Thematic Areas of Research

The Smart Controller Laboratory (SCLab) would also work towards achieving the following goals during its operation:

- Design and Development of different Smart and Distributed Power Solutions;
- Research and Development (R&D) of various Intelligent Load and Resource Management using Smart Controllers;
- Simulation and modelling of renewable energy based smart-mini micro-grid system and its component.

Outreach:

- Technical Briefs
- Journal Publications
- Conference Proceedings

Training and Capacity Building:

- Both Technical and Management Training: Through short-term courses like Management Development Programs (MDP) on Smart Grid, GIS and Virtual Lab cum Hands-on facilities for the researchers;
- Workshops/Conferences on Smart Controllers, Smart Grid, Smart Mini Grid (SMG) and GIS;
- Technology for academic community as well as field professionals;
- Specialized training courses on installation, operation and maintenance for the Off-Grid Solar PV Plants.

About TERI

The Energy and Resources Institute (TERI) is a strong, dynamic, and flexible organization with a global vision and a local focus. TERI is committed to every aspect of sustainable development providing environment-friendly solutions to rural energy problems, finding solutions to growing issues of urban transport and air pollution; promoting energy efficiency in Indian industries and much more. The emphasis has always been on finding innovative solutions for making the world a better place to live. All activities in TERI revolve around formulating local and national-level strategies and suggesting global solutions to critical energy and environment-related issues.

SMART CONTROLLER LABORATORY (SCLAB)

TREE Building, TERI Gram Gwal Pahari,
Gurgaon-Faridabad Road, Haryana, India

Supported By:

TERI Norwegian Framework Agreement

For further details, please contact:

Mr Alekhya Datta
Centre for Distributed Generation (CDG)
Energy Environment Technology Development (EETD) Division

TERI – The Energy and Resources Institute
Darbari Seth Block, India Habitat Centre (IHC) Complex
Lodi Road, New Delhi – 110 003, India
Tel: +91 (0) 11 2468 2100 or 4150-4900
Fax: +91 (0) 11 2468 2144 or 2468 2145
E-mail: alekhya.datta@teri.res.in

Designed By: www.webcommunication.com
**INFRASTRUCTURAL FACILITIES AVAILABLE IN SMART CONTROLLER LABORATORY**

<table>
<thead>
<tr>
<th>List of Equipment</th>
<th>Specifications</th>
<th>Purpose</th>
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</table>
| Solar PV Array Simulator | - Manufacturer: Elga™ by Ametek  
- Model: 57023601  
- Input: 380/400AC, 3 - Phase Delta connection, 70 Amps  
- Output: 0-600VDC, 0-25A  
- Power: 30kw  
- Software: Terra SASTM, Version 1.6.0.2 | - Emulate the real solar arrays within the lab;  
- Comparison between simulated and real PV technology;  
- Testing of different rated loads with Solar Array Simulator (SAS);  
- Simulate the different physical conditions and estimate the real module performance in the lab. |
| Grid Simulator          | - Manufacturer: California Instrument™ by Ametek  
- Model: MX30-3P-400-LF-SNK  
- Input: 400VAC, 50-60Hz, 36kVA  
- Output: 150/300VAC, 16-500Hz  
- Power: 30kVA  
- Software: MX Series MXGUIUM, Version 1.18 | - It can create grid of various combination such different frequency, voltage and harmonics  
- Can act as a source as well as sink (able to feed power back into the grid)  
- Effect of a fluctuating grid can be analyzed within the lab and its effects on different equipment and solution to the issues experienced will be developed and implemented in the field with a cost effective manner with novel technology applied to it. |
| Load Emulator           | - Manufacturer: Quinling Energy Resources  
- Model: ACLT-3803H  
- Power: 30kW  
- 10kW Resistive load  
- 10kVar Capacitive load  
- 10kVar Inductive load  
- Software: ACLT - 3803H Device Manager | - Emulate different loads in terms of the power ratings;  
- Analyze the load parameter while loading;  
- Analyze the voltage and current characteristics in simulated model of a real load;  
- Performance assessment and comparison of various renewable energy technologies with varying parameters of load on loaded condition;  
- Quick generation of load characteristic report for future analysis;  
- To create scenario to test anti-islanding of grid connected inverters. |
| Embedded System and Controller | National Instruments (NI)™ Hardware Platform:  
Controller: NI Compact-RIO (cRIO) 9074 with 8-Slots Chassis  
C-Series Modules: Voltage, Current,  
- Relay and Digital I/O modules  
Software: NI LabVIEW Developer Suite, Version 2012; NI LabVIEW Electrical Power Suite (EPS); NI LabVIEW Data-Logging and Supervisory Control (DSC) Module | - To customize different Smart Solutions and Packages for Intelligent Load Management and Control;  
- Design and Development of Integrated Resource Management platform for various Distributed Energy Resources (DERs);  
- Research on optimized system design;  
- To develop different Hands-on demonstrations and training Tool-kit. |

**VISION**

Design and develop innovative, cost-effective smart and sustainable distributed power solutions for various applications in vertical domains.

**MISSION**

- Established as an independent state-of-the-art Testing, Evaluation, and Research laboratory for Distributed Power Systems and Smart Controllers  
- Performance assessment of different Distributed Power Systems  
- Design and development of customized Smart Solutions and Packages for various applications  
- Acting as knowledge expert to several Distributed Generation-based Programme and Policies  
- Develop qualified and field proven professionals through specialized technical training courses and knowledge transfer

**SERVICES OFFERED**

- Testing and long-term performance assessment of different photovoltaic (PV) technologies both in standard lab (indoor) conditions and field (outdoor) environments;  
- Testing and long-term performance assessment of different battery technologies;  
- Testing and performance assessment of different inverters;  
- Testing and assessment of renewable energy based hybrid systems (including Smart Micro/Mini-Grids) under different operating conditions;  
- Planning, design, lab-scale emulation & testing and actual demonstration of smart-mini/ micro-grid system for different applications, using smart sensing & measurement units, advanced power electronics and secure communication infrastructure  
- Study of policy, regulatory and financial aspects of smart-mini/ micro-grid system  
- Resources forecasting simulation  
- Specialized training course on installation, operation and maintenance for the Off-Grid solar PV plants  
- Testing and performance assessment of the solar PV charge controller  
- Short course on the smart controller design and GIS