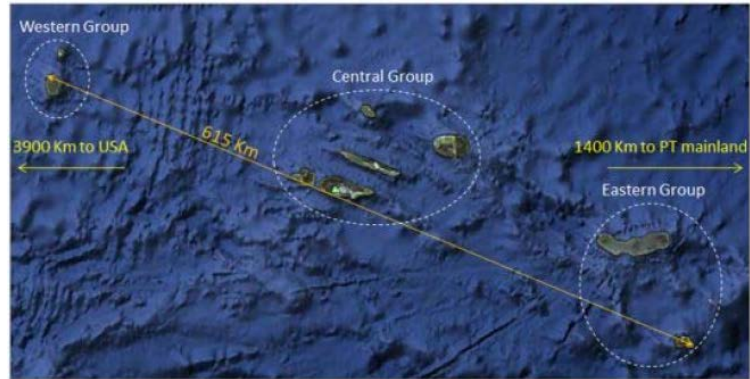


Energy Generation, Storage, and Transportation in the Azores Islands

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The main goal of the Azores Islands is to reduce its dependence on imported fossil fuel. Operating as nine independent electrical grids, each island already has the capacity to meet its residential and commercial demand. The existing infrastructure is capable of meeting projected future demand. In 2012, the nation set ambitious goals for 2020: 60% of electricity from renewable sources, 20% of total primary energy from renewables, 35% of total primary energy used in the form of electricity, and 20% reduction in carbon emissions. However, judging by current trends, these targets will not be met. There is an additional 68 MW of renewable energy generation projects underway, but all endeavors will not be operational until 2030. The net savings from renewable generation will include a reduction of 370,000 barrels of imported fossil fuel and a reduction of 160,000 tonnes of carbon dioxide equivalent emissions.



With 60% energy generation from renewables, energy storage is a vital factor in the management of the electrical grid system. Storage is required to overcome the intermittency of renewable energy sources, regulate frequency and power quality of the supplied power, and provide backup energy to meet spikes in demand. Our team recommends that seven hours of energy storage be supplied per island. The best storage technology would be lead acid batteries with carbon-enhanced electrodes.

Our team is recommending that 25,000 electric vehicles (EVs) replace the same number of conventional vehicles on the Azores Islands in order to meet the 2020 goals since the transportation sector accounts for 47% of the islands' primary energy demand and 37% of the state's emissions. These EVs would save the nation an additional 370,000 barrels of imported fuel while further reducing emissions by an additional 52,000 tonnes. This would however increase the nation's annual electricity demand by approximately 44 GWh.

It would be beneficial to interconnect the grids on each of the nine islands. This would reduce intermittency and variability, increase resiliency, and allow all fossil fuel generation to be consolidated on two of the nine islands. Both high voltage direct current (HVDC) and high voltage alternating current (HVAC) cables were considered for interconnection, but proved to be too expensive to recommend.