

Iceland's Example Demonstrates Geothermal Energy's Potential to Address Climate Change

**Statement of Karl Gawell, Executive Director
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Tuesday at the Climate Institute's "Washington Summit on Climate Stabilization" Iceland's President, Olafur Ragnar Grimsson, spoke about the dramatic progress made by Iceland to develop a clean energy economy based upon geothermal and hydropower. We applaud the accomplishments of Iceland, and as a cosponsor of the Summit, we thank the Climate Institute for giving the exemplary work of Iceland the attention it deserves.

While the US Department of Energy may be proposing to terminate its geothermal research program, there is significant support at the state and local level for expanding geothermal energy production that give us encouragement. Iceland and the US should be partners in leading worldwide efforts to expand geothermal energy production. Today, the US produces more geothermal electric power than Iceland, while Iceland has more experience with district heating and direct uses of geothermal energy. In the next few years, we expect to see significant expansions in both electric power and direct use energy produced from US geothermal resources with continued federal and state support.

In the international marketplace US companies have been leaders, and, in the past, had support from the US government. US efforts have led to significant geothermal energy development in countries such as Indonesia and the Philippines. Notably, the Philippines today is 25% geothermal powered! We expect to see US companies continuing to be strong competitors in the international marketplace, and we hope to see geothermal move from the third fastest growing energy technology to eventually challenge wind and solar for the lead!

Global warming is an immense challenge, and US industry together with Icelandic and other supporters, can make a significant contribution towards meeting the challenge if the governments of the world would recognize the potential of this resource. They should not underestimate it. The geothermal resource base's potential contribution is enormous. Below is a summary table from a recent NREL workshop on geothermal resources. This is from the final draft report summarizing a workshop held this past May – a report we hope will soon see the light of day. Unlike some past efforts, the NREL workshop examined the full range of the resource base, which covers much more than conventional hydrothermal resources.

According to the workshop report, conventional hydrothermal geothermal resources in the US would be capable of producing 30,000MW by 2050. Hidden resources, which may hold much more energy, are still uncertain given the limits of today's technology, and all resources (deep resources, geopressured resources, co-production, and unidentified or hidden resources but excluding heat pumps) could provide the equivalent of 305,000 MW by 2050 – roughly equivalent to the total coal-fired power capacity in the

US today. And, this is not in just a few Western States. There are some 25 states using geothermal resources for power or direct uses today, all 50 if you include ground-coupled heat pumps.

	Estimated Accessible Resource (MWe)	2006 (Actual MWe)	2015 (MWe)	2025 (MWe)	2050 (MWe)
Shallow Hydrothermal¹ (Identified) >90°C/194°F	30,000	2,800	10,000	20,000	30,000
Shallow Hydrothermal¹ (Unidentified) >150°C/302°F	120,000		TBD	TBD	TBD
Co-Prod & Geo-Press²	>100,000	2 ³	10,000 to 15,000	70,000	>100,000
Deep Geothermal⁴	1,300,000 to 13,000,000	0	1000	10,000	130,000
Thermal Uses	(MWt)	(MWt)	(MWt)	(MWt)	
Direct Use⁵	>60,000	620	1600	4,200	45,000
GHP⁶	>1,000,000	7,385	18,400	66,400	>1,000,000
GHP⁶ Avoided Power	120,000	880	2,100	8,000	120,000

* Please note that these resource estimates represent a consensus of a group of experts who considered existing resource assessments (referenced below). There is considerable uncertainty in the estimates as many resources are hidden and exploration to date has been relatively limited. The figures shown above are **not** a resource assessment, but, even with uncertainty, clearly show that the U.S. geothermal resource is a very large and important domestic energy source. (note from source document)

A few years ago GEA and DOE worked with leading experts to estimate the potential international contribution of geothermal power. While this report looked only at power from conventional geothermal systems, it said: “Worldwide, the report indicates that geothermal power could serve the electricity needs of 865 million people, or about 17% of the world's population. Thirty-nine countries are identified which could be 100% geothermal powered, mostly in Africa, Central and South America and the Pacific (see list below). These 39 countries have a total population of 620,637,000 (using 1998 UN population data).” This document is available to download from: <http://www.geo-energy.org/publications/reports.asp>.

This 1999 report did not consider the full range of resources examined in the NREL workshop, did not look at small power systems like the new UTC project at Chena Hot Springs in Alaska, nor did it look at direct use potential. If the new NREL workshop results are any indication of the proportion between the potential of conventional power systems and total resource potential, total worldwide geothermal potential would be roughly 10 times greater than the 1999 GEA-DOE report indicates.

While more extensive assessments of US and worldwide geothermal potential are needed (examining the full range of geothermal resources), these expert reports are the best guides available to assess the potential of geothermal resources today. What they show is that, geothermal resources can be major contributors to addressing climate change...and since they provide baseload power, geothermal energy is often a preferred option for utility power systems. These reports also show there is enormous potential from developing the technology to identify hidden resources and access deeper geothermal systems, substantial promise from distributed generation and co-production, and significant promise for energy contributions from direct uses and geothermal heat pumps.

We have barely begun to utilize the immense geothermal resource base -- despite the U.S. Office of Management and Budget's assertions to the contrary. Industry will continue to develop the technology and work to implement the policies that will allow expanded utilization of the full range of the geothermal resource base, but national and international support is critical if we are to meet the challenges facing us.

Geothermal energy can be part of the answer to address the cataclysmic challenge of global warming. We urge the US government and the international community to provide the support needed to achieve the potential of this renewable resource.

COUNTRIES WHICH COULD BE 100% GEOTHERMAL POWERED
From conventional hydrothermal resources*

<u>COUNTRY</u>	<u>POPULATION</u>
Bolivia	7,957,000
Burundi	6,457,000
Comoros Islands	658,000
Costa Rica	3,841,000
Djibouti	623,000
Dominica	71,000
Ecuador	12,175,000
El Salvador	6,032,000
Ethiopia	59,649,000
Fiji	796,000
Grenada	93,000
Guadeloupe	443,000
Guatemala	10,801,000
Honduras	6,147,000
Iceland	276,000
Indonesia	206,338,000
Kenya	29,008,000
Malagasy Republic	15,057,000
Malawi	10,346,000

Martinique	389,000
Montserrat	11,000
Mozambique	18,880,000
Nicaragua	4,807,000
Panama	2,767,000
Papua New Guinea	4,600,000
Peru	24,797,000
Philippines	72,944,000
Rwanda	6,604,000
Solomon Islands	417,000
Somalia	9,237,000
St Kitts & Nevis	39,000
St. Lucia	150,000
St. Vincent	112,000
Sudan	28,292,000
Tanzania	32,102,000
Tonga	98,000
Uganda	20,554,000
Vanuatu	182,000
Yemen	16,887,000
TOTAL – 39 Countries	620,637,000

*From: *Preliminary Report: Geothermal Energy, The Potential For Clean Power From The Earth*, Karl Gawell, Dr. Marshall Reed and, Dr. P. Michael Wright, April 7, 1999, available at: <http://www.geo-energy.org/publications/reports.asp>.

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