Centre of Energy Conservation and Management

In view of the new generation of 'Green Energy' and to develop, install, operate and maintain sustainable energy solutions for meeting the energy demand of the society, Centre of Energy conservation and Management was established in Shri Ramswaroop Memorial University, Barabanki. Interdisciplinary manpower possessing different combinations of technical knowledge and skill set is collaborated to promote and encourage multidisciplinary activities.

SRMU provides the platform to fulfill the need of trained manpower as well as research and development activities in the area of energy engineering. The major aim is to encourage various facets of energy technology in the form of research and teaching by various young professionals. Looking into the potential and application of various energy resources available in India, it is emphasized that the centre gives priority to activities in the field of solar energy. The research activities in this centre are in the form of research publication in various national and international repute journals, National conferences etc. Faculty members from various departments such as Physics, Bio sciences, Mechanical Engineering and Electrical Engineering are associated with the centre for the promotion of interdisciplinary research for sustainable energy. At present, 7 faculty members from different departments are actively involved with a Research Mentor in energy research.

The major goal of this centre is

- To train manpower in the field of renewable energy and conservation for energy efficient technologies as well as for sustainable development.
- To research and develop various energy efficient technologies to design and develop energy conversion techniques.
- To conduct conferences and workshops at national and/or International level.
- To develop a platform among the academia, industries, research centers for the interaction and promotion of technologies.
- To offer consultancy service for industries.
- To reduce the carbon footprint and promote various sustainable development technologies by introducing new and innovative designs.

Key Research Facilities

GiSPVT: In order to enhance an application of renewable sources of energy by using solar energy, an integrated system known as greenhouse integrated semi-transparent photo-voltaic thermal GiSPVT as shown in figure. Greenhouse technology integrated with photovoltaic thermal (PVT), is one of the promising solutions to exponential food and energy demands. These combination land and food issues may appear unmanageable, but they can be significantly strengthened by using agri-voltaics (dual land usage both for solar photovoltaics and agriculture), aqua-voltaics (dual water use for solar photovoltaics and aquaculture) and smart international and cross disciplines. This dual use results in greater self- sustainable productivity overall.

- **Solar Simulator:**

The I-V curve of any optimum size solar cell [silicon solar cell=4 A and 500 mV] under the standard test condition (STC) [I=1000W/m^2 and T_{ref}=25°C] is one of the basic tools/parameters to determine its electrical efficiency. At present, solar indoor simulator for testing solar cells in only indoor conditions are available to develop characteristic I-V curve. These simulators for PV module consists of a number of solar cells connected in series are also available at a very high cost in India. These PV modules are able to generate only electrical power. However, photovoltaic thermal module (PVT-M) systems which generate both electrical and thermal energy have proved to be more economical than PV modules. Such units are mostly used for thermal application in forced mode to make the thermal system self-sustained. This unique indoor solar simulator is present in the SRMU campus.

Solar Energy Park

In solar energy park, stand alone PV system, water pumping, various design of solar still, evacuated solar water heater, integrated PV hybrid active solar still, water heater, air heater, and green house crop dryer exist. All thermal based systems are also powered by semitransparent PV module integrated with thermal system to make the system sustainable.

Previous Activities:

National Conference SOLARIS 2020

SRMU in collaboration with BERS, Sukrit Solar Pvt Limited and Gajah Solar Power Pvt Limited organized the "SOLARIS 2020- a National Conference on Sustainable Environment and Climate" from 7-9 February 2020. Various faculties from IIT/NITs and research scientists were invited to discuss the new technologies in solar. The Guest of honour in SOLARIS 2020 was Prof. Vineet Saini (DST, GOI) and Chief guest was Prof A.S.K Sinha (Director, RGIPT). More than 20 invited lectures, poster sessions and 6 technical sessions were conducted during the conference.

Research Publications:

- R.G Singh, G. N Tiwari, Simulation performance of single slope solar still by using iteration method for convective heat transfer coefficient, Groundwater for Sustainable Development, Vol 10, 100287, (2020).
- AK Singh, RG Singh, G. N Tiwari, Thermal and electrical performance evaluation of photo-voltaic thermal compound parabolic concentrator integrated fixed dome biogas plant, Renewable Energy, 154, 614-24, (2020)

- AK Singh, GN Tiwari, RG Singh, RK Singh,Active Heating of Outdoor Swimming Pool Water Using Different Solar Collector systems, Journal of Solar Energy Engineering,142,(4), 041008 (2020)
- Daily exergy analysis of passive solar still for maximum yield DESALINATION AND WATER TREATMENT, 204,1-9 (2020)
- Poster presentation on "Active Heating of Outdoor Swimming Pool Water Using PV Thermal Compound Parabolic Concentrating Collector" at SRMU, Feb 7th to 9th, 2020.
- Singh, A. K., G. N. Tiwari, R. G. Singh, and R. K. Singh. "Active Heating of Outdoor Swimming Pool Water Using Different Solar Collector Systems." Journal of Solar Energy Engineering 142, no. 4 (2020). Impact factor 2.487
- Singh. A.K., G.N. Tiwari. "Performance of active solar heating of outdoor swimming pool: A constant collection temperature mode." Asian Journal of Physics, 30, no.1 (2021).
- Sunil Kumar Singh, Shikha Singh and Yashwant Singh, "Analysis of a Grid-Connected PV System Located in Educational Institution," Recent Advances in Power System, Lecture Notes in Electrical Engineering, Springer, vol.699, pp.349-355.
- Shubham Mishra and Shikha Singh, Performance Assessment of Solar Based Air Conditioning System, Solaris 2020.

Sanctioned Project

Sanctioned project entitled **"Performance Evaluation of a floating Bio-gas Plant by Integrated Semi-transparent photo-voltaic Thermal (SPVT) collectors (Bi-SPVT) during harsh winter Indian climatic conditions"** sanctioned by Petroleum Conservation Research Association (PCRA). Ministry of Petroleum & Natural Gas, Government of India.

Faculty Members involved in Centre for Energy Conservation & Management

Dr. G. N. Tiwari – Research Mentor, SRMU

Gopal Nath Tiwari received his postgraduate and doctoral degrees in 1972 and 1976, respectively, from Banaras Hindu University. He has been actively involved in the field of Solar Thermal Applications, namely, solar distillation, water/air heating system and greenhouse technology and building design. He has guided 32 Ph. D. students and published 300 research papers in journals of repute. He has authored six books. A co-recipient of 'Hariom Ashram Prerit S.S. Bhatnagar' Award in 1982, Professor Tiwari has been recognised both at national and international levels. His contribution for successful implementation of hot water system in the IIT campus has been highly appreciated. He had been to the University of Papua, New Guinea in 1987-1989 as Energy and Environment Expert. He was also a recipient of European Fellow in 1997 and been to the University of Ulster (U.K.) in 1993. Besides, he had been nominated for IDEA award in the past.

Dr. R. G. Singh – Dean, Faculty of Physical Science, INSH

Dr. Ram Gopal Singh has obtained his masters in physics and the doctoral degree in the area of Laser Plasma Interaction Physics from University of Lucknow. He joined the Faculty of Physical Sciences, Institute of Natural Sciences and Humanities at Shri Ramswaroop Memorial University, as an assistant professor in 2012. Before joining SRMU he was associated with Babu Banarasi Das Group of Institutions as a Senior Lecturer for couple of years and also served as a guest faculty in the University of Lucknow for a year. He has over 10 years of research and teaching experience. Currently he is an Associate Professor in the Faculty of Physical Science, SRMU and working in the capacity of Dean.

Dr Praveen Kumar Srivastava – Asst. Prof., Bioscience and Technology and Deputy Registrar-Research

Dr. Praveen Kumar Srivastava is working as an Assistant Professor in Institute of Bioscience and Biotechnology (IBST) as well as Deputy Registrar (Research) at SRMU. Prior to joining SRMU, he worked as **DST-Young Scientist** (Start-Up Research Grant, Science and Engineering Research Board; SERB) at Dr. Shakuntala Misra National Rehabilitation University (DSMNRU), Lucknow, **Dr. D. S. Kothari Postdoctoral Fellow** (DSKPDF) - UGC (University Grants Commission) at Lucknow University and postdoc fellow **in IFCPAR** (Indo-French Centre for the Promotion of Advanced Research) project at **Banaras Hindu University (BHU)** collaborated with **INRA, SCRIBE Campus de Beaulieu, Rennes cedex, France.** He completed his PhD as **DBT-JRF/SRF** and **DST-JRF** fellow from Department of Zoology, **University of Delhi,** New Delhi

in 2013. Apart from this he qualified **NET** and three times **GATE** with highest **98 percentile** conducted by **IISc Bangalore** and **IITs** and also has been awarded as **Honorary fellowship** and **Young Scientist Award** in the field of Aquaculture by Society of life science (F.S.L.Sc) in 2017 and 2018 respectively. His area of research interest lies in the field of Bioresource Technology, Aquaculture Engineering and published several research papers in reputed International Journals indexed in SCOPUS/WoS and SCI.

Mr Amit Kumar Singh – Asst. Prof. in Mechanical Engineering, IoT

B.Tech. in Mechanical Engineering (May 2009)
Bundelkhand Institute of Engineering & Technology, Jhansi, U.P. (State Government Engineering College)
M.Tech in Mechanical Engineering)
(June 2013)
Indian Institute of Technology BHU, Varanasi
PhD (Pursuing)
Centre for Energy Conservation & Management, Shri Ramswaroop Memorial University, Lucknow- Deva, Barabanki, U.P.

Awards and Achievements

- Best Paper award in Solar thermal applications category inernational conference SOLARIS 2019, held in Jamia Millia Islamia University, New Delhi.
- Qualified GATE examination seven times with three times under 1000 AIR rank in Mechanical Engineering discipline.

Mr. Rakesh Diwedi – Asst. Prof. in Mechanical Engineering, IoT

B. Tech. (Mechanical Engineering) from L.N.C.T, Bhopal (U.P.) in 2010**. M. Tech.** in Design from Motilal Nehru National Institute of Technology, Allahabad (U.P) in year 2014. His research area includes solar still, solar water heater.

Mr. Yashwant Kumar Singh – Asst. Prof. in Electrical Engineering, IoT

B. Tech. (Electrical & Electronics Engineering) from Raj Kumar Goel Institute of Technology, Ghaziabad (U.P.) in 2012**. M. Tech.** in Electrical Engineering (Power Electronics & ASIC Design) from Motilal Nehru National Institute of Technology, Allahabad (U.P) in year 2014. His research area includes Power Electronics, GiSPVT.

Dr. Shikha Singh – Asso. Prof. in Electrical Engineering, IOT

Shikha Singh is currently working as an Associate Professor in SRMU. She received the B.Tech. degree from Uttar Pradesh Technical University, Lucknow in 2008, and the Ph.D. degree in electrical engineering from the Indian Institute of Technology Delhi, New Delhi, India, in 2014.She was an Assistant Professor at the National Institute of Technology, Delhi, India, for one year. She joined as an Assistant Professor in the Department of Electrical Engineering, Shri Ramswaroop Memorial University Lucknow, India in 2015. Her research interests include power electronics, switched mode power supplies, Power Quality, GiSPVT, solar systems. She got **President of India's Prize** for paper entitled "Unity Power Factor Operated PFC Converter Based Power Supply for Computers," Journal of the Institution of Engineers (India): Series B, February 2018, **POSOCO Power System Award (PPSA-2015)**: From Power System Operation Corporation (POSOCO) – A subsidiary of Power Grid Corporation of India Ltd (POWERGRID) for the **top 10 PhD research work** in **INDIA** and received a **cash prize of Rs. 60,000/-, Distinction in Doctoral Research Award 2016** for best 10% of the doctoral student for "**Distinction in Doctoral Research**" by Indian Institute of Technology Delhi.

Programs offered:

Centre offers 1 Master of Technology program both in full time and part time mode and also Doctoral Program in Energy Conservation and Management.

- M.Tech. in Energy conservation & Management (FT/PT)

Program Duration: 2 Years / 3 Years

- Ph. D (Energy Conservation & Management)