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## **“The Justification of Mega-Projects in EU energy mix”**

The logic behind energy mix is simple: Don't put all the eggs in one basket. Relying on one energy source can make the economy vulnerable to the policies of source of supply. The oil shock in 1970 realised many countries to review their energy policies and build energy models which could explain energy-economy interactions. With oil prices skyrocketed, lot of economies found themselves caught in turbulence just because they were heavily dependent on one major source of energy and the supply of which depended on imports from small number of countries. These risks can be reduced by investing in diversified supply sources making the economy less vulnerable to future oil shocks and disruption of supplies.

Energy sector forms an integral part of an economy and every economy requires reliable and continuous supply of energy to develop. Complex energy sector is going through a series of challenges and these challenges comprise of achieving energy security, combating environmental concerns, oil scarcity, rising oil prices and growing energy demand. Such challenges call for an action towards a sustainable energy system that includes appropriate energy mix, use of renewable energy technologies, more efficient and sustainable use of traditional energy sources. To overcome these challenges economies will require major government initiatives, technological breakthroughs, reforms in existing policies and infrastructure; and formation of new regulatory framework.

Europe being one of the developed societies in the world requires huge amount of energy to sustain growth and development. And this can be sustained if the companies invest heavily in mega projects. One more reason for companies to invest in mega-projects is most of the infrastructure was built in 1970s and 1980s and many of them have exceeded their lifetime and therefore the whole infrastructure requires transformation and reformation.

Historically, energy sector has undergone two transitions. First transition was industrial revolution powered by coal due to the radical innovation of steam engines. Second transition was brought about by technological breakthroughs like electricity and internal combustion engines which made the conversion of energy into heat, light and work very commercial. In both the cases scarcity of major energy sources like coal and oil did not play any significant role. But in present scenario, depletion of oil is very much a reality which brings a lot of issues to the forefront, like supply disruption, rising prices and energy security. Moreover the first two transitions brought tremendous amount of growth in the economies which further increased the energy demand. Economies started generating major portion of their revenue from heavy industries and service sector, on the other hand role of agriculture gradually became minimal. This led the population to move away from rural areas to urban

areas which further brought significant increase in energy demand and supply. But to conclude whether mega-projects in energy mix are justified or not, firstly we have to analyse the issues faced by energy sector today and secondly, we have to explore what other alternatives are there besides energy mix and how promising they are?

1. **Influence of Oil Prices:** Rapid growth and development in regions other than developed regions is putting a lot of pressure on existing limited oil reserves resulting in increase in oil prices. Oil forms major part of energy supply in many resource poor countries, making these economies heavily dependent on oil supply. If we look at the trend from 2002 to 2006 rise in oil price has influenced the price of coal and LNG also, thereby increasing the price of energy supply as a whole. As energy forms the base on which an economy runs, rise in its price affects the price of every commodity that depends on it directly or indirectly resulting in the overall increase of imports. However, governments try to offset the increase in spending in energy imports by decreasing the spending in crucial sectors like healthcare, education etc, which can have serious impact on the economy in the long term. Therefore, increase in oil price adversely affects the economic growth.
2. **Energy Security:** Majority of oil reserves are concentrated in Middle East, parts of former Soviet Union and Russia. The economic regulations and political instabilities, particularly Middle East, has caused disruption in oil supply to Europe making EU countries vulnerable to such external effects. To ensure sustainable growth and development it is necessary to be less dependent on such external effects so that economy can perform without any fear of running out of energy supply.
3. **Green house gas emission reduction:** Exhaust gases produced by the combustion of fossil fuels consist various green house gases which in turn cause global warming and change in climate. Growing concern about climate change has put significant pressure on energy systems. Diversification of energy supply can make major impact on climate impact. For example, increasing the share of coal will lead to increase in green house gas emission but on the other hand increasing the share of renewable energy technologies, nuclear or LNG will reduce the GHG emissions.
4. **Growing Energy Demand:** The increase in urban population is driving the increase in energy demand. To meet this demand at affordable price energy system has to undergo major reformation and structural changes. Countries need to build roadmap towards building adequate infrastructure which not only can provide reliable and continuous supply of energy but also generate employment, and maintain healthy living conditions for future generations.

To address the above issues, countries are taking significant measures but because of high penetration of oil in the daily life and its advantages of being a very flexible and commercial fuel are posing as an obstacle for the reforms to be implemented. There is one more dilemma, that besides oil which other energy resource is equally reliable and commercial whether it is nuclear energy, gas or renewable sources of energy? After the Fukushima disaster, public acceptance for nuclear power has reached its lowest point and Japan has already drawn a roadmap to phase out all its nuclear reactors by 2040. Renewable

energy technologies are still in the developing phase and commercially expensive with respect to technology based on coal or oil. However, solar technologies have become very competitive in recent years but have still to prove their worth in the market without subsidies. Moreover among the many renewable energy technologies it is hard to say which one is the most promising universally as they are very much dependent on geographical conditions of the regions. For example, In Sahara region, solar energy is in abundance whereas regions where forests are in abundance biomass are a promising option. Unable to decide which source of energy is going to be the ultimate one, whether it is going to be the solar, fuel cells, biomass, hydro, nuclear, coal, oil or LNG? It will be foolish to concentrate all the financial resources on one particular technology.

One possible solution to all the above issues is to go for diverse energy portfolio. This implies, to build an energy system which relies on multiple sources of energy thereby making the system more flexible and reliable. Now the question comes how to implement this diversity in energy portfolio, whether to build decentralised small projects or centralised mega projects. In the future, majority of population will settle in cities making cities high energy consuming centres. Moreover, Cities are always faced with problems of lack of space and congestion. Therefore, building small decentralised projects will be impractical for cities. Although it is true that mega projects require huge investments but it generates huge returns and employment too, Furthermore, when a product is produced in bulk it lowers its production cost, ultimately benefiting the consumer.

Building mega projects in Energy mix will result in better management of available resources and will take the pressure off from the supply of single major resource. It will lead to huge investment in research and development of new technologies and also, investments will be distributed among various technologies, thereby, mitigate the risks that come with investment in one technology. The share of renewable energy technologies in country's energy mix can address the environmental and climate change concerns. A proportionate burden on different sources of energy will result in reliable and perpetual supply of energy which in turn will sustain the growth and development of society.