

Assessing the feasibility and economic viability of a Hybrid Power Plant (HPP) for a baseload power provision

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Background

In recent years, there has been a growing global emphasis on transitioning towards renewable energy sources to mitigate climate change and achieve sustainable development goals. Among renewable energy technologies, Hybrid Power Plants (HPPs) have long been recognized for their ability to provide reliable and sustainable electricity generation. HPPs consist of a mixture of PV-panels, wind turbines & batteries.

Traditionally, base load power provision (BLPP) has been primarily met by fossil fuel-based power plants due to their ability to provide consistent and reliable electricity supply.

However, the environmental impacts associated with fossil fuel combustion, including air pollution and greenhouse gas emissions, have led to increased interest in exploring alternative base load power solutions.

This has sparked research into the feasibility and economic viability of utilizing HPPs for BLPP generation.

Objectives

As the title states, this research will focus on analysing different configurations of a sustainable power plant (PV, Wind, Storage & possibly H₂) that has a competitive power output compared to a Base Load Power Plant and meets a fluctuating demand.

Vattenfall seeks a comprehensive economic understanding of the HPP composition that can compete against a BLPP.

To realise a feasible and economically viable HPP, parameters need to be considered first. Different power plant sites need specific capacity sizing regarding the change of climate conditions. Next to that, a fluctuating energy demand of surrounding areas must be met constantly by the power output of the HPP and an estimation of the expected lifetime of the different power generators needs to be considered.

Combining all the described specific data, a sizing optimization will be executed. This optimization will be done in an extension of the existing open-source tool HyDesign. After executing the sizing optimization, an economic optimization will be executed as well to analyse the HPP's economic viability.