

The Sahara Wind Project : 5 GW HVDC transmission line

With the available transmission technology today, the prospect of importing renewable electricity from remote and thinly settled regions is economically viable and technically feasible. High Voltage Direct Current transmissions have a high availability and reliability rate, as shown by over 50 years of operation. For large electricity transfers, High Voltage Direct Current technology (HVDC) enables very fast control of power flows which implies stability improvements not only for the HVDC link but also for the entire surrounding AC system.

At present, more than 130 GW of electric capacity are being transmitted through High Voltage Direct Current transmission lines in over 140 projects worldwide. Their main purpose is to actually transfer large amounts of hydro-power from remote sites to urban or industrial centers with high demands for electricity. Among these projects we could mention that of Itaipu in South America, the Pacific Intertie or the one linking the North Eastern United States (New England including New York City) that is currently fed with low-cost hydro-electricity generated out of Canada's large power dams located more than three thousand kilometers away (1900 miles). This distance actually represents a length of transmission lines that would be long enough to connect North Africa's Sahara desert wind resources to the middle of Europe. The existing High Voltage Direct Current (HVDC) technology enables large electricity transfers to limit cumulative line and AC-DC-AC converting losses, to less than 15% over a distance of 3500 km. Whereas the overall added costs per kilowatt/hour for such a long transmission line are lower than €; 0.02/kWh.

The local integration of North Africa's most suitable wind resources to gradually supply euro-mediterranean electricity grids with low cost, market based wind-generated power is technically feasible on the scale of the Sahara Wind Project with its 5 GW HVDC transmission line. With a phased implementation and a threshold capacity of 400-500 MW submitted to international funding institutions, the Sahara Wind Project focuses its initial phases on a capacity build-up and industrial synergies. Once deployed on a regional basis, the sheer size of the Sahara Wind Project would enable significant economies of scale to be achieved. In supporting the diversification of its energy supply base through a bottom-up, regionally integrated project development framework aimed at accessing local resources, the Sahara Wind Project contributes to enhance the combined energy security of the North-African and Euro-Mediterranean area.

Features

Base informations Investment Costs Performance class 5 GW Rated voltage +-500 kV Type Double bipolar Converting station
 * 60 €;/kW 120 €;/kWel. ratedpower Line Distance 3500 km Aerial line 70 €;/(kW * 1000 km) 245 €;/kWel.
 ratedpower Sea cable 700 €;/(kW * 1000 km) 35 €;/kWel. ratedpower Total Investment Cost 400 €;/kWel.
 ratedpower Life time 25 years Operation & Maintenance Costs 1% of investment costs/yr Interest rate 5% Transmission
 losses (average) 7.5% Investment Costs of HVDC line from Sahara Desert through Europe