

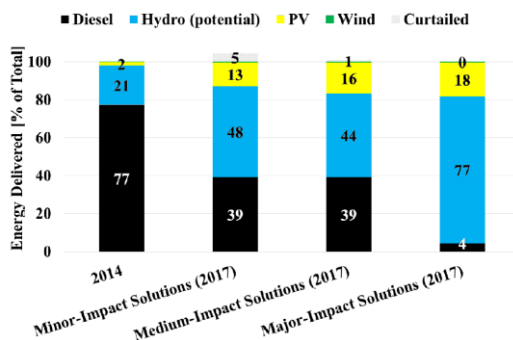
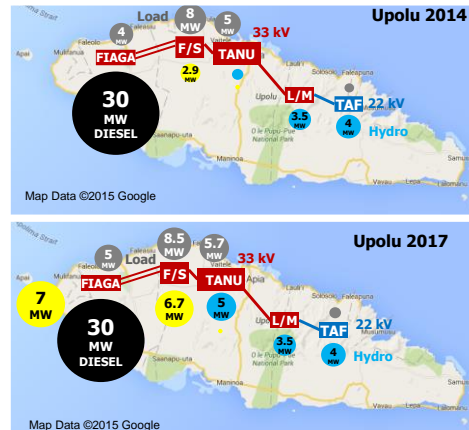
In 2014, the government of Samoa started an ambitious plan to integrate high levels of renewable energy generation into their power system. By request of the government, in 2015 IRENA engaged with the power utility Electric Power Corporation (EPC) in a study to assess the impact of the planned solar photovoltaic (PV) and wind power generation projects on reliable and stable grid operation and identifying appropriate measures to solve the potential technical problems. The study focused on Samoa's main island Upolu, which hosts about 75% of the country's population.

By 2014, the power system in Upolu had an installed capacity of 29.8 MW of diesel generation, 8.5 MW of Hydro, 2.85 MW of Solar PV and 0.55 MW of wind power. The annual electricity demand was around 115 GWh with a peak load, occurring at noon, of 20 MW.

The expansion plan 2014-2017 from the utility was used as the base case for the study. The plan included the addition of 11 MW of new solar PV, 1.8 MW of new hydropower and the rehabilitation of 3.4 MW of existing hydropower plants.

The conducted analyses followed the procedures described in IRENA's methodological guide for grid studies in small island developing states. Generation adequacy assessments as well as steady state and dynamic network studies at transmission level were done.

The results of the grid study for the base case showed that in 2017, the generation from the main diesel power station could be considerably reduced. However, the diesel generators could not be turned off, even if enough PV and hydro resources were available to cover the demand, due to the services that they provide for frequency and voltage control. In addition, it showed that energy curtailments above 5% in variable renewable energy were expected for stability and security reasons. Issues with the control of the voltage in the areas where high concentrations of solar PV were expected were also identified.



To overcome the identified issues, different infrastructure investments and operational measures were proposed as solutions. To identify the appropriate solutions, simulations were run in iterative process, incorporating solutions and analysing the fulfilment of previously defined operability criteria for the system.

As a result of this process, a set of mid-Impact and major-impact solutions fulfilled all the criteria for the operation of the system.

The effectiveness of the measures proposed was then assessed. As seen in the figure (bottom left), the contribution of renewables in 2017 has the potential to rise from a 60%, for a mid-impact set of solutions, to 95%, for a major-impact set of solutions. It is important to note that the actual levels will depend on the amount of water resources available.

For further information, please contact islands@irena.org.