Comparison study between a Renewable Energy Supply System and a supergrid for achieving 100% from renewable energy sources in Islands

Numerous efforts have been done for achieving the maximum penetration of renewable energy sources (RESs) in the autonomous grids of Greek islands, which never exceeded 10%, despite the exceptional wind and solar potential. Large fluctuations on demand during summer, winter, and 24-h period in combination with the technical restrictions of diesel generators of the existing conventional power stations are a major concern of power supply system. Reversing the roles of diesel generators and wind farms (WFs), to use WF as the basic energy source and diesel generators as stand-by system changed in fact the whole philosophy of energy supply systems in islands and created perspectives for the fundamental reformation of the conventional energy supply systems in autonomous grids. In fact, methods of contemporary interim medium term energy storage are investigated for hybrid systems in order to adjust the stochastic behavior of wind energy to the demand, to provide the system with guaranteed power. This Wind–Hydro Plants in combination with the most adequate RES forming an Renewable Energy Supply System (RESS), increase further the economical penetration of RES into autonomous grids up to 90% or even 100% and simultaneously reduce drastically the fuel costs. Furthermore, a supergrid is examined and compared with RESS as another efficient way for achieving higher penetration of RES.