

Mid-Term Outlook

U.S. Renewable Energy Exports to 2020

Over the next several decades, renewable energy will begin to rapidly transform the world's electricity mix, fundamentally changing the way economies are powered and creating unprecedented opportunities for U.S. exporters. This first-of-its-kind "Mid-Term Outlook" provides exporters a glimpse of the renewable energy sector through 2020, pointing out challenges to U.S. competitiveness, but also identifying opportunities for additional U.S. exports.

While global demand will accelerate post-2020, the Mid-Term Outlook demonstrates that policy decisions made today will influence and define the sector for years after – both in terms of global demand and export competitiveness. Based on ITA's projections, the mid-term period (2015-2020) will be categorized by inconsistent but impactful growth across regions, with certain countries attracting tremendous investment and others left wanting. These variations will warrant different approaches and programs.

The medium-term period will also be punctuated by a general lack of international market share for U.S.-made goods and services. ITA projects U.S. market share to fall below 2 percent by 2020 unless recent declines in manufacturing capacity are quickly reversed. While exports should increase based on market volume, most American firms will feel less successful, as exporters from other Asian economies benefit more than those from the United States.

Several key factors should converge to create and change the global clean energy market through 2020. Perhaps the most transformative is the continued drop in prices for many renewable energy technologies – not just end-products (solar modules, for example), but across the entire industry supply chain. As ongoing efficiency and manufacturing improvements reduce the costs of these technologies even further, and price volatility and environmental regulations should make renewables far more competitive over the next six years with traditional fossil fuels than at any prior period.

Through 2020, many planned coal-fired power plants will be abandoned globally due to climate policies, and in some markets, even existing coal facilities will be taken offline. The resulting need for power will likely be met by natural gas, renewables or nuclear. In markets with low natural gas prices, coal will more commonly be replaced with gas generation. But in markets with high gas prices renewable energy should become even more

attractive. Civil nuclear growth will be heaviest in just a few markets, with most countries choosing not to develop new nuclear capacity.

ITA expects, perhaps somewhat surprisingly the global hydropower industry will grow more than any other clean energy sector for the remainder of the decade. U.S. exporters, however, will remain largely absent in the industry's global expansion, with the limited exception of U.S. service providers, who may find more credible opportunities. The low-cost and carbon-free nature of hydropower will make the technology attractive to governments around the world that seek reliable electricity, but also must deal with the advancing impacts of climate change.

Figure 1: Medium-Term Rankings of Renewable Energy Export Markets (2015-2020)

- 1. Canada**
(large market; large share)
- 2. China**
(large market; small share)
- 3. Japan**
(large market; small share)
- 4. Saudi Arabia**
(large market; small share)
- 5. Brazil**
(large market; large share)
- 6. Mexico**
(small market; large share)
- 7. Thailand**
(large market; small share)
- 8. Chile**
(small market; large share)
- 9. India**
(large market; small share)
- 10. United Kingdom**
(large market; small share)

The solar industry, particularly distributed photovoltaic (PV) technologies, will also experience significant growth globally. While still largely dependent on policy incentives to be competitive, the small-scale nature of the distributed PV market can help consumers deal with higher energy prices without requiring lengthy transmission lines. The impact of more distributed PV systems will require utilities around the world, whose business model is based on stand-alone power plants, to adjust their investment plan and operations.

Large Regional Variation

As exporters plan both market development and entry strategies, they will need to consider that demand growth and renewable energy investment will be significantly higher in developing economies than in developed ones. The industry's marked shift towards emerging markets will be most pronounced in Asia, where renewables could become cost competitive with fossil fuels by 2020, making policy supports less critical and all-but-guaranteeing growth for years to come.

China, India and Japan alone are expected to support over half of the new renewable energy capacity installed outside the United States over the next six years. These markets are fueled by an insatiable appetite for more electricity (in the case of Japan, the drive for more electricity may be offset by the restart of the country's nuclear power fleet). In more developed economies characterized by flat energy demand growth, renewables will compete more directly with traditional energy sources.

In Europe, renewable energy markets should continue to thrive, but in many ways, the market has moved to faster growing economies. Germany and the United Kingdom are expected to be the largest European renewable energy markets for the remainder of the decade, followed by France and Italy. Most European demand should be met by either locally-produced technologies or cheaper alternatives, usually from Asia, limiting the export value of these markets.

In Africa, ITA expects the ongoing shift towards renewable energy to continue. Hydropower should constitute a major source of new electricity capacity through 2020, particularly in Sub-Saharan Africa. Kenya, for example, is expected to develop roughly 500 MW of new hydropower-based electricity by the end of the decade. The solar PV industry should also benefit from Africa's likely renewable energy development. *Bloomberg New Energy Finance* predicts that over half of all new power systems deployed on the continent will

be small solar PV systems, which are well-suited to the region's resource potential and the lack of reliable transmission grids. The geothermal industry should also expand into Africa, with significant development expected in Kenya.

In Latin America, the deployment of renewable energy should also increase dramatically over the next six years. The region should continue to support distinct U.S. competitiveness. Although investment will very likely trail other regions, Latin America's desire to diversify its energy mix away from fossil fuels and drought-ridden large hydropower should create a thriving market for U.S. exporters. Brazil will be the largest market – in terms of both development and U.S. exports – but Mexico, Chile, and Central America should all be important export destinations.

Renewable Energy Technologies to 2020

Solar

Solar PV has now become economically viable in many countries, and even economically preferable in some. ITA expects this trend to continue through the medium-term, although most solar projects will still require policy incentives to be competitive. By 2020, the solar experience curve strongly suggests that costs will decline enough that solar should be a viable option in markets with strong insolation rates.[§] U.S. exporters should seek to identify these markets and position themselves for success now, so that when development takes place, U.S. exporters are well positioned to benefit.

China is projected to be the largest solar market through 2020, followed distantly by Japan, Germany, India, and Saudi Arabia. In most of these markets, U.S. suppliers will find steep competition from other lower-cost manufacturers, but will also encounter policy barriers that restrict market access.

While net-metering restrictions could forestall growth in the distributed PV sector, in many places demand for individually-produced clean energy will be too great for policy to prevent widespread investment. The surge in distributed PV should begin to facilitate a renewed consideration of the implications for national electricity grids and, in markets with national utilities, policy changes to transmission and distribution models.

[§] In some markets, solar is already viable without policy supports (e.g., Panama and Chile).

Over the medium-term, U.S. exporters are expected to also find new opportunities in the Concentrated Solar Power sector. Chile, China, Saudi Arabia, and South Africa should all develop large CSP projects, with U.S. exporters competing effectively with suppliers from other markets.

Wind

Through the medium-term, no sector will support more renewable energy exports than wind. Manufacturing experience and economies of scale, as well as improvements in efficiencies, plant design, and operation should drive down installation costs. As costs decline, buyers may be willing to spend more on more efficient, innovative, and higher quality turbines produced in the United States. This could also result in more emphasis on design, engineering, and site assessment, which would create export opportunities for American firms.

Like the solar sector, China is also expected to dominate the wind sector for the foreseeable future. With strong resource potential, the availability of cheap technology and improving transmission infrastructure, China will install 16-18 GW of new wind capacity annually through 2020.⁸¹ In fact, nearly 40 percent of the wind capacity installed through 2020 outside the United States will be in China. Capturing just a small share of this market would make China a key export destination for U.S. exporters.

The offshore wind market will very likely continue to be dominated by Northern European countries – namely, the United Kingdom and Germany – although some growth can be expected in Japan and China. While technology improvements will help reduce costs, the industry is expected to push further offshore and into deeper waters, limiting price declines as environments get more challenging.

Hydropower

Somewhat surprisingly, the global hydropower market is projected to sustain more growth than any other renewable energy technology through 2020. Based on industry projections, ITA expects the global hydropower industry to cumulatively install over 300 GW of new

capacity outside the United States between now and the end of the decade – just less than half of all medium-term renewable energy development.

Most hydropower development will occur in the emerging markets, where the low cost of hydropower and its ability to produce baseload power (measured by leveled cost of energy) is attractive to developers, utilities, and governments. China, which has over 80 GW of capacity in its hydropower pipeline, is expected to be the largest market globally, but Brazil, Thailand, Russia, India, and Japan should all contribute to the industry's growth.

Geothermal

The global geothermal industry will lag far behind other renewable energy sectors through 2020. The industry is expected to install just over 3 GW of new capacity outside the United States cumulatively between now and 2020. To put things in perspective, this means the world will install in six years as much geothermal capacity as China will install wind capacity every three months.

Unfortunately, geothermal is the renewable energy sector that supports the most U.S. market share. U.S. geothermal firms lead in almost every part of the industry's supply chain with the exception of turbine manufacturing, which continues to be dominated by Japanese conglomerates. Many of the Japanese firms import component parts from the United States, however, so any growth in the sector should support additional U.S. exports.

Indonesia, the country with the largest geothermal resource potential, is expected to support the most geothermal development through 2020. In fact, through the medium-term, nearly one-third of all geothermal development outside the United States should be in Indonesia. U.S. exporters are expected to capture about one-fourth of the market.

Kenya and New Zealand also should also attract significant investment, with U.S. market share expected to be even higher in these markets. Kenya plans to install 1.8 GW of new geothermal capacity by 2016 (ranking it #1 on ITA's list of top near-term geothermal

Figure 2: Projecting to 2020

ITA decided to project exports through only 2020, despite the availability of industry sources that offer projections further into the future. Beyond 2020, ITA believes trade flows will be driven by primarily by renewable energy resource potential and proximity to the United States. Policy will have less of an impact because the cost of renewables will fall below that of traditional energy sources. When this happens, a country's resource potential will often determine where development is strongest.

export markets). Assuming that it falls short of this goal, it could become an important medium-term market.

Mid-Term Rankings

With growth expected in nearly every renewable energy market globally, ITA anticipates that Canada will remain the largest destination for U.S. renewable energy exports through the end of the decade. Most exports are projected to support Canada’s hydropower development, although Canada’s solar industry should provide an important export market, as supply chain ties on both sides of the border should deepen.

Over the medium-term, most U.S. exports will remain destined for only a few markets. The top five total markets will continue to account for over half of all exports in the sector. However, the concentrated nature of the industry’s export destinations should weaken a bit over time, as new markets attract global attention. Saudi Arabia and Thailand, for example, should account for a growing number of exports through 2020. Saudi Arabia jumps to fourth (from 10th) and Thailand moves to seventh (from 19th) in the medium-term rankings [See Figure 1].

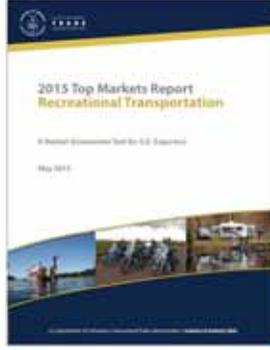
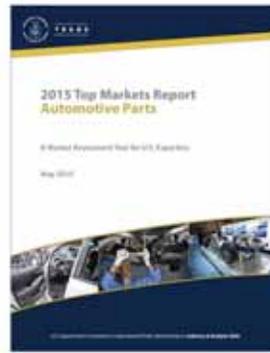
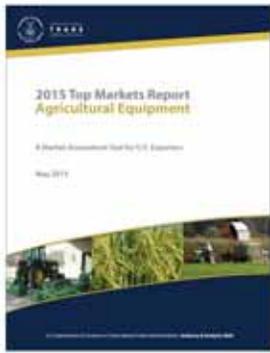
U.S. Export Competitiveness through 2020

The competitiveness position of the United States’ renewable energy industry remains weak and is expected to get weaker. As a result, while renewable energy exports are projected to more than double between 2016 and 2020, the market share captured by U.S. suppliers will decline to record low levels. Policy-makers should understand which market segments support heightened competitiveness and which segments produce only investment opportunities – not a likely export sale. By knowing which markets are likely to purchase technology from the United States, and which will be predisposed to purchase technology locally or from lower cost suppliers from elsewhere, exporters can develop effective and nuanced strategies.

Through the end of the decade, the value of renewable energy exports will be split relatively evenly between wind (34 percent); hydropower (32 percent); and solar (26 percent). The geothermal industry will account for just 8 percent of U.S. exports in the sector. According to ITA’s projections, the wind industry will surpass the solar industry, as the leading exporter of U.S. renewable energy technologies through 2020. This is in line with the wind industry’s expected capacity additions globally, which will remain larger than the solar industry’s installed global capacity (solar is expected to grow faster in percentage terms).

Figure 3: Subsector Medium-Term Rankings (2015-2020)





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