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Submission on the United States Blue Ribbon Panel Geothermal Report

U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
1000 Independence Avenue, SW
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UNITED STATES OF AMERICA

Attention: JoAnn Milliken

On behalf of the New Zealand Geothermal Association

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The New Zealand Geothermal Association (NZGA) would like to thank the United States Department of Energy for the opportunity to comment on the paper entitled "Geothermal Technologies Program Blue Ribbon Panel Recommendations[1]".

The NZGA is an independent, non-profit association that provides information on geothermal phenomena and utilisation for industry, government and educational organisations. In addition, the NZGA, as a member of the International Geothermal Association, contributes to the international exchange of information within the geothermal development industry. NZGA membership comprises participants, regulators, and interested parties within the geothermal community. It totals 305 members currently.

General comments

Firstly, we recognise that the United States Department of Energy is well informed about geothermal matters through its own experts and other US-based industry participants. Further, that the recommendations up for debate in this paper follow a guided discussion, so will represent an agreed view from a diverse range of geothermal thought leaders. As such there is little that we can add to the discussion. However, from a distance and with a slightly different perspective there are some minor areas where we can contribute.

It appears to us that the USDOE has been too self-effacing in this exercise, such that some areas for attention in a geothermal program have been overlooked in the recommendations. The last paragraph on page 2 starts "Panel members expressed the view that the role of DOE is to support a portfolio of R&D activities addressing the short-term (2020) and the longer term (2050)…" Of course DOE should also be addressing policy issues (and this is touched on in the report in a key discussion around page 8), and broad energy market issues (particularly addressing possible market failures) that may be hindering geothermal development.

Permitting

One of the policy improvement areas suggested in the report is around permitting of projects. New Zealand has an alternative system based around an act called the Resource

[1] http://www1.eere.energy.gov/geothermal/pdfs/brp_draft_report_june_17_2011.pdf

Management Act 1991[2]. This devolves decision making on resource and development approvals down to regional and district government. There is no bidding system for resource development. Rather, any person can seek consents to develop any resource. The application is considered in the light of broad regional plans and policy statements, wider government imperatives, and response of the public. There are positives and negatives to such an alternative permitting scheme, but we point out that 289 MW of geothermal electricity capacity was developed in the US between 2000 and 2009, while similar capacity has been developed in New Zealand over a similar period despite a weaker economy and smaller resource base. There may be some lessons to be learned from alternative permitting systems.

Market Failures

It is noted on page 3 that panellists did not favour investment in research, development and demonstration of a range of geothermal options "due to the absence of any major technical challenges in those areas." This is a very narrow view.

As an example, we point out that in New Zealand we have some of the largest industrial applications of geothermal energy in the world. These include heat supply to large pulp and paper mills, heat to timber drying kilns and most recently heat to a milk drying plant. These applications, with their flow-on effects on the economy are absent from the US, not because of technical challenges but because of market failures. In the US, heat users have failed to recognise that competitively costed, suitable quality heat is available from geothermal sources if development is of sufficient size. We are still working to offset this low level of comprehension in New Zealand too, but demonstration plants and case studies are key to ensuring that a market failure around lack of knowledge does not hinder geothermal development. We believe market failures such as this fully justify such government interventions.

A Low Temperature Program

The panellists did not see a role for R&D and demonstration of low temperature geothermal applications, because there are few technological challenges. That in itself is debateable, but more significantly, there is also scope for making use of high temperature fluids down to lower temperatures. One degree delta T is as useful at the low end as at the high end and there is considerable scope for R&D into how to avoid scaling and corrosion if high temperature fluids are subject to additional cooling e.g. in binary cycle plants.

The importance of projects being economic is acknowledged, but this could be taken further to develop robust, publically available financial models for geothermal projects of a variety of types (e.g. including pumping) with sensitivity analysis for key factors such as permeability. Subir Sanyal and colleagues have published a number of papers on aspects of this topic in recent years which give a good foundation.

The New Zealand Government has put emphasis on development of both heat and electricity generation from geothermal energy, recognising that commercial interests are well aware of the competitiveness of electricity generation relative to other fuels, while fewer commercial parties are aware of the potential competitiveness of geothermal heat. We note that heat projects can be more people-intensive than electricity generation, thus can be an ongoing source of employment – a benefit in itself.

Drilling and Exploration Programs

There is a suggestion on page 3 of the need for a government-assisted drilling program as a means of securing development financing. We can offer some advice from New Zealand's geothermal history. Through the 1950s to 1980s almost all drilling for large scale New Zealand geothermal projects was undertaken by a government drilling company with full government funding. There were multiple exploration projects involving both geoscience and

[2] For an everyday guide to this Act see http://www.mfe.govt.nz/publications/rma/everyday/ while for the full Act with amendments see http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html

drilling to assess resources through the Taupo Volcanic Zone and at Ngawha in Northland. A wealth of knowledge was accumulated and this was released in a controlled manner through conference proceedings or government papers.

In the late 1980s and beyond there was major restructuring of government development interests, such that government pulled out of investigation and development in favour of private investment or investment by state-owned enterprises (SOEs). As a rule, the information available from the combination of drilling and early geoscience has given the Boards of private of public geothermal developers sufficient confidence to pursue their own investigations and development. Through passage of time, better geoscientific methods have developed such that all projects have had significant supplementary work undertaken, but the original research work by government departments including the drilling has been of huge benefit to the industry.

We note that on the bottom of page 3 the panel recommends "identifying new resources and fully exploring known geothermal resources areas (KGRAs)." A developer should never be satisfied with the exploratory work of a third party, and should always satisfy itself that the resource is adequate. Thus resources do not need to be "fully" explored, but rather 'adequately' explored to the point of encouraging a developer (and associated financiers) in further exploration investment.

Since government ceased its drilling and exploration programs, to date all subsequent implemented projects by private or public developers has been on fields explored and drilled by government, though there are also now two new greenfield exploration projects under way.

Staying Alive

There is an interesting phrase on page 4 about certain actions "to help the industry stay alive." It is not clear from the context whether this is referring to maintaining the drilling industry or the wider geothermal industry. Neither is under serious threat.

The geothermal drilling industry is largely in common with the oil and gas drilling industry. They draw on the same rigs, support services, crews, etc. There are some specialist skills which must be retained, but drilling businesses will have heavy calls on services from oil and gas such that there is no threat to their ongoing viability.

In terms of the wider geothermal industry, there is no shortage of upcoming work. There appears to be a large number of projects coming in the US. For any company with an interest in export dollars for services there are multiple opportunities through South America and locations such as Indonesia, the Philippines and Kenya. If a company is prepared to work then it can "stay alive".

Enhanced Geothermal Systems (EGS) Development

We are broadly supportive of the research directions associated with EGS, and note that this generally aligns with the interests of the International Partnership for Geothermal Technology (IPGT). We point out that the IPGT and IEA Geothermal Implementing Agreement are good forums in which to take account of what is happening in the rest of the world on EGS.

We note that Australian research is now being directed to weighing the balance of benefits between drilling into hot granites versus developing a resource in the overlying cover material. The opportunity to make a comparison in the same location is developing at Innamincka. While we understand that US money should ideally be spent in the US, there may be times when the best result for future US development is to consider and then invest in joint international projects in which costs and risks can be shared.

Page 6 also discussed investigations into new working fluids such as carbon dioxide to flush heat from a reservoir. We recommend some attention be turned to surface plant to be used in conjunction with this reservoir fluid.

Reducing Operating Costs

There has been a suggestion that some effort be directed at reducing operations and maintenance costs. While we support this to an extent, O&M costs for surface plant are relatively small. One of the major ongoing costs is associated with make-up and replacement wells. If the effort is directed to ways of reducing the cost of wells and drilling, then that will have a useful flow-on effect in terms of reducing these ongoing costs.

A Workforce Shortage

We are very surprised to read that there is not a workforce shortage in the US. The US geothermal industry has been able to support the development of 287 MW over the last 10 years, and the forecasts now are for major expansion domestically and internationally. Looking at the current status of the industry in one country alone is not adequate when facing such industry transformation. In New Zealand, we are looking at combinations of training, upskilling and international recruitment in the face of an ageing workforce. We are very pleased to see a new wave of scientists and engineers coming through into the industry. The US can do the same. A danger with a relatively small international community with geothermal skills is that we may simply engage in shuffling personnel in terms of where skills lie between nations, rather than expanding the pool of competent personnel in the face of increased activity.

We trust these comments will be helpful.

Yours faithfully

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New Zealand Geothermal Association