The SuperSmart Grid

The world today is facing increasing energy prices, diminishing fossil energy resources and a rapidly increasing energy demand. The oil price today is around 100 $/bbl. Over 60 oil producing countries have already passed their production peaks; the exploitation of the world oil reserves is much faster than the discovery of new resources. At the same time, world energy demand is expected to increase by over 50% until 2030 leading to tougher competition for the diminishing resources. On top of this, ever tougher regulations and limitations on greenhouse gas emissions are expected, severely limiting the possibilities to utilise even the remaining, expensive fossil energy resources. The EU has decided to reduce GHG emissions with 20-30%, until 2020; Germany even aims at a 40%. Until 2050, the EU will need to reduce emissions by some 80%. Further, the EU has decided to increase the use of renewable energies to 20% of the total energy consumption until 2020. Regrettably, the EU will have difficulties to achieve these targets with the current energy policy paradigm, since the European potential for renewable energy is limited.

One possible solution is to utilise the enormous potentials for solar and wind power in the deserts of North Africa. Renewable electricity from North African deserts would be sufficient to satisfy the electricity need of the Mediterranean and the rest of Europe 1000 times over, and is therefore an interesting option for a future energy system for Europe and beyond. However, the electricity would have to be transported over vast distances from North Africa to the load centres in Central and Western Europe. Due to the high transmission losses this is hardly possible with the current AC system, even if the interconnection capacities were sufficient, which they are not.

However, the technology to transport electricity efficiently over vast distances is available and has been so for decades: a HVDC grid, a ***SuperSmart Grid***, could integrate the European electricity market and connect it to the neighbour regions, such as North Africa, and their vast renewable energy resources. The SuperSmart Grid would operate “on top” of the current HVAC grid and only handle long-distance transmission, whereas the existing AC grids would still distribute electricity over the shorter domestic distances. Despite the potential advantages of the SuperSmart Grid, such as market integration and a dramatic increase of renewable electricity, the concept has not been introduced. *The goal of the PIK project is to identify the reasons for this and to propose possible ways to make the SuperSmart Grid concept reality.*

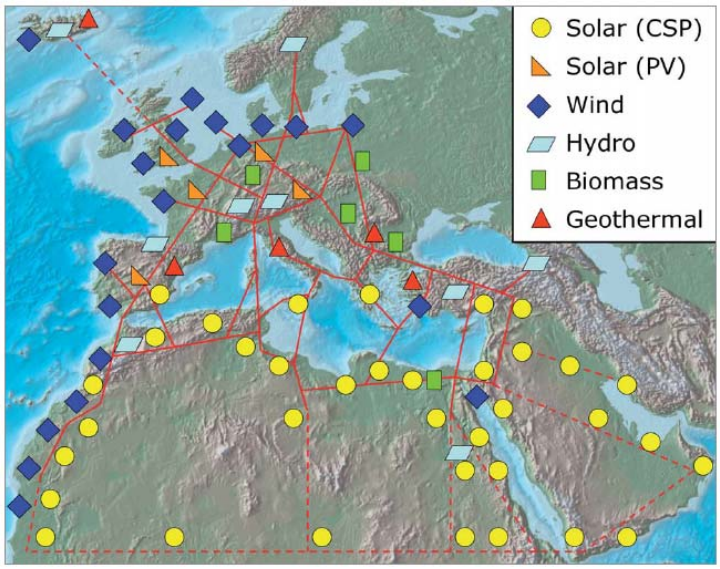

Figure 1: The vision of a HVDC grid for renewable electricity in Europe and beyond. Figure taken from the DESERTEC White Paper of the Club of Rome.