Develop a recycling plan for solar PV module and new battery technology used in micro-grid applications.

As large-scale solar PV deployment has taken place only recently in India, major end-of-life PV waste volumes may not be expected until after 2030, after which significant amount of waste is expected to be generated.

This study investigates and addresses issues related to waste management of Solar PV and battery technology used in micro-grids in India.

Key Objectives:

- To develop guidelines and plan for recycling of crystalline Si PV modules and battery technologies (lead acid and li-ion).
- Develop a framework to ensure safe and efficient recycling of the waste solar PV modules and batteries used in micro-grid applications.

Main Activities

- **Review Report on Existing Policy / Guidelines in India for Recycling of Solar Photovoltaic Modules**

Under this task existing policy guidelines globally for recycling of solar PV modules will be reviewed. UiA has expertise on recycling of solar photovoltaic materials and will contribute to review global prospective of recycling related to PV module whereas TERI will identify gaps between what is currently happening in India and compare it with other countries.

- **Review of existing policies and guidelines available in other countries for recycling of new battery technologies systems**

The study will include reviewing existing policy guidelines globally for recycling of new battery technologies. Expertise from UiA on recycling of energy storage system technologies will be used on this activity.

- **Develop a framework and guidelines to ensure safe and efficient recycling of the waste solar panels and new battery technology**

A detailed modeling and analysis of the complete system will be done for logistics (collection, transportation and safe disposal of end-of-life). This will be followed by the development of a prototype recycling plan for solar PV modules, and batteries which are currently be used in micro-grids and with various DERs as small-scale energy storage option. This framework will be developed in consultation

with Institutions such as, MoEF, MNRE, MOP, and the solar PV/battery manufacturing and testing industry.

- **Knowledge sharing, dialogue and collaborations**

This activity would focus on dissemination of the knowledge and build up capacity of various stakeholders on micro-grid technologies and its applications.

Norwegian Partner:

University of Agder

Faculty of Engineering and Science,

PO Box 422, NO 4604, Kristiansand, Norway

www.uia.no

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Principal Investigator from UiA

Professor (Dr) Mohan Kolhe, University of Agder (Norway)

Prof. Kolhe is full professor in electrical power engineering with focus in smart grid and renewable energy. He has more than twenty-five years' academic experience at international level on electrical and renewable energy systems. He has previously held academic positions at the world's prestigious universities e.g. University College London (UK / Australia), University of Dundee (UK); University of Jyvaskyla (Finland); and Hydrogen Research Institute, QC (Canada). He was a member of the Government of South Australia's Renewable Energy Board (2009-2011) and worked on developing renewable energy policies.

Co- Principal Investigator from UiA

Dr Nils Ulltveit-Moe, University of Agder (Norway)

Dr Ulltveit-Moe is associate professor in information and communication technology, specialising in security and privacy of critical infrastructures, including smart grid. He has interest in developing usable solutions for privacy and security, including policy-based privacy and security enforcement and anonymisation. He has experience as work package leader on methodology in the EU-FP7 security

project PRECYSE as well as work package leader on security and privacy in EU-FP7 SEMIAH, and currently works on a national innovation project on security in SCADA systems.

PhD student at UiA

Mr. Arvind Sharma, Fellow at TERI is pursuing PhD at the University of Agder (Norway) under this project.

The Energy and Resources Institute

Principal Investigator from TERI

Dr. Suneel Pandey, Senior Fellow and Director at TERI

Dr. Pandey has more than 25 years of consultancy / research experience in the areas of municipal, industrial and hospital waste management, waste-to-energy issues, impact assessment, air, water and soil quality monitoring, site assessments, performance evaluation of ETP and institutional strengthening and capacity building.

Co-Principal Investigator from TERI

Mr. Shirish Garud, Senior Fellow and Director at TERI

Mr. Garud has more than 30 years of experience in renewable energy, energy planning and policy development. He has excellent understanding of the Indian renewable energy sector and technologies, especially the solar energy sector. He has in depth understanding of renewable energy sector business environment and financial viability aspects.

Mr. Arvind Sharma, Fellow at TERI

Mr. Sharma has been associated with the field of Solar Photovoltaic Systems more than 10 years. His area of expertise is Testing & Certification, Design, Development and Customization of the Solar PV based micro grid systems and components i.e. battery storage, inverter, controller and charge controller. He has been implemented many projects in India and African countries related to Solar PV systems and focussing on Solar Lightning applications.

Dr. Poonam Sharma, Consultant at TERI

She completed PhD in nanotechnology and material science. She did postdoctoral work on solar cell fabrication, characterization and applications at Shanghai Jiao Tong University, Shanghai, China. She has research interest in PV and silicon materials and recycling.

Pallavi Gulati, Research Associate at TERI

Event(s)

Workshop on 'Microgrid's Interconnection Issues and Recycling of Solar PV Modules and Batteries' was organized on 30th May, 2017 at TERI, New Delhi.

Contact details

Dr. Suneel Pandey, Director at TERI

E-mail: spandey@teri.res.in

Mr. Arvind Sharma, Fellow, TERI

E-mail: asharma@teri.res.in