

# PRODUCT MARKET STUDY

## RENEWABLE ENERGY MARKET IN KOREA

### 1. OVERVIEW

Korea, an energy-intensive nation, is the world's eleventh highest in terms of energy consumption and is the fifth-largest oil importer. Energy and environmental policies focus on low-carbon and green growth and on creating a momentum for economic growth by means of green technology and clean energy. In 2008, Low Carbon, Green Growth was proclaimed by the government as a national vision to guide the nation's long-term development.

The contribution of renewable energy sources to total primary energy supply (TPES) in Korea is among the lowest in the OECD. In 2011, new and renewable energy contributed 1.6% of TPES and 1.5% of electricity supply. This compares to IEA averages of 8% and 19% respectively. Nonetheless, Korea has adopted targets and plans to increase the use of new and renewable energy supply.

- Renewables: 1.6% of TPES and 1.5% of electricity generation
- Hydropower: 0.2% of TPES and 0.9% of electricity generation
- Biofuels and waste: 1.3% of TPES and 0.2% of electricity generation
- Other renewable: 0.1% of TPES and 0.4% of electricity generation

Korea is aiming for 4.3% of its total energy needs to be met by renewable sources by 2015, 6.1% by 2020 and 11% by 2030, up from 2.61% in 2013. These have all been formally set under its Renewable Portfolio Standard (RPS). Korea's government wants to create a renewable energy market worth KRW 54 trillion (USD 47.94 billion) by 2022, up from a targeted market worth of KRW 4.1 trillion (USD 3.64 billion) at the end of 2012. Its industry, meanwhile, has been set the challenges of cornering 10% of the global renewable energy technologies market by 2020.

#### 1.1. New and Renewable Energy Supply

Between 1990 and 2011, TPES in Korea increased by more than 170%, from 93 Mtoe to 258 Mtoe while over the same period the contribution of renewable energy increased by over 200%, from only 1.3 Mtoe to 4.0 Mtoe. Biofuels and renewable waste are the largest contributors to new and renewable energy supply and in 2011 represented almost 66.7% of new and renewable energy production with the balance coming from hydro (21.6%) and to a lesser extent solar photovoltaic (PV) and wind.

In 2011, new and renewable energy contributed 7,849 gigawatt-hours (GWh) to electricity supply, of which 60% came from hydro. While the relative contribution of wind and solar PV is very low, both sectors have experienced significant growth in recent years.

## 1.2. Institutions

The **Ministry of Trade, Industry and Energy (MOTIE)** is the lead ministry for new and renewable energy policy. As part of Korea's vision of "green growth as a means of national development", MOTIE has developed the green Energy Industry Development Strategy. The MOTIE is also responsible for a number of agencies active in the sector: the **Korea Energy Technology Evaluation and Planning (KETEP)** leads the new and renewable energy research and development programs and the **Korea Energy Management Corporation (KEMCO)** is a government agency responsible for industry promotion, dissemination and policy development. **New Renewable Energy Center (NREC)**, affiliate of KEMCO, targets 11% of NRE supply in the total primary energy supply by 2030.

## 1.3. Policies and Measures

According to the Third Basic Plan for New and Renewable Energy, Korea is aiming to increase the use of new and renewable energy to 11% by 2030. This Third Basic Plan, which was established in December 2008 following the announcement of the green growth policy, sets out medium-and long-term targets to develop and deploy new and renewable energy and provides action plans and basic strategies. These included national plans focusing on greater distribution of bioenergy, geothermal and solar thermal energy, more exports of solar PV and wind power technology, and promotion of those industries. Ultimately, the Korean government wants to make new and renewable energy a new growth engine for the economy that will transform Korea into a low energy-consuming green nation.

### Programs for New and Renewable Energy Promotion

In order to reduce Korea's dependence on fossil fuels and to foster the new and renewable energy industry, the government is promoting various policies based on the Act on the Promotion of the Development, Use and Diffusion of New and Renewable Energy, which was introduced in 1997 and revised in 2004. On the basis of the Offshore Wind Power Top-Three Roadmap, for example, various policies have been implemented to develop and increase the supply of offshore wind technologies. Through these policies, KRW 9 trillion (USD 8.7 billion) will be invested by 2019 and will be focused on the

installation of new offshore wind power facilities.

### Promoting the Use of Wood Bio-Energy

To achieve its 11% target by 2030, supply and demand expansion policies for wood bioenergy have been implemented through a series of support programmes. Financial support is available for the development of wood pellet manufacturing facilities. As of 2010, 13 facilities have been supported by the government and five other facilities have been supported by private-sector investments. In total, 18 facilities have a production capacity of over 200 kilotonnes (kt) per year. The production of wood pellets, however, amounted to only 6 kt in 2009 and 13 kt in 2010. To increase demand for wood pellets, therefore, small wood pellet boilers have been distributed to agricultural and mountainous villages since 2009 and horticultural greenhouse heaters have also been deployed since 2010.

### One Million Green Homes

Launched in 2009, the One million Green Homes scheme emerged from the 100 000 Solar-Roof Programme and is a subsidy programme to facilitate the installation of new and renewable energy facilities in residential sites such as private houses, blocks of flats and public rental houses. The government offers support to a certain portion of total installation costs. While the previous 100 000 Solar-Roof Programme was to install PV systems in residential houses, the One Million Green Homes scheme focuses on a variety of resources such as PV, solar thermal, geo-thermal, fuel cells, and small wind technology.

### Mandatory Use of Renewables in Public Buildings

Since April 2011, energy supply for new buildings and recently extended or reconstructed buildings, that exceed 3 000 square metres, must include at least 10% new and renewable energy. The obligation ratio will be increased gradually from 10% in 2011 to 20% in 2020, and since 2012, the obligation applies to buildings over 1, 000 square meters.

### Regional Development Subsidy Program

In an effort to improve the energy supply and to boost regional economies by supplying region-specific new and renewable energies, the government has been promoting a regional deployment subsidy programme designed to support various projects carried out by local governments. This programme, which started in 1996, supported both new and renewable energy and energy-saving schemes until 2005. The two areas, however, were separated

in 2005 in accordance with the Act on the Promotion of the Development, Use and Diffusion of New and Renewable Energy. The subsidy for installing new and renewable energy systems such as PV and wind power supports up to 50% of the investment outlay.

#### **1.4. Electricity From New and Renewable Sources**

With only 1.5% of electricity supply coming from new and renewable sources in 2011, Korea's market remains relatively underdeveloped. At the end of 2011, solar PV capacity stood at 0.8 gigawatt (GW) while onshore wind capacity was 0.4 GW. The 254 megawatt (MW) Sihwa Lake tidal power station, the world's largest ocean project, was commissioned in August 2011.

To reduce financial burden while inducing private investment, the Korean government replaced its feed-in tariff scheme with a renewable portfolio standard (RPS) scheme effective since 1 January 2012. The scheme requires the 13 largest public and private utilities ("the obligators") to generate or purchase (through tradable certificates) 2% of their total generation as new and renewable energy in 2012, rising to 10% by 2022.

Over the medium term, Korea is expected to develop its solar and wind resources. Within the wind category, both onshore and offshore capacity is forecast to grow, reaching 5.0 GW in cumulative capacity, by 2020. Grid access and permitting procedures are persistent constraints, though the government is seeking ways to reduce these barriers. In ocean technology, several large tidal barrages are also under consideration, but some face opposition on environmental grounds.

##### Feed-in Tariffs for New and Renewable Electricity

The government compensated producers for the differences between the costs of electricity generated from new and renewable sources and fossil-fuel thermal generation to promote the production and use of renewable sources. The main features of feed-in tariffs (FITs) are related to the period and volume: the FITs guaranteed 15 years of support for all new and renewable electricity facilities. Exceptionally, the total number of years that government supports PV can be either 15 or 20 years.

##### Renewable Portfolio Standard

A Renewable Portfolio Standard (RPS) was introduced in 2012 and replaces FITs. The RPS forces power producers to supply a certain amount of their total power generation portfolio from new and renewable sources. The standards apply to generators with more than 500 MW of capacity.

## 1.5. Critique

Since the last in-depth review in 2006, the share of new and renewable energy in TPES has increased by a small amount and there has been progress with strengthening the policy framework. Following the publication of the *Green Growth Policy* in 2008, the government announced the First National Energy Basic Plan and set a target of 11% new and renewable energy in TPES by 2030. The government also drew up roadmaps for all 11 new and renewable technologies in the Third Basic Plan for New and Renewable Energy.

Since 2002, Korea has supported electricity generated from new and renewable sources by means of a feed-in tariff programme. The feed-in tariff is differentiated in order to take into account the difference between power generation cost and sale prices for various types of new and renewable energy technologies. Since the last in-depth review, the level of feed-in tariffs has been regularly evaluated and adjusted to encourage continued advancements and cost reduction in new and renewable energy technologies.

In 2012, the government replaced the feed-in tariff mechanism with a renewable portfolio standard (RPS) applicable from 2012 for the purpose of meeting its 10% target of new and renewable energy in electricity supply by 2022. The IEA analysis suggests that care needs to be taken in designing green certificate schemes to ensure cost-effectiveness. By drawing from experience elsewhere, Korea should carefully design and adjust its RPS system in order to maximise its effect, taking into account natural and economic conditions in Korea.

In addition to RPS, the government plans to decrease subsidies for new and renewable energy. For example, the One Million Green Homes programme, which was expanded from the 100 000 Solar Roof programme in 2009, has been reducing its subsidies in terms of both the subsidising ratio and the standard capital costs, set by the government, for a wide range of technologies such as photovoltaics, solar thermal, fuel cells, etc. These measures represent solid progress.

The cost-effectiveness of chosen policies and measures needs to be carefully evaluated to ensure that overall new and renewable energy objectives are met without placing an excessive burden on consumers through additional taxes or higher tariffs. Particular attention should be given to the cost of each new and renewable technology. It is important that the government decreases incentives for specific technologies over time, in order to move them towards market competitiveness. On the other hand, it is also very important to provide a stable, predictable and transparent regulatory framework with a clear timeframe for the reduction and phase-out of support schemes so as to continue to attract

investments in producing new technologies.

Owing to geographic and climatic conditions, the resource potential for renewable energy in Korea is relatively low when compared to other IEA member countries. This adds to the overall cost and challenges of meeting the renewable energy targets. It is important, therefore, to carefully evaluate the potential of all available technologies and ensure that the most cost-efficient projects can be developed.

Given that the goal of 11% new and renewable energy in TPES by 2030 does not make a distinction between electricity and other types of energy, Korea should investigate the cost-effective potential for new and renewable energy-based heating and cooling as well as for biofuels, and design support schemes to tap this potential.

Problems related to grid access can be a potential barrier to the future deployment of new and renewable energy technologies. It is very important to analyze the implications of the large-scale penetration of intermittent renewable energy production in the overall energy system, with regard to cost-efficiency and system reliability. Good coordination between the development of grid capacity and new and renewable energy production should be encouraged.

## 2. PRODUCT DESCRIPTION

New and Renewable energy is the term used by the Korean government to describe renewable energy sources and includes the followings:-

- Photovoltaic
- Hydro
- Solar PV and thermal
- Wind
- Bioenergy (including combustible renewable and waste)
- Geothermal
- Ocean energy
- Fuel cells
- Hydrogen
- Coal liquefaction or gasification
- Waste

Specific areas of businesses are as follows:-

section	Areas
Photovoltaic	solar cell module, wafer, inverter, light analyzer, clean-ESD protection, devises, ingot-wafer

<b>section</b>	<b>Areas</b>
<b>Solar Thermal</b>	solar energy kit and other relatives
<b>Wind power</b>	parts producing system, related technologies, ocean wind collectors
<b>Hydrogen</b>	hydrogen manufacturing, storing, conveyance, charging
<b>Fuel Cell</b>	electricity & power, transportation, steam supply and power generation, portable devices
<b>Energy Efficiency &amp; Green Constructions</b>	renewable energy- constructions, geothermal power generation
<b>Biomass</b>	biomass (wood pellet, palm kernel shell), bio diesel, bio ethanol, bio gas
<b>Waste</b>	restorative solid fuel, waste refined oil plastic heating disassembly fuels, distraction by fire
<b>Marine</b>	tidal plant, wave power generation, thermal difference generation
<b>IGCC</b>	coal liquefaction & coal gasification

### **3. MARKET OVERVIEW**

#### **3.1. Solar Power**

Korea's green energy growth program is split between aiming to achieve a dedicated solar target and a 'non-solar' clean energy target.

The target for solar of 450MW by 2013 has already been surpassed, notes BNEF's Kuang. In her August 2012 research note (Is Korea's RPS achievable?) she says that with current solar capacity in the country standing at 614MW, the 2014 target for 690MW will also be achieved early. So the government plans to increase that target to 880MW and bring forward a target for 1.2GW of solar by 2016 to 2015 – the formal revision is due to be announced later this year.

The non-solar clean energy element of the country's plan is where the biggest capacity is planned though, with wind power expected to dominate the country's renewables sector in the long term. Indeed, a target for 23GW of installed wind capacity by 2030 has been set to meet a goal for wind power to generate 50TWh annually (and meet 10% of South Korea's forecast electricity demand). "The long-term non-solar RPS target may be achievable, but it will be difficult to meet this year's target," Kuang notes. "The 3200MW of installed capacity reached to date is still 800MW below the 2012 target and pipeline projects are not moving quickly enough."

Most of the utilities required to meet RPS targets may therefore incur penalties, unless they can negotiate a target revision or compliance delay with the government. “We believe the latter is very likely to occur,” says Kuang.

She adds: “It is wind power that will have to take the lead, as the government expects 10,200MW to be added in 2012–22.” Onshore wind accounts for 7.7GW of this, while 2.5GW will come from offshore – the government published its Offshore Wind Master Plan at the end of last year, specifically targeting \$8.2 billion (€5.8 billion) in investment to develop 2.5GW of offshore capacity by 2019.

The wind market has however been slow to take off due to some initial public opposition to wind projects and the low feed-in tariff originally in place prior to the introduction of the RPS, notes the Korean Wind Energy Industry Association (KWEIA). Installed wind capacity has increased from 5.9MW in 2000 to just 455MW.

For 2012 though the government expects some 2.39GW of new wind plant to be installed (which would account for 70% of all renewable energy plant expected this year). KWEIA says this sudden growth spurt is being driven by the RPS requirements while companies are now realising the overall business opportunities in this segment. Kuang agrees. “The recent REC price is higher than the old FIT and thus should encourage more onshore wind development.” However she notes: “The onshore wind project pipeline is currently only 1600MW.”

Significantly, the testing/pilot phase for the offshore programme will start soon in the Young-Kwang area off the southwest coast of the Korean peninsula. Tenders will be invited shortly from companies to establish private-public partnerships (PPP) to install 500, 5MW turbines. The first phase aims for 100MW installed (originally planned by 2013), with a further 900MW planned by 2016 and the final 1.5GW by 2019. Local governments are also promoting a further 4.5GW of offshore wind projects across the country.

### **3.2. Wind Power**

In 2011, the Korean wind power industry showed weak performance due to the rapid growth of Chinese companies based on the strong domestic market, the slowdown in the global wind power industry, strict regulations on the installation of wind turbines and difficulties in exports caused by the lack of track records. In 2012, the industry is estimated to gain new momentum as the global industry starts to pick up thanks to active exports of wind power systems as well as related parts and the expansion of offshore wind power generation. The number of employees is estimated to have risen by 16% to 2,847 compared to the previous year, sales to KRW 1.76 trillion (74%), exports to USD 760 million (56%), and private sector investment to KRW 760 billion (56%).

## Wind Power Generation

In order to develop and distribute the energy produced from wind power, Korea plans to carry out a 3-stage project over the next 15 years: Technological independence and commercialization in the 1st stage (2000-2007), competition with foreign products through technological advancement and development of large-scale (1.5-3.0MW) power generator in the 2nd stage (2008-2012), and high-value added commercialization in the 3rd stage (2013-2018).

Doosan Heavy Industries & Construction is in the process of developing a 3MW-facility for offshore wind power generation from 2006. At the end of 2008, Hyundai Rotem and Hyosung developed 2MW- and 5MW-facilities, respectively. Hanjin Industries built a 1.5MW-facility by purchasing designs and parts from a German company, and now simulation process is underway.

### **3.3. Photovoltaic**

The number of PV-related companies increased by 3.3 times to 98, the number of employees to 10,660 (8.3 times), sales to KRW 7.92 trillion (18 times) and exports to USD 3.79 billion (21.4 times) in 2011 compared to 2007. The number of companies is expected to reach 11,533, increasing by 8.2%, sales to KRW 9.80 trillion (24%), and exports to USD 5.41 billion (11.8%) in 2012 compared to the previous year.

#### Photovoltaic Power Generation – Polysilicon

OCI first started the commercialization of polysilicon in March 2008, and its sales reached KRW 1 trillion for the first time in 2010. Its production capacity is the second largest (27,000 tons) in the world. Hankook Silicon and KCC started the production of polysilicon, and major domestic players including LG Chem, Woongjin Polysilicon, Hanwha Chemical, and Samsung Petrochemical are announcing plans or test-running facilities for polysilicon production. Seven Korean companies, including Woongjin Energy, Rexor, Osung LST, Nexolon, and Neo Semitech, have facilities for the mass production of ingots and wafers for PV energy.

#### Photovoltaic Power Generation – Solar Cells

The production capacity of crystalline silicon solar cells of Hyundai Heavy Industries in 2010 stood at 330MW, compared to 250MW of Shinsung Solar Energy, 100MW of LG Electronics, 100MW of KPE, 90MW of Millinet Solar, 59MW of STX Solar, 30MW of Samsung Electronics, and 30MW of Hanwha. KISCO and Altisolar have in place lines for the commercialization of thin film solar cells, producing uni-conjunction modules for solar cells made of 5th-generation amorphous silicon. The production capacity of solar cells in Korea recorded 923MW in 2009 and 1.59GW in 2010. It is expected to increase to 13.6GW in 2015. The installed capacity of PV power generation decreased steadily

from 276MW in 2008 and 167MW in 2009 to 127MW in 2010 and 79MW in 2011, but demand is expected to grow continuously due to the introduction of RPS and requirement of the use of renewable energy.

#### Annual and Cumulative Installed Capacity of PV Power Generation (MW)

	2006	2007	2008	2009	2010	2011	2012	2013 F
<b>Annual</b>	21.1	47.5	278	170.4	131.3	133.6	307.2	313.1
<b>Cumulative</b>	35	82.5	360.5	530.9	662.2	795.8	1,103	1,416.1

Source: Solar Energy, Korea Photovoltaic Industry Association

### 3.4. Hydro

It has been estimated that Korea has a small-scale hydro potential of up to 1.5GW, and that 198MW could be generated as of 2012. Installed capacity represents less than 5% of the domestic potential, indicating significant untapped resources. The project pipeline includes five small hydro plants as part of the Four Rivers Project.

### 3.5. Fuel Cell

#### For Power Generation

Thanks to the introduction of RPS and requirements of the use of renewable energy for newly constructed buildings, the use of decentralized power supply will be expanded, creating initial markets. This will help the facilitation of small-scale steam supply and power generation, which aims at producing high-quality and tailored energy. Fuel cells will be used for decentralized power supply and private power generation, to turn waste energy including gases produced in sewage disposal, landfills, petro-chemical complexes, and steel mills, into energy sources. Ultimately, it is expected to replace thermal power generation.

#### ■ Current Status of Domestic Fuel Cell Market

(MW)

Categories	2005	2007	2009	2011	2013
<b>New public buildings</b>	0.5	11.25	33.25	63.5	96.5
<b>Small-scale steam supply and power generation</b>	1	7	31	127	511
<b>Sewage disposal</b>	0.25	2.25	7.25	18.5	43.5
<b>Landfill</b>	0	2.5	8	19.75	46
<b>Other</b>	0.25	3	11.25	36	111.5
<b>Total</b>	2	26	90.75	264.75	808.5

Source: Ministry of Trade, Industry & Energy

### For Transportation

To compete with its rivals, Korea plans to enhance the performance of FCEVs by testing more than 1,000 FCEVs between 2011 and 2014. Its goal is to start mass production of 10,000 vehicles in 2015, spreading the use of FCEVs. However, the process of commercialization will not be easy due to the lack of hydrogen stations in the country. That is why a systematic plan is needed to establish infrastructure to facilitate the use of FCEVs. By 2015, the Korean government will establish a green-car development roadmap to become one of the world's top 4 countries in terms of green-car technologies. This will move up the market entry of FCEVs.

### For Buildings (Residential/ Commercial)

In 2006, 40 fuel cells were put into use as a test, and the government expects that the price of fuel cells for households can be lowered to below KRW 90 million through the monitoring programs. The localization rate of technologies and components is expected to rise to 80% from the current 55%.

### Portable Fuel Cell

According to optimistic prospects for fuel cells for mobile phones, the domestic market is expected to grow dramatically by 2015, as Korean companies have large global market shares. Currently, the demand for Korean secondary cells stands at 15% of the global secondary cell demand. Based on this, the domestic market for portable fuel cells is expected to reach KRW 300billion.

## **3.6. Biomass**

### Wood Pellets

The Korean government has set forth a policy of boosting its percentage of renewable energies to 6.1% by 2020 and then to 11.5% by 2030.

Also, the Renewable Portfolio Standard (RPS) system mandates that electric power providers to use a certain percentage of generated output from renewable energies. This percentage was 2% in 2012, but will be expanded to 10% by 2020.

The government also announced a plan to cut the country's green house gas emissions by 4% 2020 compared to 2005 levels, which would translate into a 30 percent reduction to the country's expected carbon dioxide levels in 2020.

Korea market size for the biomass is KRW 200 billion (USD 196 million) as of 2013. Total demand in 2013 was 2 million MT but the domestic supply was only 1.

The total demand for pellets is forecasted to rapidly increase to 5 million tons by 2020, of which pellets for electricity generation is expected to reach 2.88 million tons. The domestic supply capacity was only 1 million tons as of 201w, with it claimed that the remaining 4 million tons of this will be covered by imports by 2020. The market size of biodiesel in Korea as of 2013 is estimated at USD 20 billion, with 7% of annual increase rate prospected. By 2016, the biodiesel market will grow to reach USD 26.4 billion.

80% of wood pellets in Korea are used for power generation, the rest is for industrial use. The 80% wood pellets are consumed by the big five power stations i.e. Korea East-West Power Co., Korea South-East Power Co., Korea Western Power Co., Korea Midland Power Co., and Korea Southern Power Co.

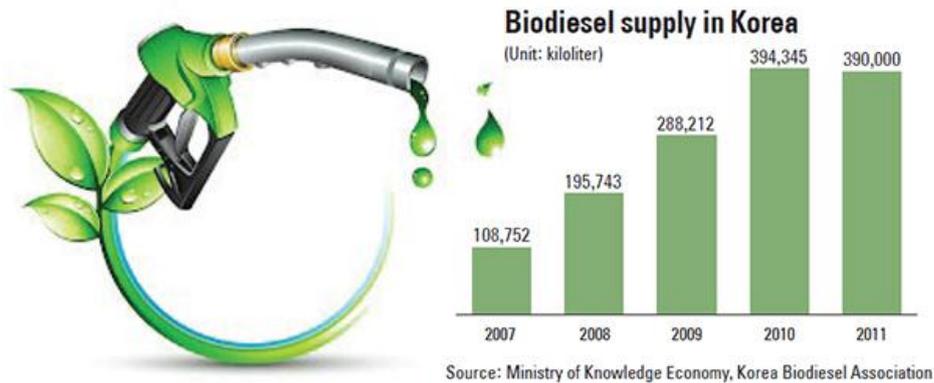
Co.	Capacity (MW)	Year	Status
Korea East –West Power Co	60	2013	-
Korea South-East Power Co	Co-firing (biomass)	-	In construction
Korea Western Power Co	20	-	-
Korea Midland Power Co	125	2013	-
Korea Southern Power Co	Co-firing	2013	Commissioned

The quantity of wood pellets to be purchased by the five power stations in 2014 is going to reach 1.5 million MT, which is 50% increase from last year. The quantity is forecasted to increase to 2.0 million MT in 2015.

Of the total demand, local supply accounts for only 4.0%, reaching 60,000MT as of 2013. Imported wood pellets are usually cheaper than locally manufactured pellets. Main supplying countries of wood pellets to Korea are Russia, Canada, USA, Indonesia, Thailand, Vietnam and Malaysia.

Korea has access to wood residues from the domestic sawmilling industry, which could be used for the manufacturing of pellets. This domestic supply will be insufficient, so Korea will need to increase pellet imports in order to meet the 6.1% goal. The government estimates that by 2020, 75-80% of pellets consumed in the country will need to be imported.

### 3.7. Biodiesel



Korean government's attempt to expand the use of biodiesel is faltering and Korean producers are going out of business as supply exceeds demand. The local biodiesel industry is expected to take another hit as the volume of diesel imports looks like it will keep on rising.

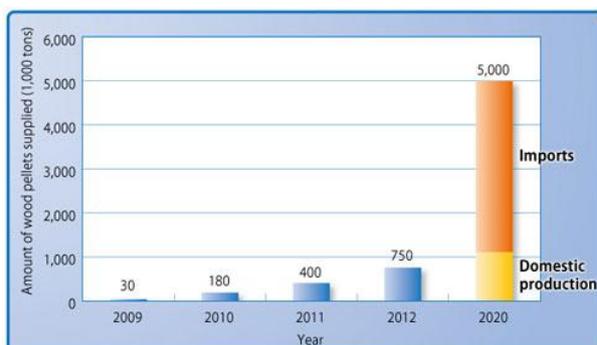
Although there are 16 Korean companies registered as biodiesel manufacturers, only nine produce and supply such products to local refineries, with SK Innovation, GS Caltex, Hyundai Oilbank and S-Oil among their major customers. The number registered has fallen sharply from 23 in 2010. But not everyone welcomes the idea of expanding the use of biodiesel. Local refineries are skeptical and say it may even be unnecessary from an environmental point of view.

Like other renewable energy sources, biodiesel is expensive to produce. It costs about 200 won (USD 0.19) more per liter than diesel, even though prices vary depending on what source it is extracted from.

Confusion is reigning right now as local refineries are opposed to raising the percentage of biodiesel in their regular diesel, while producers are all for it. Industry officials also point out that imported diesel should also be subject to the same 2% mix rule. The government is due to do this at the start of 2013, but has said it may delay by one more year.

## 4. OPPORTUNITIES FOR MALAYSIAN EXPORTERS

### Wood pellets



Though with abundant forestry resources, Korea is a major wood pellet importer. Korean wood pellet market started in 2007 and has a really rapid development during the latest five

years. But there were only a few wood pellets plants which were no more than 10 wood pellet plants in Korea. What's more, the size and capacity of these wood pellet plants were really small. Compared with the low production capacity, wood pellet demand is really high. According to estimation, demand in Korea will hit 5 million tons by 2015 and 10 million metric tons by 2022. To meet the demand, large quantity of wood pellets would be imported.

In the following decades about 75% or more wood pellets consumed in Korea will be imported according to the government's estimation. In July 2011, Canada exported 50,000 tons of wood pellets to Korea and the Australian producer, Plantation energy also plants to more than 1.5 million metric tons of wood pellets to Korea. At the same time, some of the major energy companies are also exploring opportunities to import pellets from Australia, Vietnam, Indonesia, the Philippines, Canada and the US and Canada has planted to sign long term business deals with Korea and has great confidence to expand their market in Korea.

Except for importing wood pellets from other countries, companies in Korea have also took other actions to meet their high consumption of wood pellets, for example, to produce wood pellets in other countries and send them back into Korea. The LG has obtained 200,000 hectares of forests in Kalimantan, Indonesia in 2009 where a sit had been set to produce both wood pellets and wood pulp.

For the future of Korean wood pellet market, wood pellet import will continue increasing, however, a flexible Korean wood pellet market will be the new market trend in the following years.

### Palm Kernel Shell

Palm kernel shell used to be classified as waste material, not allowed to be imported into Korea until 2013. The Act on the Promotion of Saving and Recycling of Resources has been revised in January 2014 which allows the import of PKS into Korea. Currently, the enforcement regulation is under revision to be taken into effect in July 2014, clarifying the import procedure, criteria for the quality test, labeling, etc.

PKS will be alternative biomass resource replacing or to be mixed with other bio fuels which are going through shortages in supply in Korea.

As the PKS import opportunity grows realized, a growing number of potential Korean importers have inquired on Malaysian PKS to MATRADE Seoul starting early this year.

## **5. EXHIBITION**

### **5.1. The 36<sup>th</sup> Int'l Exhibition on Environment Technology and Green Exhibition (ENVEX 2014)**

Website: [www.envex.or.kr](http://www.envex.or.kr)  
Date: June 10-13, 2014  
Venue: COEX (Seoul)  
Organized by: Korea Environment Corp  
Environment Management Corp  
Suduokwon Landfill Site Management Corp  
Korea Institute of Environmental Science and Technology  
Korea Environmental Preservation Asso.

Exhibits: **Energy Technology**  
Photovoltaic, solar thermal, wind power, hydrogen, fuel cell, energy efficiency and green construction, biomass (biomass, bio diesel, bio ethanol, bio gas), waste, marine, IGCC, green car and transportation  
Environment Technology  
**Environment Technology**  
Government policies and projects, water, air, waste, management equipment, eco-products, four-river projects, marine

## **5.2. Environment and Energy Technology 2014 (ENTECH 2014)**

Website: [www.entechkorea.net](http://www.entechkorea.net)  
Date: August 27-29, 2014  
Venue: BEXCO (Busan)  
Organized by: BEXCO  
Today Energy  
Korea Trade-Investment Promotion Agency (KOTRA)  
MM Korea

Exhibits: **“Wind Korea” Special Session:** Wind  
**Environment**  
Hydro, air, waste treatment  
**Energy**  
Renewable energy, electricity, power generation, energy efficiency

## **5.4. Energy Korea 2014 Green Energy Show / New and Renewable Energy Show**

Website: [www.koreaenergyshow.or.kr](http://www.koreaenergyshow.or.kr)  
Date: October 14-16, 2014  
Venue: COEX (Seoul)  
Organized by: Korea Energy management Corp

Exhibits: **Energy Efficiency Improvement and Renewable Energy**  
High efficiency light, LED, energy-saving equipment, super insulator, electricity demand management facilities, hybrid car, solar, wind, renewable energy facilities and system  
**Climate Change Response and Green Policy Technology**

Energy related public institutions, associations, policies, business and technology trend, CDM projects, carbon banking, CERs exchange

### 5.5. **Eco-Expo Korea 2014**

Website: [www.k-eco.or.kr](http://www.k-eco.or.kr)  
Date: October 21-24, 2014  
Venue: COEX (Seoul)  
Organized by: Korean Environmental Industry and Technology Institute  
The Korea Economic Daily

Special Exhibition: Leading Environmental Industries Exhibition  
Eco Creative Economy Exhibition  
Soil-Ground Water R&D Technology Exhibition  
Eco Tour Exhibition  
Eco Beauty Fashion Exhibition  
Eco Kid Exhibition  
Eco Game Exhibition  
Eco Food Exhibition

### 5.6. **Int'l Green Energy Expo & Conference 2015 (IGEEC)**

Website: [www.energyexpo.co.kr](http://www.energyexpo.co.kr)  
Date: April 1-3, 2015  
Venue: EXCO (Daegu City)  
Organized by: EXCO, The Korea Energy News

Exhibits: **Photovoltaic** (cell module, material components, power plant system, solar cell module production equipments)  
**Wind Power** (wind turbine, devices and components, system and software, managing services)  
**Renewable Energy** (green car, component and material, manufacturing technology, testing, analysis and evaluation, rechargeable battery, hydrogen, fuel cells, biomass, solar thermal, geothermal, small hydropower plants, green industry, LED, climate change policy office, smart grid, energy components materials)

## 6. USEFUL CONTACTS

### 6.1. Government Agency

#### **Korea Energy Management Corp (KEMCO)**

[www.kemco.or.kr](http://www.kemco.or.kr)

*(Government agency for policy implementation, also responsible for energy efficiency)*

### **New Renewable Energy Center (NREC)**

[www.knrec.or.kr](http://www.knrec.or.kr)

*(Affiliate of KEMCO, targeting 11% of NRE supply in the total primary energy supply by 2030)*

### **Korea Environment Corp (KEC)**

[www.emc.or.kr](http://www.emc.or.kr)

*(semi-government corporation affiliated to Ministry of Environment)*

## **6.2. Industry Association**

### **Korea New & Renewable Energy Association (KNREA)**

[www.knrea.or.kr](http://www.knrea.or.kr)

### **Korea Photovoltaic Industry Association (KOPIA)**

<http://www.kopia.asia/>

### **Korea Wind Energy Industry Association (KWEIA)**

<http://www.kweia.or.kr/>

### **Korea Biodiesel Association**

### **Korea Hydrogen Industry Association**

<http://www.h2.or.kr/join.html>

### **Korea Association of Pellets**

[www.koreapellet.org](http://www.koreapellet.org)

### **Korea Environmental Preservation Asso. (KEPA)**

[www.epa.or.kr](http://www.epa.or.kr)

### **Korea Green Business Association**

[www.greenbiz.or.kr](http://www.greenbiz.or.kr)

### **Korea Green Industry Promotion Association**

[www.kgipa.or.kr](http://www.kgipa.or.kr) (Korean language)

### **The Korean Society for New and Renewable Energy**

[www.ksnre.or.kr](http://www.ksnre.or.kr) (Korean)

## **6.3. Institute**

### **Korea Environmental Industry and Technology Institute**

[www.keiti.re.kr](http://www.keiti.re.kr)

## 6.4. Portal / Media

**[www.renewableenergy.or.kr](http://www.renewableenergy.or.kr)**

*(operated by Korea Energy Management Corp)*

**Today Energy**

<http://www.todayenergy.kr/>

*(Korean language only)*

**Energy News**

[www.energy-news.co.kr](http://www.energy-news.co.kr)

*(Korean language only)*

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**A. RASHID MOHD ZAIN**

Trade Commissioner

Email: [rashid@matrade.gov.my](mailto:rashid@matrade.gov.my)

Minkyung Lee (Marketing Manager)

Email: [seoul.kay@matrade.gov.my](mailto:seoul.kay@matrade.gov.my)

**MATRADE SEOUL**

Embassy of Malaysia (Malaysian Trade & Investment Center)

17th Floor, Standard Chartered Bank Korea Limited

47, Chongro, Chongro-gu

Seoul 110-702, Republic of Korea

Tel: 82-2-739 6812 (D/L), 82-2-739 6813/14 (G/L)

Fax: 82-2-739-6815