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IIL Business Plan

Waste Heat Recovery System: "Otello"

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Executive Summary

International Innovations Limited (IIL) is the 100 % owner of a waste heat recovery system called *Otello* that generates electricity from low temperature waste heat energy or renewable energy sources. These heat sources may include hot engine exhaust, industrial processes, concentrated sunlight, and many others. The *Otello* system offers end users the opportunity to reduce fuel and energy wastage, reduce emissions and lower energy costs through better use of the energy that is already available to them. The *Otello* product therefore offers significant environmental and financial benefits, through lower emissions and reduced fuel usage. Further, the system is based on a unique configuration of existing components *that are already available around the world*.

Otello is a versatile system that converts *heat* into *electricity*. The system is potentially compatible with *any* low temperature heat source in the range 90 °C to 150 °C, which makes it suitable for a wide variety of applications. The system could be used to (a) improve the overall output of power generation systems ranging from stationary diesel and/or gas fuelled generators, to large coal, gas or nuclear power stations, without the requirement to burn any additional fuel, (b) generate electricity from the waste heat by-product of industrial processes such as (but not limited to) smelters, ovens, cement manufacture and food processing, or (c) generate electricity from renewable energy sources such as concentrated sunlight or geothermal wells (heat from underground). In all these (and many other) cases, the *Otello* system takes energy from a low-cost or free heat source, which may otherwise be wasted and dissipated into the atmosphere, and converts it into useful, valuable electricity. This process reduces greenhouse gas emissions, since it offsets the need to burn extra fuel to generate the electricity, and may also generate valuable carbon credits under various carbon management schemes. At the simplest level, however, **Otello is a system that has the potential to convert a waste energy source into a valuable commodity – electricity.**

This document outlines development work that aims to produce the first functional systems for testing, optimisation and verification, currently underway in co-operation with BIG Biogas¹ of Germany. It also outlines the proposed system for distributing the product in kit form, which will allow IIL, through partnerships with mature global companies, to take full advantage of *existing* worldwide manufacturing and supply networks. This distribution system will enable the rapid deployment of the technology on a global scale, and it is made possible by the exclusive use of off-the-shelf components, including, most importantly, bladder accumulators supplied by Olaer².

Independence from customised parts represents a key competitive advantage of *Otello*. Market analysis indicates that the strong and growing demand for electricity, coupled with an increasing need for environmental sustainability and the rising cost of fuel, has created an excellent opportunity for low-temperature waste heat recovery products. This document shows how IIL, along with its development partners including Olaer and BIG Biogas, plan to benefit from this opportunity and commercialise the *Otello* technology on a global scale.

¹ www.big-biogas.de

² www.olaer.com

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1. Introduction

This document provides an overview of the current activities and plans of International Innovations Limited (IIL) relating to the development of the waste heat recovery system, *Otello*. Included in the document are an overview of the company and its collaborative partners, and a brief description of the *Otello* product and potential revenue streams. This is followed by market analysis, including potential applications, a discussion of the competitive advantage, and an assessment of the market size and trends. More details are then provided on the product development plan, including an outline of the proposed production and distribution process, an update on the prototype development work currently underway, and proposals for important product development projects. The sales and marketing process is then discussed, followed by a brief description of the company management. In addition to the overview presented, more details on the various technologies and development proposals are available in the accompanying documents.

2. Company Overview

2.1 Industry Overview

IIL is principally concerned with the sectors of the energy supply industry that implement ‘clean energy’ technologies to reduce or eliminate greenhouse gas emissions from energy supply systems. Within this industry, the technology owned by IIL is relevant to both the waste heat energy recovery and renewable energy sectors. IIL owns a versatile system that can convert thermal energy from a heat source into electricity. This technology can be used in a variety of applications to generate electricity from waste heat sources that would otherwise be vented to the atmosphere, such as hot engine exhaust or industrial processes, and also from renewable heat sources, such as the heat generated by concentrated sun-heat. Both the more efficient use of waste energy and the increased use of renewable energy are two areas of the energy supply market that have recently seen considerable development. An estimated total of USD 148.2 billion was invested in clean energy technologies, companies and projects in 2007³. IIL is well placed within this industry to take advantage of the new and suddenly urgent interest in clean energy technologies – all with proven, off-the-shelf components.

2.2 Company Description

IIL is an Australian unlisted public company that has, since its inception in 12th November 2003, aimed to develop a simple and robust system for converting low temperature waste heat into electricity. IIL now owns a number of patents for systems that convert heat into electricity, including its latest system known as *Otello*. The IIL business model is based on a lean company structure whose main purpose is to simply control the patented technology, whilst relying on a network of global component suppliers and regional licensed distributors to actually build and sell its products. As will

³ New Energy Finance, www.newenergyfinance.com, 9 April 2008.

be shown in the following sections, this company structure is well suited to IIL's needs since (a) the technology can be assembled from readily available off-the-shelf components, which eliminates the need for a central manufacturing or assembly facility, and (b) the manufacturing and supply system must support the rapid worldwide supply of the technology to satisfy the high demand for 'clean' energy systems. IIL's current activities are focused on supporting the development of the first systems to demonstrate and optimise the technology, and also on bringing together the team of companies that will facilitate the mass production and worldwide supply of the technology.

2.3 Products and Services

The IIL product is a 'clean' energy supply product that can generate electricity from heat that would otherwise be vented to the atmosphere and lost. It is a product that can generate valuable electricity from a waste energy source that is essentially *free*. It is a product that has the potential to enable a wide variety of end users to generate electricity without burning any additional fuel and without generating any additional emissions (compared to their current levels). It is a product that offers very attractive *environmental benefits* through the reduction of waste and greenhouse emissions, and attractive *financial benefits* through fuel savings and carbon trading incentives. This system is called *Otello* and it can be assembled from off-the-shelf components that are readily available around the world *today*. IIL is establishing a worldwide production and distribution network through partnerships with existing global component suppliers, with the first being International Group Olaer⁴ and will offer the product for sale through regional licensed distributors for assembly in kit form.

A detailed description of this technology is provided in the accompanying document entitled '*Otello* System Overview', and a simplified overview is presented in Figure 1. At the heart of the system is an array of accumulators, which are pressure vessels with two internal chambers separated by a flexible bladder. The accumulators are mounted in a hot water bath, which is heated by *any suitable external heat source*. Inside one chamber of the accumulators, heat input causes a refrigerant (similar to the fluid in a household refrigerator) to vaporise, which generates high pressure. This high pressure is then transferred across the flexible bladder to a hydraulic fluid (water or oil), which is then expelled from the accumulator and driven through a turbine to turn a generator. The system is potentially compatible with *any* heat source in the temperature range 90 °C to 150 °C.

⁴ www.olaer.com

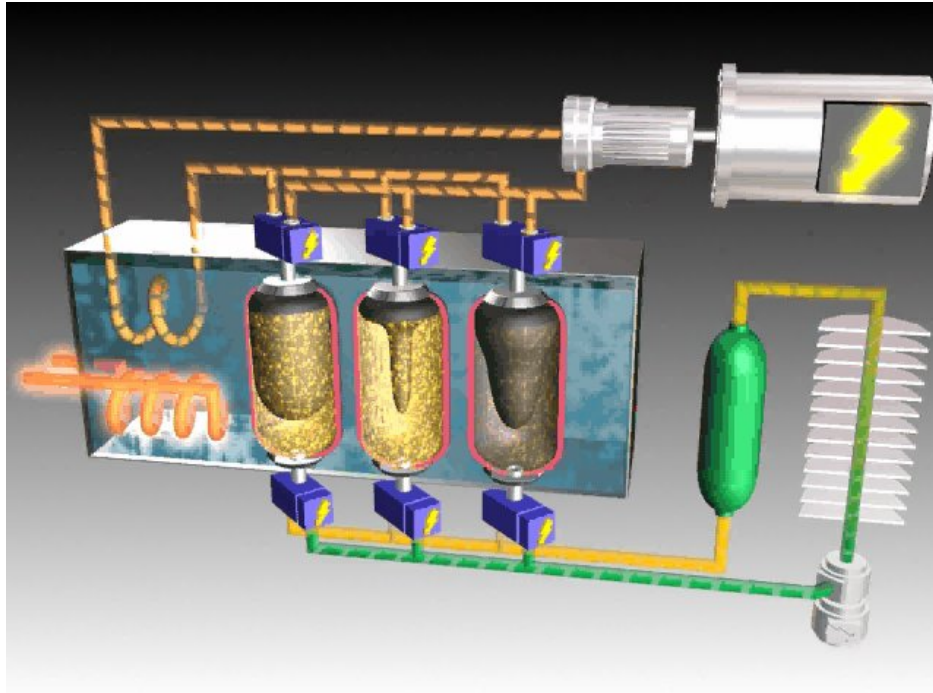


Figure 1 – Overview of the Otello waste heat recovery system.

2.4 Collaborative Partners

In addition to overseeing the development and deployment of the *Otello* technology, IIL is currently in the process of bringing together a team of mature companies to facilitate the worldwide supply of parts and completed systems. The team currently includes the following members:

- International Innovations Limited (IIL): IIL is responsible for the ownership and maintenance of all intellectual property, including all improvements. IIL also acts as project manager and co-ordinator of product development programs.
- Olaer⁵: Olaer is the worldwide exclusive parts supplier for the bladder accumulators and other products such as coolers and radiators where possible. Olaer's global presence and supply chains will underpin the provision of *Otello* systems as the demand for waste heat recovery technology rapidly increases.
- BIG Biogas Innovations GmbH⁶: BIG Biogas is the exclusive licensee and supplier of the *Otello* system in Germany, Austria, Italy, France, Belgium, Spain, Portugal, Croatia, Switzerland, The Netherlands, Denmark and Turkey. In addition, BIG Biogas is developing the first prototype *Otello* systems at its Rendsburg plant in Germany.

⁵ www.olaer.com.au

⁶ www.big-biogas.de

IIL is currently in discussions with Coote Energy⁷ regarding a license agreement for Australia, New Zealand, the Solomon Islands and other South Pacific nations, and also regarding further possible co-operation on the development of a demonstration system in Australia. IIL is also in contact with Tyco⁸ regarding the exclusive worldwide supply of turbine, alternator, valving and control system components. IIL is continually seeking collaborative relationships with potential partners relating to:

- License agreements for the sale, installation and ongoing servicing of *Otello* systems in all regions of the world.
- The supply of the secondary components of the *Otello* system that are not currently provided by Olaer.
- The development of large scale projects involving the capture of waste heat from existing power stations and/or the use of solar thermal concentrators to drive the *Otello* system.

2.5 Pricing and Revenue Streams

Retail pricing of the *Otello* system will be determined by the regional licensees. Systems sold in Europe will be priced at approximately EUR 2500 (AUD 4200) per kW of power output, giving the first 60 kWe system a retail price of EUR 150 000 (AUD 250 000). In Australia, where there are currently fewer incentives for producing 'green' energy, the retail price will be AUD \$2,500 to \$3,000 per kW.

IIL will derive its revenue in a number of ways, including the following major sources:

- 10 % license fee payable by the regional licensee, based on retail price less delivery and installation costs.
- 10 % commission payable by the preferred exclusive global suppliers (such as Olaer) based on sales of major components following the initial purchase of the system.
- 10 % commission payable by the preferred exclusive global suppliers for replacement parts throughout the lifetime of the machine.
- 10 % commission on any software and updates, throughout the lifetime of the machine.
- In the future, the sale of exclusive licensees to new licensees.
- IIL share in revenue generated by major power supply projects, such as solar thermal or power station waste heat recovery projects.

⁷ www.coote.com

⁸ www.tyco.com

- Revenue generated from provision of IIL project management services (where required) for large or unique applications.

IIL will manage the collection of license fees and commissions through a rigorous reporting system (enforced by audits, if necessary) implemented by the regional licensees.

3. Market Analysis

This section highlights the possible applications of the *Otello* technology and its competitive advantages, and includes an estimate of the potential market size for these systems.

3.1 Possible Applications

The *Otello* system is highly versatile and compatible with a wide variety of heat sources. These may include:

1. Stationary Diesel, Gas or Biomass Generators: An early application of the *Otello* system is likely to be in the recovery of the waste heat generated by stationary diesel generators. As an example, for a 500 kW diesel engine, a standard exhaust system heat exchanger can recover approximately 500 kW of waste heat, which can be used to power an *Otello*. With an optimised system operating at the maximum temperature of +150 °C, an additional up to (approximately) 20 % increase in the output of the generator for the same fuel use (or similar reduction in fuel use for the same output) may be obtained. This system would be particularly attractive to the owners of stationary diesel generators that provide primary power (i.e. not emergency stand-by power). The system will become increasingly financially attractive as fuel prices continue to rise, and as either penalties for carbon emissions or incentives for emissions reductions are introduced.
2. Solar Thermal: Solar thermal power involves generating electricity using the *heating* effect of sunlight (as distinct from the photovoltaic effect). Concentrated sunlight can generate extremely high temperatures. Temperatures well in excess of 200 °C are common. The most mature solar thermal technology is the parabolic trough solar concentrator, in which a heat transfer medium (such as water or thermal oil) is heated as it passes through a pipe situated at the focal line of the concentrator. The heat transfer medium is typically used to provide heat input to a steam or organic Rankine Cycle system to generate electricity. However, the heat transfer medium could instead be used to provide heat input to the *Otello* water bath. This could be achieved either directly, by passing the heat transfer medium through the water bath, or indirectly, via a liquid-liquid heat exchanger. The *Otello* system may be advantageous due to its operation at lower temperatures. This may simplify the heat transfer system for capturing heat from

the solar concentrators, by reducing pipe wall thicknesses, mitigating material/temperature compatibility issues, and reducing radiation losses.

3. Power Station: Conventional coal, gas and nuclear power stations waste heat through cooling/condensing systems and, in the case of coal, in exhaust flue gasses. For example, the exhaust flue gas temperature of the Kogan Creek power station in Queensland, Australia, is +120 °C. This waste heat can be captured and input to an *Otello*, through conventional heat exchanger systems. In addition to the increase in electrical output obtained, this would reduce the thermal impact on the local environment and, if heat is extracted from the condensing system, may also reduce the power scavenged by that part of the power plant. This would be especially the case at the Kogan Creek power station, where heat is rejected through an air-cooled condenser in order to reduce water consumption⁹. The trade-off is that this air-cooled system scavenges more power from the main plant compared to water-cooled systems. Therefore, using the waste heat from the cooling system in an *Otello* would not only allow the direct generation of additional electricity, but may also tend to reduce the power consumed by the air-cooled condenser, since would be a smaller heat rejection load.
4. Power Station / Solar: In some cases, such as those involving the recovery of waste heat upstream of the condensing system of a power station, the temperature at which energy is recovered may not meet the minimum requirements of the *Otello* system. In these cases, it may be favourable to use a solar concentrator field (such as the system described previously) to reheat the heat transfer medium to the minimum temperature required by *Otello*. This arrangement would greatly reduce the required size – and cost – of the solar concentrator field, compared to a stand-alone solar thermal power station of the same electrical output. This is due to the significant amount of preheating provided by the power station waste heat.
5. Geothermal Power: Geothermal power involves using heat obtained from underground to generate electricity. The *Otello* has two potential uses in this application. It could be used as a secondary system to capture the heat wasted by a primary power generation system, such as a steam or organic Rankine Cycle, in a similar way to that described above for conventional power stations. Alternatively, the *Otello* could be used as the primary power generation system. Again, this may be advantageous where the temperatures obtained are lower than those that are suitable for other power generation systems. The Australian geothermal power company Hot Rock Limited has identified geothermal sites in Victoria with temperatures of up to +140 °C at depths of 3500 m¹⁰. These heat sources are ideal for use with the *Otello* system, since, at these low temperatures, the proposed vapour turbine-based binary power plant may have very low efficiency.

⁹ http://www.csenergy.com.au/power_stations/ps_kogancreek.aspx

¹⁰ Hot Rock Limited, Projects, http://www.hotrockltd.com/projects_australia.html, 2007.

6. **Industrial:** Clearly, the *Otello* system would be beneficial in many industrial applications where heat would otherwise be wasted. Some examples include desalination plants, cement plants, kilns and ovens for metals, plastics, glass, tiles, rubber, any furnaces, and processes involving steam (such as food and/or chemical processes). The installation of an *Otello* system into the process would require only the inclusion of a heat exchanger to recover the waste heat and transfer it to the water bath. Users could then capture some of their wasted energy to generate electricity, which would reduce fuel/electricity consumption, energy costs, carbon emissions and any carbon-related penalties.

This is, of course, merely a representative list. A key feature of the *Otello* system is that it is compatible with many low grade waste heat sources, which means now and in the future there are many possible applications of the technology. As a general rule, the *Otello* should be considered potentially compatible with any heat source in the temperature range 90 °C to 150 °C. The focus on low grade waste heat sources greatly increases the number of potential applications of the *Otello* technology.

3.2 Competition and Competitive Advantage

The main competitors in the area of electricity production from recovered waste heat energy or other renewable resources are those companies that operate Organic Rankine Cycles or Kalina cycles, such as Ormat Technologies¹¹ of Reno, Nevada, Cogeneration Technologies¹² of Houston, Texas, or Turboden¹³ of Italy. IIL has also identified a number of smaller combined heat and power technologies such as Whispergen¹⁴ of Christchurch, New Zealand and Cogen Microsystems¹⁵ of Thebarton, South Australia. A company called Turbosteam¹⁶ of Massachusetts specialises in industrial waste heat recovery for electricity generation, although only higher temperature heat sources are considered. **In all of these cases, the companies rely on expensive, specialised components such as vapour turbines or other similar expansion engines.**

A significant competitive advantage of the *Otello* system over these other products is that it can be mass-produced using off-the-shelf components. In the *Otello* system, the superheated vapour is expanded in hydraulic accumulators (supplied by Olaer¹⁷), which are very robust and simple components that carry with them *decades* of development and refinement, and a proven track-record. The use of proven, existing products will reduce the development costs, production costs and through-life maintenance costs of the IIL technology. Further, through partnership with the suppliers of these components, such as Olaer, IIL can immediately make use of an existing worldwide mass production and distribution network for the rapid deployment of these systems.

¹¹ www.ormat.com

¹² www.cogeneration.net

¹³ www.turboden.it

¹⁴ www.whispergen.com

¹⁵ www.cogenmicro.com

¹⁶ www.turbosteam.com

¹⁷ www.olaer.com

3.3 Market Size and Trends

It is difficult to quantify the size of the waste heat recovery market, due to the extremely high demand for energy in nearly all sectors of the economy and in all parts of the world. The year-averaged instantaneous global consumption of all types of energy is approximately 13 TW (terawatts)¹⁸, which is equivalent to the combined output of 13 000 large (1000 MW, megawatt) power stations running simultaneously. With continued economic growth in developing nations, this figure is expected to double by 2050 and triple by 2100. Approximately 30% of this power is consumed in developing nations, and this proportion is also likely to increase, with the continued development of China, India and Africa¹⁹. This simple analysis clearly demonstrates that there is an extremely large demand for energy, in both developed and developing nations, and that this will only increase as the world's population becomes increasingly developed.

The Energy Information Administration (US Department of Energy) predicts that the global demand for electricity will jump from 1.9 terawatts in 2004 to 3.5 terawatts by 2030²⁰. This implies a required annual increase in the global electricity supply of over 60 GW (60 gigawatts or 60 million kW) per year. This global demand for increased power generation capacity will include a mix of sources including renewable systems such as wind and tidal, but it is valid to expect that some of this extra capacity will come from the recovery of waste heat. This is especially the case since all existing power generation systems that are based on heat engines (ranging from large coal and nuclear power plants down to the thousands of diesel gen-sets in operation) all waste heat to some extent, meaning that there is at all of these systems an opportunity to improve the total power output through the inclusion of an *Otello* or similar system. So, by 2030, the world needs approximately an extra 60 million kW of electrical generation capacity every year. In the simple analysis presented here, the estimate of market size is based on this fundamental requirement.

Whilst some renewable energy systems, such as solar panels, can cost up to EUR €9,500 (AUD \$15,800) per kW of generating power²¹, IIL's contacts have advised that energy producers are willing to pay up to EUR €2,500 (AUD \$4,200) per kW in Europe²², where government incentives promote the use of green technology, and up to approximately AUD \$3,000 per kW in Australia²³. The price that energy producers will pay for power generation equipment is also likely to rise as the economic costs of higher fuel prices, carbon trading and other government tariffs/incentives are factored in. However, even using the current values, these estimates indicate that the global *yearly* demand for 60 million kW of new power generation capacity could potentially be worth between AUD 180 and 250 billion. Even a small market penetration of 0.06% could be worth

¹⁸ 'Basic Research Needs for Solar Energy Utilization', Report of the Basic Energy Sciences Workshop on Solar Energy Utilisation, sponsored by the US Department of Energy, April 18-25, 2005.

¹⁹ 'Renewable Energy for a Sustainable Future', Solar Energy International.

²⁰ 'Energy Outlook 2007', Energy Information Administration, US Department of Energy, 2007.

²¹ Solar Harvest Australia, 2007.

²² Schlagregen, B., BIG Biogas, Germany, 2008.

²³ Personal communication from Bentley, D. Coote Energy, 15 April 2008.

AUD \$100 million annually.

The 25 April 2008 price for light crude oil was USD \$118 per barrel²⁴. As this resource is depleted and as demand continues to rise, the price of oil can also be expected to rise. This trend will continually act in IIL's favour, since it will reduce payback periods and tend to increase the amount customers are willing to pay per kW *for a device that can generate electricity without requiring extra fuel*. In addition, a growing global need to reduce the effects of climate change, along with the associated government tariffs and/or incentives and carbon trading, are beginning to place economic value on greenhouse emissions. As a simple system that can reduce fuel usage, cut emissions and/or generate carbon credits, the *Otello* technology is likely to become even more economically favourable when these legislative factors take effect.

In the long term, it is important to note that the *Otello* system is an external heat engine, meaning that it is not fuel specific. Therefore, as fuel types and heat sources come and go, including oil, gas, biofuels, solar thermal and others, the *Otello* system, as a generic and versatile method for converting heat into electricity, can remain a viable product.

4. Product Development

It is the short term goal of IIL to demonstrate the functional *Otello* system in Germany (currently underway in co-operation with BIG Biogas²⁵) and establish European, Australian and other regional demonstrator systems to showcase the product to potential customers and licensees. This section outlines the product development strategy being undertaken by IIL, including current work on the first system and plans for scaling up production for the worldwide supply of the *Otello* waste heat recovery technology.

4.1 Production and Distribution Process

The development of the production and distribution process has been strongly influenced by two important considerations. The first is to take maximum advantage of the fact that the *Otello* is a modular system that can be completely assembled from readily available, off-the-shelf components. The second factor is the constraint that the production and distribution process must enable the rapid, worldwide supply of *Otello* systems in order to satisfy to the maximum possible extent the large expected demand for these systems. Based on these considerations, the business model selected for the production and distribution of the IIL power systems is based on the supply of a self-assembly kit package through regional licensees. Whilst further value-added services will be available if desired by the customer, such as the construction, delivery and/or installation of complete systems, and the ongoing servicing and maintenance of those systems, the model is based on the kit assembly of the various simple components.

When a customer's order is placed with a regional licensee, the licensee will then place orders for the various components with the IIL preferred global suppliers, based on the desired power output and heat source available, etc. For example, the licensee will order

²⁴ Commodities Trading Center, CNNmoney.com, 25 April 2008

²⁵ www.big-biogas.de

a certain number of accumulators and heat exchangers from Olaer, sized to suit the application. If the customer has chosen to assemble the system on their own, then the ordered parts will be built and delivered to the customer by the preferred suppliers, through their existing manufacturing and global distribution infrastructure. The components will otherwise be delivered to the licensee if the customer requires a completely assembled system. In either case, the regional supplier then facilitates the complete construction, installation and commissioning process, either directly or through the provision of assembly instructions, as required. Alternatively, the licensee may assist by recommending preferred local installers.

This production and distribution system satisfies the need to take full advantage of the modular nature of the system and also the requirement to allow the rapid worldwide deployment of these systems. The benefits of this system are:

1. There is no need for a central manufacturing/assembly facility, which reduces initial and ongoing infrastructure and personnel costs for IIL and the development partners. This also removes a potential ‘bottleneck’ in the supply process.
2. Similarly, this allows for the *immediate* global supply of the technology without the need for ‘tooling up’ or establishing a production line or dedicated factory.
3. This process enables IIL to ‘piggyback’ onto the existing global manufacture and distribution infrastructure of the preferred suppliers, without developing its own network.
4. The use of the local outlets of the preferred suppliers reduces the need for double handling of materials and/or unnecessary transport of components around the world (which, in itself contributes to green-house reduction), which reduces cost.
5. Even though the various components of a kit package are supplied, regional licensees retain the option to provide value-added services such as installation and ongoing maintenance, meaning that they are not limited by the system. In fact, once they reach the upper limit of their ability to assemble completed systems, they may still profit from the sale of kits, which is less intensive of infrastructure, labour, etc.
6. IIL can maintain control of the technology by tracking (a) sales of the *Otello* computer control system and (b) sales of the accumulator components made through Olaer. Managing the distribution of a kit-form product by tracking the sales of its electronic control system is based on the business model employed by Permo-Drive²⁶. Reporting and auditing procedures are also built into the license and preferred supplier agreements.
7. The ability to rapidly deploy this system on a worldwide scale represents a significant competitive advantage over other waste heat recovery technologies

²⁶ www.permo-drive.com.au

that may potentially be delayed by the manufacture and supply of unique and highly specialised components.

Over time, the preferred component suppliers will ramp up their own production to match the demand for the *Otello* systems; however, this process can be instigated and managed by each supplier to suit their own requirements and constraints. The distribution process is ready for the *immediate* supply of components for the early systems. The event that is expected to trigger the beginning of sales is the demonstration of an operational system, which is the topic of the next two sections.

4.2 First System Development Status

The first *Otello* system is currently under construction at the Rendsburg, Germany, workshops operated by BIG Biogas GmbH. The system is being built inside a 20-foot shipping container that will house a diesel, gas or biomass fuelled generator and the *Otello* waste heat recovery engine. The main structural components of the system including the water bath and accumulator rack have been built and installed, as shown in Figure 2. A total of 24 accumulators (including three with their bladders removed) were installed in the prototype system. Associated piping and connections have been delivered and are being installed. Valves have been delivered, although some pneumatic controls are pending. BIG Biogas is awaiting delivery of heat exchangers, a 70 kWe generator and the turbine²⁷.



Figure 2 – Installation of Otello main structural components (left) and water bath with accumulators (centre), and a top view of the water bath showing accumulator housing and fluid ports (right).

IIL is supporting the development of the first *Otello* system by providing financial assistance to BIG Biogas for the purchase of some components, by assisting with finding suppliers and, when required, by providing technical assistance and engineering advice. In parallel, Olaer has confirmed the availability of pressure vessels with thinner walls than those currently rated to a design pressure of 300 bar (which is higher than

²⁷ Personal communication from Schlagregen, B., of BIG Biogas, GmbH, 25 April 2008.

necessary), which will improve the heat transfer performance and reduce material usage on subsequent systems.

4.3 Australian Otello Project

In addition to supporting the product development activities of BIG Biogas in Germany, IIL also intends to build an *Otello* system in Australia. The main aspects of the project will be:

1. It is intended that the project will be managed by the Australian regional licensee of the *Otello* technology. The Australian licensee will contribute the workshop facility and labour requirements. The size of the system to be built will be selected by licensee in order to suit their requirements, but will likely be in the range 10 – 100 kWe. The heat source may be a diesel engine or any other suitable heat source selected by the licensee.
2. Where possible, component suppliers will contribute to the development of the system at their own cost. Where this is not possible, IIL will purchase the components and provide them to the regional licensee for inclusion in the system. IIL will contribute the use of the technology and patents at no cost, by waiving the 10 % commission typically payable by the licensee and component suppliers. IIL can also contribute technical advice and engineering expertise at no cost.
3. When the system is functional, the system will be demonstrated and tested by an independent third party to confirm performance, fuel savings, power outputs, etc.
4. The Australia licensee shall then either (a) retain the machine or (b) sell it to the first customer and repay the suppliers and IIL for the parts contributed, retaining any additional revenue as profit. In either case it is essential that the licensee, component suppliers and IIL retain the right to access the *Otello* for demonstration purposes. In the case (a), retaining the machine would enable the licensee and/or IIL to further optimise the system.

The benefits of this project will include:

- **For the Australian Licensee:**
 - Control of the development project, including the selection of the size (power output level) that best suits their requirements, and project management of their own staff and facilities, etc.
 - Ability to trial manufacture and assembly techniques and procedures before the system is presented for sale. This will add a significant level of flexibility to final deadlines and performance requirements.
 - Reduced financial risk because the component suppliers and IIL will provide the necessary parts for the project.

- Opportunity to optimise the system for improved performance, reduced costs, etc.
 - Retain access to a working system to demonstrate *Otello* to prospective customers from licensed countries.
- **For the Component Suppliers:**
 - Increased sales through demonstration of a new product based on their components.
 - Retain access to the system to demonstrate *Otello* to prospective customers from the Australia/Asia region.
- **For IIL:**
 - Ability to have the system independently verified in Australia.
 - License fees revenue on all subsequent sales, following the demonstration of a working system.
 - Retain access to the system to demonstrate *Otello* to prospective customers from the Australia/Asia region.

4.4 Major Projects

In parallel with or following the Australian *Otello* Project, IIL also intends to deploy the *Otello* system in large power generation projects in the one-to-several megawatt class. The system may be particularly well suited to solar thermal, power station waste heat recovery, or combined power station waste heat recovery / solar thermal applications (as described in the Market Analysis section). IIL is seeking a development partner such as a utility company, State government or power station operator to build a demonstrator plant. Applications involving waste heat recovery from a power station are particularly favourable because the heat source, electricity grid connection, demand for electricity and vacant land are all readily available in one location.

A potential arrangement could see the power station contributing the heat source (waste heat supply and heat exchangers), grid connection and land, and either IIL, its preferred suppliers or the Australian licensee contributing the *Otello* system. If any concentrated solar reheating of the heat transfer medium is required (if the temperature of the power station waste heat does not meet the minimum *Otello* requirements), then this system could be either contributed by a supplier of solar concentrator technology or purchased by the other partners. The co-operating partners could then share the ongoing revenue of the new power generation facility, in appropriate and agreed proportions. The power station may also benefit through the generation of carbon credits, reduced cooling load on the condenser system (which is especially relevant to new air-cooled power stations, such as the Kogan Creek station in Queensland), and reduced thermal impact on the local environment.

5. Sales

For the worldwide marketing and sale of *Otello* systems, IIL will rely on the advertising and promotion efforts of its regional licensees and preferred component suppliers. This will enable IIL to benefit from (a) the local knowledge of the licensees, and (b) the motivation of the licensees and suppliers to continually expand their businesses through sales.

5.1 Method of Sales

The regional licensees will be the primary points of contact for making sales. Customers may deal either directly with the regional licensees or be referred there by another entity such as a global component supplier (such as Olaer) or IIL itself. Upon making contact with the customer, the regional licensee will determine whether the desired product is a kit for self-assembly, or a complete system, and whether any on-site installation is required. The licensee will then, upon determining the correct sizing of the system and components, place orders with the preferred global suppliers for the provision of those parts. These parts will then be delivered by the various component suppliers either to the customer (in the case of the self-assembly kit) or to the licensee's premises. The licensee will then facilitate all necessary assembly, delivery and/or installation tasks, as required. The licensee will then report to IIL that a sale has been made, including information such as the number of components supplied, the suppliers used and the final sale price (excluding delivery and installation). The licensee shall then pay IIL a 10 % license fee (based on the retail sale price of the *Otello* system, excluding delivery and installation costs). IIL shall also receive 10 % payments from the various preferred component suppliers used.

The regional licensees will also be the main points of sale for any ongoing servicing, replacement parts and software updates. A similar process will be followed as the initial sale, whereby the licensee facilitates the ordering and installation of any required components and then reports this information to IIL.

5.2 Sales and Marketing Strategy

Primary responsibility for the marketing of the *Otello* waste heat engine will lie with the regional licensees. In this way, licensees, such as BIG Biogas, will use their own networks of local contacts, previous customers, and known operators of diesel gen-sets to promote and distribute the product. This method has the advantage of allowing IIL to benefit from the existing and extensive local networks of contacts established by the regional licensees. The demonstrated ability to access such networks will be an important consideration in the granting by IIL of an exclusive license. This method also benefits from the motivation of the regional licensees to expand and develop their own businesses through sales.

It is intended that the preferred global suppliers, such as Olaer, will also advertise the *Otello* product on their websites and in additional advertising material (brochures, etc.), where appropriate. Any sales that are generated in this manner will be directed through the local regional licensees. The component suppliers will benefit from this method of

advertising and sales through the provision of parts for the additional products in excess of those advertised and sold by the licensee only.

In support of these activities, IIL will, in addition to advertising the *Otello* system on its website, provide at no cost documentation and other information to assist the regional licensees with advertising and promotion, such as the *Otello* System Overview document (see accompanying document), and various *Powerpoint* and *Flash* presentations. IIL is also able to provide expert engineering advice for novel applications of the system, if required. This will assist regional licensees in making sales into new market sectors involving new applications of the technology.

6. Management

6.1 Board of Directors

The IIL board of directors brings together a motivated, experienced and innovative team of professional from a variety of complimentary backgrounds in the corporate, environmental and engineering fields. The board of directors includes:

- Executive Chairman and CEO, Mr. Stephen M. Hargreaves (founder & major shareholder), whose experience includes the successful establishment of several companies, capital raising and the management of public companies for the commercialisation of inventions.
- Mr. Ian Kiernan, AO, founder of *Clean Up Australia* and celebrity environmental campaigner with significant domestic and international political contacts, including former US Vice President Mr. Al Gore.
- Dr. Nicholas Ward, whose PhD in combustion and heat transfer gives him considerable experience in the design and prototyping of novel fluidic systems and engineering project management.
- Several UK-based directors also provide local knowledge and contacts for European operations.

Further corporate information is available on the IIL website²⁸.

6.2 Support Services

In addition to the skills and experience available at board level, IIL draws on a wide network of first class support services including PKF Accountants, company secretarial service provider Company Matters, specialist patent attorney (and patent attorney for the world's largest automotive laboratory, AVL), Mr Michael Babeluk, and engineering and project management advice from development partners, including Olaer and other contacts.

²⁸ www.internationalinnovations.com.au

7. Summary

This document has described IIL's development plans for the innovative and versatile waste heat recovery product, *Otello*. The system requires only off-the-shelf components, which will enable IIL to, through partnerships with mature global companies such as Olaer, make use of existing worldwide manufacture and supply networks. The product will be sold in kit form through regional licensed distributors. The *Otello* waste heat recovery system is IIL's response to the excellent market opportunity presented by the growing need for electricity, demand for more environmental sustainability, and the rising cost of fuel.

Otello converts heat into electricity.

Otello converts waste into a valuable commodity.

IIL plans to convert this opportunity into success!

Accompanying Documents

1. *Otello* System Overview
2. [Electronic] *Otello* Flash presentation

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