

An Indian-Australian research partnership

<b>Project Title:</b>	Systems modelling and analysis of off-grid technologies for attaining and sustaining electricity access in rural areas	
<b>Project Number</b>	IMURA0820	
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### Research Clusters:

### Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? <i>(Please nominate JUST <u>one</u>. For more information, see <a href="http://www.iitbmonash.org">www.iitbmonash.org</a>)</i>		Highlight which of the Academy's Theme(s) this project will address? <i>(Feel free to nominate more than one. For more information, see <a href="http://www.iitbmonash.org">www.iitbmonash.org</a>)</i>	
1	Material Science/Engineering (including Nano, Metallurgy)	1	Advanced computational engineering, simulation and manufacture
2	Energy, Green Chem, Chemistry, Catalysis, Reaction Eng	2	Infrastructure Engineering
3	Math, CFD, Modelling, Manufacturing	3	Clean Energy
4	CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control	4	Water
5	Earth Sciences and Civil Engineering (Geo, Water, Climate)	5	Nanotechnology
6	Bio, Stem Cells, Bio Chem, Pharma, Food	6	Biotechnology and Stem Cell Research
7	Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng	7	Humanities and social sciences
8	HSS, Design, Management	8	Design

## The research problem

### *Define the problem*

Renewable energy technologies specifically off-grid solar products market is hampered by a novel set of barriers. It has been documented that many large scale solar photovoltaic (PV) implementation programs faced hurdles in the form of high dissemination cost, lack of after-sales services, poor public awareness, lack of skilled workforce and supply shortages. This has led to widespread mistrust in solar technology, especially in rural areas. Empirical evidence suggests that involving local communities is crucial for successful dissemination, implementation, and sustainability of solar PV interventions. However, to build local capacity to serve the solar market is inevitably a long-term and variable process which needs proper coordination and individual attention to standardize and scale the solar market.

This study aims to quantify and analyse the dynamics of solar entrepreneurship for solar energy access, using systems thinking methodology. This includes barriers relating to technology diffusion and uptake, supply chain issues in off-grid renewables. It also examines cooperation within and performance of the network of governmental, NGO and business actors involved directly and indirectly in provision. The project will identify the impact of skill-development of locally trained solar entrepreneurs on their livelihood opportunities and key barriers or facilitators for locally trained solar entrepreneurs to enable sustained dissemination of solar technologies to households in rural India. The overall goal will be to develop an off-grid renewables access simulator that can be used by people to understand the short and long-term impacts of off-grid access, and test strategies for tackling last mile energy access issues.

This shall be done through detailed field surveys of local solar entrepreneurs created through the Solar Urja through Localization for Sustainability (SoULS) Program and will draw lessons for the expansion of this program to other technologies and geographical areas. The SoULS program where 7 million lamps will be distributed in five states in India, so far approximately 3 million lamps has been disseminated. In doing so, the leaders of the SoULS have collected a wealth of evidence and experience about the design, implementation and performance of such large-scale programs. The SoULS program is being expanded to include more encompassing technologies that provide solar electricity for other activities and geographical areas. It is important that as the SoULS develops in this way, it learns fully from the lessons of its experience.

In analysing the evidence from the SoULS and related programs, and drawing lessons for future interventions, the project will draw on systems theory, social network analysis and theories of bureaucratic and administrative capacity. Each of these theoretical approaches are relevant to explaining variation in the performance of the programs over time and across villages.

## Project aims

### *Define the aims of the project*

This project aims to quantify and analyse the dynamics of “solar entrepreneurship for clean energy access” by tracking local solar entrepreneurs (potential and actual) across five states of India. These local people (women and men) are to be chosen randomly from the pool of local people trained under SoULS Project. The study will also survey other stakeholders involved, including various supporting local institutions & other agencies. Both quantitative and qualitative methods are to be employed in the study. This study will address the gap in the literature and the knowledge on local solar entrepreneurship, understand challenges and the measures to overcome them, and assist the government for appropriate and effective policy measures. The research work will help in future planning distributed clean energy access through local entrepreneurship.

## Expected outcomes

### *Highlight the expected outcomes of the project*

The favourable outcomes of the research project are a simulator which can help understand and evaluate strategies towards sustained energy access through off-grid affordable technologies, and entrepreneurship.

## How will the project address the Goals of the above Themes?

### *Describe how the project will address the goals of one or more of the 6 Themes listed above.*

This study will reveal the number of learnings, guidelines and suggest prospective measures at the policy level that may be used by various solar products dissemination programs in order for them to enhance the success probability.

## Capabilities and Degrees Required

List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.

- 1) B.Tech, M.Tech in the field of Industrial Engineering/ Computer Science/ Operations Research/ or similar relevant subjects (Master's degree is preferred)
- 2) A student with expertise in systems theory, simulation modelling, statistics, programming, technology diffusion. Advanced quantitative/qualitative and methods including skills in or capacity to learn multilevel analysis and social network analysis.
- 3) Should be sound in English (speaking and writing)
- 4) Should have passed at least any one national level test like GATE, CSIR NET, UGC NET, DBT BET

## Potential Collaborators

Please visit the IITB website [www.iitb.ac.in](http://www.iitb.ac.in) OR Monash Website [www.monash.edu](http://www.monash.edu) to highlight some potential collaborators that would be best suited for the area of research you are intending to float.

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Prof. Srinivas Sridharan is Professor of Marketing Department at Monash University (<https://research.monash.edu/en/persons/srinivas-sridharan>)

Dr. Jayendran Venkateswaran is Associate Professor of Industrial Engineering and Operation Research Department at IIT Bombay. He is currently leading project of national importance on the dissemination of affordable solar technology. Prof. Jayendran is the Principal Investigator in the Solar Urja through Localization for Sustainability (SoULS) project at IIT Bombay, which aims to provide solar study lamp to every child in rural India as part of its 'Right to Light' mission.

Select up to **(4)** keywords from the Academy's approved keyword list (**available at <http://www.iitbmonash.org/becoming-a-research-supervisor/>**) relating to this project to make it easier for the students to apply.

Energy, Energy Storage, Energy Materials; Green Chemistry and Renewable Energy