



# Project Overview Statement

<b>Project Title</b>	Decentralised off-grid electricity generation in developing countries: Business models for off-grid electricity supply.
<b>Acronym</b>	<b>MODES</b> (Models for <b>O</b> ff-grid, <b>D</b> ecentralised <b>E</b> lectricity Supply)
<b>Start/End date</b>	October 2009/ October 2014
<b>Funding Agency</b>	Engineering and Physical Sciences Research Council (EPSRC), U.K.
<b>Co-Funder</b>	Department for International Development, U.K.
<b>Lead Institution</b>	Centre for Energy, Petroleum and Mineral Law and Policy, University of Dundee
<b>Consortium partners</b>	<ol style="list-style-type: none"><li>Centre for Energy, Petroleum and Mineral Law and Policy, University of Dundee (Lead Institute)</li><li>School of Environment and Development, University of Manchester</li><li></li><li>Decentralised Energy Solutions Division, The Energy and Resources Institute, New Delhi, India.</li><li>TERI University, New Delhi, India.</li></ol>
<b>Principal Investigator</b>	Dr. Subhes C Bhattacharyya, CEPMLP, University of Dundee
<b>Co-Investigators</b>	Prof. Paul Cook and Dr. Khalid M. Nadvi (University of Manchester)
<b>Collaborators</b>	Ms. Akanksha Chaurey (TERI) Dr. A. Mishra (TERI University)
<b>Focus</b>	South Asia

# MODES background

A research consortium led by the University of Dundee has been selected by the Engineering and Physical Science Research Council (EPSRC) and the Department for International Development (DfID) for undertaking research in decentralised off-grid electricity generation in South Asia. This is one of the two consortia selected by the funding agency as part of their second call for Energy and International Development. The consortium has received funding for a five year project that aims to develop innovative and participatory business models for decentralised off-grid electricity supply in South Asia to alleviate the energy access problem of the region. The problem of energy access requires identifying solutions that are techno-economically viable, institutionally feasible, socio-politically acceptable and environmentally sound. Given that institutional issues and development of viable business models for rural electricity and energy supply have received less attention, and because appropriate local solutions have to be found instead of universal or global solutions to the problem, a systematic analysis and research is required. The local solution could also have scale-up potentials so that they can be replicated to bring them to the mainstream. The research project will investigate a suite of alternative decentralised business solutions and corresponding institutional frameworks for electricity and rural energy supply with a specific focus on South Asia through case studies, demonstration projects and applied academic research involving UK universities, South Asian universities, research institutes, think tanks, and other stakeholders as appropriate.

## Research questions

This research proposal is based on the premise that the solution strategy has to promote innovative solutions as opposed to prescribing standard templates for adoption and that each rural area will have to search for its own solutions

- a) by focusing on the creation of opportunities for higher income generation in monetary terms. Unless money flow increases to the poor, commercial energies stand little chance of competing with traditional energies.
- b) by developing local energy markets taking into account the specificities of local energy situation resources, needs, capacities, strengths and constraints, and adopting appropriate supply mechanisms and organizational structures to cater to the local needs.
- c) by selective and judicious use of market interventions to make energy supply affordable but ensuring financial viability of energy supply. Unless the supply is financially viable, it cannot be sustained.
- d) by ensuring local community participation in the decision-making and policy implementation process.

Deriving from the above premise, this research will focus on hybrid, multi-functional technological platforms using innovative participatory delivery mechanisms (such as franchisees,

licensees, co-operatives or other local enterprise models) and alternative funding options (e.g. micro-finance, capital grants, subsidies, fee-based systems). Two main research questions are as follows:

- (1) Are there cost-effective, secure and reliable local off-grid electricity supply solutions that can meet the present and future needs and are socially acceptable, institutionally viable and environmentally desirable?
- (2) Do these local solutions have the scaling-up and replication potentials and can these solutions be brought to the mainstream for wider electricity access in the developing world?

This research will consider four dimensions: techno-economic, socio-political, governance and environmental aspects. These would be applied at both the questions but in a sequential manner.

For the first question, the essential investigations at the local level would involve the following:

**Techno-economic dimension-** The questions to be asked here are:

- (a) Is the solution technically viable to provide a reliable supply? Will the solution be appropriate to meet present needs of the rural community and can it be relied on for meeting the future requirements?
- (b) Is it a cost-effective solution at the scale considered for the local community? If not, are there options to improve cost effectiveness? Under what conditions will the option become viable? Is the manufacturing and operating capability available locally? Is the business model attractive from the supplier's perspective?
- (c) Does the solution lock-in the rural community to a particular development path? Will this have any socio-economic impact at present or in the future?

**Governance dimension:** Relevant questions at this level are:

- (a) Is the solution compatible with the existing regulatory arrangements? If not, what modifications would be required?
- (b) Are there concerns about the regulatory effectiveness of the implementation of the solution? How can these concerns be taken care of? Does the solution require any institutional engineering? What are the developments required? At which level? Is there any transition required from the existing system? How can this transition be managed?
- (c) Is this a transitory solution? Will the transition to the future model require any major adjustments? Is the capacity available locally? If not, can the capacity be developed in the short-term? Are there any long-term capacity building issues?

**Socio-political dimension:** Here the social and political acceptability of the solutions will be looked into. The relevant issues are:

- (a) Is the solution socially acceptable and affordable by the consumers at present? Will the benefits of the solution reach the poor in an equitable manner? Will there be any gender bias of the solution and if so, how can this be corrected?
- (b) Is the solution politically acceptable? Will it generate any political controversy? Are there concerns about the future social acceptability? Will the option generate adequate income for the local community? Will the income be distributed equitably?
- (c) Does the solution require any behavioural changes and/or changes in capital stock acquisition and utilisation patterns? What are the social costs of such changes? Can the local communities afford them? If not, how can the solution be made affordable?

**Environmental dimension:** The following issues will be considered here:

- (a) Is the solution environmentally desirable – locally and globally? Are there any known and possible adverse effects? Will the solution generate any environmental benefits that are financially remunerative?
- (b) Will the programme effectively use local resources? How secure is the supply of these resources at present and in the future? Are there any environmental consequences of resource exploitation for energy purposes?
- (c) Will there be any social impacts due to environmental effects?

The scale-up and mainstreaming of the viable solutions will then be analysed at a second level. The relevant questions at this level are (but not limited to):

- (a) What are the technical implications of the scale-up and replication? Under what circumstances the scale-up will become technically feasible and economically viable?
- (b) What are the costs and benefits of the scale-up projects? Is there any positive externality? What are the enabling policies required for mainstreaming the solution?
- (c) Is the organisational arrangement appropriate for the scale-up? What are the capacity building needs for the scale up?
- (d) Will the scale-up put stress on the environment and resource availability? Will there be any positive social impacts of the scale-up and replication of the solution?

The research will pay specific attention to

- a) capacity building,
- b) cross-referencing and cross-learning,
- c) dissemination of the research outcomes, and
- d) policy translation of academic research.

The work is organised around two main themes and a total of 5 packages. The research themes are:

- 1) **Theme 1 – Local-level off-grid electricity and energy service solutions**
- 2) **Theme 2 - Search for replicable generic models for wider energy access**

Five work packages are:

- a) **WP1: In-depth analysis of off-grid delivery options and framework development**
- b) **WP2: Assessment and selection of appropriate business models**
- c) **WP3: Demonstration project**
- d) **WP4: Study of scaling-up, replication and mainstreaming of selected models**
- e) **WP5: Recommendations for wider delivery of off-grid solutions**

The overall management of the project and the consortium activities will be ensured by Dr. Subhes Bhattacharyya, the principal investigator. The South Asian team will be led by Ms. Akanksha Chaurey of TERI. A Steering Committee oversees the project management.