Energy storage for load shifting cyprus

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The EC"sStructural Reform Support Service (SRSS, now DG REFORM) coordinates and provides technical support to EU countries, including Cyprus, in cooperation with the relevant Commission services. The objective is to help build more effective institutions, governance frameworks and administrations. Also, as part of the Clean Energy Package, the EU"s Clean Energy for EU Islands initiative provides a long term framework to help islands generate their own sustainable, low-cost energy.

The Cyprus power system has the typical characteristics of isolated Mediterranean island grids: largely unexploited renewable energy potentials, heavy dependence on liquid fossil fuel imports, limited capability (i.e. low system inertia) to react to contingencies and events, high daily and seasonal demand fluctuation,no grid connection (yet) toneighbourcountries.

Cyprus is also characterized by an abundant solar energy resource across the whole year: the average global solar can reach 2000 kWh/m2. Wind energy is instead quite limited over the island of Cyprus, with an annual average wind speed below 4 m/s in the majority of areas.

We supported, along with DG REFORM (ex SRSS) and DG ENER, the Cyprus government to establish a comprehensive medium- to long-term policy (2030 time horizon) for the optimum penetration of renewable energy in the electricity system. The following two consecutive projects were carried out:

The first project, concluded in 2016, aimed at assessing the current state of the transmission and distribution electricity systems and proposing solutions for increasing the Renewable Energy Sources penetration in the electricity system. It was split in four interlinked activities, spanning from system characterisation, to transmission/distribution simulation up to Unit Commitment and Economic Dispatch (UCED) analyses, with a view to perform an integrated assessment of the Cyprus electricity system - power infrastructure and markets.

The second project, finished in 2018, aimed to complement the system analyses performed in the first project and perform deeper evaluations on the interactions of different energy systems and technologies.

Thisreportdescribes the main results of the first project we carried out to support the Cyprusgovernment. Some of the main conclusions and recommendations are listed below (more details are available in the report).

Storage units are key components to provide more flexibility in the system. Storage units are foreseen for providing both energy shifting and fast frequency response. If not enough flexibility can be obtained from the generation and the demand side, storage technology deploymentis unavoidable to integrate high shares of RES. Depending on the type of flexibility needs, different storage technologies can be used with significant differences in terms of cycling losses, investment costs, power to energy ratio and reaction speed to frequency events.

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System security is met under the loss of largestinfeedunder specific operational conditions and the assumption that Battery storage with Enhanced Frequency Response is used. Under Frequency Load Shedding scheme is expected only under Exceptional Contingencies. In the future, the most critical contingencies in the transmission system may become grave 3-phase faults, especially if small PV installations continue to trip at voltages lower than 80% of nominal.

Flexibility capabilities of the existing generation fleet could be increased in terms of ramping, minimum time off and on, start procedure, response speed of controller. However, the economic impact for the power plant operator needs to be better assessed. Increasing significantly the flexibility could increase variable operational costs and/or reduce efficiency.

Optimal management strategies for distributed resources might be different for theDSOs and theTSO. Solving problems locally (e.g. voltage quality in MV grid) and globally at system level might be conflicting. Possible conflicting interests were identified for demand response strategies and the weakening of Under Frequency Load Shedding. Smart grid deployment may offer the required tools for a more integrated approach taking into account both interests of the transmission and distribution systems.

If distributed generation is to become a significant part of the generation capacity, systematic verification of itsbehaviourunder normal and abnormal conditions must be undertaken (e.g. for Low Voltage Fault Ride Through, curtailment). Smart grid deployment could improve the observability and controllability of the small units in the distribution system. However, it is recommended to analyze the costs and benefits for this option.