

#### Wasabi Energy Limited

ABN 24 000 090 997 Level 9, 175 Collins Street Melbourne Vic 3000 Australia

Telephone: +61 3 9663 7132 Facsimile: +61 3 9650 0066 www.wasabienergy.com

# ASX

# **Announcement**

11 January 2011

# Wasabi Energy Limited subsidiary acquires Húsavík Kalina Cycle® Geothermal Power Plant in Iceland.



- Major step towards becoming an Independent Power Producer (IPP)
- Acquisition initiates the execution of the Kalina Cycle® build-own-operate (BOO) strategy
- Húsavík power plant to serve as key Kalina Cycle® reference plant following refurbishment
- Approval from the Government of Iceland's Foreign Investment Review Committee expected shortly

Wasabi Energy (ASX: WAS, AIM: WAS) is pleased to announce that its subsidiary, Global Geothermal Limited<sup>1</sup>, has acquired the Orkuveita Húsavíkur (Húsavík) geothermal power plant (*figure* 1), located at the township of Húsavík, in Northern Iceland.

This significant acquisition signals the commencement of Wasabi Energy's Kalina Cycle®2 build-own-operate strategy and involves refurbishing the existing power plant to maximise power generation.

As the first geothermal Kalina Cycle® power plant installed over a decade ago, the Húsavík geothermal power plant (the "Power Plant") provides an important reference plant for the Kalina Cycle® technology and also provides a strong platform for targeting larger, low enthalpy geothermal projects, globally.

Since Wasabi Energy announced its intention to acquire the Húsavík geothermal power plant, extensive reviews of the project have been conducted, before a formal decision to acquire the Power Plant was made. The Power Plant is not currently operational and refurbishment activities will commence immediately after receiving formal approval for the acquisition from the Foreign Investment Review Committee of the Government of Iceland with power generation expected to resume in the second quarter of 2012.

#### Húsavík Kalina Cycle® Power Plant - Side Elevation



Details regarding the acquisition of the Húsavík geothermal power plant have been provided in the following sections:

- >> Húsavík Geothermal Power Plant page 2.
- >> Outline of Acquisition page 3.
- >> Chairman's Comment page 4.
- >> Comments from Iceland page 4.

<sup>1-</sup> Global Geothermal Limited is a majority owned (~94.9%) subsidiary of Australian Securities Exchange (ASX: WAS) and Alternative Investment Market (AIM: WAS) listed, Wasabi Energy Limited.

<sup>2 -</sup> Kalina Cycle® is a registered trademark of Global Geothermal Limited. The Kalina Cycle® is a patented power cycle technology owned by Global Geothermal Limited.

#### **Húsavík Geothermal Power Plant**

The Húsavík geothermal power plant is an important power generation asset for Wasabi Energy, as it was when built, the first geothermal application of the Kalina Cycle® technology. The power plant represents an innovative and highly efficient utilisation of geothermal energy through the design

and operation of an integrated district heating and power generation system, in the form of a combined heat and power plant (CHP). Additional thermal energy is recovered from the geothermal brine leaving the Kalina Cycle® power plant, and is utilised for both residential and industrial uses.

Húsavík Kalina Cycle® Power Plant - Front Elevation

#### **Overview**

Commission Date: July 2000

Generation Technology: Kalina Cycle®

**Plant Configuration:** Combined heat & power

**Power Plant Output:** 2,000 kWe Net of parasitic losses: 1,700 kWe

Thermal Output Capacity: 20,000 kWth

**Brine Parameters:** 90kg/s at 121°C

*Outgoing brine temp:* 80°C

Kalina performance: Above specifications

Ownership Acquired by: Global Geothermal Limited<sup>1</sup>

#### **Location of Geothermal Resource & Power Plant**



# Geothermal Well Field - Source of brine for Húsavík



#### **Performance and Refurbishment**

Following the construction of the Húsavík geothermal power plant, independent tests during November 2001 verified the Kalina Cycle® power plant's net output exceeded the design specifications and operated reliably with a high level of availability, confirming the thermodynamic efficiency of the technology.

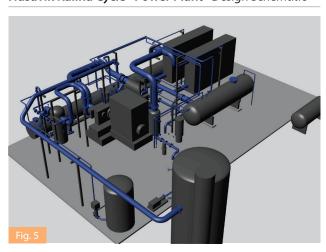
Global Geothermal intends to refurbish the power plant to maximise power output, and expects to resume power generation in the second quarter of 2012.

For additional information on the terms of the acquisition and the planned refurbishment of the power plant, refer to:

>> Outline of Acquisition -

page 3.

#### Húsavík Kalina Cycle® Power Plant - Design Schematic



# **Outline of Acquisition**

The rationale for the acquisition of the Húsavík geothermal power plant consists of a number of key drivers and is an important component of Wasabi Energy's Kalina Cycle® buildown-operate strategy. The acquisition is the first step in Wasabi Energy becoming an independent power producer

and will position the Kalina Cycle® as the technology of choice for low temperature geothermal power plants. Key terms of the acquisition are outlined below, however specific details of agreements with the City of Húsavík and Húsavík Energy remain confidential, due to commercial sensitivities.

#### **Key Terms of Acquisition**

- · Global Geothermal Limited has entered into binding agreements with the City of Húsavík and Húsavík Energy to acquire the Húsavík geothermal power plant
- Global Geothermal Limited will engage its wholly owned subsidiary, Recurrent Engineering LLC and specialist contractors to refurbish the Húsavík power plant
- Refurbishment and commissioning of the power plant by Global Geothermal Limited is expected to be finalised during the second quarter of 2012, with commercial power generation commencing shortly after
- Global Geothermal Limited will sell power into the Icelandic national grid through a power purchase agreement (PPA) with the regional utility, Orkusalan ehf.
- The acquisition includes all existing site infrastructure, a long term lease of the site where the plant is located and all existing environmental and operating permits
- The City of Húsavík will supply brine to the power plant and has an option to repurchase the plant in certain circumstances under pre-agreed terms
- The transaction is conditional on approval by the Foreign Investment Review Committee of the Government of Iceland, which is anticipated by the end of January 2011

# **Rationale and Market Opportunities**

Iceland has a strong history of innovation in geothermal energy utilisation, as evidenced by the world's first geothermal Kalina Cycle® power plant being built in Iceland. Furthermore, Iceland has a strong geothermal services sector with many specialised geothermal contractors providing technical services to both established and emerging geothermal markets globally, particularly in the resource evaluation and engineering segments. For these reasons Iceland continues to be an ideal location for a geothermal Kalina Cycle® reference plant.

Although the high temperature geothermal potential of Iceland is well recognised with a number of large operating geothermal power plants based on conventional "flash" technology, the lower temperature (<150°C) geothermal resources have been largely overlooked for power generation.

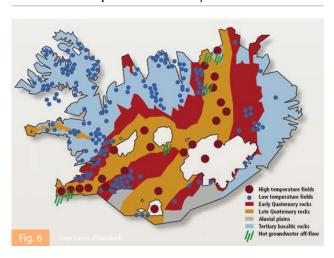
To date 30 separate high temperature geothermal fields have been identified in Iceland<sup>3</sup>. In contrast there are approximately 250 lower temperature geothermal occurrences in Iceland<sup>3</sup>, particularly in the west of the country (figure 6), where the Kalina Cycle® is likely to offer efficiency advantages in power generation.

For additional information on the market potential for the Kalina Cycle® in Iceland, refer to:

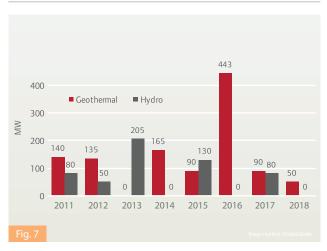
Comments from Iceland -

page 4.

### **Geothermal Map of Iceland**<sup>4</sup> - Simplified Distribution



# Additional Power Capacity in Iceland<sup>5</sup> - Forecast



<sup>&</sup>lt;sup>3</sup> - Energy Authority of Iceland, Renewable Energy in Iceland, June 2009 Publication.

<sup>4 -</sup> Adapted by Activated Logic from Islandsbanki Geothermal Research, after Reykjavik Energy - Nesjavellir Information Brochure.

<sup>&</sup>lt;sup>5</sup> - Adapted by Activated Logic from Islandsbanki - 2010 Iceland Geothermal Energy Market Report, based on ASI data.

#### Comment from the Chairman

Executive Chairman of Wasabi Energy and Director of Global Geothermal Limited, Mr. John Byrne commented:

"The acquisition of the Húsavík power plant is a key step in transitioning Wasabi Energy's Global Geothermal Limited subsidiary from purely a technology company, into a developer and operator of sustainable power generation assets, through our Kalina Cycle® build-own-operate strategy."

"The primary objective of the build-own-operate strategy is to develop an ongoing and profitable revenue stream through the sale of reliable and emission free power, whilst we establish the Kalina Cycle® as a major power generation technology."

"Our U.S. based engineering team, Recurrent Engineering LLC has worked diligently to comprehensively review this exciting opportunity since we first executed an MOU with the City of Húsavík in April 2010. We are also committed to ensuring the safe and efficient operation of this innovative geothermal power plant."

"We are delighted to be making our first geothermal acquisition in Iceland and we look forward to providing the people of Húsavík with a reliable, safe and clean source of power whilst working closely with the Icelandic geothermal community to deliver the benefits of our Kalina Cycle® technology."

Yours Sincerely,

Mr. John Byrne
Executive Chairman

#### For further information contact

**Australian Enquiries** 

Mr. John Byrne Wasabi Energy Limited

Ph: +61 (0)3 9663 7132

<u>U.K. Investor Enquiries</u> Ivonne Cantu / Beth McKiernan Cenkos Securities plc

Ph: +44 (0) 207 397 8900 / +44 (0) 131 220 9778

<u>U.K. Media Enquiries</u> Mr. Josh Royston / Ms. Hilary Millar

Threadneedle Communications

Ph: +44 (0) 207 653 9850

#### **Comments from Iceland**

Shortly before Wasabi Energy announced the execution of an exclusive Memorandum of Understanding with the City of Húsavík in April 2010, the leading geothermal research team of major Icelandic bank, Íslandsbanki, released a landmark report outlining the significant geothermal opportunities in Iceland. Íslandsbanki has played a key role in the development of the global geothermal sector, particularly in Iceland, as well as in North America.

#### **Comment**

Author of the 2010 Iceland Geothermal Energy Market Report and Director of Íslandsbanki Geothermal Energy Division, Mr. Alexander Richter commented:

"With 575 MWe of installed geothermal power generation capacity, Iceland is the 7<sup>th</sup> largest producer of geothermal power in the world. Various estimates indicate that Iceland has the potential to sustainably generate somewhere between 3,000 and 4,250 MWe of additional geothermal power."

"In Iceland there are currently 27 geothermal projects on the drawing board which could add up to an additional 1,068 MWe of geothermal power generation capacity (figure 7). On the demand side of the equation, our analysis shows that the forecast demand for power in the immediate vicinity of Húsavík alone potentially exceeds 400 MWe, depending on whether a number of large proposed industrial projects materialise, highlighting the demand for power in the north of Iceland."

"The acquisition of the Húsavík geothermal power plant announced by Wasabi Energy today, provides not only the greater Húsavík region with increased economic opportunities, but also has potentially significant ramifications for power generation from low-enthalpy geothermal resources, globally."

Executive Director of Íslandsbanki's Geothermal Energy Division, Mr. Árni Magnússon commented:

"Over the last few years, Íslandsbanki has published a number of geothermal research pieces, including our annual U.S. Geothermal Energy Market Report, but we have not released any of our research into the Icelandic geothermal energy market until quite recently."

"In the current economic environment, Iceland is increasingly interested in the development of our country's renewable energy resources and we recognise that geothermal energy will continue to be a key driver for attracting foreign investment and assisting in the economic development of Iceland."

# Overview of the Kalina Cycle® technology

Global Geothermal's Kalina Cycle®, the proven and most thermodynamically efficient power cycle technology in the world, is now on the verge of large-scale adoption in:

- Enhanced Energy Efficiency (EEE), and
- Renewable Energy Generation (REG);

applications, across the globe.

Building on the initial Kalina Cycle® Technology breakthroughs in the mid 1980's, the innovative technology has undergone intensive development, optimisation and large-scale demonstration with some of the most significant power generation and industrial companies in the world. A comprehensive suite of second generation Kalina Cycle® innovations including the patented RIP-Cycle and Multiple Heat-Source applications have recently been pioneered by Global Geothermal Limited; however the superior and unparalleled thermodynamic efficiencies remain firmly at the core of the Kalina Cycle®.

The superior efficiency of the Kalina Cycle® provides an environmentally sustainable alternative for power generation, whilst offering significant savings in the construction of new power generation capacity and ongoing operational costs.

The thermodynamic power cycles which collectively constitute the Kalina Cycle® have been reviewed and verified by the U.S. Department of Energy (DOE), numerous leading universities and a variety of independent researchers and consulting engineers over a 20 year period, including, most recently, Shaw Group's Stone & Webster.

The Kalina Cycle® is the greatest innovation in power generation technology in over a century.

The adoption of the Kalina Cycle® is underpinned by a series of operational and economic advantages over alternative power generation technologies.

# **Operational Advantages**

- Use of existing and proven power plant components
- Underlying principles are simple and understood
- Ammonia has no ozone depleting potential
- Less sensitivity to decreases in heat source temperature
- Safe power plant configuration
- Improved design performance on both hot & cold days

### **Economic Advantages**

- 10% to 50% more power with the same heat input
- Lower power plant auxiliary loads
- Ammonia is a relatively inexpensive working fluid
- Very high capacity factor with minimal downtime
- Reduced capital cost for fixed output rating
- Optimise plant efficiency with ammonia-water variation

# Global Geothermal's Kalina Cycle®.

The next-generation, power cycle technology.



#### About Íslandsbanki

- · Headquarters in Reykjavík Iceland
- Dedicated geothermal energy research team and experienced corporate finance division
- Strategic geothermal alliance with Australian renewable energy corporate advisory firm, Activated Logic
- Full time equivalent employees 1,065

Based on Financial Report for the first 9 months of the year to 30 September 2010, as announced by Islandsbanki on 1 December 2010:

- Total assets of US\$6.24<sup>^</sup> billion
- Profit after tax of US\$115<sup>^</sup> million
- Based on US\$1:114.5 ISK at 5 January 2010

#### **Geothermal Experience**

Íslandsbanki and its predecessor, Glitnir, are recognised globally for their efforts in supporting the development of the geothermal sector through the delivery of innovative solutions, including securing financing for project developers and a major U.S. geothermal drilling company.



# 2010 Iceland Geothermal Energy Market Report

Download full 36 page report from:

>> islandsbanki.is/energy

#### **Corporate Information**

General corporate information regarding Wasabi Energy and the companies Wasabi Energy holds a strategic investment in can be found in this section. Announcements regarding Wasabi Energy corporate developments are made to the Australian Securities Exchange (ASX) AIM and are also available on the Wasabi Energy website. Additional information regarding the investee companies can be found at their respective web sites, details below.



#### **About Global Geothermal Limited**

Global Geothermal Limited (GGL) holds an extensive Kalina Cycle® intellectual property portfolio and is focused on licensing the innovative technology into two core business streams, Enhanced Energy Efficiency (EEE) and Renewable Energy Generation (REG).

In 2007, Global Geothermal Limited, a private company incorporated in the United Kingdom, was established to consolidate the global Kalina Cycle® intellectual property interests, which involved the acquisition of U.S. based engineering firm, Recurrent Engineering LLC, now a wholly owned subsidiary. The initiation of new Kalina Cycle® projects generally requires Global Geothermal Limited issuing a Kalina Cycle® technology license to the project developer, and for Recurrent Engineering LLC to provide the power cycle engineering necessary for the design of the Kalina Cycle® power plant.

Global Geothermal Limited's majority shareholder, Wasabi Energy Limited has been progressively increasing its ownership interest in the Kalina Cycle® technology for over 5 years, through the acquisition of a range of commercial interests and substantial intellectual property portfolios. Wasabi Energy currently holds ~94.9% of Global Geothermal Limited.



#### **About Wasabi Energy**

Wasabi Energy Limited is an Australian Securities Exchange listed public company (ASX: WAS) with a secondary listing on the AIM market of the London Stock Exchange (AIM: WAS) that holds strategic investments in companies and projects it believes can provide solutions to the world's energy and environmental challenges. Wasabi Energy is actively involved in the management of the respective investee companies and assists in the achievement of critical business milestones, financing growth and ultimately the delivery of results that matter.

Wasabi Energy has recently focused its portfolio of investments into three core business streams, renewable power, sustainable water and renewable biofuels. Each of these core business streams is represented by a strategic corporate investment by Wasabi Energy (Global Geothermal Limited, Aqua Guardian Group and Australian Renewable Fuels, respectively) and has been strategically selected to provide solutions for the key sustainability challenges facing the world.

Additional information: www.wasabienergy.com







Wasabi Energy Ownership: 94.9%

Wasabi Energy Ownership: 50%

Wasabi Energy Ownership: 23.3%

globalgeothermal.com

aquaguardiangroup.com

arfuels.com.au







