

## **ASX Quarterly Report for the Period Ended 31 December 2009**

### **HIGHLIGHTS**

#### **India**

- **Eden completed the first three sales of its Optiblend® dual fuel system in Assam in north-eastern India, where low cost natural gas is readily available. Installation of these three systems has been completed and they are now operational.**
- **Preliminary approvals received for 50 bus Hythane® demonstration project in Mumbai**
- **Indian authorities adopt 18% hydrogen / 82% natural gas (by volume) as the national standard for Hythane® (HCNG)**
- **Indian joint venture under negotiation for up-scaling new pyrolysis technology to separate methane into hydrogen and solid carbon**

#### **United States**

- **San Francisco Airport Hythane® Project is progressing, with the hydrogen and Hythane station on target to become operational by mid-late 2010**
- **Hempstead Hythane® station near New York operational**
- **Initial US marketing attracts strong interest from dealers of a major engine manufacturer in Hythane Company's OptiBlend Dual Fuel Kit and first US installation completed.**

#### **UK & Australia**

- **Farm-out Agreement concluded with Origin Energy Ltd to farm into Eden's Cooper Basin Geothermal Licence No. 185 in SA.**
- **Negotiations commence with potential joint venture partners for Eden's coal bed methane, natural gas and geothermal energy projects.**
- **UK Coal Bed Methane joint venture completes initial review and plans are being considered to develop several pilot production wells over the next three years.**

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# **HYDROGEN, HYTHANE® AND DUAL FUEL PROJECTS**

## **Background - India**

Progress continued with Eden's various hydrogen and Hythane® projects in India during the quarter. In 2006, India adopted a Hydrogen Roadmap that proposes to have 20% of all vehicles running on a hydrogen based fuel by 2020, and plans to use hydrogen enriched natural gas (Hythane®) as the transitional fuel. At present there are approximately 12 Indian cities that have established natural gas distribution networks, in which expanding numbers of natural gas fueled vehicles, particularly buses, are operating. The Indian Government has announced a new target to expand such networks to 200 cities by 2015 – opening up a potentially huge Hythane® market across the country.

Additionally, commercial production of natural gas from the large offshore KG basin commenced in April 2009, which is expected to significantly increase the amount of available natural gas in the coming years. These factors together make India the primary target market for Eden's hydrogen and Hythane® technology.

## **Progress on Eden's Indian Projects**

### **1 Indian Hythane Bus Demonstration Projects**

There was varied progress on each of the two proposed Hythane® bus demonstration projects during the quarter. These projects each plan the installation of a hydrogen reformer and Hythane® blending and dispensing facilities, and testing of Hythane® fuel on between 50-75 buses over a 6-12 month period.

During the quarter, a site for the previously announced proposed demonstration with Gujarat State Petroleum Corporation, with which Eden has entered into a preliminary memorandum of agreement, was selected and preliminary engineering drawings and designs completed. A full budget and a detailed proposal was prepared and a formal agreement, which was subject to board approval was also executed. However since the end of the quarter, the GSPC board has decided to place this project on hold for the time being and watch the results of the other Hythane demonstrations. Discussions are continuing but for the time being Eden will focus on the other demonstration project in Mumbai.

Preliminary Board approval was also obtained from the first of the two parties involved in the other proposed Indian Hythane® bus demonstration project in Mumbai, which will be similar in size and scale to the Gujarat demonstration project but will be located at a bus station. It is now hoped that all necessary formalities will be completed and an agreement executed to enable this project to commence in the first quarter of 2010.

Proposals for conversion of one additional Indian natural gas bus engine to operate on Hythane® have been approved by the major Indian bus manufacturer, and Eden is confident that suitable, high efficiency, ultra-low emission Hythane® fuelled buses will be available for this demonstration when it begins late in 2010. This demonstration in Mumbai is planned to deliver both commercial and environmental results that support the rollout over the next 5 years of a large scale, commercially viable, ultra-clean public bus system in India operating on Hythane® fuel.

Of considerable interest is the fact that during the quarter following extensive Indian research, Indian authorities decided to adopt a blend of 18% hydrogen (by volume) and 82% natural gas as its Hythane® (HCNG) standard. This mixture is a good compromise suitable for both smaller vehicles and large heavy duty engines and will be suitable for all Hythane® purposes.

## **2 Proposed Joint Venture for Up-scaling Pyrolysis Technology**

Negotiations are progressing with a potential Indian partner to undertake a scale-up to pilot plant scale of a technology, jointly owned and developed by Eden with the University of Queensland over the past four years, and over which patent applications have been lodged in over 50 countries. The process converts natural gas (methane) into its primary constituents of hydrogen (that can be used as a very clean fuel) and solid carbon.

Solid carbon is produced by this technology in various forms, including carbon fibres and carbon nanotubes, which have a tensile strength of up to 300 times that of steel while weighing less than 20% of the weight of steel. Super-strong, ultra light weight carbon fibre based composite materials are already used in many high technology applications, including replacing steel and aluminium in Formula 1 racing cars and other high end performance cars and by both Boeing and Airbus in their new very strong, light weight fuel-efficient aircraft, but its current production method is relatively energy intensive, and the material is presently very expensive.

Similarly, at present, the normal method of producing hydrogen from natural gas has the unwanted effect of producing carbon dioxide as a by-product.

Eden's new technology, however, is anticipated to be more energy efficient and has the potential to not only produce hydrogen from natural gas at a relatively low cost, but to have extremely valuable solid carbon instead of carbon dioxide as its only by-product. This opens up exciting possibilities for future low cost widespread commercial use of ultra-strong and ultra-light material using carbon fibre and carbon nanotubes, particularly in the motor vehicle and aircraft industries. With automobiles for instance, it has been estimated that the total weight of the average car could be reduced by more than 50% by using carbon composite materials for both the chassis and body panels, offering a great reduction in fuel consumption resulting from the reduction in weight and also potentially huge reductions in the greenhouse gas emissions over the life of the vehicle, due to both the use of the carbon as a structural material to displace steel and aluminium, and also due to the reduced fuel consumption.

Additionally, the value of the carbon which will be produced is projected to result in the effective cost of hydrogen being greatly reduced, thereby increasing the competitive benefits of both Hythane® and hydrogen as ultra-low emission, ultra-low greenhouse gas producing fuels.

## **3 Dual Fuel Technology**

Eden has completed the development of a very efficient dual fuel kit that is capable of operating on diesel engines and displacing up to 70% of the diesel fuel with natural gas. If Hythane® is used in place of natural gas, the displacement of diesel fuel could be as high as 80-85%. The use of the natural gas will greatly reduce greenhouse gas emissions and, in places where natural gas is cheaper than diesel, will also reduce fuel costs. In various parts of India, natural gas is already significantly cheaper than diesel, and accordingly Eden has been targeting a diversified market for this technology, starting with stationary power generators and then locomotives.

Eden completed the sale and installation of the first three of its OptiBlend® dual fuel systems in Assam in north-eastern India, where low cost natural gas is readily available. These first sales are to one of the world's largest tea plantations, and will be trialled on diesel generators with a power output of between 400 kVA and 1,250 kVA. Preliminary results from the trials show the OptiBlend® dual fuel systems are displacing above expected amounts of diesel, resulting in short capital cost payback periods.

In India there are many hundreds of thousands of medium and large sized diesel-powered generators that are used to provide either back-up power or base-load power to commercial, industrial, residential and institutional complexes throughout the country. Apart from greatly reducing local air pollution resulting from NOx, carbon monoxide and particulate matter emissions, the new dual fuel kits are projected to have a pay-back period of between 6-24 months, depending upon the size of the engine and the amount of usage.

Eden is pursuing many other possible customers in both India and USA (and then planning to expand into other suitable territories). It is anticipated that a significant market will emerge in both countries (and many more as well), particularly as natural gas both becomes more widely available in India, and becomes more cost competitive in both countries compared with diesel as it is projected to do over the next few years.

## **Progress on Eden's US Projects**

### **1 San Francisco International Airport (SFO)**

For the past quarter, progress on the Hythane® station at San Francisco International Airport has involved continued negotiation of the contractual arrangements which are now nearing completion. For this project, Hythane Company has received funding for station infrastructure as well as the conversion of 27 Ford E-450 airport shuttles to run on Hythane®. The project will demonstrate the practicality of Hythane® vehicles for large-scale projects across the US.

Funding is being supplied by the Bay Area Air Quality Management District (BAAQMD) and the San Mateo County Government, with additional funding anticipated through two separate grants from the Department of Energy (DOE). Recently, the major merchant gas company with which Hythane Company is working on this project, received grant funding for its hydrogen fueling station adjacent to the Hythane® station. This award is a significant boost to the Hythane® project as it makes low-cost hydrogen readily available at the site

Once the agreements are finalised, the design and permitting stage of the SFO Hythane project will be completed, with construction planned for later this year. Both the hydrogen and Hythane® stations are projected to be completed and operational sometime during the second half of 2010.

### **2 BAF Hythane® Engine Calibration**

Hythane Company, in conjunction with BAF Technologies, has developed a Hythane® calibration for Ford 6.8L V10 engines used in E-450 vehicles. This calibration, which demonstrates the dramatic emissions reductions that can be achieved through the use of Hythane®, was granted certification during July 2009 by the California Air Resources Board (CARB). CARB certification allows commercial sale and use of this engine, no longer limiting it to use in demonstration projects.

The Hythane<sup>®</sup> calibration provides dramatic emissions reductions over the natural gas version of the engine, which already provides substantial emissions benefits as compared to the gasoline version of the engine. Specifically, the Hythane<sup>®</sup> calibration achieves a 10.5% reduction in CO<sub>2</sub>, a 40% reduction in non-methane hydrocarbons, a 49% reduction in CH<sub>4</sub> emissions, and a 70% reduction in particulate matter over the natural gas version of this engine.

Non-methane hydrocarbon emissions contribute to the formation of photochemical smog, a significant problem in many urban areas. In addition to causing local air pollution, these emissions are also powerful greenhouse gases.

In addition to emissions reductions, the use of Hythane<sup>®</sup> fuel provides a 3.9% efficiency gain over the natural gas version of the particular engine. When spread over a large fleet, efficiency gains provide considerable economic benefit. With other types of engines, even greater efficiency gains of up to 15% are anticipated in the future.

The Hythane<sup>®</sup> engine calibration was designed for the Hythane project at San Francisco International Airport (SFO) referred to above, and Hythane Co will receive a royalty for the sale of each Hythane engine sold by BAF. The first sale of one of these engines was for the City of Hempstead project mentioned below.

### **3 City of Hempstead**

As part of the Hythane engine calibration project, BAF Technologies has established a Hythane<sup>®</sup> version of the Ford E-450 as a standard offering. The City of Hempstead has placed an order for one of these Hythane<sup>®</sup> vehicles for use as a shuttle bus to showcase at their hydrogen/natural gas blended fuel station. With the vehicles at SFO, this will place Hythane<sup>®</sup> vehicles in operation on both coasts of the US, and it is planned to use these to open up further Hythane<sup>®</sup> vehicle projects around the country.

In October 2009, the official opening of the Hempstead blended fuel station occurred and once the Hythane<sup>®</sup> shuttle bus is received it is scheduled to commence operation.

### **4 Dual Fuel Kits**

Dealers throughout the US for a major engine manufacturer have shown a strong interest in the OptiBlend<sup>®</sup> Dual Fuel Kit developed by Hythane Company. The OptiBlend<sup>®</sup> Kit, which is the same as that currently being introduced into India, allows the conversion of a diesel generator to run on up to 70% natural gas. In addition to being a less expensive fuel, natural gas provides dramatic emission reductions over diesel fuel.

Noting the advantages of the OptiBlend<sup>®</sup> over other commercially available kits, many US dealers are now actively marketing the kit, specifically in the Gulf Coast area. This region is heavily dependent upon backup diesel generators for power during natural disasters such as hurricanes. The OptiBlend<sup>®</sup> allows a doubling of available power for a given amount of diesel, which adds to the appeal of the kit for these regions of the US.

During the quarter, Hythane Company received its first US order for an OptiBlend<sup>®</sup> kit to be used as the US demonstration project and the installation was completed in December 2009. It is now awaiting installation of a new catalyst system after which EPA certification of the emissions reductions can be completed which will provide support for future marketing.

## **5 Hythane® in Stationary Power**

Hythane® fuel in natural gas generators can provide significant emissions reductions over ordinary natural gas. Hythane is exploring the applicability of this technology to smaller stationary generators in Southern California.

If it is proven that Hythane can provide sufficiently low emissions to comply with state and local regulations, the technology will offer a low-cost alternative to pure hydrogen generators, which is one of the only approved methods for generating power on a small scale. Given the high price of power in Southern California, small-scale power holds tremendous market potential for Hythane®. The EPA certification of the first US demonstration project referred to above is a major step in this.

### **Process Gas to Liquids Research Project – The University of Queensland**

Eden and The University of Queensland (“UQ”) have lodged a provisional patent application on a new simplified method of producing liquid hydrocarbons and hydrogen from methane (natural gas), and have secured a \$500,000 Australian Research Council Grant to fund a significant portion of the 3 year project. Preliminary indications are that the new process has potential for production of both ethylene (which is used in the plastics industry as a major feedstock) and liquid motor vehicle fuel from natural gas. During the quarter, the new equipment for this project was installed and testing begun.

## **ENERGY PROJECTS**

### **UK Coal bed Methane, Conventional Natural Gas and Shale Gas Project**

During the quarter, the major gas company that acquired 90% of Eden’s interest in the coal bed methane in four of its 18 licences and which is meeting all the costs of the next £500,000 of expenses, continued a review of all past work in the area. Plans are being considered for development of several pilot wells over the next three years.

Additionally, the review undertaken of previous seismic surveys over the licence areas in South Wales and plans are being formulated for a further detailed seismic review of the promising conventional gas and shale gas targets.

Discussions have also commenced with our joint venture partner with a view to possibly establishing a joint company as a highly resourced UK-based gas producer. Further discussions are planned during the March quarter to evaluate market conditions and assess terms for the establishment of such a joint entity.

### **Australian Natural Gas and Geothermal Projects**

Eden entered into an agreement with Origin Energy Ltd (“Origin”), a major Australian energy utility, for Origin to farm-in to Eden’s Cooper Basin Geothermal Licence No. 185 in South Australia. The agreement is conditional upon approval by the South Australian Government

During the quarter, Origin paid to Eden \$1 million cash and as part of the agreement will bear the first \$500,000 of expenditure on the licence, to earn a 70% interest in GEL 185. Each party will then contribute proportionally to further expenditure. Origin will be operator of the project.

Eden, directly and through its wholly owned subsidiary Terratherma Ltd, retains 100% interest in all of its remaining geothermal licences in South Australia.

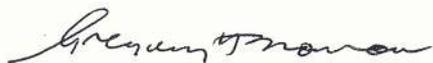
GEL 185 adjoins the geothermal licences of Geodynamics Ltd in the Cooper Basin where Geodynamics has undertaken a considerable amount of drilling and other work and identified a significant geothermal energy resource. In 2007, Origin entered into an agreement with Geodynamics to farm-in to a 30% interest in Geodynamics' geothermal licences. Origin is also a substantial shareholder in Geodynamics.

Eden is actively exploring a variety of ways to further progress the funding of the exploration and development of all of Eden's geothermal interests in South Australia, and is hopeful that a suitable way forward can be found during the next few months, subject to suitable market conditions.

Apart from providing additional working capital to Eden, the farm-in by Origin provides a significant boost to Eden's plans to develop its geothermal interests by enabling Eden to progress the development of GEL 185 with a significant joint venture partner, and still retain a strategic interest in the broader Cooper Basin geothermal licence area, and is a welcome step in Eden's plans to develop a significant geothermal base in South Australia.

## **CONCLUSION**

Encouraging progress continues to be made on many fronts, although the rate of progress in some areas was slower than hoped. Eden will continue to focus on achieving early positive cashflow, whilst maintaining steady progress with major long term projects.



**Gregory H Solomon**

*Executive Chairman*

### ***About Eden Energy Limited***

Eden Energy Ltd is a diversified clean energy company that listed on the Australian Securities Exchange in June 2006. Eden has interests in hydrogen production, storage & transport fuel systems, including the low emission Hythane hydrogen-methane blend, coal seam & abandoned mine methane in the UK, conventional gas in SA, low temperature pyrolysis research into hydrogen production and geothermal energy production.

All these aspects of Eden's business are part of an integrated strategy to become a major global participant in the alternate energy market, particularly focussing on the clean energy transport market, producing hydrogen without any carbon emissions, transporting the hydrogen to markets & providing the engines to power hydrogen-based transport & energy solutions.

For further information please contact Greg Solomon (+61 8 9282 5889) or visit our website ([www.edenenergy.com.au](http://www.edenenergy.com.au)).