Energy Market Resource Guide

-EUROPE-

June 2014

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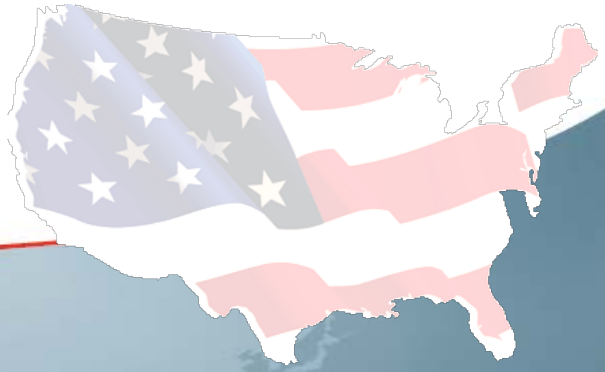

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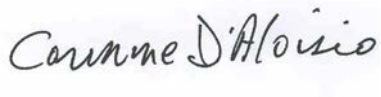
INTRODUCTION

For years, we have witnessed U.S. companies struggle to identify the most promising export markets for their products and services. In fact, some exporters were spending valuable company resources assessing markets that held little promise. As a result, U.S. Commercial Specialists around Europe worked together to create a solution – the European Energy Market Resource Guide. We are proud to offer you this resource which identifies key markets where U.S. power generation products or services are most likely to succeed. You can also view the guide online at http://export.gov/industry/energy/index.asp

Our goal is to promote U.S. exports with solutions that transcend borders. Whether you need to understand market drivers or meet key contacts, the U.S. Commercial Service is well-connected and will open doors so you can access international opportunities before your competitors. Our Commercial Specialists have an extended network of distributors, importers and contacts across Europe. Working collectively with you on multiple markets or individually in their specific country, they can connect you to key individuals and organizations through customized solutions including one-on-one meetings, company promotion events targeting your customers and partners, market insights and advice responding to your needs. We have included contact details for our specialists in the reports and encourage you to contact them directly.

We look forward to delivering opportunities to your doorstep and helping to increase your international sales.

Sincerely,



Carmine D'Aloisio
Minister for Commercial Affairs for Italy &.
Senior Commercial Officer for Europe

Austria

Capital: Vienna
Population: 8.2 million
GDP: $418 billion (2012)
GDP per capita: $50,975 (2012)
Currency: Euro
Language: German

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Overview of the Austrian Power Generation Market

Generation	2011	2012
Gross Generation (TWh)	**65.8**	**72.4**
Of which hydro	57.3%	65.7%
Of which coal/oil der.	12.6%	9.6%
Of which gas	18.8%	13.3%
Of which biomass/gas	6.9%	6.4%
Of which wind/PV/Geothermal	3%	3.6%
Other generation	1.3%	1.4%
Final Consumption (TWh)	**68.8**	**69**

Source: e-control 2013

Generation Park	2012	
Energy source	**Units**	**MW Capacity**
Hydro	2,795	13,350
Thermal (gas)	63	5,119
Thermal (coal/oil derivate)	20	1,945
Thermal (bio)	491	622
Wind	265	1,337
PV	19,435	215
Total	22,828	23,164

Source: e-control 2013

Transmission/Distribution network	2011
Delivery Points	5.9 million
Lengths of grid	253,151 km
Percent underground	67%
Electrical Substations	1,060
Transformer Stations	75,895

Political and Economic Background

National Objectives

- Promote renewable resources/reduce CO^2 emissions
- Maintain/increase energy independence
- Keep prices competitive
- Improve internal market mechanisms (unbundling)
- Rejection of nuclear energy

Renewables

One of the primary influences on alternative energy projects in Austria is the "eco-electricity" (Oekostrom) law, which lays out the level of public support for alternative power generation projects. The law currently in force is from 2012 and has two elements: feed-in tariffs and investment subsidies. Feed-in tariffs are guaranteed prices for eco-electricity, in which the state guarantees operators to pay the difference to the market price up to a cap for a set number of years, variable according to source, for units built in a particular year. The current law caps at 50 million Euros ($64 million)/year. The second element of the eco-energy law establishes investment subsidies, which are available for projects involving small PV (households) and small hydro. The eco-electricity law of 2012 also set out target investments for the various forms of renewable. By 2020, Austria aims to bring 1,000 MW of additional small hydro, 2,000 MW of additional wind, 200 MW of additional biomass/biogas, and 1,200 MW of additional PV online. In the 2013 update to the 2012 law, feed-in tariffs were reduced by 1% across the board, with the exception of PV, which was slashed from 18.5 Cents/KwH in 2013 to 12.5 Cents/KwH in 2014 after an investment wave in 2012/13.

Investment in High Voltage Lines

Electricity providers and policymakers agree that the high voltage network in Austria needs to be expanded. Electricity providers plan to add 200 km to the 380 KV and 550 km to the 200 KV networks by 2020 in order to accommodate increased EU electricity trading and the transfer and storage of renewable electricity output across Europe. There are significant barriers to the construction of these lines, including massive resistance from residents and the geographical challenges of the alpine regions of the country. The "master plan" for the expansion of high voltage lines calls for construction to begin in 2015, and there are currently several environmental impact studies underway. The estimated cost of these upgrades is approximately $7.7 billion).

Smart Grids

Despite the reluctance of Austria's electricity distributors, regulation was passed in 2012 which requires that 95% of all household and small commercial customers have a smart meter installed by 2019. In addition to the meters themselves, there will be a need to invest in the associated software and communications systems that will tie smart metering to monitoring, distribution, and billing systems. The estimated cost of this roll-out plus the supporting equipment/services is $11.2 billion.

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Belgium

Capital: Brussels
Population: 11.04 million
GDP: $511.53 billion (2011)
GDP per capita: $43,412 (2012)
Currency: Euro
Language: German – French - Dutch

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Overview of the Belgium Power Generation Market

	2011	2012
Total Net Generation (TWh)	**85.6**	**76.6**
Of which Thermal Nuclear	45.9	38.5
Of which Fossil Fuels	29	28.9
Of which Hydraulic	1.4	1.6
Of which Wind	2.2	2.8
Of which Solar	1.2	1.6
Of which Biomass	n.a	3.2
Of which non-identifiable	0	0
Final Consumption (TWh)	**87**	**84.9**

	2012	
Generation Park	**Units**	**MW Capacity**
Hydro	30	1,422
Thermal (Fossil Fuels)	86	8,043
Thermal Nuclear	7	5,926

Distribution Network	**2012**
Lines < 220 KV (in km)	n.a
Lines 220 – 285 KV (in km)	433
Lines 330 KV (in km)	n.a
Lines 380/400 KV (in km)	1326
Lines > 400 KV (in km)	n.a
Transformer of Power Units è 220 KV	n.a
Transformer of Power Units è 330 KV	n.a
Transformer of Power Units è 380/400 KV	n.a
Transformer in the Network 220 KV è ≥ 110 KV and < 220 KV	25
Transformer in the Network 330 KV è ≥ 110 KV and < 220 KV	n.a
Transformer in the Network 380/400 KV è ≥ 110 KV and > 220 KV	30
Transformer in the Network 380/400 KV è 220 KV	9
Transformer in the Network 380/400 KV è 330 KV	n.a
Transformer in the Network 750 KV è ≥ 380/400 KV and < 380/400 KV	n.a

Political and Economic Background

Summary

Currently, several shifting factors influence the rapidly changing Belgian energy market, among others the continuing EU-wide process of de-regulation and liberalization, the incentives to develop renewable energy sources, the changing structure of the country's energy distribution and so forth. U.S. companies wanting to export to the Belgian energy market must be aware and take into account these uncertain or changing factors, which will determine the potential for exports of relevant goods and services to this market.

Except for some limited renewable energy potential, Belgium has no natural energy sources. The country imports all its coal, natural gas and petroleum requirements for its energy needs that amount to almost 42,000 ktoe (kilo-ton oil equivalent, or about 489 TWh). Of this total consumption, 31% is used for residential needs, 30% by the industry and 23% for transport purposes.

Electricity

Deregulation has been set in place on a policy level, but this has not yet led to a satisfactory level of competition. The federal and regional governments will most likely continue to create incentives to improve the efficiency of market forces on the industry. While the various government bodies have persistently warned against a likely shortage of Belgian electricity production capacity, the industry itself seems reluctant to invest in relevant infrastructure at the moment. Key factors highlighted for this are the fear of a low electricity price in the long run, limited cross-border network capacity impairing exports of excess production, and finally uncertainties with respect to environmental policies, the phasing out of the civil nuclear electricity program, and the market behavior of the incumbent utility Electrabel. U.S. firms can therefore expect opportunities in those areas improving some of these bottlenecks.
The Belgian Commission for Energy Regulation – CREG- has highlighted the need for investments in power generation infrastructure in Belgium because of a perceived future shortage of electricity production. It also notes that investments are taking place in other EU countries with similar energy pricing levels, including by GDF/Suez, owner of the dominant provider Electrabel. Therefore, the lack of investments in Belgium cannot be based solely on economic factors, and investments with associated opportunities for U.S. firms, equipment providers and subcontractors alike, could appear in the near future.

Emissions-controlling Measures and Renewable Energies

Belgium is committed to lowering its CO2 output under the Kyoto Protocol. Several studies made specifically for the Belgian market have shown that a wide approach will be needed to attain the national emissions-reduction targets. These comprise a mixture of consumption reduction, green/ renewable technologies and investments in cleaner, more efficient production facilities.

Many power plants in Belgium consume a mixture of coal and natural gas, and are highly polluting. Some parties suggest their replacement with more modern versions, which would serve the purpose of capacity expansion as well as lowering the country's output of CO2 and other pollutants. Retro-fitting these facilities with pollution-mitigating devices could also present opportunities for U.S. firms.

In this context, CREG submitted a proposal for an indicative power generation program in 2005-2014, stating that the capacities to be invested in the period 2005-2014 that amount to 1,729 MW in renewable energy sources and 1,749 MW in qualitative co-generation. In this same proposal, by 2014, decisions are recommended on investments in eight units using combined steam and gas cycles (CCGT plants) of 400 MW and four gas turbines with open cycles (GT) of 80 MW.

Further investments come from large industrial sites active in the (petro) chemical industries that have a focus on co-generation. For example, ExxonMobil has just commissioned co-generation facilities at its Antwerp refinery that generate 125 MW of power. Given the importance of the (petro) chemical industry in Belgium, similar investments can be expected from other companies.

Finally, many smaller businesses are investing in renewable energies given the advantages of using electricity from their own sources and the incentives proposed by the government. Distribution centers and other businesses with large surface areas that allow the installation of wind turbines and/or photovoltaic cells are driving this market.

Maintenance and Provision of Spare Parts

Despite the current economic crisis, maintenance and repairs to facilities are still needed, in particular in the secondary (transforming) sector that is well represented in Belgium. Opportunities for small equipment manufacturers specializing in process control and similar equipment can find a market in Belgium, especially when working through an effective, well established distributor.

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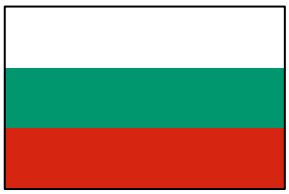
Bulgaria



Capital: Sofia
Population: 7.3 million
GDP: $103.8 billion
GDP per capita: $6,986 (2012)
Currency: Bulgarian Lev
Language: Bulgarian

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Overview of the Bulgarian Power Generation Market

	2011	2012
Total Net Generation (TWh)	**45.1**	**41.9**
Of which Thermal Nuclear	15.2	14.7
Of which Fossil Fuels	25.9	22.1
Of which Hydraulic	3.5	3.8
Of which Wind	0.54	1
Of which Solar	0	0
Of which Biomass	n.a	0
Of which non-identifiable	0	0
Final Consumption (TWh)	**33.2**	**32.5**

	2012	
Generation Park	**Units**	**MW Capacity**
Hydro	139	3,030
Thermal (Fossil Fuels)	69	6,550
Thermal Nuclear	2	2,000

Distribution Network	**2012**
Lines < 220 KV (in km)	n.a
Lines 220 – 285 KV (in km)	2837
Lines 330 KV (in km)	n.a
Lines 380/400 KV (in km)	2419
Lines > 400 KV (in km)	n.a
Transformer of Power Units è 220 KV	5
Transformer of Power Units è 330 KV	0
Transformer of Power Units è 380/400 KV	0
Transformer in the Network 220 KV è ≥ 110 KV and < 220 KV	24
Transformer in the Network 330 KV è ≥ 110 KV and < 220 KV	n.a
Transformer in the Network 380/400 KV è ≥ 110 KV and > 220 KV	16
Transformer in the Network 380/400 KV è 220 KV	4
Transformer in the Network 380/400 KV è 330 KV	n.a
Transformer in the Network 750 KV è ≥ 380/400 KV and < 380/400 KV	n.a

Political and Economic Background

Summary

The business landscape in the electricity sector of Bulgaria is gradually changing since the beginning of 2000 due to restructuring, privatization and the commitment to follow the European energy policy, namely as far as the development of new subsectors based on RES, climate change, energy efficiency and energy security are considered. Currently the renewable energy sources (RES) in Bulgaria are well developed.

The electricity sector in Bulgaria is managed by the State Energy Regulatory Agency. Under the agency, Nationalna Elektricheska Kompania (NEK) was split into six independent generators, a national transmission system operator, and seven regional distribution system operators. Steps towards the deregulation of the electricity market are underway. As of 2007, the electricity generation companies are mainly state-owned, the electricity distribution companies are privatized, and the district heating companies are still undergoing privatization

Market Entry

Finding a good, reputable local representative is key in order to successfully enter the market, and conducting due diligence before selecting a representative is essential. Enlisting qualified local legal services for contract negotiations is also highly recommended. The U.S. Commercial Service located in the U.S. Embassy in Sofia can assist with market research, contact facilitation, contact evaluation, and service providers – refer to: http://www.export.gov/bulgaria .

Current Markets Trends

The EU has mandated full liberalization of the Bulgarian market by Jan. 1, 2015, which will likely usher in still higher prices, and Brussels is seeking to untangle Bulgaria's energy situation to ease the transition. Adding to the full market liberalization and the complexities of the energy sector in Bulgaria is the process of joining the international greenhouse gas trading.

Currently the power sector in Bulgaria faces a number of challenges, which can be addressed through integration of smart grid technologies. The Bulgarian electric power system incurs many non-technical losses (NTL). Bulgaria’s transmission lines are operating across great distances, resulting in high energy losses. To connect the planned new generation facilities to the grid, Bulgaria has to increase the transmission system capacity. However, investments in traditional transmission capacity alone will not be enough to guarantee the system’s stability because of the intermittent nature of the many new renewable energy power plants. An integrated strategy of smart grid development would help to secure transmission system reliability.

Current Demand

Bulgaria’s net installed generating capacity stands at 12,668 MW including thermal, nuclear, RES and hydroelectric resources. The existing generation assets in Bulgaria have been sufficient to supply domestic demand and have created opportunities for a significant export of electricity.
For the period November 2012 – January 2013, the net electricity consumption in Bulgaria fell by 3.97%, compared to the same period of the previous year. The electricity demand is shrinking

(domestic and foreign), and access to funding is squeezed. Currently, domestic consumption would not justify additional power generation capacity. Much of the electricity produced by any expansion of Bulgaria's nuclear sector would be for export.

Competitors

The energy sector in Bulgaria suffers from lack of competition and from inefficient government regulation, both of which create conditions that incur excessive costs at the expense of consumers. The sector is strongly dependent on the energy sources supplied under monopoly import terms and conditions. Quite indicative in this respect is the Russian import of nuclear fuel for Kozlodui NPP.

Major competitors in energy projects considering Bulgaria as a good place for investment are Atomstroyexport (ASE), Rosatom, Lukoil, Gazprom, RWE, Siemens, ABB, Dalkia, ENEL, Schneider Electric, Toshiba, Hitachi, Gas de France Suez.

Barriers

When designing equipment and machinery for export to Bulgaria, a potential market issue should be kept in consideration. This is the necessity for U.S. manufacturers to use the European metric system. Equipment and materials, exported from the USA, should also comply with the ISO quality standards. Additionally products tested and certified in the U.S. to American standards are likely to have to be retested and re-certified to EU standards.

Croatia

Capital: Zagreb
Population: 4.27 million
GDP: $63.85 billion (2011)
GDP per capita: $13,227 (2011)
Currency: Croatian kuna
Language: Croatian

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Overview of the Croatian Power Generation Market

	2011	2012
Total Net Generation (TWh)	**10**	**9.9**
Of which Thermal Nuclear	0	0
Of which Fossil Fuels	5.2	4.7
Of which Hydraulic	4.6	4.8
Of which Wind	0.2	0.3
Of which Solar	0	0
Of which Biomass	n.a	0.07
Of which non-identifiable	0	0.001
Final Consumption (TWh)	**17.5**	**17.3**

	2012	
Generation Park	**Units**	**MW Capacity**
Hydro	49	2,088
Thermal (Fossil Fuels)	20	1,787
Thermal Nuclear	0	0

Distribution Network	**2012**
Lines < 220 KV (in km)	4860
Lines 220 – 285 KV (in km)	1210
Lines 330 KV (in km)	n.a
Lines 380/400 KV (in km)	1248
Lines > 400 KV (in km)	n.a
Transformer of Power Units è 220 KV	7
Transformer of Power Units è 330 KV	n.a
Transformer of Power Units è 380/400 KV	1
Transformer in the Network 220 KV è ≥ 110 KV and < 220 KV	16
Transformer in the Network 330 KV è ≥ 110 KV and < 220 KV	n.a
Transformer in the Network 380/400 KV è ≥ 110 KV and > 220 KV	7
Transformer in the Network 380/400 KV è 220 KV	5
Transformer in the Network 380/400 KV è 330 KV	n.a
Transformer in the Network 750 KV è ≥ 380/400 KV and < 380/400 KV	n.a

Political and Economic Background

Overview

Unit: $ thousands

	2011	2012	2013 (estimated)	2014 (estimated)
Total Market Size	360,000	370,000	400,000	500,000
Total Local Production	220,000	210,000	230,000	240,000
Total Exports	22,000	20,000	30,000	40,000
Total Imports	162,000	180,000	200,000	300,000
Imports from the U.S.	15,000	15,000	20,000	25,000
Exchange rate: 1$	5.14	5.5	5.6	5.5

Total Market Size = (Total Local Production + Total Imports) – (Total Exports)

Data Sources: All Figures are Rough Estimates.

Croatia imports over 50 percent of the total of about 300 PJ (petajoules) of energy consumed annually. It imports 80 percent of its oil needs, 40 percent of gas, 20 percent of electricity, and 100 percent of coal needs. Due to the expected three percent annual increase of energy demand and the projected exhaustion of Croatia's own oil and gas resources during the next ten years, its dependence on imported energy will continue to grow.

Croatia is scheduled to become a member of the European Union (EU) on July 1, 2013, and has already adjusted most of its energy sector regulations and development plans to enable smooth integration into the European energy market. In line with the EU approach, on October 16, 2009, Croatia's parliament adopted a professionally-prepared and publicly-discussed Energy Strategy for the period until 2020. Adjusting Croatia's energy policy with EU goals for 2020, the strategy addresses Croatia's need for increased, diversified and sustainable supply of energy resources and improved energy efficiency.

In the electric power generation sector, the strategy has identified the need for construction of a total of about 3,500 MW of the installed capacity (the current total capacity is about 4,000 MW, of which about 1,100MW is in facilities at the end of their life-cycle). In the oil and gas sector, it has identified the need for construction of additional oil and gas pipelines, an LNG terminal and gas storages. Upgrades and modernization are also needed in the district heating sector. The estimated total investment in these projects exceeds $20 billion (about $2 billion annually). An estimated 60 percent of the investments would be needed in the electric energy sector, 30 percent in the oil and gas sector, and 10 percent in the district heating sector. Croatia does not have sufficient financial and technology resources for these investments and it will highly depend on foreign investors and equipment suppliers.

Sub-Sector Best Prospects

- Key equipment for gas-fired (especially cogeneration) and coal-fired power plants
- Key equipment for LNG terminals (on shore)
- Key equipment for renewable energy plants (especially wind, solar and biomass)
- Oil-pipeline and gas-pipeline equipment
- Underground gas storage equipment

Opportunities

Implementation of the Energy Strategy adopted in 2009 has not been as smooth as expected. The current government has set the following major projects as its top priority:

- Coal-fired plant in Plomin (500 MW) – a strategic partner for the project should be selected by Fall 2013 from the pre-selected group of bidders
- Construction of LNG terminal at the Island of Krk – a strategic partner is being sought; construction is anticipated for early 2014
- Construction of two gas-fired cogeneration plants in Sisak and Rijeka (probably 500 MW each) – both projects in early preparation stages
- Renovation of hydro-power plant in Senj (240 MW) and construction of hydropower plant Kosinj (52 MW)
- Construction of underground gas storage Benicanci

Republic of Cyprus

Capital: Nicosia
Population: 1.17 million
GDP: $21.78 billion (2013)
GDP per capita: $24,500 (2013)
Currency: Euro
Language: Greek, Turkish, English

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Overview of the Cypriot Power Generation Market

	2013
Total Net Generation (MWh)[1]	**3941936.3**
Of which Thermal	3941625
Of which Wind	230.6
Of which Solar	44.9
Of which Biomass	35.8

	2013	
Generation Park	**Units**	**MW Capacity**
Combined Cycle Plant	2	440
Steam Turbines	9	750
Gas Turbines	5	187.5
Internal Combustion Engine	6	100

Transmission Network Length	2013
Total Transmission Network Length	1370.35 km
220/132 kV Transmission Lines	87 km
132 kV Transmission Lines	882 km
132/66 kV Transmission Lines	107 km
66 kV Transmission Lines	82 km
132 kV Underground Cables	208 km
132/66 kV Underground Cables	3.7 km
66 kV Underground Cables	0.65 km

[1] MWh utilized in this report to more accurately reflect energy use in Cyprus.
NOTE: Data derived from the Cyprus Transmission Systems Operator

Economic and Energy Sector Background

Cyprus offers significant opportunities for U.S. companies because of its recently discovered offshore energy resources and strategic location at the crossroads of Europe, the Middle East, and Africa. Despite becoming the fifth Eurozone country to receive bailout assistance in 2013, Cyprus remains an attractive place to do business because of its low corporate tax rate, skilled English-speaking professionals, and favorable business climate. Cyprus has an advanced telecommunications network, a wide network of air-routes, modern ports, and first-rate sea connectivity. In 2008, Cyprus awarded its first of six offshore exploration blocks to U.S. Noble Energy, which announced in 2013 an estimated 3.6 - 6 trillion cubic feet (Tcf) of natural gas in Block 12 of Cyprus' Exclusive Economic Zone (EEZ). The Republic of Cyprus (ROC) government includes the monetization of its offshore hydrocarbon resources and the lowering of domestic energy costs among its top priorities.

As part of its accession to the European Union in 2004, Cyprus agreed to overhaul its energy sector. In 2014, Cyprus ended the state-owned Electricity Authority of Cyprus' (EAC) monopoly on electricity generation and distribution. The EAC owns the national transmission system and operates three power generating stations, the largest of which is the Vasilikos Power Station (VPS). The EAC's three power plants currently operate on imported heavy fuel oil and diesel, although VPS is technically capable of generating power with natural gas. Cyprus established the Natural Gas Public Company (DEFA) to act as the country's sole natural gas importer.

To comply with EU unbundling requirements, Cyprus formed the Transmission Systems Operator (TSO), the Cyprus Energy Regulatory Authority (CERA), and the Cyprus Organization for Storage and Management of Oil Stocks (COSMOS). Cyprus' TSO manages the power grid, secures the operation of the electricity transmission system, regulates the electricity market (particularly as more power generation companies come online), and promotes electricity generation from renewable energy sources (RES). CERA's role is to issue licenses to power generation companies, ensure market competition, and maintain adequate electricity supply to the domestic market. COSMOS was established to maintain Cyprus's 90-day fuel reserves in compliance with EU directives. In 2012, the ROC government formed the Cyprus Hydrocarbons Company (EYK), a limited liability company to manage the commercial aspects of the development of Cyprus' offshore hydrocarbon resources.

These developments have created opportunities for U.S. companies and products in the areas of consulting, environmental assessment, offshore hydrocarbon exploration, and supporting services. One area restricted from U.S. companies is the ownership of the production, transfer, and provision of electrical energy as stipulated in Cyprus' Law on the Production, Transport, and Supply of Electrical Energy and Electricity Market Regulation of 2003 to 2012.

Sub-Sectors

Monetizing Cyprus' Natural Gas

The discovery of natural gas in Israel's EEZ, which is adjacent to Cyprus' EEZ, has led the ROC government to accelerate its plans to explore and monetize its potential offshore natural gas resources. In 2008, the ROC government awarded Noble Energy a license to develop Block 12; exploratory drilling began in 2011. In February 2013, the ROC government approved Noble Energy's transfer of 30% of its interests in Block 12 to the Israeli firms Delek Drilling (15%) and Avner Oil

Exploration (15%). During a second licensing round, the ROC government awarded blocks 2, 3, and 9 to an Italian/South Korean consortium of ENI and KOGAS, and blocks 10 and 11 went to the French firm Total. In October 2013, Noble Energy announced reduced estimates for Block 12 that ranged from 3.6 – 6 Tcf of natural gas, with a mean of 5 Tcf. ENI/KOGAS is expected to start exploratory drilling in late 2014, and Total has plans to begin drilling in 2015.

Noble Energy's announcement of reduced estimates for Block 12 increased the likelihood that gas from alternative sources will be needed to confirm the commercial viability of constructing an onshore liquefied natural gas (LNG) export terminal. The entire project is estimated to cost $10 billion and would be located near VPS in the Vasilikos area. The project also would require the expansion of a proposed state-owned energy park. As a potential energy exporter and regional energy hub, the ROC government is drafting and amending legislation in an effort to build a pro-business legal and regulatory framework that is in line with European Union requirements.

Lowering Electricity Prices and Expanding Renewable Energy Sources (RES)

Cyprus' consumer electricity prices are among the highest in the EU. ROC government efforts to lower energy costs to consumers include procuring cheaper fuel (e.g. natural gas), to power VPS and the entry of future independent power producers into the market. The ROC government also seeks to expand the share of renewable energy sources (RES) in Cyprus' energy mix through government subsidies and incentives. In 2013, the Cyprus Energy Regulatory Authority (CERA) initiated the first phase of its net metering project targeting end-consumers and prioritizing low income households. Cyprus' goal is to increase to 60,000 by 2016 the number of households participating in the project. Cyprus' net metering project allows privately-owned photovoltaic systems to connect to the EAC's power grid in a give-and-take arrangement. Consumers offset their electricity costs by providing power to the grid during peak production time and drawing from the utility during low production time. Under EU-mandated targets, Cyprus is required to increase from 6% to 13% by 2020 its total energy consumption that is drawn from RES. ROC government projects include the expansion of wind turbine generated-electricity, biomass-fueled power plants, the construction of additional photovoltaic parks, and the modernization of residential and commercial solar hot water heaters.

ONGOING OPPORTUNITIES

Port Expansion and Port Re-Development Projects:

- Cyprus' Ports Authority and the Ministry of Communications are evaluating a proposal to expand the port at Vasilikos to be able to service energy companies. The project is estimated to cost $205 million (€150 million). U.S. companies that design, construct, or service energy ports may find business opportunities here.

- Cyprus is considering which of its two main ports, Limassol or Larnaca, will service energy companies until Vasilikos comes online. Recently, energy companies in Cyprus have moved their drilling mud production units from Limassol to Larnaca. This move is likely to be temporary as local officials in Larnaca consider transitioning the port away from energy to service the growing tourism sector. Local authorities are likely to seek the assistance of environmental-assessment experts once these decisions are finalized, particularly in an effort to transition fuel storage areas for other uses. Companies with site remediation technology and expertise may also find opportunities here.

Supply of Natural Gas to DEFA for Power Generation:

- The Natural Gas Public Company (DEFA) issued a tender on January 25, 2014, for the interim supply of natural gas to Cyprus and ahead of the expected delivery of gas from Block 12 in 2019-2020. DEFA launched a previous tender in September 2012 but terminated it in October 2013 after failing to conclude a deal that would have lowered electricity generation costs on the island. As of the April 14, 2014 deadline, DEFA had received four bids, which it is currently evaluating. The estimated value of this project is $4 billion (€3 billion).

Construction of National Distribution Network for Natural Gas:

- DEFA plans to issue a tender for the construction and operation of a natural gas on-shore distribution network to supply consumers with natural gas once it becomes available in Cyprus. The ROC government is likely to seek assistance in designing, developing, and constructing its natural gas distribution network.

Fuel Storage Projects:

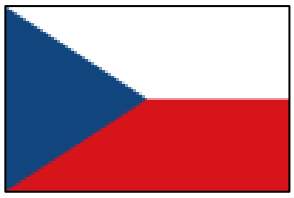
- VTTI B.V., the holding company of VTT Vasiliko Ltd (VTTV), invested approximately $410 million (€300 million) to construct an oil terminal in Cyprus at Vasilikos. The company's shareholders are Vitol (a Swiss-based, Dutch-owned energy and commodity trading company) and Malaysia International Shipping Corporation (an international maritime corporation owned by PETRONAS and specializing in energy transportation). The facility, which is currently under construction (28 tanks in total), is scheduled to be operational by July 2014. It will serve as an import/export and trans-shipment center. VTTV will facilitate oil trade within the Eastern Mediterranean, the Middle East, and European markets and will also provide storage options for domestic use. Phase two of the project is still under evaluation and will require the construction of an additional 13 tanks. Companies servicing fuel storage facilities may find business opportunities with VTTV.

- In January 2014, and as part of its efforts to become a tourism hub, the Larnaca municipality issued a decree requiring oil companies operating there to relocate their fuel storage facilities within the next three years. Companies offering site remediation may find opportunities for new business as a result of this requirement.

RES Power Storage:

- A lack of domestic storage capability for RES generated power adds to grid instability and is an issue the Cyprus Transmission Systems Operator (TSO) plans to address in the coming months. U.S. companies with grid stabilizing expertise or storage technology may find new business opportunities in this sector.

Czech Republic



Capital: Prague
Population: 10.5 million
GDP: $196 billion (2012)
GDP per capita: $26,698
Currency: Czech Crown
Language: Czech

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Overview of the Czech Power Generation Market

	2011	2012
Gross Generation in GWh	**81,028**	**81,088**
Of which:		
• Coal	49,973	47,261
• Gas	3,995	4,435
• Hydro	2,835	2,963
• Nuclear	28,280	30,324
• Renewables	2,514	2,590
Final Consumption	**70,516**	**70,453**

Source: ERU, www.eru.cz

Transmission Network total length	5506 km
• 400kV	3555 km
• 220 kV	1951 km
Transformer stations	
• 400/220 kV	4 units
• 400/110 kV	46 units
• 220/110 kV	21 units

Source: CEPS, www.ceps.cz

Political and Economic Background

National Objectives

- Cut greenhouse gas emissions by 40% by 2030 (compared with the year 1990)
- Maintain energy independence
- Construction of two additional nuclear reactors between 2025-2030

Investment in High Voltage Lines

EU regulations require that every country should free up a minimum of 10 % of its overall transmission capacity for international trade. The capacity available from the Czech Republic is already at 20 % and it is fully utilized. There are certain technical problems associated with the cross border transmission due to large volumes of electrical power that are traded internationally. To maintain the internal stability and integrity of the distribution network, the grid operators CEPS, www.ceps.cz will invest 3 billion USD on the nation's grid by 2023 to strengthen both cross border transmission capabilities and its own internal networks. The development is coordinated within the framework of The Association of European Transmission Operators, ENTSO-E .

Investment in Renewables

In 2013, significant changes for support of renewables RES were approved to limit an increase of installed PV and wind capacity to prevent a sharp spike in electricity prices. With the exception of small water power plants (up to 10 MW), power plants with combined electricity and heat production, and PV installations of up to 30kW on roofs and buildings, new RES units launched after December 31, 2013 will not get any subsidies.

Investment in Smart Grids

In 2009, a pilot project called Smart Region has been launched by the major Czech energy company Czech Energy Works (CEZ). Under this project, ČEZ has been investing 30 million USD into installation and testing of smart technologies in the town Vrchlabi. By 2015, ČEZ will install 4,500 smart meters in households and companies will build up the necessary infrastructure for electro mobility, install monitoring sensors and local energy generators will be effectively connected to the grid. A tender for suppliers of smart technologies was won by a consortium lead by HP. The consortium is composed of Swiss Landis&Gyr, Austrian Schrack Technik, GE Energy and Czech companies ZPA Smart Energy and Transtech CZ. A massive roll-out of smart metering technology is planned between 2013 and 2015 in a region inhabited by one million people.

Estonia

Capital: Tallinn
Population: 1.34 million
GDP: $22.18 billion (2011)
GDP per capita: $16,316 (2012)
Currency: Euro
Language: Estonian

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Overview of the Estonian Power Generation Market

	2011	2012
Total Net Generation (TWh)	**11.4**	**10.5**
Of which Thermal Nuclear	0	0
Of which Fossil Fuels	10.3	9.1
Of which Hydraulic	0.03	0.03
Of which Wind	0.4	0.4
Of which Solar	0	0
Of which Biomass	n.a	0.9
Of which non-identifiable	0	0
Final Consumption (TWh)	**7.8**	**8.1**

	2012	
Generation Park	**Units**	**MW Capacity**
Hydro	0	0
Thermal (Fossil Fuels)	17	2,242
Thermal Nuclear	0	0

Distribution Network	**2012**
Lines < 220 KV (in km)	3537
Lines 220 – 285 KV (in km)	158
Lines 330 KV (in km)	1605
Lines 380/400 KV (in km)	n.a
Lines > 400 KV (in km)	n.a
Transformer of Power Units è 220 KV	n.a
Transformer of Power Units è 330 KV	12
Transformer of Power Units è 380/400 KV	n.a
Transformer in the Network 220 KV è ≥ 110 KV and < 220 KV	2
Transformer in the Network 330 KV è ≥ 110 KV and < 220 KV	18
Transformer in the Network 380/400 KV è ≥ 110 KV and > 220 KV	n.a
Transformer in the Network 380/400 KV è 220 KV	n.a
Transformer in the Network 380/400 KV è 330 KV	n.a
Transformer in the Network 750 KV è ≥ 380/400 KV and < 380/400 KV	n.a

Political and Economic Background

Overview

Thanks to its large domestic oil shale reserves, Estonia is relatively independent in energy, but produces the second highest greenhouse gas emissions per capita in the EU. The Estonian government is planning to diversify electricity supply via investment in renewables, and cleaner oil shale technology, which will create considerable commercial opportunities for U.S. companies.
Estonia's renewable energy potential lies mainly in biomass, biogas, wind and cogeneration from bio fuels. There is also interest in other energy technologies such as pumped-storage hydroelectricity and smart grid solutions.

There is an increasing interest (particularly by Eesti Energia and Viru Keemia Grupp) in shale oil production as the price of shale oil has increased in correlation with the world market prices of oil products.
Estonia is also interested in building an EU supported regional LNG (Baltic countries and Finland) terminal in the northwest city of Paldiski. Balti Gaas (LNG project company of Alexela Group) is currently the front runner from the Estonian side. To get EU funding for the project, all countries need to reach a political consensus about the location of the plant. As of May 2013, the countries had not reached a consensus.

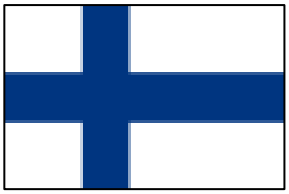
Sub-Sector Best Prospects

- Energy savings and storage technology
- Cogeneration technology

Opportunities

Please see the Supplement to the Official Journal of the European Union dedicated to European public procurement.
http://ted.europa.eu/TED/main/HomePage.do
http://www.tradewithestonia.com
LNG terminal project Balti Gaas: http://www.baltigaas.eu/en/cms/main.html

Finland



Capital: Helsinki
Population: 5.5 million
GDP: $268 billion (2013)
GDP per capita: $49,340 (2012)
Currency: Euro
Language: Finnish - Swedish

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Overview of the Finnish Power Generation Market

	2011	2012
Total Net Generation (TWh)	**70.4**	**67.7**
Of which Thermal Nuclear	22.3	22
Of which Fossil Fuels	24.2	17.1
Of which Hydraulic	12.3	16.7
Of which Wind	0.5	0.5
Of which Solar	0	0
Of which Biomass	n.a	10.5
Of which non-identifiable	0.7	0.9
Final Consumption (TWh)	**84.2**	**85.1**

	2012	
Generation Park	**Units**	**MW Capacity**
Hydro	166	3,142
Thermal (Fossil Fuels)	123	8,767
Thermal Nuclear	4	2,692

Distribution Network	**2012**
Lines < 220 KV (in km)	n.a
Lines 220 – 285 KV (in km)	2590
Lines 330 KV (in km)	n.a
Lines 380/400 KV (in km)	4390
Lines > 400 KV (in km)	n.a
Transformer of Power Units è 220 KV	11
Transformer of Power Units è 330 KV	0
Transformer of Power Units è 380/400 KV	12
Transformer in the Network 220 KV è ≥ 110 KV and < 220 KV	28
Transformer in the Network 330 KV è ≥ 110 KV and < 220 KV	n.a
Transformer in the Network 380/400 KV è ≥ 110 KV and > 220 KV	50
Transformer in the Network 380/400 KV è 220 KV	5
Transformer in the Network 380/400 KV è 330 KV	n.a
Transformer in the Network 750 KV è ≥ 380/400 KV and < 380/400 KV	n.a

Political and Economic Background

Overview

Total Energy Consumption by Energy Source (2013*)

Oil 23.4%
Wood fuels 24.2%
Nuclear Energy 18.5%
Coal 10.9%
Natural Gas 8.0%
Peat 3.6%
Hydro and Wind Power 3.6%
Net Imports of Electricity 4.2%
Others 3.6%

Total Energy Consumption: 1.341 PJ (2013)
* Preliminary data
Source: Statistics Finland

Energy Consumption by Sector (2013*)

Industry 46%
Space Heating 25%
Transport 16%
Others 12%

* Preliminary data
Source: Statistics Finland

Finland is a Nordic country and shares a 900-mile long border with Russia. Finland is the world's northern-most industrialized nation and energy consumption per capita is high. In terms of land area, Finland is the seventh largest country in Europe, but has a population of only 5.5 million, mostly concentrated in urban areas. Finland's energy needs are high due to its energy-intensive industry, cold climate, high standard of living and long distances. Finland does not have its own fossil fuels – coal, oil or natural gas – but does have bio fuels, rich reserves of peat, and extensive wood resources. Also, as indigenous fuel, peat has considerable effect on regional policy. It increases employment and security of the energy supply.

On an international scale, energy production and usage in Finland are quite efficient, due to resource availability, production infrastructure and geographical location. Energy-intensive industries play a large role in the Finnish economy, which has spurred the development of efficient energy systems. The pulp and paper industry supplies over two fifths of heat and electricity needs by utilizing solid and liquid wood residues.

Finland has four operating nuclear reactors. In addition, one reactor is being built and two reactors are in the planning phase. There are no inactive reactors.

Nuclear power plants in Finland				
Reactor's name	Type	Net MWe	Began operating	Owner
Loviisa 1	PWR	490	1977	Fortum Power and Heat Oyj
Loviisa 2	PWR	490	1981	Fortum Power and Heat Oyj
Olkiluoto 1	BWR	840	1979	Teollisuuden Voima Oyj
Olkiluoto 2	BWR	840	1982	Teollisuuden Voima Oyj
Olkiluoto 3	EPR	1600	estimated 2016	Teollisuuden Voima Oyj
Olkiluoto 4	unknown	estimated 1450 - 1750	unknown	Teollisuuden Voima Oyj
Hanhikivi 1	PWR	about 1200	estimated 2024	Fennovoima Oy

Opportunities

Finnish energy companies use open tenders according to European Union (EU) regulations. The development of renewable energy in Finland is expected to offer opportunities for U.S. companies in introduction of innovative renewable energy source equipment technology. Finland's Ministry of Employment and the Economy has bilateral cooperation on energy and environment with several countries. U.S. companies can also participate in cooperation with

Finnish companies in TEKES (Finnish Funding Agency for Technology and Innovation) funded projects (http://www.tekes.fi/).

Renewable Energy and Energy Efficiency

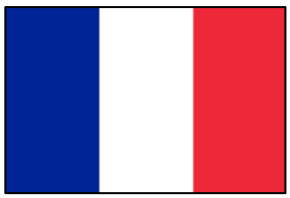
One of the world's leading countries in clean energy utilization, especially biomass, Finland has been active in expanding the role of renewable energy in energy production. The goal is to increase the share of renewable energy to 38 percent by 2020.Traditional Finnish energy efficiency strengths are in the areas of energy intensive industrial processes, power electronics, combustion and gasification technologies, combined heat and power production, and biomass based fuels. Additional growth comes from smaller firms operating in the areas of new materials, smart grids, recycling, and measurement technologies. Surprisingly, new areas to watch for include power electronics used in automotive manufacturing.

Best Prospects in this area include:

- Effective insulation materials
- HRV-systems

- Heating and cooling pumps
- Pellet furnaces and technology used for pellet production
- Low energy construction building concepts
- Recycled building materials
- Heating and cooling systems using alternative energy sources, such as solar, geothermal and small-scale wind
- Heat exchangers and heat meters
- Technology used in agricultural biomass
- Controls, pumps, piping
- Indoor and outdoor lighting solutions

France



Capital: Paris
Population: 65.8 million
GDP: $2.6 trillion (2012)
GDP per capita: $41,141 (2012)
Currency: Euro
Language: French

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Overview of the French Power Generation Market

	2011	2012
Gross Generation (TWh)	**542.9**	**541.4**
Nuclear	77.5%	74.7%
Hydro	9.3%	11.8%
Combustibles (Coal/Natural Gas)	9.5%	8.9%
Renewables (Solar/Wind/Waste/Biofuel)	3.7%	4.6%
Final Consumption (TWh)	**479.2**	**489.4**

Production Park	2012 MWe Capacity
Nuclear	63,130
Hydro	24,600
Thermal (gas, coal/oil, bio)	27,000
Wind	7,000
PV	3,500
Total	**125,230**

Distribution network	2012
Delivery Points	35 million
Length of Grid	1.31 million km
Transformer Stations (low / medium voltage)	751,000

Political and Economic Background

National Objectives

- Manage Energy Demand;
- Extend the range of technical sources of production and supply;
- Develop research in the energy sector;
- Guarantee the provision of energy transportation and storage infrastructures adapted to consumption requirements;

- Encourage the public and socio-economic players to save energy, particularly high daily consumers (households, offices, shops and transport);
- Promote renewable energy sources (biomass, solar power, geothermal energy and heat pumps).

Investment in Renewables

Due to government initiatives, France as a whole is looking for extensive growth in the renewable energy sector. Lyon, France, has a particular focus on renewable energies. Lyon gathers a high-level economic and scientific structure by its quality and its density. Thus, it is among Europe's most important clean technology development regions.

Big industrial groups and SME's, public and private R&D centers, and marquee training establishments compose the cleantech landscape in Lyon, France. On this basis, the region of Lyon allocates more money to renewable energy than any other in France with €54 million invested in the environment to become a European reference on clean technologies in 2015. Thanks to a strong political commitment and its cleantech development plan, Lyon could offer a great business opportunity in France for testing innovative environmental solutions.

Investment in High Voltage Lines

RTE plans to invest EUR 15 billion ($19 billion) on the nation's grid by 2020, and a further EUR 20 billion by 2030 with the present energy mix. However, it says that EUR 50 billion would be required by 2030 if the government decides to reduce nuclear share from 75% to 50% of supply and replace this with renewables. Either way, the grid investments are needed to improve security of supply and accommodate rising renewable power capacity.

Investment in Smart Grids

France is considered one of the most active smart grid markets in Europe. In 2007, as part of a pilot program, 300,000 smart meters were installed. Building on the results of the pilot phase, a national roll-out is in preparation. The roll-out phase envisages the deployment of 35 million smart meters, with an expected investment of about EUR 4 billion. The goal is from January 2012 to install only electronic meters and to have 95% coverage by the end of 2016.

Market Background

SWOT

Strengths

- All business customers in France have been eligible to choose their electricity supplier since July 2004, representing a 68% opening of the total market (in consumption volume terms). Household customers became eligible from July 1, 2007.
- The French electricity market is closely linked with German and British markets, and less so with Spain and Italy, although market interaction has increased with all neighboring countries since 2004. Exchanges with Germany represent the bulk of electricity exports and imports.

Weaknesses

- The power market is highly concentrated and is dominated by a small number of very large incumbent suppliers (EDF, Alstom, AREVA).

- An overreliance on nuclear power gives France limited access to alternative sources of energy; despite electoral promises, little progress has been made in diversifying the electricity mix.
- Delays in renewals of concessions for hydroelectric power plants in 2012 generated concern among utilities, particularly as incumbent EDF continues to manage supply, even though some concessions have already expired. The government has promised to resolve this, with the first tenders expected in 2014.

Opportunities

- France is targeting 25 gigawatts (GW) of installed wind capacity by 2020, with about 19GW onshore and 6GW offshore, and a tender for the first offshore farms was opened in May 2011.
- In November 2012, the French government launched a national debate on energy use, as part of its 'energy transition' towards renewables and a gradual reduction of the role that nuclear power plays in the electricity mix.
- The introduction of a carbon tax should help boost interest in the renewable energy sector and also ensures that nuclear power will stay on the agenda.

Threats

- Nuclear power will continue to represent three-quarters of total generation in France, with few options for diversification.
- Government strategy is sending mixed messages: while shale gas exploration is banned, geothermal drilling has been approved, which is also associated with risks.
- Thermal power plants will suffer as the carbon tax comes into force.

Germany

Capital: Berlin
Population: 82 million
GDP: $ 3.4 trillion (2012)
GDP per capita: $ 41.515 (2012)
Currency: Euro
Language: German

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Overview of the German Power Generation Market

	2011	2012		2011	2012
Lignite coal	150.1	161.1	**Hydro**	17.7	21.8
Hard coal	112.4	116.1	**Wind**	48.9	50.7
Nuclear	108.0	99.5	**Biomass**	32.8	38.7
Gas	82.5	75.7	**Photovoltaic**	19.6	26.4
Nuclear	108.0	99.5	**Waste**	4.8	4.9
Other sources	25.6	25.9			

Gross Generation (TWh): 628.8 (2012) Final Consumption (TWh): 594.0 (2012)

Generation Park (larger 100 MW) in 2014	Units	MW Capacity
Total	297	94.555,40
Hard coal	72	26.903,40
Lignite	44	22.108,20
Natural gas	93	21.248,37
Nuclear	9	12.696,00
Furnace gas	7	1.428,70
Hydro	37	7.152,53
Wind on shore 14 and off shore 3	17	2.476,80
Photovoltaic 3 and Biomass 1	4	541,40
Power plants using several methods	25	3.872,80

Distribution network	2013
Length of grid	1,780,000 km
Length of grid underground (80%)	1.440,000 km
Low voltage lines (1KV)	1,160,000 km
Medium voltage lines (1 - 72,5 KV)	513 500 km
High voltage lines (72,5 - 125 KV)	79 900 km
Extremely high voltage lines (larger than 125 KV)	34,810 km
Transformer stations (mid to mid/low voltage	600,000

Overview of the German Power Generation Market

National Objectives
Economic efficiency, security of supply, and environmental compatibility
http://www.bmwi.de/EN/Topics/Energy/energy-policy.html

Investment in Renewable Energy Equipment, Energy Storage and Energy Efficiency
Legal Background: The Renewable Energy Source Act (EEG) - fixed feed-in-tariffs and grid priority for renewable energy. The EEG only regulates the renewable electricity sector. The Renewable Energies Heat Act (EEWärmeG) promotes the increase of heat generated from renewable energy to 14% by 2020. http://www.germanenergyblog.de/?page_id=283
Goals:

- Phase out of nuclear power plants by 2022
- Reduction of greenhouse emissions
- Increase of the renewable energy share - 35 % by 2020, 65 % by 2040, 80 % by 2050
- Improvements in energy efficiency especially in the fields of buildings, mobility and electricity consumption.

Investments: 19.5 billion Euros have been invested in renewable energy technology in 2012.
Estimate: 500 billion Euros until 2050.

Investment in High Voltage Lines and Grid Expansion
The Federal Network Agency (Bundesnetzagentur) is the regulatory authority.
4 grid operators are responsible for expansion and modernization:
50 Hertz Transmission, Amprion, TenneT TSO and TransnetBW

The German electricity networks are not yet ready to cope with the transport of a growing share of renewable energy. Decentralized generated electricity needs to be collected and transported to the consumers over long distances.
The Electricity Grid Development Plan and the first Offshore Grid Development contain all the optimization, enhancement and expansion measures deemed necessary to ensure a safe and reliable operation of the on- and offshore grids over the next ten years, giving also an outlook until 2033.
2,800 km of existing power lines shall undergo enhancement and optimizations measures and 2,650 km of new power lines built.
Investment needs for grid extension and modernization:
until 2020: EUR 18.4 billion – EUR 26.7 billion
until 2030: EUR 27.5 billion – EUR 42.5 billion

Investment in Smart Meters
Rollout of smart metering systems still unclear in Germany – selective rollout will be the key to savings. General rollout is not in the interest of German consumers. See study E&Y on behalf of the German Federal Ministry of Economics analyzing the costs and benefits of a full smart meter rollout.
http://www.ey.com/GL/en/Industries/Power---Utilities/Plug-in---Smart-move-for-German

Investment in Modern Power Plant Technology
To securely maintain electricity supply conventional power stations are still needed. Only flexible conventional power stations can safeguard system stability. Until 2015 Germany will open 9 new coal power plants. However, there will be no major new coal or lignite projects for the foreseeable future beyond those currently under construction.

Greece

Capital: Athens
Population: 10.815 million (2012)
GDP: $265 billion (2012)
GDP per capita: $20,108 (2012)
Currency: Euro
Language: Greek

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Overview of the Greek Power Generation Market

	2012	2013
Gross Generation (TWh)	**51.09**	**48.61**
Of which hydro	7%	11%
Of which coal/oil der.	54%	48%
Of which gas	28%	25%
Of which renewables	11%	16%
Total Consumption (TWh)	**50.29**	**46.45**

	2013	
Generation-Facilities	**Units**	**MW Capacity**
Total	**14,741**	**7,298.6**
Hydro	120	3,238.14
Biomass	12	45.81
Wind	192	1,808.66
PV	14,417	2,205.99

Distribution network	2013
Delivery points	-
Length of grid	233,000 km
Percent underground	<0.04
Transformer stations (mid/low to high voltage)	160,000
Transformer stations (mid/low to mid voltage)	225

Political and Economic Background

National Objectives

- Promote major private sector investment
- Draw on diverse sources of energy
- Establish sustainable, competitive & secure energy sources
- Promote renewable resources become a major part of energy supply
- Emerge as a strategic energy hub in Southeast Europe

Wind Energy

Wind power is driving growth in the renewable energy sector. The wind resources in Greece are among the most attractive in Europe, with a profile of more than 8 meters/second and/or 2,500 wind hours in many parts of the country. Capacity increased by an average of 30% annually between 1990 and 2003, and almost 30% of total capacity was installed in the period of 2003-2004. Approximately 1400 MW of wind farms are in operation, with a target of 7,500 MW to be installed by 2020, from which 300 MW are attributed to offshore wind farms.

Wind energy has the advantage of being a priority sector of the Greek government. Renewables can be developed in Greece at very competitive costs, and the government's target is for renewables to have a 40% share of electricity production by 2020. These targets are legally binding, due to EU regulations and Kyoto Protocol agreement.

Advantages of Investing in Wind Energy

- Superb wind resources – among the best in Europe
- Priority dispatch by the system operator
- High feed in tariffs
- 20-year PPA (power purchase agreement)
- Favorable, long term legislative framework, ensuring investment reliability

Geothermal Energy

Greece lies in a geographic position that is favorable to geothermal resources, both high temperature and low temperature. High temperature resources, suitable for power generation coupled with heating and cooling, are found at depths of 1-2 kilometers on the Aegean Islands of Milos, Santorini, and Nisyros. Other locations that are promising at depths of 2-3 kilometers are on the Islands of Lesvos, Chios, and Samothraki as well as the basins of Central-Eastern Macedonia and Thrace. Low temperature geothermal resources are found on the plains of Macedonia-Thrace and in the vicinity of the 56 hot springs found in Greece. These areas include Loutra-Samothrakis, Lesvos, Chios, Alexandroupolis, Serres, Thermopyles, Chalkidiki, and others.

Advantages of Investing in Geothermal

- A wealth of geothermal resources
- Emerging market substantial entry-stage opportunities
- High feed in tariffs
- Wide variety of synergistic applications

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Biomass & Biofuels

Biomass and biofuels have been identified as strong markets with high growth potential. Investors will find numerous opportunities to source abundant raw materials and will benefit from attractive feed-in tariffs. In Greece, the agricultural sector accounts for more than 5% of GDP, more than three times the EU average of 1.8%. Companies involved in biomass and biofuels will therefore find abundant sources of raw materials. In addition, the binding commitments of the Greek government to replace 10% of current transport fuels with biofuels by 2020 translates into measurable opportunities within the next decade.

Advantages of Investing in Biomass and Biofuels

- Abundant raw materials
- Agricultural sector equals 5.2% of GDP vs 1.8% EU average
- High feed in tariffs
- Binding national commitments in biofuel use
- Favorable, long term legislative framework, ensuring investment reliability

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  - http://www.deddie.gr/el/to-diktuo-ilektrismou/vasika-megethi-tou-diktuou-ilektrismou
- Table 4 [*Political/Economic Background*]
  - http://www.investingreece.gov.gr/default.asp?pid=36&sectorID=38&la=1

Hungary

Capital: Budapest
Population: 9.9 million
GDP: $ 125.5 billion (2012)
GDP per capita: $ 12,621.74 (2012)
Currency: Hungarian Forint
Language: Hungarian

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Overview of the Hungarian Power Generation Market

	2011	2012
Total Generation (TWh)	**34.39**	**34.68**
Of which coal	6.21 (18.05%)	6.42 (18.62%)
Of which oil	0.14 (0.40%)	0.14 (0.40%)
Of which gas	10.37 (30.17%)	10.22 (29.46%)
Of which nuclear	14.90 (43.33%)	14.82 (42.73%)
Of which renewables	2.55 (7.42%)	2.84 (8.18%)
Of which hydro	0.22 (0.64%)	0.21 (0.61%)
Net Consumption (TWh)	**37.20**	**36.83**

	2012	
Generation Park	**Units** *(only regulated power plants)*	**MW Capacity** *(all power plants)*
Total	**198**	**9,173**
Hydro	-	53 (0.58%)
Thermal (gas, coal & oil)	156	6,238 (68.01%)
Nuclear	8	2,000 (21.80%)
Renewables	34	881 (9.61%)

Distribution network	**2011**
Length of grid	161,954 km
Total Transmission Network Substations	28
Transformer stations (220/120/35/20/10 kV)	11
Transformer stations (400/120 kV)	16
Transformer stations (750/400 kV)	1
Transformer stations (mid to mid/low voltage	59,485

Sources: Business Monitor International, Hungarian Energy & Public Utility Regulatory Authority, Mavir

Political and Economic Background

National Objectives

National Energy Strategy 2030

- Getting independent from energy dependence;
- Increase of energy savings and energy efficiency;
- Utilization of domestic RES at the highest possible share;
- Safe nuclear energy and electrification of the transport sector;
- Integration into the EU energy market, infrastructure and policy;
- Sustainable utilization of the domestic lignite and coal reserves and the non-recyclable communal waste.

Investment in Renewables

While renewable energy remains an important national objective, investment and development in this area has been overshadowed by the government's key policy to strengthen the nuclear energy sector with the construction of Paks NPP reactors 5 & 6 (with a gross capacity of MWe 1200 each). Instead of conducting an open tender, the Hungarian government signed a strategic agreement with Rosatom in January 2014, with Russia providing 80% of the finance for the new builds (a 10-billion-euro credit). Construction is expected to start in 2015 and the operation of the first reactor is planned for 2023.

Currently there are two forms of operational support instruments within the renewable energy sector:

1. Feed-in tariff system ("KÁT") which supports renewable electricity production and waste-to-energy;
2. KÁT balance group (MAVIR Ltd, the TSO) has to buy this electricity at the pre-defined feed-in tariffs.

The producers can sell in the KÁT system until the feed-in period expires or until the feed-in quantity is used up.

Another subsidy program is part of the Operational Programme Environment and Energy financed by the European Regional Development Fund (ERDF). Public bodies, companies and non-profit organizations are entitled to apply for a grant supporting the planning and realization of pilot projects on the use renewable energy sources in the heating sector.

Investment in Smart Grids

At this time there are two trials running in Hungary: The three key energy providers E.ON, Elmű-Émász and EdF Démász have installation over 8000 smart meters in homes across the country. In the spring of 2014 a thorough assessment and proposal has to be handed in to the government with regards to wide-range installations of smart meters. In addition Mavir is testing the model of Smart Grid Distribution Control Center (based on German model).

Israel

Capital: Jerusalem
Population: 8.170 million (2014)
GDP: $272.7 billion (2013)
GDP per capita: $20,108 (2012)
Currency: New Israel Shekels
Language: Hebrew/Arabic

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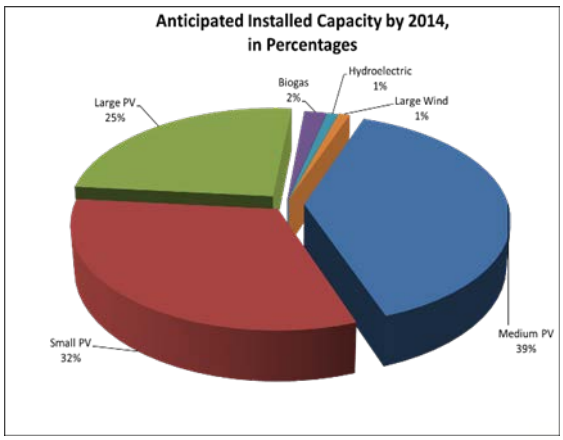
Overview of the Israeli Power Generation Market

	2012 (latest available figures)	2015 forecast
Total Installed Capacity in MW	**13.750, incl. 500MW in IPP's)**	**15.910, incl. 2000MW in IPP's**
Coal	35%	33%
Natural Gas	56%	64%
Diesel and Fuel Oil	8%	0.5%
Renewables	0.87%	3%

Transformation and Distribution networks	2013
400kV	735 km
161kV	4.486 km
115kV	114 km
Underground medium and high voltage lines	21.603 km (46%)
Substations	191
Switching stations	10
Transmission capacity	10.150 MWA (400/161kV switching stations) 16.627 MWA (IEC-owned); 2.825 MWA (IPP-owned)

Renewable Energy Sector (estimates for 2014) Source: Public Utilities Authority-Electricity (July 2013)



Renewable Energy - Estimates for 2014: Installed Capacity, by Energy Type, number of facilities, percentage of total RE installed capacity, installed capacity and electricity production (estimates).

Medium PV	156	74%	287MW	487.914MWh
Small PV	35	16%	233MW	375.406MWh
Large PV	4	2%	183	328.615
Biogas	8	4%	11	73.099
Hydroelectric	7	3%	6	No estimate available
Large Wind	2	1%	6	14.722
Medium Wind	0	0	0	0
Small Wind	0	0	0	0
Thermo Solar	0	0	0	0
Total	212	100%	726 MW	1.279.756 MWh (plus hydroelectric power)

Political and Economic Background

National Objectives

- Promote energy efficiency
- Promote competition in the electricity sector
- Promote the use of gas for industry
- Promote renewables to become 10% of energy supply by 2020
- Encourage R&D in Renewable Energies

Israel is an electricity island; its network is not connected to the systems of neighboring countries. The energy sector is dominated by government-owned utility Israel Electric Corp. The company generates over 95% of electricity to the national grid, and owns the transmission and distribution networks. IEC's production reserve is only 4-5%. Peak demand in summer 2012 was 11.920 MW. IEC's fuel sources are fossil fuels (coal, gas, diesel and fuel oil).

Over the past decade, boosted by the significant offshore natural gas finds, an IPP industry has been developing, so far resulting in the connection of two large independent IPP's selling to the grid, and the planning and construction of numerous cogeneration plants.

Israel's renewable energy (RE) sector has been slow to develop. The government's plan to reach the 2020 goal of 10% RE generation includes tenders and quota-based feed-in tariffs (FIT). However, industry sources doubt that these goals can be met. The government's focus is mainly on solar (thermo-solar and photovoltaic (PV). There has been little activity in wind and biomass. An FIT has been set for pumped storage, and two such facilities are currently under construction. They are expected to be operational by 2017. Current RE production reaches 0.87% of the country's total generating capacity. In December 2012, the regulator approved a net metering regulation for RE systems.

Israel has 200 RE technology companies that develop solutions in all sub fields of the sector: wind, solar-thermal, PV, smart grid, energy efficiency and biofuels. About 30% of the companies are technology start-ups. (Source: Ministry of Economy)

Opportunities in the sector include

- environmental systems for IEC's coal driven power stations;
- cogeneration systems for industries hooking up to the natural gas distribution networks;

biomass and biogas facilities

Solar

The government has identified potential sites suited to become RE clusters for large scale RE projects: the desert area for solar energy and the Golan Heights for wind energy. Currently, two stations, producing 8 and 11 MW, are operative in the Aravah desert. The Negev Ashalim area is the location of two planned concentrated solar power and photovoltaic projects, totaling 250MW. The two areas are also rich in disbursed rooftop panels, and may become energy independent by 2016. Medium size and small PV installations are found all over the country.

The government's 2020 goals include 1200MW for large thermo solar and PV; 350 MW for medium-size PV, based on FIT and quotas; 200MW for rooftop PV up to 50KW, based on FIT and quotas. The quotas for medium size and small units have been fully subscribed. From time to time, the government decides to increase the quotas or shift quotas from other RE sectors to solar.

Wind

Currently, Israel produces 6MW in wind energy. A large scale wind project on the Golan Heights is in advanced planning stages, and several additional projects have requested licenses from the regulator. With preference given to solar technologies, the government has repeatedly tried to cut the wind energy quotas. Israel is not considering offshore wind facilities. The 2020 RE plan foresees 800MW in wind energy. The development mechanism includes tenders and quota-limited FIT.

Biomass and Biogas

The 2020 plan calls for 210MW in biogas and biomass facilities. The country currently has a few small biogas installations, mainly in agricultural areas. Other biogas and biomass facilities, e.g. an 11.2MW sludge-fueled cogeneration plant, are in various planning stages. In 2013, the Ministry of Environmental Protection issued incentives for the development of biomass facilities.

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• http://dx.doi.org/10.1787/5kg0s2dnrbxq-en. OECD Economics Department - Addressing Challenges in the Energy Sector in Israel

Italy

Capital: Rome
Population: 60.9 million
GDP: $2.015 trillion (2012)
GDP per capita: $33,090 (2012)
Currency: Euro
Language: Italian

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Overview of the Italian Power Generation Market

	2012	2013
Gross Generation (TWh)	**299.2**	**303.5**
Of which fossil fuels	**68.5%**	**64.6%**
➔ gas	43.1%	31.3%
➔ coal and other solids	15.6%	18.5%
➔ other fossil fuels	9.8%	14.8%
Of which renewables	**31.5%**	**35.4%**
➔ photovoltaic	6.3%	7.3%
➔ wind	4.5%	4.9%
➔ bioenergy	4.2%	4.7%
➔ hydro	14.6%	16.7%
➔ geothermal	1.9%	1.8%
Final Consumption (TWh)	**328.2**	**317.1**

	2012 (last available data)	
Generation Park	**Units**	**Gross MW Capacity**
Total	485,915	128,134.1
Hydro	2,977	22,249
Thermal power plants	3,553	81,345.9
➔ conventional	3,520	80,573.9
➔ geothermal	33	772
Wind	1,054	8,119.4
PV	478,331	16,419.8

Distribution network	**2012**
Smart meters installed (mandated by law)	37 million
Length of transmission grid	62,700 km
Length of distribution grid	1,232,834 km
Transformer stations (150/132 kV)	173
Transformer stations (220 kV)	158
Transformer stations (380 kV)	153

Political and Economic Background

National Objectives

- Significantly reduce electricity prices and adjust them to the European average.
- Reduce CO^2 emissions and meet the targets set by the European climate and energy package.
- Improve energy security and increase energy independence, especially in natural gas sector.
- Promote sustainable growth by developing an internal energy market.

Investment in Renewables

A generous Feed-in-Tariff (FIT) regime and renewable portfolio standards have driven Italy's renewable energy market since 2005. Feed-in premiums replaced fixed tariffs for larger PV projects in June 2013. Shortly thereafter, Italy's national agency for the promotion and incentivizing of renewables, GSE, announced that FIT spending to support solar development had reached Italy's cap of €6.7 billion. As a result, there is currently no FIT scheme in place to support new solar PV installations, but installers of PV panels can still benefit from tax deductions for renovation works and from Italy's "net metering" scheme. FITs, green certificates and other types of incentives still apply to other renewable energy sources. In total, the new incentive mix is expected to be successful, albeit less so than the previous policy regime. Estimates indicate that roughly 3.5 GW of new solar power, 2 GW of new wind power (both onshore and offshore), and 990 MW of new biomass development will be installed through 2015. The new incentive program includes a differentiated FIT scheme for different technologies and project sizes.

Investment in high Voltage Lines

In Italy the high voltage network is managed by Terna Rete Italia. Terna's 2014 development plan highlights the need to expand the high voltage transmission grid in order to favor the growth of renewables power production. Network expansion will impact many Italian Regions, with projects including the building of new 380/150 kV transformer stations and new 150 – 132 kV switching stations, upgrading of part of the grid and local grid reorganization due to the addition of new substations. Some of the major works in progress or already authorized involving the high voltage grid are: development of the 380-220kV primary network in Sicily, development of the new interconnection between Sicily and the mainland, projects in Puglia and Campania (improvement of the 380 kV Foggia-Benevento II power line), the 380 kV Deliceto–Bisaccia and 380 kV Altomonte–Laino power lines, grid upgrades in the metropolitan areas of Turin, Milan, Naples and Palermo, and more. The budget for the projects in the 2014 Development Plan amounts to 8.1 billion Euros, of which 5.6 billion to be allocated in the next 10 years.

Investment in Smart Grids

- The Italian Authority for Electricity and Gas (AAEG) has been shifting incentives from renewable generation to Smart Grid development.
- Main areas of investment in Smart Grid include:
    - Integration of renewables
    - Grid automation (primary and secondary substations)
    - Operating centers

Lithuania

Capital: Vilnius
Population: 3.2 million
GDP: $42.73 billion (2011)
GDP per capita: $14,150 (2012)
Currency: Lithuanian litas
Language: Lithuanian

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Overview of the Lithuanian Power Generation Market

	2011	2012
Total Net Generation (TWh)	**4.4**	**4.6**
Of which Thermal Nuclear	0	0
Of which Fossil Fuels	2.8	3
Of which Hydraulic	1	0.9
Of which Wind	0.5	0.5
Of which Solar	0	0
Of which Biomass	n.a	0.2
Of which non-identifiable	0	0
Final Consumption (TWh)	**10.4**	**10.6**

	2012	
Generation Park	**Units**	**MW Capacity**
Hydro	12	1,009
Thermal (Fossil Fuels)	19	2,826
Thermal Nuclear	0	0

Distribution Network	**2012**
Lines < 220 KV (in km)	5012
Lines 220 – 285 KV (in km)	n.a
Lines 330 KV (in km)	1672
Lines 380/400 KV (in km)	n.a
Lines > 400 KV (in km)	n.a
Transformer of Power Units è 220 KV	n.a
Transformer of Power Units è 330 KV	11
Transformer of Power Units è 380/400 KV	n.a
Transformer in the Network 220 KV è ≥ 110 KV and < 220 KV	n.a
Transformer in the Network 330 KV è ≥ 110 KV and < 220 KV	24
Transformer in the Network 380/400 KV è ≥ 110 KV and > 220 KV	n.a
Transformer in the Network 380/400 KV è 220 KV	n.a
Transformer in the Network 380/400 KV è 330 KV	n.a
Transformer in the Network 750 KV è ≥ 380/400 KV and < 380/400 KV	n.a

Political and Economic Background

Overview

By agreement with the European Union, Lithuania decommissioned the Ignalina nuclear power plant, which generated up to 90% of the country's electricity. The first of the plant's two reactors was closed on December 31, 2004; the second was closed on January 1, 2009. Lithuania imports almost all of its energy resources, including oil, gas, and coal. The production capacity of Lithuania‟s oil refinery exceeds domestic demand, making the country a net exporter of petrochemicals. Electricity exports have dropped sharply since Lithuania took two of Ignalina's nuclear reactors offline and today about 50% of electricity is produced locally with the rest being imported primarily from Russia. Lithuania has no gas fields, and imports all of its natural gas from Russia. Gas accounts for approximately 30% of Lithuania's energy demand. Thermal energy plants and the chemical industry are the largest users of natural gas. The government is considering construction of a gas storage facility and a LNG terminal to diversify gas supplies and maintain reserves.

High-voltage (330kv and higher) overhead lines interconnect Lithuania's energy systems, which operates synchronously with the IPS/UPS electricity grid, which includes the power systems of nearly all the countries of the former Soviet Union, including Latvia, Estonia, Russia, and Belarus. Lithuania's National Energy Strategy (NES), adopted in 2007 and an update of which is pending in the Parliament, calls for Lithuania to synchronize its electricity grid with Western Europe's UCTE grid by 2015. The NES also calls for high-voltage links with Poland and Sweden by 2014. The Baltics' first electricity connection with the Western European grid, between Estonia and Finland, began operation in December 2006. All three Baltic States have agreed to cooperate in constructing a new nuclear power plant on the site of the current plant at Ignalina, a project which could cost between USD 6 and 8 billion.

Opportunities

Potential opportunities in the Lithuanian power-generation sector for both U.S. power-generation technology and service companies include the following:

- Restructuring and privatization of the state-owned power generation companies (modernization of the existing plants, process control, environmental issues);
- Decommissioning of the Ignalina Nuclear Power Plant's two reactors;
- Construction of the Visaginas nuclear power plant;
- Construction of electric power lines to Poland and Sweden;
- Expansion and modernization of the gas distribution network;
- Construction of natural gas storage facilities;
- Construction of LNG terminal support infrastructure;
- Development of renewable energy sources;
- Construction of nuclear waste storage

Poland

Capital: Warsaw
Population: 38.5 million
GDP: $516.3.73 billion (2013)
GDP per capita: $13,410 (2012)
Currency: Polish Zloty PLN
Language: Polish

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Overview of the Polish Power Generation Market

	2012	2013
Gross Generation (TWh)	**162.1**	**162.5**
Of which coal (hard & brown)	83.3%	84%
Of which renewables (biomass, biogas, hydro & wind)	10.4%	10.5%
Of which natural gas	3.9%	3.5%
Of which other (oil & LNG)	2.4%	2%
Final Consumption (TWh)	**157**	**158**

	2013	
Generation Park	**Units**	**MW Capacity**
Total	2,379	38,490
Thermal (hard coal/liquid fuels)	238	20,066
Thermal (brown coal)	35	9,420
Thermal (natural gas)	33	873
Hydro	139	2,198
Thermal Industrial	175	1,869
Other Renewables	1,759	3,495

Transmission and Distribution Network	2013
Length of transmission and distribution grid	787,739 km
Percent overhead	72%
Delivery Points	16.6 miln
Transformer stations (the highest/ high voltage)	187
Transformer stations (high/ mid voltage)	2575
Transformer stations (mid/mid voltage)	1213
Transformer stations (mid/low voltage)	250,229
Total connector number	6,740

Political and Economic Background

National Objectives

- Increase energy independence;
- Reduce CO^2 emissions/develop renewable energy;
- Promote and increase energy efficiency;
- Expand and modernize generation assets;
- Expand and modernize transmission and distribution networks/smart grid technologies;
- Maintain and develop high efficient coal-fired power generation plants/develop clean coal technologies.

Investment in Power Generation

Eighty three percent of Poland's electricity is produced by hard and brown coal fired power plants. The majority of these power plants were built between1960-1980, and now they become worn-out and inefficient. For these reasons, some 7 GW of old Polish coal-fired power plants will be detached from the system by 2020 and another 4 GW are planned for deep modernization. Currently, there are four large and several small power generation projects under construction of 4000 MW total power and USD 7 billion value. The following USD 10 billion power generation projects are in the final tendering stage, and next USD 20 billion are in the initial tendering stage, including nuclear power plant. The Polish government program being implemented by state-owned power concern PGE envisages construction of two nuclear power plants of 3,000 MW each until 2035, with the first power block to be in commercial operation by the end of 2024.

Investment in Transmission and Distribution Network

Poland's aging electricity distribution and transmission system generating energy losses of 9.36% is in need of upgrades and modernization. Expanding and modernizing the electricity grid is a key element of Poland's efforts to meet its EU goals of increasing renewable energy sources, improving energy efficiency, and better integrating the European transmission networks. Poland is building interconnections with Lithuania and upgrading connections with Germany. Investments undertaken by Polish Transmission System Operator (TSO) and five Distribution System Operators (DSOs) in the area of grid expansion and upgrade are estimated at USD 14 billion by 2019.

Smart Grid

Poland is obliged by EU directive to improve energy efficiency by 20% in 2020. The system of White Certificates that awards energy efficiency investments and undertakings is an instrument for increasing energy efficiency in Poland. The system is obligatory for utilities selling electricity to end-users. The catalog of products/undertakings qualified for White Certificates is included in the Energy Efficiency Law. Development of smart grid technologies in the area of grid measuring, diagnostics and automation is pretty advanced in Poland. The EU directive requires development of Advanced Metering Infrastructure AMI and installation of smart meters at 80% of final consumers by 2020. It would require installation in Poland of sixteen millions of smart meters at the cost estimated at $2.3 billion. Poland has not yet committed to this requirement by putting in place legal provisions of mandatory installation of smart

meters by DOSs. However, Polish DSOs have started to organize tenders for AMI supply, with about 400,000 smart meters already installed, and the following 900,000 to be contracted this year.

Investment in Renewables

Poland is obliged to achieve a 15% share of renewable energy in the final energy balance in 2020, with a goal of 19.3% of electricity produced from renewable sources. This enforces extensive investment in renewable sources generation capacity in Poland. The total installed capacity in renewable sources power plants exceeded 5,000 MW in 2013, with almost 60% of capacity installed in wind power plants, followed by 18.8% in biomass, 18.7% in hydro and 3% in biogas power plants. Currently, wind energy and the utilization of biomass for electricity generation purposes are seeing the most dynamic growth. Photovoltaic power plants are marginal. The new RE law that is to be in place within next few months will strongly support prosumer activities. The EU and national funds will be used for co-financing individual RE projects up to 1MW capacity.

Romania

Capital: Bucharest
Population: 21.38 million
GDP: $179.79 billion (2011)
GDP per capita: $7,942 (2012)
Currency: Romanian leu
Language: Romanian

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Overview of the Romanian Power Generation Market

	2011	2012
Total Net Generation (TWh)	**57**	**54.3**
Of which Thermal Nuclear	10.7	10.5
Of which Fossil Fuels	30.1	28.6
Of which Hydraulic	14.7	12.2
Of which Wind	1.2	2.7
Of which Solar	0	0
Of which Biomass	n.a	0.2
Of which non-identifiable	0	0
Final Consumption (TWh)	**54.9**	**54.4**

	2012	
Generation Park	**Units**	**MW Capacity**
Hydro	329	6,039
Thermal (Fossil Fuels)	91	9,392
Thermal Nuclear	2	1,300

Distribution Network	**2012**
Lines < 220 KV (in km)	0
Lines 220 – 285 KV (in km)	4796
Lines 330 KV (in km)	0
Lines 380/400 KV (in km)	5050
Lines > 400 KV (in km)	4
Transformer of Power Units è 220 KV	38
Transformer of Power Units è 330 KV	n.a
Transformer of Power Units è 380/400 KV	15
Transformer in the Network 220 KV è ≥ 110 KV and < 220 KV	89
Transformer in the Network 330 KV è ≥ 110 KV and < 220 KV	n.a
Transformer in the Network 380/400 KV è ≥ 110 KV and > 220 KV	31
Transformer in the Network 380/400 KV è 220 KV	14
Transformer in the Network 380/400 KV è 330 KV	n.a
Transformer in the Network 750 KV è ≥ 380/400 KV and < 380/400 KV	n.a

Political and Economic Background

Overview

Romania is one of the biggest Central and Eastern European oil producers, after Russia and the Caspian states. Romania's oil and natural gas reserves make the country less
dependent (29%) on imports for its energy consumption than the European Union, which is almost 50% dependent on imports.
According to Europe's Energy Portal statistics, Romania has the following proven reserves:

- Oil: 0.5 billion barrels
- Natural Gas: 0.6 trillion cubic meters
- Coal: 398 million tons

The country dominates Southeast Europe's downstream petroleum industry with a refining capacity that exceeds its domestic consumption, ensuring potential export capability.

Romania also benefits from the largest power sector in Southeast Europe. According to BMI estimates, Romania's overall power generation is expected to increase by an annual average of 2.9%, reaching 75.6 terawatt hours (TWh), in the next nine years. The generation of electricity is primarily based on coal, large-scale hydro generation, and nuclear power. The power sector is currently unbundled into generation, transmission, distribution, and supply. Around 83.5% of the electricity market was liberalized by July 2005, and since July 2007 all customers have been able to choose their supplier. Priorities for the Romanian power sector are partial privatization of the state-controlled nuclear and hydro generators, coupled with rapid growth in the renewable sector.

Sub-Sector Best Prospects

Oil and Gas

The award of two offshore blocks to Russia's Lukoil, as well as a partnership between ExxonMobil and the largest company in Romania, Petrom, to explore deep water parts of the Neptun Block have spotlighted the Black Sea as a potentially significant source of oil. In addition, Chevron's acquisition of three coastal blocks on the Black Sea has drawn attention to the area's potential as a producer of shale gas. International oil companies are showing increased interest in Romania as a result.

Renewable Energy

Like other industrialized countries, Romania is seeking to derive more of its energy needs from renewable sources. Entry into the EU brought Romania the obligation to comply with EU directives on renewable energy. In addition, Romania's desire to increase its energy security and begin to develop its solar and wind resources has coincided with private investor interest in alternative energy. To facilitate the development of these resources, the Romanian Government began introducing alternative energy incentives in 2005. The 2005 incentives were based on the trading of "green certificates" and on mandatory purchase quotas. The mechanisms were amended in 2011 and vetted by the European Commission; they now represent the main driver for renewable development.

Romania is seen as the fastest growing market for wind energy in the region, with installed wind generation capacity skyrocketing from as little as 7MW in 2007 to 1941MW in January 2013 (source: the Romanian Wind Association). In 2013 the Romanian Government is attempting to adjust the green energy support scheme. According to a draft Government emergency ordinance, Romania will temporarily reduce the number of green certificates granted to renewable energy producers to rein in electricity price increases. The measure will take effect on July 1, 2013 and will be valid until December 31, 2016. According to the draft document, between July 2013 and December 2016 wind power producers will receive one green certificate for each megawatt of energy they produce, instead of the two certificates they receive currently. Hydropower producers with installed capacity not exceeding 10 MW will receive one certificate instead of three, while solar power producers will get four green certificates instead of six. According to the draft act, solar power and hydropower producers will recover the green certificates taken away through the new regulations beginning in January 2017, and winder power producers will recover certificates starting in January 2018. As of publication of this document, the draft Government Ordinance has not yet been approved.

Opportunities

In light of these priorities, the best prospects for American companies will be found in electrical power systems, and products and services related to the construction of new power generation capacity, particularly hydro, wind, and solar. These opportunities include design and construction, installation, upgrading, maintenance, and repair.

Russia

Capital: Moscow
Population: 143 million (2013)
GDP: $2.5 trillion (2013)
GDP per capita: $18,100 (2013)
Currency: Ruble
Language: Russian

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Overview of the Russian Power Generation Market

		2012	2013
Total Net Generation (BkWh)		**1054.0**	**1045.0**
Of which Thermal (fossil fuels)	64%	647.8	622.6
Of which Hydroelectric	18%	155.4	174.8
Of which Nuclear	17%	177.1	172.0
Of which Renewables	< 1%	-	-
Of which Industrial (private enterprise)		51.8	54.2
Final Consumption (BkWh)		**1038.0**	**1031.0**

Operational Capacity	**2013**	
Energy Source	**Units**	**Capacity**
Thermal (oil, gas, coal) and Hydroelectric	440	220 GW
Nuclear	33	24 GW
Renewables:		
- Wind	9	22 MW
- Solar	4	24 kW

Russian Government Planning (to bring online by 2030)	**Added Capacity**
Thermal	157,664 MW
Nuclear	25,280 MW
Hydroelectric	22,561 MW
Wind	6,060 MW

Distribution Network	**2013**
Length of Grid (miles)	2,000,000
Lines < 220 KV (miles)	1,927,000
Lines >220 KV (miles)	73,000
Regional power systems	8

Political and Economic Background

National Objectives

- Russia is aiming to reduce GDP energy consumption by 2020 to 40% of its 2007 levels.
- According to Russia's Energy Strategy until 2030, significant investment is planned for the thermal, hydropower, nuclear and renewable sectors amounting to nearly 212 GW, requiring an estimated $600-800 billion in investment.
- In 2009, Russia implemented a new climate change policy, mandating that regional and municipal programs must increase use of energy efficient and/or renewable energy sources with specific energy savings targets over the next 15 years.
- Under the renewables policy re-launched in 2013, the first renewables capacity auctions are currently underway for small hydropower (under 25 MW), wind generation, and solar power projects.

Investment Climate

During the past decade, Russia has been struggling with shifting its power market from Soviet-styled planning to a more western market-based model. Policymakers continuously battle to find the right balance between channelling crucial investment and maintaining reasonable end-user power costs.
As part of market reform, most of Russia's fossil-fueled power generation has been privatized, while hydropower and nuclear remain under state control. The reform also divided the electricity sector into wholesale companies that participate in a new wholesale market. The Ministry of Energy regulates the country's power sector, with the exception of nuclear energy, which is administered by the State Atomic Energy Corporation (Rosatom).

According to industry analysts, the break-up of Russia's power monopoly helped several large Russian industrialists and western players buy into the market. Then a capacity-based market prompted a second wave of investment. However, the overall investment climate has been dampened by state consolidations, incoherent policies, price fixing, and market interference. Current investment focus has shifted toward auto-generation, energy efficiency and renewables, where opportunity still lies for equipment and engineering services.

Nuclear Sector

Russia's Federal Target Program envisions a 25-30% nuclear power share of total generation by 2030, 45-50% by 2050, and 70-80% by 2100. In order to achieve the goals, Russia's rapidly aging fleet of nuclear reactors will need to be replaced, as over half of Russia's current nuclear reactors are over 30 years old (the typical working life of a reactor). As of September 2013, 10 new nuclear reactors were under construction (with total capacity of 8,382 MWe), including a floating nuclear plant expected to commence operations in 2019. In addition, another 25 units are planned (with combined capacity of 27,809 MWe) and expected to be completed between 2017 and 2025. Industry analysts estimate that the amount of needed for the nuclear sector to be $22 billion in the short-term (2013-2019), and $100-139 billion in the long-term (by 2030).

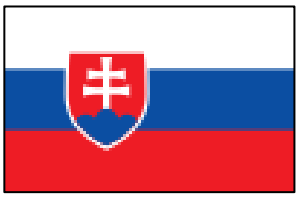
Renewables Sector

Currently, Russia's use of renewable sources to generate power accounts for less than 1% of total generation. However, an appetite for building renewable generation was cemented in May 2013, when the state approved a number of legislative acts supporting investment into renewable power. The first renewable plan covers the period until 2020, in which the government plans to build 6 GW of power generation, of which 61% is dedicated to wind power, 26% solar power, and 13% small-scale hydro power. Industry analysts estimate that the amount of investment needed for the wind energy to be $180 billion in the short-term (2013-2019), and bring on additional capacity of 6,060 MW by 2030.

Grids

The country's transmission and distribution grids are mostly controlled by Rosseti (aka "Russian Grids"), which is majority state-owned. The national grid is comprised of over 2 million miles of power lines, connecting seven of the eight regional power systems. The Far East region is the only one not connected through the integrated power system. Existing transformers at the substations and high-voltage lines are suffering from considerable wear and tear (more than 50%). As part of their construction and rehabilitation planning, Russian Grids anticipates incorporating innovative equipment and technologies. In particular, the Russian government has shown interest in smart grid technologies, and has advanced "smart city" pilot projects in Belogorod and Kaluga. Analysts predict that Russia will be spending between $217-334 billion to upgrade the grid infrastructure by 2030.

Slovak Republic



Capital: Bratislava
Population: 5.4 million
GDP: $99.95 billion (2012)
GDP per capita: $25,175 (2012)
Currency: Euro
Language: Slovak

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Overview of the Slovakian Power Generation Market

	2012	2013
Total Net Generation (TWh)	**28.4**	**28.6**
Of which Thermal Nuclear	15.5	15.7
Of which Fossil Fuels	5.2	4.5
Of which Hydraulic	4.3	5.1
Of which Wind	0	0
Of which Solar	0.6	0.6
Of which Biomass	n.a	0
Of which non-identifiable	2.8	2.8
Final Consumption (TWh)	**28.8**	**28.7**

	2013	
Generation Park	**Units**	**MW Capacity**
Hydro	90	2,531
Thermal (Fossil Fuels)	48	2,801
Thermal Nuclear	4	1940

Distribution Network	**2013**
Lines < 220 KV (in km)	80
Lines 220 – 285 KV (in km)	832
Lines 330 KV (in km)	n.a
Lines 380/400 KV (in km)	1951
Lines > 400 KV (in km)	n.a
Transformer of Power Units è 220 KV	7
Transformer of Power Units è 330 KV	n.a
Transformer of Power Units è 380/400 KV	17
Transformer in the Network 220 KV è ≥ 110 KV and < 220 KV	11
Transformer in the Network 330 KV è ≥ 110 KV and < 220 KV	n.a
Transformer in the Network 380/400 KV è ≥ 110 KV and > 220 KV	25
Transformer in the Network 380/400 KV è 220 KV	3
Transformer in the Network 380/400 KV è 330 KV	n.a
Transformer in the Network 750 KV è ≥ 380/400 KV and < 380/400 KV	n.a

Political and Economic Background

Summary

The current situation in the Slovak energy market has been stabilized. Economic crisis have led to a decrease in the demand for energy in the Slovak Republic. Energy demand in Slovakia is still 1.9 times higher than the EU average. The Slovak market for electric power generation is small compared to that of other European countries. In 2012 there was a total installed capacity (from all sources) of 8,152 MW. Approximately 53.8% of the total consumption of 28,786 GWH of electricity in Slovakia (2012) was obtained from nuclear power stations, 18.2% from conventional power stations, 15.1% from hydro stations, 11.5% from industrial and renewable power sources and about 1.4% was imported, mostly from Ukraine, the Czech Republic and Poland.

Market Entry

Electric power generating equipment is subject to import tariffs that range from three to five percent. Power generating equipment used in Slovakia must comply with European standards and in some instances with Slovak technical norms and safety standards as well.

Slovak standards legislation is regulated by the Technical Requirements for Products and Conformity Assessment Act, which follows EU legislation. Conformity with Slovak technical standards is voluntary except when specifically required by this Act or other technical regulations. Conformity to Slovak technical standards is mandatory if there is a direct reference to the issue in the technical regulations. According to the law, importers or producers are responsible to assess the conformity of their product to technical requirements.

The National Testing Center for certification of power generating equipment is the Electrotechnical Research and Design Institute (Elektrotechnicky skusobny a projektovy ustav a.s.)

Slovak state-owned or public companies interested in purchasing power generating equipment issue a public tender with technical specifications. Private companies prefer to contact potential suppliers directly. They also may issue a public tender with technical specifications. Each public tender is published in Obchodny Vestnik magazine, which is issued by the Slovak Public Procurement Office.

Current Market Trends

During negotiations to become a member of the European Union, the Slovak Government agreed to close two nuclear reactors at Nuclear Power Plant V1 Jaslovske Bohunice. One reactor was closed in 2006. After the second reactor was closed in 2008, total installed production capacity in Slovakia dropped to 7,453 MW. Slovenske Elektrarne a.s. is completing two new nuclear reactors at the Mochovce plant that will be completed in 2014 and 2015. In the meantime, the share of nuclear power stations installed capacity dropped starting in 2006 then again in 2009 and will remain at current levels until 2014.

Current Demand

The most important energy project is the construction of a new 1,000 MW to 1,700 MW third generation Pressure Water Reactor (PWR) type nuclear power plant with a minimum design life of 60 years. This project will be situated in Jaslovske Bohunice in order to take advantage of the existing infrastructure network from the closed Nuclear Power Plant V1 Jaslovske Bohunice.

The government approved the construction of the new plant in December 2008. The total cost of the new plant has been estimated at between $4.8 to 7.2 billion (EUR 4 to 6 billion). Preparatory work is estimated to cost $280 million (EUR 232 million), and will include a feasibility study and an environmental impact study. Slovenske Elektrarne a.s. is the largest investor in the energy sector in Slovakia. Slovenske Elektrarne a.s. has invested more than $4.8 billion in Slovakia between 2009 and 2014. The greatest portion of this investment, almost $3.8 billion, has to be spent to complete two additional reactors at the Nuclear Power EMO 2 Plant Mochovce. The company plans to complete the third Mochovce reactor by the end of the year 2014 and the fourth Mochovce reactor by 2015. The less portion of Slovenske Elektrarne a.s. investment, almost $625 million, has to be spent in order to complete modernization projects at Nuclear Power Plant EMO 1 Mochovce and Nuclear Power Plant V2 Jaslovske Bohunice. The Nuclear Power Plant EMO 1 Mochovce modernization project will increase the power output by 42 MW and switch to gadolinium-II fuel. The state-owned company JAVYS a.s. is in the process of decommissioning the first two reactors at Nuclear Power Plant V1 Jaslovske Bohunice that were shut down in 2006 and 2008. The planned expenses for the first phase of decommissioning of V1 had been approximately $111.2 million through 2011. The total planned expenses for the second phase of decommissioning of V1 will be approximately $204.7 million between years 2012 - 2015. The total decommissioning cost for V1 is estimated at $594.3 million.

Competitors

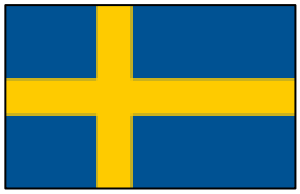
Compared to market share in other Central and Eastern European countries, the U.S. share of energy equipment, technologies and services in Slovakia is relatively low. European competitors are already located in the Slovak market and have a long-standing tradition of serving this market. Slovak business representatives indicate that they would welcome U.S. suppliers because Russian, German and French companies can sometimes be insensitive to local market conditions. U.S. suppliers often win international tenders in neighboring countries. U.S. companies can compete and win similar business opportunities in Slovakia. Major U.S. suppliers should have branch offices in Europe, as customers prefer to do business with companies that have a presence nearby. Positive references from customers in other Central European countries are highly valued in Slovakia.

Barriers

Foreign goods imported into Slovakia from non-EU countries are subject to customs inspection and imposition of customs duty, taxes, and import charges. Import and excise duties as well as value-added taxes are collected by the Slovak Customs Office after submission of a customs declaration for release of these goods into free circulation. The customs authorities collect both customs duties and value added tax (VAT) for imports. The VAT rate is 20 percent. The licensing system is Slovakia's primary non-tariff measure. The Ministry of Economy is authorized to issue import and export permits or licenses for sensitive goods with the objective of protecting the domestic market. The licensing procedure is governed by Regulation no. 15/1998 and amended Regulation no. 163/1999, which describes the conditions for issuing official authorization for import/export of goods and services.

Sweden

Capital: Stockholm
Population: 9.6 million
GDP: $552 billion
GDP per capita: $57,297
Currency: Swedish Krona
Language: Swedish



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Overview of the Swedish Power Generation Market

	2012	2013
Gross Generation (TWh)	**594**	**596**
Of which hydro	13%	11%
Of which coal/oil der.	33%	33%
Of which nuclear	31%	31%
Of which renewables	25%	26%
Final Consumption (TWh)	**382**	**385**

	2012	
Generation Park	Units	MW Capacity
Total	55,319	37,353
Hydro	1,800	16,203
Nuclear	10	9,363
CHP	51.124	8,018
Wind	2,385	3,607
PV + Panels (Statistics only on capacity and production)	N/A	24

Distribution network	**2013**
Length of grid	15,000 km
Percent underground	5%
Transformer stations, domestic (220kV)	72
Transformer stations, domestic (400kV)	61
Transformer stations, international (220kV) / (400kV)	2 / 8
Transformer stations, international (HVDC) / (< 200 kV)	6 / 7
Transformer stations (high voltage)	7,000
Transformer stations (mid to low voltage)	179,000

Political and Economic Background

National Objectives

- Increase renewable resources in the energy-mix
- Fossil fuel independent transport sector by 2030, emission neutral country by 2050
- Nordic electricity retail market (super grid) by 2015
- Smart grid roadmap by the end of 2014

Renewables

- Sweden is one of the world leaders in CHP bioenergy use.
- By 2020 Sweden plans to reduce its greenhouse gas emissions by 40 %.
- 85% of bioenergy comes from woody biomass and WTE from other sectors.
- During 2013-2016 the Swedish Energy Agency is investing USD 19 million in solar cells, thermal solar power and solar fuels research. 8.3 MW was installed in 2012 and 19 MW in 2013, a total capacity of 43.1 MW.
- The use of wind power has increased. Currently there are 2681 turbines, 2612 onshore and 69 offshore, with a total capacity of 4469 MW.
- Since 2012 the Swedish-Norwegian electricity certificate market has delivered 6.2 TWh of renewable energy. The goal is to reach 26.4 TWh by 2020.

National Grid Upgrade

- In order to meet the growing demands for secure electricity supply and the expansion of renewable electricity, ground- and sea cables will be replaced, tunnels and transformer stations renewed.
- The ongoing projects include the Stockholm City link project, linking the north and south of the city by a 400 kV ring, and the Nordbalt project, integrating the Baltic countries' systems with the Nordic grids.
- Since Sweden has international electricity wholesale, some of its transformer stations serve both domestic and international conduits.
- Since 2011, Sweden is divided into 4 electricity bidding areas

Smart Grid

- There are several major Smart Grid projects in Sweden, including the ones in Malmo, Gotland and Stockholm, looking into integration and distribution.
- Challenges include stability, variation and increased demand issues.
- 100% smart meter roll out (e.g. Echelon and Landis & Gyr).
- The government appointed Swedish Coordination Council for Smart Grid is developing a roadmap on how to stimulate the deployment of Smart grids, and creating a knowledge platform.

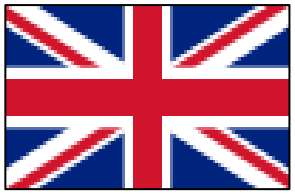
Nuclear

- There are three nuclear power plants with 10 reactors (3 PWR and 10 BWR), with the capacity to account for 50 % of the annual electricity production.
- Due to service stops and minor malfunctions on the current, old reactors, there is only an average of four normally in use.
- The operators can apply for permits for reactor replacement, provided that one of the existing ones will be closed, keeping the number of active reactors at the current 10.
- Vattenfall is looking into replacing two reactors at one of their plants. This provides opportunities for U.S firms with the latest nuclear technologies, 4th generation reactors and plant construction engineering services.

U.S. COMMERCIAL SERVICE
United States of America
Department of Commerce

United Kingdom

Capital: London
Population: 63 million
GDP: $2.4 trillion
GDP per capita: $38,514 (2012)
Currency: British pound
Language: English



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Overview of the Great Britain Power Generation Market

	2011	2012
Total Net Generation (TWh)	**435.3**	**426.2**
Of which Thermal Nuclear	67.9	63.7
Of which Fossil Fuels	330.2	301.1
Of which Hydraulic	7.5	6.9
Of which Wind	24.2	28.3
Of which Solar	0	0
Of which Biomass	n.a	0
Of which non-identifiable	0	0
Final Consumption (TWh)	**436.9**	**449.3**

	2012	
Generation Park	**Units**	**MW Capacity**
Hydro	50	3,901
Thermal (Fossil Fuels)	44	1,957
Thermal Nuclear	0	0

Distribution Network	**2012**
Lines < 220 KV (in km)	1378
Lines 220 – 285 KV (in km)	7814
Lines 330 KV (in km)	n.a
Lines 380/400 KV (in km)	12099
Lines > 400 KV (in km)	n.a
Transformer of Power Units è 220 KV	10
Transformer of Power Units è 330 KV	n.a
Transformer of Power Units è 380/400 KV	n.a
Transformer in the Network 220 KV è ≥ 110 KV and < 220 KV	504
Transformer in the Network 330 KV è ≥ 110 KV and < 220 KV	n.a
Transformer in the Network 380/400 KV è ≥ 110 KV and > 220 KV	295
Transformer in the Network 380/400 KV è 220 KV	116
Transformer in the Network 380/400 KV è 330 KV	n.a
Transformer in the Network 750 KV è ≥ 380/400 KV and < 380/400 KV	n.a

Political and Economic Background

Summary

The UK electricity production sector generates an annual turnover of over $90 billion. The number of people directly and indirectly employed in the sector is over 600,000. The UK's determination to become a low carbon economy creates many opportunities for U.S. companies to supply products and services that will help the UK develop sustainable, secure, low carbon energy sources. Over $300 billion of investment is needed over the next ten years to replace older power plants and upgrade the grid - twice the rate of investment seen in the previous decade. Some of the best prospects are found in the smart grid sector, renewable energy, the nuclear sector, and gas-fired generation.

Market Entry

The maturity and competitiveness of the UK electricity market typically make product quality and performance, delivery timescales and costs key to market acceptance. One traditional method of entry for small to medium-sized companies is through a local partner who has local contacts and a good understanding of local procurement practices. Companies favoring direct sales to buyers may find it beneficial to register to the relevant suppliers' websites and establish relationships with local buyers. Many utility industry companies in the UK use procurement intermediary services offered by organizations such as the Achilles Utilities Vendor Database (UVDB), to help shortlist appropriate companies and reduce the time and expense involved in managing official procurement projects.

Current Market Trends

More than $300 billion will be invested in the UK's electricity sector over the next ten years to replace older power plants and upgrade the grid. UK public and private organizations are investing in the upgrade of the grid, creating significant business opportunities for U.S. companies that have developed products, services or technologies related to smart grids. Pilot projects undertaken in the UK market can serve as a benchmark to provide U.S. companies with early adopter opportunities in other European countries and in the global market.

The uptake of renewable energy technologies has also been identified by the UK Government as key for the provision of new, secure supply, whilst contributing to meeting CO2 reduction targets.
In 2011, the market for renewable energy products and services was estimated to be worth nearly $85 billion. The UK is the global leader for offshore wind energy with 1.8 GW of operational capacity with 568 turbines already installed, and is well placed to continue this lead role to 2020 and beyond - up to 18 GW of additional future capacity from offshore wind could be deployed by 2020. Beyond 2020 there is a very high potential for deployment with over 40 GW possible by 2030. Another renewable technology with great potential is biomass. Biomass and waste capacity increased by over 85% in the period from 2004 to 2011. In 2010 the UK had 2.5 GW of capacity in operation and deployment forecast indicates that biomass electricity could 45 contribute up to 6 GW by 2020, corresponding to an annual growth rate of 9%. Biomass imports are and will continue to be a significant source of biomass feedstocks in the UK.

New nuclear electricity generation plant will also play a role in the UK energy mix. The estimated investment for planned, future 16GW new nuclear capacity currently stands at $65 billion and is estimated

to create 30,000 jobs by 2025.There are also opportunities in nuclear decommissioning.
The UK will also require new gas plant to enable the transition to a low-carbon electricity system while ensuring security of supply. In the long-term, gas with carbon capture and storage could generate significant quantities of low-carbon electricity.

Current Demand

The UK has a generating capacity of some 90 GW. Most of the UK's electricity is produced by burning fossil fuels, especially natural gas (40%) and coal (30%). 19% of the UK electricity comes from nuclear reactors. Currently there are 19 operating nuclear reactors in the UK totaling 11GW capacity. These reactors are now reaching the end of their operational lives and will close gradually. Several companies have plans to build a new generation of reactors, the first of which could be online by the end of the decade. Renewables produce 9.4% of the UK's electricity, and EU and UK CO_2 reduction targets mean that this is likely to increase to some 30% by 2020.

Competitors

The UK is a very mature and competitive market. Over thirty thousand companies are actively involved in the energy industry in the UK. U.S., UK and foreign companies have been attracted to the UK by the strength of market demand, substantial government investment, and the country's relatively low-risk business environment.

Barriers

A potential market issue to keep in consideration when designing products for export to the UK is the need for US manufacturers to use the metric system. Equipment and materials, exported from the USA, should also comply with the ISO quality standards. Additionally products tested and certified in the U.S. to American standards are likely to have to be retested and re-certified to EU standards.

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