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CHANGING ENERGY DYNAMICS IN EUROPE

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ABSTRACT: The newly emerging energy game and changing trends in Europe going to influence the energy map of the world. The volatility of power & gas market has opened new opportunities for midstream companies in one way while the low oil & commodity prices has put same companies in situation to renegotiate their long term oil-gas contracts with supplier. The entry of new technologies and advancement in renewable sector has shifted whole portfolio mix for many power generation companies.

The current paper shall elaborate changing government policies and various factors affecting the energy business in Europe and hedging strategy of major energy-utility companies (mainly utility & midstream sector). Based on secondary research, interviews and discussions with the key personalities of energy sector, the paper also studies the dynamics from the perspective of the world energy market. The study shall be helpful to understand developed and mature energy market and provide good learning base for emerging economies like India.

1. INTRODUCTION

On the fine sunny Sunday of 16th June, 2013, power market of Germany witnessed very strange thing. The retail power was available at negative €100 per MWH. It means power generation companies were forced to pay the grid- keepers to take their electricity. It happened as the demand was suddenly bottomed up and electricity price went to lowest. Between 2pm and 3pm, renewable sources like solar and wind pumped around 28.9 GW of power, much above than expectation. The grid at that time was not able to handle more than 46 GW unless becoming unstable. At the peak, total generation was over 50 GW; so prices fell suddenly to encourage generation cut and safeguard the grid from overcapacity.

At that time, the major sources of power generation respectively were nuclear, coal, gas and renewables which were throwing electricity into grid. The power plants based on nuclear fuel or brown coal are designed such way that cannot easily switched off to reduce production, while the energy coming from solar and wind power is unrestricted. So the load of adjustment fell on gas-fired and hard-coal power plants, whose output plunged to only about 10% of full load capacity.

Such event is an example of complex problem faced by mature and developed energy market such in Europe opposite to market of power-scarce regions of developing countries. It is also a small-scale version of the challenges affecting European market-Germany in particular where renewable sources of energy are becoming more important and regulatory policies forcing energy industries to change traditional way of operating.

European energy market is into developed and mature stage having all infrastructure facility with suitable trading and distribution mechanism. For developing countries, on one hand energy market which is currently into nascent stage with lot of demand faces issues like poor infrastructure, availability & supply problems, on other hand European market faces major challenges due to changing govt. regulations, decreasing demand and geopolitical issues.

European market, which pioneered in CO2 emission trading, is undergoing a profound transformation with energy transition coinciding with technological advancement and regulatory changes due to commitment of reducing greenhouse gas emissions by 40% below 1990 levels by 2030. Nuclear phase out is another major challenge initiated by German government. Security of gas supply is also raise concern in current hostile environment between Russia and Ukraine.

As demand of power consumption stagnates, utility companies in Europe continue to be in hot water. Energy business revenues are directly linked to the demand for consumable energy. Final Energy Consumption (FEC) remained growing between 1990 and 2009. But after 2010 FEC levels has declined from earlier 20 years which is clearly not good sign for energy-utility companies. (Final energy consumption-FEC is defined as the total energy that reaches the end-users for consumption which include individuals, households, agriculture and industry).

The perfect indication is their stock prices which are also crashing like anything. Once considered the quintessential safe stocks and good investment bet, now no more attracting investors. Such energy-utility companies are now undergoing big restructuring as they respond to regulatory changes, demand fluctuations, price volatility and new energy trends. Such development has forced some utility companies to break down their business units into different entities to separate loss-making unit from profit making business. Fully-integrated* energy companies are selling their hydrocarbon and upstream assets to focus on one business and remain profitable. More effort is given to trading and midstream business to become more efficient. They have also started investing heavily in renewables apart from their traditional business.

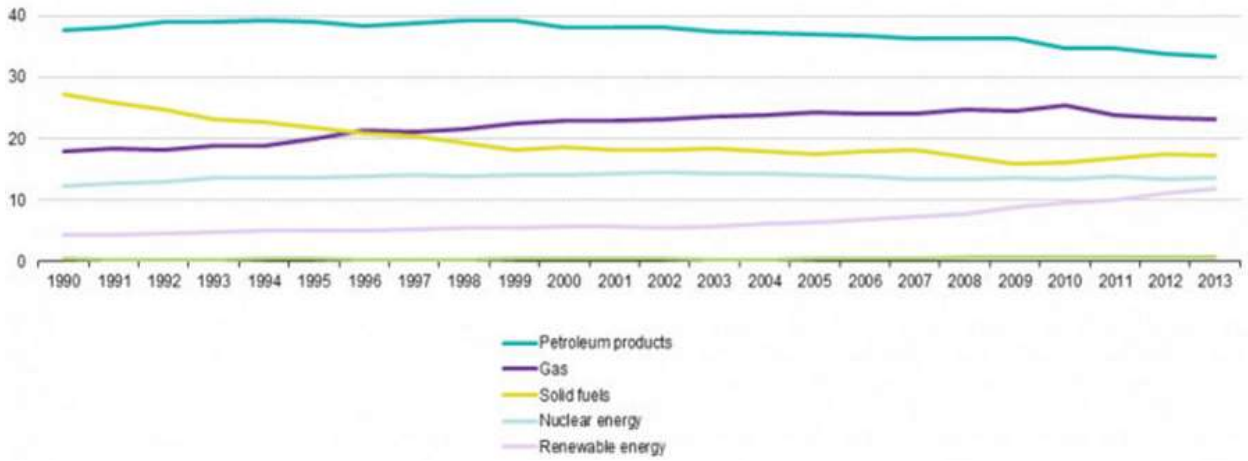
My research would analyze such factors in detail and also focus on changing strategy of energy-utility companies. The main epicenter of study would be Germany and European Union energy & utility business with little attention to other countries and upstream companies.

2. EUROPEAN ENERGY MIX

The energy industry involves the production and sale of energy, including crud exploration, refining and distribution. In broad terms, the energy sector comprises the petroleum industry-oil & gas, logistics & refining companies and the power utility industry including electricity generation, distribution and sales. As petroleum industry is categorized into upstream, midstream and downstream same way the utility company could be also categorized based on type of electricity generation such as coal based, nuclear based, gas based and slowly but steadily increasing renewable base.

European Union countries comprise only 2.8% of Global petroleum production which is not sufficient to fulfill its total energy demand. Since early 2000, crude oil production in Europe has been continuous dropped and it also missed out new fracturing boom unlike US. It is importing Petroleum products from other countries. In such condition, the major chunk of European demand is fulfilled by Gas supply through

Russian originated pipelines, internal coal reserves and nuclear based power plants. Total energy mix in European countries is as shown in below image.



Source: http://www.mining.com, Gross Inland consumption EU-28- Source)

Renewables have steadily increased in consumption since the 2000, and as a result the amount of electricity driven by renewables was around 12% higher in 2014-15 than it was in 1990. The energy source that has seen the least fluctuations in total usage for energy is nuclear energy. Until now its usage in power and other source as energy has remained steady. But now this trend is also going to change.

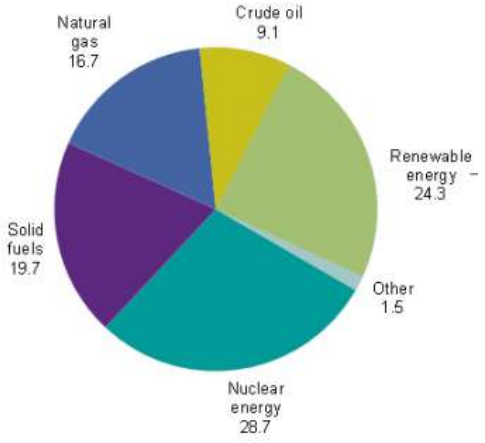
Consumption of gas is also an exciting story. Natural gas has been used more prominently in recent years as it became regarded as more environmentally friendly clean fuel than other fossil alternatives. However, as Europe is trying to reduce its dependence on Russian gas, leading to decline in its consumption in recent time for overall energy need including electricity.

The European Environmental Agency (EEA) measures final energy consumption-FEC and finds that the transport sector is responsible for around 32% of total energy consumption, households 26.2%, industry 25.6%, services 13.5% and agriculture 2.9% of total FEC in 2015. *(Source: EEA).*

3. ELECTRICITY GENERATION

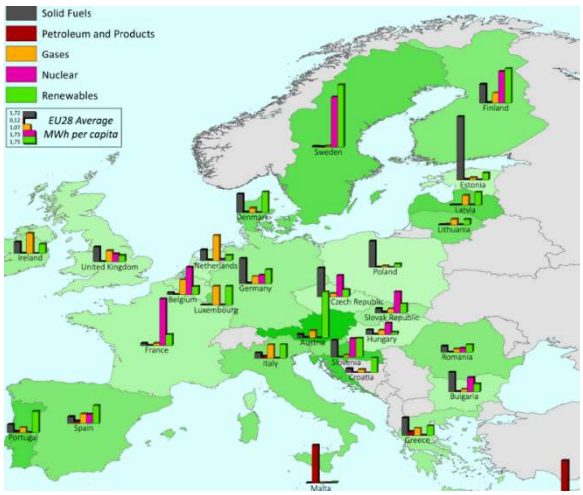
Traditionally, electricity generation in Europe is mainly based on Nuclear, Natural Gas and Coal (Solid Fuels). The major European countries highly depend on nuclear power for more than one-quarter of its electricity, and a higher proportion of base-load power. Break-up for energy generation in European Union countries based on type of fuel is shown in Figure 1.

FIGURE 1: *Energy generation in European Union countries based on type of fuel*



(Source-http://ec.europa.eu/eurostat/statistics)

FIGURE 2: *Europe's electricity consumption by country and fuel type*



(Source: INFOGRAPHIC)

Some outliners in Europe are countries like Estonia, Malta, Cyprus. Estonia is the only European country that relies heavily on solid fuels, with 86.6% of its energy needs met this fuel type, where shale gas is also considered part of solid fuels. Malta and Cyprus depends on petroleum products, which account for 98.3% and 92.4% of consumption respectively. They are small island-nations with little populations and resources to pursue big infrastructure spending on things like nuclear power plants. They simply import what they need, which allows them flexibility.

France is the biggest user of nuclear power, with 74% of consumption coming from that source. Belgium, Hungary, and Slovakia have more than half of their power coming from nuclear. Austria uses the most renewable energy with 80%. That said, the vast majority of this comes from hydro, where Austria uses its mountainous terrain to its advantage.

Germany is one of the largest consumers of energy in world and the highest in Europe. Due to abandon reserve of coal conventionally, almost one quarter of electricity in Germany produced based on coal. Germany is the 5th largest consumer of oil in the world. Russia, Norway, and the United Kingdom are the largest exporters of oil to Germany. Germany is also the third-largest consumer of natural gas in the world. Almost 39% of Germany's natural gas comes via pipeline from Russia.

Because of its rich coal deposits it has a long tradition of fuelling its economy with coal. It still is one of the top five consumers of coal in the world, even though it has started closing out domestic coal mining. Germany has the largest market of electricity in deregulated and mature European market. Nuclear power in Germany accounted for 16% of national electricity supply in 2015, compared to 23% in 2010 thanks to German government policy of nuclear plant phase out by 2022.

4. ELECTRICITY MARKET OF EUROPE

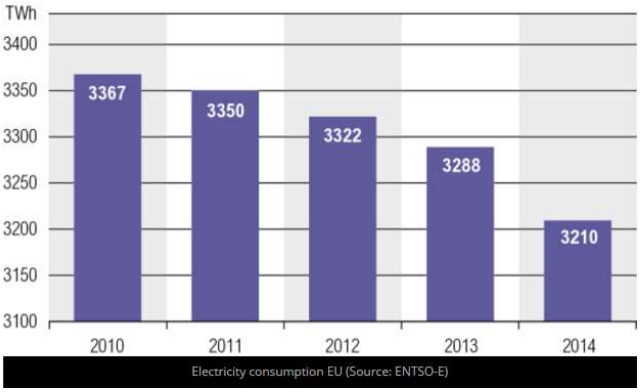
The European power market is continuously experiencing substantial changes with changing time. In 1990, the United Kingdom was the first country in Europe to liberalize its electricity market and set the example for other European nations for change in power dynamics that had driven EU liberalization and indirectly forced for unbundling of electricity market. Over the time, many steps were taken for achieving this aim by EU authority. In Germany also, with the passage of the energy law of 2005, the electricity market undertook an additional reform after the reform of 1998 which was initiated by the European Union (EU). Electricity generation, transmission and pricing were subjected to the new regulation; the wholesale market made advancement in the whole EU and the prices on the Exchange such as European Energy Exchange (EEX) became deciding factor.

In Europe, at present around 260-Million European customers are connected to electricity distribution grids. Around 2000 electricity distribution companies employing 2,00,000 people across the EU are responsible for providing a reliable and quality of supply to their customers. The German electricity market is the largest within the EU. It is connected to all neighbouring countries and in the way of achieving single power market within EU, there are considerable power flows have started between countries. The technical integration of

the central European network is managed by the Transmission Service Organizations (TSOs) long before the liberalization in Europe. The supply-demand through grid management is done by Distribution System Operators (DSOs) and Transmission System Operators (TSOs). They are jointly in charge of maintaining security of supply and providing quality service of electricity in the grid system throughout the Europe. (Figure Source: Wikipedia, Transmission Grid Operator Network in German.

The top ten power companies in Europe are EdF, RWE, E.ON, Enel, GdF Suez, Vattenfall, Iberdrola, CEZ, EnBW and PGE – which make up around 80% of the electricity through direct or indirect subsidiaries. The total electricity consumption in the EU Countries was 3.21 million GWh in 2014-15 — which is the third consecutive fall in output from earlier years.

FIGURE 4: *Electricity consumption in Europe union*



Presently, The European Union countries have unanimously set an ambitious goal of reducing its greenhouse gas emissions by 40% by year 2030 with strong policy framework. This will require lot more investment in renewable sector than present one with additional resources for wind and solar generation as well as measured policies to deal with the fluctuating & not-so-regular capacity offered by such renewables. The integration of national power systems into a single European system would provide huge benefits in levelling such fluctuations, enabling the whole power market to further increase its reliance on renewables. In this changing market Current utility companies and other market participants are facing challenges as expected for adapting to the new environment, but it is very important for them to sustain in this wave by adopting new ways.

5. CHANGING ENERGY DYNAMICS AND MAJOR CHALLENGES

It is apparent from the aforementioned historical data that energy consumption from traditional sources is declining in Europe. The Energy Information Administration projects that while the upward consumption of electricity growth is guaranteed over the long run, the medium to short-term direction of the market would remain uncertain. European electricity market is poorly hurt by changing regulatory policies, low electricity prices, overcapacity due to slow growth in Europe and renewable energy development. Wholesale electricity prices have dropped by around 30% and continue to decrease in EU markets. Power companies today can hardly bear their variable costs with present electricity-market model. No energy company is able to invest more in building new production capacity. This decline in pricing and sluggishness in retail consumption directly impact business revenues of all energy companies. While decreasing Oil & Gas prices has put upstream European companies like BP in difficult situation, falling power consumption demand has affected bottom line of utility companies as well. Fully-integrated energy companies also finding them in hot water situation. Either they are

restructuring their business or selling out their assets.

Amid such decreasing demand, traditional utility companies are trailing behind due to the availability of alternate energy sources like renewable energy. Business myopia of such traditional energy companies to foray into emerging trends and changing market scenarios has failed them to diversify their business by enlarge till now. Currently none of the world's top 10 solar utility companies is from Europe. Two of the UK's big six and Germany's big four still remain heavily dependent on coal burning for their current revenues. i.e. RWE is facing difficulties to deal with its traditional portfolio of power generation which contain lignite (37% of the company's total power generation), coal (23%), gas (18%) and nuclear (15%) and only 4% renewables. This is one of the challenges faced by energy companies

Various other factors are as below.

6. CHANGING REGULATORY FRAMEWORK & REDESIGNING OF EU POWER MARKET

The European Union is on the edge of a full restructure of its electricity market including greater cross border trading of electricity. Market rules are supposed to change in accordance of the single decentralized system where renewables and the consumer would be the king. Changing regulatory norms & market rules are becoming challenge for utility companies as they may face newly arising issues such as grid bottleneck, inter-connection blocks, guarantee of supply & fluctuating demand. Also they will have to come up with diverse connectivity criteria between various Transmission Service Organizations.

At present, the market participants are also facing the heat in the form of enormously augmented & stringent regulation. Initially in the form of EMIR (European Market Infrastructure Regulations) and now REMIT (Regulations on Energy Market Integrity & Transparency). Although the aim of these regulations is to bring more transparency, their initial effects are really challenging for companies in many ways. Firstly, to hedge against the market manipulation, extra burden and complication have been added for market contributors who have to increase risk management and report trades to authority in transparent manner. Furthermore, such stringent regulations have removed many speculative or financial players from the market and from the ownership of assets as well. The influence of such change has shifted liquidity and strength of market to trading & marketing entity rather power generators and had changed electricity market dynamics rapidly.

The reason EU countries have put their trust on a single power market is to expand wholesale electricity competition among all market participants & electricity provider, with the aim of achieving lower electricity prices and providing cheap power to customers through more efficient use of resources in Europe. In many European countries, wholesale generation & even distribution markets are controlled by a single supplier. In such situation power supplying utility company would be at risk and have to change their current business model by diversifying in other geography.

7. NUCLEAR PHASE OUT POLICY BY VARIOUS EUROPEAN GOVERNMENT

In 2011, after the Fukushima disaster in Japan many European countries started reducing dependency on Nuclear Power. Germany has already initiated process of decommissioning all nuclear power plants under its long-held policy of 2002 for phasing out all reactors by 2022. Eight of the Seventeen operating reactors in Germany were permanently shut down till now and gradual phase-out of nine remaining nuclear power plants is under way. Belgium is also following it. Spain has cut down its plan to add any more nuclear based power plant. Even France, the home of many nuclear giants, has announced plan to reduce drastically its dependency on atomic energy.

Almost all major European utility company owns nuclear power plants across the Europe. Until last decade all of them were running to generate electricity based on nuclear power with heavy investment across the Europe. Now they all have

to shut down such plant with additional cost of decommissioning them. The situation is like someone has robbed all assets and asking cost of doing that. Almost one quarter of revenue generation source is being taken away from major utility companies.

8. REGULATIONS TO LIMIT LIGNITE MINING AND CO2 EMISSION

Coal is categorized into hard coal (Lignite/Anthracite based) and soft coal (Bituminous based). Hard coal power generation is major source of CO2 emission and pollution. Having huge reserves of hard coal almost all countries in Europe till now produced large chunk of power based on it. But commitment to reduce emission under earlier Kyoto protocol and recent COP21-Copenhagen conference various European countries are forcing energy companies to reduce such environment polluting power generation.

In Germany, in an effort to cut power-sector emissions, Economic Affairs and Energy ministry, in March 2015 proposed that old, lignite coal based electricity plants have to pay a levy when they exceed a certain CO2 emissions level. Also government is mulling to ban on Lignite mining. Although such proposal led to fierce opposition as coal industry employs many people around the Europe and most energy companies majorly dependent on Coal for power generation. But growing momentum and strict government norms are forcing utility companies to find alternative as soon as possible.

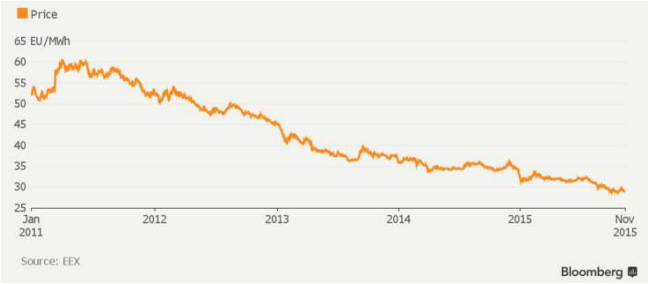
After nuclear thrust this one is another blow to energy companies. It's like someone is asking to fight war without carrying main weapons. Coal and nuclear being main source of power generation for many energy producing companies till now are finding themselves nowhere on the ground. As the rightly said by CEO of RWE

"Debates such as the one over lignite make RWE look like a football team that has been forced onto the back foot and robbed of its ability to play a free-flowing game"

9. DECREASING ELECTRICITY DEMAND AND PRICES

In first sense, reducing oil & gas price should benefit the power generation companies. But the situation in Europe is totally different, along with decreasing commodity prices, demand of power is also reducing and technological advancement with more availability of power than actual need spurring low price of electricity. Excess supply plus depressed demand equals lower prices. Electricity prices have fallen from over €80 per MWh at peak hours in Germany in 2008 to around €30-40 per MWh now.

FIGURE 5: *Electricity price*



Another jolt has come from less cold winter from last few years have also decreased seasonal demand in Europe. Smart technology advancement is making retail users more efficient to save their electricity usage. Still the cost of production is not that much decreasing in line which has created critical condition for them to survive.

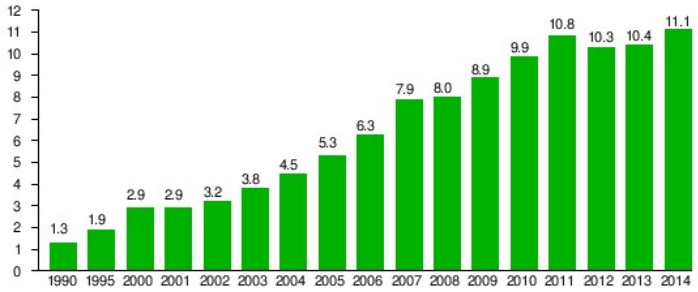
10. INCREASING CONSENSUS FOR USE OF RENEWABLES

Climate change has become one of the burning issues across the Europe. People in masses take out procession against nuclear and coal based power plant and supporting cause of saving environment which has forced government to promote the use of renewables for electricity generation. Drastic reduction in PV cell used for solar power has made the solar electricity cheaper. In the absence of nuclear and coal, various European countries are considering renewables as the best option to fill the void and power generation gap.

Such steps are putting traditional power generation companies in fierce competition against newly renewable based power generation companies. Additionally, increased opposition from environmental organizations and the general public against fossil fuel usage is putting such companies in more pressure.

Germany has planned to generate 70-80% of its electricity from renewable power by 2050, as part of efforts to combat climate change. Subsidies for renewables have increased power generation, and depressed wholesale electricity prices, and this has damaged the profitability of the utilities' coal and gas-fired power stations.

FIGURE 6: *Renewables as a percentage of primary energy consumption in Germany*



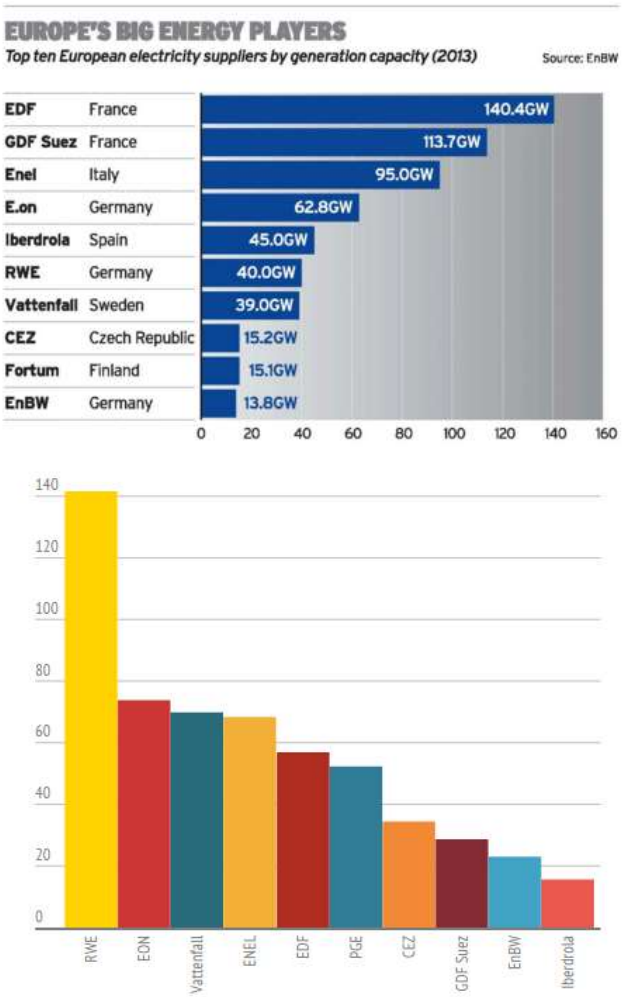
11. GEOPOLITICAL ISSUES

The strained relationship between European Union and Russia due to ongoing Ukraine crisis has worsened situation for European power companies whose gas based power plant depends on Russian originated Gas Pipelines. This geopolitical issue has made painfully obvious how Germany and other EU nations are dependent on Russian natural gas. There are other alternatives like LNG for supplying the natural gas, but they all come at additional price and may further increase production cost of electricity.

12. UTILITY COMPANIES AND THEIR HEDGING STRATEGIES

The value of power generation assets is getting down by billions of euros amid a plunge in wholesale power prices and a bleak future for fossil fuels. One of the top five European energy companies and Germany's largest EON SE posted its biggest net loss of €3.16 billion for 2014. Another Power major RWE posted net loss of loss of €2.8 billion earlier year. Their profit from conventional power plants has also reduced by 42%.

The other companies which were able to diversify early hedged themselves from overall loss but their traditional margins are shrinking to the lowest. Areva part of French Electricity giant EDF- reported a loss of about 4.9 billion euros ($5.6 billion) for 2014.



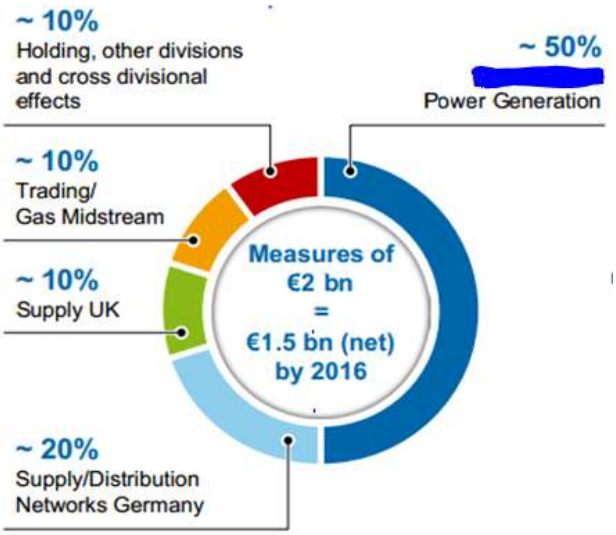
Coal based Power generation of various utility companies in Europe (Source: - http://www.greenpeace.org.uk/)

It's high requirement for such energy companies to think alternative to survive them in changing energy market. Fossil fuels which is still used by many companies for major power generation may lead nowhere to them and they have to invest in renewables as timely need.

13. CHALLENGES BRING NEW OPPORTUNITIES- A WAY AHEAD

To combat against all odds, European energy companies are restructuring their business model, changing their portfolio mix, making their midstream & trading business more efficient and investing in renewables & new technology.

First of all they become more focused and sold of upstream assets to concentrate on one business. Secondly they structurally regrouped their non-core functions by following of operational excellence programs. Also they chose to diversify their portfolios outside the European countries and outside the power generation business such as trading and midstream in order to become less dependent on reality of the declining energy demand.



Source: RWE website

Energy companies have known well now that the business model which has worked well for them around 100 years may not last any longer. Europe's major energy companies are responding in different ways to the new challenges. Germany's EON has decided to split renewable business from conventional activities, whereas CEZ of the Czech Republic is reinforcing its focus on purely clean conventional generation. France's EDF has set asset management partnership with investors to finance its renewable business. RWE also recently introduced radical changes in its energy policy by unveiling plans to spin off its operations focused on renewable power, electricity distribution and retail sales. The group has proposed the creation of a separate listed company and splitting its business is similar to plans by its rival company Eon, which highlights Germany & Europe's energy transition phase.

As the RWE's Head of Innovation Inken Braunschmidt says "We want to be the Uber for energy" RWE recently invested in one of the world's largest solar power company Conergy and planning to invest around one billion euros in renewable energy in the next three years through direct or indirect mode. Apart from it, RWE is optimizing its midstream business. As shown in figure is RWE's plan for revenue generation for next year as they are focusing more on trading business which seems too lucrative in volatile market condition. Presenting RWE's results recently, CEO Peter Terium said: *"In our retail business, we will focus on developing our product and service offerings to existing and new customers. Alternative supply models and technological advances in the areas of smart metering and home automation will become increasingly important to win and retain customers"* (Source:-from Interview with Energy Post).

A market shift is now occurring in European energy and it is impacting everyone involved. Focus on ETRM (Energy trading & Risk Management), big data and smart technology in European power sector is set to bring changes dramatically. The future for European energy is going to be about optimizing assets; not just generating assets.

14. CONCLUSION

Amid falling end-user consumption, the energy business in Europe is expected to remain choppy at least in near term. The situation may worsen further if factors such as financial turmoil, currency challenges, efficiency improvements and a continued migration to renewables with stringent government norms. If relation with Russia further deteriorates then it would be double jolt for most European energy companies who has contract with Russian Gazprom for supply of Gas. Utility companies, especially those which are dependent on traditional sources like fossil fuels and nuclear power are expected to feel the heat of government policy.

Diversification into renewables is critical for long-term sustainability for these European energy business houses. Where there are challenges there are new opportunity as well. A key success factor for growth in the long-run will be to align business in government interests. Regulators and governments have also to play their role and establish rule enabling the market to evolve from a liberalized market to a managed market with opportunity of growth.

The energy companies of many other countries and continents are far from such situation and heavily investing in Nuclear and Coal but for sustainable growth diversification in renewables would be wiser step to survive in long run. The mix-portfolio structure is supported throughout the organization and ensures a long term sustainable position.

One thing is clear that every country would need lot of energy to satisfy hunger of their growing economy- be it European continent or any other in the world. When the economic downturn will start to disappear, the net demand for power may increase again. The companies who able to survive in current challenging environment would be dark horse in coming future. It's all about adjusting with time and streamlining according to situation!

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