

Turkey's Electricity Market and Opportunities for U.S. Renewable Energy Exporters

Turkey, a country of almost 80 million people, sits at the historic cross section of East and West; its culture, people, and business environment no doubt inspired by both. However, with economic gains spreading in Asia, the perceived benefits of closer European collaboration have weakened. Turkey's leadership now seems increasingly willing to engage China and other Asian economies, even at the expense of its more traditional European allies. This change also opens the door for U.S. exporters to compete against European suppliers for market share in Turkey.

Despite expectations that Turkey's rapidly growing economy will slow in 2012, the country's long-term economic growth prospects are positive. Recent reforms have improved Turkey's investment climate, spurring rising interest from global investors. The ongoing liberalization of the electricity sector has resulted in higher energy prices for Turkish consumers, as Turkish leaders attempt to better align electricity prices with actual costs.

Turkey's energy reforms are motivated by several key factors. First, the country's economic growth is supported by growing energy consumption. To meet this demand, significant private sector investment is needed. Second, Turkey continues to seek a broadly diversified energy mix with the goal of limiting the impact of price-volatile imports, particularly natural gas from Russia. Turkey also wants to capitalize on its geopolitical positioning to

become an "energy hub," offering it a significant role in the global energy market. Currently, only 3 percent of oil and natural gas consumed in Turkey is produced domestically. Finally, Turkey's push to be an innovative manufacturing hub for multi-national businesses requires the development of high-tech industries, like renewable energy, to build a high-skilled workforce connected with the latest research and development. As a result, renewable energy is gaining traction among Turkish officials, with recent policy decisions reflecting their intent to address these concerns.

Turkey's Energy Mix

According to the International Energy Agency (IEA), Turkey's energy demand will expand faster than any of the IEA's 27 other member countries over the medium to long-term.¹ Without additional development, Turkey's Energy Market Regulatory Authority (EMRA) predicts electricity demand will surpass supply sometime between 2016 and 2019. This will place a significant strain on the country's economic development goals by forcing dependence on electricity imports if this shortfall is not addressed effectively.

While significant investment in Turkey's energy industry has occurred, more is needed. Turkey's installed generation capacity grew at a combined annual

¹ *Energy Policies of IEA Countries: Turkey* (2009), International Energy Agency, accessed May 2012, http://www.iea.org/publications/free_new_Desc.asp?PUBS_ID=2276.



June 2012

Turkey Quick Facts

Size: 783,562 sq. km

Population: 79,749,461 (July 2012)

Type of government: Republican parliamentary democracy

Chief of state: President Abdullah Gul

Capital: Ankara

Major religion: Muslim

Language: Turkish

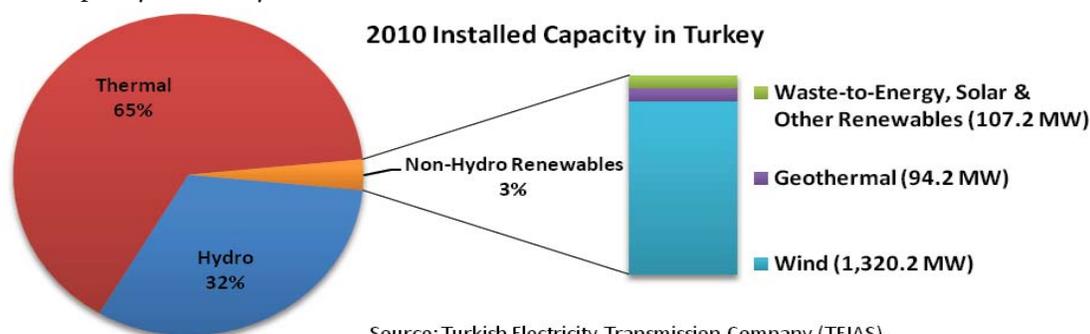


Source: CIA World Factbook



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Figure 1. Installed Capacity in Turkey



Source: Turkish Electricity Transmission Company (TEIAS)

growth rate of 6.2 percent between 1998 and 2009.² Business Monitor International estimates that Turkey's total electricity generation must increase 73 percent by 2021 to meet expected demand, rising from 219.67 terawatt hours (TWh) in 2011 to 381.64 TWh by 2021.³ The Turkish Electricity Transmission Company predicts the country will need to add 3-4 GW of total installed capacity each year to meet this objective – an investment opportunity worth up to \$4 billion annually through 2021.

Traditional fossil fuel capacity accounts for the majority of Turkey's current energy mix, with non-hydro renewables accounting for only 3 percent of total generation – mostly from wind power.⁴ However, with a national target of 30 percent of total generation from non-hydro renewables by 2023, much of the country's installed capacity additions over the coming decade will be renewable in nature. Turkey is also planning to build nuclear energy generation plants, signing an agreement with Russia in May 2010 to build its first plant.⁵

Regulatory Structure

Turkey's electricity market and regulatory structure are based on the 2001 Electricity Market Law No. 4628 (EML), which liberalized the country's electricity market and sped the transition away from a primarily state-owned and controlled market. For most of its history, the Turkish Government held a monopoly on electricity production and transmission through the Turkish Electricity Authority (TEK), which controlled all aspects of generation, transmission, and distribution in Turkey. In 1984, private sector companies were first allowed to participate in the country's electricity market through Build Operate (BO), Build Operate Transfer (BOT), and Transfer of Operating Rights (TOOR) arrangements.⁶ Additional reforms are gradually establishing a more open market that allows private sector actors to produce, transmit, and sell electricity.⁷

In 2004, Turkey's Electricity Power Sector Reform and Privatization Strategy furthered the government's privatization efforts, providing a framework and timeline for the privatization of assets and the attraction of foreign

6 This was established through Law 3096 (1984)

7 In 1993, TEK was unbundled into two companies – the Turkish Electricity and Transmission Company (TEAS) responsible for generation and transmission and TETAS for distribution and trade. The EML created the Energy Market Regulatory Authority (EMRA) tasked with regulating Turkey's electricity market, issuing licenses to sector players, and approving tariffs. EMRA also regulates Turkey's oil and liquefied natural gas markets.

Another aim of EML and subsequent laws was the acceleration of privatization through measures including the gradual elimination of the state's role as an investor in the sector (except for transmission), the privatization of state-owned facilities, and a more effective regulatory regime. Under the law, TEAS was unbundled into the Turkish Electricity Generation Company (EUAŞ), the Turkish Electricity Transmission Company (TEİAŞ), and the Turkish Electricity Wholesale Company (TETAŞ). EUAŞ and TETAŞ are currently under various stages of privatization, while the Government of Turkey (GOT) will continue to control transmission through TEİAŞ.

2 "Turkey Energy Industry Report." Investment Support and Promotion Agency of Turkey, and Deloitte August 2010. Accessed May 2012. <http://www.invest.gov.tr/en-US/infocenter/publications/Documents/ENERGY.INDUSTRY.PDF>

3 *Turkey Power Report, Q2 2012* (2012), Business Monitor International, accessed May 2012. Subscription required.

4 2010 installed capacity by source: Thermal: 32171.5 MW, Renewables & Waste: 107.2 MW, Hydro: 15831.2 MW, Geothermal: 94.2 MW, Wind: 1320.2 MW

"Annual Development of Turkey's Installed Capacity by Primary Energy Resources, 1984-2010," Turkish Electricity Transmission Company, accessed May 2012. <http://www.teias.gov.tr/istatistik2010/Istatistik%202010.htm>.

5 *Energy Policies of IEA Countries: Turkey* (2009), International Energy Agency, accessed May 2012, http://www.iea.org/publications/free_new_Desc.asp?PUBS_ID=2276.

investment. By December 2011, 62 percent of Turkey's state-owned distribution network had been privatized; and, by the end of 2012, it is expected that the remaining 8 distribution companies will be privatized as well. The result has been a strong increase in private sector investment in the country's electricity distribution system, which reached \$16 billion by April 2011.

Key Players

- **Electricity Generation Incorporated Company (EUAŞ):** EUAŞ is the state-owned electricity generation company. As of 2009, EUAŞ and its affiliated companies owned 48.2 percent of Turkey's installed generation capacity.⁸
- **Independent Power Producer (IPP):** IPPs operate generation facilities and sell electricity either to a private wholesaler or to TETAŞ. Turkish regulations prohibit the total market share of generation facilities operated by a particular private sector generation company and its affiliates to exceed 20 percent of the total installed capacity as compared to the preceding year.
- **Turkish Electricity Distribution Corporation (TEDAŞ):** TEDAŞ owns the distribution network

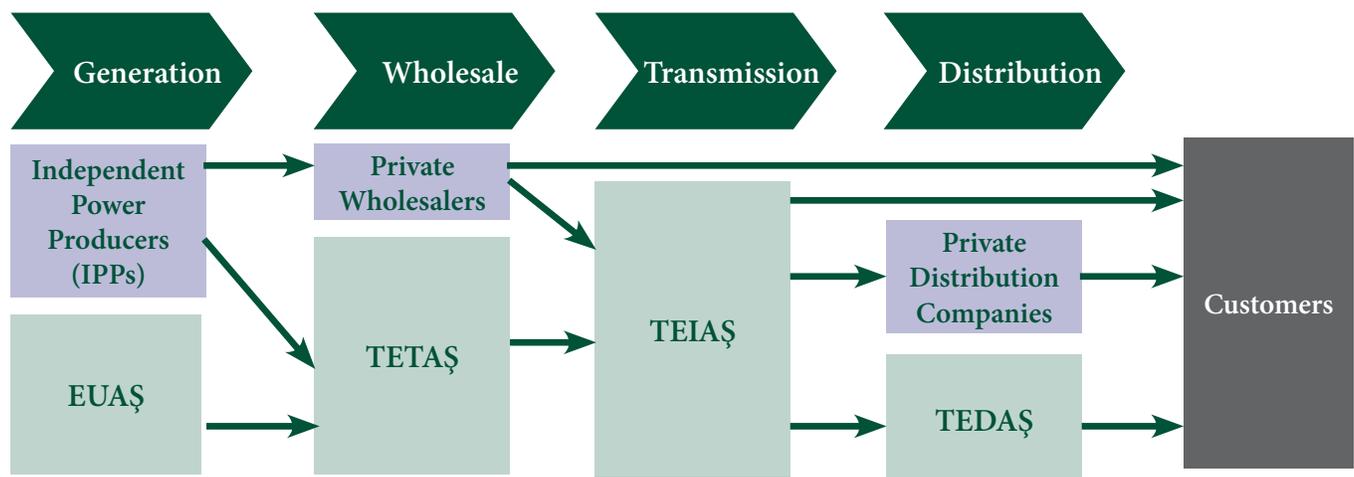
that allows 21 regional distribution companies to sell electricity for final consumption.

- **Turkey Electricity Transmission Corporation (TEİAŞ):** TEİAŞ is a state-owned company with a legal monopoly over transmission planning, construction, and operation services.
- **Turkish Electricity Trading and Contracting Company (TETAŞ):** TETAŞ currently serves as the primary purchaser of electricity from EUAŞ. Although under Turkish law, private sector wholesale companies are allowed to engage in electricity wholesale activities, in practice, TETAŞ operates as a near monopoly. TETAŞ and private wholesalers are the only entities authorized to import and export electricity. Retail providers are authorized to import, but not export, electricity.
- **Private Wholesalers:** Unlike TETAŞ, private wholesalers are allowed to sell to new qualified consumers.⁹ With approval from Ministry of Energy and Natural Resources (MENR) and EMRA, private wholesalers can also import from or export to international markets. Turkish regulations prohibit any private wholesaler's and its affiliates' market share to exceed 10 percent of the electricity consumed the preceding year.

8 "EUAŞ: Statistical Data," Electricity Generation Incorporated Company, accessed May 2012, <http://www.euas.gov.tr/Sayfalar/Eng/AnaSayfa.aspx#>.

9 A qualified consumer either is connected to the electricity grid or consumes an electricity amount above a threshold set by EMRA.

Figure 2. Turkish Electricity Market Structure



Source: "Turkey Energy Industry Report." Investment Support and Promotion Agency of Turkey and Deloitte, August 2010. Accessed May 2012. <http://www.invest.gov.tr/en-US/infocenter/publications/Documents/ENERGY.INDUSTRY.PDF>.

Pricing

In Turkey, the government sets consumption tariffs for residential, commercial, and industrial users every three months. Average electricity prices per kWh to domestic customers was 12.87 cents/kWh and 11.35 cents/kWh for industrial customers.¹⁰ Electricity and natural gas prices are automatically calculated and periodically updated to reflect changes in fuel prices, including foreign exchange and inflation rates. Historically, low electricity tariffs have forced electricity generators and operators to operate at a loss. IPPs have often complained of late or no payment, limiting private sector investment.

Turkey addressed its pricing problem as part of its efforts to privatize the electricity market. In 2006, the Turkish Government created a wholesale electricity market in an attempt to bring energy prices in line with actual generation costs.¹¹ Modeled after the privatized electricity market in the United Kingdom, the new system helped simulate market-based electricity pricing by allowing independent power producers to choose between selling directly to customers or to the wholesale market. The new system has gradually increased electricity prices.

In 2008, the Turkish Government continued their reforms, introducing a cost-based pricing system that increased retail electricity rates nearly 50 percent in one year. This increase has improved the prospects for renewable energy deployment in Turkey; the closer electricity prices come to the levelized cost of energy, the greater the incentive for developers to invest in renewable energy projects.

Current Renewable Energy Market

While several renewable energy sectors offer potential in Turkey, only large hydro and wind power development have occurred at scale to date. In 2010, Turkey had 14.4 GW of hydroelectric capacity, representing 30 percent of the country's total installed capacity.¹² Turkey's wind power capacity reached 1.8 GW by the end of 2011, up from zero just five years earlier. Today, only 15 countries globally have installed more wind power capacity than Turkey.¹³ Modest geothermal development has occurred to

date as well; roughly 100 MW of capacity is now installed¹⁴ and future growth is projected by many analysts over the coming decade.¹⁵ Although significant potential exists for solar development, development has thus far been limited to small projects.¹⁶ Turkey also uses a small portion of its domestic biomass resources for electricity production and is a net exporter of ethanol.

Turkey's goal of generating 30 percent of its electricity from renewable resources by 2023 (excluding large hydro) should fuel continued growth in each of these renewable energy sectors over the coming decade. Importantly, Turkey has set industry-specific goals. The country aims to reach a total of 20 GW of installed wind capacity and 600 MW installed geothermal capacity. In addition, Turkey plans to fully utilize its existing hydropower resources and to invest substantially in solar power. Biomass is included in the overall 30 percent target, but does not have a specific capacity target.

Meeting these targets will require significant and sustained investment in new renewable energy to 2023, as well as a thorough upgrade to the country's transmission and distribution infrastructure. Fortunately, Turkey's investment in the necessary transmission infrastructure has been consistent; the country has installed more than 10,000 km of new transmission lines in the past 20 years.¹⁷ Meeting Turkey's financing needs will require participation from international financial institutions as well as greater engagement by domestic financial institutions.

Energy Council (GWEC), accessed May 2012, http://www.gwec.net/fileadmin/documents/NewsDocuments/Annual_report_2011_lowres.pdf.

14 "Installed Generating Capacity," International Geothermal Association, accessed May 2012, http://www.geothermal-energy.org/226,installed_generating_capacity.html.

15 Ruggero Bertani. "Geothermal Power Generation in the World: 2005-2010 Update Report." World Geothermal Congress. Accessed May 2012. <http://geotermia.org.mx/geotermia/pdf/WorldUpdate2010-Ruggero.pdf>.

Serpen, Umran, Niyazi Aksoy, and Tahir Ongur. "2010 Present Status of Geothermal Energy in Turkey." Accessed May 2012. <http://es.stanford.edu/ERE/pdf/IGAstandard/SGW/2010/serpen.pdf>

Turkey Power Report, Q2 2012 (2012), Business Monitor International, accessed May 2012. Subscription required.

16 "Solar Energy in Turkey," General Directorate of Electrical Power Resources Survey and Development Administration, accessed May 2012, http://www.eie.gov.tr/english/solar/solarTurkey_e.html.

Marc Roca, "Turkey's Small Solar Plant Rules to Spur Boom in Installations." Bloomberg, February 29, 2012.

17 "Annual Development of Transmission Lines of Turkey, 1979-2010," Turkish Electricity Transmission Company (TEİAŞ), accessed May 2012, <http://www.teias.gov.tr/istatistik2010/Istatistik%202010.htm>.

10 International Journal on Hydropower and Dams, "2011 World Atlas and Industry Guide." Subscription required.

11 This occurred through the introduction of the Settlement and Balancing System (DUY) of 2006.

12 *Electricity Market Report 2010*, Energy Market Regulatory Authority, 2010, accessed May 2012, <http://www.emra.org.tr/documents/10615/b8ff3b3a-8853-45ad-8bdd-00428c1857a8>.

13 "Global Wind Report: Annual Market Update 2011," Global Wind

Drivers of Renewable Energy Development

Renewable energy incentives, along with the recent structural reforms of Turkey's electricity sector, have been the primary drivers of renewable energy development in Turkey. Turkey's renewable energy sector is buoyed by feed-in tariffs, which were established first in the Law Concerning Use of Renewable Energy Resources for Generation of Electricity (Law 5346) in 2005. The feed-in tariffs were amended in December 2010. Each renewable technology received a specific feed-in tariff level, as described in Figure 3.

Figure 3.

Feed-in Tariff Rates in Turkey	
Hydro	\$0.073/kWh
Wind	\$0.073/kWh
Geothermal	\$0.105/kWh
Solar	\$0.133/kWh
Biomass	\$0.133/kWh

Source: Bloomberg News¹⁸

Under the new feed-in tariff regime, project developers must apply for renewable energy generation licenses; license holders must complete construction of their facility by December 31, 2015 to be eligible for a ten year tariff. Renewable energy generators also benefit from an 85 percent discount on transmission costs for 10 years, as well as bonus payments for the use of components manufactured in Turkey.

Future growth in renewable energy will depend on the Government of Turkey's commitment to maintaining – if not increasing – these incentives. Solar feed-in tariffs, for example, are limited to the first 600 MW of installed capacity and extend only to 2013. The Council of Ministers is expected to extend the feed-in tariff after the initial 600 MW is achieved, but without a guarantee of this increase, future growth remains uncertain.

Challenges Facing U.S. Exporters

Turkey's potential as a destination for U.S. renewable energy exports is tempered by the ongoing challenges of obtaining an attractive return on investment and

bureaucratic hurdles. For example, some industry players have expressed disappointment in the level of the feed-in tariffs. This disappointment, along with potential bureaucratic barriers, could temper enthusiasm from private investors. Additionally, developers must first apply for a license in order to qualify for feed-in tariffs. Obtaining a license can be cumbersome as applicants must obtain a number of certifications from several different government agencies. Despite recent reforms, the process remains an obstacle for developers. The European Bank for Reconstruction and Development maintains that the regulatory requirements remain a strong disincentive for future renewable energy development in Turkey.

In the geothermal sector, some industry insiders note resource mapping and characterization efforts are lacking and the licensing process opens license-holders to unnecessary risk.¹⁹ Turkey's General Directorate of Mineral Research and Exploration (MTA) has surveyed much of Turkey's geothermal resources. MTA has licensed most of these areas to the private sector. However, considerable geophysical research and drilling remains to be done before investors can move forward with project development.

Turkey has also added policies to boost the competitiveness of locally manufactured products, adding to a global protectionist trend as governments introduce localization policies in an effort to create jobs domestically. Several global firms have announced plans to manufacture in Turkey with an eye towards using the "bonus payment" tariffs to their advantage. As a result, ITA expects the U.S. market share of Turkish imports to remain low over the NEI time frame. However, a growing overall renewable energy market size should increase total U.S. exports to Turkey during the same period.

18 Ercan Ersoy and Ali Berat Meric, "Turkish Parliament Approves Renewable Energy Law Guaranteeing Price Levels." Bloomberg, December 30, 2010.

19 Harte, Julia. "Italy's Green Giant Enel to Tap Turkey's Geothermal Reserves." Reuters, March 2011. Accessed May 2012. <http://www.reuters.com/article/2011/03/10/idUS317936995520110310>.

Opportunities by Sector

Geothermal:

Much of Turkey's geothermal development to date has focused on direct heating applications, with limited development for electricity generation. In 2010, Turkey claimed 94.2 MW of installed geothermal capacity, up from just 29.8 MW in 2008.²⁰ Estimates of Turkey's geothermal potential are imprecise, ranging from 500 MWe to 2000 MWe.²¹ While exaggerated resource potential and questions about the licensing process²² could slow future development, there is still potential for U.S. geothermal exports to Turkey. As low-temperature geothermal technologies are further commercialized, much of Turkey's potential in the sector is likely to become commercially viable. ITA expects this to become a market with considerable room for U.S. market share. In fact, low-temperature resources are best suited for binary geothermal technologies, which is an area of distinct U.S. competitiveness.

Solar:

Though Turkey's solar potential is substantial, little development has taken place to date.²³ Both photovoltaic and concentrating solar power technologies can be deployed effectively in Turkey. As solar costs continue to decline, deployment should increase across both technologies.²⁴ Gaining early entry into the Turkish solar market is critical for U.S. manufacturers, given the high-level of competition expected from foreign suppliers. In

20 "Annual Development of Turkey's Installed Capacity by Primary Energy Resources, 1984-2010." Turkish Electricity Transmission Company (TEİAŞ). Accessed May 2012. <http://www.teias.gov.tr/istatistik2010/Istatistik%202010.htm>.

21 Mertoglu, Orhan, Nilgun Bakir, and Tevfik Kaya. "Geothermal Application Experiences in Turkey." Accessed May 2012. <http://pangea.stanford.edu/ERE/pdf/IGAstandard/EGC/szeged/I-4-02.pdf>.

Didem Korkmaz Basal, E., Umran Serpen, and Abdurrahman Satman. "Assessment of Turkey Geothermal Resources." Accessed May 2012. <https://pangea.stanford.edu/ERE/pdf/IGAstandard/SGW/2009/basal.pdf>.

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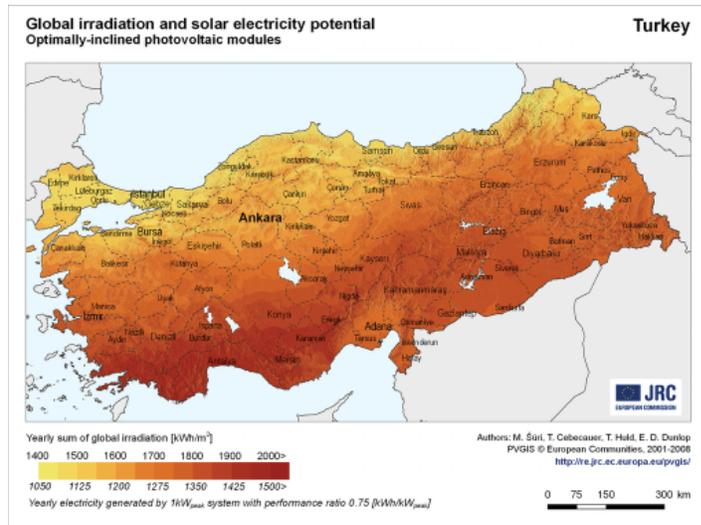
22 Harte, Julia. "Italy's Green Giant Enel to Tap Turkey's Geothermal Reserves." Reuters, March 2011. Accessed May 2012. <http://www.reuters.com/article/2011/03/10/idUS317936995520110310>

23 "Turkish Environmental Technologies and Renewable Energy Industry Report." Investment Support and Promotion Agency of Turkey, August 2010, accessed May 2012, <http://www.invest.gov.tr/en-US/infocenter/publications/Documents/ENERGY.INDUSTRY.PDF>.

24 Zachau, Ulrich. "Renewable Energy: A Major Opportunity – Solar Energy in Turkey." The World Bank, 2009.

addition to foreign competition, U.S. solar manufacturers will also face an emerging Turkish domestic solar industry, which already includes over 100 firms producing some type of solar equipment.²⁵

Figure 4.



Source: PVGIS, © European Communities 2001-2008²⁶

Hydro:

Turkey has begun shifting its hydropower focus away from solely large hydropower, which now accounts for a third of Turkey's electricity production, to small hydro facilities. Currently, there are 290 hydro dams in operation reaching a total installed capacity of 16.9 GW; 76 small hydro plants with a total capacity of 189 MW; and 230 hydro plants of all sizes are under construction, adding 10.5 GW of expected capacity.²⁷ Microhydro projects (<200kW) are subject to fewer licensing and permitting requirements. According to Bloomberg New Energy Finance, over 500 MW of small hydro projects are currently under development.²⁸ Given Turkey's emphasis on smaller-scale hydro facilities, a number of U.S. manufacturers may find a competitive position, as well as U.S.-based service providers that

25 "Solar Energy in Turkey," General Directorate of Electrical Power Resources Survey and Development Administration, accessed May 2012, http://www.eie.gov.tr/english/solar/solarTurkey_e.html.

26 Šuri M., Huld T.A., Dunlop E.D. Ossenbrink H.A., 2007. "Potential of solar electricity generation in the European Union member states and candidate countries." *Solar Energy*, 81, 1295-1305, <http://re.jrc.ec.europa.eu/pvgis/>.

27 International Journal on Hydropower and Dams, "2011 World Atlas and Industry Guide." Subscription required.

28 Bloomberg New Energy Finance database, accessed April 2012. Subscription required.

specialize in small hydro projects. However, Turkish state-owned microturbine manufacturer, Temsan, will compete with U.S. microturbine suppliers.

Wind:

Turkey's wind market has grown from non-existent to the 16th largest in the world in five years. The growth can be attributed both to increasing policy support, as well as Turkey's high-quality wind resources in the Aegean, Marmara, the eastern Mediterranean, and central Anatolia regions.²⁹ However, considerable regulatory and competitive questions surrounding the development of the wind industry in Turkey remain -- namely, licensing requirements, which temper investor interest. Turkey's proximity to Europe and growing interest in extending its commercial ties to Asia, raise concerns about whether U.S. wind sector exporters can compete successfully in Turkey. Like other highly-competitive markets, U.S. exporters may be more inclined to find opportunities selling component parts, or high-tech services to the Turkish wind industry, instead of turbines or other large, capital-intensive products.

Renewable Fuels:

The ethanol and biodiesel markets in Turkey have declined significantly in recent years, in part due to the unfavorable regulatory environment surrounding the industry. Furthermore, biofuels are not classified as a renewable energy source under Turkish renewable energy law, and instead are regulated like traditional petroleum products. Turkey is currently an ethanol exporter, as production has exceeded domestic demand. As a result, the country is not likely to import renewable fuels from the United States in the foreseeable future, but may import biorefinery equipment for biofuels production.³⁰

Biomass Power:

In 2009, Turkey used only 129 MW of biomass capacity for electricity generation.³¹ Recently, several municipalities have developed waste-to-energy plans that are expected to attract investor interest due to a high feed-in tariff rate of \$0.13/kWh. Turkey's first biogas plant began operations in April

29 "Turkey: Total Installed Capacity," Global Wind Energy Council (GWEC), accessed May 2012, <http://www.gwec.net/index.php?id=133>.

30 *Turkey Biofuels Annual Report* (2010), U.S. Department of Agriculture, Foreign Agricultural Service. Accessed May 2012. http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Ankara_Turkey_8-13-2010.pdf.

31 "International Energy Statistics," Energy Information Agency, accessed May 2012, <http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm>.

2012, as a previously constructed plant took advantage of the new tariff regime to begin operations. With abundant local biomass resources, imports of U.S.-made pellets or chips appear unlikely.

Recent Activities in Support of U.S. Exporters

The U.S. Department of Commerce led a Renewable Energy & Energy Efficiency Trade Mission to Turkey in December 2011. The delegation, which included 16 U.S. energy firms as well as officials from various U.S. government agencies, stopped in Ankara, Izmir and Istanbul. Participating U.S. firms met with numerous Turkish counterparts to discuss possible joint-venture opportunities. Over 350 of these business-to-business matchmaking meetings took place during the five-day mission. Trade mission participants reported a potential \$40 million in business deals in the 6-36 months following the mission. Two such companies, AES and DOW, have already announced investments with Turkish partners valued at \$1.2 billion and \$1 billion, respectively.

The trade mission built on work already underway through the Near-Zero Zone Project, which the U.S. Department of Energy has developed to demonstrate energy efficiency technologies to Turkish industrial firms. The project has been executed in cooperation with the Government of Turkey, several U.S. government agencies, and private sector companies. The first-of-a kind demonstration project paired 20 Turkish companies in the Ataturk Organized Industrial Zone (IAOSB) in Izmir with technical resources and the expertise needed to achieve significant energy savings. Participating agencies and U.S. companies then helped these Turkish firms identify and implement cost-effective energy efficiency investments, providing important opportunities for U.S.-based suppliers.

Important Contacts

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