

A Study on the Economic Viability of Hybrid Solar-Biomass Systems

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Solar and biomass hybridisation in power generation plants potentially provides a mechanism for improving the performance of CST systems through increasing the capacity factor and providing surety that generation will occur at specific times. The different requirements for system performance can mean that different types of hybridisation are more appropriate than others, with options ranging from minor solar input to conventional plants to solar-based systems that are supported only by back-up systems using other technologies. The opportunities and technologies required to integrate biomass and CST plants are worthwhile to examine, but it is apparent that the viability of hybridisation will rely on a coincidence of geography where significant supplies of biomass coexist with acceptable solar conditions. Typically, high production agriculture relies on significant water availability and this tends to result in weather conditions that are not ideal for solar plants. There are some exceptions to this where irrigation supplied from a neighbouring region is used for crop growing or rainfall occurs in a brief intensive season that may have limited disruption to solar input, but these will be notable exceptions rather than the norm. Many agricultural industries also rely on very short harvest seasons, so biomass would need to be storable if all year power generation is required. Combining biomass from a range of agricultural industries may appear beneficial to extend operations, but a significant hindrance is that transport of biomass over long distances is typically not cost effective for power generation purposes. In practice there are relatively few processing plants in Australia that produce quantities of suitable bio-waste that could be considered sufficient to provide enough fuel for economically viable power generation. Identifying sites that also have suitable solar conditions could be beneficial to improving the economics of power generation by increasing either the plant scale or capacity factor by adopting a biomass-solar hybrid system. This study reviews the potential for different types of solar-biomass hybrid plants in Australia based on resource availability. A specific case study is also presented based on real data from a current biomass power plant with an assessment of the benefits to economic viability that occur by converting this plant to a hybrid solar-biomass power generation system.