Submission Template

COAG Review Discussion Paper 1 – Eligibility of new small-scale technologies and heat pumps

Overview

This submission template should be used to provide comments on:

COAG Review Discussion Paper 1 – Eligibility of new small-scale technologies and heat pumps

The purpose of this discussion paper is to provide an introduction to the key issues relating to the eligibility of new small-scale technologies and heat pumps within the RET, and to encourage input on these issues from individuals, businesses and organisations to inform the review process.

Stakeholders are asked to use the template provided to answer the questions posed in the discussion paper. The Department will also accept any other documents, further information, costing tables etc that are attached to the submission template.

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Confidentiality

All submissions will be treated as public documents, unless the author of the submission clearly indicates the contrary by marking all or part of the submission as 'confidential'. Public submissions may be published in full on the Department of Climate Change website, including any personal information of authors and/or other third parties contained in the submission. If any part of the submission should be treated as confidential then please provide two versions of the submission, one with the confidential information removed for publication.

A request made under the *Freedom of Information Act 1982* for access to a submission marked confidential will be determined in accordance with that Act.

Do you want this submission to be treated as confidential? ☐ **Yes** ☒ **No**

Submission Instructions

Submissions should be made by **close of business 30 October 2009**. The Department reserves the right not to consider late submissions.

Where possible, submissions should be lodged electronically, preferably in Microsoft Word or other text based formats, via the email address - **RET@climatechange.gov.au**.

Submissions may alternatively be sent to the postal address below to arrive by the due date.

Renewable Energy Sub Group Secretariat
Department of Climate Change
GPO Box 854, Canberra ACT 2601

For more information phone: 02 6159 7428

Existing eligibility of small-scale technologies under the RET

Question 1: Are there any new small-scale renewable energy technologies not currently eligible under the RET which may be considered for eligibility to participate in the scheme? Details are sought on:

- a description of the technology and how it works (including how it uses renewable energy to generate or displace electricity); and
- the extent to which the technology has been or is ready to be deployed to the market, such as industry size, capacity and market penetration.

Under the *Renewable Energy (Electricity) Act 2000*, the Mandatory Renewable Energy Target (MRET) Scheme was established to guarantee a 20 year market using a system of tradable renewable energy certificates (RECs) to achieve an annual target of 9,500 GWh by 2010 and maintain this until 2020. According to the Office of Renewable Energy Regulator: "*The RET provides renewable energy power stations and owners of solar water heater and small generation unit installations (small-scale solar PV, wind and hydro electricity systems) with a financial incentive through the creation and trade of RECs via the REC Registry*".

However, no direct use applications of geothermal energy are provided with the benefit of this financial incentive.

Geothermal energy, a renewable and emissions-free energy source, has the potential to directly power a broad range of large scale applications, in particular district heating and cooling, and desalination. The extent to which these direct applications can provide base load energy, with cost-effective reduction in carbon emissions with simultaneous reduction of peak power loads from carbon based electricity, has been seriously under estimated. The direct use of geothermal energy is not new; it has been applied extensively in many parts of the world including Europe, Asia and North America and the technology is well proven. Several companies are now proposing to implement this form of energy extraction in Australia.

Our unique opportunity:
From a geothermal perspective Perth has a highly advantageous location and opportunity with the city sited over the Perth Basin - geothermal water at temperatures around 100°C, accessible at depths of just 3km below the Perth metropolitan area, are commercially suitable for district heating and cooling. The development of geothermally powered district heating and cooling networks, similar to the water, electricity and gas networks, have the potential to be employed over time on a substantial scale across the city.

The Perth Basin includes a series of extensive sedimentary aquifers down to depths in excess of 10 kms. Shallow aquifers, down to 1 km deep, have been used for bore and drinking water for many years. Low temperature geothermal energy, around 40°C, is also being recovered: swimming pools, including at the Challenge Stadium Aquatic Centre and at a number of schools, use low temperature geothermal energy from wells around 750m deep for heating the pools. But it is the medium temperature geothermal resources that make the Perth Basin truly unique. Temperatures between 75°C to 100°C to depths of 3kms are widespread through the Perth Basin providing the opportunity for widespread direct use of geothermal energy.

The development of these resources was initiated by the Government of Western Australia with the first release of acreage for geothermal exploration last year to which industry has responded well in uptake of tenements.

While other areas across Australia do have capability for hot aquifer geothermal energy, no other city is so well placed with such substantial resource.

Comparison with other renewable energy sources:
Geothermal energy provides energy 24 hours a day, 365 days a year, emits zero green house gases (energy required for driving pumps can be offset by geothermally powered electricity generation) and has only a small footprint. This contrasts with other renewable energy sources such as wind, wave and solar where energy is only available intermittently. To achieve a steady supply of electricity, wind and solar require back up energy supplies for times when they can not deliver.

The development of district heating and cooling by direct use of geothermal energy can provide:

- quiet, secure, base-load renewable energy
- an energy source with a predictable cost to the consumer not subject to global, national or climatic events
- substantial help towards the attainment of the State's share of the Australian renewable energy target,
- substantial replacement of carbon emitting fossil fuel generated electricity with zero emission geothermal heat energy
- a reduction, rather than an increase, in peak electricity demand,
- a 30 MWe to 50 MWe reduction in required electricity generation capacity for each new development of 50,000 people
- a showcase city viewed globally as a model city for combined district heating and cooling,
- added impetus in the growth of Perth as the Australian/Asian base for deep drilling (petroleum, mining and geothermal) expertise,
- export income from the expertise generated from the development of the technology in Western Australia, and
- support and impetus for the Western Australian Geothermal Centre of Excellence – which is substantially funded by the WA State Government

Geothermal energy applications:
Heating and cooling are typically a building's largest energy loads, accounting for more than 50 percent of the energy consumed in most commercial buildings.

District heating and cooling has proven to be a major contributor to green house gas reduction in Japan, many European countries (eg Denmark, France, Germany, South Korea, Switzerland, Sweden) and USA. The majority of district heating and cooling utilities utilise waste heat as the energy source, however, as energy costs have increased, community concerns about green house gas reductions increase and with increasing governmental incentives, industry is finding new ways to use the technology. As a result, geothermal energy is becoming an important source of energy for district heating and cooling.

District heating and cooling is the production and delivery of thermal energy, in the form of hot water and chilled water, from a central plant to multiple other buildings via an underground pipeline system, for space and process heating and cooling. The heating, and cooling, is provided from a central plant, eliminating the need for separate systems in individual buildings. It is a reliable, efficient, low-maintenance, cost-effective way to provide comfortable climate control without on-site hot water boilers, heaters, chillers, or air conditioners.

District heating and cooling systems consists of four primary components: the geothermal energy source, the central plant, the distribution network and the consumer system.

- The geothermal energy will be delivered from a production well located near the central plant with an injection well returning water to its parent aquifer.

- The central plant comprises the heating and cooling equipment. In geothermal powered plants, the main components are (a) a heat exchanger to take the heat from the geothermal water and transfer it to the water flowing through the hot water distribution network, and (b) an absorption chiller that uses the heat from the geothermal water to produce chilled water that will be reticulated to buildings where it is needed.
- The distribution or piping network comprises two systems, one taking and returning the hot water at temperatures around 70°C (from the central plant to the consumers' buildings and returning to the central plant) and the other taking and returning the chilled water at around 9°C.
- The consumers' systems will comprise hot water systems and air handling units where the water circulates through heating or refrigeration coils for the heating and cooling the building. Fans blow air across the coils, or radiators, which heat or cool the air.

In summary, geothermal energy has merit as a form of renewable energy because it is base load and scalable. It provides energy 24 hours a day, 365 days a year, emits near zero green house gases and has only a small footprint. This contrasts with other renewable energy sources such as wind, wave and solar where energy is only available intermittently. To achieve a steady supply of electricity, wind and solar require back up energy supplies for the large percentage of time when they cannot deliver power.

Based on the experience in Germany, it is estimated that the cost of reducing one tonne of CO_2 when substituting different renewable energies for fossil fuel in electricity or heat generation is substantially less for geothermal than it is for solar or photovoltaic systems (Schellschmidt, Clauser and Sanner, Proceedings World Congress 2000).

Question 2: Where possible, provide examples of the amount of renewable energy produced by a system in a particular application, noting: geographic location; size; and the amount of fossil fuel based energy also used in producing the total energy output (if any).

Potential sites for geothermally powered heating and cooling:

Many major residential and commercial buildings and complexes, such as shopping centres, hospitals, airports, data centres and cold storage facilities are ideal sites for application of this technology. Several large commercial buildings and building complexes within Perth are already using district heating or cooling, but powered by electricity using fossil fuels. The University of Western Australia's Crawley Campus, uses centralised compression chillers, powered by electricity, to generate chilled water, at around 9°C, for their air-conditioning system. The substitution of an absorption chiller powered by geothermal energy, for a compression chiller powered by electricity, as currently planned, will not only reduce the demand for electricity generation and CO_2 emissions, it will do so during the peak-load periods when the electricity transmission network is fully loaded.

The Stirling City Centre project, a high density combined residential and commercial project with a planned 30,000 population 6.5 km north-west of the Perth CBD and Alkimos, a 60,000 residential and commercial centre being prepared for development 40 kilometres north of the Perth CBD, alone would result in a reduction in electricity generation capacity by 50MWe to 80MWe if geothermal district heating and cooling were installed.

CSIRO and Geothermal Power P/L are collaborating on a potential demonstrator site at the Australian Resource Research Centre based in Bentley where direct use of geothermal energy may be used to deliver more than the required 9 Mwth for annual base load airconditioning requirements for its current facilities and proposed data centre. This project will provide an invaluable demonstrator for many other sites with high airconditioning demands.

The direct use of geothermal energy for district cooling at the UWA Campus is an example. The location is the UWA's main Crawley Campus on the banks of the Swan River 3 km south west of the Perth CBD.

A 5MWth absorption chiller, to replace an existing electricity powered compression chiller, is planned to be installed in 2011 following the drilling of two geothermal wells, a production and an injection well, to 3 km depth, during 2010. The absorption chiller will link into the UWA's existing district cooling system and supply the 9°C chilled water displacing the supply from the electricity powered compression chillers.

An absorption chiller uses less than one tenth the electricity that a comparable size electricity powered compression chiller would use. The pumping for the geothermal wells will also consume around one tenth the electricity required to power the compression chiller. Therefore, for every 1 MWe of compression chiller displacement, a net 0.8MWe of electricity will be displaced .

The primary variable that drives the economics of absorption cooling is the electricity demand charge. Therefore, like renewable energy sources which generate electricity, direct use of geothermal energy for district heating and cooling, requires the financial incentive of RECs to drive the development of the technology.

Eligibility of heat pumps

Question 3: Should heat pumps continue to be eligible under the RET? How cost-effective are heat pumps compared to solar hot water systems and conventional systems such as gas and electric systems? In particular, details are sought on:

- the capital cost, including installation;
- annual running costs, including maintenance;
- the effective life of the system; and
- annual savings compared to using fossil fuel based energy such as gas or electricity.

Question 4: What is the effectiveness of heat pumps in reducing greenhouse gas emissions in different circumstances?

Cost-effectiveness, reliability and market deployment

Impact on existing eligible technologies and REC market

Question 6: Would including new small-scale technologies or amending the eligibility of heat pumps have a major impact on the deployment of existing eligible technologies?

Geothermal powered district heating and cooling could impact the deployment of solar hot water systems, if a residential neighbourhood was provided with district heating and cooling.

Any other additional comments