Justification of mega projects in the EU energy mix

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Introduction

Global warming and depletion of energy resources are serious global problems. Although most of the countries are aware of these issues, the main priorities are focused on the economic growth and industrialization which have exactly the opposite effect on saving our planet. Developing countries are trying to catch up with the developed ones which are also investing all possible resources to maintain their leading positions. This drive results in the exponential growth of world economy which is unfortunately unsustainable. The problem is that in democratic and also non-democratic countries the first and the most important task of the government is usually to secure well-being of citizens in order to secure re-election or avoid revolution. Sustainability and nature preservation problems are high on the priorities agenda only in very few highly educated societies which are represented maybe only by Switzerland, Scandinavia and partially by Germany and Austria[1]. Unfortunately, the biggest economies behave towards environmental problems only after disasters such as hurricanes in the US or air pollution disasters in several Chinese cities.

From all the superpowers, the EU behaves as the most responsible player regarding ecology and sustainable development. Numerous EU regulations and directives protect environment and resources even on the cost of negative economic growth impact. For example, tough limits on ECO classes of electrical devices (A++,A+, A,B….) or limits on automobiles in grams CO_2 per kilometre. Nevertheless, forbidding classical light bulbs has forced producers as well as households to switch to the energy-saving light bulbs Making similar restrictions seems to be the right way towards sustainability, however, participation of all economic superpowers is necessary. Since the EU is made of 27 countries with different electric grids, different energy regulations and habits, it makes all the common projects very difficult to coordinate.

Project attributes

One of the promising megaprojects is import of solar power from North Africa. This idea attracts lot of attention as North African countries dispose with massive desert land areas in Sahara desert, which are almost unpopulated. The intensity of solar radiation is on maximal (figure 1) world levels and it is relatively close to Europe. All the conditions to build a massive green energy supplier for Europe seem to be ideal. Unfortunately, the

[1] *In Germany and Austria is preservation of environment, all the political parties and movements are strongly bonded with the anti-nuclear campaigning, which is very trendy. Even though the anti-nuclear campaigning has hardly anything to do with activities to prevent global warming and resource depletion, additional activities and programmes are usually promoting ecology and sustainability.*

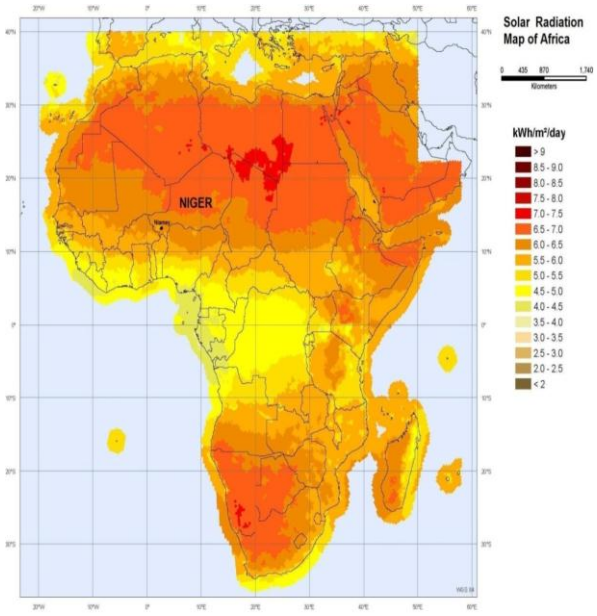

Figure 1: Figure 1: Solar radiation map of Africa.

project faces several crucial problems which are both, technical and political. " Mediterranean Solar Plan" is defined as collaboration in renewable energy field between the EU and its Southern and Southeastern Mediterranean neighbours, involving support of the production of solar energy in North Africa. In addition, there are initiatives such as the initiative of Desertec foundation, which developed challenging picture of 15%-20% energy import to the EU from renewable energy sources from the Mediterranean region. To do the analysis, it is important to present basic types of solar plants. In general, solar power plants could be divided into 3 categories: 1) PV solar power plants, 2) thermal solar plants, 3) concentrating solar plants (figure 2). Concentrating solar plants are mostly used in large scale. They consist of mirrors and lenses to absorb the sunlight. The light then goes to the central unit where it is converted to energy by thermal or PV way. Europe pilot large scale solar power plant is located in the Seville province, Spain - Gemasolar Thermosolar power plant [1]. This power plant disposes with maximal Power of 19.9 MW and effective energy storage which allows supplies 24 hours a day.

Figure 2: Example of concentrating solar power plant (Gemasolar)

Technical obstacles

Solar energy suffers from very low efficiency and relatively high initial costs by solar plants commissioning, however, the efficiency of photovoltanic (PV) solar panels has increased approximately ten times in the last two decades. The highest efficiencies of solar cells can reach up to 42.8 % [2], although the most used commercial types are reaching up to 20 %. The most effective solar cells are still highly uneconomical. European project of the Gemasolar plant has proven that solar technology can provide relatively high and reliable power output when it is built in a suitable location. The problem is still the high prices of which the significant portion is consumed by energy storage. Building similar solar plants on the Sahara desert would have to face additional challenges. In order to avoid power drop, the mirror reflecting surfaces must be regularly cleaned and maintained. The costs could be higher in dusty and sandy desert areas. Transport losses in cables from distant desert areas to the African urban areas or Europe could be enormous. Long distance

cables manufactured from high temperature superconductors could be an option to avoid these losses, however, prices of those cables are still extremely high and they require cryogenic cooling. Moreover, further development of the EU energy grid is needed since many European countries dispose with rather closed grid systems with limited transmission of power to the grid of their neighbours. For this reason, massive investments in improving intergrid junctions and transporting grid capacities from production sites to the demand centres are needed. An example of potential grid network with North African energy sites is shown in Figure 3.

Political obstacles

Even though the technical problems might be serious, further investments and R&D efforts will make the project feasible. On the other hand, the political problems of the region seem to be much more complicated to resolve. The first problem is that the region of Northern Africa is rich in oil. Consequently, oil is cheap. Adding the fact that population of the countries is relatively low (compare to the land area), region is rather underdeveloped and has no real interest to invest in green technologies. Importing cheap green energy from the region might cause drop in oil demand which represents the main economic income for the countries such as Libya or Algeria. In addition, stability of the region is a serious problem. The Arab Spring has caused the end of long-lasting authoritarian regimes in Tunisia, Libya and Egypt whereas in some other parts like Syria, it has caused a bloody civil war which is still far from the end. On the other hand, Algeria and Morocco wished to avoid these scenarios and speedily gave more rights to their citizens. In spite of these facts, Morocco, Algeria and even Tunisia are considered today relatively stable which is not the case of Libya or Egypt. Serious security problems and numerous riots and protests are a daily routine in both countries. The governments are weak and face strong opposition though the political picture in both cases is very different. And one should not forget other challenges which are not posed by the internal political situation of these countries, such as taking land needed for power plants from the local tribes, giving support to Europeans – the same Europeans who supported dictatorial regimes and had made massive profit on their oil resources - are not as marginal as they might seem to be.

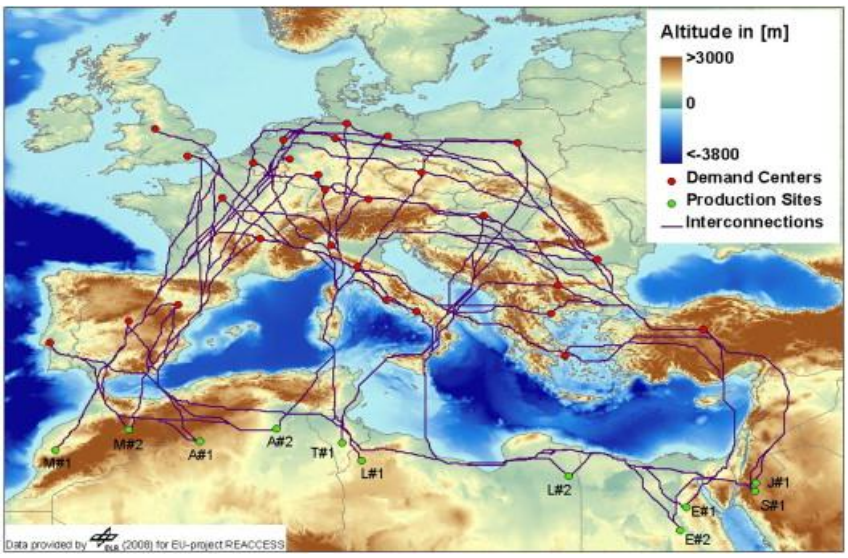

Figure 3: Potential future Europe interconnection grid map together with potential solar production sites

Conclusions

From all the discussed issues, it is more than obvious that finding the way how to make this megaproject feasible in all 27 EU countries and in the Southern Mediterranean will require enormous effort from all participating sides. The project has a huge potential and can be very beneficial for all the participating partners and the environment itself. Huge amount of negotiations, contracts research initiatives connected with massive paperwork will be required. Even most optimistic scenarios do not expect that EU could be supplied by energy from the region before 2030. However, more realistic looks year 2050. We shall see if it is going to be 15%-20% as the Desertec organization challenges. Important point is that this project is on the EU table and next steps are being discussed. As recommendation, it would be very useful to act very soon with investments in Tunisia, which became a democratic country after successful revolution. The country is not rich in oil resources and suffers from huge youth unemployment. The government of the country is not strong and stable enough due to absent of democratic culture. Any investments of the EU which could give jobs to the local citizens would improve stability of democratic regime and expand mutual relations between the EU and Tunisia. Nevertheless, it could offer a good base for the project enlargement after political situations in other countries gets more stable and predictable.

References

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