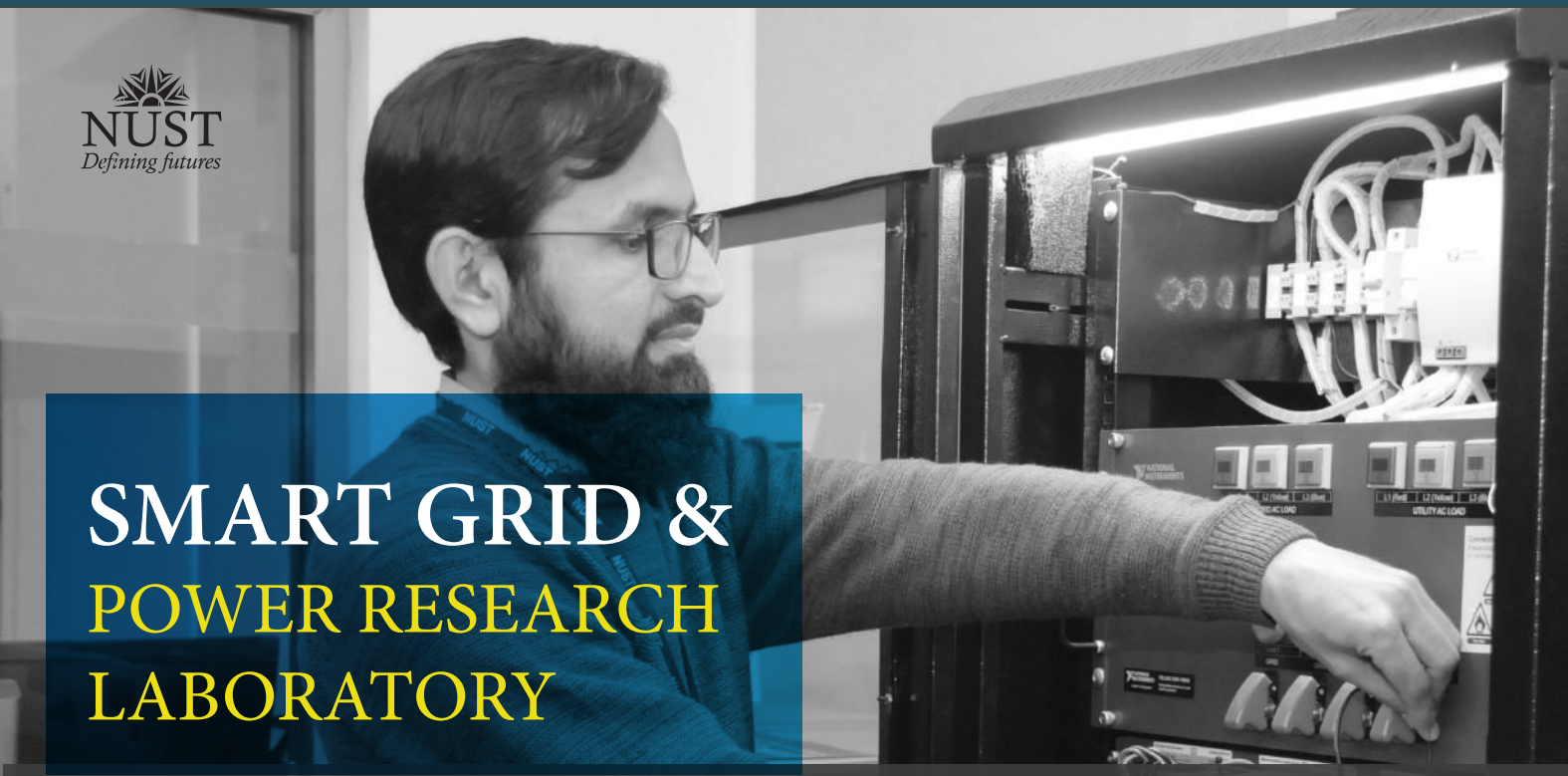

SMART GRID & POWER RESEARCH LABORATORY

The Lab offers prototyping/testing system based on National Instruments Hardware and LabVIEW. It has demonstrated modern engineering techniques combined with a cost efficient, flexible development platform, and creates opportunities for control and measurement in various parts of power systems. The Lab is capable of real-time simulation/emulation of power systems through power hardware in the Loop and Power Grid Simulator. The state-of-the-art facility is established with the worth of one million USD through the USAID funding.

Our vision is to be nationally recognised for choice educational programmes as well as vanguard research through purposeful activities and eminence of its faculty, staff and graduates. The EPE Department at USPCAS-E aims to offer quality education programmes of international standard; to be a place of useful learning and research in Electrical Power Engineering; and to serve the community and industry as an instrument of technological innovation and educational advancement. The department has a dedicated Smart Grid Lab that has capacity of real-time digital simulation. The lab enables research and development of new equipment, such as numeric relays as well as facilitates hardware or controller in the loop testing. We collaborate with national as well as international academic and industrial partners and centres of excellence through applied and joint research projects and exchange visits of students and faculty.

LAB MISSION

Conducting research in the Domestic Power Sector, while keeping focus on problem solution and upgradation of the conventional grids to smart grids in Pakistan. It aspires to increase synergy between conventional and smart grids by utilising modern innovative technologies.

RESEARCH PORTFOLIO

Power Grid Simulator (HIL), GPS based Transmission/ Distribution Monitoring, Microprocessor Relay Protection System, Power Quality Analysis, Transient Measurement System, Operation and Control and Customizable Micro Grids Control and monitoring.

RESEARCH EQUIPMENT

Equipment	Description	Specification
FPGA Based Rapid Control Prototyping	NI-GPIC Back to Back Invertor Board	• 400 MHz Real-Time Processor • 256 MB RAM • 512 MB Non-volatile Storage • Xilinx Reconfigurable FPGA • 58 hardcore DSP48A1 slices (multipliers)
Protection Relay Development system	Micro Relay Protection System based on NI-CRIO Consisting of range of ready-made electromechanical and microprocessor relays as well as compact Rio enables protection relays that can be programed for various protection logics	• CPU Intel Atom E3940 • Number of cores 4 • CPU frequency • 1.6 GHz (base) • 1.8 GHz (burst) • On-die L2 cache 2 MB
NI phasor Measurement Unit (PMU) development system	This system is used to monitor the power flow with GPS time stamping	• GPS time synchronization to +- 10 ns • Input modules for 400v(rms),50A(rms) signals • 4 GB of local non-volatile storage • -400C -700C operating temperature range • 50KS/s per channel simultaneous wave for acquisition
NI phasor Data Concentrators (PDC)/Synchro phasor Development System	Used to concentrate the PMU data	• Two PMU can be attached with the System
Transient and Frequency Measurement Setup	NI-PXIe-1071 With Oscilloscope Card	• 4 or 8 simultaneously sampled 14-bit channels • User-programmable with lab-VIEW FPGA • Streaming and Logging
Power Quality Analyzer	The system is used to measure the power quality related variables	• GPS time synchronization to +- 10 ns • Input modules for 400v(rms),50A(rms) signals • -400C -700C operating temperature range
Programmable Electronic Load, High Voltage Programmable DC power Supplies and Batteries	The system is used as a load for different research purposes	• Programmable resistive, capacitive and inductive loads up to 25 KW • High voltage programmable DC power supplies having output voltage in the range 50 V – 5000 V and output current in the range 0-5 mA
Smart Grid automation along with SCADA and DCS System)	The system is used to monitor and control different remote parts of the electrical system	• Three nodes are available with the system
Power Grid Simulator	This system is used to run Hardware in the loop simulations	• The system is capable for simulating 72 switches • 64 LC components • Unlimited Resistive elements