

Asheem Garwa

PhD Student at UPNA



Asheem comes from Sirsa, Haryana, a region of the north of India.

He is an Engineer with experience in the power transmission sector, involved in multiple engineering projects in that field since 2017.

Employment history:

- Assistant Engineer Electrical in Haryana Vidyut Prasaran Nigam Ltd. (HVPNL)
- Sr. Project Executive (Electrical) in National Buildings Construction Corporation (INDIA) Limited.
- Industrial Trainee in Microtek International P.Ltd.

'I'm deeply passionate about the field of renewable energy grid integration. I aspire to contribute significantly to the ongoing transition towards sustainable energy sources'

Asheem has joined INGEPER-Electrical Engineering, Power Electronics and Renewable Energies group at UPNA, under the supervision of Dr. Luis Marroyo and Dr. Julio Pascual.

INGEPER, additionally to the research activity, co-operates with industrial companies from the sectors of renewable energies, power electronics and electrical storage.

Research

Modeling and management of the power grid of the future: power grid based on electronic converters.

Research objective: To optimize grid integration of renewables by assessing energy management strategies, system sizing, and evolving technologies. Utilizing real-world data and open-source tools, this study aims to provide transparent insights benefiting both private companies and public institutions. Dissemination of findings at local and international forums will promote informed decision-making for a sustainable energy future.

Abstract:

The urgent global imperative to reduce fossil fuel dependency, driven by environmental concerns, high electricity prices, and energy security considerations, has led to a heightened focus on transitioning to cleaner energy sources. Photovoltaic (PV) solar and wind power have emerged as economically attractive options for reducing fossil fuel reliance in the electricity sector. However, the intermittent nature of these renewable resources, coupled with their grid integration through electronic converters, presents multifaceted challenges. This research aims to address the complex task of integrating substantial amounts of PV and wind power into the Spanish electric system, considering technical constraints.

The study unfolds in several phases: firstly, an exploration of PV and wind power integration without system modifications to gain insight and quantify associated challenges. Subsequently, an in-depth analysis will assess the potential reduction in natural gas generation by further incorporating PV and wind power, optimizing hydropower dispatch, and considering technical aspects alongside market-based decisions. The investigation extends to evaluate the role of energy storage technologies, including pumped-hydro, batteries, and hydrogen, in displacing natural gas from the electric mix. Moreover, the research explores the evolving landscape of energy consumption patterns and delves into the integration of demand response techniques. Finally, a comprehensive optimization program will synthesize the findings from these individual components, facilitating a holistic analysis of the entire energy system. This work contributes valuable insights towards achieving a sustainable, low-carbon electric grid while addressing the challenges associated with the integration of renewable energies.

'From a young age, I've held a strong passion for acquiring knowledge and nurturing dreams of becoming an inventor, all in pursuit of the ultimate objective of making valuable contributions to the betterment of humanity.'

'I've enjoyed my professional and academic work so far, but I really feel I've got more to offer as a researcher. This project will benefit millions of people; it is the best platform to contribute to the sustainable development of society.'