

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

### Overview and Key Findings

#### Introduction

The renewable energy industry remains one of the most vibrant, fast-changing, and transformative sectors of the global economy. Technology improvements, cost declines, and the catalytic influence of new financing structures, have turned the sector into a driver of economic growth – both in the United States and around the world.

The renewable energy sector faces many competing dynamics at once – the outcome of which will alter the policy landscape, and thus the investment landscape, for years to come.

First and foremost, there is a growing global consensus that the world must deal with the threat of climate change in part through the deployment of clean energy technologies. The conclusion of the international climate agreement in Paris in December 2015 has provided new momentum for countries to promote policy incentives for clean energy development, which should drive investment in almost all markets.

As the most tangible evidence of commitment under the agreement, countries have agreed to publicly outline their post-2020 climate actions, known as their Intended Nationally Determined Contributions (INDCs). Although not all the INDCs reflected new policy commitments since the publication of the last

*Top Markets Report*, the International Energy Agency predicts that the full implementation of these pledges will require \$13.5 trillion in clean energy and energy efficiency technology deployment investments over the next 15 years.<sup>1</sup> The agreement also included a collective goal of keeping temperature rise to well below 2 degrees Celsius – something that cannot be met by only delivering on the initial INDCs pledges. Nevertheless, the INDCs point the way to future opportunities for the sector. Furthermore, countries will also submit new INDCs on a regular, five-year cycle to take stock of progress and set new, stronger goals to reduce climate pollution.

However, despite the widespread desire to deploy clean energy, most countries’ tendency to cheaply import fossil fuels pulls them in the opposite direction. Governments around the world must decide whether to incentivize a clean, sustainable growth path or whether to allow investments in traditional energy sources to continue or even increase. The choices they make will govern the industry through both the short and medium-term.

For example, in the United States renewable energy manufacturing and deployment are getting a timely boost from the multiple-year extensions of the Business Energy Investment Tax Credit (ITC) and the Renewable Electricity Production Tax Credit (PTC),

**Figure 1: Projected Top Markets for Renewable Energy Exports (2016-2017)**

1	Canada	7	Chile	13	South Africa	19	Germany	25	Peru
2	Japan	8	China	14	Venezuela	20	South Korea	26	Honduras
3	India	9	France	15	Nicaragua	21	Ecuador	27	Argentina
4	Kenya	10	Turkey	16	El Salvador	22	Guatemala	28	Vietnam
5	Mexico	11	Indonesia	17	Philippines	23	Egypt	29	Panama
6	Brazil	12	Uruguay	18	United Kingdom	24	Russia	30	Thailand

another development that came late in 2015. Building a stronger domestic market through the ITC and PTC will contribute to the international competitiveness of U.S. renewable energy solutions.

This *Top Markets Report* provides analysis on key trends, areas of opportunity, and important challenges that exporters need to know in order to compete effectively in foreign markets. It offers projections for potential exports in the 2016-2017 time frame, as well as eight country case studies with more in-depth information.

The report, which builds on earlier versions published in 2014 and 2015, includes rankings of 74 different markets (see Appendix 1), as well as subsector-specific projections (see Appendix 2). Our analysis of biofuels and biomass wood pellet exports is covered separately in the *Renewable Fuels Top Markets Report*, and the growing industry related to energy efficient electricity transmission is covered in the *Smart Grid Top Markets Report*.

This report provides useful context in which to view export opportunities in a changing world, offering commentary on how exporters can best leverage the trade policy and export promotion tools offered by the U.S. Government. The report is meant to provide context to global markets over the near-term, helping exporters compare international opportunities. Companies should note that ITA's rankings are based on our current understanding of the market, which – given the pace of change in the sector globally – can be subject to unexpected twists and turns.

### Key Findings: Top Markets and Methodology

#### Top Markets, 2016-2017

Export markets with the strongest potential, in the top level of the rankings, tended to have substantial opportunities across multiple subsectors (e.g., Canada, India, Mexico, Brazil, China, Chile, and

Turkey). However a few markets had overwhelmingly strong prospects in particular subsectors, due to unique driving factors such as the popularity of solar in Japan and France, the coordinated exploitation of geothermal resources in Kenya, and abundance of wind farm projects in Uruguay.

Of the markets that exhibited a jump in their overall rankings compared to last year, the most notable were India, France, and Vietnam. One of the biggest disappointments in last year's projection was Saudi Arabia, where ambitious plans for solar development are in limbo for the near term while the focus turns to natural gas for its clean energy needs. Developing countries in Africa, particularly in the Sub-Saharan, remain challenging export markets. This is partly due to the lack of strong nationwide infrastructure, which limits the integration of renewable energy technologies to the grid; but also exporters face the reality of stiff competition from Chinese and European suppliers.

Within the sector rankings, in addition to the aforementioned special cases, other noteworthy changes included:

- the emergence of India as an attractive market for solar as its new deployment goals far exceed its own manufacturing capacity;
- the downgrading of potential wind exports to China and hydro exports to Chile, reflecting the shrinking U.S. market shares; and
- the strengthening of Mexico as a serious contender in the geothermal sector, creating new project opportunities for U.S. suppliers.

The renewable energy sector is so reliant on policy that any policy changes – either positive or negative—will have an almost immediate impact on a market's attractiveness. As a result, the rankings

**Figure 2: Methodology for Ranking Markets**



provided in this report could change substantially as new policies are announced. Political upheaval could also have an unforeseen negative impact in an otherwise promising export market. However, despite the significant changes in policy environments in the past year, only six countries dropped out of the top 30 rankings compared to last year, which indicates a stable yet growing industry.

### Methodology

ITA rankings are based on the projected value of U.S. exports in the 2016-2017 timeframe. The basic formula is summarized in Figure 2. For each market, we estimated the projected capacity installations for each technology through 2017 using projections from *Bloomberg New Energy Finance and Business Monitor International*, as well as several sector-specific sources. In the case of geothermal power, longer project time tables were taken into consideration.

We then estimated the value associated with each market's expected capacity growth by multiplying its capacity growth projected by the cost of each technology. Where possible, ITA used country-specific and regional CAPEX estimates for the cost of technology, relying upon the *Bloomberg New Energy Finance* analysis of levelized cost of energy.

The proportion and value of each market likely to be met by imports, as well as the percentage of imports expected to come from the United States, were derived from historical trade data while taking into consideration the existing domestic manufacturing capacity. In doing so, we were able to calculate a projected export market for each country and each subsector within countries, allowing markets to be compared against each other.

It is important to note that the *Renewable Energy Top Markets Report* only includes an analysis of product exports. Service exports, which may provide an even greater opportunity than the export of products, are not included in the rankings. Global trade in products is easier to track using harmonized tariff system codes. However, based on work undertaken by the U.S. International Trade Commission,<sup>2</sup> ITA believes that service exports are highly correlated with the export of renewable energy equipment. As such, the rankings featured in this analysis should provide policy-makers an

adequate assessment of service export opportunities despite their exclusion from the methodology.

Moreover, this analysis does not include an assessment of regional opportunities, although regional estimates are possible based on the methodology. In some markets, like Central America or the European Union, exporters can consider opportunities based on regional energy policies or transmission infrastructure. Thus while individual markets may rank low, opportunities when paired with other regional projects may be considerably larger.

### Market Size vs. Market Share

Since 2014, the *Renewable Energy Top Markets Report* framework has emphasized market size and market share in considering renewable energy export opportunities. ITA continues to encourage exporters to develop market entry and market expansion strategies based on these two variables. Therefore, the case studies and industry snapshots in the report reference each market in terms of their import market size and the share of their import market expected to be captured by U.S. exporters.

If a market is large and U.S. exporters are likely to capture a significant market share, efforts should focus on making as many connections as possible. Exporters can feel good about their prospects, but may find other American competitors also having success in the market. Participation in trade missions, reverse trade missions, trade shows, and other "traditional" export promotion activities is encouraged in these markets.

Canada is a prime example. Though it is expected to import about one-third as much as China over the next two years from the world, it ranks number one on ITA's list of projected export markets through 2017, because of the significant market share enjoyed by U.S. suppliers (25.8 percent).

In markets that are large, but in which the United States captures only a tiny fraction of the import market, exporters should consider the reasons for the lack of U.S. competitiveness before pursuing export opportunities – particularly opportunities that include long lead times or require considerable resources. Perhaps importers are demanding products that are not often sold competitively by U.S. exporters, in which case a niche product might

play well in the market. However, in certain markets, where U.S. market share is low because of a specific trade barrier, then exporters may want to prioritize other markets and alert U.S. Government entities, so that appropriate action can be taken to remove that barrier.

In markets that are small, but where U.S. exporters capture a large market share, exporters may find significant demand for their products and services – but accompanied by a small market or restrictive investment climate that stifles growth. Would-be exporters are encouraged to work with the U.S. Government to pursue market development activities in these locations, including through trade policy missions, technical capacity building, feasibility studies, and tendering assistance.

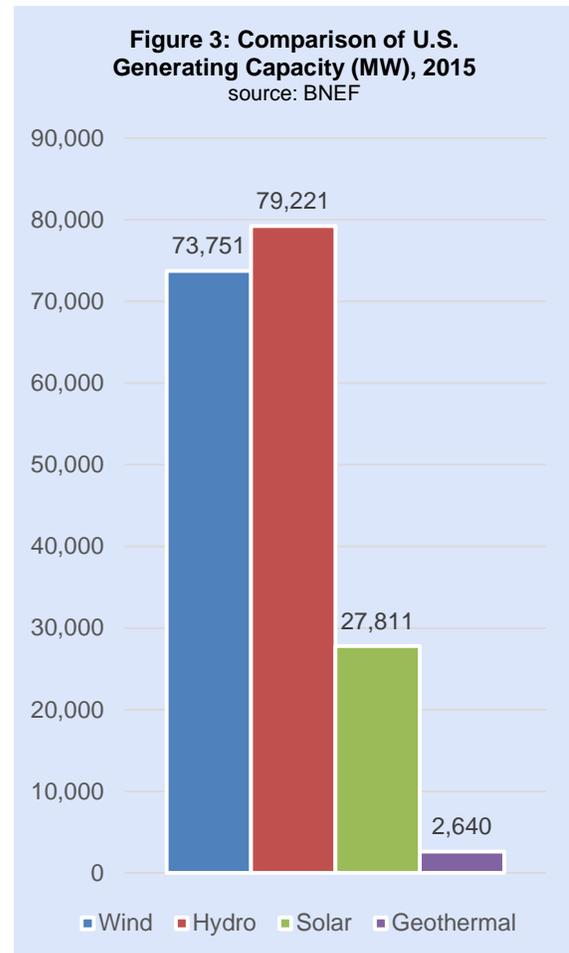
Many Latin American markets fall into this category. In these countries, the share of the import market captured by U.S. technology is greater than the share captured globally – often substantially. Regrettably, Western Hemisphere markets outside the United States are expected to account for just \$40 billion of total imports, about 20 percent of the entire import market covered by this report (when Canada is removed, this number falls to just 16 percent).

Finally, some markets are neither large nor support significant U.S. market share. While some companies may find niche opportunities, most exporters would be wise to consider opportunities elsewhere.

### Industry Overview and Competitiveness

The renewable energy industry continues to grow steadily and show no sign of slowing down. Between 2005 and 2015, the world added over 1,000 GW of capacity total in the four subsectors covered by this report (geothermal, hydro, solar, and wind).<sup>3</sup>

Of these, the United States – which ranks second in the world for renewable energy capacity – has a mature hydro industry that is soon to be overtaken by wind power generation. (Figure 3). While the capacity of U.S. geothermal power is small compared to the other three subsectors, the industry is actually far ahead of other countries in its deployment.<sup>4</sup>



In terms of renewable energy investment, the United States also ranked second for most additional capacity in 2015.<sup>5</sup> Rapid growth in the solar subsector is almost entirely driven by utility-scale and commercial projects, although the residential solar segment will also see installations continue to increase at a steady pace.

While The United States is unquestionably a leader with regards to innovation and deployment in the renewable energy sector, the export base varies for each of the subsectors in this report. For the wind and solar industries, numerous new manufacturing facilities are under construction across the country.<sup>6</sup> By comparison, the U.S. hydro subsector, which is dominated by European-owned manufacturing that targets Western Hemisphere markets, is not expanding actively except in the niche small-hydro subsector. Meanwhile U.S. companies in the geothermal sector face an industry dominated of a small number of companies, of which 40 percent are Japanese manufacturers. However, U.S. geothermal

expertise in still highly regarded in project development, engineering, and resource exploration/drilling.

### **Global Industry Landscape**

Global clean energy investment, including renewable energy, totaled more than \$329 billion in 2015.<sup>7</sup> Because the cost of most renewable energy technologies continued its downward trend, the world's investment supported an unprecedented deployment of new renewable energy projects despite the availability of extremely cheap fossil fuels.

But growth is just beginning. According to ITA's projections, the 74 markets included in this study will install over 250 GW of new renewable energy capacity through 2017. To help meet this demand, the global import market in this sector is expected to reach \$195 billion cumulatively in the 2016-2017 timeframe.

Based on the estimates in this study, China is expected to account for more than 40 percent of all capacity installations outside the United States over the next two years. Its renewable energy investment is expected to be split relatively evenly between solar, wind, and hydropower through 2017 [for more information on China, see country case study]. Other key developers of new capacity will be Japan, India, Brazil, Turkey, and the European Union (particularly, Germany and the United Kingdom).

What is more, the sector's growth is now global in nature, escaping the traditional markets of Western Europe and strongly taking root in Asia, Latin America, and Africa. Over the remainder of the decade, this trend should continue with important consequences for U.S. export competitiveness.

Unfortunately, U.S. exporters are relatively ill-positioned to benefit from rising demand globally. According to ITA's projections, exporters will capture just 5.6 percent of the global import market through 2017. Although this is an improvement over last year's projection of 3.2 percent, there are missed opportunities in certain key markets where renewable energy is growing rapidly enough to support substantial imports. In Japan, for example, where imports are expected to account for two-thirds of all solar products deployed in the market,

U.S. exporters are expected to capture just 2.6 percent. In China, projected U.S. market share is less than half a percent for hydro imports; other subsectors fare slightly better, with 3 percent for solar, around 2 percent for wind, and an estimated 40 percent for the nascent geothermal market (where China lacks domestic manufacturing). Further analysis of the challenges in these markets is provided in the country case studies.

The United States does – and should continue to – capture a significant piece of the import market in the Western Hemisphere. U.S. exports benefit from geographic proximity as well as a longstanding reputation for reliable, innovative products. In fact, the share of the import market captured by U.S. exporters in the region (North America, Central America, and South America) during this period will reach nearly 13 percent. Exports of renewable energy products to the Caribbean were not measurable in this study.

While opportunities can be found in most markets, the destination of U.S. renewable energy exports will continue to be highly concentrated. The top 4 export markets are expected to account for 50 percent of all exports in the sector through 2016, while the top 10 markets should support over three-quarters of all exports.

### **Challenges and Barriers**

In addition to understanding the competitiveness landscape facing exporters in different markets, exporters should also appreciate the other market dynamics facing the sector. For example, the impact of low fossil fuel prices will cascade across the renewable energy sector – both in the United States and around the world. Put simply, reaching “grid parity” – long the dream of the clean energy industry – will be harder to achieve given lower coal and natural gas prices. And in markets that use imported oil to power diesel generators, distributed renewables may seem less attractive.

However, unlike the period around 2009, when low energy prices undermined global renewable energy investment, the fall in clean energy costs over the past few years should help the industry remain competitive. In fact, renewable energy is already cost competitive in some markets where policy-makers have implemented effective policies.

For various reasons, the mechanisms by which renewable energy is incentivized are starting to shift away from straightforward feed-in tariffs to power auctions. In this system, increasingly used in developing countries,<sup>8</sup> governments allocate power purchasing agreements for a certain capacity of renewable energy after evaluating the developer's proposed price per unit of electricity.

On the one hand, the price competition of auction schemes has worked well in an industry that is continually lowering its costs through innovation. From the government's perspective, auctions help to avoid both windfall profits and underpayments that can potentially result from the feed-in tariff. On the other hand, critics assert that only large developers have the know-how and financial resources to participate in auctions. U.S. suppliers must choose their partners wisely if the proposed project depends on the auction system. These auctions are sometimes designed to pit different renewable energy subsectors against each other but are sometimes limited to a specific subsector.

U.S.-based suppliers can also expect to encounter markets that are more inclined towards protectionism. For example, the financing terms or the auction requirements sometimes build in an obligation for a certain percentage of local content.

### Opportunities

Close monitoring of renewable energy policies in foreign markets is the first and foremost key to identifying opportunities. A variety of resources exist to help exporters in this area, including analysis from U.S. government agencies that have "boots on the ground" in the embassies and consulates (Departments of State, Commerce, and Energy; U.S. Agency for International Development, etc.). Bilateral dialogues regarding clean energy policies are also increasingly incorporating private sector participation to ensure that stakeholders can keep governments informed of technological, market, or policy changes, which are fast-paced in this industry.

Despite a natural tendency for countries to rely on domestic or regional sources, market forces can still play a role in fostering export opportunities. Even when U.S. suppliers are not as cost-competitive as rivals from other countries, they are often well-positioned to offer technology solutions that are

more innovative or reliable. For example, thin film PV enjoys an advantage for solar projects in India due to its cost efficiency; small hydro projects such as run-of-river are in increased demand in the Western Hemisphere as a less costly and less disruptive alternative to large hydro; geothermal plants utilizing binary turbines are becoming more prevalent as the technology matures. Whether offering a traditional technology or a newer one, U.S. exporter can use U.S. Government financing tools to support their exports.

In some markets, for example, exporters can be disadvantaged by distance from their customers or by low-cost competitors. The U.S. Export-Import Bank can provide a comparative advantage by delivering financing rates attractive to developers, financing which requires the developers to use U.S. technology. In addition, exporters should consider working with the U.S. Trade and Development Agency (USTDA), which can provide funding for feasibility studies for projects in emerging markets, or the U.S. Agency for International USAID, which can provide a key first-mover advantage through pilot projects or technical aid in many developing countries.

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<sup>1</sup> IEA World Energy Outlook, 2015

<sup>2</sup> USITC, Renewable Energy and Related Services: Recent Developments, August 2013

<sup>3</sup> Bloomberg New Energy Finance, Market Size: Generation and Capacity.

<sup>4</sup> Geothermal Energy Association, *2016 Annual U.S. & Global Geothermal Power Production Report*.

<sup>5</sup> Bloomberg New Energy Finance, United States country profile.

<sup>6</sup> Bloomberg New Energy Finance, database of manufacturing plants.

<sup>7</sup> Bloomberg New Energy Finance Press Release, January 14, 2016, "Clean energy defies fossil fuel price crash to attract record \$329bn global investment in 2015"

<sup>8</sup> IRENA, 2013 "Renewable Energy Auctions in Developing Countries"

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