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## U.S. Wind Turbine Export Opportunities in Canada and Latin America

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**July 2012**

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# U.S. Wind Turbine Export Opportunities in Canada and Latin America<sup>1</sup>

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July 2012

## Abstract

This paper reviews past U.S. exports of utility-scale wind turbine nacelles and blades, and assesses the potential for future U.S. exports of these products to markets in Canada and Latin America. These markets are growing in importance and, though they are smaller than the Chinese and European markets, are significant potential export destinations for U.S. producers. The results of this analysis indicate that U.S. exports increased annually during 2007–11, with Canada and Latin America accounting for the largest share of exports, but that the total volume of U.S. exports remains low in comparison to global exports. Markets in Ontario, Western Canada, and Mexico are growing rapidly and U.S. producers are positioned to increase exports to these places in the next few years. However, U.S. producers are unlikely to benefit from installations in Quebec and U.S. exports to Brazil will be limited by trade barriers. The remaining markets in Latin America offer at least limited export opportunities, but these opportunities vary by country and depend on how the manufacturers producing in the United States decide to allocate production across their global supply chains.

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# Introduction

As global renewable energy markets have expanded, leaders in many countries have started looking at the renewable energy manufacturing sector as a potential export industry. In the United States, a substantial wind turbine manufacturing industry has developed in response to the growth of the domestic market, raising the question of whether this industry has significant export potential. This paper reviews past U.S. exports of utility-scale<sup>2</sup> wind turbine nacelles and blades and assesses the potential for future U.S. exports of these products to markets in Canada and Latin America. These markets are rapidly growing and, though they remain smaller than the large European and Chinese markets, present some of the most substantial export opportunities for U.S. producers. The results of this analysis indicate that U.S. exports of wind-powered generating sets<sup>3</sup> increased each year during 2007–11, but the total volume of U.S. exports remains low in comparison to global exports (box 1). U.S. producers are positioned to increase exports to Ontario, Western Canada, Mexico, and some markets in Central and South America, but are unlikely to benefit from installations in Quebec and trade barriers will limit U.S. exports to Brazil.

## BOX 1 Key findings

- U.S. exports of wind-powered generating sets increased each year during 2007–11, with Canada and Latin America accounting for the largest share of exports. The total volume of U.S. exports remains low in comparison to global exports of these goods.
- Markets in Ontario, Western Canada, and Mexico are growing rapidly, and U.S. producers are positioned to increase exports to these markets in the next few years.
- U.S. producers are unlikely to benefit from installations in Quebec, while U.S. exports to Brazil will be limited by trade barriers and the growth in local production.
- U.S. producers are currently supplying the Central American market, and U.S. exports to the region could grow if the pace of wind installations accelerates.
- The remaining markets in Latin America offer at least limited export opportunities. These export opportunities vary by country, and whether they are realized will depend on how the firms producing in the United States decide to allocate production across their global supply chains.

## Product and Geographic Coverage

This paper examines U.S. exports of two key components of a utility-scale wind turbine: the nacelle and blades (box 2).<sup>4</sup> Nacelles house the main components of the wind turbine (e.g., the gearbox and the generator). They are typically manufactured in-house by original equipment manufacturers (OEMs),<sup>5</sup> while blades may be either produced by the OEM or made to the OEM's specifications by an outside supplier. Project developers (the firms that develop the wind project) purchase the entire wind turbine from the OEM.<sup>6</sup> Therefore, exports of blades are affected by which OEMs are doing well in foreign markets and where those OEMs choose to source blades for wind turbines.

<sup>2</sup> For the purposes of this paper, utility-scale wind turbines are those rated at 100 kilowatts (kW) or more. While 100 kW turbines are on the line between small and large wind turbines, they are included here as there are significant U.S. exports of 100 kW wind turbines. The paper will also focus on on-shore wind turbines, as there is not currently any U.S. manufacturing of off-shore wind turbines.

<sup>3</sup> Wind-powered generating sets include nacelles and any items imported with the nacelle, such as the blades or hub. If these components are imported or exported separately from the nacelle, they are included in different HS subheadings. Wind-powered generating sets are included in 8502.31 in the international Harmonized Commodity Description and Coding System (HS).

<sup>4</sup> This paper only examines exports of equipment and does not discuss service exports.

<sup>5</sup> Wind turbine OEMs typically design the wind turbine or license a wind turbine design, produce the nacelle, and sell the wind turbine under their own name (e.g., Gamesa, General Electric Co. (GE), Siemens, and Vestas).

<sup>6</sup> Some OEMs also engage in project development.

## BOX 2 Wind turbine nacelles and blades

**Nacelles:** The nacelle houses the main components of the wind turbine, such as the gearbox, generator, and shafts. According to Navigant's BTM Consult, the most commonly supplied nacelles globally in 2011 were for 1.5 to 2.5 megawatt (MW) wind turbines. Wind turbines have grown larger over time: worldwide, the average size of installed turbines rose from 1.5 MW in 2007 to 1.7 MW in 2011.

**Blades:** Most wind turbines have three blades. The blades are bolted to a hub attached to the front of the nacelle. Blades for 1.5 to 2.5 MW turbines typically range from 35 to 50 meters (115 to 164 feet).



Photo courtesy of DOE/NREL, credit Dennis Schroeder.

Sources: David, *Wind Turbines*, June 2009, 2; Navigant's BTM Consult, *World Market Update 2011*, March 2012, 35, 52; LM Wind Web site, <http://www.lmwindpower.com/Blades/Products/Blade%20summary.aspx> (accessed April 13, 2012); Vestas Web site, <http://www.vestas.com/en/media/brochures.aspx> (accessed April 13, 2012); GE Web site, [http://www.ge-energy.com/products\\_and\\_services/products/wind\\_turbines/](http://www.ge-energy.com/products_and_services/products/wind_turbines/) (accessed April 13, 2012).

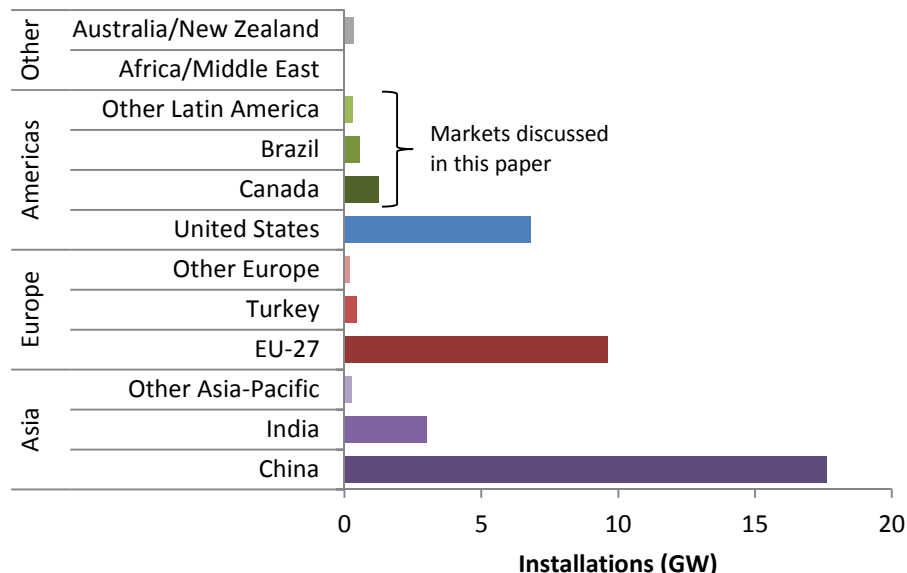
This paper focuses on Canada and Latin America since these markets have accounted for the largest share of U.S. exports to this point, and the growth in these markets and their proximity to U.S. producers suggest they offer further export potential. Annual installations in Canada and Latin America are projected to rise from 2,169 megawatts (MW) in 2011 to almost 5,000 MW in 2015, an increase of more than 120 percent as compared with a projected rate of increase in global installations of about 40 percent (figure 1).<sup>7</sup> While 2015 installations in Canada and Latin America will still only account for 8.3 percent of global installations—up from 5.3 percent in 2011—the growth of these markets is a significant export opportunity for U.S. producers.<sup>8</sup> The large markets in China and the EU, meanwhile, offer very limited export opportunities for U.S. producers, because they are principally supplied by local producers and because many of the firms producing in the United States also have plants in one or both of these markets.<sup>9</sup> This paper does not assess the potential for U.S. exports to emerging markets in Asia, Africa, or other locations.

<sup>7</sup> The drivers of demand in Canada and Latin America will be discussed in the individual country sections. Though the demand drivers vary by country, they may include government policies (at the national or subnational level), excellent wind resources, improvements in the grid infrastructure, better availability of financing, declining wind turbine prices, rising electricity demand, the complementarity of wind and hydroelectric power, a need to reduce dependence on imported fossil fuels, and a desire to install technologies with a minimal environmental impact. Navigant's BTM Consult, *World Market Update 2011*, March 2012, 70; GWEC, *Global Wind Report: Annual Market Update 2011*, March 2012, 11; McKenna, "Broader Global Role," May 1, 2012.

<sup>8</sup> Navigant's BTM Consult, *World Market Update 2011*, March 2012, 70; GWEC, *Global Wind Report: Annual Market Update 2011*, March 2012, 11; McKenna, "Broader Global Role," May 1, 2012.

<sup>9</sup> Though China and the EU were the two largest markets in 2011, they are primarily supplied through local production, with EU imports of wind-powered generating sets from all sources totaling only \$67 million and Chinese imports totaling only \$12 million in 2011. U.S. exports to the EU were less than \$1 million in 2011 and there were no U.S. exports to China that year. The largest U.S.-based wind turbine producer, GE, has production plants in both China and Europe and many of the leading producers in the United States are EU-based firms that also have production both in their home region and China. GWEC, *Global Wind Statistics 2011*, February 7, 2012; GTIS, Global Trade Atlas database (accessed April 18, 2012); USITC DataWeb/USDOC (accessed April 13, 2012); David, *Wind Turbines*, June 2009, 20; Siemens, "Hutchinson Nacelle Assembly Facility," 2011, 7; Vestas Web site, <http://www.vestas.com/en/about-vestas/company-structure.aspx> (accessed December 22, 2011).

**FIGURE 1** China, the EU, and the United States were the largest markets in 2011, but the Canadian and Latin American markets are of increasing significance



Source: GWEC, *Global Wind Report: Annual Market Update 2011*, March 2012, 11.

## Key Terminology

The production of wind turbine nacelles in the United States, as will be discussed below, is dominated by large global firms. Many of the OEMs that produce nacelles in the United States also have production in Europe, and some produce in Asia as well. In this paper, production in the United States by a firm, regardless of where the firm is headquartered, is considered U.S. production. For example, production in Colorado by Vestas, which is headquartered in Denmark, is considered U.S. production, and the Vestas units producing in the United States are considered U.S. producers.

Much of the data that are available on the wind industry, however, are firm level data. For example, data are available on all Vestas installations in Canada during 2007–11 and on total wind turbine shipments by Siemens in 2011. In order to fully understand trends and export potential for overseas markets, this paper will look at firm-level data before examining the export prospects for U.S. industry. As will be discussed, many firms have a choice of whether to supply a foreign market from their U.S. plant or from one of their plants in another country, so a wind turbine contract between a firm with U.S. production and a project developer in Canada or Latin America does not always lead to a U.S. export.

This paper will discuss the size of the “project pipeline,” sometimes also referred to as just the “pipeline,” for firms with U.S. production. For the purposes of this paper, a firm’s project pipeline is orders and planned installations<sup>10</sup> of the company’s wind turbines and is measured in MW. This information is based on a number of sources such as company press releases, media reports, and project documents and Web sites.

In this paper, the size of a country’s wind market is defined based on MW installed. Annual installations are the MW installed in a single year, while cumulative installations are the sum of all annual

<sup>10</sup> In some cases, project developers may have indicated that they plan to use turbines from a particular company, but it is not clear if the developers have placed firm orders for these turbines.

installations. Wind turbine installations are not always correlated with wind turbine shipments, since wind turbines are often shipped in one year but not installed until the next year.

Several terms are used in this paper in reference to wind turbines (box 3). In this paper, the term wind turbine refers to the entire structure, including the complete nacelle, hub, blades, and tower. When the terms nacelle and blade are used, they refer to the specific components referenced and not to the whole turbine. Finally, the trade term wind-powered generating sets will be used to refer to imports and exports. This term has a specific meaning for trade data, which is the complete nacelle and any items imported with the nacelle. If blades and hubs, for example, are imported in the same shipment as nacelles, they are considered part of the wind-powered generating set. If they are imported separately from the nacelle, they are not included in the trade data for wind-powered generating sets.

**BOX 3** Key terminology as used in this report

- **Feed-in tariff (FIT):** A policy mechanism that requires the purchase of electricity from a renewable energy system at a specified price for a certain period of time. The FIT rates are often lowered over time as the cost of renewable energy systems decline.
- **Power purchase agreement (PPA):** A long-term agreement between a utility and an independent power producer to purchase electricity.
- **Project pipeline:** A firm's project pipeline is orders and planned installations of the company's wind turbines. It is measured in MW.
- **Renewable portfolio standard (RPS):** A mandate that a certain percentage of renewable energy come from renewable sources by a particular date.
- **Tender:** In some markets, utilities select wind projects through a tender process. A utility indicates that they will contract for a certain amount of electric generating capacity, project developers submit bids, and the utility selects the winning bid based on low price and/or other considerations.
- **U.S. producer:** A company producing in the United States, regardless of where the parent firm is headquartered.
- **U.S.-based firm:** A company headquartered in the United States.
- **Utility-scale:** In this paper, utility-scale wind turbines are those rated at 100 kilowatts (kW) or more.
- **Wind-powered generating set:** Refers to the complete nacelle and any items imported with the nacelle. Used for trade data. Wind-powered generating sets are included in 8502.31 in the international Harmonized Commodity Description and Coding System (HS).
- **Wind turbine:** The complete turbine, including the nacelle, hub, blades, and tower.



## U.S. Market Uncertainty

This paper's assessment of the export opportunities for the U.S. wind industry is based on the current production capacity in the United States. The U.S. industry, however, is facing a potentially large drop in domestic demand due to the pending expiration of several federal tax credits/incentives for wind, including the production tax credit (PTC), bonus depreciation, and investment tax credit (ITC) and grant in lieu of the ITC (box 4). State renewable portfolio standards (RPSs) remain a driver of wind installations, but without federal government policies are not projected to sustain installations at the current levels. The U.S. wind turbine market averaged more than 7 gigawatts (GW) in installations during 2007–11 and is projected to be between 8 and 12 GW in 2012 as companies rush to complete projects before incentives expire. However, installations are forecast to fall to between 0.5 GW and just over 2 GW in 2013 and to be less than 3 GW in 2014 if the PTC is not renewed (figure 2).<sup>11</sup> U.S. nacelle capacity is more than 10 GW, so a market of this size may not be large enough to sustain some of the U.S. manufacturing plants.<sup>12</sup>

### BOX 4 Select U.S. government policies for wind

- **Bonus depreciation:** Wind projects were eligible for 50 percent bonus depreciation in their first year during 2008–September 2010, 100 percent bonus depreciation during September 2010–2011, and 50 percent in 2012.
- **Investment tax credit (ITC)/ITC grant:** Wind projects were also made eligible for the 30 percent ITC in 2009 or could elect to receive a cash grant in place of the ITC. In order to be eligible for the ITC, wind projects must be completed by the end of 2012. To be eligible for the cash grant, projects must have started construction by the end of 2011 and must be completed by the end of 2012.
- **Production tax credit (PTC):** A tax credit based on the amount of electricity generated by a wind project over its first ten years. The tax credit is adjusted for inflation and in 2010 was 2.2 cents per kilowatt-hour (kWh). Currently, projects must be completed by the end of 2012 to receive the tax credit.

Source: USDOE, Loan Programs Office Web site, [https://lpo.energy.gov/?page\\_id=41](https://lpo.energy.gov/?page_id=41); Wisner and Bolinger, *2010 Wind Technologies Market Report*, June 2011, 61–62; Platzer, *U.S. Wind Turbine Manufacturing*, September 23, 2011, 25–30.

Note: Wind project developers must choose between the PTC, ITC, and ITC grant. Wind projects also became eligible for loan guarantees under the American Recovery and Reinvestment Act of 2009. Four wind projects received full or partial guarantees.

Uncertainty over the PTC may lead to more exports in the short term since companies are looking at export markets to help offset the decline in U.S. demand, but an extended period without the PTC could lead to fewer long-term exports.<sup>13</sup> The export opportunities discussed here are unlikely to offset all of the U.S. sales decline and a lack of demand could lead to a contraction in U.S. production capacity. This

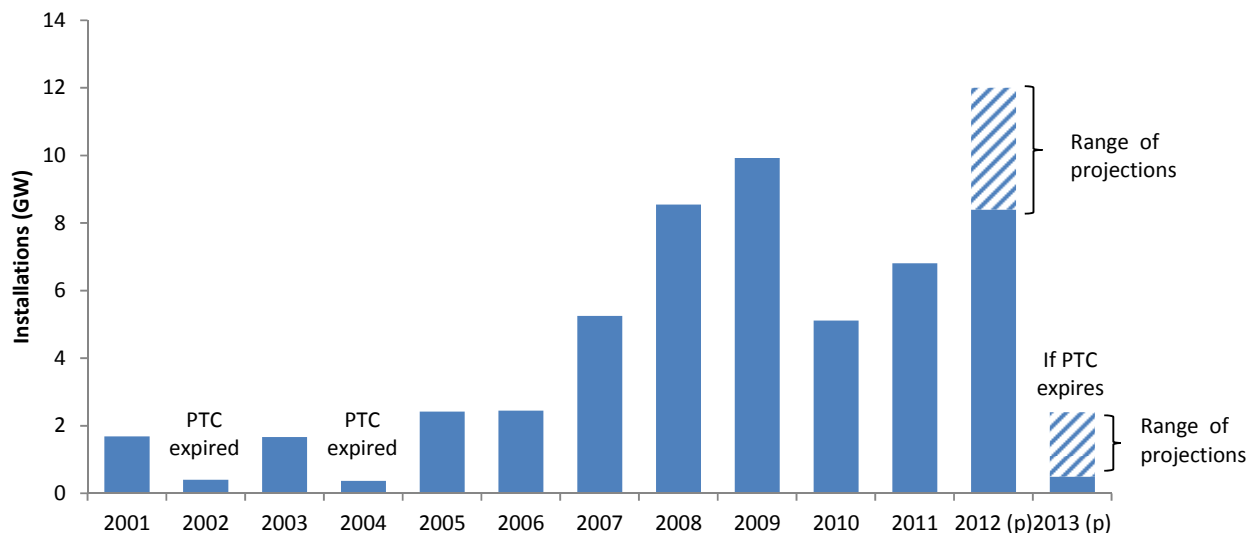
<sup>11</sup> This discussion focuses on the PTC since it has been in place for the longest period of time and has traditionally been a key driver of installations. If the PTC is renewed, installation levels in 2013 will likely depend on the timing of its renewal. In 2014, installations with the PTC are projected to be between 6 and 8 GW. One estimate concluded that the state RPSs will drive 4–6 GW in installations during 2011–20, but a substantial portion of these could come in the second half of the decade if the PTC expires. Kaplan, "United States Wind Market," November 2, 2011, 6–7; Navigant's BTM Consult, *World Market Update 2011*, March 2012, 70; Zindler, written statement to the Senate Committee on Finance, March 27, 2012, 2; Voorhis, "Energy Industry Fears," April 5, 2012; AWEA, *U.S. Wind Industry Fourth Quarter 2011 Market Report*, January 2012, 1; AWEA, *U.S. Wind Industry Year-End 2010 Market Report*, January 2011, 1; AWEA, *Annual Wind Industry Report: Year Ending 2008*, 2009, 4; Wisner and Bolinger, *2010 Wind Technologies Market Report*, June 2011, 61–62

<sup>12</sup> See table 1 below for more on U.S. nacelle production capacity. In some cases, production capacity is announced capacity and companies probably have not reached announced production levels. It is unclear whether U.S. demand at current levels is sufficient to sustain all of the nacelle manufacturers currently active in the U.S. market, but at current demand levels a dramatic contraction in production capacity is less likely. For discussion of the impact of the PTC expiration on U.S. industry, see, for example, Navigant Consulting, *Impact of the Production Tax Credit*, December 12, 2011; Zindler, written statement to the Senate Committee on Finance, March 27, 2012.

<sup>13</sup> Kessler, "Siemens Sees Americas Turbine Sales," June 6, 2012; *Windpower Monthly*, "Create Opportunities When the Market Dips," May 2012, 25; Romano, "GE Boss," June 1, 2012, 24–25; Norfleet, "IWEA Head Withdraws 'Layoff' Quote," March 2, 2012; industry representative, interview by USITC staff, June 6, 2012.

paper does not analyze the impact of U.S. market scenarios on production capacity, but it is possible that expiration of the PTC could lead to a smaller industry that exports fewer products.

**FIGURE 2** U.S. wind installations are projected to fall in 2013 if the production tax credit is not renewed



Sources: Navigant Consulting, *Impact of the Production Tax Credit*, December 12, 2011, 13; Zindler, written statement to the Senate Committee on Finance, March 27, 2012, 2; Kaplan, “United States Wind Market,” November 2, 2011, 6; Voorhis, “Energy Industry Fears,” April 5, 2012; AWEA, *U.S. Wind Industry Fourth Quarter 2011 Market Report*, January 2012, 1; AWEA, *U.S. Wind Industry Year-End 2010 Market Report*, January 2011, 1; AWEA, *Annual Wind Industry Report: Year Ending 2008*, 2009, 4; AWEA, *Year-End 2009 Market Report*, January 2010, 2.

Note: p: projected installations.

## U.S. Wind Industry Expanded in Response to Domestic Market Growth

There has been substantial investment in U.S. nacelle production by foreign OEMs, particularly those based in the EU, in response to growing U.S. demand (table 1).<sup>14</sup> In addition, several U.S.-based companies also produce domestically. In 2011 all three firms with at least 1,000 MW in installations in the United States, and six of the top nine firms in the U.S. market (considering REpower and Suzlon separately), assembled nacelles in the United States.<sup>15</sup> In addition, a number of companies with smaller markets shares are producing nacelles in the United States. This growth in production was enough to make the United States the third largest nacelle producer in 2011, but U.S. production was still significantly lower than that in China and Europe (box 5).

Three OEMs (Gamesa, Siemens, and Vestas) have established blade production in the United States. In addition, several independent suppliers of blades to OEMs produce in the United States. TPI Composites and Molded Fiberglass supply GE from their U.S. plants. LM Wind Power likely supplies multiple OEMs from its U.S. plants. It is the largest global independent blade supplier and had a 27 percent market share in North America in 2010.<sup>16</sup>

<sup>14</sup> Companies also sought to reduce transportation costs, minimize the risks of currency fluctuations, ease logistical challenges, and avoid import duties. David, *Wind Turbines*, June 2009, 6.

<sup>15</sup> REpower is based in Germany and is a subsidiary of India-based Suzlon. Repower was previously an independent firm and will be discussed separately from its parent company here as this will allow a more nuanced discussion of market trends.

<sup>16</sup> Information is not available on whether Molded Fiberglass and TPI Composites supply OEMs other than GE. LM Wind Power, “Announcement of Financial,” April 26, 2011; High-Performance Composites, “GE Energy Announces,” January 1, 2008.

**TABLE 1** U.S. nacelle and blade producers, March 2012

Company	Headquarters	2011 U.S. MW installed	U.S. production	Production capacity		Exported in past?
				MW	Units	
<b>OEM</b>						
Acciona Windpower	Spain	0	Nacelles: Iowa	675	450	Yes
Aeronautica	United States	0.8	Nacelles: New Hampshire	N/A	N/A	N/A, but plan to export from U.S. plant
Alstom	France	39.6	Nacelles: Texas	800	N/A	No, but plan to serve the North American market from U.S. plant
Daewoo Shipbuilding & Marine Engineering Company (DSME)/DeWind <sup>a</sup>	Korea	0	Nacelles: Texas	600	300	Yes
Gamesa	Spain	152	Nacelles: Pennsylvania Blades: Pennsylvania	1,200 N/A	N/A N/A	Yes
General Electric Co. (GE)	United States	2,006.1	Nacelles: California, Florida, and South Carolina	5,024	3,140	Yes
Nordex	Germany	287.5	Nacelles: Arkansas	750	300	N/A, but plan to serve Canada and Latin America from U.S. plant
Northern Power Systems	United States	2.3	Nacelles: Michigan, Vermont Blades: California	N/A N/A	N/A N/A	Yes
Siemens	Germany	1,233.1	Nacelles: Kansas Blades: Iowa	1,500 1,610	650 2,100	N/A, but plan to export from U.S. plants
United Technologies Corp. (UTC)/Clipper Windpower <sup>b</sup>	United States	257.5	Nacelles: Iowa	>1,000	>400	Yes
Vestas Wind Systems	Denmark	1,969.4	Nacelles: Colorado Blades: Colorado (2 plants)	N/A 3,000	1,500 3,800	Yes
<b>Independent blade suppliers</b>						
Energetx Composites	United States	N/A	Blades: Michigan	N/A	N/A	No blade exports, did export blade molds
LM Wind Power	Denmark	N/A	Blades: Arkansas, North Dakota	N/A	N/A	Yes
Molded Fiberglass	United States	N/A	Blades: South Dakota, Texas	N/A	N/A	Yes
TPI Composites	United States	N/A	Blades: Iowa	N/A	N/A	N/A

*Sources:* Compiled from press releases, media reports, company documents and Web sites, interviews with industry representatives, and AWEA publications. GE production capacity is from the Bloomberg New Energy Finance database.

*Notes:* N/A: not available. Does not include planned plants. For Siemens, the figure for blade production capacity is based on its expected annual number of blades produced as of September 2011, and the figure for MW is based on the assumption that all blades are used for its 2.3 MW wind turbine. GE's production capacity is based on the average-size GE wind turbine installed in the United States in 2011, which was 1.6 MW. Nacelles for Northern Power Systems' 2.5 MW turbines are manufactured by Merrill Technologies Group in Michigan, and the nacelles for the DeWind wind turbine are produced by TECO Westinghouse in Texas. In some cases production capacity is announced capacity, and companies may not have reached the announced production levels. The DeWind production rate is TECO Westinghouse's production rate for one shift per year. Construction of a planned Mitsubishi nacelle plant was suspended in 2012. Northern Power Systems acquired Knight & Carver's blade group. Nordic Windpower announced plans in 2010 to move its manufacturing plant from Pocatello, Idaho to Kansas City, Missouri. Information is not available on Nordic's current status, so Nordic is not included in this list. Several other firms, including Blade Dynamics and Global Blade Technology, have set up blade plants, but information is not available on whether they have started commercial production.

<sup>a</sup>Subsequently referred to as "DeWind."

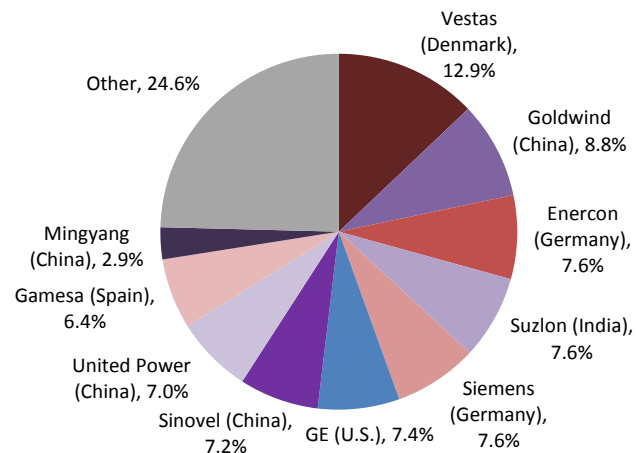
<sup>b</sup>Subsequently referred to as "Clipper" or "Clipper Windpower."

## BOX 5 Global wind industry in 2011

Most of the leading wind turbine suppliers in 2011 were based in the EU and China. EU-based firms have significant production in their home market from which they supply both domestic and foreign markets. These firms have also localized production in key markets such as Brazil, China, and the United States. China-based firms produce only in China and have primarily supplied the domestic market, though many are actively seeking to expand their foreign sales. U.S.-based GE and India-based Suzlon are also among the leading global producers.

China was the leading producer of nacelles in 2011, followed by the EU, the United States, and India. The EU, however, was the dominant global exporter of wind-powered generating sets in 2011 due to its large domestic industry and sales by EU firms in many overseas markets. China was second, followed by the United States. India and Japan have also been significant exporters in past years, though their exports were low in 2011 because of a drop in shipments to the United States.

### EU- and China-based firms were the leaders in 2011 global installations

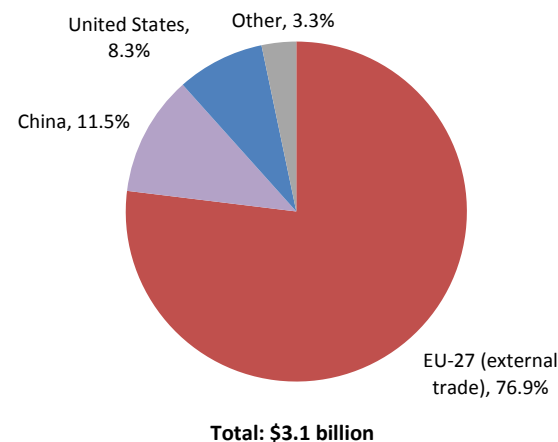


Source: North American Windpower, "Report Reveals Top 10 Wind Turbine Manufacturers for 2011," March 26, 2012.

Notes: MAKE Consulting estimate of 2011 installations. Total not available. Headquarters location in parentheses.

Source: Information on the leading nacelle producing countries is based on estimates by USITC staff.

### The EU was the dominant global exporter of wind-powered generating sets in 2011



Source: GTIS, Global Trade Atlas database (accessed July 23, 2012).

Note: U.S. export data from GTIS may differ slightly from U.S. export data discussed elsewhere in this paper.

## U.S. Exports Significantly Increased During 2007–11

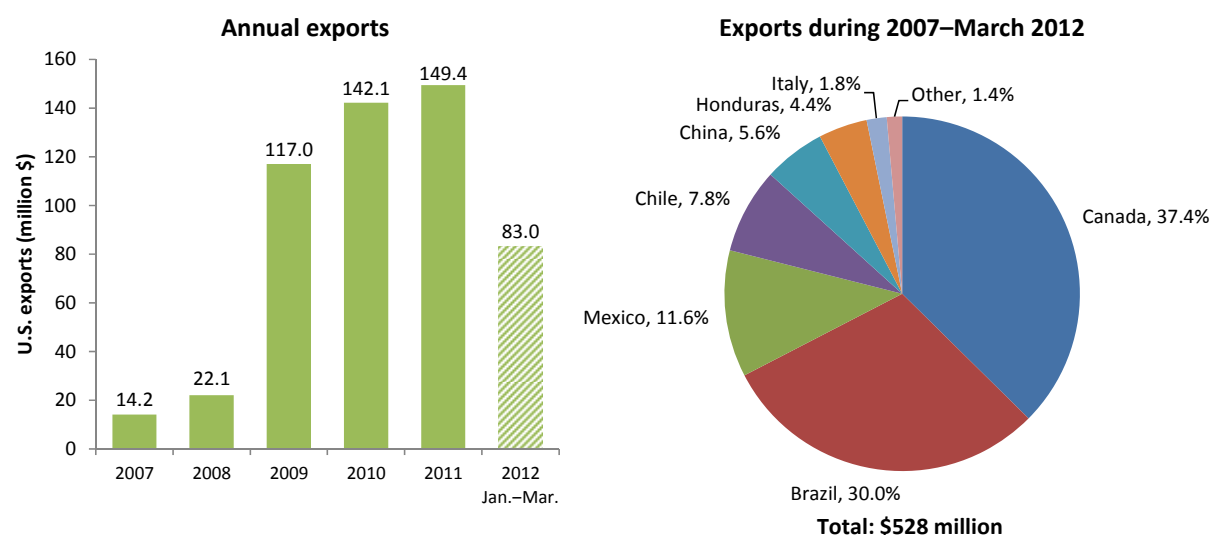
U.S. exports of wind-powered generating sets<sup>17</sup> rose substantially during 2007–11, with Canada and Latin America accounting for the largest share of exports (figure 3 and table 2).<sup>18</sup> The increase in U.S. exports is driven principally by three factors: the increase in the number of firms producing in the United States and the related growth in U.S. production capacity; growing markets in Canada and Latin America; and the competitiveness of U.S. firms in nearby markets. A majority of U.S. nacelle producers have exported in the past and those that have not exported have indicated that they intend to supply foreign market from their U.S. plants (table 1). Despite the increase in U.S. exports, they accounted for only 8 percent of global exports of wind-powered generating sets in 2011.<sup>19</sup>

<sup>17</sup> The 10-digit provision in the export classification system (Schedule B) that includes blades also includes non-wind products, so blade export data will only be discussed in the specific country sections below and only if the data provide some useful insights into U.S. trade.

<sup>18</sup> The leading markets have fluctuated annually, with exports for a small number of projects generally dictating which markets accounted for the most exports. Though the EU is not discussed extensively in this paper, Northern Power Systems has had success in exporting its 100 kW turbine to Italy, where there are incentives for the installation of wind power projects of less than 200 kW. USITC DataWeb/USDOC (accessed February 14, 2012); Ex-IM Bank, "Vermont Manufacturer," May 26, 2011.

<sup>19</sup> GTIS, Global Trade Atlas database (accessed March 29, 2012).

**FIGURE 3** U.S. exports of wind-powered generating sets rose annually during 2007–11 and were primarily to Canada and Latin America



Source: USITC DataWeb/USDOC (accessed April 27, 2012).

**TABLE 2** U.S. exports of wind-powered generating sets, 2007–March 2012, million \$

	2007	2008	2009	2010	2011	Jan.–Mar. 2012	Total
<b>Americas</b>							
Canada	0.0	0.0	77.7	107.9	11.8	0.0	197.4
Brazil	0.0	5.9	0.0	0.0	99.6	52.7	158.2
Mexico	0.0	0.0	18.1	24.4	11.8	6.7	61.0
Chile	0.0	0.0	18.1	0.0	0.0	22.9	41.1
Honduras	0.0	0.0	0.0	0.0	23.4	0.0	23.4
Argentina	0.0	0.0	1.2	0.0	0.0	0.0	1.2
Saint Kitts and Nevis	0.7	0.0	0.0	0.0	0.0	0.0	0.7
Bahamas	0.0	0.0	0.0	0.0	0.6	0.0	0.6
<b>Other</b>							
China	12.8	16.2	0.0	0.0	0.6	0.0	29.6
Italy	0.0	0.0	1.2	7.6	0.8	0.0	9.6
Korea	0.0	0.0	0.0	2.1	0.8	0.0	3.0
Spain	0.0	0.0	0.7	0.0	0.0	0.0	0.7
Japan	0.6	0.0	0.0	0.0	0.0	0.0	0.6
United Kingdom	0.0	0.0	0.0	0.0	0.0	0.6	0.6
<b>Total</b>	<b>14.2</b>	<b>22.1</b>	<b>117.0</b>	<b>142.1</b>	<b>149.4</b>	<b>83.0</b>	<b>527.7</b>

Sources: USITC DataWeb/USDOC (accessed April 27, 2012).

Notes: Exports to Honduras in 2011 were incorrectly categorized as foreign exports (re-exports or goods that are imported into the U.S. and then exported in essentially the same condition), so they are included here with domestic exports. U.S. exports totaled \$0.8 million during Jan.–Mar. 2011.

One of the main reasons that U.S. producers are competitive in nearby markets is that transportation costs are lower than for producers located farther away.<sup>20</sup> U.S. data illustrate the expense of exporting from Europe to the Americas. In 2011, for instance, insurance, freight and other charges for wind-powered generating sets exported from Denmark to the Houston-Galveston customs district averaged \$39,000 per wind-powered generating set (2.6 percent of the average import value); to the Minneapolis customs district, costs were \$39,000 (3.0 percent); and to the Columbia-Snake customs district, \$63,000 (5.7 percent).<sup>21</sup>

<sup>20</sup> Northern Colorado Business Report, “Vestas Colo. Shipping to Latin America Markets,” December 16, 2011.

<sup>21</sup> Percentage is of the customs value. USITC DataWeb/USDOC (accessed April 27, 2012).

Industry representatives indicate that the ability to access competitive financing from the Export-Import Bank of the United States (Ex-Im Bank or Ex-Im) can benefit U.S. firms that export, especially in Latin America where financing projects can be challenging. Ex-Im Bank has a target, set by Congress,<sup>22</sup> to provide 10 percent of its export financing to renewable energy or energy efficient products. It has established an Environmental Exports Program under which it offers enhanced financing (e.g., extended repayment terms) and other incentives (e.g., the ability to lock in interest rates when the loan is approved) for renewable energy. In addition, for renewable energy Ex-Im Bank can provide financing for projects in Canada. At least four firms have accessed Ex-Im financing for projects in Latin America, and other firms are reportedly considering doing the same (table 3). However, the Ex-Im Bank requires that firms use U.S.-flagged shipping and meet domestic content requirements, which may make it more difficult for some firms to use this financing.<sup>23</sup>

**TABLE 3** Announced Ex-Im Bank funding for wind exports, 2009–June 2012

Company	Announced	Project location	Number of turbines	Turbine rating (MW)	Total (MW)	Ex-Im financing (million \$)
Gamesa (nacelles) and LM Wind Power (blades)	August 20, 2010	Honduras	51	2	102	159
LM Wind Power (blades)	May 31, 2012	Brazil	N/A	N/A	N/A	32
Northern Power Systems	May 26, 2011	Italy	55	0.1	5.5	22
UTC/Clipper Windpower	November 24, 2009	Mexico	27	2.5	67.5	81

Sources: Ex-Im Bank, “American Windpower Firm Grows,” November 24, 2009; Ex-Im Bank, “Export-Import Bank Provides \$159 Million,” August 20, 2010; Ex-Im Bank, “Vermont Manufacturer,” May 26, 2011; Ex-IM Bank, Summary of Minutes, May 31, 2012.

Note: N/A: Not applicable.

Local-content requirements are likely the most significant barrier to U.S. exports of nacelles and blades. Several of the largest markets, including Ontario, Quebec, and Brazil, have implemented requirements to source locally, though the impact of these requirements will likely vary depending on the design of the rules.<sup>24</sup> A few countries in the Americas, including Brazil, maintain high tariffs on wind-powered generating sets that may affect U.S. exports, but tariffs in the region generally remain low. U.S. producers may also have a competitive advantage in countries where U.S. products enter duty free due to free trade agreements.<sup>25</sup>

<sup>22</sup> Consolidated Appropriations Act, 2012, Pub L. No. 112-74, § 5, 125 Stat. 1191 (December 23, 2011).

<sup>23</sup> GAO, *Export-Import Bank*, July 2010, 4, 39–40; industry representative, interview by USITC staff, April 24, 2012; Richards, written statement to the House Committee on Energy and Commerce, October 7, 2009, 10.

<sup>24</sup> Local content requirements and the specific impact of the requirements will be discussed in more detail in the individual country sections.

<sup>25</sup> Tariffs will be discussed in more detail in the individual country sections.

# Canada Could Become a Significant U.S. Export Market

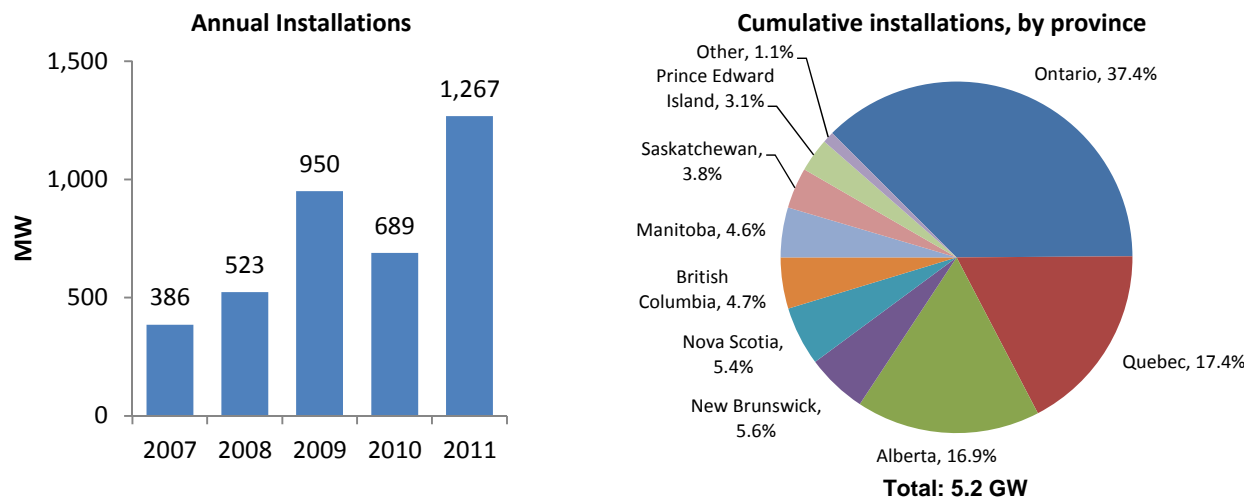
## Overview

Policies at the provincial level in Canada are driving a rapid expansion of the Canadian wind turbine market and creating export opportunities for U.S. producers of nacelles and, to a lesser extent, blades. Firms with U.S. nacelle production, like Acciona, GE, Siemens, and Vestas, have large project pipelines in Canada. Many of these firms have supplied Canadian projects from the United States in the past and intend to supply future projects from the United States. There is also the potential for additional blade exports to Canada, with at least one firm increasingly supplying the Canadian market from its U.S. plant. U.S. exports to Canada may be limited, however, by local content requirements in Ontario and Quebec.

## Market

Canada is the largest wind market in the Americas after the United States, with 1.3 GW in installations in 2011 (figure 4).<sup>26</sup> The market is expected to grow further in the next few years, with annual installations projected to reach 2 GW in 2013 and 2.5 GW in 2014.<sup>27</sup> Three provinces—Ontario, Quebec, and Alberta—accounted for 72 percent of cumulative Canadian wind installations through the end of 2011, with Ontario alone accounting for 37 percent.<sup>28</sup> These provinces also account for the largest share of new project development activity in Canada, though installations are also rising in other provinces.<sup>29</sup> In British Columbia, wind developers are hopeful that wind-generated electricity will be in demand as a result of the provincial government's need for new electricity generation to supply provincial efforts in developing liquid natural gas plants, shale gas resources, and mining activities.<sup>30</sup> The province's power company, BC Hydro, however, has awarded contracts for only 0.5 GW of new wind capacity.<sup>31</sup>

**FIGURE 4** Wind installations in Canada rose significantly during 2007–11



Source: CANWEA, *Powering Canada's Future*, December 2011.

<sup>26</sup> CANWEA, *Powering Canada's Future*, December 2011.

<sup>27</sup> Navigant's BTM Consult, *World Market Update 2011*, March 2012, 70.

<sup>28</sup> CANWEA, *Powering Canada's Future*, December 2011.

<sup>29</sup> See discussion of project pipelines below.

<sup>30</sup> Simpson, "Wind Power Sector Eager to Deliver," February 3, 2012.

<sup>31</sup> BC Hydro Web site,

[http://www.bchydro.com/energy\\_in\\_bc/acquiring\\_power/closed\\_offerings/clean\\_power\\_call/outcome.html](http://www.bchydro.com/energy_in_bc/acquiring_power/closed_offerings/clean_power_call/outcome.html) (accessed April 10, 2012); Simpson, "Wind Power Sector Eager to Deliver," February 3, 2012.

Canada's national energy policy is market oriented, and thus wind installations in Canada are driven by renewable energy goals and policies at the provincial level (table 4).<sup>32</sup> To accomplish their goals of increasing power from renewables, the provinces, with the exceptions of Alberta and Manitoba, have established RPSs, offered or tendered contracts for electricity generated by wind power or other renewables through provincial-owned electric companies, and introduced feed-in tariffs (FITs).<sup>33</sup> RPSs are often used in combination with other policies, such as tendering and FITs. Ontario has the most comprehensive FIT in North America for renewable energy.<sup>34</sup> In September 2009, Ontario launched its FIT, which is included in the province's Green Energy and Green Economy Act of 2009. Among the goals of the FIT is to help Ontario phase out coal-fired electricity generation by 2014 and create jobs in renewable energy industries. By the end of September 2011, more than 3 GW of wind projects were being developed under the Ontario Power Authority's FIT program.<sup>35</sup>

The provinces of Quebec and Ontario have included domestic-content requirements in their wind programs in order to encourage economic development; however, wind turbine producers contend that such requirements act as barrier to entry and raise costs.<sup>36</sup> The Province of Quebec, through the province's utility company, Hydro-Québec, required 40 percent to 60 percent regional content for wind projects in its first wind tender in 2003. In the 2005 second wind tender and the 2009 third wind tender, Hydro-Québec required that a minimum of 30 percent of the content of the wind turbines must be produced in manufacturing plants in the regional county municipality of Matane and the administrative region of Gaspésie-Îles-de-la-Madeleine in Quebec and a minimum of 60 percent of the costs of the wind farms must come from Quebec.<sup>37</sup>

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<sup>32</sup> Natural Resources Canada, "Overview of Canada's Energy Policy," n.d., <http://www.nrcan.gc.ca/energy/policy/1352> (accessed May 1, 2012).

<sup>33</sup> Alberta is the only province without a provincial-owned utility.

<sup>34</sup> Ontario Power Authority, *Ontario's Feed-in Tariff Program—Background*, April 8, 2010.

<sup>35</sup> Ontario Power Authority Web site, <http://www.powerauthority.on.ca/current-electricity-contracts/wind-power> (accessed April 13, 2012).

<sup>36</sup> Farrell, *Maximizing Jobs from Clean Energy*, January 2011, 12; Romano, "GE and Vestas Slam Canadian Provinces," October 20, 2011.

<sup>37</sup> Hydro-Québec, *Wind Power Ensuring Québec's Electricity Supply*, 3rd Quarter 2008, 5; Hydro-Québec, "Call for Tenders A/O 2009-02," April 30, 2010, 7; Hydro-Québec Web site, <http://www.hydroquebec.com> (accessed April 6, 2012).



**TABLE 4** Canada's installed wind energy capacity (MW), December 2011, and principal wind energy goals by provincial jurisdiction

Province	Cumulative capacity (MW)	Provincial wind energy goals	Major policy used
Alberta	891	No provincial target for wind.	Planned transmission improvements.
British Columbia	248	No provincial target for wind. During 2007-2012, set a goal of electricity self-sufficiency by 2016 with 93 percent from renewable energy sources. In February 2012, set a goal to develop electricity sources to power natural gas and mining projects. These sources may include wind power.	Tendering by BC Hydro for large projects; Standing Offer Program for projects up to 10 MW.  Feed-in tariff proposed in 2010, but not yet adopted.
Manitoba	242	1,000 MW by 2016.	Tendering by Manitoba Hydro.
New Brunswick	294	In 2006, set an RPS of 10 percent of provincial utility electricity (kW) sold from renewables by 2016, with approximately 400 MW from wind. In October 2011, RPS raised to 40 percent of NB Power total sales by 2020, but this includes imported wind power, and improved wind power infrastructure planned.	Tendering by NB Power.  Feed-in tariff for community-based wind projects with a capacity less than 15MW established in February 2010.
Newfoundland and Labrador	55	80 MW (maximum electricity from wind that the grid can accept) on the island of Newfoundland.	Tendering by Newfoundland and Labrador Hydro, a subsidiary of Nalcor Energy.
Nova Scotia	286	25 percent renewable energy by 2015 (from 1,300 gigawatt-hour (GWh)/year to 3,000 GWh/year); 40 percent renewable energy by 2020.	RPS in Renewable Electricity Regulations of 2010; feed-in tariff system for community-based wind projects; tendering for half of all large- and medium-size renewable energy projects for independent power producers.
Ontario	1,970	10,700 MW of renewable energy by 2018.	Feed-in tariff.
Prince Edward Island (PEI)	164	RPS in Renewable Energy Act of 2005 for 15 percent of total generation by 2010. PEI Energy Accord, effective March 2011, sets a goal of 33 percent of electricity consumption from wind generation by 2016.	RPS in Renewable Energy Act of 2005 and RPS in PEI Energy Accord.
Quebec	918	4,000 MW by 2015; additional 100 MW of wind power for every 1,000 MW of new hydro power.	Tendering by Hydro-Québec.
Saskatchewan	198	Add 175 MW during 2010–15	Tendering by SaskPower.
Yukon	1	Increase Yukon renewable energy use by 20 percent during 2008–2020 from 297 GWh/year to 356 GWh/year. By 2012, create RPS for Yukon Energy Corp. for 90 percent clean or renewable energy.	RPS for Yukon Energy Corp. in 2012.

Sources: CANWEA, *Powering Canada's Future*, March 2012; various provincial Web sites.

Note: GWh: gigawatt-hour.

Under Ontario's FIT program, wind projects over 10 kilowatts (kW) that started commercial operation during 2009–11 must have a minimum provincial domestic content level of 25 percent. The content requirement rose to 50 percent for projects starting in 2012 and later.<sup>38</sup> Minimum domestic content percentages are set out for 18 manufacturing inputs or activities areas carried out in Ontario. The largest domestic content percentages are for the wind turbine blades, gearbox or generator (depending on whether the turbine is direct drive), steel for towers, grid connection transformers, and construction costs and on-site labor.<sup>39</sup> In September 2010, Japan requested consultations with Canada under the World Trade Organization (WTO) dispute settlement process regarding domestic content requirements in Canada. The Japanese complaint alleges that Ontario's FIT discriminated against imported renewable energy products relative to those made in Ontario.<sup>40</sup> In August 2011, the EU requested consultations within the WTO on the same issue. Both Japan and the EU requested the formation of dispute panels.<sup>41</sup>

Currently, Canada does not have a national, funded renewable energy incentive program. The major Canadian national program was the ecoENERGY program, enacted in 2007 and terminated in 2010.<sup>42</sup> The program paid renewable energy providers 1 cent (before tax) per kilowatt-hour (kWh) for the first 10 years of commercial renewable power production. Projects had to be completed between April 1, 2007, and March 31, 2011, so payments made by the program under these contracts will continue through March 31, 2021. Two federal tax provisions also aid the development of wind in Canada. The first is a tax program that accelerates the capital cost allowance (CCA) on clean energy generation equipment and can be applied to assets acquired from February 23, 2005 to December 31, 2019.<sup>43</sup> The second is the Canadian Renewable and Conservation Expense (CRCE), introduced in March 1996.<sup>44</sup> The CRCE was established to place the tax treatment of renewable energy on a parity with the treatment given to the petroleum, natural gas, and mining industries.<sup>45</sup>

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<sup>38</sup> Ontario Power Authority, *Feed-In Tariff Program, Program Overview*, Version 1.1, September 30, 2009, 5; Ontario Power Authority Web site, <http://fit.powerauthority.on.ca/domestic-content-1> (accessed April 12, 2012).

<sup>39</sup> Ontario Power Authority, *FIT Contract Exhibits* (accessed May 4, 2010).

<sup>40</sup> WTO, "Dispute Settlement: Dispute DS412," September 13, 2010.

<sup>41</sup> The panel reports are expected to be issued in November 2012. WTO, "Dispute Settlement: Dispute DS426," August 11, 2011.

<sup>42</sup> Government of Canada Web site, <http://www.ecoaction.gc.ca/ecoenergy-ecoenergie/power-electricite/index-eng.cfm> (accessed April 12, 2012); CANWEA, "Federal Budget Fails to Extend Support," March 4, 2010.

<sup>43</sup> Department of Justice Canada, *Income Tax Regulations, CRC*, c. 945 (2012), part XI, "Capital Cost Allowance," [http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.,\\_c.\\_945/page-44.html#h-104](http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.,_c._945/page-44.html#h-104) (accessed April 13, 2012); Monteith, Gupta, and Timmins, "The Wind North Of The 49<sup>th</sup> Parallel," March 2011, 15–17.

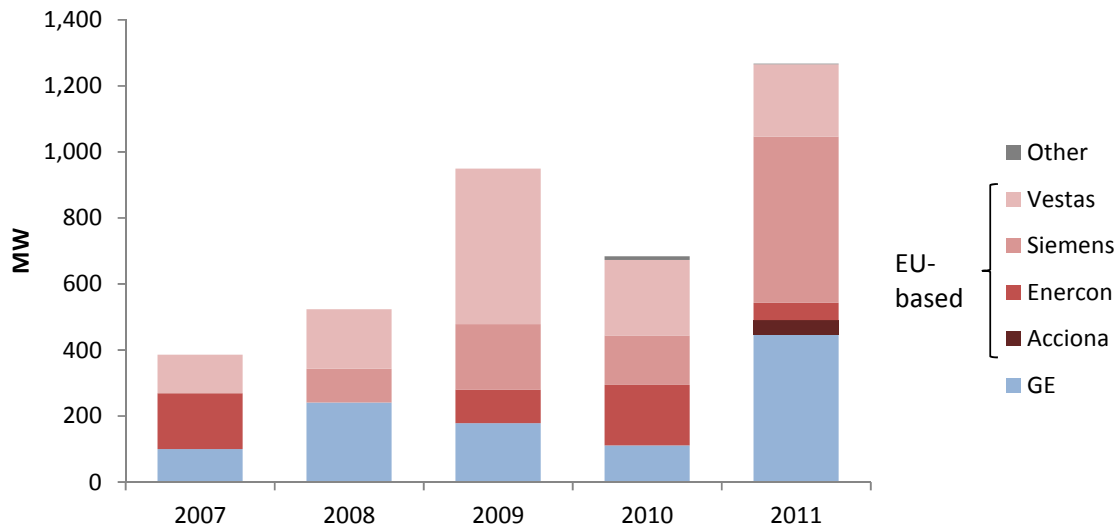
<sup>44</sup> Shannon, "Canadian Renewable & Conservation Expense ('CRCE')," January 2006; Canada Revenue Web site, <http://www.cra-arc.gc.ca/tx/bsnss/tpcs/fts-paa/nrgy-eng.html> (accessed April 13, 2012).

<sup>45</sup> Upfront developmental costs, such as engineering and design work and feasibility studies could be deducted as an expense immediately or carried forward indefinitely. Under a "flow-through" shares financing system, eligible expenses may be transferred or sold to shareholders (i.e., investors). The investors would then have the full benefit of the income tax expenses (which they can use to reduce their tax liability), while the company selling the shares receives money to finance its activities.

# Market Competition

GE, Enercon, Siemens, and Vestas were the leading suppliers to the Canadian market in 2007–11, accounting for a combined 98 percent of wind turbine installations (figure 5). Acciona has developed a number of wind projects in Canada using turbines produced by other companies, but completed its first wind project using its own turbines in 2011. Other companies with installations in Canada during this period include Leitwind, Northern Power Systems, REpower, and Vensys.<sup>46</sup>

**FIGURE 5** The Canadian market has been dominated by GE and EU-based producers

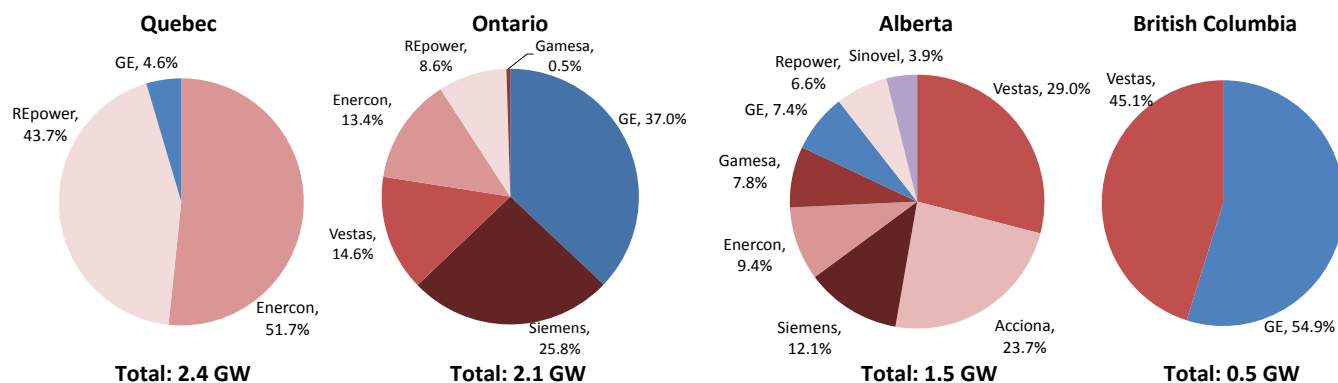


Source: CANWEA Web site, [http://www.canwea.ca/farms/wind-farms\\_e.php](http://www.canwea.ca/farms/wind-farms_e.php) (accessed April 2, 2011).

While four OEMs dominated the market during 2007–11, competition is increasing. Examining wind projects under construction or in development in four provinces—Alberta, British Columbia, Ontario, and Quebec—indicates that as of March 2012 seven firms each had project pipelines of at least 100 MW in the four provinces combined (figure 6).

<sup>46</sup> CANWEA Web site, [http://www.canwea.ca/farms/wind-farms\\_e.php](http://www.canwea.ca/farms/wind-farms_e.php) (accessed September 7, 2011 and April 2, 2012).

**FIGURE 6** OEM project pipelines differ by province, April 2012



*EU-based firms are in shades of red, U.S.-based firms in blue, and Asia-based firms in purple.*

*Sources:* The list of projects is from the Ontario Power Authority’s list of FIT contracts offered, Alberta Electric System Operator’s active project list, and BC Hydro and Hydro-Québec information on awarded contracts under wind tenders. For Quebec, information on equipment suppliers is from the Hydro-Québec Web site; for all others it is based on media reports, press releases, company Web sites, and project documents.

*Notes:* The charts above only include projects for which USITC staff could identify the OEM that the project developer has contracted with or intends to use to supply the project. Therefore, the actual pipeline for at least some firms could be even larger. In addition, some project documents may list a particular OEM as the supplier, but the project developer may not have a contract with this firm and may ultimately choose to use a different supplier. Therefore, the project pipeline of firms shown here could change slightly.

Competition among OEMs, however, varies significantly by province, depending on the characteristics of the market and factors such as local-content requirements. In Quebec, competition is fairly limited. Quebec’s second wind tender or request for bids (in 2005, for 2,000 MW, selections announced in 2008) resulted in bids including turbines from five manufacturers. Its third wind tender (in 2009, for 500 MW, selections announced in 2010) resulted in bids from project developers that included four manufacturers. At least one firm chose not participate in the Quebec tenders because the market was not large enough to warrant meeting local-content requirements.<sup>47</sup> Under the Ontario FIT, which also includes a local-content requirement, the leading suppliers are GE, Siemens, and Vestas, while leading Quebec suppliers Enercon and REpower have the fourth- and fifth-largest project pipelines. Alberta, meanwhile, has a completely deregulated utility market and projects in development there are being supplied by eight OEMs, of which Vestas and Acciona have the largest pipelines. British Columbia’s call for proposals, meanwhile, resulted in the selection of projects that are likely to use wind turbines from either Vestas or GE. Chinese wind turbine manufacturers have not made major inroads in the Canadian market yet, despite active efforts by firms such as Goldwind and Sinovel to increase their sales.<sup>48</sup> Similarly, with the exception of sales by REpower, the Germany-based subsidiary of Suzlon, Indian producers have had few sales in Canada.<sup>49</sup>

<sup>47</sup> Romano, “Local Rules Decisive,” December 10, 2010.

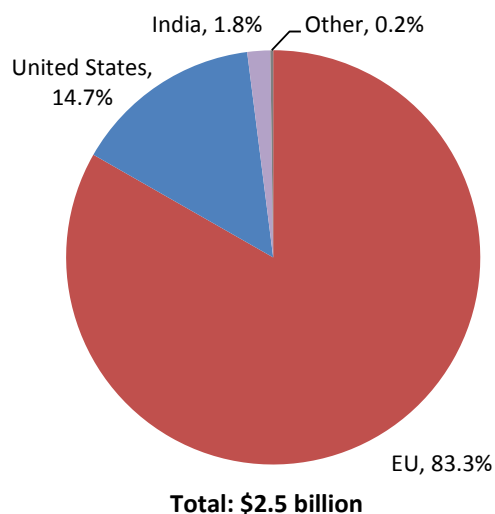
<sup>48</sup> The only project using Chinese wind turbines that was identified was a 60 MW wind project in Alberta that is planning to use Sinovel wind turbines. *North American Windpower*, “Goldwind USA Hires Rao-Aourpally,” June 7, 2011; Sinovel, “Sinovel Led Chinese Companies,” May 25, 2011; Municipal District of Pincher Creek No. 9, Public Meeting Notice, 2012.

<sup>49</sup> The only project using Indian wind turbines that was identified was a 31.5 MW wind project in Amherst that is using Suzlon wind turbines. Suzlon announced in 2011 that it was shifting production of some REpower nacelles to India; if these nacelles are used for projects in Canada rather than those produced in Europe, there could be additional Canadian imports from India. Suzlon, “First Suzlon S97 Turbines Arrive,” September 28, 2011; Pearson, “Suzlon Shifts Nacelle Production,” May 20, 2011.

## U.S. Export Opportunities

The United States exported about \$200 million in wind-powered generating sets to Canada during 2007–11. In total, 164 nacelles were exported, all during the last three years of this time period. The U.S. producers that exported to Canada include Acciona, GE, and Northern Power Systems.<sup>50</sup> Canada's imports from the United States, however, were significantly lower than those from the EU. Canadian imports of wind-powered generating sets from the EU totaled \$2.1 billion during 2007–11 and accounted for 83 percent of imports by value (figure 7). The largest source of imports was Denmark, which accounted for \$1.6 billion, followed by Germany at \$540.4 million.<sup>51</sup>

**FIGURE 7** The EU and the United States were the leading suppliers to Canada during 2007–11



Source: GTIS, Global Trade Atlas database (accessed April 2, 2012).

Note: Based on Canadian import data, which may differ from U.S. export data discussed above.

The large share accounted for by EU exports reflects the location of the leading suppliers' manufacturing plants. Three of the top four suppliers to the Canadian market—Enercon, Siemens, and Vestas—are EU-based firms that did not have U.S. nacelle production for most of this time period. Siemens and Vestas did not open their U.S. nacelle plants until the second half of 2010 and Enercon does not have U.S. nacelle production.<sup>52</sup> GE was the second largest supplier to Canada during this time period, but established nacelle production in Quebec due to local content requirements.<sup>53</sup> Based on an analysis of trade data, it appears that GE supplied nacelles for projects in Quebec from this plant, but supplied most nacelles for projects outside of Quebec from its U.S. plants.<sup>54</sup>

The U.S. industry is positioned to supply more nacelles to Canada in the future due to the establishment of U.S. plants by Siemens and Vestas, more firms with U.S. production entering the market, the fact that most of GE's future pipeline is outside of Quebec, and the growth of the Canadian market. The project pipeline for firms with U.S. production totals about 3.6 GW. This includes three firms with project

<sup>50</sup> Industry representative, e-mail to USITC staff, October 1, 2010; USITC DataWeb/USDOC (accessed April 10, 2012); CANWEA Web site, [http://www.canwea.ca/farms/wind-farms\\_e.php](http://www.canwea.ca/farms/wind-farms_e.php) (accessed September 7, 2011 and April 2, 2012); Northern Power Systems, "Northern Power Systems Launches," September 9, 2009.

<sup>51</sup> GTIS, Global Trade Atlas database (accessed April 2, 2012).

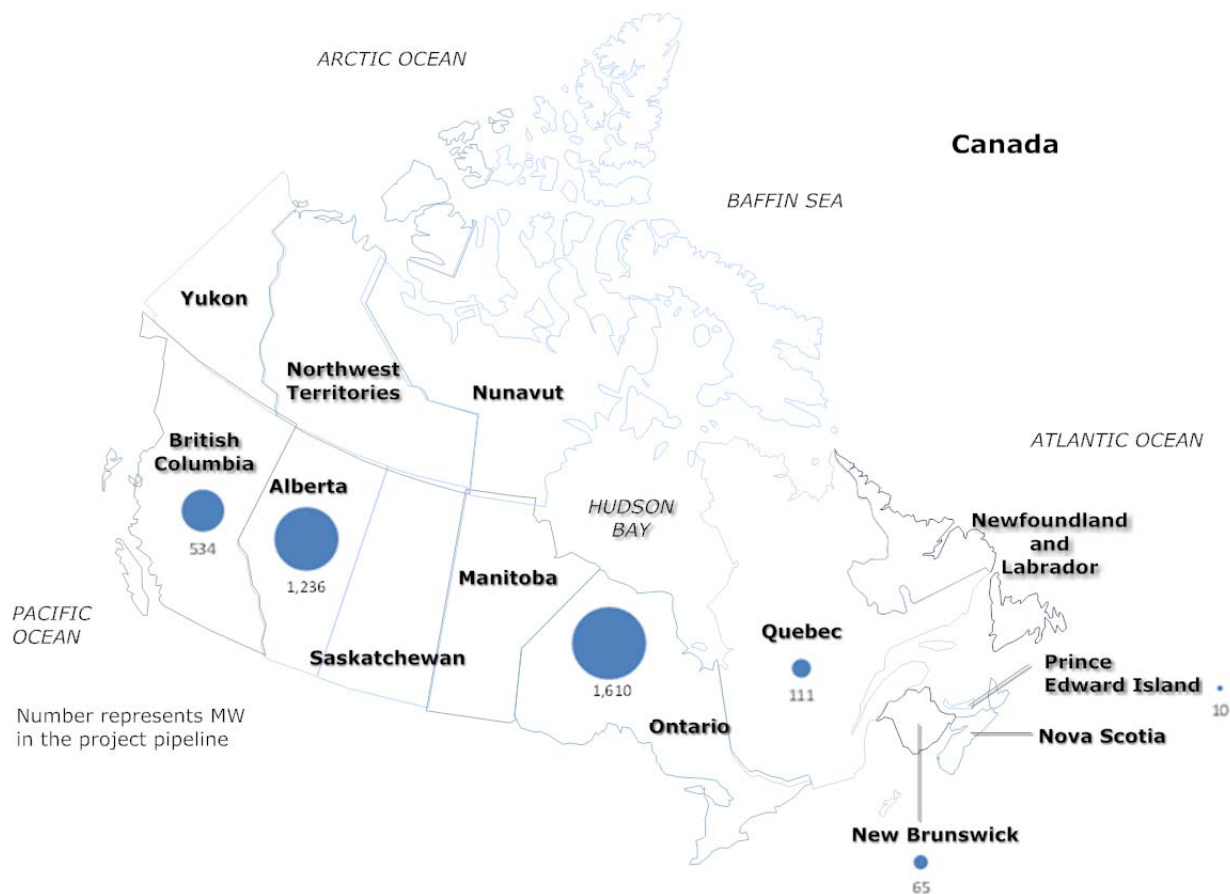
<sup>52</sup> David, *Shifts in U.S. Wind Turbine*, June 2011.

<sup>53</sup> Hydro-Québec, *Wind Power Ensuring Québec's Electricity Supply*, 3rd Quarter 2008, 5.

<sup>54</sup> USITC DataWeb/USDOC (accessed April 10, 2012).

pipelines of more than 700 MW—GE, Siemens, and Vestas—and two firms with pipelines of more than 100 MW—Acciona and Gamesa. Most export opportunities for U.S. produces are in Ontario, Alberta, and British Columbia (figure 8). Though Ontario has a local content requirement, this can be met without producing nacelles in Ontario, as long as blades or at least some nacelle components are sourced locally (box 6). Quebec has a large market, but there are no current export opportunities to this market for U.S. nacelle producers since GE supplies that market from its plant in Canada and the winning suppliers in the last two wind tenders—Enercon and REpower—do not have U.S. nacelle plants.

**FIGURE 8** For firms with U.S. nacelle plants, the largest project pipelines are in Ontario, Alberta, and British Columbia, April 2012



*Source:* The list of projects is from the Ontario Power Authority’s list of FIT contracts offered, Alberta Electric System Operator’s active project list, and BC Hydro and Hydro-Québec information on projects awarded contracts under wind tenders. For all other provinces, it includes projects under construction or in development identified by USITC staff. For Hydro-Québec information on equipment suppliers comes from the utility’s Web site; for all other provinces it is based on media reports, press releases, company Web sites, and project documents.

*Notes:* This figure represents projects under construction or in development that are planning to use turbines from OEMs that have nacelle plants in the United States. It only includes projects for which USITC staff could identify the OEM that the project developer has contracted with or intends to use to supply the project. Therefore, the actual pipeline for firms could be even larger. In addition, some project documents may list a particular OEM as the supplier, but the project developer may not have a contract with this firm and may ultimately choose to use a different supplier. Therefore, the project pipeline of firms shown here could change slightly.

## BOX 6 Local-content rules in Ontario

In Ontario, the local-content rules establish “qualifying percentages” for specific components and services that are part of the wind project. Local content must be 50 percent as calculated using these pre-established percentages. As a result, there are a number of different ways that suppliers can reach the mandatory 50 percent local-content percentage. Sourcing everything but the blades, the nacelle, and nacelle components from Ontario results in a local content share of more than 40 percent. The manufacturer can surpass the required local-content threshold by sourcing either the blades or one or more of the nacelle subcomponents in Ontario. Therefore, it is not necessary to assemble nacelles or produce blades locally to meet local content requirements. Vestas, for example, appears to be reaching the required domestic content level for wind farms in Ontario by sourcing nacelle components and controllers from Ontario rather than by producing locally. This does not mean that local content requirements have no impact on trade and competition in the market. However, it does indicate that nacelles and/or blades can be sourced from foreign locations.

*Sources:* Romano, “GE and Vestas Slam Canadian Provinces,” October 20, 2011; *North American Windpower*, “Vestas Nacelles Signs Deal,” January 6, 2012; Ontario Power Authority, “Feed-in Tariff Contract,” July 15, 2011, 84–89; Ontario Power Authority, “Feed-in Tariff Program: FIT Rules,” July 15, 2011, 16–17; Automodular Corp., “Annual Information Form,” March 9, 2012, 7–8, 13–14; Wong and Zlahtic, “Insight into the Current Status,” October 5, 2010, 8–9.

The firms with project pipelines in Canada are likely to source at least a portion of the nacelles for the Canadian market from the United States (table 5). GE and Acciona both exported nacelles from the United States to Canada during 2007–11 and could again export nacelles for some of the projects in their pipeline.<sup>55</sup> GE has tended to supply a larger share of demand outside of Quebec from the United States, and will likely continue to supply some Canadian projects from the United States. DeWind and Gamesa both indicated that they will export turbines for 10 MW projects.<sup>56</sup> Vestas intends to serve the Canadian market from its nacelle plant in Colorado and nacelles for at least three upcoming projects totaling 345 MW will be produced in Colorado.<sup>57</sup> Siemens also plans to meet a substantial portion of Canadian demand from its U.S. nacelle plant in Hutchinson, Kansas. According to one Siemens representative, “Once Hutchinson is up and running, we expect to supply the majority of all projects we do in the U.S. and Canada from that facility.”<sup>58</sup>

<sup>55</sup> Industry representative, e-mail to USITC staff, October 1, 2010; USITC DataWeb/USDOC (accessed April 10, 2012); CANWEA Web site, [http://www.canwea.ca/farms/wind-farms\\_e.php](http://www.canwea.ca/farms/wind-farms_e.php) (accessed September 7, 2011, and April 2, 2012); Norfleet, “IWEA Head Withdraws ‘Layoff’ Quote,” March 2, 2012.

<sup>56</sup> Quilter, “Gamesa Wins First Canadian Order,” February 20, 2012; AWEA, “Gamesa Turbines from Pa. Plant,” February 23, 2012; *North American Windpower*, “DeWind to Supply Turbines to Research Site,” May 26, 2011.

<sup>57</sup> Vestas, “Vestas Receives 104 MW Order,” April 20, 2011; industry representative, interview by USITC staff, September 7, 2010; Vestas, “Vestas Bolsters Colorado Economy,” July 13, 2010; Vestas, “Vestas Receives 99 MW Order,” December 21, 2010; Capital Power Web site, <http://www.capitalpower.com/community/consultationengagement/Pages/qualitywindproject.aspx> and <http://www.capitalpower.com/community/consultationengagement/Documents/Quality-Wind/2012-spring-quality-wind-info-sheet.pdf> (accessed July 11, 2012).

<sup>58</sup> Stephens and Green, “Hutch Can Soar,” December 4, 2010.

**TABLE 5** U.S. nacelle producers active in Canada and their strategies for supplying the Canadian market, April 2012

OEM	Installations		Non-U.S. nacelle plants		Extent to which supply the Canadian market from the United States
	2007–11 (MW)	Estimated pipeline (MW)	Canada	Other	
Acciona	45	431	No	Yes	Supplied nacelles for previous installation in Canada from U.S. plant; plans to export nacelles for other projects from the United States.
DSME/DeWind	0	10	No	No	Plans to export nacelles for this project from its plant in the United States.
Gamesa	0	130	No	Yes	Plans to export nacelles for 10 MW project in Ontario from the United States.
GE	1,078	1,284	Yes	Yes	Will likely meet demand in Quebec via local nacelle production. Since 2006, has likely met a portion of demand in Ontario via U.S. production and most demand in Alberta via U.S. production.
Northern Power Systems	0.3	0	No	No	Exports from the United States to Canada; all its production is domestic.
Siemens	952	720	No	Yes	Had limited or no exports before 2012, but plans to supply the majority of its U.S. and Canadian projects from its U.S. plant.
Vestas	1,216	992	No	Yes	Had limited or no exports to Canada before 2012, but plans to export products from its U.S. nacelle plant to Canada. Vestas nacelles for at least three orders scheduled for delivery in 2012—a 99 MW order, a 104 MW order, and a 142 MW order—will be built in the United States.

Sources: Vestas, “Vestas Receives 104 MW Order,” April 20, 2011; industry representative, interview by USITC staff, September 7, 2010; Vestas, “Vestas Bolsters Colorado Economy,” July 13, 2010; Vestas, “Vestas Receives 99 MW Order,” December 21, 2010; Stephens and Green, “Hutch Can Soar,” December 4, 2010; industry representative, e-mail to USITC staff, October 1, 2010; USITC DataWeb/USDOC (accessed April 10, 2012); CANWEA Web site, [http://www.canwea.ca/farms/wind-farms\\_e.php](http://www.canwea.ca/farms/wind-farms_e.php) (accessed September 7, 2011 and April 2, 2012); Waggoner, “Achieving Supply Chain Success,” June 5, 2012; Quilter, “Gamesa Wins First Canadian Order,” February 20, 2012; AWEA, “Gamesa Turbines from Pa. Plant,” February 23, 2012; *North American Windpower*, “DeWind to Supply Turbines to Research Site,” May 26, 2011; Northern Power Systems Web site, <http://www.northernpower.com/about/index.php> (accessed April 10, 2012); Capital Power Web site, <http://www.capitalpower.com/community/consultationengagement/Pages/qualitywindproject.aspx> and <http://www.capitalpower.com/community/consultationengagement/Documents/Quality-Wind/2012-spring-quality-wind-info-sheet.pdf> (accessed July 11, 2012); David, *Wind Turbines*, June 2009, 20; Vestas Web site, <http://www.vestas.com> (accessed April 30, 2012); DeWind Web site, <http://www.dewindco.com/eng/> (accessed April 30, 2012). See figures 6 and 8 for project pipeline sources and methodology.

U.S. producers have likely exported wind turbine blades to Canada in the past, though precise data are not available. Canadian imports of “parts of windmills” from the United States, which could include blades, hubs, and nacelle components, were less than \$5 million annually during 2007–08, but averaged \$50 million during 2009–11.<sup>59</sup> U.S. exports in the Schedule B provision that includes blades were also significantly higher during 2009–11 than in the prior two years.<sup>60</sup>

There are further export opportunities for blades, but it is not clear whether exports will be widespread. As with nacelles, Vestas invested in U.S. production in Colorado with the intention of also serving the Canadian market from these plants, and it has indicated that it plans to export blades for at least three

<sup>59</sup> GTIS, Global Trade Atlas database (accessed April 10, 2012).

<sup>60</sup> This provision, 8412.90.9080 (parts of generators n.e.s.o.i.), is even less specific to wind than Canada’s import data for parts of windmills. However, comparing month and port of export with that for wind-powered generating sets, it appears that at least a portion of the exports were correlated with nacelle exports and that at least some of these products were blades, hubs, and/or other wind components.



projects totaling 345 MW from its U.S. plants.<sup>61</sup> Beyond this, however, little information is available on U.S. export potential. LM Wind Power is a supplier to multiple OEMs that have contracts in the Canadian market, but also has a plant in Canada and is likely to supply many Canadian projects from this plant, including the REpower projects in Quebec, where there is a local-content requirement.<sup>62</sup> Siemens has a blade plant in Iowa, and has indicated that with the potential PTC expiration it may source more blades for the Canadian market from the United States, but is also building a blade plant in Ontario in response to the local content requirements.<sup>63</sup> Information on whether other firms will source from U.S. suppliers or build blades at in-house U.S. plants for installations in Canada is not available.

## Mexican Market Provides Opportunities for U.S. Producers

### Overview

The Mexican market for wind power is smaller than the Canadian market, but it is growing rapidly, and there is no local production of nacelles. This rapid growth and lack of domestic competition suggest potential export opportunities for U.S. nacelle and blade producers. Although the firms that are supplying the Mexican market are mostly EU-based, these firms also have the option of exporting to Mexico from the United States, as they have U.S. nacelle and, in some cases, blade plants. These EU-based firms have generally chosen not to source from the United States in the past, but are likely to increase U.S. sourcing as the Mexican market expands and shifts toward the larger turbines commonly produced in the United States. In addition, some EU-based firms started U.S. production in 2010 and are more likely to export now that these firms have reached higher production rates.

### Market

The wind turbine market in Mexico rapidly expanded during 2007–11 and is projected to grow further in the next few years. Annual wind turbine installations in Mexico increased from 0 MW in 2007 to 316 MW in 2010. Installations totaled only 50 MW in 2011, but more than 450 MW was completed in the first quarter of 2012.<sup>64</sup> Navigant's BTM Consult projects that annual installations in Mexico will total 600 MW in 2013 and 750 MW in 2015.<sup>65</sup> As of the end of 2012, most wind installations were in Oaxaca, which has some of the best wind resources in the world. A significant number of projects are also planned in Baja California, from which electricity can be exported to California.<sup>66</sup>

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<sup>61</sup> Vestas, "Vestas Receives 104 MW Order," April 20, 2011; industry representative, interview by USITC staff, September 7, 2010; Vestas, "Vestas Bolsters Colorado Economy," July 13, 2010; Vestas, "Vestas Receives 99 MW Order," December 21, 2010; Capital Power Web site, <http://www.capitalpower.com/community/consultationengagement/Pages/qualitywindproject.aspx> and <http://www.capitalpower.com/community/consultationengagement/Documents/Quality-Wind/2012-spring-quality-wind-info-sheet.pdf> (accessed July 11, 2012).

<sup>62</sup> REpower, "REpower Turbines," n.d. (accessed May 17, 2012).

<sup>63</sup> Romano, "Local Rules Decisive," December 10, 2010; Siemens, "Siemens Selects Tillsonburg," December 2, 2010; Kessler, "Siemens Sees Americas Turbine Sales," June 6, 2012.

<sup>64</sup> GWEC, *Global Wind Report: Annual Market Update 2010*, April 2011, 11, 49; AMDEE, "Wind Energy Projects," n.d. (accessed May 14, 2012); GWEC, *Global Wind Statistics 2011*, February 7, 2012; media reports, press releases, and company Web sites.

<sup>65</sup> Navigant's BTM Consult, *World Market Update 2011*, 70.

<sup>66</sup> AMDEE, "Wind Energy Projects," n.d. (accessed May 14, 2012); Kalinoski, "Mexico's Wind Market," March 2011, 42.

The expansion of the wind market in Mexico, which has excellent wind resources, has been driven by added transmission capacity, legislative and regulatory changes, declining wind turbine prices, and improving access to capital.<sup>67</sup> There are several regulatory or legislative changes that have played a role in the expansion of the wind market. In 1992, the Law of Public Service of Electricity was amended to open up power generation to the private sector, which is developing most new wind projects. The private sector generally participates in wind development in one of the following ways: (1) a private project developer bids on and wins a 25-year power purchase agreement (PPA) with the Federal Electricity Commission (CFE, the state-owned national utility) for the purchase of electricity; (2) self-supply arrangements, whereby an end-user becomes a part owner of the wind project and contracts to purchase the electricity generated for a 15- to 20-year period; or (3) a developer puts together a project that will export electricity. Producers of less than 30 MW can also sell their electricity to CFE, but pricing for this is not currently competitive.<sup>68</sup>

Later legislative or regulatory changes that benefited wind development made wind equipment eligible for accelerated depreciation, reduced electricity transmission charges, and created an “energy bank” in which self-supply customers can essentially store credit for any energy generated in excess of their use at a particular point in time.<sup>69</sup> In 2008, the Law for the Use of Renewable Energy and Financing of the Energy Transition (LAERFTE) set a goal of increasing renewables (excluding hydroelectric) from 3.3 percent to 7.6 percent of generation capacity and expanding them from 3.9 percent to 6.6 percent of actual generation. The law also addressed issues such as grid access, interconnection standards, and research and development.<sup>70</sup>

These policies have encouraged more wind energy development in Mexico, but they have not addressed all regulatory issues. Moreover, transmission capacity remains insufficient (despite the additional capacity brought online), and there can be significant permitting and land-leasing challenges in project development.<sup>71</sup> The United Nations Clean Development Mechanism, which allows facilities to generate clean carbon emissions certificates for global trading, remains an important component of making wind projects in Mexico economically viable.<sup>72</sup>

Financing can also be a challenge for projects in Mexico, particularly for small project developers, and any concerns that arise about the credit-worthiness of electricity purchasers for self-supply projects can make these projects harder to finance.<sup>73</sup> Project development in Mexico is currently being done by several different types of firms: Mexico-based project developers; at least one U.S.-based developer (Cannon Power Group); large international—especially Spain-based—developers (e.g., Iberdrola, Renovalia, and EDF Energies); and the development arm of some OEMs (e.g., Acciona and Gamesa).<sup>74</sup> Many of the projects, including those developed by large international project developers, involve a

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<sup>67</sup> GWEC, *World Market Update 2010*, 2011, 48; IEA, *Wind: 2010 Annual Report*, 2011, 124; Kalinoski, “Mexico’s Wind Market,” March 2011, 42–44.

<sup>68</sup> Rodriguez, “Wind Projects in Mexico and Financing,” May 25, 2011; GWEC, *World Market Update 2010*, 48; Center for Clean Air Policy, “Mexico’s Renewable Energy Program,” October 11, 2011, 3; Bierzwinsky, “Renewables Opportunities in Mexico,” June 2011, 16–17.

<sup>69</sup> IEA, *Wind: 2010 Annual Report*, 2011, 126; Rodriguez, “Wind Projects in Mexico and Financing,” May 25, 2011; Kalinoski, “Mexico’s Wind Market,” March 2011, 44; Center for Clean Air Policy, “Mexico’s Renewable Energy Program,” October 11, 2011, 7–10.

<sup>70</sup> GWEC, *World Market Update 2010*, 2011, 48–49; IEA, *Wind: 2010 Annual Report*, 2011, 125.

<sup>71</sup> GWEC, *Annual Wind Report 2010*, 49; Rodriguez, “Wind Projects in Mexico and Financing,” May 25, 2011; Kalinoski, “Mexico’s Wind Market,” March 2011, 41.

<sup>72</sup> Kalinoski, “Mexico’s Wind Market Comes of Age,” March 2011, 44; Center for Clean Air Policy, “Mexico’s Renewable Energy Program,” October 11, 2011, 13.

<sup>73</sup> Rodriguez, “Wind Projects in Mexico and Financing,” May 25, 2011.

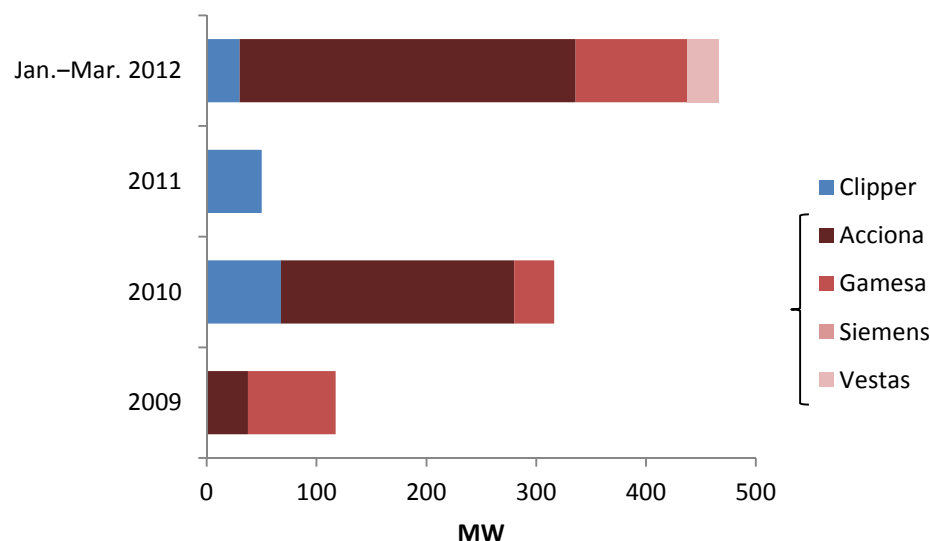
<sup>74</sup> AMDEE, “Wind Energy Projects,” n.d. (accessed May 14, 2012); Kalinoski, “Mexico’s Wind Market,” March 2011, 44; Quilter, “Mexico Hands Acciona,” March 9, 2010; *Windpower Monthly*, “Vestas Breaks New Ground,” March 15, 2012.

multitude of funders. These funders may include international development banks (e.g., the Inter-American Development Bank and North American Development Bank) and export credit agencies (e.g., Denmark’s export credit agency, Eksport Kredit Fonden [EKF], and the Ex-Im Bank).<sup>75</sup>

## Market Competition

Three companies, EU-based Acciona and Gamesa and U.S.-based Clipper, accounted for all wind turbine installations in Mexico during 2009–11, but there is increasing competition in the wind turbine market (figure 9).<sup>76</sup> Gamesa has the largest project pipeline in Mexico, but GE, Siemens, and Vestas are increasing their presence in the market.<sup>77</sup> In addition, Asian wind turbine manufacturers are actively seeking to enter the Mexican wind turbine market.<sup>78</sup>

**FIGURE 9** EU-based companies are the leading suppliers to the Mexican market, as of March 2012



Source: AMDEE, “Wind Energy Projects,” n.d. (accessed May 14, 2012); *North American Windpower*, “Iberdrola Commissions,” January 17, 2012; Windpower Intelligence, “Last Clipper Windpower Turbine,” March 9, 2012; *North American Windpower*, “Vestas Receives Order for Wind Project,” July 5, 2011; Windpower Intelligence, “Mexico: Acciona,” March 8, 2012.

Note: No projects were completed in 2007 and 2008.

All wind turbine demand is currently met from outside of Mexico; there is no domestic production of nacelles, and the only blade producer (Vientek, a joint venture of TPI Composites and Mitsubishi Heavy Industries) makes products for Mitsubishi, which does not have any recent Mexican installations.<sup>79</sup> Mexico’s imports of wind-powered generating sets totaled \$341.4 million in 2011, making it the ninth-largest global importer.<sup>80</sup>

<sup>75</sup> Rodriguez, “Wind Projects in Mexico and Financing,” May 25, 2011; Kalinoski, “Mexico’s Wind Market,” March 2011, 44; EIB, “EIB finances wind farm in Mexico,” May 5, 2010; Ex-Im Bank, “American Windpower Firm Grows,” November 24, 2009; Macquarie Group, “Macquarie Mexican Infrastructure Fund Announces,” February 24, 2012; Bierzwinoski, “Renewables Opportunities in Mexico,” June 2011, 18.

<sup>76</sup> No projects were completed in 2007–08.

<sup>77</sup> These firms’ project pipelines are discussed in more detail below.

<sup>78</sup> Sciaudone, “Suzlon Puts \$3bn Wind,” June 1, 2012, 5; Rodriguez, “Mexico Wind Industry Update,” June 5, 2012.

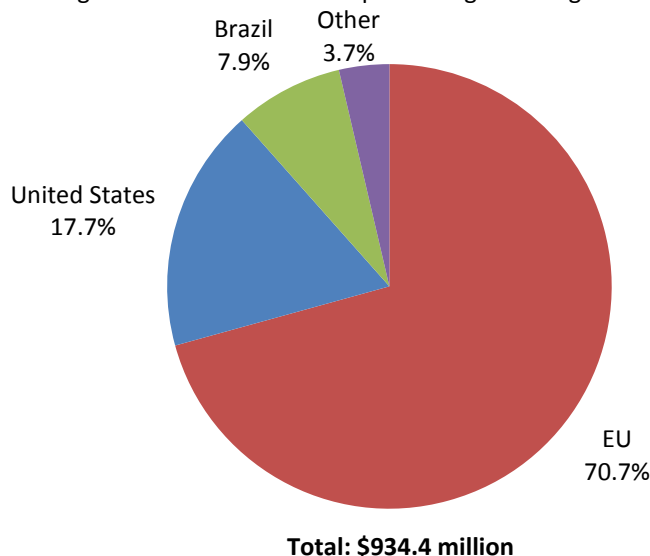
<sup>79</sup> Mitsubishi Power Systems Web site, <http://www.mpsdq.com/facilities/vientek.html> (accessed March 21, 2012); AMDEE, “Wind Energy Projects,” n.d. (accessed May 14, 2012).

<sup>80</sup> GTIS, Global Trade Atlas database (accessed March 21, 2012).

## U.S. Export Opportunities

The United States exported more than \$50 million worth of wind-powered generating sets to Mexico during 2007–11 and was the second largest supplier to Mexico. Overall, however, the EU was the dominant exporter to Mexico during 2007–11 (figure 10). U.S.-based Clipper, which produces nacelles only in the United States, was the leading U.S. supplier to the market in Mexico, likely accounting for 59 of the 76 nacelles (78 percent) exported from the United States to Mexico during 2009–March 2012.<sup>81</sup> The leading EU-based suppliers to the Mexican market have both U.S. and foreign production locations, but up to this point most have principally supplied the market from their nacelle plants in Europe.<sup>82</sup>

**FIGURE 10** The EU was the leading source of Mexican wind-powered generating set imports during 2007–11



Source: GTIS, Global Trade Atlas database (March 21, 2012).

Note: Based on Mexican import data, which may differ from U.S. export data.

European firms have primarily served the Mexican market from their nacelle plants in Europe for several reasons. First, most imports from Denmark were in 2010, when the Siemens and Vestas plants in the United States were just opening and beginning to ramp up production.<sup>83</sup> Second, much of the demand in Mexico through the end of 2011 was for Gamesa’s 850 kW turbines, which are not generally produced in the United States. Of the 246 Gamesa turbines installed during 2009–February 2012, all but 5 were 850 kW turbines.<sup>84</sup> Third, EU and European national export credit agencies have been a significant source of funding for projects in Mexico, but these may require the sourcing of equipment or services from the EU or the particular country where the agency is based. For example, Mexico’s recently completed La Venta project, which received funding from the European Investment Bank (EIB), used 121 Gamesa 850 kW

<sup>81</sup> USITC DataWeb/USDOC (accessed March 20, 2012); AMDEE, “Wind Energy Projects,” n.d. (accessed May 14, 2012).

<sup>82</sup> GTIS, Global Trade Atlas database (accessed March 21, 2012).

<sup>83</sup> GTIS, Global Trade Atlas database (accessed March 20, 2012); Vestas, *Annual Report 2011*, 2012, 16.

<sup>84</sup> AMDEE, “Wind Energy Projects,” n.d. (accessed May 14, 2012); Biller, “Calderón Inaugurates,” January 23, 2009; *North American Windpower*, “Iberdrola Commissions,” January 17, 2012; Iberdrola, “Iberdrola Renewables Buys,” January 11, 2011; RenewableEnergyWorld.com, “Gamesa Reaches 10-MW Mexican Wind Supply Deal,” July 8, 2009.

wind turbines from Spain.<sup>85</sup> Fourth, the prevalence of Spain-based project developers in the market may have influenced sourcing patterns. Spain-based project developers have primarily sourced wind turbines from the EU to this point, though whether this is due to a preference for these products or the other factors discussed here is not clear.<sup>86</sup> Finally, firms' decisions about allocating plant capacity across their global production network and relative levels of demand in the United States, Europe, and other markets may influence their sourcing decisions.

There is now more potential for EU-based firms to export from the United States to Mexico. Much of Gamesa's project pipeline, which is the largest in Mexico at about 948 MW, is for 2 MW wind turbines that can be made in the United States, and the company is planning to supply at least one project from its U.S. plant (table 6).<sup>87</sup> Vestas, which has the second largest pipeline in Mexico, has ramped up production at its plant in the United States and started exporting from the United States to Mexico in 2011.<sup>88</sup> GE also is planning to supply a project in Mexico, and given the proximity of the project to GE's U.S. plants, it is likely that GE will choose to supply this project from the United States. In addition, the project pipelines listed here may understate the potential for U.S. exports as many projects in development have not publicly announced a wind turbine supplier. Moreover, the listed pipelines only take into account the first phase of some projects that developers intend to ultimately be much larger. For example, Gamesa's approximately 948 MW project pipeline only includes the first (72 MW) phase of the Aubanel wind project being developed by Cannon Power Group, but the project could reach 1,000 MW in size.<sup>89</sup>

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<sup>85</sup> The one project in Mexico funded by the Ex-Im Bank uses U.S.-made Clipper wind turbines. EIB, "EIB Finances Wind Farm," May 5, 2010; *North American Windpower*, "Iberdrola Commissions," January 17, 2012; Ex-Im Bank, "American Windpower Firm Grows," November 24, 2009; *North American Windpower*, "Vestas To Supply Wind Turbines," March 12, 2012; Macquarie Group, "Macquarie Mexican Infrastructure Fund Announces," February 24, 2012.

<sup>86</sup> For example, the projects in Mexico that have used Clipper wind turbines to this point were developed by Mexico-based Fuerza Eolica and France-based EDF Energies, while U.S.-based Cannon Power Group plans to source turbines for its projects from Gamesa's U.S. plant. Spanish firms have played a role in the development of a number of projects, many of which have sourced a significant share of their nacelles from the EU. AMDEE, "Wind Energy Projects," n.d. (accessed May 14, 2012); Soto, "Del Mar Firm Signs Deal," May 20, 2010.

<sup>87</sup> Soto, "Del Mar Firm Signs Deal," May 20, 2010; *North American Windpower*, "Gamesa, Eolia Renovables De Inversiones," December 2, 2010; United Nations Framework Convention on Climate Change (UNFCCC) Clean Development Mechanism (CDM) Web site, <http://cdm.unfccc.int> (accessed April 30, 2012).

<sup>88</sup> Vestas, "Vestas Bolsters Colorado Economy," July 13, 2010; industry representative, interview by USITC staff, September 7, 2010; Soto, "Del Mar Firm Signs Deal," May 20, 2010; GTIS, Global Trade Atlas database (accessed July 19, 2012). Project pipeline from AMDEE, "Wind Energy Projects," n.d. (accessed May 14, 2012), and other projects identified by USITC staff.

<sup>89</sup> The estimated project pipeline and project construction data here are a conservative estimate that includes only projects listed by the Mexican Wind Energy Association with secured access to transmission capacity, together with a small number of additional projects identified by USITC staff. Soto, "Del Mar Firm Signs Deal," May 20, 2010; Kalinoski, "Mexico's Wind Market," March 2011, 42.

**TABLE 6** U.S. nacelle producers active in Mexico and reported strategy for supplying the Mexican market, March 2012

	Installations			Non-U.S. nacelle plants	Extent to which supply the Mexican market from the United States
	2007–March 2012 (MW)	Under Construction	Estimated pipeline (MW)		
Acciona	556	0	0	Yes	Limited or no exports in the past. Has indicated that it has international customers that may supply from U.S. plant, but no known projects under construction or in development in Mexico.
Clipper	148	0	0	No	Only produces in United States, so exports from Iowa plant for all installations.
Gamesa	218	164	948	Yes	Limited exports in the past as most turbines supplied have been 850 kW turbines. Plan to export nacelles for project in Baja California from the United States. Substantial portion of current project pipeline is for 2 MW turbines.
GE	0	0	253	Yes	Not available.
Siemens	0	161	99	Yes	Not available.
Vestas	29	102	549	Yes	Likely exported to Mexico in 2011 and 2012. Has indicated that it plans to export products from U.S. nacelle plant to Mexico.

Sources: Norfleet, "IWEA Head Withdraws 'Layoff' Quote," March 2, 2012; Vestas, "Vestas Bolsters Colorado Economy," July 13, 2010; industry representative, e-mail to USITC staff, October 1, 2010; Soto, "Del Mar Firm Signs Deal," May 20, 2010; USITC DataWeb/USDOC (accessed April 10, 2012); *North American Windpower*, "Iberdrola Commissions," January 17, 2012; *North American Windpower*, "Gamesa, Eolia Renovables De Inversiones," December 2, 2010; United Nations Framework Convention on Climate Change (UNFCCC) Clean Development Mechanism (CDM) Web site, <http://cdm.unfccc.int> (accessed April 30, 2012); Biller, Calderón Inaugurates," January 23, 2009; *North American Windpower*, "Iberdrola Commissions," January 17, 2012; Iberdrola, "Iberdrola Renovables Buys," January 11, 2011; David, *Wind Turbines*, June 2009, 20; Vestas Web site, <http://www.vestas.com> (accessed April 30, 2012); GTIS, Global Trade Atlas database (accessed July 19, 2012). Project pipeline from AMDEE, "Wind Energy Projects," n.d. (accessed May 14, 2012), and other projects identified by USITC staff.

Notes: There are no nacelle plants in Mexico. The estimated project pipeline and project construction data here reflect a conservative estimate that includes only projects listed by the Mexican Wind Energy Association with secured access to transmission capacity and a small number of additional projects identified by USITC staff.

The growth in the wind turbine market in Mexico will result in some export opportunities for U.S. blade producers.<sup>90</sup> Gamesa plans to export blades from its U.S. plant for the 72 MW Aubanel wind project in Baja California and could potentially export to other Mexican projects from this plant.<sup>91</sup> Vestas has also indicated that it plans to export blades from its U.S. plant to projects in Mexico.<sup>92</sup> Other export prospects are uncertain. Acciona opened a blade plant in Spain in 2010 and sources many of the blades it uses in Mexico from this plant.<sup>93</sup> LM Wind Power supplies OEMs active in the Mexican market, but whether any of these firms will choose to source from LM Wind Power's U.S. blade plants is unknown. Siemens has U.S. blade production, but it is not known whether Siemens plans to source from the United States for any projects in Mexico. Finally, GE has multiple U.S. blade suppliers, but no information is available on whether it plans to use these suppliers for projects in Mexico.

<sup>90</sup> Little information is available on U.S. blade exports to this this point. U.S. exports to Mexico in the provision that includes blades were \$18.4 million in 2007, \$8.1 million in 2008, \$8.7 million in 2009, \$109.5 million in 2010, and \$27.4 million in 2011. The increase in exports in 2010 could be due to exports of blades or other wind components, but it is not possible to be certain. USITC DataWeb/USDOC (accessed April 12, 2012).

<sup>91</sup> Soto, "Del Mar Firm Signs Deal," May 20, 2010.

<sup>92</sup> Vestas, "Vestas Bolsters Colorado Economy," July 13, 2010.

<sup>93</sup> Acciona, "Acciona Opens," June 30, 2010; McGovern, "Mexican Orders Boost," July 1, 2010.

# Vibrant Brazilian Market Offers Inconsistent U.S. Export Opportunities

## Overview

Brazil is by far the largest market for wind power in Latin America, and also has the largest potential for wind power in the region. Brazilian government policies favoring renewable energy and the country's eagerness to develop wind power, along with domestic content requirements, are leading most global wind turbine OEMs to locate production in the country. Some of these OEMs indicate that their Brazilian production facilities will become bases for exports to other Latin American countries. U.S. exports of wind turbines to Brazil are increasing at present, but as wind turbine OEMs increase their production operations in Brazil, future U.S. export potential may be limited.

## Market

Brazil has significant potential for wind power, with the best resources being the Northeast, the Southeast, and the Southern Regions. Brazil's cumulative installed wind power capacity rose from 247 MW in 2007 to 1.5 GW in 2011.<sup>94</sup> Since Brazil's potential wind energy is estimated at 305 GW, there is considerable scope for expansion.<sup>95</sup>

In recent years, the growth in Brazil's renewable energy market was principally driven by the PROINFA program (Programa de Incentivo às Fontes Alternativas de Energia Elétrica). Established in 2004 and terminated in 2011, PROINFA was designed to develop renewable energy sources for Brazil's electricity portfolio.<sup>96</sup> The program used a feed-in tariff (FIT) scheme requiring the state-owned electricity company Eletrobrás to buy electricity from renewable energy producers under 20-year power purchase agreements at rates higher than those of conventional power sources. At the end of 2011, the PROINFA program had developed 1,326 MW of wind power.<sup>97</sup>

To add further renewable energy production capacity, in 2008, the Brazilian government launched a policy whereby electricity generating companies must bid to sell their electricity into the national grid system. This is done through auctions that cover wind, hydro, biomass, and other power generation sources. Brazilian Electricity Regulatory Agency (ANEEL) establishes the regulations for the auctions, which are conducted by a nonprofit organization, the Chamber of Electrical Energy Commercialization. Those companies offering the lowest price per megawatt-hour (MWh) win the bidding. Six auctions for wind power were held between December 2009 and December 2011, resulting in a total of 6,876 MW under contract.<sup>98</sup>

Brazil also has an increasing amount of wind power development in the non-regulated market, called the Ambiente de Contratação Livre (ACL), or the Free Contract Environment, in which electricity prices are freely negotiated under power purchase agreements between wind power producers and electricity

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<sup>94</sup> GWEC, *Global Wind Report: Annual Market Update 2011*, March 2012, 24.

<sup>95</sup> *Windpower Monthly*, "Interview with Brazilian Wind Industry," August 13, 2010.

<sup>96</sup> Ministério de Minas e Energia Web site, <http://www.mme.gov.br/programas/proinfa> (accessed May 17, 2010).

<sup>97</sup> GWEC, *Global Wind Report: Annual Market Update 2011*, March 2012, 24.

<sup>98</sup> Wind is expected to increase from 1.3 percent of electricity generation capacity in 2011 to 12.5 percent in 2020. GWEC, *Global Wind Report: Annual Market Update 2011*, March 2012, 24–25; Fiuza, "Updates on Brazilian Markets," June 4, 2012.

consumers. Wind installations in this market segment totaled at least 14 MW in 2011, with another 546 MW under development.<sup>99</sup>

Many of Brazil's wind energy projects have obtained long-term project financing from the government-owned National Economic and Social Development Bank (Banco Nacional de Desenvolvimento Econômico e Social, or BNDES).<sup>100</sup> Credit approvals for wind energy by BNDES totaled approximately \$140 million in 2008; \$601 million in 2009; \$682 million in 2010; and \$2,033 million in 2011.<sup>101</sup> Some of the projects financed by BNDES occurred under the Brazilian Growth Acceleration Program (PAC), begun in January 2007.<sup>102</sup> PAC is a major Brazilian economic stimulus initiative, which included approximately \$150 billion for energy infrastructure development.

In addition, since 1997, the wind energy industry in Brazil has benefited from exemptions from the *Imposto sobre Circulação de Mercadorias e Serviços* (ICMS), the merchandise and service circulation tax, which is a value-added tax on imports and domestically produced goods.<sup>103</sup> In December 2010, the exemption was expanded to include wind turbine blades; previously only nacelles and towers were covered.<sup>104</sup> Without the exemptions, the ICMS on wind turbine components would be approximately 17 percent of their value. ICMS exemptions are issued for a 2-year period, and have been consistently renewed. The latest exemption agreement for the wind power industry was renewed in January 2010 and will expire in December 2012.

Another significant tax exemption affecting the Brazilian wind turbine market involves the *Imposto sobre Produtos Industrializados* (IPI), which is a tax on imported and domestically produced manufactured goods. In December 2006, the Ministry of the Treasury exempted parts of wind turbines from the IPI. In June 2009, that exemption was eliminated, but in December 2009, the Ministry of the Treasury, as part of a national economic stimulus plan, again exempted parts of wind turbines from the tax, which was approximately 7.5 percent of the value of the equipment.<sup>105</sup>

## Market Competition

The Brazilian wind turbine and component manufacturing industry is rapidly expanding due to the recent influx of foreign investment in the sector. Before 2008, Brazil had two wind turbine producers, Wobben Windpower Ind. e Com. and IMPSA S.A.—both subsidiaries of foreign producers—as well as indigenous production of blades and castings (table 7). The vast majority of wind turbine OEMs opened production in 2011 or have openings planned for 2012 and 2013. These companies are establishing wind turbine assembly facilities in Brazil because of (1) the large size of the wind power market and the dramatic rise in wind power development in Brazil and other Latin American countries; (2) Brazilian domestic content requirements under the PROFINA program; (3) BNDES requirements for obtaining financing (discussed later); and (4) incentives from Brazilian states for foreign investment.

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<sup>99</sup> GWEC, *Global Wind Report: Annual Market Update 2011*, March 2012, 25.

<sup>100</sup> BNDES offers low cost financing and can finance up to 70 percent of a wind project. Phillips, "Cheap as Chips," June 2012, 22.

<sup>101</sup> BNDES, "BNDES Approves," March 3, 2011.

<sup>102</sup> BNDES, "BNDES Portfolio," May 7, 2010.

<sup>103</sup> The exemption is granted by the issued by Brazilian Committee of the Treasury Policy (Conselho Nacional de Política Fazendária, or CONFAZ). *Diário Oficial*, "Portaria Interministerial No. 338," December 18, 1997, 30274–30275; USDOC, ITA, *Doing Business in Brazil*, n.d., 52 (accessed July 20, 2012).

<sup>104</sup> *Diário Oficial*, "Convênio ICMS 187," December 16, 2010, 48.

<sup>105</sup> *Diário Oficial*, "Decreto No. 7.032," December 15, 2009, 64–65; USDOC, *Doing Business in Brazil*, n.d., 52 (accessed July 20, 2012).



**TABLE 7** Principal wind turbine and component manufacturing operations in Brazil, and their status, March 2012

Manufacturer	Location (city, state)	Product	Date announced	Date operational
Acciona (Spain)	Unknown	Hubs and nacelles	April 2012 (nacelles), July 2012 (hubs)	October 2012 (hubs), no date set for nacelles
Aeris Energy/Suzlon (India)	Pecém, Ceará	Blades	February 2011	August 2011
Alstom Power (France)	Camaçari, Bahia	Nacelles	December 2009	November 2011
Fuhrländer AG (Germany)	Pecém, Ceará	Nacelles	August 2009	N/A
Gamesa (Spain)	Camaçari, Bahia	Nacelles	October 2010	July 2011
GE Energy (United States)	Campinas, São Paulo	Wind turbines	November 2009	December 2009
GE Energy (United States)	Bahia	Wind turbines	September 2011	Mid-2013
IMPISA (Argentina)	Suape, Pernambuco	Wind turbines	N/A	September 2008
IMPISA (Argentina)	Rio Grande do Sul	Wind turbines	April 2012	2013
LM Wind Power	Suape, Pernambuco	Blades	December 2011	June 2013
Renobrax Energias Renováveis (Brazil)	Guaíba, Rio Grande do Sul	Wind turbines	October 2009	October 2011
Siemens (Germany)	Unknown	Unknown	2009	N/A
Sinovel (China)	Unknown	Wind turbines	September 2011	N/A
Tecsis (Brazil)	Sorocaba, São Paulo	Blades	N/A	1995
Vestas (Denmark)	Maracanaú, Ceará	Nacelles	August 2011	May 2012
Wobben Windpower (Enercon GmbH—Germany)	Sorocaba, São Paulo	Nacelles	N/A	1995
Wobben Windpower (Enercon GmbH—Germany)	Pecém in Ceará	Blades	N/A	2002

*Source:* Compiled from news releases, media reports, company Web sites and documents, and Bloomberg New Energy Finance database (accessed April 16, 2012).

*Note:* N/A: not available. The term “wind turbine” is used where more specific information is not available, but in most cases these plants likely produce nacelles. Siemens has not made a firm decision on whether to proceed with building a plant in Brazil.

The Brazilian wind turbine industry is large enough to have begun exporting some wind-powered generating sets (HS 8502.31). Exports rose from \$1 million in 2007 to \$25.9 million in 2010, but totaled only \$564,000 in 2011 as producers focused on fulfilling domestic orders.<sup>106</sup> During 2007–11, primary destinations for Brazilian exports of wind-powered generating sets were Costa Rica (\$12.8 million in 2008 and \$10.9 million in 2009), the Netherlands Antilles (\$4.9 million in 2009), and Argentina (\$25.8 million in 2010). OEM wind turbine producers Gamesa and Alstom plan to export from their Brazilian factories, as does blade producer LM Wind Power.<sup>107</sup> Brazilian blade producer Tecsis was an early entrant to the U.S. and other markets and has been producing blades for over 10 years.<sup>108</sup>

<sup>106</sup> GTIS, Global Trade Atlas database (accessed May 1, 2012).

<sup>107</sup> Gamesa, “Gamesa Announces Industrial Project,” December 1, 2010; Nielsen, “Alstom Brazil Plant,” December 8, 2011; LM Wind Power, “LM Wind Power Announces Site Search,” May 10, 2010.

<sup>108</sup> Tecsis Web site, <http://www.tecsis.com.br/site/Wind.html> (accessed July 22, 2012).

## U.S. Export Opportunities

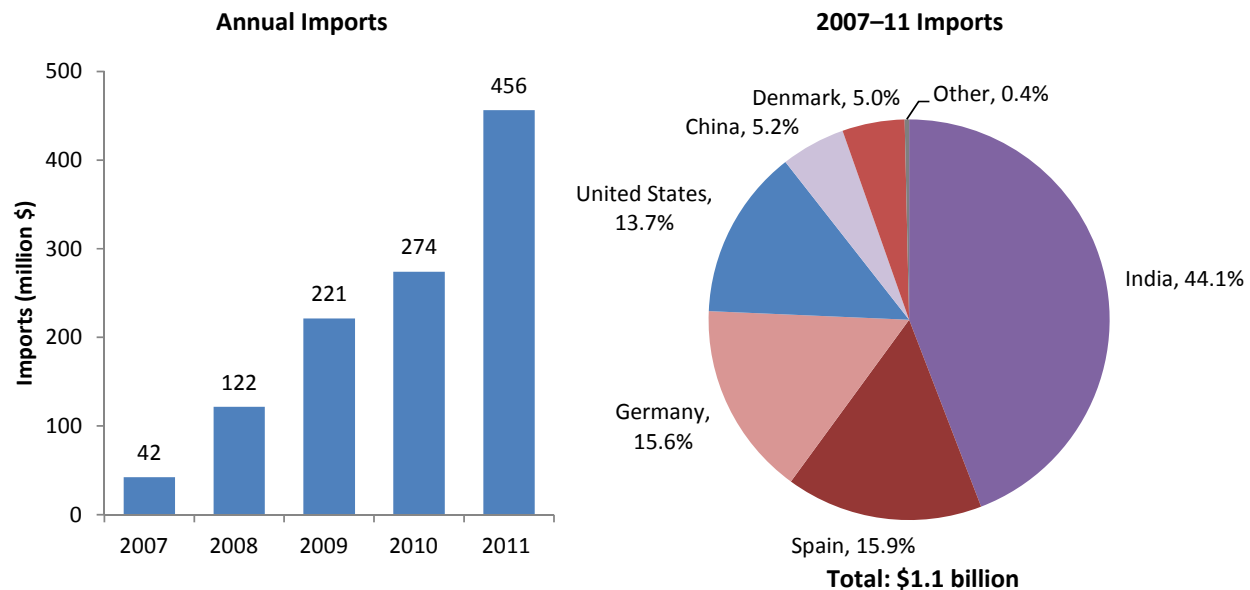
Brazilian imports of wind-powered generating sets have risen steadily in tandem with the development of wind power in the country (table 8 and figure 11). In 2011, Germany became the leading supplier to Brazil, followed by the United States, Spain and India. The rise in imports since 2009 corresponds with the first government auctions for wind power. Chinese firms are increasing their presence in the market, with Sinovel scheduled to provide 23 wind turbines to a Brazilian wind energy project by July 2012. The wind energy project is receiving funding from the China Development Bank.<sup>109</sup>

**TABLE 8** Brazilian imports of wind-powered generating sets, 2007–11, million \$

	2007	2008	2009	2010	2011
Germany	0.4	0.4	0.0	40.7	133.2
United States	14.9	14.1	8.7	5.9	109.7
Spain	0.0	0.0	0.0	84.2	93.0
India	27.0	107.2	160.1	134.0	64.0
Denmark	0.0	0.0	0.0	0.0	56.1
China	0.0	0.0	48.5	9.2	0.1
All others	0.0	0.1	3.8	0.0	0.1
<b>Total</b>	<b>42.3</b>	<b>121.7</b>	<b>221.1</b>	<b>274.0</b>	<b>456.3</b>

Source: GTIS, Global Trade Atlas database (accessed May 1, 2012).

**FIGURE 11** Brazilian imports of wind-powered generating sets are rapidly increasing



Source: GTIS, Global Trade Atlas database (accessed May 1, 2012).

Note: Based on Brazilian import data, which may differ from U.S. export data.

<sup>109</sup> Sinovel, "Desenvix Taps Chinese Bank," February 1, 2012.

U.S. producers have had some success in exporting to Brazil since the start of 2011. U.S. exports of wind-powered generating sets to Brazil, likely by GE, totaled \$152.3 million from 2010 through the first quarter of 2011.<sup>110</sup> In 2012, LM Wind exported 60 wind turbine blades from its plant in North Dakota to Brazil and secured Ex-Im Bank financing for the export of blades from its plant in Arkansas to Brazil.<sup>111</sup>

There are, however, trade barriers that may limit future U.S. exports to Brazil. Brazil has implemented domestic content and import tariff policies to develop the Brazilian wind energy equipment manufacturing and service industry. Under the PROINFA program, wind farms selected for the program were required to have a minimum domestic content of at least 60 percent of the value of equipment and services used in the project.<sup>112</sup> Also, BNDES has the same requirement for its wind energy loans.<sup>113</sup> As a significant number of the wind energy projects under PROINFA and the ANEEL auctions have obtained BNDES financing, there has been a de facto minimum 60 percent domestic content-level in Brazilian wind energy projects. The relatively high levels of domestic content in wind energy projects are also required in financing provided for projects in Northeast Brazil by the Bank of Northeast Brazil (BNB) and the Development Agency of the Northeast (ADENE). The use of domestically produced wind turbines also shows up in the requirements for the auctions under ANEEL for electricity supplied to the national grid. The Ministry of Mines and Energy initially required that wind energy projects could only use imported wind turbines with a capacity of over 2MW, but that threshold was reduced to 1.5 MW.<sup>114</sup> Regulations for subsequent auctions did not specify requirements regarding imported wind turbines—but if financing is from BNDES, then a 60 percent domestic content level is still needed.

BNDES conducted an audit in June 2012 of wind turbine suppliers, and reportedly suspended the distribution of loans to projects using turbines from several OEMs, including Acciona, Fuhrländer, Suzlon, and Vestas, because they did not meet local content requirements. This affects approximately 2 GW of projects for which these companies are suppliers.<sup>115</sup>

Brazil's import tariffs on wind turbines have fluctuated. The import tariff on wind turbines was lowered from 14 percent to zero in March 2007 to assist wind energy projects in meeting timely completion deadlines under the PROINFA program.<sup>116</sup> But in June 2009, the Council on Foreign Trade (Câmara de Comércio Exterior (CAMEX)) raised the import tariff on wind turbines with a capacity of 3.3 megavolt-amperes (MVA) and below from free to 14 percent. This change went into effect on January 1, 2010.<sup>117</sup>

U.S. export opportunities to Brazil exist for global OEM producers located in the United States, but these may be limited due to a significant number of wind turbine assembly facilities beginning operations in Brazil during 2011-13. However, U.S. exports to Brazil may fill production constraints by these global OEM producers at their Brazilian factories, or supply demand from the non-regulated market for wind power.

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<sup>110</sup> USITC DataWeb/USDOC (accessed July 20, 2012).

<sup>111</sup> LM also exported 54 blades from North Dakota to Brazil in 2008. Duluth Seaway Port Authority, "Exporting Blades," June 28, 2012; Ex-IM Bank, Summary of Minutes, May 31, 2012; Biofuels Journal, "Port of Duluth," August 26, 2008.

<sup>112</sup> Ministério de Minas e Energia, *PROINFA – EÓLICA: Guia de Habilitação Eólica*, n.d., 11, 36–37 (accessed April 1, 2011);

<sup>113</sup> BNDES, "Circular Nº 195," July 28, 2006.

<sup>114</sup> Ministério de Minas e Energia, Gabinete do Ministro, "Portaria No. 242," June 25, 2009.

<sup>115</sup> Additional firms may also be affected, but media reports vary on the other firms that were noncompliant. Sciaudone, "BNDES Audit," July 19, 2012.

<sup>116</sup> Ministério do Desenvolvimento, Indústria e Comércio Exterior, "Resolução Nº 07," March 1, 2007.

<sup>117</sup> This coincided with the action by the Ministry of Mines and Energy noted above. Ministério do Desenvolvimento, Indústria e Comércio Exterior, "Camex inclui três itens na Lista de Exceções à Tarifa Externa Comum," June 18, 2009.

# As Other Latin American Markets Expand, Export Opportunities are Increasing

## Overview

Other markets in Latin America are also expanding, and many markets could offer at least limited export opportunities, though these opportunities will vary by country. Firms with U.S. production have significant project pipelines in the region and may choose to supply some of these projects from their U.S. plants. U.S. producers are currently supplying the Central American market, planning to export to Uruguay, and have exported to Chile in the past. The extent of U.S. export opportunities will be affected by factors such as whether global OEMs export a significant share of nacelles for these projects from Brazil, how they choose to allocate production across their global manufacturing plants, and increasing competition from local and Chinese firms.

## Market

The market in Latin America (excluding Brazil and Mexico) is currently small compared to the global market, with less than 1 GW in cumulative installations (table 9). In 2011, only 270 MW was installed in Latin America (excluding Brazil and Mexico), accounting for less than 1 percent of 2011 global installations.<sup>118</sup> However, substantial wind development is taking place in the region and Navigant's BTM Consult projects that annual installations in Latin America (excluding Brazil and Mexico) will increase from 270 MW in 2011 to 750 MW in 2014 and 1,100 MW in 2016.<sup>119</sup>

**TABLE 9** Latin American annual installed wind energy capacity, MW, 2007–11 (excluding Brazil and Mexico)

	2007	2008	2009	2010	2011
Honduras	0	0	0	0	102
Argentina	2.0	0	0	25.3	79
Chile	18.1	0	147.5	2.6	33
Dominican Republic	0	0.2	0	0	33
Costa Rica	0	0	49.0	0	13
Nicaragua	0	0	40.0	0	N/A
Uruguay	0.4	19.9	0	10.0	N/A
Jamaica	0	0	34.0	0	0
Netherlands Antilles	0.3	0	12.0	0	N/A
Colombia	0	0	0.5	0	N/A
Cuba	1.6	5.1	0	4.5	0
Ecuador	3.1	0.9	0	0	N/A
Dominica	0	0.2	0	0	0
Other/not specified	0	0	0	0	10
Total	25.5	26.3	283.0	42.4	270

Sources: WWEA, *World Wind Energy Report 2010*, April 2011, 19–20; WWEA, *World Wind Energy Report 2009*, March 2010, 16–17; GWEC, *Global Wind Report: Annual Market Update 2011*, March 2012, 11.

Note: N/A: not available. Only includes countries with installations during 2007–11. Data from the Bahamas, the British Virgin Islands, El Salvador, French Guiana, Guatemala, Panama, Paraguay, Suriname, and Venezuela are not reported by the World Wind Energy Association. Data for 2011 come from GWEC. The “other” category in the 2011 data includes Colombia, Ecuador, Nicaragua, Peru, and Uruguay. GWEC data are rounded to the nearest MW.

<sup>118</sup> GWEC, *Global Wind Statistics 2011*, February 7, 2012.

<sup>119</sup> Navigant's BTM Consult, *World Market Update 2011*, March 2012, 70.

The main drivers of the wind market in Latin America (excluding Brazil and Mexico), though they vary by country, are:

- New policies to encourage the development of wind power;
- Rising electricity demand;
- Declining wind turbines prices;
- Lower hydroelectric production in recent dry years and resulting higher electricity prices;
- The need to complement hydropower with another power generation source during the dry season, along with the fact that wind generation in some areas peaks when hydro generation is at its lowest;
- The cost-competitiveness of wind-generated electricity in some countries;
- Excellent wind resources;
- A need to reduce dependence on imported fossil fuels and mitigate the risk of fossil fuel price fluctuations; and
- A desire to install energy generation technologies with a low environmental impact and/or that are carbon free.<sup>120</sup>

Some countries also have an interest in developing wind projects to export electricity.<sup>121</sup>

Despite this increasingly favorable environment for wind, a number of significant barriers to wind development remain including:

- The poor electric grid infrastructure;
- A shortage of skilled personnel with renewable energy experience;
- Utilities' lack of familiarity with wind;
- Challenges financing projects; and
- Continuing insufficient policy support, despite recent improvements.<sup>122</sup>

## Market Competition

EU-based companies were the dominant suppliers to Latin American projects (excluding Brazil and Mexico) during 2007–11 (figure 12). Vestas alone accounted for more than 40 percent of projects installed during 2007–11 and is widely present in the region, having supplied turbines to at least 10 countries during its history.<sup>123</sup> Gamesa was second in terms of MW installed, mostly due to a 102 MW project recently completed in Honduras.<sup>124</sup>

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<sup>120</sup> GWEC, *World Market Update 2010*, 2011, 28–29; Bennett, “Latin American Wind Takes Shape,” January 19, 2011; Bloomberg New Energy Finance, “Chile Renewable Power Target,” February 2, 2012; Sawyer, “Latin America—A Sleeping Giant,” August 3, 2010; Castano, “Bolivia Plans Wind Power,” January 5, 2011; Araluce, “Clean Energy,” September 2011, 58; Weiss, “The Challenge and Potential for Renewable Energy,” September 2011, 6–8.

<sup>121</sup> Castano, “Bolivia Plans Wind Power,” January 5, 2011.

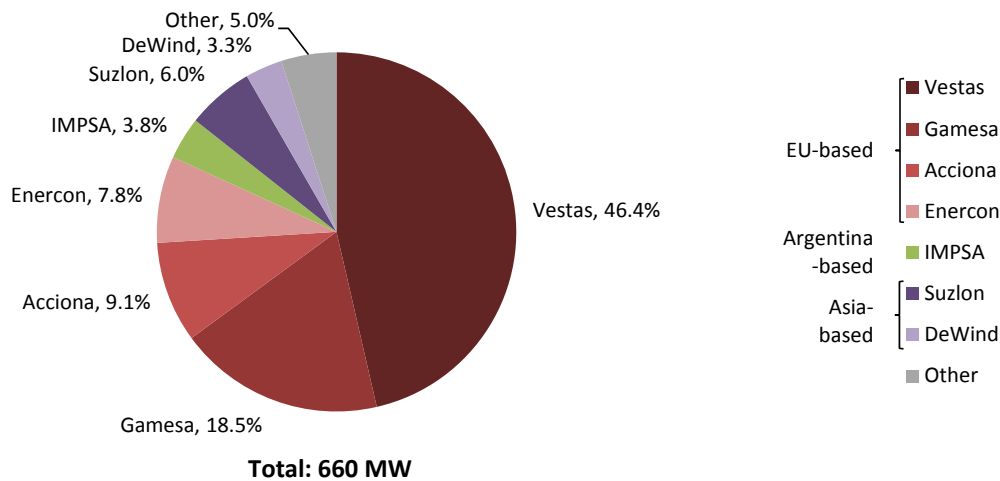
<sup>122</sup> GWEC, *World Market Update 2010*, 2011, 29; Bennett, “Latin American Wind Takes Shape,” January 19, 2011; Bloomberg New Energy Finance, “Chile Renewable Power Target,” February 2, 2012; Sawyer, “Latin America—A Sleeping Giant,” August 3, 2010; reNews Americas, “Approaching Escape Velocity,” December 16, 2010.

<sup>123</sup> Bloomberg New Energy Finance database (accessed March 22, 2010); Vestas, *Track Record as of 31 December 2011*, 2012, 4–5.

<sup>124</sup> Bloomberg New Energy Finance database (accessed March 22, 2010).

There are several local wind turbine producers that are currently competing against foreign suppliers in these Latin American markets. Argentina has three wind turbine manufacturers, IMPSA, Patagonia NRG, and INVAP (table 10). IMPSA produces 1.5 MW, 1.8 MW, and 2.1 MW wind turbines and is also active in project development.<sup>125</sup> With 4 percent of installations during 2007–11 and a significant project pipeline, as discussed below, IMPSA is a major supplier in the region.<sup>126</sup> IMPSA recently indicated that it is increasing its focus on Latin American markets other than Brazil, including Venezuela, Argentina, and Uruguay, as a result of the intense competition in Brazil and consequent decline in prices and profits in the Brazilian market.<sup>127</sup> Patagonia NRG produces a 1.5 MW wind turbine and INVAP is developing a 1.5 MW turbine.<sup>128</sup>

**FIGURE 12** Vestas and other EU-based firms were the leading suppliers to Latin American markets (excluding Brazil and Mexico) during 2007–11



Source: Bloomberg New Energy Finance database (accessed March 22, 2012).

Note: Total may differ slightly from GWEC and WWEA data.

**TABLE 10** Latin American nacelle producers, excluding Brazil and Mexico, March 2012

Manufacturer	Product
<b>Argentina</b>	
IMPSA, SA	1.5 MW, 1.8 MW, and 2.1 MW turbines
INVAP	Developing a 1.5 MW turbine
NRG Patagonia	1.5 MW turbine
<b>Panama</b>	
I.T.P./Turbowinds	600 kW, 1.6 MW was expected to be developed by the end of 2011

Source: I.T.P. Web site, <http://www.itp.com.pa/index.html> (accessed April 17, 2012); Turbowinds Web site, <http://www.turbowinds.com/index.php> (accessed April 17, 2012); Patagonia NRG Web site, <http://www.nrgpatagonia.com/> (accessed April 17, 2012); INVAP Web site, <http://www.invap.com.ar> (accessed April 17, 2012); IMPSA Web site, <http://www.impsa.com> (accessed April 17, 2012).

Note: The Turbowinds and I.T.P. Web sites both list 600 kW wind turbines, but for the other turbines produced by the company the two Web sites list different turbine sizes. This table relies on the more recently updated I.T.P. Web site.

<sup>125</sup> Impsa also has a wind turbine plant in Brazil and wind-related production in Malaysia. IMPSA Web site, <http://www.impsa.com> (accessed April 17, 2012); industry representative, interview by USITC staff, Atlanta, GA, June 5, 2012.

<sup>126</sup> Bloomberg New Energy Finance database (March 22, 2012).

<sup>127</sup> Bloomberg New Energy Finance, “IMPSPA Pursuing Sales,” February 9, 2012.

<sup>128</sup> Patagonia NRG, <http://www.nrgpatagonia.com/> (accessed April 17, 2012); INVAP Web site, <http://www.invap.com.ar> (accessed April 17, 2012).

Industria Tecnológica Panameña S.A (I.T.P) subsidiary Turbowinds produces utility-scale wind turbines in Panama. Turbowinds currently produces a 600 kW wind turbine and, according to I.T.P., it expected to have a 1.6 MW turbine by the end of 2011.<sup>129</sup>

Chinese companies, facing overcapacity and a stagnant market at home, are also seeking sales in Latin America. Goldwind has already achieved a significant sales volume in the region. Goldwind's first nacelles shipped to Latin America were installed in a 4.5 MW project in Cuba in 2011 and it has contracts to supply another 121.5 MW to projects in Chile and Ecuador.<sup>130</sup> China also exported \$41 million in wind-powered generating sets to Argentina in 2011 and XEMC has an upcoming 100 MW project in Argentina that will use wind turbines from China.<sup>131</sup>

Other firms have not yet made major sales inroads into Latin America (excluding Brazil and Mexico). GE was selected to supply turbines for one upcoming 50 MW project, but otherwise U.S.-based firms do not have many sales in the region.<sup>132</sup> India-based Suzlon and Korea-based DeWind—which only produces in the United States—and Unison have also had a small volume of sales in the region.<sup>133</sup>

Vestas and Gamesa have the strongest project pipelines in Latin America (excluding Mexico and Brazil), with the highest number of projects, the greatest geographical diversity, and the largest total MW in the project pipeline (figure 13). IMPSA, other EU-based firms, and China-based Goldwind have significant projects in development, but these firms are not supplying as many projects and are not present in as many markets.<sup>134</sup> When the pipelines of the other EU firms are taken together with the Gamesa and Vestas pipelines, however, it is apparent that EU-based firms and Argentina-based IMPSA currently account for the bulk of the market.

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<sup>129</sup> I.T.P. Web site, <http://www.itp.com.pa/index.html> (accessed April 17, 2012); Turbowinds Web site, <http://www.turbowinds.com/index.php> (accessed April 17, 2012).

<sup>130</sup> Backwell, "Mainstream and Goldwind," February 2012; Patton, "China's Wind Manufacturers," October 14, 2011; Windpower Intelligence, "Cuba: Gibara II," October 5, 2010.

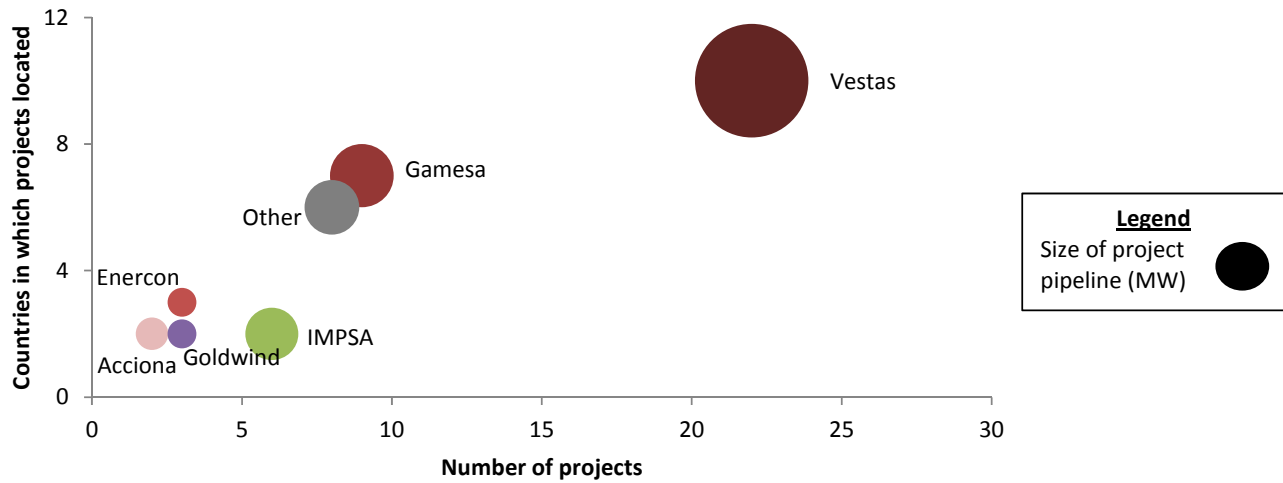
<sup>131</sup> GTIS, Global Trade Atlas database (accessed April 18, 2012); Argentine Wind Energy Association, "PE Reta: La Comitiva Realizó Diversas Actividades," [PE Reta: the group carried out various activities], September 5, 2011.

<sup>132</sup> U.S.-based Nordic Windpower, which no longer has an operational plant, also installed three wind turbines in Uruguay. Nordic Windpower, "Nordic Windpower's First Utility Scale Wind Turbines," December 7, 2011; GTIS, Global Trade Atlas database (accessed April 18, 2012).

<sup>133</sup> Unison, "Unison Co., Ltd. Celebrating Ceremony," October 18, 2010; United Nations Framework Convention on Climate Change (UNFCCC) Clean Development Mechanism (CDM) Web site, <http://cdm.unfccc.int> (accessed April 17, 2012).

<sup>134</sup> *North American Windpower*, "Pattern Energy Developing 115 MW," November 28, 2011; UNFCCC CDM Web site, <http://cdm.unfccc.int> (accessed April 17, 2012); Bloomberg New Energy Finance database (accessed March 22, 2012); REVE, "La Rioja Signs Contract with IMPSA," November 2, 2010; IMPSA, "Uruguayan UTE Approves Contract," n.d.; IMPSA, Corporate Presentation, February 2012, 14.

**FIGURE 13** Vestas and Gamesa have the strongest project pipelines in Latin America (excluding Brazil and Mexico), April 2012



EU-based firms in shades of red, Argentina-based firms in green, and China-based firms in purple.

Source: North American Windpower, “Pattern Energy Developing 115 MW,” November 28, 2011; United Nations Framework Convention on Climate Change (UNFCCC) Clean Development Mechanism (CDM) Web site, <http://cdm.unfccc.int> (accessed April 17, 2012); Bloomberg New Energy Finance database (accessed March 22, 2012); REVE, “La Rioja Signs Contract,” November 2, 2010; IMPSA, “Uruguayan UTE Approves Contract,” n.d.; IMPSA, Corporate Presentation, February 2012, 14.

Notes: Size of bubble represents number of MW in the project pipeline. Includes firms with either at least 150 MW or at least 3 projects.

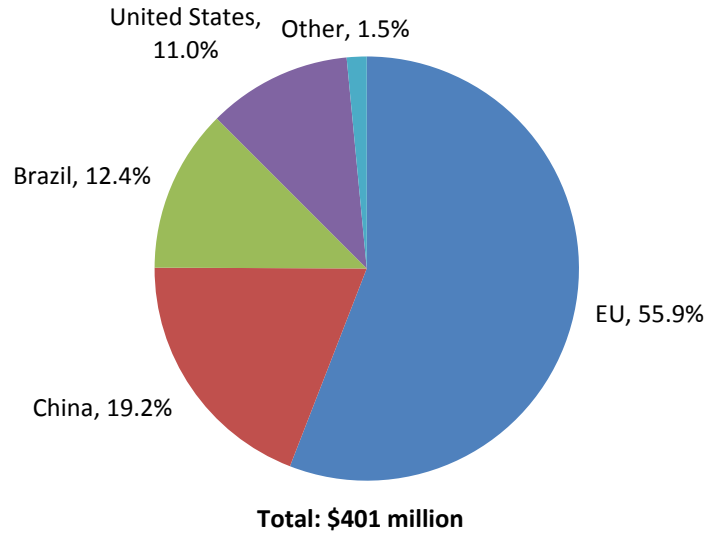
## U.S. Export Opportunities

The United States is a significant supplier to Latin America (excluding Brazil and Mexico), shipping nacelles for almost 20 percent of installed capacity during 2007–11 and accounting for 11 percent of global exports to Latin America (figure 14). However, the U.S. share of the market is small compared with that of the EU, and Brazil and China also account for a larger share of exports to the region than the United States. The largest projects supplied by U.S. producers during 2007–11 were a 102 MW Gamesa project in Honduras and a 20 MW project in Chile supplied by DeWind.<sup>135</sup>

<sup>135</sup> Bloomberg New Energy Finance database (accessed March 22, 2012); GTIS, Global Trade Atlas database (accessed March 23, 2012); Ex-Im Bank, “Export-Import Bank Provides \$159 Million,” August 20, 2010; Composite Technology Corp., “Composite Technology’s DeWind,” March 23, 2011.



**FIGURE 14** The EU was the leading exporter to Latin America (excluding Mexico and Brazil) during 2007–11



*Source:* GTIS, Global Trade Atlas database (accessed March 23, 2012).

*Notes:* Chart shows shares of global exports to Latin America, based on each country's exports under HS 8502.31. Data are from GTIS and may differ slightly from U.S. data found in DataWeb. Indian exports for 2011 are estimates based on partial-year data.

Firms with U.S. nacelle production have a project pipeline in Latin America (excluding Mexico and Brazil) of more than 2.9 GW and could export from the United States for some of these projects (table 11). Of the seven companies with orders in these countries, at least three have exported to Latin America (excluding Brazil and Mexico) in the past and at least one other firm is considering future exports. The extent of U.S. export opportunities, however, is likely to vary by country.

**TABLE 11** U.S. nacelle producers active in Latin American markets (excluding Brazil and Mexico) and reported strategy for supplying these markets, April 2012

Company	Estimated project pipeline (MW)	Non-U.S. nacelle plants		Extent to which supply the Latin American market (excluding Brazil and Mexico) from the United States
		Brazil	Other	
Acciona	153	Yes	Yes	No information on intent to supply from the United States.
DeWind	10	No	No	Exported from the United States to Chile in the past. Only produce nacelles in the United States.
Gamesa	586	Yes	Yes	Exported nacelles from the United States for 102 MW project in Honduras that received Ex-Im Bank funding. Plans to export from the United States for projects in Nicaragua and Uruguay, though has also indicated that may use new plant in Brazil to supply nearby countries.
GE	50	Yes	Yes	No information on intent to supply from the United States.
Nordex	130	No	Yes	Is considering options for exporting from the United States.
Siemens	115	Yes	Yes	No information on intent to supply from the United States.
Vestas	1,880	Yes	Yes	Likely exported from the United States to South America in the past and is producing in the United States for at least one project in Central America. Reportedly has cost advantages in supplying Latin American projects from the United States rather than from the EU.

*Sources:* Ex-Im Bank, "Export-Import Bank Provides \$159 Million," August 20, 2010; Gamesa, "Gamesa Announces Industrial Project," December 1, 2010; Business News Americas, "In Brief: DeWind Shipping," December 31, 2008; *North American Windpower*, "Pattern Energy Developing 115 MW," November 28, 2011; UNFCCC CDM Web site, <http://cdm.unfccc.int> (accessed April 17, 2012); David, *Wind Turbines*, June 2009, 20, 41–42; DeWind Web site, <http://www.dewindco.com> (accessed April 17, 2012); GTIS, Global Trade Atlas database (accessed July 11, 2012); Bloomberg New Energy Finance database (March 22, 2012); Northern Colorado Business Report, "Vestas Colo. Shipping," December 16, 2011; Gamesa, "Gamesa Strengthens its Presence," May 28, 2012; industry representative, interview by USITC staff, May 1, 2012. See Brazil section for list of firms with manufacturing plants in Brazil.

*Notes:* Total in this table may differ from total in next table due to rounding. Includes planned manufacturing plants in Brazil.

In South America, the three countries outside Brazil with the largest near-term markets are Argentina, Chile, and Uruguay. While Peru's market is small, both Gamesa and Vestas have been selected to supply turbines to upcoming projects, indicating at least some export potential.<sup>136</sup> Other South American countries also have only small wind markets, though there is discussion in some countries of increasing wind capacity. If there is significant wind development in Colombia, U.S. exports could benefit from the implementation of the U.S.-Colombia free trade agreement (FTA), which eliminates Colombia's 5 percent duties on nacelles and blades.<sup>137</sup> The export prospects for Argentina, Chile, and Uruguay are described below:

<sup>136</sup> Based on information compiled by USITC staff.

<sup>137</sup> WTO Tariff Download Facility (accessed March 22, 2012 and April 17, 2012); text of U.S.-Columbia FTA.

**Argentina** Argentina has a growing wind market; 750 MW in projects were awarded in its first wind tender (Genren I) and almost 1.1 GW were expected to be awarded in a second tender (Genren II), though financing problems have slowed the development of the first round of wind projects.<sup>138</sup> Significant competition in Argentina's wind market may limit U.S. exports prospects. Several global OEMs are planning to supply Argentina's markets from Brazil and Argentina's domestic producers have significant market share. In addition, Chinese firms appear to be making significant inroads into the market. China accounted for 69 percent of Argentina's imports of wind-powered generating sets in 2011, Chinese firm XEMC has a contract for 100 MW in Argentina, and the developer of a recently announced wind project of more than 1 GW is planning to use Chinese wind turbines. The availability of Chinese financing was a critical factor in the decision to source from China for this 1 GW wind project and is a competitive advantage of the Chinese industry in Argentina.<sup>139</sup> The only firm with U.S. nacelle production that was identified as having been selected for projects in Argentina was Vestas, which is providing turbines for more than 400 MW of projects (table 12).<sup>140</sup> Overall, only limited information is available on how global OEMs intend to supply this market, but there appear to be challenges for U.S. firms seeking to enter the market.<sup>141</sup>

**Uruguay** Uruguay has held several rounds of wind tenders and Brazil and Uruguay agreed to jointly develop a wind project near the Brazilian border.<sup>142</sup> At least three firms with U.S. nacelle production, Gamesa, Nordex, and Vestas, have been selected by project developers to provide equipment for winning bids in Uruguay's wind tenders.<sup>143</sup> U.S. producers appear to have significant interest in exporting to Uruguay and are actively exploring producing in the United States for projects in Uruguay. Gamesa is planning to export for one project in Uruguay from the United States and Nordex is reportedly considering doing the same.<sup>144</sup> Like Argentina, however, some OEMs are also planning to serve the market from Brazil. In announcing its plant in Brazil, Gamesa indicated that it would export to Uruguay from Brazil, but it is pursuing Ex-Im Bank funding for exports to Uruguay and decided to supply its first project in Uruguay from the United States.<sup>145</sup> In Uruguay's first wind tender, one of the criteria for rating proposed projects was the share of domestic content, which benefited Argentina-based IMPSA because its proposal included producing concrete towers on-site, even though the turbines will be supplied

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<sup>138</sup> Wilkinson, "Future Uncertain for Genren II Renewables Round," April 12, 2012.

<sup>139</sup> Bloomberg New Energy Finance database (March 22, 2012 and July 11, 2012); GTIS, Global Trade Atlas database (accessed April 18, 2012); Argentine Wind Energy Association, "PE Reta: La Comitiva Realizó Diversas Actividades en Tres Arroyos," [PE Reta: the group carried out various activities], September 5, 2011; Gamesa, "Gamesa Announces Industrial Project," December 1, 2010; Nielsen, "Alstom Brazil Plant," December 8, 2011; industry representative, interview by USITC staff, Atlanta, GA, June 5, 2012; Nielsen, "Argentina Plans," July 5, 2012; press releases, media reports, and company Web sites.

<sup>140</sup> Information is not available on whether Vestas intends to supply this market from the United States or another location. Based on data compiled by USITC staff and from Bloomberg New Energy Finance database (accessed March 22, 2012).

<sup>141</sup> While nacelles now enter Argentina duty free, the government is reportedly considering ways to promote the development of a domestic industry. According to one report, options might include "increased import duties for the equipment, a minimum requirement of locally produced goods or... an incentive program for local manufacturers." Wilkinson, "Government Mulls Wind," March 7, 2012.

<sup>142</sup> MercoPress, "Uruguay and Brazil Agree to Jointly Develop and Expand Wind Power," April 21, 2012.

<sup>143</sup> Based on data compiled by USITC staff.

<sup>144</sup> Uruguay also imported three 1 MW wind turbines from U.S. producer Nordic Windpower in 2010. Industry representative, telephone interview by USITC staff, April 24, 2012; Gamesa, "Gamesa Debuts in a New Market," May 3, 2012; Nordic Windpower, "Nordic Windpower's First Utility Scale Wind Turbines," December 7, 2009; GTIS, Global Trade Atlas database (accessed April 18, 2012).

<sup>145</sup> Gamesa, "Gamesa Announces Industrial Project," December 1, 2010; Nielsen, "Alstom Brazil Plant," December 8, 2011; Buddelmeyer, "Addressing Competitiveness," June 5, 2012.

**TABLE 12** Tariffs in select Latin American markets and pipeline for U.S. producers, March 2012

	Wind-powered generating sets			Parts of other engines and motors	
	Project pipeline for firms with U.S. plants (MW)	MFN duty rate (%)	Duty rate for U.S. goods (%)	MFN duty rate (%)	Duty rate for U.S. goods (%)
Chile	903	6	0	6	0
Panama	594	10	0 <sup>a</sup>	3.7	0 <sup>a</sup>
Argentina	414	0	0	14	14
Peru	234	0	0	0	0
Uruguay	199	0	0	1.7	1.7
Dominican Republic	175	0	0	0	0
Nicaragua	126	0	0	0	0
Costa Rica	100	0	0	0	0
Venezuela	100	10	10	5	5
Curaçao	54	N/A	N/A	N/A	N/A
Guatemala	21	0	0	0	0
St. Kitts and Nevis	5	5	5	5	5
Colombia	0	5	0	5	0
Aruba	0	N/A	N/A	N/A	N/A
Ecuador	0	0	0	2.5	2.5
Barbados	0	5	5	5	5

Source: WTO Tariff Download Facility (accessed March 22, 2012 and April 17, 2012); text of U.S. FTAs; see project pipeline figure for project data sources.

Note: N/A: Not available. If there are multiple tariff lines, rate of duty is a simple average of the duties in those tariff lines. Total in this table may differ from total in prior table due to rounding. All tariff rates are for 2011 except Argentina (2010), the Dominican Republic (2008), Guatemala (2009), Nicaragua (2009), and Peru (2009).

<sup>a</sup> Upon implementation of the trade promotion agreement.

from Brazil.<sup>146</sup> Nevertheless, a significant number of EU-based OEMs are supplying projects in Uruguay and these firms are exploring the possibility of exporting from the United States.

**Chile** Chile has extensive project development underway and could offer some export opportunities for U.S. nacelle producers. Chile's market is competitive, with EU- and Asia-based firms generating sales, though EU-based firms account for most of the project pipeline. Four firms with U.S. production have pending projects, for a combined project pipeline in Chile of more than 900 MW.<sup>147</sup> DeWind's activity in the Chilean market (past and pending projects totaling 30 MW) leads directly to U.S. exports, as DeWind only produces in the United States.<sup>148</sup> The three other firms with U.S. production, Acciona, Siemens, and Vestas, have been selected to provide turbines to Chile. Vestas has likely supplied wind turbines to Chile from its U.S. plant in the past, but is opening a plant in Brazil and could choose to source either from Brazil or from another global production location for projects in Chile.<sup>149</sup> Acciona and Siemens have not moved as quickly to produce in Brazil, but would still have the option of sourcing from non-U.S.

<sup>146</sup> It is not clear if local content was a factor in later wind tenders. Sciaudone, "Uruguay Wind Power Tender Results," December 14, 2010; Sciaudone, "UTE Sticking to its Guns," March 18, 2011; Sciaudone, "Argentina's Impsa," February 7, 2012; Sciaudone, "IMPSPA to Build," June 1, 2012, 11.

<sup>147</sup> Bloomberg New Energy Finance database (accessed March 22, 2012); media reports, press releases, and company Web sites.

<sup>148</sup> Bloomberg New Energy Finance database (accessed March 22, 2012); Composite Technology Corp., "Composite Technology's DeWind," March 23, 2011.

<sup>149</sup> Several producers, though none of the firms just mentioned, have indicated that they intend to supply the market in Chile from Brazil. Nielsen, "Alstom Brazil Plant," December 8, 2011; Gamesa, "Gamesa Announces Industrial Project," December 1, 2010; GTIS, Global Trade Atlas database (accessed July 11, 2012).

production locations for these projects. While the U.S.-Chile FTA eliminates the 6 percent tariff on wind-powered generating sets, other countries also benefit from FTAs with Chile.<sup>150</sup>

Central America has substantial wind resources and could be a significant U.S. export market if the pace of wind development picks up. U.S. producers could benefit from their proximity and, in Panama, from the elimination of the duty on wind-powered generating sets upon implementation of the trade promotion agreement.<sup>151</sup> Gamesa exported wind turbines to Honduras in 2011, as noted earlier, and Acciona, Gamesa, and Vestas have been selected to supply wind turbines for projects in Costa Rica, Guatemala, Nicaragua, and/or Panama.<sup>152</sup> Firms with U.S. nacelle production have been selected to supply wind turbines for more than 800 MW of projects. While all of these nacelles may not necessarily be exported from the United States, Gamesa and Vestas plan to at least partially source from the United States for projects in Nicaragua.<sup>153</sup>

Markets in the Caribbean are close to the United States, likely providing transportation cost advantages for U.S. nacelle producers. These markets are likely to remain small, however. Also, at least one recent installation used turbines less than 1 MW in size, which are not as widely produced in the United States.<sup>154</sup> The largest potential market appears to be the Dominican Republic, where Gamesa, GE, Nordex, and Vestas—all of which have U.S. nacelle production—have been selected to provide wind turbines.<sup>155</sup> The Caribbean has excellent wind resources, but overall electricity demand is relatively low. Installed electric generating capacity in the Caribbean (excluding U.S. territories) is only about 17 GW, with about 63 percent of that generating capacity in Cuba and the Dominican Republic.<sup>156</sup> One compilation of estimates of wind potential in nine markets in the region (Antigua and Barbuda, Barbados, the Dominican Republic, Guadeloupe, Haiti, Jamaica, Saint Kitts and Nevis, Saint Vincent and the Grenadines, and Trinidad and Tobago) indicated that up to 3.8 GW of wind power could be installed, with 85 percent of that potential in the Dominican Republic and 11 percent in Antigua and Barbuda.<sup>157</sup> During 2007–11 there was one U.S. export to Saint Kitts and Nevis, and also one export of a turbine to the Bahamas by Northern Power Systems.<sup>158</sup>

In the past, U.S. producers have also exported blades to Latin American markets. For example, LM Wind Power in North Dakota produced blades for the Gamesa wind turbines that were installed in Honduras, and it is likely that blades for the DeWind turbines exported to Chile were also produced in the United States.<sup>159</sup> As with nacelles, competition from producers in Brazil and the potential for EU-based firms to

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<sup>150</sup> WTO Tariff Download Facility (accessed March 22, 2012 and April 17, 2012); text of U.S.-Chile FTA.

<sup>151</sup> Text of the U.S.-Panama trade promotion agreement.

<sup>152</sup> Based on data compiled by USITC staff.

<sup>153</sup> Vestas has indicated that some of the components for at least one of the projects it is supplying in Nicaragua will be sourced from the United States and Gamesa is planning to produce some of the turbines for a Nicaraguan project in the United States. It is not clear exactly which components these firms plan to source from the United States. Northern Colorado Business Report, "Vestas Colo. Shipping," December 16, 2011; Gamesa, "Gamesa Strengthens its Presence," May 28, 2012.

<sup>154</sup> Unison, "Unison Co., Ltd. Celebrating Ceremony," October 18, 2010.

<sup>155</sup> Based on data compiled by USITC staff and from Bloomberg New Energy Finance database (accessed March 22, 2012).

<sup>156</sup> Gerner and Hansen, *Caribbean Regional Electricity Supply Options*, 2011, 6.

<sup>157</sup> Gerner and Hansen, *Caribbean Regional Electricity Supply Options*, 2011, 22.

<sup>158</sup> USITC DataWeb/USDOC (accessed April 27, 2012); Northern Power Systems, "'Northern Power Systems' Wind Turbine Fleet," April 4, 2012.

<sup>159</sup> Ex-Im Bank, "Export-Import Bank Provides \$159 Million," August 20, 2010; USITC DataWeb/USDOC (accessed April 17, 2012).

supply blades from other production locations may limit U.S. exports.<sup>160</sup> Overall, the country-by-country trends for blades are likely to be similar to those for nacelles.

## Conclusion

U.S. exports of wind turbine nacelles and blades worldwide are limited, but are increasing and appear poised for further growth in the next few years. Many of the leading global OEMs, and their blade suppliers, now produce in the United States, and the nearby Canadian and Latin American markets are rapidly increasing in size. Markets in Ontario, Western Canada, and Mexico, in particular, appear to offer significant near-term export possibilities as they are dominated by U.S.- and EU-based firms, many of which have U.S. plants from which they intend to supply a share of the turbines sold in these markets. Many of the other markets in Latin America are highly competitive, but Central America, the Caribbean, and certain South American markets like Chile and Uruguay could offer export opportunities, depending on how firms choose to allocate production across their global manufacturing plants.

Some growing markets, however, will provide only limited export opportunities. The wind market in Quebec is substantial, but offers no export opportunities due to local-content requirements and the fact that the two producers that won contracts in recent wind tenders do not produce nacelles or blades in the United States. Brazil offers some export opportunities for U.S. producers, but these may be limited due to local-content requirements and a significant number of wind turbine assembly facilities beginning operations during 2011–13 in Brazil. Once these plants are open, U.S. exports to Brazil will likely occur only when Brazilian plants are operating near capacity or firms receive orders for the non-regulated wind market.

Overall, the U.S. industry benefits from its proximity to markets in Canada and Latin America, and resulting lower transportation costs for nacelles and blades. This will likely lead to further exports in the next few years, but expectations should remain modest as these markets, though growing, remain small in global context. In addition, nontariff barriers may impact trade, and it remains unclear how OEMs will allocate production across their global supply chains.

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<sup>160</sup> LM Wind Power has indicated that when it completes its plant in Brazil, it intends to export from Brazil to other countries in South America. While no information is available on exports by Tecsís to other markets in Latin America, this firm is a supplier to multiple OEMs and has supplied the European and North American markets. Tecsís Web site, <http://www.tecsis.com.br/site/Wind.html> (accessed April 18, 2012); LM Wind Power, “LM Wind Power Announces Site Search,” October 5, 2010.

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