

TITLE: Energy Management System for Grid Connected PV-Battery-Diesel Hybrid System		AUTHOR: Heybet Kilic DATE:
Object under Investigation (Oul) The Oul are the following: <ul style="list-style-type: none"> - Active Power Controller - PV in RTS - Wind in RTS - Converter in RTS - Inverter in RTS - Real Loads 	Test Objectives The wind and solar based hybrid power generation system for home applications is presented in this paper. Due to merits and advantages, PMDC generator is considered for electrical power generation from wind turbine. Maximum power from wind and PV systems have been achieved by proper controller of dc to dc converters associated with wind and PV system. <ul style="list-style-type: none"> - Expected outputs - Compensated line voltages at PCC under unbalanced load - Increase efficiency of PW and WT systems. - - balance the PV, WT production with the local consumption 	System under Test (SuT) The specific test case is concerned with the performance of microgrids in terms of power balancing. A microgrid is usually connected to a Transmission/Distribution grid via a transformer. In the specific test case we consider a microgrid consisting of PVs, WTs and controllable loads. At the Point of Common Coupling we have considered that the requirement is to balance the PV, WT production with the local consumption, thus minimising the power interchanges. To this end, a control system that controls the active power loads is order to follow the production of the microgrid’s PV and WT. Overall, the SuT is depicted in <ul style="list-style-type: none"> - PV and wind in RTS - inverter ins RTS - Grid in RTDS - Active Power Controller - Controllable loads
Function(s) under Investigation (Ful) The specific Ful uses the active power value produced by the PV and WT in order to change the active power consumption of the loads. The variation of the latter is done only when the power difference is above a threshold value e.g. 50W in order to reduce unnecessary load activations/deactivation for very small PV power and WT variations.	Purpose of Investigation (Pol) Feasibility of WT and PV power profiles with a control system Overall, the Pol is the characterisation of the controller’s (Ful) and the PVs’ and the WTs’ performance (Oul).	Functions under Test (FuT) The function that is regarded as FuT in this TC is the Active Power Controller. This function is a controller that uses the value of the measured PV power and WT power as a set-point to the loads.
Domain under Investigation (Dul): The domains that are involved in the TC as Dul are the following: <ul style="list-style-type: none"> - Electric power domain - Primary source domain - Control domain The electric power domain is related to the active power balancing that is the objective of the TC. As a matter of fact, most interactions of the system happen in this domain. The primary source domain plays a very crucial role in the performance of the PVs and WTs and, therefore in the power profile that the controllable loads should follow. Last but not least, the control domain is related to the connection of the control strategy to the loads in order to achieve the reference power profile.		
Target metrics (TM) Comparison of PV, WT and load active power profiles. In particular, the load curves showing the variation of both powers over time during the day can be used to evaluate both test criteria. To this end, active power should be monitored and recorded every second for both quantities.	Test criteria (TCR) The test criteria for the success of the specific test are the minimization of the imbalance between loads PVs and WTs in the microgrid and the assessment/maximisation of the PV and WT production.	Variability attributes (VA) In the specific TC the varying parameters are related to the Primary Source domain. Specifically, solar irradiance and wind speed determine the output power of the PVs, and WTs which, in turn, specify the set-point for the load control. both solar irradiance and wind speed determine the output yield, therefore they were considered important controllable variability attributes. The values that these parameters should assume are the following values: <ul style="list-style-type: none"> - Solar irradiance: 0 to1000W/m² - Ambient temperature: -20 to +45°C - wind speed: 0-25m/s

	<p>Quality attributes (QA)</p> <p>The overall deviation of the load consumption during a day should not exceed 10% of the PV and WT production of the energy yield of the PVs. Instantaneously, the active power profiles should not differ more than 25% of the PV and WT production.</p>	<ul style="list-style-type: none">- In terms of faults, the system should be subjected to sudden variations of the solar irradiance-wind speed as well as discrepancies in the load consumption.
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