



ASX Release | ClearVue Technologies Limited (ASX: CPV)

**Market Update: US Certification, Greenhouse, Mini-Home, PV Module Sizes**

**Highlights:**

- Update on UL and IEC certification testing progress for US and EU
- Scientific Validation of the ClearVue Technology at Warwick Grove trial confirmed via scientific study published through high-impact peer-reviewed publication
- Update on work with BeyondPV – new solar module sizes expand IGU panels to greater than 45 sizes from 3 solar PV strip lengths
- Update on Mirreco Hemp-based mini-home project
- Update on CRC-P supported greenhouse project at Murdoch University

**30 September 2019:** Smart building materials company ClearVue Technologies Limited (ASX:CPV) ("**ClearVue**" or "**the Company**") is pleased to provide the following market update on various of its projects and activities:

**UNDERWRITERS LABORATORIES (UL) AND INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC) TESTING PROGRESS**

Further to the Company's earlier announcements<sup>1</sup> UL and IEC testing have been progressing well over the last few months. The UL and IEC's testing programs have taken longer than initially anticipated as the testing protocols had to be specifically designed and agreed by UL and ClearVue for the ClearVue product as a *first-of-kind* product incorporating both solar photovoltaic elements within glass modules.

The testing protocols that were ultimately agreed upon have been broken down to testing either or both of the whole complete IGU (UL and IEC) and testing the individual solar PV strips used within an IGU but tested outside of the IGU (UL only). UL and IEC have both been testing against standardized IEC tests 61730:2016 (61730-1 and 61730-2) (UL also uses the now globally harmonized IEC test) which includes the testing sequence intended to verify the safety of the PV modules inside and outside of the IGU modules.

The test sequences and pass criteria for the testing are designed to detect the potential breakdown of internal and external components of PV modules that would result in fire, electric shock, and/or personal injury. The standard defines the basic safety test requirements and additional tests that are a function of the PV module end-use applications.

<sup>1</sup> <https://www.asx.com.au/asxpdf/20180820/pdf/43xgppvw6182f9q.pdf> and <https://www.asx.com.au/asxpdf/20181130/pdf/440ttvyrvf9thf.pdf>







Test categories include general inspection, electrical shock hazard, fire hazard, mechanical stress, and environmental stress.

The UL testing for the ClearVue products (both the complete IGU and the solar PV strips) comprises 9 main categories of testing. Each category has between 1 and 8 sub-tests before testing is completed for that category. A number of the categories are now completed. Other categories are typically greater than 70% of the way through the lists of sub-tests with the balance under way. It is now expected that testing for the products will complete during late October or early November 2019.

The IEC testing for ClearVue products (the complete IGU only) comprises 8 main categories of testing. Again, each category has between 1 and 8 sub-tests before testing is completed for that category. A number of the categories are now completed. Other categories are typically greater than 60% of the way through the list of sub-tests with the balance under way with the last scheduled product test to commence on or before 23 November 2019 with completion expected by the end of November 2019.

The final aspect of testing for both UL and IEC before certification can be issued is manufacturing testing and observation at ClearVue’s OEM manufacturer premises – the testing here being to ensure standardized quality product manufacturing processes are employed. ClearVue is working with its manufacturers and suppliers to ensure readiness for this next step. The Company looks forward to keeping the market updated on UL and IEC certifications in the coming months.



			<b>Model: STP40W-M40C-D001</b>	PV module maximum power ( $P_{max}$ )	40W	Maximum power current ( $I_{mp}$ )	0.77A	Maximum system voltage	150V	 <b>ClearVuePV</b> ClearVue Technologies Ltd 16 Ord Street West Perth WA 6005, Australia Tel: +61 8 92482 0500 (Registered Office) www.clearvuepv.com
			Power tolerance	±5%	Voc & Isc tolerance	±5%	Maximum overcurrent protection rating	4A		
			Open circuit voltage ( $V_{oc}$ )	61.5V	Weight	72kg	Protection Class	II		
			Short circuit current ( $I_{sc}$ )	0.835A	Dimensions	1200mm x 1200mm	Maximum Design Loading	2400Pa(TBC)		
			Maximum power voltage ( $V_{mp}$ )	51.5V						
					STC AM = 1.5	E=1000W/m <sup>2</sup>	Tc = 25°C	<b>MADE IN CHINA</b>		

ClearVue certification label examples as pre-approved by both UL and TUV SUD to be used on the final CPV UL certified products.

## CLEARVUE TECHNOLOGY & WARWICK GROVE SHOPPING CENTRE TRIAL VALIDATED THROUGH SCIENTIFIC STUDY PUBLISHED IN HIGH-IMPACT GLOBALLY DISTRIBUTED JOURNAL

Further to the Company's updates on the progress of the trial at the Warwick Grove Shopping Centre<sup>2</sup> the Company is pleased to confirm completion of a technical / scientific study carried out by Edith Cowan University researchers based on data collected and analyzed from the trial site.

The study has formed the basis for a peer-reviewed scientific journal article published in globally distributed journal *Applied Sciences* (Appl. Sci. 2019, 9(19), 4002) on 24 September 2019. The full article is located at, and can be downloaded from<sup>3</sup>: [https://www.mdpi.com/2076-3417/9/19/4002#stats\\_id](https://www.mdpi.com/2076-3417/9/19/4002#stats_id)

The study, as summarised in the paper is focused on photovoltaic performance characteristics such as the electric power output, specific yield, day-to-day consistency of peak output power, and the amounts of energy generated and stored daily. The dependencies of the generated electric power and stored energy on multiple environmental and geometric parameters are also studied. The article also provides an overview of the current and future application potential of high-transparency, visually clear solar window-based curtain wall installations suitable for practical building integration.

The article begins by examining the large emerging market opportunity observing, amongst other things, that the global building integrated photovoltaics (BIPV) market is likely to expand from USD 6.7 billion to USD 32.2 billion by 2024, witnessing a compound annual growth rate (CAGR) of 23.4% over the forecast period.<sup>4</sup>

The article concludes with the following remarks around the ClearVue PV product as installed at the Warwick Grove Shopping Centre:

*"... The results reported elucidate the practical application potential of the described type of solar window products in various public infrastructure and commercial property-based applications. In particular, a small-scale (18 windows, with none installed at optimum orientation) solar window microgrid generated about 1 kWh of stored electric energy per 11 MJ/m<sup>2</sup> of land-area cumulative solar exposure, as measured by a local weather station, in variable weather conditions. Each vertically-placed, north-facing window unit of area near 1.3 m<sup>2</sup> harvested approximately 0.1 kWh on each sunny winter day of total sunshine duration ~6–7 h. It can be expected that multiple new commercial and residential building-based installations of the latest transparent BIPV products and technologies will continue to be constructed and trialed, broadening the acceptance of transparent energy-generating construction materials."*

<sup>2</sup> <https://www.asx.com.au/asxpdf/20190130/pdf/442512jc5p01tq.pdf>,  
<https://www.asx.com.au/asxpdf/20190328/pdf/443v6jr2zhbvm7.pdf>,  
<https://www.asx.com.au/asxpdf/20190510/pdf/44507ymw7ykh3.pdf>

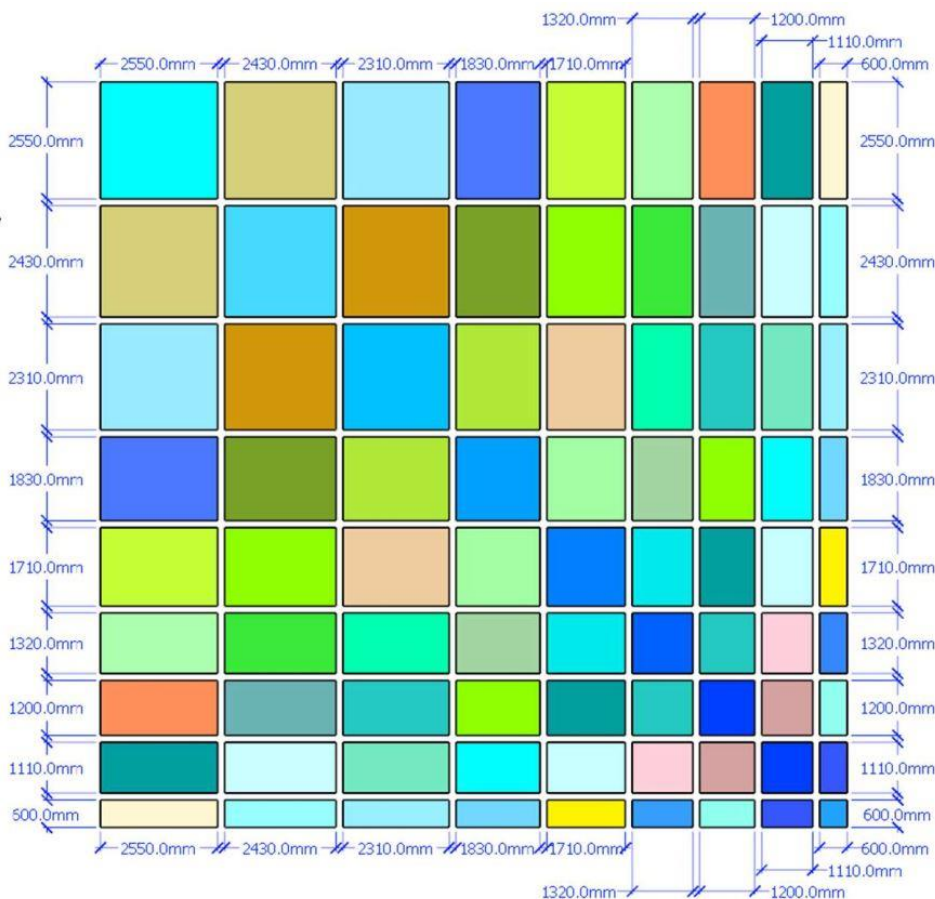
<sup>3</sup> <https://doi.org/10.3390/app9194002>

<sup>4</sup> Global Building Integrated Photovoltaics (BIPV) Market to Witness a CAGR of 23.4% during 2018–2024. Available online: <https://www.bloomberg.com/press-releases/2019-04-25/global-building-integrated-photovoltaics-bipv-market-to-witness-a-cagr-of-23-4-during-2018-2024> .

### UPDATE ON WORKS WITH BEYONDPV – NEW SIZE RANGE OF SOLAR PV MODULES

Since announcing the signing of the MOU with BeyondPV of Taiwan in mid-July 2019<sup>5</sup> ClearVue has been working with BeyondPV on developing a range of solar PV strip modules to maximise size options for use in ClearVue’s glass IGU’s whilst at the same time minimizing costs of production by maximizing the usable area and utilization rates of silicon wafers and the considered design of PCBs used in the PV strip modules.

ClearVue is pleased to report that BeyondPV has now optimized the form factor of ClearVue’s PV solar strip modules to 3 different strip lengths which when combined in different ways (and with the addition of connectors) can create varying IGU panel side lengths of between 600mm up to 2550mm and provide for more than 45 different IGU panel size combinations catering for a majority of window use-cases and applications.



Size matrix of possible IGU designs based on 3 new strip sizes.

In relation to ClearVue signing a formal OEM Supply Agreement with BeyondPV this is progressing with the expectation that this will be signed in coming weeks. The Company looks forward to updating the market on this in due course.

<sup>5</sup> <https://www.asx.com.au/asxpdf/20190715/pdf/446m0ht1vtcxqs.pdf>

## MIRRECO HEMP-BASED MINI HOME PROJECT

Further to ClearVue's announcement of 7 June 2018<sup>6</sup> ClearVue has been working together with Mirreco towards development of Mirreco's first demonstration hemp-based eco mini-home - now branded as 'Project Lumecast'<sup>®</sup> (**Project Lumecast<sup>®</sup>**). Whilst progress has been slow - largely due to delays in securing a suitable site for the project, the Mirreco team lead by CEO Richard Evans have now been successful in securing a site in Development WA's<sup>7</sup> new world leading eco-village development located at Knutsford Street, near Fremantle in Western Australia.

The siting of the project is a significant coup for the Mirreco team, and by extension ClearVue, as the hemp-based mini home is to be sited at Lot 28 at 1819 East Village in the Knutsford project.

East Village at Knutsford is being developed by Development WA (the Western Australian Government's land and development agency).<sup>8</sup>

In an Australian first, East Village will deploy a village micro-grid using PowerLedger's blockchain technology that will allow residents to generate and share energy with their neighbours using an innovative energy trading platform. The whole development zone's renewable energy features and solar passive design is expected to cut household energy costs in half with the area intended to become a world-class example of sustainable urban development. In addition to the renewable energy technology, every home will be equipped for electric vehicle chargers and there will also be a shared fast EV charging station for residents and guests.

The Lumecast<sup>®</sup> hemp 'Carbon Architecture' mini-home (<https://mirreco.com/carbon-architecture/>) will showcase ClearVue's PV power generating glazing and Mirreco's world leading CAST<sup>®</sup> Carbon Asset Storage Technology (<https://mirreco.com/technology/cast-polymer-chains/>) and will form part of a larger sustainable housing demonstration zone on a 1.5 hectare former industrial site on Montreal Street in Fremantle, Western Australia as launched earlier this year by Western Australian Lands Minister Ben Wyatt.

The 36 homes to be constructed in the project will be powered by 100 per cent renewable energy using roof top solar panels and a shared community battery operated through the Power Ledger blockchain and supported where necessary with green energy from the grid. The Mirreco/ClearVue mini-home along with Curtin University's Legacy Living Lab will be connected to the battery but are not included in the 36 homes/sites that will be for sale in the East Village zone.

In a similar manner to Mirreco's Lumecast<sup>®</sup> prototype mini-home, the Legacy Living Laboratory, will display live data from the whole project zone as well as being used as a study space for Curtin University students and a housing prototype to demonstrate alternative building materials.

The Power Ledger energy trading platform and battery will be integrated with the Mirreco Lumecast<sup>®</sup> prototype mini-home's array of ClearVue PV glazing panels deployed into the mini home as its main glazing areas as well onto an adjacent carport. In the case of the Lumecast<sup>®</sup> mini-home itself, it is expected that this will deploy 6 of the larger format panels at 2500mm high x 1200mm wide panels with a 6 further smaller 600mm high x 1200mm wide highlight windows to create a 3.1m x 7.2m façade area. On the carport it is expected that the carport roof

<sup>6</sup> <https://www.asx.com.au/asxpdf/20180607/pdf/43vm15s2ss887f.pdf>

<sup>7</sup> DevelopmentWA combines the former Landcorp and Metropolitan Redevelopment Authority.

<sup>8</sup> <http://www.landcorp.com.au/eastvillage>

will deploy 21 of 1200mm x 1000mm panels and will have a side wall deploying a further 21 panels of the same size.

In relation to timing of the Mirreco/ClearVue project:

- Mirreco is currently setting up for 'off-site' fabrication for production of the CAST<sup>®</sup> panels and assembly of the Lumecast<sup>®</sup> prototype mini-home in a facility provided by the Dept of Primary Industries and Regional Development WA (**DPIRD**), before being prepared for delivery and 'on-site' assembly. Off-site fabrication and construction is expected to take 4 weeks and be concluded by the end of 2019.
- The Lumecast<sup>®</sup> mini-home is then expected to be delivered to site in early 2020 for final assembly with the ClearVue PV glazing.



*Cleared and prepared site at Knutsford East Village.*



*Power Ledger shared battery module installed at site.*



*Site showing community EV charging station adjacent site where the Mirreco/ClearVue demonstration mini-home and Curtin Legacy Living Lab are to be constructed.*



*Digital renderings of the proposed Mirreco Lumecast mini-home with ClearVue glazing.*

### **CRC-P GRANT SUPPORTED GREENHOUSE AT MURDOCH UNIVERSITY**

Further to the Company's Prospectus and subsequent announcements about the CRC-P grant supported greenhouse<sup>9</sup> the Company is pleased to advise that progress is being made such that Murdoch has allocated ClearVue a site onto which the ClearVue CRC-P greenhouse will be constructed (shown in yellow on the site plan shown below) and after long delays, mostly due to environmental approvals required for the site, development approval has now been granted and that site works have recently been commenced by Spyda, Murdoch University's approved site works contractor.

ClearVue and Murdoch are currently negotiating the terms of a lease and associated documents that expand upon the terms outlined in the Memorandum of Understanding announced on 30 August 2018.

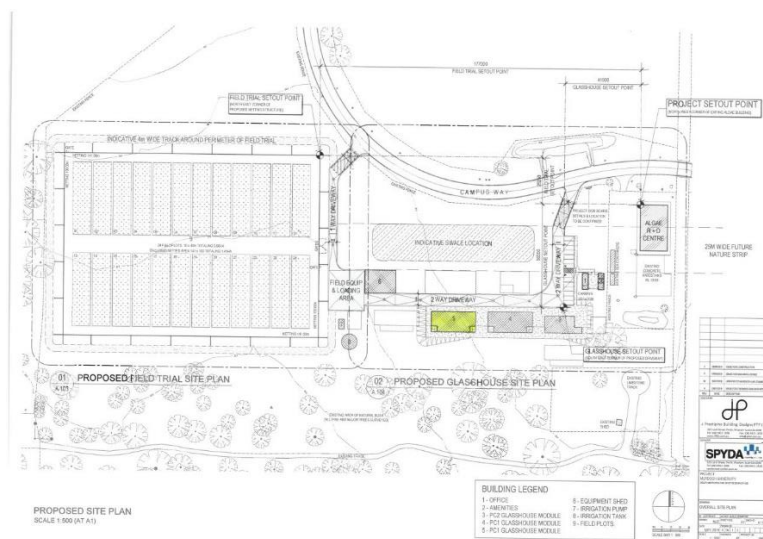
<sup>9</sup> <https://www.asx.com.au/asxpdf/20180830/pdf/43xvj2j3kcwng6.pdf>

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In the meantime, the Company is currently revising its greenhouse plans and structural drawings so as to be suitable for submission to Melville City Council with a view to obtaining a building licence and is also preparing to place an order for glazing the greenhouse with the ClearVue PV panels to ensure delivery in coming months. The company looks forward to updating the market once construction commences.



Site preparations at Murdoch University for new greenhouses, including the ClearVue CRC-P supported greenhouse.



Site Plan at Murdoch University for ClearVue greenhouse highlighted in yellow.



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**About ClearVue Technologies Limited**

ClearVue Technologies Limited (ASX: CPV) is an Australian technology company that operates in the Building Integrated Photovoltaic (BPIV) sector which involves the integration of solar technology into building surfaces, specifically glass and building façades, to provide renewable energy. ClearVue has developed advanced glass technology that aims to preserve glass transparency to maintain building aesthetics whilst generating electricity.

Solar PV cells are incorporated around the edges of an Insulated Glass Unit (IGU) used in windows and the lamination interlayer between the glass in the IGU incorporates ClearVue's patented proprietary nano and micro particles, as well as its spectrally selective coating on the rear external surface of the IGU.

ClearVue's window technology has application for use in the building and construction and agricultural industries (amongst others).

ClearVue has worked closely with leading experts from the Electron Science Research Institute, Edith Cowan University (ECU) in Perth, Western Australia to develop the technology.

To learn more please visit: [www.clearvuepv.com](http://www.clearvuepv.com)

**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 ClearVue Technologies Limited, 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. Actual results and developments may differ materially from those expressed or implied by these forward-looking statements depending on a variety of factors.