



SDG-7 AFFORDABLE AND CLEAN ENERGY

Affordable and Clean Energy (SDG 7) is one of the 17 global goals established by the United Nations as part of the 2030 Agenda for Sustainable Development. SDG 7 focuses on ensuring access to affordable, reliable, sustainable, and modern energy for all. The goal recognizes the importance of energy in various aspects of development, including economic growth, environmental sustainability, and social well-being.

This goal recognizes the crucial role of affordable and clean energy in achieving sustainable development. Access to reliable and clean energy sources is essential for poverty eradication, economic growth, environmental protection, and improved quality of life. By addressing the targets outlined in SDG 7, countries can work towards ensuring that everyone has access to affordable, reliable, and modern energy services while promoting sustainable energy practices and reducing environmental impact.

All buildings at CUI's campuses are designed and constructed with a focus on energy efficiency parameters and compliance with standards issued by the Capital Development Authority (CDA) and the government of Pakistan. Energy-efficient buildings can help reduce energy consumption and lower environmental impact while also providing a more comfortable and sustainable environment for occupants.

"If you want to find the secrets of the universe, think in terms of energy, frequency and vibration."

Nikola Tesla

new construction on campus This policy will be reviewed and updated periodically as public awareness, management

techniques, and technologies change.



Energy Research Centre

COMSATS University Islamabad,
Lahore Campus



CUI had planned to replace all conventional lights with LED lights which saved 95% energy as compared to conventional lights. CUI had installed 1700 No's LED Lights in the Year 2022.

Following are the recommendations to support energy conservation plan at CUI-Lahore campus level:

1. On-Campus Solar Energy
2. Solar Heating and Hot Water
3. Energy Efficiency in Campus Buildings
4. Sustainable Transportation
5. Energy Conservation

100 KW Solar Power Plant at Islamabad Campus was commissioned in September 2016.

The per kWh CO₂ emission by Thermal Power Plant is 0.6 kg. Total Energy Produced by this plant up to August 2023 is 647,584 KW. This means that this Solar Power Plant has saved 355 tons of CO₂ emission during the period under consideration. One grown tree roughly absorbs 24 kg of CO₂ annually. The CO₂ emissions saved by this Power Plant are equal to 14,800 full-grown trees. 300 KW Solar Power Generation Facility Installed at Sahiwal Campus. The commissioning date of the project is April 14, 2022. To date, the total units produced by this facility are 434,960 kWh. This means that this Solar Power Plant has saved 260 tons of CO₂ emission since its commissioning. CO₂ emissions saved by this Power Plant are equal to 10,874 full of trees.

The agreement for establishment of 400 kW solar power

generation facility at Vehari Campus is signed on Nov. 2022. Tentative production in one year would be 584,000 kW.

CUI had installed Multi Digital Scroll System (MDS) Technology which is 30% energy efficient as compared to conventional air conditioning. Furthermore, Building Management Systems installed at all buildings of CUI, Islamabad campus has been installed resulting in efficient usage of energy consuming devices. Inverter A/C are installed where MDS system is not used. Power Factor Improvement Panel installed to Control Power Factor effected by inductive load.

The mission of the Energy Research Center (ERC) is to develop actively smart energy-related programs, improve the quality of domestic talents in basic research and the development of smart energy, and promote sustainable development curricula with the Ministry of environment and Ministry of Science and Technology. ERC endeavors to improve and advance its commitment to renewable energy through education.

Apart from establishing the ERC, the University also aligns its policies with the Executive 'four conservations' (water, electricity, paper, and fuel conservation) initiative, striding vigorously towards 100% renewable energy.

It includes:

University-based education activities (including academics altering their programs to coordinate their teaching on some aspect of climate change)

Research activities (such as conferences and workshops on climate change)

Education activities beyond the university (such as talks to schools, community groups or the general public on climate change; forums and Q&A sessions)

Online activities (such as webinars, discussion groups, forums, social media, online Q&A sessions, podcasts). Campaigns (including petitions, consumer boycotts, demonstrations)

An energy audit was conducted in 2015. The report concluded that the measures taken by CUI are as per standards for conservation of energy.

Research has shown that the most electricity-consuming equipment in the campus is air-conditioning, followed by lighting systems. Solutions are devised to improve the most electricity-consuming aspects, including the setting of timer switches, manual controls and checks, public announcements and promotions, announcements through students, and access to special data. These solutions aim at reducing energy wastage and fulfilling the sustainable development goals. University campuses can implement energy efficiency improvements rapidly:

Controlled Environment: Campuses are highly structured, controlled environments and University has the ability to deploy resources quickly.

Environmental Awareness: At University level, environmentally conscious students, faculty and staff are eager to develop and implement energy efficiency solutions.

Innovation Hubs: Campuses provide testing grounds to save energy, using “intelligent” information technology and experimenting with zero-net energy and passive building techniques. At campus level, a carbon-neutral research lab and a green building certification program can be opened and designed.

Workshop on Energy Efficiency and Decarbonization of Industries in Pakistan: In continuation of study conducted by the Centre for Industrial and Building Energy Audits on behalf of World Bank. The Director Campus/ UNESCO Chair on Knowledge Systems for Integrated Water Resources Management (IWRM), COMSATS University Islamabad, Wah Campus Pakistan attended the workshop on July 04, 2022 on Energy Efficiency and Decarbonization of Industries in Pakistan, organized by the World Bank at Serena Hotel Islamabad, Pakistan.

The CUI has a plan to phase out diesel generators with renewable

energy technologies. In this regard, an in-house feasibility study was conducted to determine the potential of solarization of CUI campuses. Based on the study, the solarization of the campuses is underway. The agreement for establishment of 400 kW solar power generation facility at CUI, Vehari Campus was signed on Nov. 2022. Tentative production in one year would be 584,000 KWh will be produced and 350 Tons carbon will be saved (Which is equal to 14,600 full of grown trees). Furthermore, 300 KW Solar Power Generation Facility has been commissioned on April, 2022.

The CUI, Islamabad campus has already recommended establishment of 850 KW solar power generation facility. Furthermore, 100 KW solar power plant is operational since 2016 at CUI, Islamabad campus.

The Alternative Energy Development Board (AEDB) created a national-level policy created in the Year 2020. COMSATS University has adopted this policy since its creation.

In 2022 Total energy used in all campuses (Local) 8,196,428 KWh (from Wapda) 263,951 (From Solar)

The Government of Pakistan envisions deploying solar power on a fast-track basis to eventually complement and/or substitute the expensive imported fossil fuels currently being used for power generation. CUI is moving toward renewable energy production like Solar Power Plants.

CUI, Islamabad Campus has already installed a 100W Solar Power Plant at its Islamabad campus and a 300 kW Solar Generation Facility at CUI, Sahiwal Campus. A 400 KW system is at an advanced stage of completion. Moreover, the establishment of a 700 KW Solar Power plant at Islamabad Campus has been planned and recommended by the Campus Works Committee.

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ERC Collaborated with local industry (US Denim) for energy efficiency, smart energy programs.

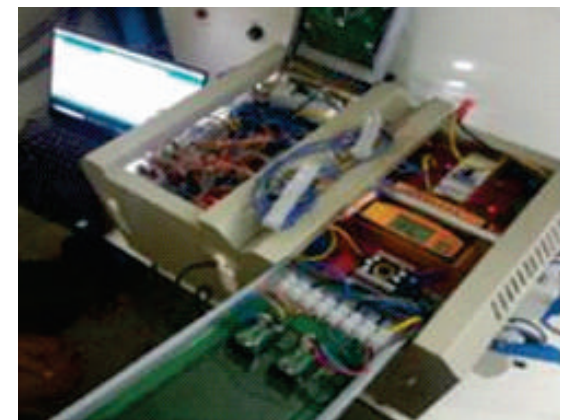
An international MoU with an international Energy Centre, name INERGE, Brazil is signed to promote R&D activities between CUI and INERGE.

MoU was signed with EPTEck Pvt Ltd for fostering industry academia collaborative effort for promoting energy efficiency, smart energy, smart grids and net metering.

Energy Audit was performed for a Local Industry named "Ali Embroidery".

Alternative Energy Development Board, Government of Pakistan have developed the Alternative Energy Policy in Year 2019 and same is implemented by CUI.

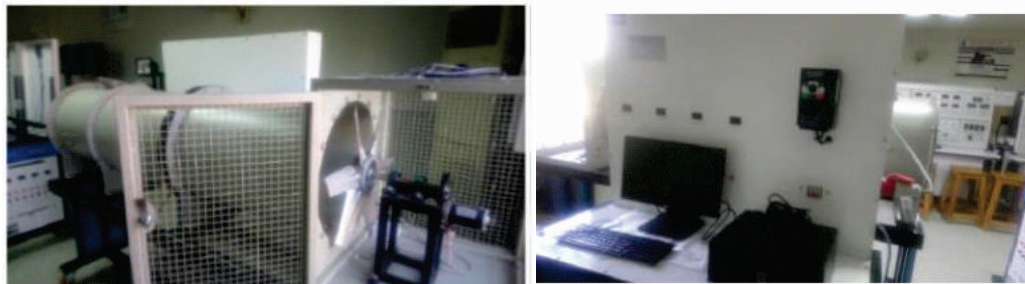
ERC submitted draft policy points to Adviser National Electric Power Regulatory Authority on instructions of Chairman NEPRA



To cater to the modern energy needs, the Commission on Science and Technology for Sustainable Development in the South (COMSATS) organized an International Conference on 'Sustainable Technologies in Modern Energy: A Roadmap

Towards Green Economy' with support of the United Nations Educational, Scientific and Cultural Organization (UNESCO), and COMSATS' Centre of Excellence in Islamabad, the COMSATS University Islamabad (CUI). This conference was hosted by COMSATS University at its Islamabad Campus on February 16th-17th, 2022. The aim was to provide an interdisciplinary forum to academicians, scientists and early career researchers to deliberate on the importance of energy efficiency, sustainable and renewable energy resources, technologies and applications.

ERC faculty members contributed in organization of this conference and Speakers for this conference were arranged by ERC.



Dr. Sobia Baig represented ERC in this conference and presented a talk, titled, **“Digitization of Power Networks for Sustainable and Reliable Distribution”** in Sustainable Technologies in Modern Energy: A Roadmap Towards Green Economy conference on March 8, 2022.



Dr Sobia Baig presented a talk, titled, “Micro-grids -The Way Forward for Electrification of Rural Communities in 4IR” in the International Conference on Industry 4.0 in the Developing World: Challenges, Gaps and Opportunities, Colombo, Sri Lanka on March 17, 2022.

ERC at CUI Lahore is actively involved in providing training and education to both current students and working members of the public. Organizing technical education and training courses, as well as clean and renewable energy-related activities such as talks, conferences, webinars, and seminars, can have a significant impact in promoting awareness and understanding in the field of clean energy technologies.

ERC conducted a short course named Hydrogen: The Fuel of Future from the Past, by Dr. Shakeel, Senior lecturer at University of Malaya, Malaysia.

COMSATS University Islamabad, Lahore Campus
Webinar date: 26th February 2022 Timing: 2 pm to 4 pm

Emerging Power System Optimisation
Energy Research Centre COMSATS University Isb, Lhr campus brings a new short course

Dr. Muhammad Adnan Hayat (PhD)
Chair - IEEE Industrial Electronics Society Western Australia Chapter
Policy Analyst - Energy Policy Department in Western Australia

Why to Attend
Power system is transforming! Conventional large generators spanning over a large geographical area are being replaced by localized generation resources. This transformation is rapid in some countries and slow in others, but this is what the future holds. This course walks through in details how the power system is transforming and how this power system can be optimized techno-economically to supply clean and reliable energy at the lowest sustainable cost.

Course Objectives
This course will discuss in detail how the electricity market and power system is evolving and its impact on power system security and reliability. This course will then look through how this emerging power system can be optimized using linear programming.

Course Contents

- Emerging Power System.
- Distributed energy resources.
- Techno-economic analysis.
- Reserve capacity mechanism.
- Wholesale electricity Market.
- Modelling assumptions, inputs, and outputs.
- Conclusion.

Target Audience
Electricity policy and regulatory professionals.
Power system operators.
Power system and renewable energy engineers.
Engineering students and researchers.

For Registration: <https://bit.ly/ercpd2> For Info: info.erc@cuiilahore.edu.pk

Venue: COMSATS University Islamabad, Lahore Campus

ONLINE COURSE
Course date: January 29th, 2022

Energy Research Centre COMSATS University Isb, Lhr campus brings a new short course

Hydrogen: The Fuel of Future from the Past

Dr. Muhammad Shakeel
"Senior Lecturer" in UM Power Energy Dedicated Advance Center, University of Malaya

Why to Attend
Current energy systems have to undergo profound transformation to compete 21st century climatic and sustainable challenges. However, the total decarbonization of certain sectors such as transportation and industry that requires high grade heat may prove to be challenging purely by means of electrification. In this regard, gaseous hydrogen being produced using renewable sources such as solar, wind, biomass etc is becoming one of the most viable fuel due to its easy production, abundant raw material and ability to be integrated in primary energy mix.
Although hydrogen industry is well established with total estimated global market of 115 billion USD by 2022 and growing significantly, the market share of hydrogen being produced by electrolysis is just 4% which is coming mostly through Chlor-Alkali industry. Recently, the ability of state-of-the-art electrolyzers to compensate intermittence of renewable sources and proven concept of directly injecting hydrogen in natural gas pipeline network proved to be a game changer and could create a new downstream market.

Course Objectives
The course has been designed to provide brief understanding of hydrogen related technologies and the possible integration in primary energy mix. The attendees will learn the system level integration approaches and policy roadmaps.

Course Contents

- Introduction to hydrogen
- Production processes of hydrogen
- Green: the good and the better
- Current and potential applications of hydrogen
- Take away's
- Advantages of hydrogen

Target Audience

- Engineers of Various disciplines
- Energy Policy makers
- Mechanical engineering
- Chemical Engineering
- Electrical engineering

Registration Fee: 500 Account Title:
HBL CIFT: IEEE STUD
0023057901524103

Online webinar organized by ERC on “Emerging Power System Optimization” held on 26 February 2022

ERC recently completed a joint Pak-China, PSF-NSFC research project titled, "Implementation and Testing of Microgrid in Rural Communities with Maximum Penetration of Renewable Energy Resources in Pakistan". Furthermore, wind and solar labs were established in this project by Funding from Pakistan's Science Foundation (PSF) Pakistan.

Python for Data Science, Machine learning Workshop was conducted by Dr. Muhammad Jawad. This Course was conducted on campus. A large number of students attended this paid course. The students showed keen interest in this trending topic. ERC plans for this course regular offering and to introduce advanced levels as well.



Energy Research Centre (ERC) & ECE Department CUI Lahore
Presents short course on

PYTHON FOR DATA SCIENCE MACHINE LEARNING WORKSHOP
1.5 CPD POINTS COURSE

WHY TO ATTEND THIS COURSE
Machine learning is a trending topic in this age of Artificial Intelligence. The fields of computer vision and Natural Language Processing (NLP) are making breakthroughs that no one could've predicted. The machine learning is preferred to be implemented on Python because Python code is understandable by humans, which makes it easier to build models for machine learning. Since Python is general purpose language, it can do a set of complex machine learning tasks and enable you to build prototypes quickly that allow you to test your product for machine learning purpose.

COURSE CONTENTS

- Python Installation and Basics
- Data Preprocessing
- Regression (Simple linear regression, multiple linear regression, Polynomial Expression, Support Vector machine, (SVM), Decision tree Regression, Random Forest Regression,)
- Classification (k-NN, Kernel SVM, Naive Bayes, Decision Tree, Random Forest)
- Clustering (Kmean and Hierarchical)
- Introduction to ANN and CNN
- Dimensionality Reduction (PCA, Kernel PCA and LDA)
- Model Selection (k fold cross validation and Grid Search) and Boosting (XG Boost)

WHO SHOULD ATTEND

- Data Scientists
- Electrical, Computer Engineering, Computer Science Students.
- Research Students belonging to any other Allied Fields.

REGISTER NOW
<http://bit.ly/erccpd2>

FEE SUBMISSION
Account Title HBL CIIT: CPD Fund
Account Number 2305-7000826-03
Fee: 5000 PKR for Professionals
3000 PKR for CUI Students
3500 PKR for NON CUI Students





Venue
CUI Lahore Campus

Date & Time
17-19 August 2022
2.30 pm to 6.30 pm

Course Instructor
Dr. Muhammad Jawad
Associate Professor
ECE

For Info
Email at info.erc@cui lahore.edu.pk

Workshop on Energy Conservation

ERC faculty members attended a workshop on Energy Conservation by NEECA at PC Hotel Lahore. This workshop was aimed at promoting energy conservation throughout the country and promoting the use of energy-efficient devices and appliances. To make use of energy conservation techniques for making Pakistan energy efficient.

Dr. Sobia Baig HoD ERC and Dr. Fawad Azeem Assistant Professor ERC were provided certificates for successfully completing energy Management course by NEECA.



Visit of US Denim & US Apparel Officials

US Denim & Apparel, a renowned textile exporting group visited COMSATS CUI Lahore Campus in January 2022 and had a meeting with ERC & ECE Faculty members. The meeting was aimed at collaboration between Industry and Academia. They elaborated about their energy and sustainability plans for the textile industries.



PEC Training Workshop

PEC training workshop was held at UET Lahore Campus. Dr. Sobia Baig and other Faculty members from the ECE department attended this workshop. The training for PEVs was held at UET Lhr and was delivered by the Malaysian Expert on Outcome based Education, Prof. Megat Johari P.Eng. JMS, Board Member & Chair of Examination and Qualifications Committee, Board of Engineers Malaysia (BEM). The two day training covered multiple aspects of the Washington Accord and its review process from Pakistan.



HoD ERC Talk in International Conference

HoD ERC presented a talk on Microgrids-The Way Forward for Electrification of Rural Communities in 4IR 4th Industrial Revolution- Megatrends & Opportunities for Sri Lanka-Conference. The talk included Deployment of Hybrid/DC Microgrids with DERs-Optimal and economic solution, IoT based Data Acquisition and Analytics of rural microgrids. The participants of the conference discussed categorization with reference to electricity needs and regional resources of renewable generation, Deploy Demand Side Management & Demand Response and Customized Optimal System Design for an efficient and reliable DER utilization for the regional Microgrid.

Dr. Sobia Baig highlighted the importance of remote monitoring based IOT protection, reliable operation and preventive maintenance etc. It was agreed in conference to motivate students and researchers to work for sustainable Microgrids Establishment. The conference ended on the notion that government should form a consortia of academia, industry and governmental organizations.

MOU with Federal University of Juiz de Fora, Brazil

Federal University of Juiz de Fora, Brazil and the COMSATS University Islamabad, Islamic Republic of Pakistan, are signing a formal Memorandum of Understanding (MOU), through which both institutions are desirous to foster their relationship in order to promote national and international exchanges intended to educate students, faculty and staff members from both sides. The MoU will facilitate internationalizing the lifelong learning processes with an aim to promote academic and research programs. Prof. Dr. Sobia Baig, Head, Energy Research Centre, CUI Lahore Campus has been assigned as the Focal Person from CUI for the signing of the MoU. The MoU was signed by the Worthy Director CUI-Lhr, Professor Dr. Asad Hussain, nominated by the Worthy Rector CUI to represent him in signing the MoU at the CUI side. A ceremony was held in this context dated December 20, 2022.



ERC signed an MOU with EP Teck for collaboration in fields of smart energy, smart grids and net metering. After the MOU Signing a meeting was held between ERC Faculty members, Registrar CUI Lahore and EpTeck Officials to discuss areas of mutual cooperation.



List of Projects Submitted 2022 for Funding

S.R No	Project Title	Funding Agency
1	Design and Analysis of Solar PV-thermal Hybrid System Technologies " by PI ., Co Pi Dr. Tareq Manzoor .	HEC
2	Efficient and Flexible Fuel Combustion System through Flameless Regime. Co Pi Dr. Tareq Manzoor .	HEC
3	Interconnection & Coordination of Multi-Microgrids to Promote Penetration & Efficient Utilization of Renewable Energy(2022-2023)	Ajman University

ERC Academic Collaborations

Academic Collaboration with Other Universities

- University of the Punjab
- CERAD UET Lahore
- USPCASE-NUST
- Aalborg University Denmark
- University of Malaya
- UFJF, Brazil
- Lancaster University UK
- SCOUT China



Academic Collaborations within CUI

- Architecture Department
- ECE Department
- Humanities Department



ERC Industrial & Govt Collaborations

Industrial Collaborations

- ETRC
- EpTeck
- Presscon Engineering (PVT) Ltd
- Al Rehman Switch Gear
- Circutor
- Jolta batteries



Government Collaborations

- NEPRA
- NEECA
- LESCO
- NTDC
- PEECA



Policy Framework Contributions

- NEECA
- Microgrid NEPRA
- World Bank

