Title of Diploma Thesis

Site Selection of Wind Farms in Uninhabited Islands

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ABSTRACT

Wind energy is a Renewable Energy Source (RES), practically inexhaustible and environmentally friendly. It can contribute significantly to a sustainable development and to the mitigation of climate change effects. The exploitation of wind energy is related to the long-term strategic priorities of the European Union in order to cope with the rising energy demand, saving conventional energy resources' savings and the energy autonomy of the European countries. The issue of the site selection of Wind Farms (WFs) is as critical as any RES project since, in fact, they do not lack of environmental impacts. In countries with a large number of islands, islets and rock islands, the selection of islets for WFs' installation offers a combination of advantages as exist for both onshore and offshore WFs. Moreover, the exploitation of uninhabited islets seems to be the best solution to deal, mainly, with the impacts on the human environment.

Motivated by this, the present thesis aims to determine the appropriate areas in uninhabited islands of Greece for onshore WFs' installation. This site selection is implemented by developing a relevant methodological framework, which consists of three stages. Specifically, Stage No. 1 excludes all the areas that do not meet the criteria of definition, safety and protection of cultural heritage sites, environmental interests and other uses. In Stage No. 3, the suitable from the Stage No. 1, areas are further examined considering criteria related to functionality, environment, tourism, productive and residential activities, and the specific land use scheme. The output of the second Stage includes locations on uninhabited islets suitable for WFs' installation. Finally, in Stage No. 3, WFs with a specific number of wind turbines and capacity are configured at the areas of the second Stage. Moreover, these areas are preliminarily evaluated, based on the number of wind turbines per WF, the spatial configuration of the wind turbines, the wind speed and the distance from the grid. The objectivity in the exclusion Stages (Stages No. 1 and 2) is ensured by digitizing the data of the relevant criteria and by using Geographic Information Systems, while a photorealistic imaging is performed for the preliminary evaluation/comparison of the proposed WFs in the final suitable areas (Stage No. 3).

Keywords: Onshore wind farms, Uninhabited islets, Site selection, Geographic Information Systems, Photorealistic (3D) imaging