SKF: Accelerating Growth in the BeyondZero™ Portfolio[1]

First Smeal Sustainability Case Competition - Fall 2014

PENNSTATE SMEAL College of Business

SKF'S APPROACH TO SUSTAINABILITY AND EVOLUTION OF ITS BUSINESS STRATEGY[2]

In the last thirty years, SKF has transformed itself from designer and producer of high quality bearings to a provider of integrated systems and knowledge-based solutions. As an industry leader, it successfully combined its core skills in bearing design with expertise in condition monitoring, developing wireless and self-powered technologies for "smart" bearings. More recently, SKF has sought to leverage its powerful technological and service capability to develop clean energy solutions, energy efficiency solutions, and other solutions that bring significant environmental performance improvements for customers; all branded as its BeyondZero portfolio. The portfolio includes offerings to the wind turbine industry, where SKF sells bearings, seals, mechatronics, and lubrication systems as well as monitoring and reliability services that enhance overall wind turbine life cycle performance.

With an ambitious portfolio revenue target for 2016, SKF is seeking ways to accelerate portfolio revenue growth. SKF Group Management knows that government legislative and regulatory actions significantly impact the prospects for such growth by stimulating innovation and product and service demand, but wants to understand better what specific impacts these actions will have for the wind power industry and how SKF should position itself strategically to take optimal advantage of them. A proper inquiry requires SKF to review its current business strategy, the wind industry's prospects for growth, and government actions that stimulate investment in and consumption of wind energy.

Business Areas. SKF operates in four business areas. (1) SKF Industrial Market, Strategic Industries (31.5% of net sales); (2) SKF Industrial Market, Regional Sales and Service (40% of net sales); (3) SKF Automotive (27% of net sales)[3]. Specialty Business was added as a fourth business area in 2014. The first two business areas cover the whole industrial market, and Industrial Market, Strategic Industries is where bearings and related products are designed, developed and manufactured, including the wind turbine products. SKF Industrial Market, Regional Sales and Service is also important to the wind segment because it contains its growing service business, including post-market service on wind turbines.

SKF Industrial Market, Strategic Industries consists of seven business units: Aerospace, Renewable Energy, Traditional Energy, Railway and Off-highway, Industrial Drives, Precision Lubrication. SKF's renewable energy business is mostly wind related. Solar is insignificant due to the lack of moving parts. Ocean energy, however, may grow because SKF can apply its previously developed technology and knowledge of wind to waves and currents.

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[2] This case was written by Professor Gerald I. Susman, with assistance from second-year MBA students Tim Sandusky and Eddie Looper. Great thanks to Rob Jenkinson, Director of Corporate Sustainability at SKF, who reviewed and commented on case drafts.

[3] All percentages are based on 2013 net sales of SEK 63,597 million. See SKF Annual Report 2013.

Business Strategy. SKF's business strategy for achieving sustainable profitable growth and financial targets includes:

1. Keeping a clear and dedicated customer focus
2. Deploying the asset life cycle concept
3. Using second brands to reach new customers and markets
4. Strengthening the product portfolio through R&D investment and acquisition
5. Creating and capturing more value by applying the SKF platform and industry approach
6. Creating a positive impact on the environment by reducing the negative environmental impact from SKF's operations, and providing customers with innovative technologies, products, and services to do the same in their operations.
7. Focus on rapidly expanding geographies and industries
8. Optimizing capital employed
9. Developing and protecting the SKF brand
10. Attracting and retaining talent

Of particular importance, the focus on tailored solutions helps customers improve performance, reduce energy use and lower total costs at every stage in the asset life cycle. About two-thirds of SKF's new products are evolutionary and originate from extended customer relationships. The remaining one-third comes from R&D labs (R&D budget is 2.9 % of sales). To make it easier for medium and smaller OEM customers and end-users to access knowledge, SKF has set up a global infrastructure of knowledge centers (currently 27), each called an SKF Solution Factory. Managed by SKF Industrial Market, Regional Sales and Service, the centers are equipped with engineering expertise that covers SKF's five technology platforms:

1. Bearings and Units
2. Seals
3. Mechatronics
4. Services
5. Lubrication Systems

For SKF's wind business, lowering the Levelized Cost of Energy (LCOE) with condition maintenance systems that increase system uptime is a critically important component of providing value through the asset life cycle. [4] SKF emphasizes total cost of ownership (TCO). The cost of acquiring a machine is often only between 10–15% of the total cost of using that machine throughout its operating life from specification to decommissioning. The remaining 85–90% is related to operations and maintenance.

[4] LCOE is determined by dividing the project's total cost of operation by the energy generated. The total cost of operation should include all costs that the project incurs—including construction and operation— and may incorporate any salvage or residual value at the end of the project's lifetime. Incentives for project construction and energy generation can also be incorporated.

BeyondZero. The SKF BeyondZero portfolio is a marketing framework that includes clean tech products from the businesses. While not a profit center, it is managed by committee to meet revenue targets and demonstrate SKF's capability to enable clean energy technology. The vision for the SKF BeyondZero portfolio is a key piece of its integrated four-part sustainability framework, called SKF Care[5]. BeyondZero was conceived as a bridge between Business Care and Environmental Care.[6] It has two major components. First, it consists of practices and processes that reduce the environmental impact from SKF's own operations. Between 2006 and 2012, SKF's business increased by over 20%, but it still reduced its total energy requirements from operations by 14% and reduced greenhouse gas emissions, specifically CO2, by 16%. Second, BeyondZero consists of technologies, products and solutions that improve SKF's customer environmental performance. These can be added to the BeyondZero portfolio if they provide significant environmental benefits without serious environmental trade-offs, from a life cycle perspective. They must address one or more defined environmental challenges, such as climate change, natural resource use and the avoidance of various types of environmental contamination.

Approximately 50 technologies, products and solutions have been added since 2012. Six were added from Industrial Market, Strategic Industries in 2013, which has now contributed 28. Future sales can come from organic growth of products that are currently in the portfolio, or from acquisitions of companies that sell products that likely can be added to the portfolio (e.g., acquisition of Kaydon, some of whose products contributed to the BeyondZero portfolio). Whether new technology ideas originate with their customers or in SKF R&D labs, SKF works closely with customers throughout the new product development process. Given their core competencies and strategic intent, SKF had committed to an ambitious BeyondZero portfolio target: SEK 10 billion by 2016. Yet, in 2013 the portfolio had earned only SEK 3.3 billion.

Wind Energy Products and Services. SKF's wind-related products fall into four major categories: main shaft, gearbox, generator and pitch and yaw. Each of these categories features one or two major bearings. The remaining items within each category are seals, lubricants, and enhanced intelligent products/devices to optimize the bearings' use. Under main shaft, the featured products are self- aligning bearings and the Nautilus bearing, which can eliminate the need for a main shaft. Under gearbox are various types of roller bearings. Under generator are various types of deep groove ball bearings. Under pitch and yaw (changing the angle of the blades relative to wind direction and speed) are types of thin section and slewing bearings, which is a product capability that SKF gained by acquiring Kaydon in 2013.

Wind Energy Customers. Industrial Market, Strategic Industries sells bearings and related systems to wind turbine OEMs. SKF engineers from this business area maintain a close working relationship with most if not all of the top-ten turbine and gearbox OEMs. In this way, they form partnerships that become the basis for new product and process innovation. Once turbines are

[5] SKF's annual reports are organized around SKF Care, which includes the four dimensions of Business Care, Environment Care, Employee Care and Community Care. See SKF Annual Report 2013, p. 13 for details.
[6] Tom Johnstone, President and CEO of SKF, Youtube, January 10, 2014

installed and operational on a wind farm, then wind farm owners and other end-users[7] become customers of Industrial Market, Regional Sales and Service. Customers' requirements and purchasing patterns determine whether SKF delivers its products to customers directly or through its network of distributors. Regional Sales and Service offers and delivers a full range of products, solutions and services to both OEMs and end-users within different industries, including wind. It also serves the industrial aftermarket through a distribution network present in around 7,000 locations worldwide.

A sample of recent customers includes Dongfang Electric for Nautilus bearings, Goldwind for fully integrated systems, including Nautilus bearings, Siemens Windpower for a new generation of SKF Nautilus bearings, and Vestas Services for SKF WindCon systems in multiple markets. SKF is a supplier and development partner with David Brown Wind for gearbox development for a multi-megawatt offshore wind turbine model. Nordex signed a global agreement with SKF for the delivery of main shaft bearings and lubrication systems. It tripled seal sales to a leading German gearbox producer, and is the main seal supplier to several of this gearbox producer's manufacturing locations.

SKF extended its collaboration with Envision Energy in 2013 to include delivery of SKF's Nautilus bearings for Envision's 3.0 MW turbines, and other types of roller bearings for Envision's 4.0 MW turbines. SKF has been a development partner to Envision Energy since it was founded in 2006 and supplies all the bearings for its standard 1.5 MW, 1.6 MW and 2.3 MW turbines. Envision Energy, with its research and development base in Denmark, is one of the most rapidly expanding companies and among the top five leading wind turbine manufacturers in China.

SKF won service contracts worth more than SEK 200 million to provide companies in Latin America with different asset management services including machine lubrication and condition monitoring. Latin America is the fastest growing region for SKF's service business.

Several pilot projects are in progress in the wind energy sector for the newly launched self-powered sensor bearing SKF Insight. The solution can wirelessly communicate information about the condition of the bearing via the SKF network of Remote Diagnostic Centers. This will help SKF's customers to further extend maintenance intervals and reduce the operating cost for main shaft and gearbox applications.

Competitors. Offering a total systems approach places SKF in competition with multiple firms in multiple markets. In bearings, SKF, Schaeffler, JTEKT, NSK, NTN and Timken take approximately 60% of a global market that stayed between SEK 320 and 330 billion in 2013. There is also a group

[7] Wind farm owners typically are independent power producers, e.g., Iberdrola, Acciona, FPL Energy, Brown & Babcock, or investor owned or publicly owned utilities. Independent power producers (IPPs) owned 88% of all new wind power capacity installed in the United States in 2012 and 83% of the cumulative installed capacity(2012 Wind Technologies Market Report, U.S. Department of Energy).

of Chinese bearing companies that take another 20% of that market. However, 80% of their sales are found in Asia, with less than 10% in Europe and less than 7% in the Americas.

In polymer seals, a global market that stayed flat in 2013 and only reached about SEK 75-80 billion, SKF is considered a top global player. However, the largest supplier is the German Freudenberg Group, along with their Japanese affiliate NOK (Nippon Oil Seal Company).

The global lubrication market (automatic lubrication systems, design and installation, and manual lubrication tools and equipment), which declined 10% over the previous year to approximately SEK 30 billion in 2013, has seen a trend of moving from manual solutions to automatic and centralized lubrication systems, which drives market growth above underlying market growth. SKF's major competitors here are BEKA(Germany), Groeneveld Group(Netherlands), LUBE Corp(Japan), Bijur Delimon(US), Graco(US), and Samoa Group (Spain).

SKF is a global leader in the asset efficiency optimization market. This includes a range of products and services – such as asset reliability consulting – that help companies set up the right maintenance program, remanufacturing services, and condition monitoring products and services, which provide early diagnostics about equipment problems. This rapidly expanding market continues to hold the strongest portfolio of products and services within its area. It remains dominated by a few key players with many small local suppliers and niche, technology driven companies. Most of the major wind turbine OEMs have asset efficiency optimization capability that they developed internally or through acquisitions. SKF's largest competitor in this market is GE Energy-Bently-Nevada. Siemens has SIPLUS CMS Condition Monitoring Systems. Timken acquired the Schulz Group in 2014.

WIND ENERGY INDUSTRY

Aggregate Demand. Table 1 shows world total added wind power capacity in 2013 of 35.3 GW. Asia and the European Union are nearly tied in total capacity. Asia added the most capacity in 2013, and the E.U. was second. North America added only 3.1 GW in capacity in 2013. This number reflects a 92% reduction in the U.S. over 2012, mainly due to the late extension of the production tax credit (PTC) and investment tax credit (ITC). [8]

Overall, 2014 is projected to be a record year, with an annual growth rate of about 33%, to bring the world total added capacity to about 47 GW, with strong growth in North America and Asia. Installations in the U.S. have risen dramatically in 2014. More than ninety projects are underway; 13 GW of new capacity in 20 states. Texas leads with 7 GW. Iowa is second with 1.5 GW. [9] Brazil, Mexico and South Africa are expected to increase strongly in future years. Growth rates will likely be 6-10% annually out to 2018. Cumulative growth will rise to nearly 15% in 2014, but average 12-

[8] http://www.windpowermonthly.com/article/1289861/us-sees-92-drop-2013-installations
[9] The Outlook For Renewable Energy In America, 2014, America Council on Renewable Energy
10 http://www.gwec.net/global-figures/market-forecast-2012-2016/

14% from 2015 to 2018. Total installations should nearly double from 318.1 GW in 2013 to about 600 GW by the end of 2018.[10]

TABLE 1: GLOBAL INSTALLED WIND POWER CAPACITY (GW) REGIONAL DISTRIBUTION[11]

Region	Total Capacity 2012	Added Capacity 2013	Total Capacity 2013
Africa & Middle East	1.2	.90	1.3
Asia	97.7	18.2	115.9
EU-28	106.4	11.1	117.5
Latin America & Caribbean	3.5	1.2	4.7
North America	67.7	3.1	70.8
Pacific Region	3.2	.65	3.9
World Total	283.2	35.3	318.1

Table 2 shows a more detailed breakdown of cumulative capacity. China, the U.S. and Germany have 58% of the world's cumulative installed capacity. Wind reached 2.87% of global installed capacity in 2013. By 2023, global installed capacity is expected to be 918 GW or 7.28% of the total.[12].

TABLE 2: TOP TEN CUMULATIVE CAPACITY DECEMBER 2013

Country	Gigawatts	% Share
China	91.4	28.7
US	61.0	19.1
Germany	34.3	10.8
Spain	23.0	7.2
UK	10.5	3.3
Italy	8.6	2.7
France	8.5	2.6
Canada	7.6	2.5
Denmark	4.8	1.5
Rest Of The World	48.3	15.2
Total Top 10	269.8	84.8
World Total	318.1	100.0

[11] Ibid
[12] Navigant Consulting, March 2014

Table 3 shows the top 10 wind turbine manufacturers by market share of added capacity in 2013. This represents 68.6% of added capacity in 2013. SKF supplies bearings and related components or services to all ten of these wind turbine manufacturers.[13]

TABLE 3: TOP 10 WIND TURBINE MANUFACTURERS BY MARKET SHARE OF ADDED CAPACITY 2013

Company	Headquartered	Market Share	Rank in 2012
1 Vestas	Denmark	13.1%	1
2 Goldwind	China	11%	7
3 Enercon	Germany	9.8%	5
4 Siemens	Germany	7.4%	3
5 GE	US	6.6%	2
6 Suzlon	India	5.3%	6
7 Gamesa	Spain	4.6%	4
8 United Power	China	4%	8
9 Mingyang	China	3.5%	10
10 Nordex	Germany	3.3%	Not in top 10

Although published reports show aggregate sales in industrial markets, there is little literature available that focuses strictly on the wind sector. A practical way to address this limitation is to look at aggregate demand for wind turbines. The size of the bearings market for wind turbines can be estimated by assuming that 3% of total wind turbine cost is for bearings. An industry rule of thumb is that the total investment cost (excluding grid connection) for a wind turbine can be estimated at around 1 million Euros per MW, so the bearings market is about 30,000 Euros per MW. Also, once total projected MW per wind farm is known, and the turbine size used (average size is 2 MW), the number of turbines per wind farm can be calculated.

Demand for Off-Shore Wind. Current global offshore capacity is over 6 GW, which represents 2.1% of total installed capacity. Thirteen new offshore projects were installed in 2013, adding 1.7 GW - 50% more capacity than was added in 2012. More than 6.6 GW of offshore wind are currently under construction in 29 projects in Germany, the U.K., the Netherlands, Belgium, China, Japan, South Korea and the U.S. The average offshore wind turbine size is 4 MW. The average offshore wind farm size was 485 MW in 2013, 78% more than the previous year. The trend towards larger projects is expected to continue over the coming years.

Almost 47% of new offshore capacity in 2013 was installed in the U.K., all of it supplied by Siemens. The U.K. retains its status as the largest offshore wind market, and Siemens holds on to its title of the largest offshore turbine supplier. Germany is also a leader in offshore wind development. In the Far East, China added a 36 MW offshore intertidal wind plant, while Japan added a 16 MW near-shore project. China has seven offshore projects underway in 2014; expects to add 5 GW of

[13] Stefan Karlsson, Global Segment Manager, SKF Renewable Energy, Warsaw, Poland, April 21, 2010

offshore capacity by late 2015. There are few offshore projects in the U.S. (e.g., MA, DE, RI, NJ, TX). Offshore projects are closer to population centers and thus have lower transmission costs, but offshore turbines are more expensive than onshore ones. We can expect to see more U.S. offshore wind projects soon. Permit applications are being reviewed by the Bureau of Ocean Energy Management (Department of Interior).

Industry Trends. The industry trend is toward larger turbines (average size now is 1.9 MW) that are lighter, have a longer service life, and are placed in remote and harsher environments. Greater diversification in application is expected, such as turbines for lower speed, higher altitudes, and use in areas with blade-tip to height limits. Direct drive or gearless turbines are 28.1% of all installed turbines. The global gearless wind turbine market is projected to grow at a CAGR of 14.43% during 2012-2016[14]. One of the key factors contributing to this market growth is the increased capability of offshore wind turbines. The major direct drive wind turbine OEMs are Enercon, Goldwind, GE Wind, Siemens, Dongfang Electric, Vensys Energy, and Leitwind AG. [15]

Services Aftermarket. The services aftermarket will grow significantly due to the growing installed base and warranty expiration for 33% of current installations. The expected average life of a turbine is twenty years. MAKE Consulting expects 10% growth per year in this market on average over the next six years. While traditional markets in Europe and their large installed bases constitute the greatest share of demand, the rapidly growing installed base in Asia Pacific is expected to provide significant opportunities over the next decade. MAKE expects the services aftermarket in the Americas to reach $3.8 billion in 2020. [16]

While the sector's growth is promising, revenues and profit opportunities vary significantly based on a company's ability to differentiate itself in scheduled maintenance, remote monitoring, minor correctives, technical support, spares and distribution, major correctives and component upgrades. Scheduled maintenance services are generally the least profitable, but major correctives and component upgrades have traditionally been the highest-profit opportunities in the market and are expected to offer a revenue potential of $36.5 billion in 2020. [17]

Many owners of large wind farms have decided to perform planned maintenance in-house through the development of an internal services division or through acquisition of independent service providers (ISPs). Self-performing asset owners are a growing population and are able to utilize a cost and experience advantage to put significant pressure on full-service ISPs and turbine OEMs. Turbine OEMs globally have recognized the aftermarket opportunities and are aggressively pursuing post-warranty service agreements. OEMs are marketing their intrinsic competitive advantages, including advanced knowledge of the turbine, proprietary upgrades and access to spare-part supply, as key selling points to adopt aftermarket services.

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[14] http://www.researchandmarkets.com/research/z6hdq9/global_gearless
[15] Ibid
[16] http://www.nawindpower.com/e107_plugins/content/content.php?content.13167
[17] Ibid

ISPs present an attractive alternative to the turbine OEMs for aftermarket services. ISP business models run a full spectrum, from planned service to project-based maintenance, presenting many opportunities to asset owners seeking flexible, cost-effective and reliable service. Bruel & Kjaer Vibro, Gram & Juhl, Pruftechnik, and Mita-Teknik are major ISPs.

Grid Parity. Onshore wind power will reach parity with traditional fossil fuels in Europe, U.S., and Asia by 2015.[18] Currently wind is on average worldwide about 10% above grid parity -- the level at which it's able to compete with other technologies if all are subsidy-free. Larger and more efficient turbines will help wind become competitive within two years, and further drive down costs through 2020. Wind turbine prices have fallen 20 to 35% from their highs back in 2008, and these declines are pushing project-level costs down. Based on a large sample of wind projects, average project costs in 2012 were down almost $200/kW from the reported average cost in 2011 and down almost $300/kW from the reported average cost in both 2009 and 2010. [19]

"Wind will be a very competitive power generation technology in 2020, cheaper than all the fossil fuel technologies" in the European Union, Robert Clover, research director at Aarhus, Denmark-based Make, wrote in the study. In the U.S., "in 2020 wind will be one of the most competitive power generation technologies, cheaper than coal and nuclear technologies and at least comparable to gas." [20]

WIND-RELATED REGULATIONS AND INCENTIVES

European Union. The European Union has set binding renewable energy targets to derive 20% of total energy consumption (electricity, heating/cooling, and transportation) from renewable sources by 2020. Feed-in tariffs are the most commonly used incentive mechanism in the E.U. However, there has been a recent increase in use of market premiums, green certificates, and government-based tenders. A second trend is an increase in the reduction rate of FIT payments, even including retroactive reductions. Political, economic, and power system concerns are influencing this trend. [21]

The E.U. Emissions Trading System (EU ETS) is the first and by far the largest international system for trading greenhouse gas emission allowances. It covers more than 11,000 power stations and industrial plants in 31 countries, as well as airlines. A cap is set on the total amount of certain greenhouse gases that can be emitted by any entity within the system. The cap is reduced over time so that total emissions fall. In 2020, emissions from sectors covered by the EU ETS will be 21% lower than in 2005. By 2030, the Commission proposes that they be 43% lower. [22]

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[18] http://www.bloomberg.com/news/2013-02-27/wind-power-to-compete-with-fossil-fuels-by-2015-make-says.html
[19] 2012 Wind Technologies Market Report, U.S. Department of Energy
[20] Op. cit.
[21] Phillip Brown, European Union Wind and Solar Electricity Policies: Overview and Considerations Congressional Research Services, August 7, 2013
[22] http://ec.europa.eu/clima/policies/ets/index_en.htm

Within the cap, companies receive or buy emission allowances that they can trade with one another as needed. They can also buy limited amounts of international credits from emission-saving projects around the world. The limit on the total number of allowances available ensures that they have a value. Nevertheless, a price drop in emission allowances in 2013 threatened the program's existence. An oversupply of 2 billion allowances has prompted proposals - most recently from the U.K. - to overhaul the system.

Yearly a company must surrender enough allowances to cover all its emissions, otherwise heavy fines are imposed. If a company reduces its emissions, it can keep the spare allowances to cover its future needs or else sell them to another company that is short of allowances. The flexibility that trading brings ensures that emissions are cut where it costs least to do so.

Germany (32.3 GW) and the U.K. (18.8 GW) installed nearly half the new capacity installed in the E.U. in 2013. As such, the policies of these two countries are explored in greater detail.

The Fukushima accident in Japan in 2011 profoundly influenced energy policy in Germany, prompting it to exit nuclear energy by 2022 and ensuring the continued growth and support for renewable energy. In addition to increasing incentives, the government has been improving the regulatory framework for renewable energy by reducing planning law restrictions for renewable energy projects and establishing a €5 billion loan program for offshore wind farms through the state-owned development bank.

The central pillar of the German renewable energy regime remains the FIT system combined with a guaranteed right of access to the grid for renewable energy projects. Grid operators must connect renewable energy plants to their grid and remunerate generators for all the energy they feed into the grid. The FIT system applies for 20 years including the year of commissioning. FIT levels vary by renewable energy type. The highest tariffs are for solar PV energy, geothermal energy, some types of energy from biomass and offshore wind energy. The costs of grid operators remunerating renewable energy generators on the basis of the FIT system are transferred at various stages of the energy supply chain via a levy system and ultimately the end consumer bears the costs.

In 2011, the government reduced the FIT for onshore wind, and increased the yearly reduction rate for newly commissioned projects from 1 % to 1.5 %. These changes reflect that the onshore wind energy sector is a mature part of the energy industry and requires less start-up support than other renewable energy types. In contrast, Germany has increased its support for offshore wind. The yield of an offshore wind farm is larger than that of an onshore one and potentially can add large amounts of new generation capacity. There are two tariff systems for offshore wind that vary by size of remuneration and initial remuneration period, and depend on the water depth and the distance to shore. After the initial remuneration period, the FIT for both tariff systems will be reduced. [23]

[23] http://www.nortonrosefulbright.com/knowledge/publications/66180/european-renewable-energy-incentive-guide-germany

The United Kingdom has committed to a legally binding target of sourcing 15 % of its final energy consumption (including electricity, heat and transport sectors) from renewable sources. In order to meet its obligation, the government estimates that around 30 % of the U.K.'s electricity and 12 % of the U.K.'s heating must come from renewable sources by 2020.

About 25 percent of the U.K.'s existing generation capacity (mainly coal and nuclear) will close in the next decade as generating plants reach the end of their life cycle or as a result of E.U. emissions standards. Substantial investments are needed to develop new generation capacity to meet rising demand. The government's strategy is to prioritize investments in the renewable energy sector, nuclear generation and, in time, gas and coal with carbon capture and storage.

A new FIT system called "contracts for differences" is being phased in. It is a contract to pay or be paid the difference between a market reference price for electricity and an agreed "strike price". It is a two-way contract which could lead to the generator receiving payments from or having to make a payment to its counterparty. This system is designed to shift the electricity market price risk from the generator to the consumer, reducing risk and the cost of capital for investors. This new system will co-exist with the current support system until 2017 when the latter will be phased out.

Energy generators also are allocated Renewable Obligation Certificates for each MWh of renewable energy they produce. Licensed electricity suppliers must source a proportion of the electricity they supply from renewable sources or pay a published buy-out price.

A tax on fossil fuels used in the U.K. to generate electricity was introduced in 2013 and effectively increases the wholesale electricity price. This should benefit the renewable energy industry as electricity from renewable sources is exempt from this tax.

Offshore wind will likely play a significant part in the energy mix in the U.K. as rights to develop up to 32 GW of offshore wind farm capacity by 2020 were granted in 2009. Nine developers or developer consortia were granted exclusivity over specific zones of the U.K. sea bed for the development of offshore wind farms. The latest round of bidding aimed to deliver a quarter of the UK's total electricity needs by 2020. This equates to up to 32 GW of offshore wind farm capacity being installed at a cost of up to £75 billion. It is unlikely that the successful partners alone will be in a position to meet this huge level of investment; therefore there is considerable potential for third party investors to become involved. [24]

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[24] http://www.nortonrosefulbright.com/knowledge/publications/66174/european-renewable-energy-incentive-guide-united-kingdom

China. [25] China's Renewable Energy Law (2005) (1) sets middle and long-term national targets for the total volume of renewable energy development; (2) mandates connection with the grid and the purchase of electricity from licensed renewable energy generators, and (3) makes available preferential loans with subsidized interest rates, and grants tax benefits for renewable energy projects.

The National Development and Reform Commission (NDRC), which was initially responsible for implementing this law, set the target for renewable energy at 10% of total primary energy consumption by the end of 2010, and 15% by 2020. The latest Five Year Plan (12th) aims to reduce energy intensity an additional 16% by 2015.

The NDRC approves wind power projects over 50 MW and sets prices for electricity generated by these projects. Wind projects under 50 MW can be approved by local governments, but prices for wind power are generally subject to final approval by the NDRC. Typically, a regional grid power company enters into a long-term power purchase agreement to buy electricity from the selected bidder over the life of the wind project, with the national government guaranteeing the power purchase. The bidding process also determines the in-grid tariff, with the agreement specifying how much electricity the bidder would provide to the grid. Also, foreign companies were expected to be attracted by the long-term purchase power agreement to invest in China's wind energy sector. Initially, winning bids were often too low to make the projects economically viable. This prompted the government to change the weighting of power prices in evaluating bids. In 2009, the NDRC replaced the public bidding process and instituted FITs for wind power, scaled according to the available wind resource and construction conditions in the various regions of China.

Bidding for offshore wind concessions is similar to onshore. However, developers must be Chinese-funded enterprises or Sino-foreign joint ventures with majority Chinese ownership. The process of establishing concession areas has already begun with government agencies issuing an "Interim Measure" in 2010 concerning regulations for developing offshore capacity. In 2012, China's offshore installed capacity was about 260 MW, which accounts for only about 0.5% of installed wind capacity. China's current goal is 30 GW of installed offshore wind capacity for 2020.

Financial support for renewable energy in China involves subsidies, tax policies, pricing mechanisms, and a reward scheme for green production. Subsidy support is extended to overhead costs of programs (i.e., administrative, operational, and other expenses for government renewable energy agencies), renewable energy technology research and development, and provincial or local electrification projects. Tax incentives can come from the central or local governments, and can be technology specific. Pricing for renewable energy is not standardized, and is set by contracts negotiated between projects and utilities.

[25] Richard J. Campbell , China and the United States- A Comparison of Green Energy Programs and Policies, April 30, 2014.

Renewable energy is subsidized by a rate fee charged to all electricity users in China. Electricity customers in China pay rates according to customer class. The fee was originally based on the incremental cost difference between coal and renewable energy. The fee goes to the companies that operate the electricity grid and must buy the renewable power from project developers. The fee for industrial users of electricity doubled in 2009. However, reported problems with levels of payments into the renewable energy fund led to delays in reimbursing generators of renewable energy. To address the issue, the NDRC shifted the burden of renewable energy funding to the industrial sector in 2013 by doubling the industrial surcharge, while keeping the fee levied on other electricity customers the same.

Latin America. Wind power development is progressing in this region without the support of traditional incentive mechanisms or renewables targets, especially Brazil and Mexico. The few incentives that are used include investment or other tax credits, public investment, loans, or financing and public competitive bidding[26]. While several regional development banks have facilitated financing for many Latin American projects, the value proposition of wind power has proven attractive to central power authorities, utilities and private off-takers in the region. High power prices and strong growth in demand for electricity in the majority of the region's markets have facilitated the incorporation of wind into regional power mixes without feed-in tariffs or production incentives.[27]

United States. The production tax credit (PTC) is a 10-year, inflation-adjusted credit that is now 2.3 cents per KWh. The importance of the PTC to the U.S. wind industry is illustrated by the deep troughs in installations when the PTC lapsed and by peaks in installations preceding its expiration. The spike in wind additions in 2012 and the trough in 2013 clearly demonstrate the importance of this credit. The PTC was extended in January 2013 as was the ability to take the 30% investment tax credit in lieu of the PTC. While the credit was not extended in 2014, the IRS determined that construction that began by January 1, 2014 will receive the credit. The future of the program is highly uncertain. Many observers think that its fate depends on the outcome of the 2014 midterm election and the prospects for a broader deal to extend other tax exemptions, deductions or credits.[28]

The PTC lowers total project cost and encourages innovation to generate more KWh per project. Revived uncertainty over renewal of the PTC led to a race to get projects started before the most recent PTC expired in 2013. [29] That may explain why renewable energy is 54% of added U.S. electrically generating capacity so far in 2014. [30] There is no breakdown by type of renewable energy in 2013, but wind was 43% of added capacity in the U.S. in 2012.

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[26] Taxes and Incentives for Renewable Energy, KPMG, June 2011

[27] http://www.nawindpower.com/e107_plugins/content/content.php?content.12790

[28] http://www.eenews.net/stories/1060001293

[29] The IRS changed the eligibility criteria from project completion by December 31, 2013 to construction initiation. There is no fixed deadline by which time projects beginning construction in 2013 must be placed in service; however, continuous activity must be maintained and provisions exist to streamline qualification for those projects that are commissioned prior to year-end 2015.

[30] Bloomberg Business Week, June 30-July 6, 2014

The Investment Tax Credit (ITC) is another tax scheme that the facility owner can often choose in lieu of the PTC. The credit provides a credit equal to 30% of expenditures for solar, fuel cells, and small wind and 10% for geothermal, microturbines, and combined heat and power. With a few exceptions, there is typically no maximum credit or cap, however there are often system size and efficiency requirements that must be met in order for ITC eligibility. The American Recovery and Reinvestment Act extended the program to include facilities in service on or before December 31, 2016. [31] [32]

Renewable Portfolio Standards (RPS) are regulations that require the increased production of energy from renewable energy sources, such as wind, solar, biomass, and geothermal. They currently exist in 29 states and Washington D.C. From 1999 through 2012, 69% of the wind power capacity built in the U.S. was located in states with RPS policies; in 2012, this proportion was 83%. Efforts to establish a national RPS have been introduced twice in the U.S. Senate and failed. Although no new state RPS policies have been passed in the last two years, a number of states strengthened previously established RPS programs. Attempts to weaken RPS programs also have been initiated increasingly in some states, although those efforts have not—with few exceptions—led to meaningful changes in RPS design thus far. Renewable Portfolio Standards (RPS) encourage use of renewable energy, but will have an only moderate impact on future wind sales; maybe 3-5 GW per year through 2020 (only a portion of which will be from wind). [33]

RPS schemes tend to be aided when paired with Renewable Energy Credit (REC) systems. At the point of electrical generation, a renewable energy source can receive credit for its environmental benefit. These credits accrue to the owner of the electrical generation and can be traded on a market. For example, if a power producer has a RPS but cannot meet the target with their current renewable energy generation capacity, they can purchase credits from other producers who have excess renewable energy credits. [34]

Feed-in tariffs are much more common in Europe than in the U.S. Many European countries have adopted national feed-in tariffs (Germany, Austria, Spain, Portugal, France, and Greece). Ontario, Canada has a feed-in tariff and seven U.S. states have permanent or pilot programs as of June 2013 (California, Hawaii, Oregon, Rhode Island, Vermont, Maine, and Washington). Typically, feed-in tariffs guarantee owners of renewable energy systems a connection to the electrical grid, and require utilities to pay a premium rate to the system owners so that they can earn a reasonable profit over a fixed term, usually 15-20 years. The premium rate varies by technology to insure that each renewable energy type can profitably be installed and operated. U.S.-based feed-in tariffs tend to favor distributed systems that are owned by private residents, small businesses, or communities. This preference is explicit in legislation in Hawaii, California and Vermont, which limits the size of the systems that qualify for the tariff to less than 5.0 MW, 3.0 MW and 2.2 MW, respectively. [35]

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[31] http://energy.gov/savings/business-energy-investment-tax-credit-itc
[32] http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US02F
[33] 2012 Wind Technologies Market Report, U.S. Department of Energy
[34] http://www.epa.gov/greenpower/gpmarket/rec.htm
[35] http://www.eia.gov/electricity/policies/provider_programs.cfm

Accelerated depreciation enables wind farm owners to depreciate the vast majority of their investments over a 5- to 6-year period. An even more attractive 50% first year "bonus depreciation" schedule was in place during 2008–2010. This first year bonus was increased to 100% for those projects placed in service in 2010-2011, then reverted to 50% for projects placed in service during 2012. The American Taxpayer Relief Act then extended this 50% bonus depreciation for qualifying property placed in service in 2013 (and 2014 for certain long-lived property).

Further, the U.S. has two regional cap-and-trade schemes: California and the Regional Greenhouse Gas Initiative (RGGI). The California initiative was launched on January 1, 2013 and aims to cover 85% of GHG by 2015. The ambitious program shows early signs up success, including stabilized secondary market prices and interchangeability with the Quebec cap-and-trade program. [36] [37] [38] The earlier RGGI scheme includes Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, Delaware, and Maryland. RGGI has achieved gains though not without some difficulties, including low natural gas prices and New Jersey's exit. A new cap of 91 million tons in 2014 with 2.5% decline from 2015 – 2020 will significantly reduce GHG compared to the original cap. [39] [40]

Other Factors Affecting Demand for Wind Energy. Growth in demand for U.S. energy is slowing due to demand-side management (e.g., incentives to encourage energy use in off-peak hours), energy efficiency (e.g., Energy Star appliances, LEED certified buildings). Natural gas is very competitive with wind on price and puts pressure on wind demand as well as on wind project costs. Utility-sized solar installations are still more expensive to build than wind projects, but their costs are declining. On the other hand, an EPA ruling that requires 30% reduction in carbon from power plants by 2030 will lead to closing a large number of coal-fired plants and replacing them with less carbon-intensive alternatives such as wind.

[36] http://www.edf.org/california-cap-and-trade-updates
[37] http://www.arb.ca.gov/cc/capandtrade/capandtrade.htm
[38] http://www.climateactionreserve.org/wp-content/uploads/2009/05/CA-Quebec-Slidedeck.pdf
[39] http://www.rggi.org/
[40] http://www.eia.gov/todayinenergy/detail.cfm?id=14851

QUESTIONS FOR MBA TEAMS

1. What is the likely impact of regulatory and legislative developments (domestic and global) on demand for wind farm projects and wind turbine sales?

2. How should SKF position itself strategically between now and 2020 to take optimal advantage of these regulatory and legislative developments?

3. Speculate on how your answers to the above two questions might impact the size and composition of the BeyondZero portfolio in 2016 and afterwards.