

Large-scale Integration of Renewables and the Role of Interconnections in the Future Electricity System: The Case of Turkey Mainland and Islands

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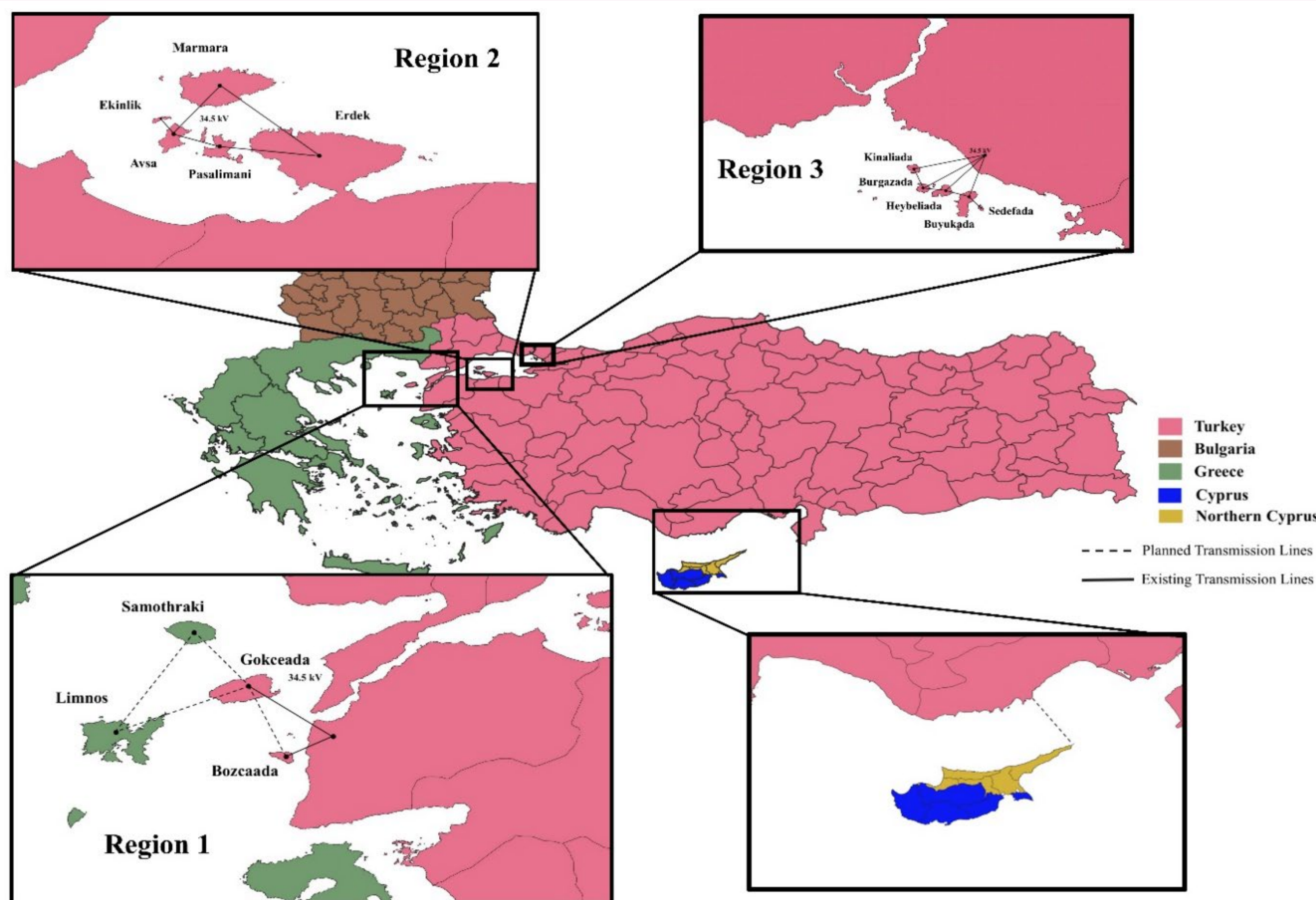


Fig. 1: Map of nodes, regions coded, and interconnections modelled

Energy System in the Turkey mainland and islands

- Divided in main region and 3 island regions consisted of 11 islands
- Currently, only 27% of primary energy consumption and 50% of power generation are met by domestic resources. 39% of overall power generated in Turkey is from RE sources.
- It is predicted to sharply increase new wind offshore generation in Island Region. Regional electricity generation will increase by 54 GWh from 2020 to 2040. The important difference between two scenarios is wind offshore plant with 40.5 GWh.
- The peak in energy demand is experienced during the summer months (Figure 2)

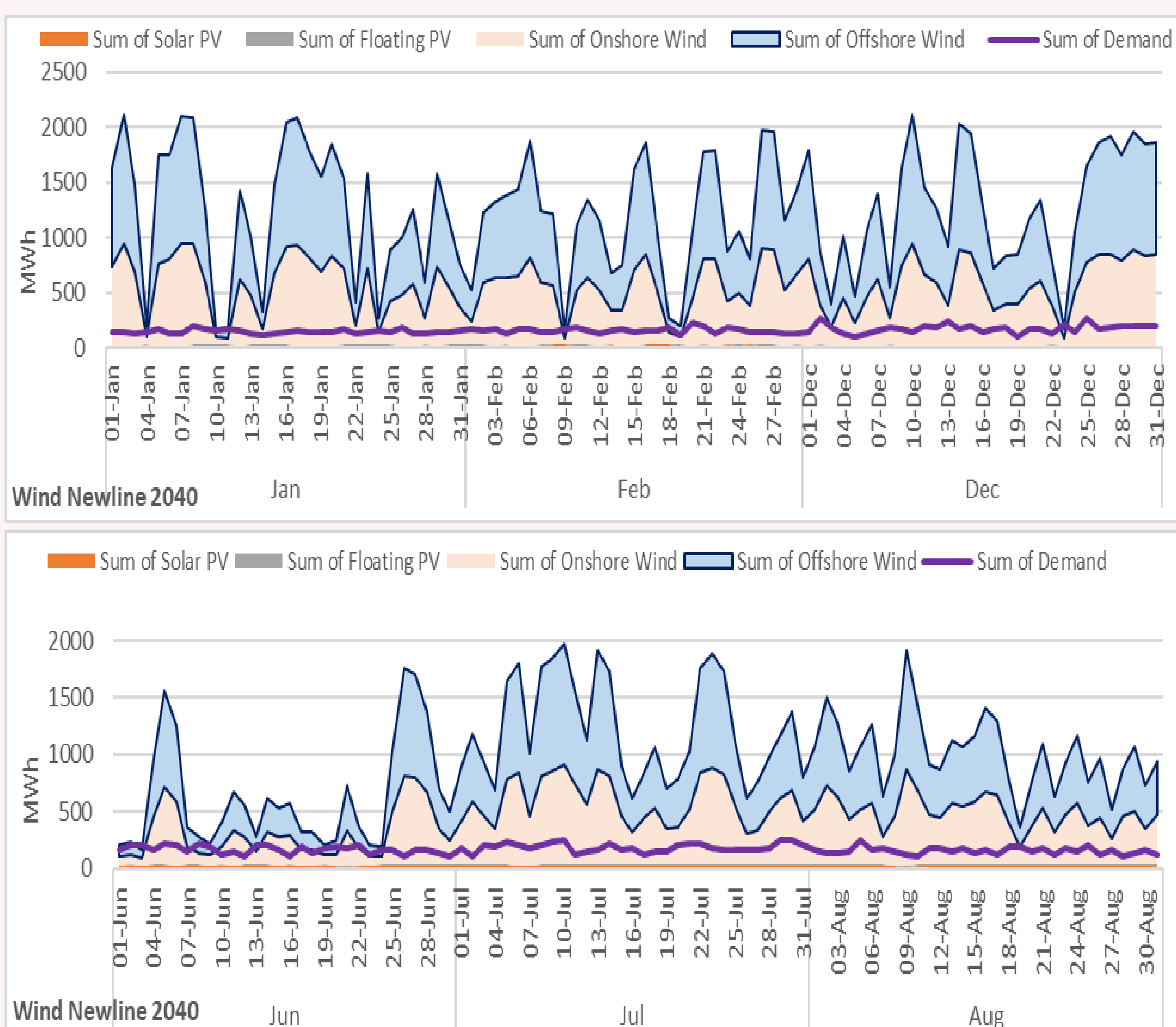


Fig. 2: Island Region 2040 Seasonal Electricity Generation Demand Supply

To analyse the impact of renewable energy in islands in Turkey electricity network, a model was developed in PLEXOS which is an energy market simulation software developed by Energy Exemplar 2019. In this research, the model configuration consists of 12 nodes within 4 regions (mainland and 3 islands regions) (Figure 1). For these regions; solar, onshore wind, offshore wind, geothermal, hydro and biomass has been considered.

Project aim: To assess the integration of renewable energy in the mainland and in the island in Turkey. The model analyses the electricity interconnected Turkey mainland-islands power grid, and future scenarios with solar and wind power generation in island regions.

Project objectives: This research is to assess the role of renewable energy and interconnections in providing access to electricity supply in Turkey Islands.

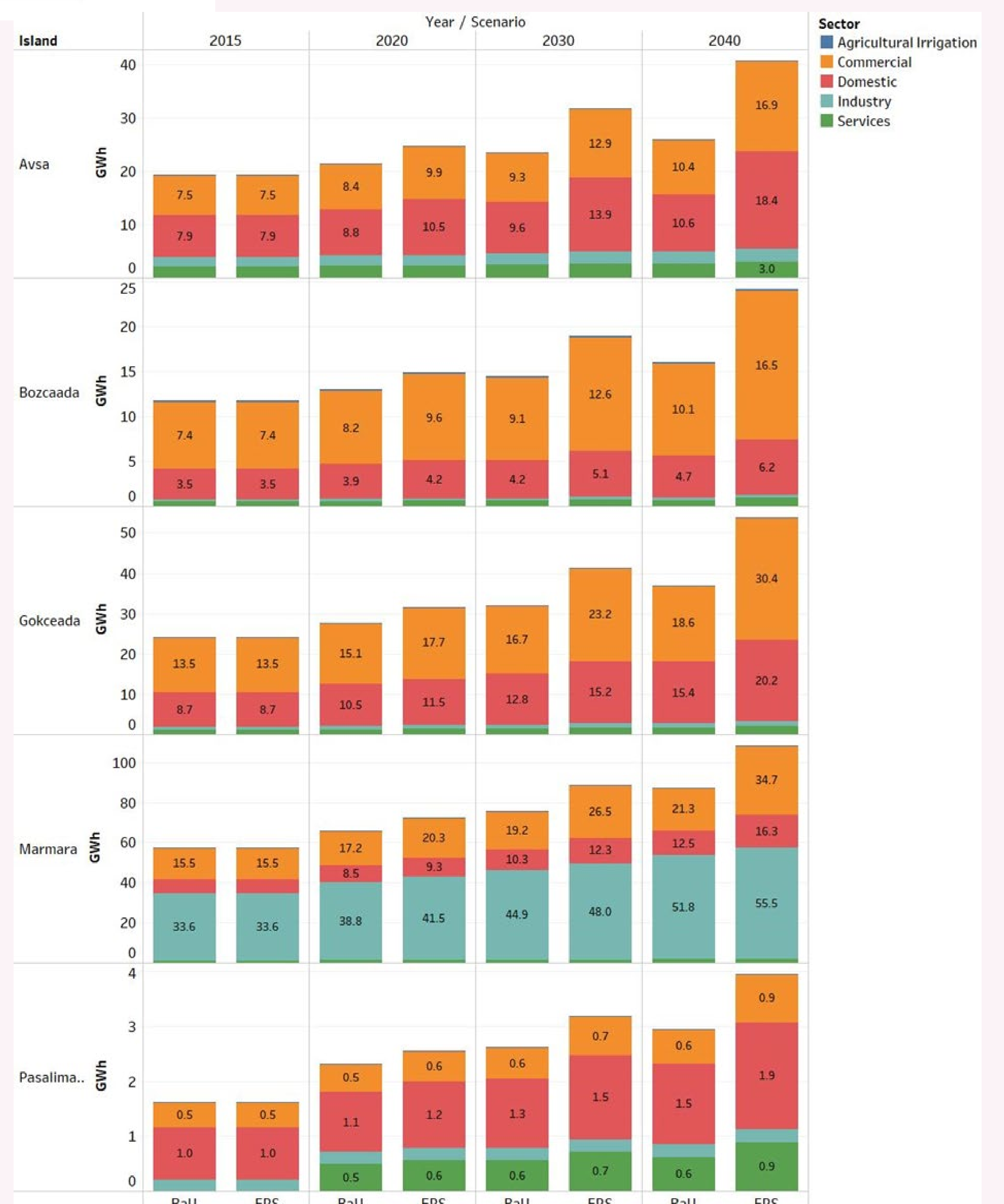


Fig. 3: ISLA Model Electricity Demand Per Sectors and Islands

The commercial sector dominates the electricity end-use consumption with a proportion of 50% in Bozcaada and Gokceada islands. The industrial sector electricity end-use consumption has 50% percent in Marmara Island. The islands where the domestic sector has a large share are Avsa and Pasalimani. On the contrary services and agricultural irrigation sectors account for a small fraction of the five sectors in all islands. The commercial and industrial sectors should be considered for future electricity supply plans, because of their increasing trend (Figure 3).