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The present study covers the knowledge gap regarding the clean energy transition in Crete. It has various innovative aspects regarding the clean energy transition of large islands which have different characteristics than several smaller islands that have already eliminated their carbon footprint [3]-[5], [7]. It can be useful to policymakers, power companies, environmentalists, and several stakeholders in Crete. The limitations of this study are related to the accuracy of the energy characteristics of Crete, the future projections regarding the electricity requirements, and the uncertainty regarding the construction of the planned PHES system.

The text is structured as follows: after the literature survey the characteristics of the electricity grid of Crete, the development of renewable energies in the island, and some details concerning the grids" interconnection are stated. Next, the possibility of electricity storage and the clean energy transition in several sectors in Crete are mentioned. After that, the zeroing of the net-carbon emissions in the electricity sector and the economic, environmental, and social consequences of the clean energy transition are analyzed. The text ends with a discussion of the findings, the conclusions drawn, and the citation of the references used.

The literature survey is separated into four sections including: (a) the clean energy transition in islands, (b) the electric system in Crete, (c) electricity storage systems, and (d) de-carbonization in the transport sector.

The island of Crete has abundant renewable energy resources particularly solar energy, wind energy, and biomass. The annual solar irradiance is very high while the average annual wind speed in many locations is also high. Additionally, the island has many biomass resources based on olive tree cultivation. All of them are used for heat and electricity generation. Since the electric grid of Crete has been autonomous so far there are technical constraints, related to the stability of the grid, for the installation of more wind farms and solar-PV plants although the interest of the investors was very high. The installed power of various renewable energy systems and the energy generation in Crete are presented in Table II.

The interconnection of the electric grids of Crete and continental Greece is currently under implementation and it is expected to be ready in the next 1-2 years. This is achieved with two undersea electric cables [6] as follows:

The small-scale interconnection can cover only part of the island"s peak power and electricity demand which are estimated at around 710 MWpeak and around 3,000 GWh annual consumption [18], [19]. Both cables

though are expected to cover the requirements of Crete for the next 25 years. The total length of both undersea cables is around 350 Km while the maximum depth at 1,000 m. The electricity that could be transferred through both cables is estimated at

150 MW x 8,760 (hours/year) + 300 MW x 8,760 (hours/year) = 3,942 GWh/year

exceeds the projected electricity demand in Crete estimated at around 3,305-3,439 GWh/year [19].

Additionally, the interconnections of the electric grid of Crete with Cyprus and Egypt are planned and hopefully they will be realized in the coming years.

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