



29 October 2019

ASX:14D

QUARTERLY SHAREHOLDER UPDATE

- First operating results of GAS-TESS confirmed efficient biogas burning. Modifications underway to increase electrical output
- Data for business case to replace Glenelg engines to be provided to SA Water by end 2019
- Potential for early revenues from sale and trading of energy to facilitate TESS rollout
- Scalable silicon storage technology under development with promising early results
- Engineering reorganised to scale up silicon thermal storage technology and focus on efficiency
- \$7.7m cash at end quarter to be boosted by a substantial R&D rebate in November

1414 Degrees Limited (ASX:14D) is pleased to provide its September 2019 quarterly update.

Finance

The Company's cash balance remains strong because monthly outgoings have decreased following the commissioning of the GAS-TESS. Over \$1.5m has been advanced for a bespoke turbine, heat exchanger and storage components for the next TESS plant. Total assets are now more than \$17m. The \$7.7m cash balance at the end of the quarter is expected to be boosted with a substantial R&D rebate in November.

GAS-TESS operations

Following its successful commissioning, the GAS-TESS has been undergoing performance testing by our engineering team while delivering heat to the biological digestors and electricity to the site. The team reported first operational results in the quarter, showing near target combustion efficiency in burning biogas. This means the GAS-TESS is effective for disposing of the waste gas and has competitive advantages over reciprocating gas engines because it burns at a higher temperature, makes very little noise and should have reduced maintenance costs because the gas does not need pre-treatment.

The engineering team are now modifying the prototype GAS-TESS to increase heat flow so the turbine operates at its maximum efficiency for longer duration. The aim is to provide operational data by the end of December so SA Water can model the business case for the GAS-TESS compared to its current engines, and our engineers can start on the design of an enhanced production model.

In late October the device started operations under SA Water direction to test it in various scenarios, including integrating with the site solar PV and existing engines to contribute to SA Water's target of zero net electricity cost.

GAS-TESS taps a very large market

There is an immense potential value stream from the market for our GAS-TESS, one that is fortunately independent of the vagaries of the electricity market or uncertainties in new technologies. Recently we hosted a delegation of Singaporean wastewater engineers who requested to inspect the GAS-TESS and they confirmed what we have been told by water utilities in Australia and overseas - the available reciprocating gas engines are costly for burning corrosive biogas. To consume all of the biogas generated by the Glenelg site per day would require TESS units of between 4 or 12 times the capacity of the current unit, depending on how the TESS is operated. Translating this to the global market indicates tens of thousands of GAS-TESS would be needed to replace all existing engines, before considering the many sewerage plants that do not tap their potential energy resource.

Business development

The feasibility study for TESS integration into the Stone and Wood brewery is expected to be completed by the end of the year. The current indications are that a system to fully replace LPG will need between 50 and 100 MWh of storage, potentially making it a suitable site for the TESS-GRID test module as well as the first commercial pilot for an electrically charged TESS.

Your Company's analysts have been preparing the business case for wind and solar power purchase agreements (PPAs) to supply commercial and industrial customers with TESS based energy solutions.

We also expect to soon report modelling of cash flows from firming renewable energy using PPAs with financial hedging that can be replaced by physical hedging from storage as our TESS units are integrated into the NEM.

We continue to receive worldwide expressions of interest in purchasing our devices, or heat and electricity energy solution packages. We assess these for early revenue potential.

Technology and engineering

Our Chief Operating Officer Dr Jordan Parham has created three technical teams to improve delivery on your Company's objectives to commercialise scalable TESS solutions.

The **R&D** team are focussed on technology to fully exploit silicon's lower unit cost of energy storage to deliver large scale energy storage. They have been testing a new silicon containment technology to provide a solution for all scales and devices. A materials scientist will soon join the team to accelerate development and oversee our collaborative work with several Australian and international research organisations and suppliers.

Our new **Thermal Systems Engineering** team will focus on optimising the system design and components to maximise the performance of the TESS system. They are fine tuning a complete energy model of the TESS to enable prediction and optimisation of equipment and storage configurations to suit customer requirements. This will mean we can design and build the most efficient configurations as we scale to TESS-GRID capacity. Business Development will use the Thermal Systems team for concept design and performance modelling.

The **Project Engineering** team will focus on delivering successful projects, such as the remarkably successful, first of its kind GAS-TESS. They will perform the detailed engineering, project management and oversee construction to successfully integrate heat store technology and system designs into products that deliver value for customers.

Business development will draw upon these resources as required to conduct feasibility studies, such as that for Stone and Wood, providing costing, timing and scope for integration.

To assist this reorganisation, Matthew Johnson has resigned his part time position as Chief Technology Officer effective 25 October 2019. He continues to contribute seminal ideas as consultant and a major shareholder.

Energy markets and commercial opportunities

It is encouraging that Australian regulators are proposing changes that could recompense providers of firming power supply and storage such as provided by our technology. Without such changes, grid storage security will continue to require subsidies and grants. With such changes, an open market for firming and storage will attract investment in the most cost effective technologies. 1414 Degrees grid scale TESS is targeted at being the most effective storage technology, tapping a much wider energy market base than, for example, batteries or pumped hydro.

Although a number of regulatory bodies have asked for submissions on ways to provide secure, lower cost electricity, they are yet to look beyond electricity demand and consider the impact of electrifying the much larger heat market. Changing emphasis to consider renewable electricity as a replacement for fossil fuels like gas could reduce the emphasis on decommissioning reliable coal generation to achieve carbon reduction.

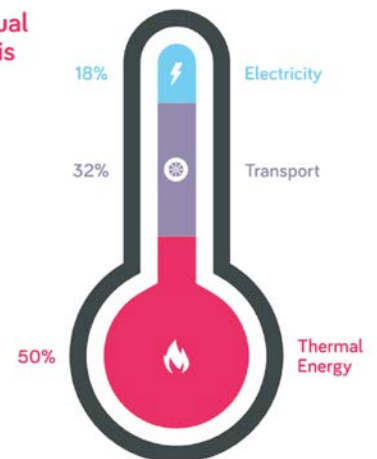
Electrifying some of the heat energy market will enable more investment on existing network infrastructure while reducing the proportion of network charges paid by current electricity consumers because it could greatly enlarge the pool of electricity users.

Of course, energy demand in advanced economies is so large that many technologies can coexist in providing future solutions, but large scale energy storage could also reduce the urgency to develop new hybrid energy technologies, such as the proposal to use renewable electricity to produce hydrogen by electrolysis, that could in turn be mixed with gas or exported. Hydrogen has advantages as a transportable energy source, but might be best used to power commercial transport, which consumes substantially more energy than the current global electricity market.

Interestingly, 1414 Degrees' TESS could more efficiently provide both energy storage and lower cost hydrogen production. The high temperature heat output from the turbines could power hydrogen production systems more efficiently than electrolysis-based systems and increase the overall efficiency of a TESS. The effect of such a combined energy output could reduce or eliminate our need to co-locate with process industries so we intend to progress this exciting possibility for our technology.

Our immediate focus is on achieving sales of our vanguard GAS-TESS devices in the next twelve months and on developing recurrent revenues from energy sales and trading.

“50% of the EU’s annual energy consumption is for thermal energy.”



Dr Kevin Moriarty

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ABOUT 1414 DEGREES LIMITED

1414 Degrees is working to create a sustainable energy future, where energy is available to all, at all times. Its clean energy storage is set to reduce energy costs by increasing the efficiency of renewable generation and stabilising grid supply. The 1414 Degrees thermal energy storage system (TESS) is unlike any other energy storage system in the world.

1414 Degrees' technology stores energy generated from electricity or gas and supplies both heat and electricity in the proportions required by consumers. It is unique in its combination of low cost, flexibility of location, scalability, and sustainability. Following years of effort by the Company's engineering team and the successful development of its commercial demonstrator, the Company is commercialising its scaled up products.

For more information please visit www.1414degrees.com.au