

## Department of Energy Science and Engineering

### Executive Summary

#### *About The Department*

In 1981, Energy Systems Engineering was founded as an inter-disciplinary group at IIT Bombay offering M.Tech. and Ph.D. programmes. In the year 2007, it was evolved into Department of Energy Science and Engineering (DESE), in 2007. DESE has started an integrated M.Sc.- Ph.D. programme in Energy from 2007 and a Dual Degree (B.Tech - M.Tech.) programme in Energy Systems Engineering from 2008. As clean and efficient energy systems are key aspects in addressing energy security of India as well as developing sustainable development. The vision of the DESE is “To Develop Sustainable Energy Systems and Solutions for the Future.”

At present, DESE has 18 core faculty members, 35 associated faculty members from various other departments, 8 staff members, 133 project staff, and 386 students (out of which 159 are PhD students). Research area of the department includes renewable energy (solar photovoltaic, solar thermal, biomass, wind, etc.), energy conversion and storage (fuel cell, battery, hydrogen, engine, etc.), and energy systems analysis (clean coal, building, process integration, micro-grid, planning and policy, system optimization, etc.). In the period 2008-2012, 130 journal papers (with 1742 citations in Scopus with h-index of 26 and i-10 index of 59), many books and book chapters had been published and 12 patents had been filed. Significant research facilities have been developed through various projects (with special mention of Development of a Megawatt-scale Solar Thermal Power Testing, Simulation and Research Facility, and National Centre for Photovoltaic Research and Education). Faculty members are now associate editor and/or editorial board members of many international journals (e.g., Solar Energy, Energy for Sustainable Development, and Clean Technologies and Environmental Policy, etc.).

#### *Review Committee*

A committee with the following experts was formed to review the progress of DESE: Prof. J. Srinivasan, Prof. A. K. Shukla, Dr. N. Forbes, and Dr. S. Maithel. The committee met on 2<sup>nd</sup> January 2014. The committee was impressed by the growth of the department, number of students, faculty, research projects, research outputs during the review period (2008-2012), in spite of the limited physical infrastructure. It has been noted that this is the only department of its kind in the country and the intellectual vibrancy both from the faculty and the students. The committee observed that most of faculty members are very young and hence, the department has a bright future provided the desired infra structure is provided. The department can provide manpower for country's energy future.

Committee made the following recommendations:

- 1. Growth of the Department is hampered by the fact that there is no dedicated building.*
- 2. In the mean time, a contiguous space of about 5000 sq. ft should be provided in the interim basis, so that all the many of the interrelated labs can be conducted together and collaborative research can be performed.*
- 3. Significant Industry interaction is under way. This can be expanded further through more systematic targeting of 100 relevant industries.*
- 4. Department should take the leadership role in energy education and research by helping and collaborating with other technical institutes.*
- 5. The excellent work done by the department should be more visible to potential students and relevant industries.*
- 6. As the PhD student numbers have grown there is need for strengthening the ongoing seminar program.*

The committee looks to the department to play an important role in India's energy future.

#### *Action Plans*

- 1. Building:** A combined building for DESE and Centre for Environmental Science and Engineering is already planned. However, the progress of the building needs to be on the first track, as it hampers the growth of the Department. DESE request Institute to expedite the progress of the building and clear timeline should be defined.
- 2. Space:** In the mean time, as recommended by the expert committee, department needs some contiguous space. DESE is looking forward to the institute to provide some research space for the interim period.
- 3. Industry interaction:** Department has already started identifying various industries for further interactions and strengthening the research and education program. We expect to finalize the list of industries by next semester.
- 4. Technical leaderships and collaborations:** Department have already started planning to collaborate with some other technical institutes to enhance energy education and to enhance collaborative research in the field of energy science and engineering.
- 5. Visibility and seminars:** Department is planning to increase its outreach program to increase its visibility and in the same time started identifying outstanding speakers to strengthen its own seminar program. As a first step, we are strengthening our existing Energy Day (reaching industry and other technical colleagues with presentations from passing out students) and Helios (student competitions, organized by the students).