School of Sustainability
Arizona State University

In Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

Saurabh Biswas

Will defend his prospectus

Socio-Energy Ecosystem and Sustainable Communities: Investigating Transformation Dynamics Through Evidence Based Interventions

Abstract

Scholarship in energy poverty and access has seen renewed interest in the last decade or so, encouraged by global concerns and goal setting. A strong influence remains from the early energy efficiency and optimization focused research, having its roots in the 70's oil crises. More recently, new scholarship influenced by ideas of sustainability/sustainable development and energy justice, made imminent by socio-ecological effects of rapid technological change, is beginning to shape the discourse. Decentralized energy technology for production and use of energy from alternative or renewable sources of energy is a significant component of this discourse.

A socio-ecological-technological system view of decentralized energy systems opens up the possibility space for outcomes in each domain; covering impacts, consequences and uncertainties across varying degrees of disaggregation. This research examines such “socio-energy ecosystem”, consisting of elements formed of a variety of actors and processes. The structure, function and dynamics between actors and possible outcomes are explored through intervention experiments, case studies and an agent based model of change. The observations and results from different modes of investigation, work towards corroborating the system structure and characterizing sustainability to context. The social value of energy concept is utilized as an accounting framework to assess sustainability of outcomes and as a core for an evaluation scheme. Quantitative and behavior based qualitative datasets are collected using a range of methods spread over scales of aggregation, time and outcomes.

This research also aims to contribute to furthering the understanding of change dynamics at the grassroots, utilizing them to explore methods and principles applicable at functional and operational levels of decentralized energy systems. Solution strategies and processes for broad sustainable transformation in a community, at the experimental

location of *Rio Claro* (Brazil), closely linked to social value created through decentralized energy systems, is the longitudinal focus of this research. It also builds on the behavior oriented energy choices and use pattern scholarship from earlier studies and the recent developments in agent based modeling of diffusion and consumer behavior, to explore the pathways and variable map of the solution strategies across a variety of scales, empirically grounded in the experiment.

Tuesday, January 16, 2018
9:00 a.m.
WGHL, 481

Faculty, students, and the public are invited.

Supervisory Committee:

Dr. Clark A. Miller (Chair)
Dr. Arnim Wiek (Member)
Dr. Marco Janssen (Member)