

**Behind the Meter: Implementing Distributed Energy Technologies to Balance Energy Load
in Virginia**
(Technical Report)

**The Fragility of ‘Success’: An Actor Network Theory Analysis of the Regional Greenhouse
Gas Initiative**
(STS Research Paper)

An Undergraduate Thesis Portfolio
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In Partial Fulfillment of the Requirements for the Degree
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by

Thomas Anderson

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Name: Thomas Anderson
Date: 30 April 2021
Course: STS 4600
Section: 004 -- Monday 5-7:30

Socio-Technical Synthesis: Load Shifting and the Regional Greenhouse Gas Initiative

My technical work and my STS research are connected primarily through the premise of climate change, exploring the impact of legislative bodies and large institutions. The best way to address climate change is through a reduction of greenhouse gases. Although the two works both pursue this end goal, they differ in the way they choose to address it. My technical work focuses on the contributions that large institutions, such as colleges and universities, are uniquely positioned to make, whereas my STS research focuses on the current weaknesses present in environmental policy. So, while my technical work and my STS research approach climate change from different angles, the pursuit of a more environmentally compatible society is consistent across both projects.

My technical work focuses on the effect that distributed energy technologies (DETs) can have on the landscape of energy demand in the state of Virginia. As it currently stands, the fluctuation in demand within a singular day makes widespread implementation of clean energy complicated. However, the implementation of DETs allows for a more flexible demand curve that can be shaped around energy output, allowing for further implementation of renewable energy sources. Large institutions serve as an excellent home for these DETs due to their size and centralized infrastructure, as well as their concurrent heating and cooling loads. To model the influence that implementation of these technologies in Virginia institutions would have, my capstone team made use of Tools for Energy Model Optimization and Analysis (TEMOA), a software capable of modeling and forecasting energy demand levels for the state of Virginia. Through the data outputted by this simulation, government officials can make a more fully informed decision about the ways in which they choose to address climate change.

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My STS research also explores climate change, but from a different angle. My research focuses on the vulnerability inherent in the Regional Greenhouse Gas Initiative (RGGI), a multi-state auction-based carbon emission cap-and-trade program that has seen growing popularity in the northeastern United States. Callon's Actor-Network Theory is employed to examine the interconnectedness of the network that encompasses both RGGI and its participating states. My claim is that RGGI is impregnated with two major vulnerabilities: (i) an imbalance in the distribution of power, and (ii) a lack of focus placed on the influence that actors considered outside the network could have. My paper works through the danger of misunderstanding the stability of this legislation, and how identifying these vulnerabilities can help protect RGGI from ignorance-based problems. The goal of this research is to stimulate debate over how RGGI's bylaws can be restructured for the purpose of generating better results.

Working on these two projects in tandem greatly added value to both. My technical work gave me a better understanding of the limitations of an infrastructural approach to solving climate change, providing background on the importance of these two approaches being pursued simultaneously. Similarly, the research I conducted for my STS paper gave me a better understanding of the limitations in approaching the problem from a legislative perspective. Both my technical work and my research served to enlighten me on the complexity of climate action, each addressing problems that are often glossed over by public commentary. In summary, working on both my STS research paper and my technical project together has allowed me to explore ways in which society can address climate change, as well as the obstacles that stand to impede progress through each method.

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