPC business focusing on energy efficiency and renewable energy solutions. It is the Capstone Turbine Distributor for Australia, NZ and the South Pacific.
- Optimal entered the green hydrogen market in 2018 and has completed or has current projects in both fuel cells, electrolyzers and H<sub>2</sub> fuelled Microturbines.
- Optimal has a national service capability supporting hydrogen electrolyzers, fuel cells and microturbines.
- In 2021 Optimal Group launched Optimal Renewable Gas to develop ten renewable gas-to-grid or LNG facilities in Australia. The first project will be a 2TJ/day LNG facility in Tasmania.
- Completed turnkey projects range in size from 30kW to 4MW capacity and include microgrids & utility stand-alone power systems (SPS).



**Panasonic**



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