



In Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy
Madeline Tyson

Will defend her dissertation

Managing Distributed Information: Implications for Energy Infrastructure Co-production

Abstract

The Internet and climate change are two forces that are poised to both cause and enable changes in how we provide our energy infrastructure. The Internet has catalyzed enormous changes across many sectors by shifting the feedback and organizational structure of systems towards more decentralized users. Today's energy systems require colossal shifts toward a more sustainable future. However, energy systems face enormous socio-technical lock-in and, thus far, have been largely unaffected by these destabilizing forces. More distributed information offers not only the ability to craft new markets, but to accelerate learning processes that respond to emerging user or prosumer centered design needs. This may include values and needs such as local reliability, transparency and accountability, integration into the built environment, and reduction of local pollution challenges.

The same institutions (rules, norms and strategies) that dominated with the hierarchical infrastructure system of the twentieth century are unlikely to be good fit if a more distributed infrastructure increases in dominance. As information is produced at more distributed points, it is more difficult to coordinate and manage as an interconnected system. This research examines several aspects of these, historically dominant, infrastructure provisioning strategies to understand the implications of managing more distributed information. The first chapter experimentally examines information search and sharing strategies under different information protection rules. The second and third chapters focus on strategies to model and compare distributed energy production effects on shared electricity grid infrastructure. Finally, the fourth chapter dives into the literature of co-production, and explores connections between concepts in co-production and modularity (an engineering approach to information encapsulation) using the distributed energy resource regulations for San Diego, CA. Each of these sections highlights different aspects of how information rules offer a design space to enable a more adaptive, innovative and sustainable energy system that can more easily react to the shocks of the twenty-first century.

Wednesday, March 21, 2018
3:00 p.m.
WGHL 323

Faculty, students, and the public are invited.

Supervisory Committee:
Marcus Janssen, ASU (Chair)
Brad Allenby, ASU (Member)
Jason Potts, RMIT (Member)
John Tuttle, DOE (Member)