ENERGY AND CLIMATE
PANORAMA

GREEN HYDROGEN

As a Fuel in the Energy Transition of Pakistan, Toward a Zero-Carbon, Climate-Resilient Future

ABOUT US

Who we are

We are a dedicated team of researchers and experts who recognize the urgent need for action in addressing climate resilience and energy transition in Pakistan. Our mission is to develop and implement effective policies for cleaner, renewable energy sources like solar and wind, aligning with Pakistan's 2030 goal of 30% renewable energy in its electricity mix. As a multidisciplinary team, we leverage expertise in three key disciplines of study—Energy Systems Engineering, Thermal Energy Engineering, and Electrical Power Engineering—to drive our mission forward. We are united by a shared vision of creating a sustainable and resilient future for Pakistan, where cleaner energy sources play a pivotal role in reducing the nation's vulnerability to climate-related challenges.

What we do

We conduct in-depth, evidence-based research to analyze and improve energy policies in Pakistan. Our focus is on advancing renewable energy solutions and engaging stakeholders to ensure effective policy implementation. Our methodology involves a critical examination of current energy policies to pinpoint areas of improvement and formulate strategies for the widespread adoption of renewable energy sources across various levels.

In line with our commitment to fostering sustainable practices, we have established a fellowship program as part of our broader initiatives that aims to facilitate evidence-based research for promoting energy transition in Pakistan. Through research studies, surveys, and forecasting, we plan to assess various aspects of energy transition, including the adoption of renewable energy technologies and their impact on climate change. Our approach involves active engagement with stakeholders to address their concerns and facilitate the effective implementation of policies, fostering the growth of renewable energy manufacturing and marketing facilities.

CONTACT US

Industry Liaison & Outreach Office

Bilal Mehmood Bhutta
Phone: +92-51-90855274
Fax: +92-51-90851302
Email: ilo@uspcase.nust.edu.pk
USPCAS-E Building, National University of Sciences & Technology, H-12, Islamabad.

Primary Contributors

DR. NASEEM IQBAL
PRINCIPAL INVERSTIGATOR
Professor

DR. MUSTAFA ANWAR
CO-PRINCIPAL INVERSTIGATOR
Assistant Professor

JOSHI LAILA
RESEARCH ASSISTANT
MS in Energy Systems Engineering

Layout Design

SAAD NADEEM
RESEARCH ASSISTANT
MS in Energy Systems Engineering

SANA MEHMOOD
RESEARCH ASSISTANT
MS in Energy Systems Engineering

Table Of Content

Executive Summary

Hydrogen being an energy vector is increasingly becoming a crucial element in the decarbonization of hard-to-abate sectors. Heavy industry sectors include iron and steel, cement, fertilizer production, oil refineries that are carbon intensive and emit large amount of CO2 emissions. To meet paris agreement goal of 1.5 C, it is the need of hour to decrabonize heavy industry sector by introducing zero carbon initiatves. Decarbonizing industrial processes using green hydrogen is very promising and challenging. Pakistan is currently facing challenges with economic growth and energy security. As pakistan is blessed with great potential of wind and solar energy due to its geographical location, which makes pakistan a best candidate for implementing green hydrgen projects. Hydrogen generated through water electrolysis using renewable energy sources is the best proposed solution for decarbonizing industrial processes such as steel production, as considered in this case study. In this process hydrogen is used as a reducing agent that helps to reduce iron ore which is further converted into green steel with the help of electric arc furnace (EAF). This study performed a techno-economical analysis for hydrogen production from wind and solar using Hybrid Optimization of Multiple Energy Resources (HOMER) Pro optimisation software. The study compared off-grid and on-grid hybrid system based on net present cost (NPC), levelized cost of energy and hydrogen. Results depicted that on-grid hybrid system is more feasible as compared to off-grid system. A qualitative analysis was performed through a survey questionnaire that help us to determine social significance of green hydrogen as a fuel in Pakistan. The study outcomes and future recommendations are provided at the end of this study. This study will help policy makers and researcher community to develop an understanding of the green hydrogen technology and make new standarized policy regulations.

NUST
Defining futures

OUR PARTNERS

Pakistan Renewable Energy Coalition
Together for a Renewables Powered Pakistan

SDPI
Sustainable Development Policy Institute

RENEWABLES FIRST

PRIED
Policy Research Institute
for Equitable Development

Indus Consortium
Humanitarian Environment and
Development Initiatives

PAKISTAN
ENVIRONMENT TRUST

Private Power & Infrastructure Board
Ministry of Energy (Power Division)
Government of Pakistan

https://uspcase.nust.edu.pk

ilo@uspcase.nust.edu.pk

USPCAS-E Building, NUST Sector H-12,
Islamabad, 44000 Pakistan