School of Sustainability
Arizona State University

In Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

Christine Sturm

Will defend her dissertation

Germany's Energy Transition Experiment: A Case Study about Guiding Decisions and Steering Large Socio-Technical Systems in Desired Directions

Abstract

The *Energiewende* aims to drastically reduce Germany's greenhouse gas emissions, without relying on nuclear power, while maintaining a secure and affordable energy supply. Since 2000 the country's renewable-energy share has increased exponentially, accounting in 2017 for over a third of Germany's gross electricity consumption. This unprecedented achievement is the result of policies, tools, and institutional arrangements intended to steer society to a low-carbon economy. Despite its resounding success in renewable-energy deployment, the *Energiewende* is not on track to meet its decarbonization goals. *Energiewende* rules and regulations have generated numerous undesired consequences, and have cost much more than anticipated, a burden borne primarily by energy consumers. Why has the *Energiewende* not only made energy more expensive, but also failed to bring Germany closer to its decarbonization goals? I analyzed the *Energiewende* as a complex socio-technical system, examining its legal framework and analyzing the consequences of successive regulations; identifying major political and energy players and the factors that motivated them to pursue socio-technical change; and documenting the political trends and events in which the *Energiewende* is rooted and which continue to shape it. I analyzed the dynamics and the loopholes that created barriers to transition, pushed the utility sector to the brink of dissolution, and led to such undesirable outcomes as negative wholesale prices and forced exports of electricity to Germany's European neighbors. Thirty high-level energy experts and stakeholders were interviewed to find out how the best-informed members of German society perceive the *Energiewende*. Surprisingly, although they were highly critical of the way the transition has unfolded, most were convinced that the

transition would eventually succeed. But their definitions of success did not always depend on achieving carbon-mitigation targets. Indeed, Germany jeopardizes the achievement of these targets by changing too many policy and institutional variables at too fast a pace. Good intentions and commitment are not enough to create economies based on intermittent energy sources: they will also require intensive grid expansion and breakthroughs in storage technology. The *Energiewende* demonstrates starkly that collective action driven by robust political consensus is not sufficient for steering complex socio-technical systems in desired directions.

Wednesday, April 4th, 2018
12:00 pm
WGHL, Room 481

Faculty, students, and the public are invited.

Supervisory Committee:
Daniel Sarewitz (Chair)
Clark Miller (Member)
Paul Hirt (Member)
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