## Suitability/Need

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**Aim, Significance, and Relevance of the Proposed Laboratory-Assisted Research**

The proposed ‘Bangladesh Advanced Laboratory for Energy and Power Research’ at the Department of Electrical and Electronic Engineering, CUET, is aligned with the strategic vision of the Bangladesh Energy and Power Research Council (BEPRC) to enhance energy security through innovation, research, and capacity building. The primary aim of this laboratory is to establish a cutting-edge research facility that empowers academia and industry to address critical energy and power challenges of Bangladesh in a sustainable, affordable, and technologically advanced manner.

Bangladesh is undergoing rapid energy sector transformation, with a national target of achieving 60,000 MW power generation capacity by 2041, of which 40% is expected to come from clean energy. This transformation requires innovative solutions, skilled manpower, and modern research tools to address emerging challenges including integration of renewable energy, energy storage systems, smart grids, electric vehicles, and energy efficiency.

This laboratory will provide the necessary infrastructure to develop knowledge-based human resources, strengthen local R&D capacities, and support BEPRC’s broader agenda of Innovation, Incubation, and Entrepreneurship (I2E). It will serve as a hub for national and international research collaboration, promote the development of indigenous technology, and foster synergy among universities, industries, and government agencies.

###### Relevance to Bangladesh's Needs

The laboratory directly addresses the national need for resilient, efficient, and sustainable energy

systems. With current university-level facilities insufficient to support research in many critical domains—such as smart grid testing, renewable energy component evaluation, and power device diagnostics—this lab will bridge a significant infrastructure gap. The proposed infrastructure will also help realize the mandates outlined in the Bangladesh Energy and Power Research Council Act, 2015, which calls for the establishment of dedicated energy research facilities. Sustainable Development Goal 7 (SDG7) aims to ensure access to affordable, reliable, sustainable, and modern energy for all. Bangladesh has adopted SDG7 and aims for 100% electricity access by 2021. The government is working to increase the share of renewable energy and improve access to clean cooking technologies by 2030. This proposed laboratory will contribute to achieve SDG7 goal.

###### Importance of Tools for Researchers

The inclusion of specialized equipment such as Solar Cell IV testers, LED test setups, Solar Street

Light testers, Transformer and Switchgear testing systems, and advanced simulation software will provide faculty members, postgraduate students, undergraduate students, and early-career researchers with hands-on experience in critical areas. These tools are vital for conducting experiments, validating prototypes, testing performance metrics, and generating high-impact scientific output. Additionally, these facilities will be instrumental in supporting BEPRC-funded innovation projects and fostering an ecosystem of practical learning and experimentation.

###### Enhancement of Research Scope

By upgrading and expanding current capabilities, the proposed laboratory will significantly increase

the scope of existing research and unlock new opportunities. Areas such as renewable energy integration, grid stability studies, smart grid and microgrid simulation, energy storage systems, and power electronics will see enhanced activity. The lab will also support emerging fields like electric mobility, power quality

improvement, and distributed generation systems—domains critical to Bangladesh’s clean energy transition.

###### Role in Collaborative Initiatives

The lab is envisioned as a collaborative platform for national and international research programs,

including multi-institutional and public-private partnerships. It will serve as a cornerstone for future linkages with the centrally established Bangladesh Energy & Power Research Laboratory (BEPRL) and enable the hosting of joint projects with reputed global institutions and funding agencies. The lab will also facilitate research exchange programs and technical internships, promoting cross-border knowledge sharing and workforce development.

###### Proposed Laboratory Use and Expected Measurable Outcomes

The laboratory will be actively used for:

* Academic research leading to high-quality publications, patents, and student theses.
* Skill development of undergraduate and postgraduate students through lab courses, workshops, and internships.
* Testing and validation of equipment and innovations related to power systems and renewable energy technologies.
* Collaborative research involving industry and research organizations.

Expected outcomes include:

* A significant increase in peer-reviewed journal and conference publications.
* Industry-grade prototypes and patents.
* Enhanced employability of students through practical experience.
* Stronger collaboration between CUET and industries, utilities, and research councils.
* Support for national-level pilot projects and standards testing.
* Skilled workforce development for Bangladesh’s energy sector.

###### Availability and Utilization of Similar Infrastructure

Currently, no similar integrated research facility exists in the Chattogram region or in the majority of public universities in Bangladesh. Existing labs are fragmented, under-equipped, or focused solely on academic instruction without the capability to handle real-time testing, high-power component analysis, or advanced renewable integration studies. Internationally, such facilities are common in leading universities and contribute significantly to their R&D outcomes. The proposed lab aims to align CUET’s capacity with global standards and address a pressing national deficiency.

###### Rate of Use of Proposed Infrastructure

Given the increasing interest in energy research, policy shifts toward renewables, and the growing number of postgraduate and undergraduate students in the EEE department and allied disciplines, the rate of utilization is expected to exceed 85% annually. The lab will also support ongoing and upcoming BEPRC- funded projects, ensuring continuous and meaningful use of its infrastructure.

###### Regional and Remote Institutional Support

This laboratory will be developed as a regional research hub, extending support to other academic institutions, polytechnic colleges, and training centres in the Chattogram division and beyond. Many such institutions lack access to modern energy research infrastructure. The lab will be open for joint research, external testing, and skill development programs, thus meeting the special needs of regional and under- resourced organizations.