



ClearVue<sup>PV</sup>

INVESTOR PRESENTATION

CLEARVUE TECHNOLOGIES LIMITED

6 September 2019

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# Introduction



- ❑ ClearVue Technologies Limited (ASX: CPV) operates in the Building Integrated Photovoltaic (BIPV) sector which involves the integration of solar technology into building materials, specifically glass and building surfaces to produce localised renewable energy.
- ❑ ClearVue offer a powerful renewable energy solution that incorporates solar energy generation into transparent glass that can be used to allow significant energy saving costs for its clients.
- ❑ ClearVue's glass technology represents an untapped opportunity to use one of the worlds most used building materials for energy generation – clear GLASS.

## Mission & Motivation

- ❑ Our mission is to capture the energy that surrounds us through the use of innovative building materials. We believe that the future of energy is localised generation – energy generated where it is needed.
- ❑ We are driven by green building goals and believe that our technology can assist building owners and developers achieve their own green and sustainability goals - including Net Zero buildings and even carbon negative buildings in some cases.



# Corporate Snapshot



- ❑ ClearVue raised \$5m through an IPO and listed on the ASX on 25 May 2018
- ❑ Since listing, the Company's share price has ranged from a high of \$0.83 to a low of \$0.11.
- ❑ 39.9% of the Company shares are escrowed for 24 months (from IPO) being 39,026,956m shares in total
- ❑ Top 20 holding 60.5%

<b>ASX Code: CPV (as at 4 September 2019)</b>	
Ordinary Shares	97,730,300
Options	63,148,024
Performance Shares	13,000,000
<b>Market Cap (approx) (Share price \$0.20)</b>	<b>\$20 million</b>
Cash Balance (30 Jun 19)	<b>\$1,432,290</b>
Liquidity (12 months)	\$53,787,784

# Board and Management



<b>Victor Rosenberg</b>	<b>Jamie Lyford</b>	<b>Brett Tucker / Deborah Ho</b>	<b>Sean Rosenberg</b>	<b>Stuart Carmichael</b>	<b>Ivan Wu</b>
<b>Executive Chairman</b>	<b>General Counsel &amp; Corporate Officer / Director</b>	<b>Joint Company Secretaries</b>	<b>Non-Executive Director</b>	<b>Non-Executive Director</b>	<b>Non-Executive Director</b>
Serial Entrepreneur. Globally recognised for his contributions to glass industry. Extensive business experience in senior management and sales.	IP and licensing lawyer with over 20 years experience. Previously worked in BHP, IT company ATOS and ran Western Australian Government Innovation Centre	Company Secretaries to a number of ASX listed and private companies and has been involved in numerous public corporate transactions and acquisitions. Both are Chartered Accountants with a strong corporate and compliance background.	Member of the Institute of Chartered Accountants with over 10 years professional experience in finance, auditing and accounting of listed corporations	Member of the Institute of Chartered Accountants with over 20 years accounting and corporate finance experience. Currently Non-Executive of Swick Mining Services (ASX:SWK), Chairman of Schrole Limited (ASX:SCL) and Serpentine Limited (ASX:S3R) and Non-executive Director of De.mem Limited (ASX:DEM)	Corporate adviser to various private & ASX listed companies with over 20 years of corporate and commercial experience in the IT, resource and gas industries

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# Investment Highlights

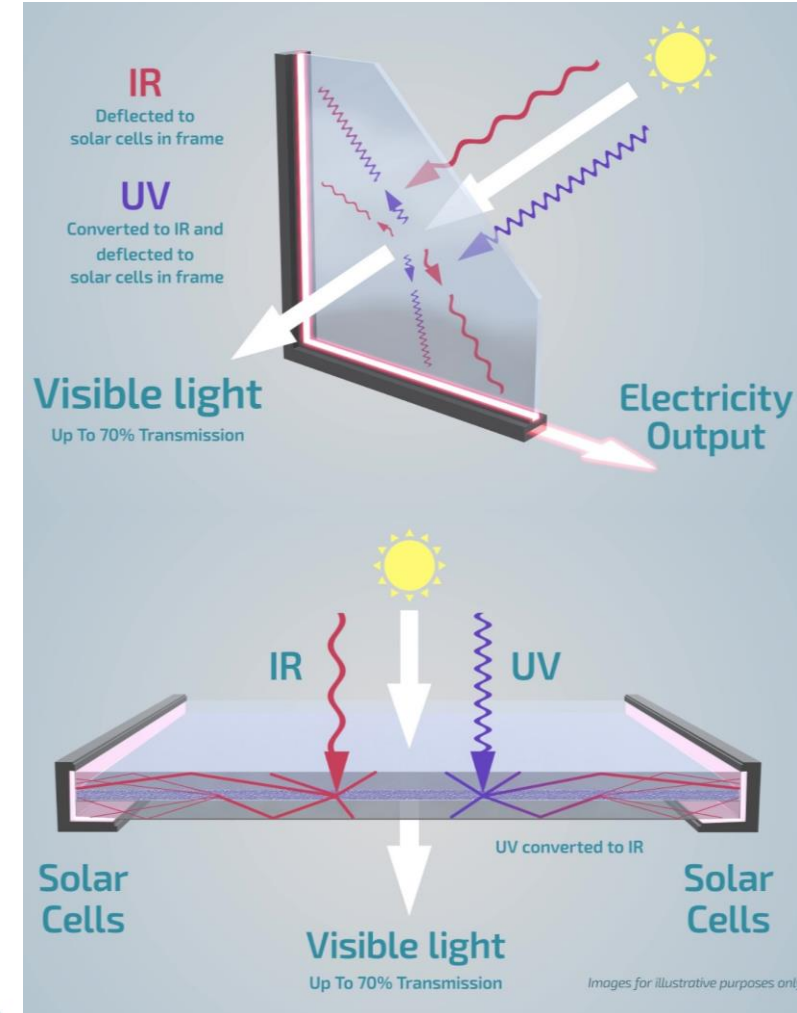


- ❑ Technology has been developed for over 8 years with over \$9m invested to date
- ❑ Smart building technology that uses ultra clear glass to convert sunlight into energy resulting in significant electricity, heating and cooling cost savings for users while preventing unwanted heat and solar radiation (UV and Infrared)
- ❑ Recently executed Consultancy Agreement with ARUP to further develop the Company's Smart Façade panel concepts
- ❑ Patented technology – **85 granted patents** and 40 patent applications throughout the World
- ❑ Australian Government support – \$1.6m grant from the Australian Federal Government to build a grid-independent greenhouse in 2019
- ❑ Manufacturing partner(s) ready for commercial sales. The product is clear and functional.

# ClearVue's Technology – An overview



- ❑ ClearVue's patented technology sits within an activated interlayer between two panes of glass.
- ❑ Visible light (VIS) passes through the glass
- ❑ Micro & nano particles interact with Ultraviolet (UV) radiation which is down-converted to longer wavelengths and scattered along with Infrared (IR) light to the edges of glass
- ❑ IR is collected by Photovoltaic (PV) cells - produces electricity
- ❑ Reduces heat and blocks damaging UV and IR radiation
- ❑ Insulation properties reduce heating and cooling costs
- ❑ ClearVue has extensive IP protection on its technology and products



# ClearVue's Product

**SCALABLE** - The ClearVue product is both scalable in size ( $\frac{1}{4}$ sqm,  $\frac{1}{2}$ sqm,  $\frac{3}{4}$ sqm, 1sqm, 1.2sqm, 1.4sqm already) - **moving up to 2.5sqm**; and scalable in terms of production and manufacturing (signing licensee manufacturers)

The ClearVue glass/window product is both **CLEAR** and **FUNCTIONAL**



Key Target Markets:	Key Specifications:
<ul style="list-style-type: none"> <li>❑ Agriculture and Horticulture</li> </ul>	<ul style="list-style-type: none"> <li>❑ <b>Ultra clear</b> - up to 70% transparency (VLT/AVT)</li> </ul>
<ul style="list-style-type: none"> <li>❑ Commercial and Residential</li> </ul>	<ul style="list-style-type: none"> <li>❑ <b>Power generating</b> - 30 W/m<sup>2</sup> peak power (anticipated <math>\approx</math> 50 W/m<sup>2</sup> possible through ongoing R&amp;D)</li> </ul>
<ul style="list-style-type: none"> <li>❑ Public Amenities</li> </ul>	<ul style="list-style-type: none"> <li>❑ <b>Insulating</b> - U-factor 1.26 W/(m<sup>2</sup> °K)</li> </ul>



# Commercial & Residential Applications



**large market opportunity** – at the moment demand for BIPV solutions is limited by product characteristics  
- no high energy performing and architecturally accepted transparent colourless products except from ClearVue:

- ❑ By 2025 there will be more than 29 mega cities with 10 million plus people\*
- ❑ Buildings can be a significant source of their own energy needs
- ❑ Insulation properties reduce heating and cooling costs
- ❑ Building owners obtain a faster payback from energy generating structures
- ❑ Skylights are the fastest new window market globally
- ❑ Emerging opportunities in mini-homes. Collaboration agreements for Sweden and Australia in place.

\* Source: UN Report on World Urbanisation & World Energy Outlook Report 2014



# Public Amenities & Agriculture



- ❑ Free energy in public places, e.g. libraries, or charge your mobile phone at a bus stop
- ❑ Provide energy in developing countries in public buildings such as schools without large plots of adjacent land needed for solar arrays
- ❑ Awnings, Atriums, Skylights, Road barriers
- ❑ Waste management services and water purification
- ❑ Powering IoT sensors and building electronics
- ❑ Food and food security is a global multi billion dollar industry. Key markets are China, Europe and USA.
- ❑ Technology presents opportunity for self powering greenhouses



# Case Study – Shopping Centre at Warwick Grove WA

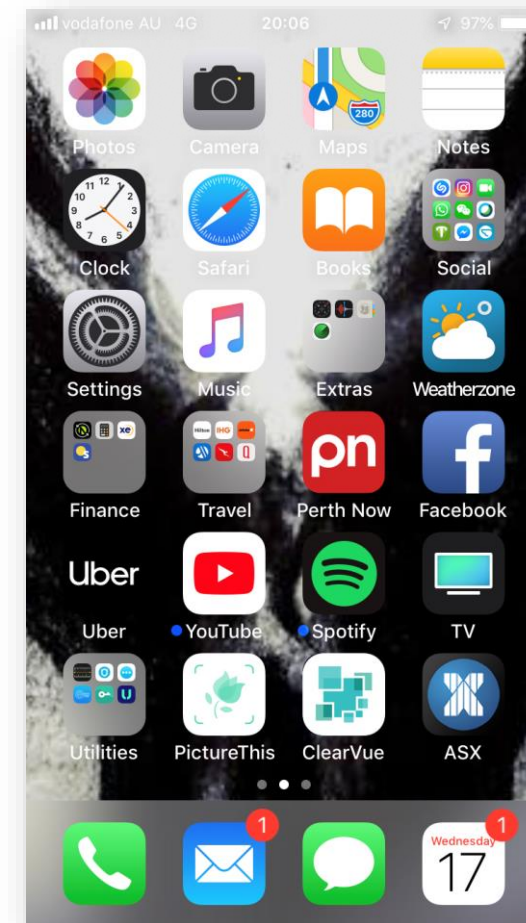


- ❑ ClearVue has successfully deployed its technology at the Warwick Grove Shopping Centre in Western Australia.
- ❑ The atrium entry glass includes 18 of ClearVue PV's triple-glazed, low-e, power-generating IGU panels.
- ❑ The PV glass charges a battery for energy storage and is providing power for lighting and outside signage.
- ❑ Live power being generated is being publicly displayed on site inside the centre and provides management an insight into energy management and cost savings.



# Smart Window Solutions

(Monitoring, sensors/sensing and IoT integrations)

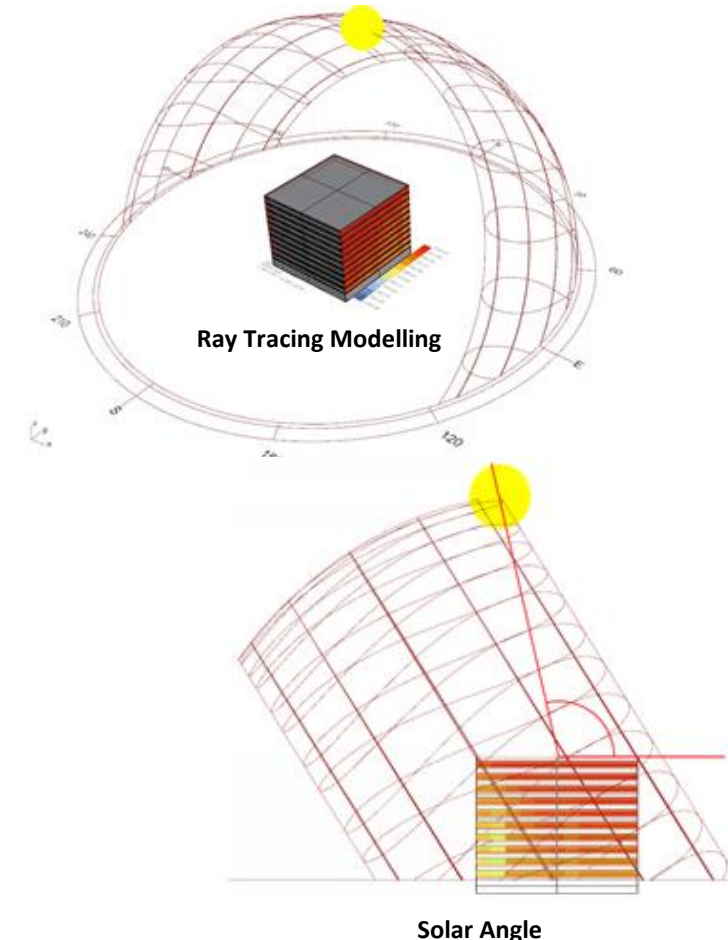


Photographs of actual Apps developed for ClearVue with IoT partner IoTStream ([www.iodstream.io](http://www.iodstream.io))

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# Size of the Market & Opportunity

- ❑ ARUP modelling for a 10-floor building (25,000 sqm) equates to approx. 3,150 sqm of ClearVue product (see [ASX Announcement - Technical Update 28/03/2019](#))(1).
- ❑ The ClearVue target market represents in excess of 2,155,000,000 sqm(2) of glass per annum (total market size 5,500,000,000+ sqm of glass per annum).



1. <https://www.asx.com.au/asxpdf/20190328/pdf/443v6jr2zhbvm7.pdf>

2. Source: [https://www.nsg.com/~media/NSG/Site%20Content/Temporary%20Downloads/Japanese/NSGFGI\\_2011%20EN2.ashx](https://www.nsg.com/~media/NSG/Site%20Content/Temporary%20Downloads/Japanese/NSGFGI_2011%20EN2.ashx)

3. ClearVue does not represent that it will be able to obtain such market share or that such revenue can be achieved. See Disclaimer Slide Page 2.

# ClearVue's Research Partners



## Edith Cowan University

ClearVue has partnered with Edith Cowan University (ECU) in Perth Western Australia since 2011 to develop the core IP that can convert a pane of glass into a luminescent solar concentrator (LSC). ClearVue has entered into an exclusive agreement for contracted R&D for the development of ClearVue's core technologies.

ECU is also working on a new research project to develop all-inorganic micropatterned clear thin film solar cells onto glass which we hope to integrate into the exiting products and as a new stand alone technology.



## Nanyang Technological University

ClearVue has signed a collaboration agreement for with Nanyang Technology University (NTU) (Singapore) and Singapore HUI Alliance for Research and Enterprise Ltd research to explore printing of solar PV amongst other things.



## University of New South Wales



ClearVue has signed a Research Agreement with the World renowned UNSW School of Photovoltaic and Renewable Energy Engineering to explore the use of quantum dots in combination with ClearVue's existing LSC technology or as a stand-alone for new applications.

# Product Pipeline

- ❑ In conjunction with ARUP, ClearVue are developing a number of new products to broaden the Company's product offering and drive further growth.
- ❑ The Company is working closely with its partners and potential customers to assess market demand for new products.
- ❑ In particular, the Company are developing a range of 'smart façade' solutions which integrate ClearVue's proprietary solar technology with smart systems such as automatic blinds, electrochromic window tinting and open and closing functionality.

*This self-powering automatic casement window can be **retrofit into existing buildings.***

*It will learn the optimum **temperature and airflow** requirements of the building occupants.*

*The window will **automatically open and close** to optimise building temperature and airflow. The **rain sensor** allows the window to close in wet weather.*



**AUTOMATICALLY  
OPENS & CLOSES WITH  
CHANGING WEATHER**



*This smart façade uses an **automated blind** to regulate building **temperature and lighting** comfort.*

*The blind operates within a **closed cavity** and is powered by a small motor that activates in response to outdoor solar conditions and the requirements of the building occupants.*

*Our ClearVue PV panel makes the system fully **self-powered**, removing the need for cabling to the façade.*

*These smart facades utilise **electrochromic technology.** This enables our glass to automatically tint and therefore adjust building **temperature and lighting** comfort.*

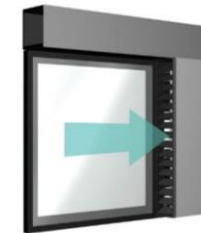
*The panels can be **retrofit** into existing buildings with **no need for cables**, as they are completely self-powering.*

*Light sensors and learning algorithms give these windows intelligence to **optimise occupant health and wellbeing.***



**WINDOWS AUTOMATICALLY  
TINT TO ADAPT TO LIGHTING  
CONDITIONS**

**EXTERIOR  
FRESH AIR  
ENTERS VENTS**



*This intelligent panel incorporates **natural ventilation** with an **automatic motorized damper**, enabling optimized control of a building's ventilation.*

*The interior of the façade is embedded with a **CO<sub>2</sub> sensor**, while the exterior contains a **rain sensor.***

**INTERIOR  
AIR FLOW  
REGULATED  
BY DAMPER**



*This system allows for **automatic night flush**, and has the added benefit of **acoustic damping.***

# Potential Projects

## Savings

- Using humidity sensors and fans powered by localised PV to ventilate a wall cavity eliminates the need for secondary humidity pipe work.
- Using PV to charge a battery for blind motors or electrochromic switchable glass eliminates the need for electrical wiring to the window / façade panel for the blind motors etc. **This has potential to save up to \$1000 per façade panel.**
- Using sensors to monitor CO<sub>2</sub> and control ventilation at the window ensures rooms receive fresh air without the need to provide fresh air ducting work to A/C units. **Again significant potential savings.**

200 George Street

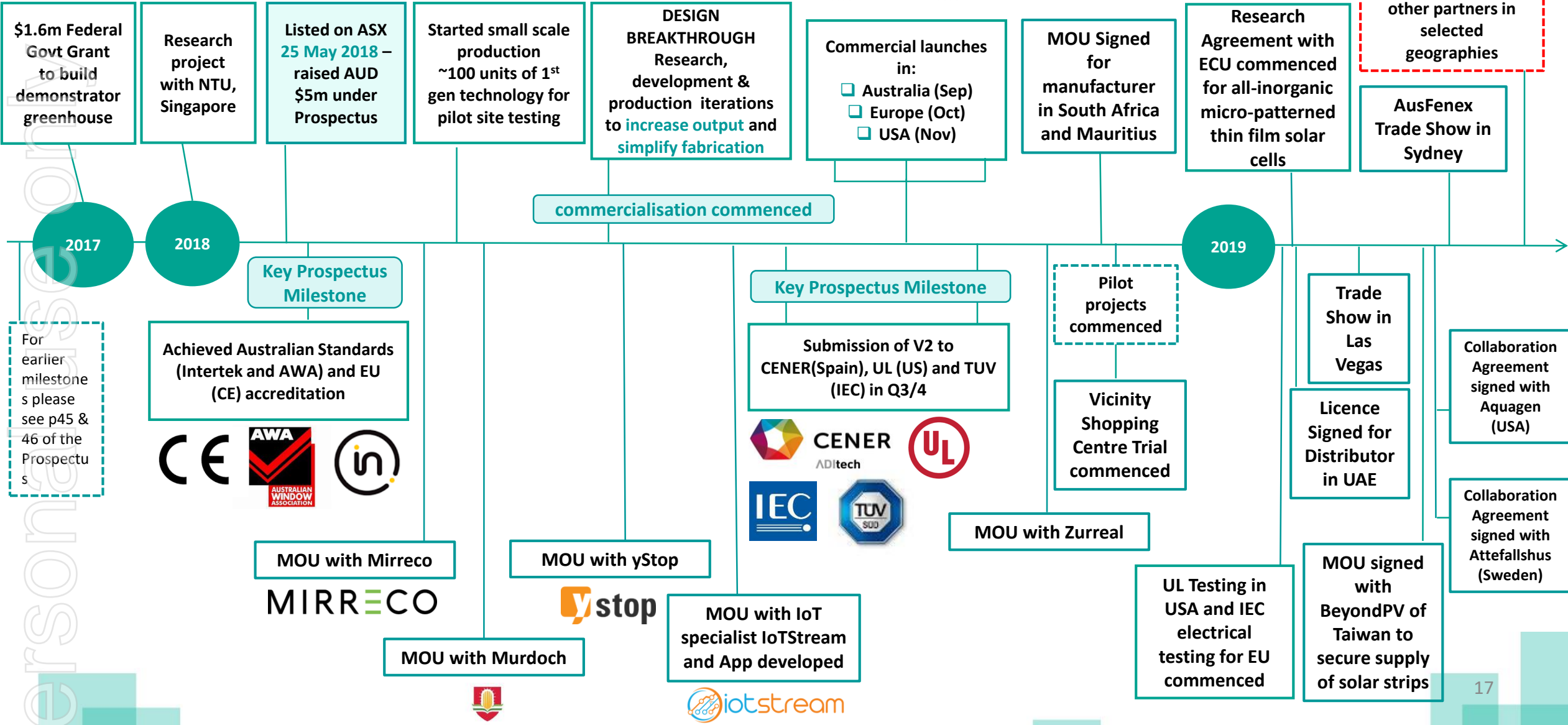




# Company Milestones



Currently targeting customers, licensee manufacturers and distributors and other partners in selected geographies



For earlier milestones please see p45 & 46 of the Prospectus

# Latest Update and Milestones

## Singapore Marketing Office

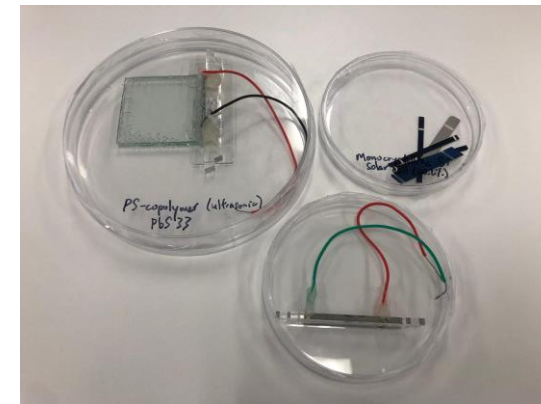
- ❑ ClearVue has established ClearVue Asia Pte Ltd in Singapore as its wholly owned South East Asian marketing office
- ❑ ClearVue Asia has signed a Collaboration Agreement with CSME Power Systems – leading electrical installation engineers in Singapore (for more info. see [ASX Announcement 2 September 2019](#))(1).
- ❑ ClearVue Asia has signed an MOU with Seiko Architectural Wall Systems Pte Ltd (**Seiko Wall**) in Singapore to negotiate and formalise a licence for Seiko Wall to become the *exclusive* licensed manufacturer and *sole* distributor of ClearVue's technology and products for the territories of Singapore and Malaysia. Seiko Wall has been in business for over 40 years supplying building façade products to Singapore, Hong Kong, Taiwan, Malaysia, Japan, the USA and Canada.

## UNSW - Quantum Dots (QD) Research Program

- ❑ QD research is progressing well with early POC small-scale prototypes demonstrating that completely clear inorganic quantum dots could be a viable option for inclusion into ClearVue's technology mix and included into its activated interlayer. Market to be updated as research progresses and prototyping sizes are increased.



Glasstec – Oct 2018 Dusseldorf



1. <https://www.asx.com.au/asxpdf/20190902/pdf/44842hjlppddjsq.pdf>

# Target Milestones

- ❑ Complete various demonstration projects
- ❑ Incorporate ClearVue's technology into a commercial building
- ❑ Complete and achieve IEC and UL accreditations by Q4 2019 calendar year
- ❑ Continue and complete commercialisation steps during 2019
- ❑ Continue discussions throughout 2019 with potential licensees
- ❑ Continue R&D and product development work including working with Arup on Smart Façade modules
- ❑ On track for early sales commencing latter half of 2019, early 2020
- ❑ Currently targeting customers, licensee manufacturers and distributors and other partners in selected geographies- Ready for sales



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