Japan's Electricity Market and Opportunities for U.S. Renewable Energy and Smart Grid Exporters

December 2012

Country Quick Facts

Size: 377,915 sq. km.

Population: 127,368,088

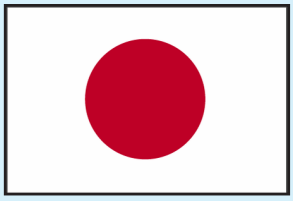
Type of government: Parliamentary Monarchy

Head(s) of state: Emperor Akihito, Prime Minister Yoshihiko Noda

Capital: Tokyo

Primary Religion(s): Shintoism & Buddhism

Language: Japanese



Source: CIA World Factbook

In March 2011, Japan's future changed as a 9.0 magnitude earthquake struck off the coast of Tōhoku, producing a tsunami that toppled seaside villages and caused widespread concern over the potential meltdown of the Fukushima Daiichi nuclear reactor. The effects were both sudden and dramatic. The Japanese Government ordered the shutdown of the entire Japanese nuclear fleet (totaling 54 reactors) and began preparing to shift the nation's electricity infrastructure towards renewable energy sources and a greater focus on energy efficiency.

This *Market Intelligence Brief* details Japan's renewable energy and smart grid market, highlighting opportunities for U.S. exporters. It also seeks to explain the complex drivers of Japan's energy policy and the challenges faced by U.S. companies.

ITA anticipates Japan's future energy strategy will be guided by three pillars:

- A substantial reduction in the use of nuclear power;
- A massive deployment of renewable energy; and
- A significant increase in the use of energy efficient technologies, particularly smart grid.

While other countries are pursuing similar clean energy strategies, the speed and scale of Japan's energy transition is staggering. By 2030, the Japanese Government aims to triple renewable energy electricity generation, reaching 300 terawatt hours (TWh) -- up from 110 TWh in 2010. To achieve this increase, a total of 101 GW of new renewable energy capacity must be installed in the next two decades.[1]

To achieve this objective, the Japanese power sector will require—and sustain—massive investments in both renewable energy and smart grid

1 *Innovative Strategy for Energy and Environment*, The Energy and Environment Council, Government of Japan September 2012. Note: As of 2010, Japan's total installed generating capacity from renewable energy sources was 31 GW.

technologies over the coming decades. The sheer size of the expansion, and the investment opportunity it will create, should provide opportunities for U.S. companies capable of providing cutting-edge technologies and services to the Japanese market.

Market Overview

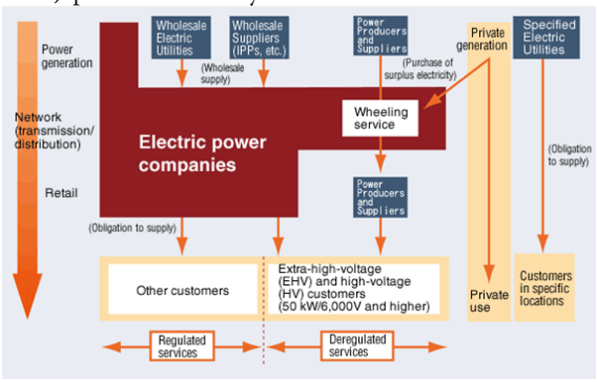
Market Structure

The Japanese electricity market can be complicated, but understanding how and why the market functions is critical for U.S. businesses seeking opportunities for their products or services. The market is overseen by the Ministry of Economy, Trade, and Industry (METI), which is responsible for policy planning and regulation through the Agency for Natural Resources and Energy. The Japan Fair Trade Commission monitors the state of competition and has been increasingly active in the electricity market since market reforms were undertaken in the 1990s.

Liberalization and deregulation of the electricity market began in 1995. By 2011, 60% of the electricity market had been liberalized—mostly in the industrial sector, leaving much of the household and small business market regulated.[2] Market competition is non-existent in the regulated residential sector, as General Electric Utilities (GEUs) hold regional monopolies. However, in the deregulated sector, some level of market competition exists as industrial and other high-voltage consumers can choose between different power suppliers.

Japan's energy sector is heavily dependent on imports of coal, oil and natural gas, which account for 96% of Japan's primary energy supply.[3] In 2010, Japan was the largest electricity consumer in OECD Asia, with an installed electricity generating capacity of 282 GW, making it the third largest electricity generator in the world (behind the United States and China).[4]

Figure 1: Japanese Electricity Market Structure



Source: Tokyo Electric Power Company (TEPCO)

Key Players

- General Electric Utilities (GEU): The ten regional GEUs are vertically-integrated and are responsible for generation, transmission, and distribution of electricity. Though most of the GEUs are privately owned, the Japanese Government recently became the majority stockholder of Tokyo Electric Power Company (TEPCO), as a result of the Fukushima accident. GEUs currently sell 99% of electricity in Japan.[5]

- Wholesale Electric Utilities (WEU): WEUs have a supply capacity of 2,000 MW or above and supply electricity to GEUs. There are 2 WEUs: The Japan Atomic Power Company and J-POWER.

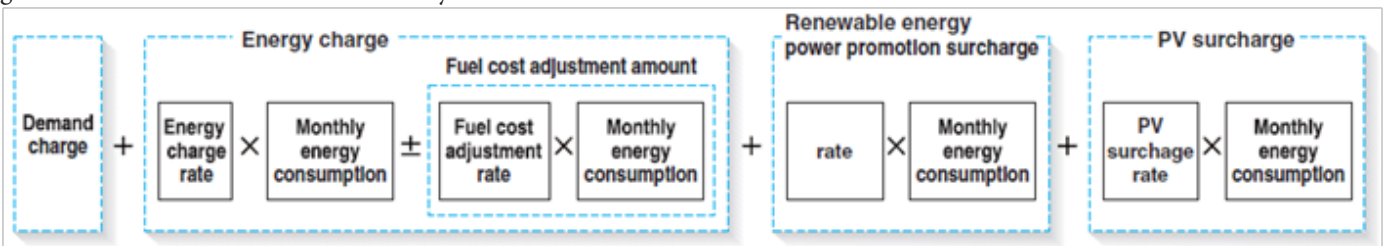
- Independent Power Producers (IPP): IPPs joined the electricity market during the first round of deregulation in 1995. IPPs supply electricity to GEUs, contracting with them to supply 1 MW or more of electricity for at least 10 years, or of 1,000 MW or more for at least five years.[6]

- Power Producers and Suppliers (PPS): PPSs joined the electricity market in 2000, further deregulating the electricity market. PPSs supply electricity to industrial consumers for 50 kW or more, and pay a fee to GEUs to use their distribution networks. PPSs currently compose only 3.5% of Japan's power supply.

- Specified Electric Utilities (SEU): SEUs supply electricity to defined areas using their own generation and distribution facilities.

2 Nakamura, Yugo. "Power Market Reform—News for Japan!" *Bloomberg New Energy Finance*, July 2012.
3 *Federation of Electric Power Companies of Japan* Data (2012).
4 "Country Analysis Brief: Japan." U.S. Energy Information Administration, June 4, 2012.
5 Suzuki, Takahiko. Japan: *Electric Power Industry*, U.S. Commercial Service Report, U.S. Department of Commerce, June 2011.
6 Nakata, Hiroko. "Retail Power Slow to Make Inroads Despite Nuclear Crisis," *The Japan Times*, April 2012.

Figure 2: Formula for Cost-Based Electricity Rates



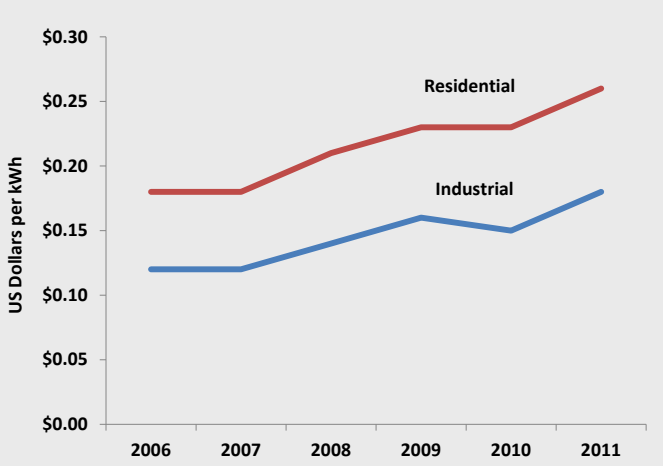
Source: Tokyo Electric Power Company (TEPCO)

Pricing

Unlike other countries, there is no overarching regulatory body that oversees pricing in the Japanese electricity sector. In the regulated residential market, electricity rates are generated by utilities using a cost-based method (as seen in Figure 2), rather than a market-determined price. In the deregulated market, electricity rates are negotiated between suppliers and consumers with changes approved by METI. In practice, often only a notification of rate change is required.

The lack of a consumer-driven regulator has traditionally produced higher costs for Japanese electricity consumers than their peers in others markets, and has resulted in recent electricity rate increases (as seen in Figure 3). In 2011, for example, industrial and residential consumers paid $0.18 and $0.26 per kWh of electricity consumption, respectively.[7] The average rate for OECD electricity consumers in 2010 was $0.11 and $0.16 per kWh for industrial and residential consumers, respectively.[8]

Figure 3: Electricity Prices in Japan, 2006 – 2011



Source: International Energy Agency

Market Liberalization

Despite the presence of some opposition, the Japanese Government seems committed to continued market liberalization, which could result in the restructuring of regional monopolies and cost-based pricing. If deregulation and liberalization continues, ITA anticipates that U.S. companies may realize additional commercial opportunities in the renewable energy and smart grid industries, particularly through partnerships with Japanese firms.

Policy Goals

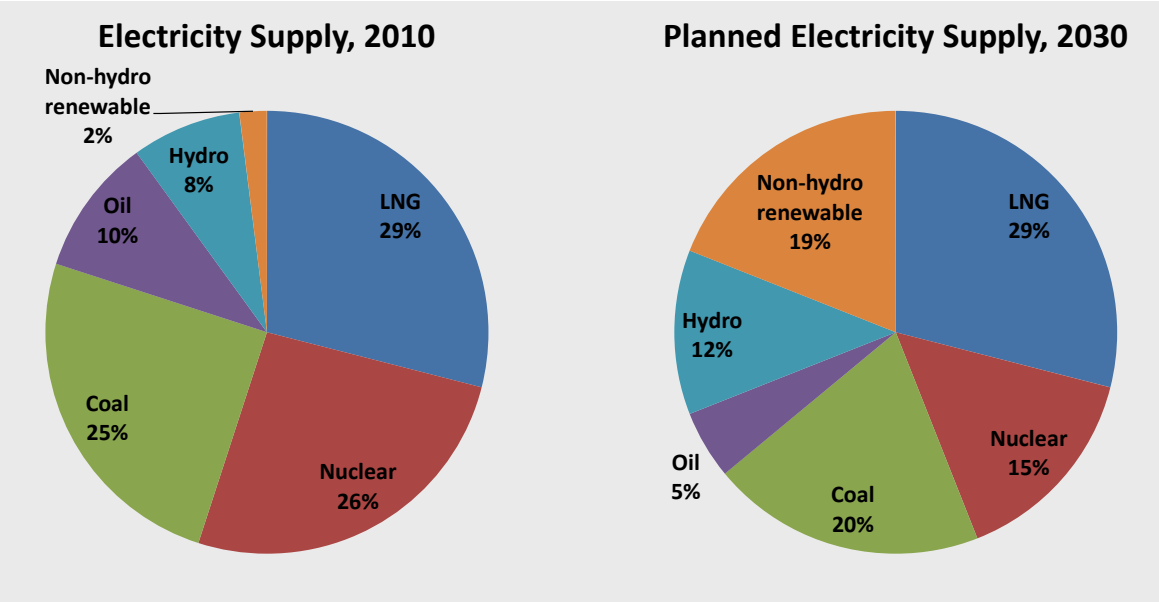
To support a drastic shift in its energy industry, the Japanese Government is focused on the creation of a nation-wide "energy society", bringing together government, industry, and civil society to create a new Japanese energy identity.[9]

The Energy and Environment Council, under the authority of the National Policy Unit (an organization within the Cabinet Secretariat) recently published the "Innovative Strategy for Energy and the Environment." This strategy highlights Japan's interest in achieving the "three Es": energy security, environmental friendliness, and economic efficiency, which, according to the strategy, will be achieved by reducing nuclear power generation, increasing renewable energy production, and broadly deploying energy efficiency technologies.

Shortly thereafter, the Japanese Cabinet announced its intent to implement energy policies based on the strategy, with the exception of fully endorsing specific goals for nuclear energy reduction. ITA recommends that U.S. exporters monitor the upcoming Japanese elections, which could result in changes to the market for energy-related technologies.[10]

7 *Electricity Information 2012*, IEA Statistics (2012).
8 *Electricity Information 2012*, IEA Statistics (2012).
9 *Innovative Strategy for Energy and Environment*, The Energy and Environment Council, Government of Japan September 2012.
10 If the December 2012 election alters these plans significantly, ITA will provide an update to its stakeholders, if appropriate.

Figure 4: Electricity Supply, 2010 (L) and Planned Electricity Supply, 2030 (R)



Source: National Policy Unit, Bloomberg New Energy Finance

Nuclear Energy

Prior to the potential meltdown of the Fukushima Daiichi power plant, Japan's 54 nuclear reactors generated 30% of Japan's electricity. The fallout from the disaster resulted in the shutdown of the entire Japanese nuclear fleet in 2011, removing 49 GW from the nation's electricity infrastructure. Since then, only two nuclear reactors have been brought back online to help meet the country's electricity demands.

Before the tsunami, Japan had planned to increase its use of nuclear power, with the sector expected to contribute up to 50% of the Japan's electricity supply by 2030 (potentially 68 GW of capacity).[11] Today, the Japanese Government is focused on substantially reducing its use of nuclear power, with some entities calling for a complete prohibition of nuclear generation. The Japanese Government has made clear that it plans to enforce the forty-year operating limits of its existing nuclear power plants; and to restart nuclear power plants only after exhaustive safety assurance from the Nuclear Regulation Authority.[12]

The Government of Japan's Energy and Environment Council in September 2012 laid out a strategy to "mobilize all possible policy resources" to "enable zero operation of nuclear power plants in the 2030s."[13] The Japanese Cabinet responded with its own statement five days later, saying it would take this strategy "into account" when implementing future energy and environmental policies, causing some opinion leaders to question the Cabinet's commitment to a zero nuclear policy. Interest remains high as Japan considers a new Basic Energy Plan and many see the policy situation as still fluid.

Renewable Energy

The abrupt changes in nuclear policy have created significant opportunities for renewable energy providers, as Japan seeks to transform itself into one of the world's largest renewable energy markets. Prior to March 2011, Japan had planned to increase its use of renewable energy (including hydro power) to 20% of national electricity generation by 2030.[14] Wind and solar technologies were already widely used and large Japanese conglomerates were global leaders in the development of these technologies. By the time of the tsunami, Japan had 2.5 GW of wind power capacity and 5 GW of solar power capacity online, and by most accounts investment in the renewable energy sector foretold significant growth into the future.[15]

11 "H1 2012 Japan Market Outlook: Shaping a Bold Plan." *Bloomberg New Energy Finance*, June 2012.

12 *Innovative Strategy for Energy and Environment*, The Energy and Environment Council, Government of Japan September 2012.

13 *Innovative Strategy for Energy and Environment*, The Energy and Environment Council, Government of Japan September 2012.

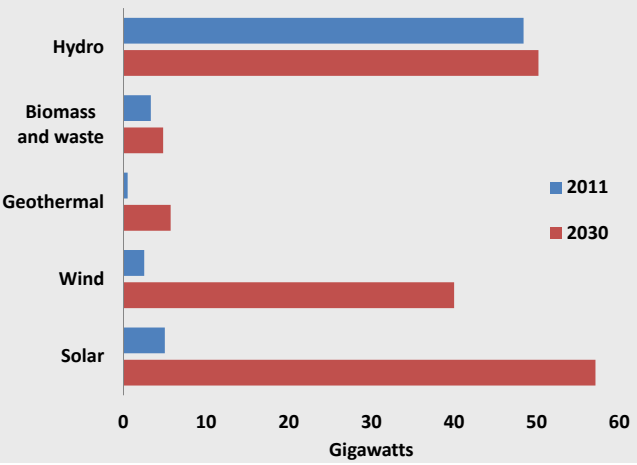
14 "H1 2012 Japan Market Outlook: Shaping a Bold Plan." *Bloomberg New Energy Finance*, June 2012.

15 "H1 2012 Japan Market Outlook: Shaping a Bold Plan." *Bloomberg New Energy Finance*, June 2012.

The Japanese market, however, did not attract the interest of global renewable energy companies or U.S. exporters in large numbers, as local suppliers continued to dominate the market. That changed abruptly following the Japanese Government's announcement that it would triple the production of renewable energy by 2030, and would use strong feed-in tariffs to incentivize development. The Japanese Government now estimates the total installed capacity for renewable energy (including hydro power) will reach 132 GW by 2030.[16] Unprecedented growth in demand for renewable energy technologies will drive new opportunities for suppliers and developers, including U.S. exporters.

Japan has not yet outlined binding sector-specific production targets, and is relying on its feed-in tariffs to drive the market rather than specific production mandates. Nevertheless, to meet its goal of tripling renewable energy production, *Bloomberg New Energy Finance* (BNEF) suggests growth in several renewable energy sectors would be significant. In the solar sector, for example, BNEF suggests Japan would need to produce 52 GW of solar power by 2030 to meet its renewable energy target. If this were to occur, Japan would become one of the largest solar markets in the world over the next two decades, rivaling China and Saudi Arabia for the largest growth potential.

Figure 5: Renewable Energy Capacity By Subsector Under "RE 30% Scenerio," 2011 and 2030 in Gigawatts



Source: National Policy Unit, Bloomberg New Energy Finance

The expansion of the renewable energy sector in Japan is also expected to drive growth across the supply chains of many technologies, which should create opportunities for U.S. exporters of component parts and materials. In fact, should Japan meet its renewable energy goals, the export opportunity provided to U.S. companies would likely be as sustained and consistent as any in the world.

Smart Grid and Energy Saving Technologies

According to Japan's electric power industry, over $100 billion was invested in the 1990s to upgrade electric power generation and transmission, particularly in technologies and systems that increased grid reliability and averted blackouts. As a result, Japan's grid is viewed as one of the most reliable in the world. It has only 17 minutes of blackout time annually (compared to 138 minutes in the U.S.) and only 5.1 percent line loss rate.[17] The dual disasters of March 2011 caused widespread destruction of Japan's electricity infrastructure and created a paradigm shift in the way Japan views energy efficiency and the smart grid.

Smart grid developments, including the Sendai microgrid in Tōhoku, were already underway in Japan before the tsunami, but the effectiveness of microgrids integrating new energy sources and supporting reliability during emergencies was brought to the forefront during the disaster and recovery periods. In Tōhoku, for example, the microgrid went into "island mode" and supplied emergency power from solar PV systems and gas engines after the earthquake, despite widespread system outages in the region.

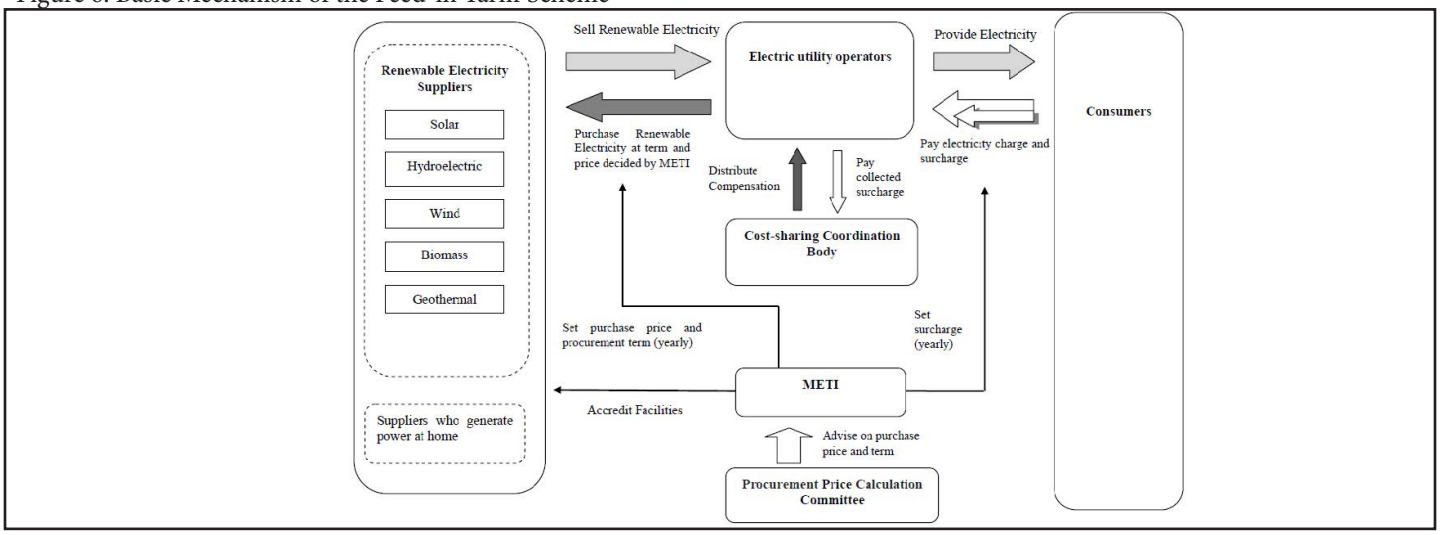
As Japan undergoes its energy transition, the deployment of smart grid and energy efficiency systems and technologies will be integral to the achievement of its policy objectives. The "Innovative Strategy for Energy and the Environment" outlined a target to reduce electricity consumption by 110 billion kilowatt hours (kWh) by 2030.[18] To drive the deployment of the smart grid, the Government of Japan has set a goal to achieve smart meter coverage in 80% of Japanese households by 2017. TEPCO, the largest Japanese utility, has already announced its plans to hold bids to acquire roughly 17 million smart meters in 2013. The utility plans to deploy smart meters to all of its 27 million customers by 2023. ZPryme, a research and consulting firm based in Austin, Texas, projects that the

16 *Innovative Strategy for Energy and Environment,* The Energy and Environment Council, Government of Japan September 2012.

17 Bojanczyk, Kamil. "The Fast and the Furious: Japan's Race to Energy Management." *Green Tech Grid*, August, 2012.

18 *Innovative Strategy for Energy and Environment*, The Energy and Environment Council, Government of Japan September 2012.

Figure 6: Basic Mechanism of the Feed-in Tariff Scheme



Source: Ministry for Economy, Trade, and Industry (METI)

smart grid market in Japan will grow from approximately $1 billion in 2011 to $7.4 billion in 2016.[19]

Market Drivers

Feed-in Tariffs

Since March 2011, the Japanese electricity market was modified to make the production of renewable energy easier and more profitable. The "Act on Purchase of Renewable Energy Sourced Electricity by Electric Utilities" introduced feed-in tariffs (FiTs) for electricity produced by solar, wind, geothermal, hydroelectric, and biomass technologies. Under the act, electric utilities are obligated to purchase electricity generated by renewable sources. In turn, utilities transfer the costs of the FiTs to consumers in the form of higher electricity rates. The FiT rates and contract durations, as determined by METI, became effective July 1, 2012 and are scheduled to be re-evaluated annually.

The high FiT rates demonstrate Japan's intention to become one of the world's largest renewable energy markets and the Japanese Government's willingness to create the market conditions needed to achieve this goal. In the first month of the program, METI received over 32,500 residential, 900 commercial, and 81 utility-scale applications for solar photovoltaic (PV) projects.[20] By September 2012, just three months after the introduction of the FiT regime, METI announced the approval of renewable energy projects totaling 1.3 GW, including 1 GW of new solar development (excluding residential solar generation).[21] In total, Japanese utilities plan to have commissioned 2.0-2.3 GW of new solar projects, 2.6 MW of hydro projects, and 16 MW of biomass projects by the end of 2012.[22]

Table 1: FiT Rates for Solar, Wind, Geothermal, and Hydro

Sector	Capacity	Rates (/kWh)	Term (years)
Solar PV	10 kW+	JPY 40 ($0.50)	20
Solar PV	<10 kW	JPY 42 ($0.53)	10
Wind	20 kW+	JPY 22 ($0.28)	20
Wind	<20 kW	JPY 55 ($0.69)	20
Geothermal	15 MW+	JPY 26 ($0.33)	15
Geothermal	<15 MW	JPY 40 ($0.50)	15

Source: Ministry of Economy, Trade, and Industry (METI)

Yet FiT rates as dramatic as the ones offered by Japan in 2012 are expensive and can only be maintained with significant and sustained political support. It is therefore highly probable that the FiT rates will decline as renewable energy technologies become more cost competitive with

19 "Japan Turning to Smart Grid Technologies After Tsunami." *ZPryme Research*, March 15, 2012. Available at: http://www.elp.com/index/display/article-display/6845392184/articles/electric-light-power/smart-grid/2012/March/Japan_turning_to_smart_grid_technology_after_tsunami.html

20 Woodward, Travis. "Japan Solar Market Update—One Month After the FiT Start," *Bloomberg New Energy Finance*, August 2012.

21 Nakamura, Yugo. "No Clear Nuclear Exit Strategy for Japan." *Bloomberg New Energy Finance*, September 2012.

22 "H1 2012 Japan Market Outlook: Shaping a Bold Plan." *Bloomberg New Energy Finance*, June 2012.

more traditional fossil fuel sources. Even with lower future rates, ITA anticipates that Japan will continue to offer globally competitive FiTs for the foreseeable future, which should continue to drive the market forward.

Table 2: FiT Rates for Biomass Technologies

Technology/Feedstock Type	Rates (/kWh)	Term (years)
Gasification	JPY 39 ($0.49)	20
Forest Thinning	JPY 32 ($0.40)	20
Wood (non-recycled)	JPY 24 ($0.30)	20
MSW, Waste Water Residue	JPY 17 ($0.21)	20
Recycled Wood	JPY 13 ($0.16)	20

Source: Ministry of Economy, Trade, and Industry (METI)

Tax Incentives

In addition to high feed-in-tariffs, renewable energy developers are provided tax incentives to make the Japanese electricity market even more attractive. METI provides accelerated depreciation incentives for investments in solar, wind, biomass, and energy efficiency projects.

For solar investments above 10 kW and wind investments above 10 MW, renewable energy developers receive 100% depreciation of the asset, effective until March 2013.[23] Biomass, energy efficiency, and other renewable energy investments are offered accelerated depreciation of up to 30% through March 2014.[24]

Consumer Subsidies

In addition to renewable energy tax incentives, METI also offers consumer subsidies for Home Energy Management Systems (HEMS) and Building and Energy Management Systems (BEMS). METI has budgeted $36.6 million to subsidize the costs of energy efficiency devices and systems, as well as the cost of installation.[25] METI believes the subsidy will be offered until the end of 2013, when total subsidy levels are expected to reach their budget limit.

Additional subsidies may be coming: a recent article in *Nikkei*, a leading Japanese newspaper, reported that the government's "Green Policy Outline," a campaign pledge aimed at explaining how the country could achieve a zero-nuclear policy, included a recommendation for additional consumer subsidies that would promote residential technologies, like roof-mounted solar panels and heat-insulating building materials.[26]

Land Use Reform

To supplement the consumer-facing incentives and the FiT rates for developers, Japan's Ministry of the Environment (MOE) and the Ministry of Agriculture, Forestry, and Fisheries (MAFF) have introduced several regulations regarding land use that further incentivize renewable energy development. In July 2012, developers were granted access to national forests for the development of renewable energy projects, including geothermal energy development in national parks. Estimates indicate that 11 GW of geothermal potential remains untapped on these federal lands, providing a substantial opportunity for development.[27]

Furthermore, the delisting of solar PV projects under the "Factory Location Act" lifted the land spacing limit for solar PV applications, which previously required that 50% of the project site remain unoccupied. Effectively, this meant that solar power projects in Japan are now limited only by the available land for each project and could produce more electricity than previously allowed.

Climate Change Targets

Since the Kyoto Protocol agreement was adopted in 1997, the Japanese Government has outlined several targets to reduce its greenhouse gas (GHG) emissions. In 2005, Japan pledged to reduce GHG emissions by 6% from its 1990 level by 2012. At the United Nations Framework Convention on Climate Change (UNFCCC) in Copenhagen in 2009, Japan announced a new target to reduce GHG emissions by 25% from the 1990 level by 2020.

The Japanese government has recently acknowledged that achieving this target is unrealistic and expects the level of GHG emissions in 2020 to be only 5-9% lower than the

23 Nakamura, Yugo. "How Serious is Japan about Promoting Renewable Energy Investments?" *Bloomberg New Energy Finance*, August 2012.

24 Nakamura, Yugo. "How Serious is Japan about Promoting Renewable Energy Investments?" *Bloomberg New Energy Finance*, August 2012.

25 "Selected Devices to be Subsidized in the Project to Promote Introduction of the Home Energy Management Systems (HEMS)." Ministry of Economy, Trade, and Industry, April 2012. Available at: http://www.meti.go.jp/english/press/2012/0410_01.html.

26 http://e.nikkei.com/e/ac/tnks/Nni20121127D27JF120.htm

27 "H1 2012 Japan Market Outlook: Shaping a Bold Plan." *Bloomberg New Energy Finance*, June 2012.

1990 level.[28] Nevertheless, Japan's new national "climate plan" is expected to be completed by April 2013 and is expected to outline hard targets for future GHG emissions reductions in the medium-to-long-term.

To support its GHG emission reduction targets, Japan introduced a carbon tax for electricity utilities and other primary users of fossil fuels. The tax began on October 1, 2012 with a starting cost of $3.70 per metric ton of carbon emissions. The tax on oil, natural gas, and coal-based power plants will be increased in stages until April 2016 and is expected to yield revenues of $3.2 billion at its highest point.[29]

The introduction of the carbon tax has raised concerns regarding the effect of the carbon tax on the Japanese economy by several Japanese companies. Despite the negative sentiment, the Japanese Government has not announced intentions to reconsider this policy. While it is too early to determine the new carbon tax's effect on GHG emissions, its continued implementation alone is testament to the Japanese government's commitment to transform its energy portfolio.

Challenges Facing U.S. Exporters

Market Entrance

The vertically-integrated nature of the Japanese electricity market can present both challenges and opportunities for U.S. companies. The presence of a small number of Japanese firms allows U.S. companies to target a limited number of potential customers, but can reduce opportunities when Japanese conglomerates have strong existing supplier networks. Continued liberalization of the electricity market may provide an opportunity for increased market competition, as newly liberalized segments of the market may support additional opportunities for U.S. exports.

In fact, the recent implementation of the FiT regime has propelled foreign investment into Japan's renewable energy market, broadening the potential client-base away from traditional Japanese companies and towards a more global market where U.S. technologies may be in higher demand. Imported solar panels, for example, accounted for 32% of Japanese solar cell sales between July and September of 2012.[30]

The market for smart grid technologies remains highly constrained in Japan, with major conglomerates like Toshiba, Hitachi, and Mitsubishi controlling a vast segment of the industry. New entrants therefore face significant challenges in supplying the electric power sector, but new opportunities for low-cost innovations and new services in the smart grid sector are emerging. As the Japanese Government takes stronger steps to encourage utilities to become more efficient, an even larger market opportunity for smart grid companies should develop.

Burdensome Project and Technology Certification Processes
In some cases, burdensome certification and regulatory approval processes have inhibited the development of renewable energy projects. To secure FiT rates, developers must submit a project plan that describes the project site, key plant specification, the O&M management plan, and other items to METI for approval. In addition, projects larger than 50 kW must apply for grid connection with a power utility.

According to BNEF, large projects (2 MW or more) are likely to take around 1.7 – 2.7 years from initial project design to commissioning.[31] For wind and geothermal projects larger than 10 MW, the overall approval process may be even longer. BNEF estimates a project completion timeframe of 5.5 – 9.0 years for wind projects and 9.0 – 13.0 years for geothermal projects.[32] Smaller projects (50 kW – 2 MW) can be completed in a shorter timeframe, roughly 1 – 1.5 years. Since projects smaller than 50 kW do not require a grid application, they can be constructed after only 1 – 2 months. As market conditions can change rapidly, the extended wait time associated with the Japanese project and technology certification processes can dramatically slow the deployment of new technologies.[33]

28 Nakamura, Yugo. "No Clear Nuclear Exit Strategy for Japan." *Bloomberg New Energy Finance*, September 2012.

29 Watanabe, Chisaki. "Japan Introducing Carbon Tax Prompts Backlash From Businesses," *Bloomberg*, September 2012.

30 "Solar Cell Imports Soar As Incentive Program Spurs Demand." *Nikkei*, November 16, 2012.

31 Woodward, Travis. "Japan Solar Market Update—One Month After the FiT Start," *Bloomberg New Energy Finance*, August 2012.

32 Nakamura, Yugo. "How Serious is Japan about Promoting Renewable Energy Investments?" *Bloomberg New Energy Finance*, August 2012.

33 Wind energy projects are subject to an additional review, under the "Building Standard Act." In July 2012 MILT exempted floating offshore farms from the "Building Standard Act," sparking increased development in offshore wind power.

Burdensome certification processes also pose a challenge to smart grid and energy efficiency technology deployment in Japan, although the Japanese Government has acknowledged the need to streamline processes and align standards to international best practices. For example, TEPCO originally intended to apply its own standards to its tender for the acquisition of 17 million smart meters in 2013, but in response to criticism, announced it would adhere to global standards in the technical specifications for this procurement. TEPCO's decision to use global standards may set a precedent for other utilities to follow; however, it is unknown whether other utilities will follow suit.

Table 3: Environmental Impact Assessment (EIA) Requirement by Category and Capacity

Technology	EIA is mandatory	EIA may be required
Biomass	>150 MW	112.5-150 MW
Hydro	>30 MW	7.5-10 MW
Geothermal	>10 MW	7.5-10 MW
Wind	>10 MW	22.5-30 MW

Source: Ministry of the Environment (MOE)

Environmental Impact Assessments

The Japanese Government's push for renewable energy production, however, has not eased requirements to undertake environmental impact assessments. On the contrary, MOE tightened project certification regulations by amending the Environmental Impact Assessment Law. Effective April 2012, large-scale renewable energy projects (except solar) now require Environmental Impact Assessments (EIAs) prior to project implementation; and smaller-scale projects may require EIAs on a case-by-case basis (as seen in Table 3). As a result, renewable energy project certification can be quite burdensome, as long lead times required to complete EIAs slow project development. METI has suggested plans to streamline the application process, but new requirements have yet to be announced.

Opportunities by Sector

Capturing opportunities in the Japanese market can be difficult. U.S. companies typically need a Japanese business partner capable of identifying upcoming projects, having frequent face-to-face meetings in Japanese to discuss technical issues with end users, conducting all necessary testing and certification procedures, facilitating import procedures and delivery, providing after-sales service, etc. In the electric power sector, such partnerships are critical. U.S. exporters of both renewable energy technologies and smart grid technologies should foster relationships with the regional utilities, along with their major contractors and suppliers.

Solar

Based on projections from several analysts, solar energy has the largest growth potential in the Japanese power sector in both the short and medium-term. Solar projects are highly accessible for small to medium scale IPPs and do not require the same certification processes as other renewable energy technologies.

As a result, the solar sector has seen an unprecedented level of interest from global project developers, as well as Japanese consumers and the combination of both utility-scale and residential opportunities should provide ample opportunities for U.S. companies going forward. This year alone, Japanese and foreign solar developers have announced 148 projects, the majority of which have yet to choose an equipment provider.[34] In fact, BNEF predicts 3.2 GW – 4.6 GW of new solar capacity will be added in Japan by the end of 2013. Should this occur, ITA expects a significant increase in U.S. solar exports to Japan, as the demand for solar technologies will likely outpace the supply of domestically produced technology in the near-term.

Wind

Despite burdensome regulations and high project costs, wind developers have shown an increased interest in the sector as well. Project developers have announced 24 wind projects this year, including 19 onshore wind projects and projects and 5 offshore wind projects.[35] As an example, a February 2012 bid for a 400 MW project resulted in over 3.2 GW of applications.[36]

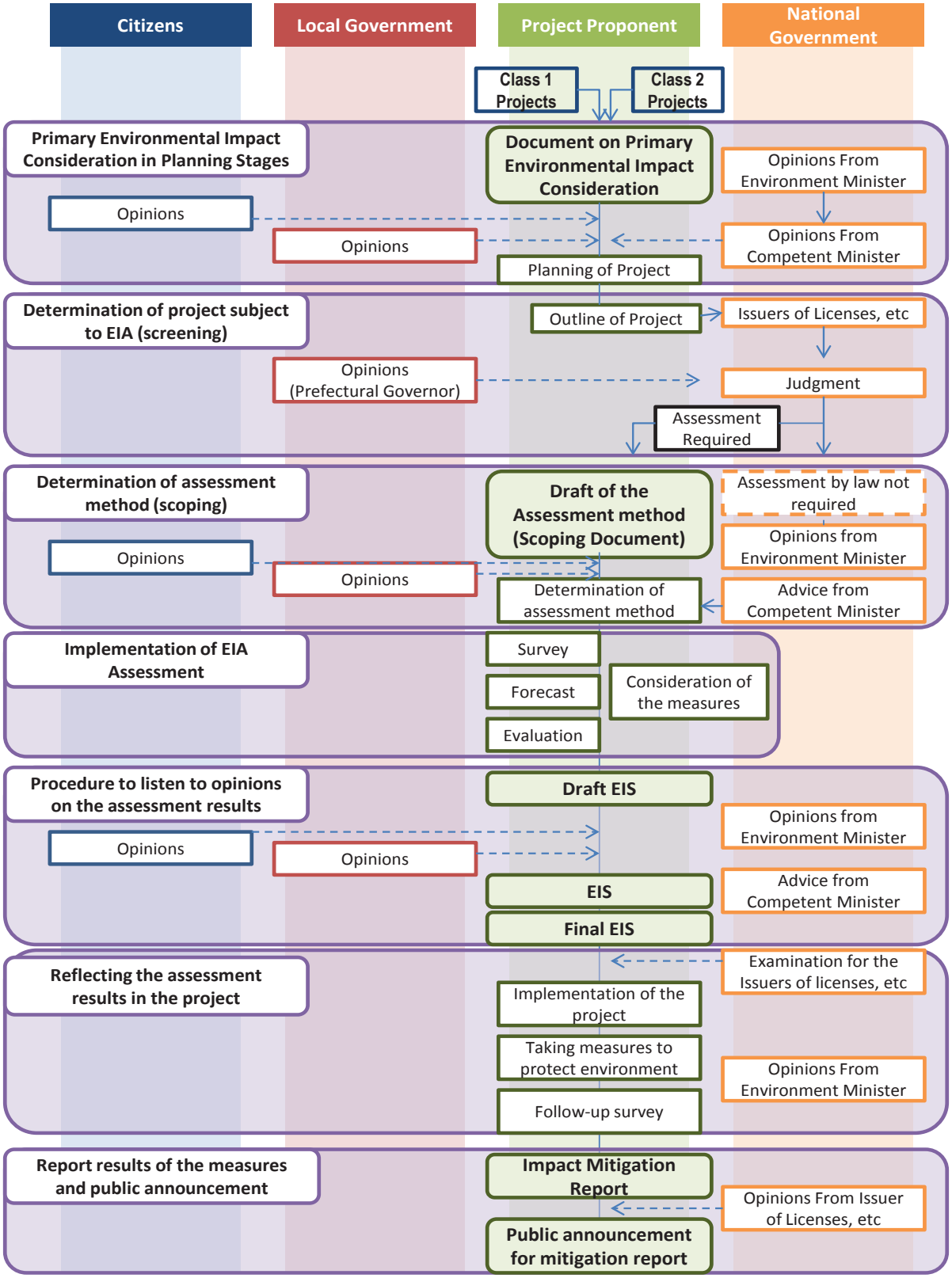
In addition to onshore wind opportunities, offshore wind development is becoming increasingly attractive and will likely account for a large proportion of Japan's wind development into the future. Despite the high price of offshore wind technologies, the MOE has set a goal of

34 Bloomberg New Energy Finance Database, accessed November 13, 2012.

35 Bloomberg New Energy Finance Database, accessed November 13, 2012.

36 "H1 2012 Japan Market Outlook: Shaping a Bold Plan." *Bloomberg New Energy Finance*, June 2012.

Figure 9: Current Environmental Impact Assessment Procedure



Source: Ministry of the Environment (MOE)

increasing offshore wind generation from 30,000 kW to 8 million kW by 2030.[37] According to the Japanese Government's "Green Policy Outline," commercial operation of floating wind turbines is expected by 2015 and technology is already being tested off the coast of Fukushima Prefecture.[38]

Geothermal

The new FiT regime and Japan's relaxed regulations for geothermal drilling in national parks have created a widespread interest in geothermal energy for the first time in more than a decade. While recent regulatory reforms have increased the accessibility of geothermal resources, the long-times required for geothermal projects will continue to hamper growth. The MOE has announced a plan to double geothermal power generation to 1 GW by 2020 and nearly 4 GW by 2030.[39]

Biomass

The biomass sector in Japan is experiencing marginal growth, as Japan relies on biomass generation for only 1% of its energy (compared to a 10% world average).[40] While the FiT regime provides different rates for various types of biomass technologies, ITA does not predict substantial development in the short- to medium-term. BNEF anticipates only a 45% increase in biomass development by 2030 (compared to solar predictions at over 1000% increase).[41] Only two projects totaling 22 MW have been announced by biomass developers this year.[42]

Hydro

ITA expects opportunities in the hydro sector to be in the small to micro project size, as the FiT regime rewards higher tariffs for smaller projects. Interest in hydro projects under 1 MW has grown substantially, and Marubeni (a Japanese trade and investment company) has recently announced plans to develop 30 such small hydro projects by 2020.[43] Although utilities plan to develop more small hydro projects in the short- to medium-term, only four projects are expected to be commissioned in 2012.[44] U.S. providers of the services associated with small hydropower projects are likely to find more opportunities from the Japanese market than suppliers of technology, as most small hydro technologies are expected to be procured locally.

Smart Grid and Energy Saving Technologies

Japan's investment in the modernization of its electric grid and in technologies and systems that engage consumers in energy efficiency programs, should likewise provide opportunities for U.S. smart grid and energy efficiency exporters. In particular, ITA expects an increase in opportunities for U.S. exporters that can help Japanese utilities ensure the grid reliability of new renewable energy sources and increase the efficiency of existing energy assets. Specific energy sector objectives and technology opportunities include the following:

- Integration of renewables will require utility investment in Distributed Energy Management Systems.
- Improved grid reliability will be achieved through the implementation of advanced Outage Management Systems and the development of microgrids capable of islanding.
- Meeting energy efficiency goals will require increased consumer engagement and the deployment of smart meters.
- Reducing electricity demand will be facilitated by Building Energy Management Systems and aggregation services, along with the establishment of Demand Response programs.

37 "True Potential of Renewable Energy," *Nikkei*, October 2012.
38 http://e.nikkei.com/e/ac/tnks/Nni20121127D27JF120.htm
39 "True Potential of Renewable Energy," *Nikkei*, October 2012.
40 "True Potential of Renewable Energy," *Nikkei*, October 2012.
41 "H1 2012 Japan Market Outlook: Shaping a Bold Plan." *Bloomberg New Energy Finance*, June 2012.
42 Bloomberg New Energy Finance Database, accessed November 13, 2012.
43 "H1 2012 Japan Market Outlook: Shaping a Bold Plan." *Bloomberg New Energy Finance*, June 2012.
44 "H1 2012 Japan Market Outlook: Shaping a Bold Plan." *Bloomberg New Energy Finance*, June 2012.

IMPORTANT CONTACTS

International Trade Administration Staff

U.S. Department of Commerce
1401 Constitution Ave. N.W.
Washington, DC 20230
http://www.commerce.gov

Office of Energy and Environmental Industries
Ryan Mulholland – Renewable Energy Trade Specialist
Email: Ryan.Mulholland@trade.gov
Tel. (202) 482-4693

Cora Dickson – Renewable Energy Trade Specialist
Email: Cora.Dickson@trade.gov
Tel. (202) 482-6083

Andrew Bennett – Smart Grid Trade Specialist
andrew.bennett@trade.gov
Tel. (202) 482-5235

Office of Japan and Korea
Danius Barzdukas – Japan Desk Officer
Email: Danius.Barzdukas@trade.gov
Tel. (202) 482-1147

U.S. Foreign Commercial Service – Tokyo
Greg Briscoe, Commerical Officer
Email: Greg.Briscoe@trade.gov
Tel. 03-3224-5060

Websites

Renewable Energy and Energy Efficiency Exporters Portal
www.export.gov/reee

Commercial Service – Japan
www.export.gov/Japan

International Trade Administration
www.export.gov

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