

Master Thesis Brief Description

Thesis Title	Enhancing Gas Turbines with Battery Energy Storage for power generation in Power Plants
Programme of Studies	MSc in Sustainable Energy Systems
Course	MES 580 Master Thesis
Area of Study	Energy Storage
Student's Name	Evangelos Stamatiou
Students Reg. Number	16820
Supervisor	Dr.-Ing. Paris A. Fokaides, Ass. Professor, Mechanical Engineering Department
Supervisory Committee	Dr Michalis Menicou, Assoc. Professor, Mechanical Engineering Department Dr. Nicholas Christofides, Asst. Professor, Electrical Engineering Department
Semester	Fall Semester 2020
Short Description	<p>This final year project investigates the integration of Battery Energy Storage Systems (BESS) with gas turbines in natural gas power plants to enhance their performance, provide back-up power, and increase operational flexibility. The technical challenges associated with gas-fired power plants are addressed, emphasizing the potential benefits of combining battery storage with combined cycle gas turbines. The project's focus then shifts to the black start process, where the gas turbine is combined with a battery energy storage system to address blackout events. The process is thoroughly analyzed and explained using diagrams and figures. The applicability of this feature in Vassilikos Power Plant during a typical day in Cyprus is demonstrated using demand data from the Cyprus Transmission System Operator (TSO). The study's outcome showcases how BESS can significantly improve gas turbines' efficiency, reduce CO₂ emissions, and lower electricity costs while ensuring reliable back-up power and enhanced operational flexibility. This research provides valuable insights for power plant operators and policy-makers seeking sustainable and efficient solutions to address the challenges of gas-fired power generation.</p>