IBU International Burch University	**FORM FOR PROPOSING A TOPIC IN THE SECOND CYCLE OF STUDİES**	Oznaka	
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Department	Department of electrical and electronic engineering
Master thesis title (Draft):	Design of residential PV system with storage, energy performance and cost analysis
Mentor/professor - contact:	Assoc. Prof. Dr Jasna Hivziefendić

Thesis background:	Transition of the existing electrical distribution networks to the smart grids, includes integration of renewable and storage systems in buildings. Solar energy and storage systems are receiving attention in applying technologies and energy systems in recent years. Given that the residential sector represents 27% of global energy consumption and 17% of global CO2 emissions, using solar PV to decarbonise its electricity demand could play a considerable role in mitigating climate change. High exergy electricity from PV is not only reliable, safe and sustainable, but now it has become an economical way of providing global society's energy needs as well. As the demand for PV installation continues to increase, the costs continue to decline feeding a virtuous cycle. The technological development and economic of scale for solar photovoltaic (PV) and batteries system have led to the technical potential for a creation of off-grid home electricity production for a significant number of residential homes. Solar systems in buildings are designed for heating, ventilation, thermal isolation, shading, electricity generation and lighting of building. Therefore, design and technical and economic analysis of PV system integration in the residential buildings will be done in the thesis. The analysis will be done for different case studies.
Thesis objective:	One of the main objective of the thesis is to create PV system with storage batteries, using several variables such as PV data and modules types, batteries capacities, and inverter type, based on technical performance. The aim of the thesis is also to demonstrate financial attractiveness of the proposed PV system over the lifetime. Therefore, the total cost for the integration of PV system will also be analysed as well as financial returns for the residential house. All simulation will be done in MATLAB or HOMMER. The following will be done: The optimal size of a PV and battery storage system for residential home, based on the demand side. Design of system, including PV panels, batteries, convertors/invertors and other electronic equipment.

	Economic analysis will be performed including the financial returns. The optimal operation of the created system for a residential building in terms of electricity consumption will be determinated.
Literature:	Miles Abarr, Saleh N.J. Al-Saadi "Energy storage for residential buildings: review and advances" APEC Conference on Low-carbon Towns and Physical Energy Storage May 25-26, 2013, Changsha, China M. Nassereddine, M. Nagrial, J. Rizk, A. Hellany, "PV solar system for residential homes: PV panel tracking system using electronics circuits", IEEE, 2018 "Solar Electric System Design, Operation and Installation", An Overview for Builders in the Pacific Northwest, 2009 Washington State University Extension Energy Program Grazia Barchi, Giordano Miori, David Moser "A Small-scale Prototype for the Optimization of PV Generation and Battery Storage through the use of a Building Energy Management System", 2018 IEEE Adorkor Bruce-Konuah, Rajat Gupta "Using smart energy storage to increase self - consumption of solar-generated electricity and reduce peak grid load at household and community level" Low Carbon Building Group, Oxford Institute for Sustainable Development PhD thesis: Aditya K. Mishra "Energy Optimizations for Smart Buildings and Smart Grids, November 2015 PhD thesis: Fortenbacher, Philipp „On the Integration of Distributed Battery Storage in Low Voltage Grids" 2017 Li X., & Ogden, J. M. Pearce. Understanding the design and economics of distributed tri-generation systems for home and neighborhood refueling—Part I: Single family residence case studies. Power Sources, 2011; 196(4), 2098-2108.