



Shareholder Update – Coldry Pilot Plant Upgrades

Friday 21 July 2017: Environmental Clean Technologies Limited (ASX: ESI) (ECT or Company) is pleased to provide the following update on completion and commissioning of its Stage 2 upgrades to the High-Volume Test Facility at Bacchus Marsh, Victoria.



Figure 1 Aerial view of Coldry Pilot Plant (High-Volume Test Facility) just prior to completion of upgrades

Outline:

- Stage 2 Upgrades completed
- Commissioning program completed
- Research and Development (R&D) program supply contract underway.

Stage 2 Upgrades Completed

The Company has recently completed an extensive round of infrastructure upgrades at our Bacchus Marsh High Volume Test Facility (HVTF), providing significantly enhanced R&D and commercialisation capacity.

ECT Chief Operating Officer Jim Blackburn commented “The Stage 2 Upgrades to our High-Volume Test Facility have focused on improving our continuous R&D operations ability, whilst also setting up apparatus at larger scale from which we can draw important data for our proposed future commercialisation projects”

The broad objectives of the Stage 2 upgrades included:

- Increased raw material storage and handling capacity (Coldry & Matmor)
 - These upgrades included the installation of a large ‘all shelter’ structure (figure 2) to house more than 100 tonnes of raw lignite for supply into both the Coldry and Matmor processes.

Figure 2 New 'All-shelter' covering the in-ground raw coal bunker



- Further enhancements for material handling were achieved with the acquisition of a Claas Telehandler (figure 3) together with 5 conveyor belt replacements and conveyor motor upgrades.
- Improved product flow-through design (Coldry & Matmor)
 - A bottleneck analysis was conducted on the existing primary processing train which resulted in key process limitations being rectified such as conveyor speed matching and variable speed drive coupling to existing power plants.
 - Programmable Logic Controller (PLC) system control enhancements and integration points across the plant.
- Greater stability in simulated waste heat supply (Coldry & Matmor)
 - The previous gas-fired heat source has now been replaced with a 4 MW (thermal) mixed fuel boiler system (figure 6). New foundation works and fuel supply system were installed to increase the upper threshold temperatures that can now be simulated across the Conditioning Belt and Packed Bed Dryer systems.
 - Further improvements to the duct work and fan systems which drive the Packed Bed Dryer were implemented to take advantage of the additional heat capacity within the system.
- Upgrades to test equipment at both lab scale and test scale (Coldry & Matmor)



Figure 3 Claas Telehandler



Figure 4 Control system interface



Figure 5 New electrical and control systems



Figure 4 4MW (Thermal) mixed fuel boiler system - delivers waste heat simulation capabilities for R&D test programs

- ECT continues to focus on a parallel R&D program structure across increasing scale operations of both its Coldry and Matmor programs. With data collected at lab scale, test scale, pilot scale and (we anticipate) soon, demonstration scale, we ensure that wherever possible we are measuring and mitigating scale up risk ahead of our commercialisation programs.
- Recent stage 2 upgrades have included:
 - Gas monitoring equipment adaptations to both Matmor lab and test scale apparatus
 - Development of Hydrogen gas sampling protocols for the ECT COHGen¹ project
 - Additional moisture analysis units added to existing on-site sample analysis capacity
 - Significant upgrades to the Matmor test retort for enhanced gas flow and recharge performance
- Safety and security upgrades (Coldry & Matmor)
 - Site-wide CCTV system implemented providing for greater process control during 24-hour operations together with enhanced security over the broader site.
 - With the introduction of 24/7 operations, a 'man down' alarm system has been installed to ensure all site personnel are protected in the event of an incident.
 - ECT has also met with CFA representatives to review improved signage and firefighting system management across the broader 'JBD Industrial Park' site (where our plant is located) upgrades.
 - As part of its overall commitment to safety, ECT conducted a series of internal safety audits which resulted in a number of minor but necessary safety improvements across the site including enhanced lighting and signage and a new anti-slip floor surfacing (below, left).



Figure 5 New anti-slip floor coating



Figure 8 CCTV system - camera overlooking remote plant area



Figure 9 Safety signage updated

- New Hopper and Conveyor outfeed systems and integrated logistics (Coldry)
 - Installation of a 70-tonne outfeed Hopper completed which, together with new pneumatic slide gates provides the capacity to load a 22-tonne single tipper truck in under 5 minutes.
 - The Hopper is fed by a 45-metre inclined conveyor which in turn is supplied by an upgraded discharge system at the base of the Packed Bed Dryer.
 - This system, combined with other flow-through enhancements should allow the plant to deliver at a rate of ~15,000 tonne per annum
 - First transport and logistics agreement implemented to supply a 3-month R&D trial in Southwestern Victoria. Through this process, the Company will continue to develop its capabilities, together with our strategic partners and industry groups ahead of the anticipated increase in R&D product supply to the solid fuel market

¹ COHGen – Catalytic Organic Hydrogen Generation (see announcement 12 July 2017)



Figure 10 New outfeed incline conveyor, overlooking boiler system and packed bed dryer building



Figure 11 New outfeed hopper capable of storing 70 tonnes finished product and loading a truck in 5 minutes.

With all Stage 2 upgrades completed, a commissioning program has tested the operational range of the new integrated system. With several upgrades focused on continuous operations, the commissioning program was conducted over a period of 24/7 plant operations.

Jim Blackburn remarked on the process, “Given the research and development nature of these activities, we anticipated a certain level of troubleshooting would be required to achieve the desired steady-state operations. A number of system performance issues were identified within the first 48 hours of the commissioning program which resulted in a range of remediation works”. These issues and remediation works included:

- Heat losses from the upgraded boiler delivery system were resolved by additional pipe replacements and insulation works around the Conditioning Belt system
- Boiler performance improvements through optimisation of combustion fuel atomisation
- Identification and sealing of air flow leakages
- Identification of coal dust accumulation points for enhanced dust management as part of the next upgrade program.

With the exception of additional dust extraction devices, the remediation works were promptly completed and the commissioning program was back on line, achieving a two-week period of continuous operations.

R&D program supply contract underway

With the commissioning program completed, and the Packed Bed Dryer full, bulk deliveries of Coldry product have commenced in July to supply a 3-month R&D trial underway in Southwestern Victoria.

Blackburn added “Whilst the upgrades have proven successful in achieving our broad objective of enhanced capacity, the process of planning, managing and implementing these upgrades has also coincided with additional staff resources appointed at the Company’s R&D Facility in Bacchus Marsh to operate the upgraded plant. It is the combination of both the physical, mechanical infrastructure with the new, skilled human resources that provide us with the greatest leverage for our future commercialisation pathway to India, Latrobe Valley and beyond.”

“The change in scale, extended production cycles and continuous data acquisition would not have been achieved without a dedicated team at the plant, led by our Coldry Chief Engineer and Plant Manager Warrick Boyle.

“Warrick and his operations team have committed a great deal of time and effort to the project. We have all learned a great deal which will benefit our R&D program, commercialisation objectives and strategic planning for additional development sites,” Blackburn said.

“Having now had the opportunity to review the completed works, the improved capacity has also come with the clear responsibility to ensure it is fully utilised. As such, we are pleased to confirm that both the Coldry and Matmor research programs have undergone a review of their respective test variable matrices and applied methods and will soon be re-commenced, at pace, to continue to fuel our data collection and design development basis.”

The company looks forward to providing additional information and updates on activities at the Bacchus Marsh High-Volume Test Facility as our program continues.

For further information:

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About ECT

ECT is in the business of commercialising leading-edge energy and resource technologies, which are capable of delivering financial and environmental benefits.

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

ECT’s business plan is to pragmatically commercialise these technologies and secure sustainable, profitable income streams through licencing and other commercial mechanisms.

About Coldry

When applied to lignite and some sub-bituminous coals, the Coldry beneficiation process produces a black coal equivalent (BCE) in the form of pellets. Coldry pellets have equal or superior energy value to many black coals and produce lower CO₂ emissions than raw lignite.

About MATMOR

The MATMOR process has the potential to revolutionise primary iron making.

MATMOR is a simple, low cost, low emission, production technology, utilising the patented MATMOR retort, which enables the use of cheaper feedstocks to produce primary iron.

About the India R&D Project

The India project is aimed at advancing the Company’s Coldry and Matmor technologies to demonstration and pilot scale, respectively, on the path to commercial deployment.

ECT have partnered with NLC India Limited and NMDC Limited to jointly fund and execute the project.

NLC India Limited is India’s national lignite authority, largest lignite miner and largest lignite-based electricity generator.

NMDC Limited is India’s national iron ore authority.