



THE UNIVERSITY OF  
MELBOURNE



ENERGY  
Research Institute

*Victorian  
Geothermal  
Assessment Report*

*Briefing paper  
August, 2009*





## MOTIVATION

Over the past decade, the case has been made for humanity to take serious action to minimise the effects of climatic change. The challenge now is to develop sources of energy that will meet global requirements whilst being environmentally sustainable.

Important contributions are already being made by wind and solar systems, but base load power options providing continuous energy generation will be needed. Clean coal technologies will provide some respite from the damaging effects of the coal emissions, but remain undemonstrated at the scale required to provide a significant contribution. Nuclear power has significant societal barriers to overcome.

Geothermal energy is a potential alternative that could provide significant base load power with almost zero carbon footprint. While the potential is huge, the technology for extracting geothermal energy in geological settings such as Australia remains to be proven at commercial scale.

With global interest in geothermal energy accelerating, Australia is leading the race to produce enhanced geothermal energy. While our highest profile prospects occur in South Australia's Uranium-rich hot rock province, there is growing awareness that Victoria's insulating sedimentary basins offer great potential particularly where they contain thick heat-trapping coals.

The Victorian Geothermal Assessment Report (VGAR) will provide a rigorous evaluation of geothermal energy in Victoria, paving the way for substantial investment should this new energy option prove viable.

The University of Melbourne has initiated this project to provide a full geophysical, technical, legal and economic assessment of the potential for geothermal energy in Victoria. The project will provide an independent, detailed evaluation of the prospects for geothermal energy production in Victoria and the most promising technologies required to develop a commercially viable industry. It will address the necessary R&D hurdles that need to be addressed to realise any potential, and highlight existing investments and synergies.

This project would bring the intellectual strength of the University of Melbourne to bear on a global issue, with the possibility of a major impact locally. It will be a flagship project for the new Melbourne Energy Institute.



## Project Scope

### **What geothermal resources exist in Victoria?**

Geothermal energy production requires temperatures ideally above 200°C within 5 kilometres of the earth's crust. As yet, accurate identification, analysis, and mapping of geothermal resources in Victoria at this depth do not exist. VGAR will examine existing data, determine the most efficacious method for obtaining the necessary new data, and assess the most promising areas in Victoria for geothermal energy production.

### **What new technologies need to be developed?**

Above ground, the technologies used are 'low temperature' electricity generation methods, as distinct from the higher temperatures used in coal-fired plants. This technology is well-understood, but must be optimized for local conditions. However there is still much to be learned about the development, stimulation and management of reservoirs at depths of 5km. In Victoria, reservoirs that are being examined for Carbon Capture and Storage. Probably the largest unknown is the expected behaviour of the high temperature fractured rock at depths of four to five kilometres.

### **What are the likely economics?**

The economic case for commercial power production will need to consider the full cycle of costs from exploration, drilling, to plant, regulatory and environmental impact. In addition, an assessment of the cost of R&D is required. The impact of proposed Emission Trading Schemes will be assessed.

### **What are the appropriate institutional mechanisms and regulatory frameworks?**

A critical evaluation of the legal and regulatory regime applicable to exploration for and extraction of geothermal energy in Victoria will be performed with particular emphasis placed upon the scope of the powers of the Commonwealth and State governments, security of title, environmental controls and land rehabilitation requirements, fiscal arrangements, project finance considerations, access to energy markets, third party access to infrastructure, and liability of operators.

### **Synergies with existing R&D programs**

Novel systems and processes for the efficient capture of the heat from the working fluid need to be developed to ensure that it is put to maximal use. For example, could CO<sub>2</sub> be used as the working fluid? If water is used as the working fluid, the quality and quantity of the water required, needs to be assessed. For example, hot water may be available for a variety of uses, including desalination. The technology for geothermal exploration and monitoring is immature; with the expertise being marshalled for VGAR, it is expected that



significant impact can be made in the design and development of new imaging and monitoring instrumentation for geothermal exploration and resource management. This technology might also be beneficial for monitoring geosequestration.

## Outcomes

VGAR will be a comprehensive independent report, to be released publically in September 2010, detailing:

- The most promising locations in Victoria for geothermal energy production given the geology, water supply, and existing electricity transmission infrastructure
- The current state of technology, key areas of uncertainty and estimation of likely ability to solve these
- The economics of geothermal in the most likely Victorian locations
- Models for funding realistic options: R&D, prototype and production plants

## PROJECT DESIGN

### Staff

The project will be managed by Prof. Edwin van Leeuwen. Other contributions will be provided either on a consultancy basis or pro bono.

Prof. Edwin van Leeuwen will be joining the Melbourne Energy Institute to Manage VGAR and build new energy initiatives at the University of Melbourne. He brings a record of exceptional contribution to the mineral exploration, mining and energy industries and achievement in leading large multidisciplinary projects and teams. He is a recipient of the Clunies Ross Award (2002), Prime Minister's Centenary of Federation Medal for Service to Australian Society in Science and Engineering (2003) and the CSIRO Medal for Research Achievement (2000) and was elected as a fellow to ATSE in 2000. While at BHP he led the development of the US\$20 million airborne gravity gradiometer project that delivered one of the most significant advances in geophysical exploration in the past fifty years.

### Timelines

First steering group meeting	August 2009
Project team commences	September 2009
Report delivery	September 2010



## Budget

The project has been costed at \$500,000 for the full year. The University of Melbourne is providing half the cash for the study, but additional funding is required and is being actively sought. In addition, in kind contributions to the study will be welcomed.

## Steering group

The steering group will comprise:

Prof Rachel Webster	(UM: Chair)
Prof Mike Sandiford	(UM: Geophysics)
Prof John Daley	(Grattan Institute)
Dr Adrian Williams	(Industry: Geodynamics)
Prof Michael Crommelin	(UM: Law)
Prof John Freebairn	(UM: Economics)
Prof Ian Johnston	(UM: Engineering)
Dr Shane Huntington	(UM: Strategy & Public Relations)
Ms Kathy Hill	(Geoscience Victoria)
Prof Edwin van Leeuwen	(UM: Project manager)

## The Melbourne Energy Institute

VGAR is a foundation project of the University of Melbourne's recently formulated Melbourne Energy Institute (MEI). The MEI is one of a set of new cross-disciplinary institutes that focus on crucial society issues and provide leadership for the University's research. The mandate of the MEI is new science, new technologies and new ways of thinking for our future energy needs. MEI coordinate's University wide research across the energy space and helps forge research partnerships with regional and international partners.

## Key Contacts

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