Annexure-I

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
ALTERNATE HYDRO ENERGY CENTRE

Major Research Initiatives of AHEC for Academic Year 2012-13 to 2015-16

1. **Research and Development in Hydro Turbine:** Initiated R&D in hydro turbine by establishing an International level Laboratory for developing hydro turbine-model and its testing, human resource development (HRD), generation of design data, design validation through CFD analysis and third party evaluation. This facility is the first independent facility in the region. With this, the institute shall be assisting industries through R&D work.

2. **Solar Energy Use for IIT Roorkee Campus**: with the support of Ministry of New and Renewable Energy, Govt. of India IIT Roorkee installed three research projects for Solar Energy Use (a) 1.8 MW SPV power plant on roof top of buildings (b) 4.4 lacs lpd Solar water heating system and (c) solar steam cooking system for 9 students messes in IIT Roorkee Campus. The data on performance of different systems is monitored through SCADA and is being used for research and development work by students and faculty.

3. Initiated **Sediment Monitoring and Impact Analysis** Studies in Hydro Power Plant to study the impact of sediment laden water on different components of hydropower plant in laboratory as well as field conditions. A depository of the sediment data of hydropower plant shall also be made.

4. Initiate study for **optimization of Hydro resources** by considering the addition of capacity planned from thermal, solar and wind generation, ways to achieve regulatory requirements with respect to operational parameters considering the present condition of the equipment

5. Carry out the research on the development of **standard designs of cross flow turbine** with improved efficiency by providing the guide mechanism to guide the flow inside the runner. The proposed improvement shall be analysed with CFD analysis for different operating conditions. The optimal parameters shall be worked out for a prototype which shall be fabricated and installed at a suitable site for its field performance monitoring.

6. **Solar thermal energy storage and utilization:** studies are being carried for performance enhancement of solar air heaters by promoting artificial roughness to absorber plates. Further, studies are being carried out for the development of packed bad material based sensible heat solar thermal storage

7. **Setting up a solar energy laboratory:** To simulate and conduct performance evaluation of solar photovoltaic systems under different operating conditions. All equipment/instrumental facilities are created to carry R&D on SPV systems.

8. Biodiesel production from vegetable oil resources, biofuel quality improvement and utilization for diesel engine operation for power and motive power. The biodiesel production processes are being developed alongwith improvement in the stability as well as cold flow properties of biodiesel and its utilization of biodiesel and its blends with petroleum diesel for diesel engine operation.

9. Estimation of green house gases (GHGs) from hydropower reservoirs and municipal solid wastes (MSW) dumping sites. Research is underway to estimate the GHG emissions potential of hydropower reservoir/ MSW. In recent times, it is a serious environmental concerns and studies are being done on suitability of wastes for material and energy recovery just after waste generation to minimize the emissions.

10. Ecological health assessment of lakes/ reservoirs / ponds/ wetlands is also carried out to assess the pollutional status of water bodies and to undertake appropriate measures to restore the health of water bodies.

11. Development of IRES and HES for energizing the remote rural areas involving the integration of renewable and non-renewable sources to meet the electrical power needs of given areas.

12. Research initiatives are also undertaken in the following areas:

- Optimization of placement of distributed generation in the utility network.
- Development of variable frequency transformer for integration of wind energy system with grid.
- Performance analysis of self-excited six phase induction generator.
- Improvement of power output using grid interactive SPV system.
- Investigation & planning of civil works for SHP plants.