



## 2016 Top Markets Report **Renewable Energy** Sector Snapshot

### Geothermal Energy

The United States has long been the world's leading user of geothermal power. Most U.S. firms, however, have looked abroad for export opportunities only occasionally. In recent years, domestic policy uncertainty slowed growth at home and new developments overseas has caused the industry to shift attention to lucrative export opportunities. While ITA expects other renewable energy sectors to deploy more technology in the near-term, the U.S. industry's depth of experience should position geothermal exporters for success internationally.

#### Industry Overview

Globally, untapped geothermal potential has been estimated at 200GW, out of which only 13.3GW is currently in operation in only 24 countries.<sup>1</sup> Several countries included geothermal-specific pledges in their commitments under the Paris climate agreement in December 2015, through which the number may grow to 32GW by 2030. However, the Global Geothermal Alliance, established by the International Renewable Energy Agency (IRENA) and supported by the United Nations Framework Convention on Climate Change, is aiming even higher, to around 65GW.

East Africa, Central and South America, and the South Pacific are regions that are expected to have significant geothermal capacity come online in the next decade. Some international development banks are providing public financing for the exploration stage of such projects to help mitigate the risks.<sup>2</sup>

#### Export Opportunities

Growth in the geothermal market outside the United States is starting to eclipse U.S. growth. Indonesia, for example, has 3 GW of projects in its pipeline and Kenya, which again ranks number one on ITA's list of top geothermal export markets, has a national target of 1.9 GW of new geothermal development by 2016.<sup>3</sup> Geothermal energy offers these countries a

#### Geothermal Export Markets (2016-2017)

1. **Kenya**  
*large market; large share*
2. **Mexico**  
*large market; large share*
3. **Indonesia**  
*large market; small share*
4. **Chile**  
*large market; small share*
5. **Turkey**  
*large market; small share*
6. **Nicaragua**  
*small market; large share*
7. **Guatemala**  
*small market; large share*
8. **Philippines**  
*large market; small share*
9. **Canada**  
*small market; large share*
10. **Argentina**  
*large market; small share*

primary source of electricity that is key to both economic growth goals and low-carbon development strategies.

The geothermal industry is reliant on the availability of naturally occurring geothermal reservoirs and thus has been limited to markets near tectonic fault

lines. As a result, the industry's export markets are extremely concentrated, with only the top 10 markets expected to account for 97 percent of all exports in the sector.

Kenya tops ITA's list of projected export markets through 2017, keeping the same rank as last year's report. By the end of 2015, Kenya had already reached 740 MW of geothermal capacity. And although it may not reach its goal in 2016, geothermal will comprise half of Kenya's total renewable energy capacity. Fortunately, U.S. exporters have demonstrated a strong ability to compete in the market and would benefit greatly from its continued development.

Many of the top ranked markets for U.S. geothermal opportunities are in Latin America. In particular, Mexico has substantially overhauled its regulatory framework in order to encourage more geothermal development. U.S. export competitiveness is strong in the region, where ITA expects between one-third to one-half of the geothermal equipment import market to be met by products manufactured in the United States.

U.S. exporters may also find short-term export opportunities in the geothermal heat pump industry. While not considered in the *Renewable Energy Top Markets Report* analysis, demand for geothermal heat pumps appears to be increasing globally with U.S. suppliers enjoying considerable market share.

### Challenges

However, exporters for this industry face unique challenges. Project timetables, which include an exploration stage, are longer than other renewable energy sectors. Many announced geothermal projects never reach completion -- abandoned out of resource concerns, a lack of policy support, or development opportunities that occur elsewhere.<sup>4</sup> Two additional factors complicate efforts to support exports in the sector. First, while the United States

enjoys a large share of the global import market, development of geothermal projects will account for less than one percent of total renewable energy capacity growth through 2017, as other sectors attract far more investment.

Second, the only segment of the geothermal industry not dominated by U.S. suppliers is also its fastest growing -- "flash" geothermal turbines. Japanese firms (Toshiba, Mitsubishi, and Fuji) have captured roughly two-thirds of the "flash" turbine market.<sup>5</sup> While the choice of turbine is heavily dependent on the temperature of the geothermal resource being tapped, flash turbines are expected to capture a large share of new geothermal development. Most projects currently under development are greenfield projects at a site that is yet to confirm the expected resource via full diameter deep drilling (the industry standard), but drilling has commenced at those sites that are expected to be "high-grade flash" resources. This may limit the export opportunity for U.S. component providers going forward.

U.S. companies excel in producing "binary" geothermal turbines, which are estimated to account for only about one sixth of global capacity.<sup>6</sup> To the extent that markets trend toward building geothermal power plants for resources with lower temperatures, the more likely U.S. exporters will benefit from that investment.

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<sup>1</sup> Geothermal Energy Association, 2016 Annual U.S. & Global Geothermal Power Production Report, p.8.

<sup>2</sup> Geothermal Energy Association, 2016 Annual U.S. & Global Geothermal Power Production Report, p.13.

<sup>3</sup> Bloomberg New Energy Finance, "H2 2014 Geothermal Market Outlook" 28 August 2014

<sup>4</sup> Bloomberg New Energy Finance, "Q2 2013 Geothermal Market Outlook" (27 June 2013) pp. 3

<sup>5</sup> Bloomberg New Energy Finance, "H2 2014 Geothermal Market Outlook" 28 August 2014

<sup>6</sup> Geothermal Energy Association, 2016 Annual U.S. & Global Geothermal Power Production Report, p. 18