Thesis Portfolio

CARBON CAPTURE, UTILIZATION, AND STORAGE
(Technical Report)

ACTOR NETWORK THEORY ANALYSIS OF WATER CRISES IN LOW-INCOME, UNITED STATES CITIES
(STS Research Paper)

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Sociotechnical Synthesis

The technical thesis, “Carbon Capture, Utilization, and Storage” focuses on the process of capturing carbon dioxide from a natural gas power plant and converting it into fuel via the Fischer-Tropsch process. The Pastoria Energy Facility, which produced 750 MW of electricity, is retrofitted with an amine scrubbing system to capture carbon dioxide leaving one of the stacks. The carbon dioxide is then sent to a reverse water-gas shift reactor and reacted with hydrogen gas to produce carbon monoxide and water. The remaining compounds are sent to the Fischer-Tropsch process which reacts carbon monoxide and hydrogen to produce diesel. The process is not a net carbon sink as expected because hydrogen must be bought from methane reforming or electrolysis, both of which produce carbon dioxide at some point in the hydrogen synthesis. We found that carbon storage, via compressing and burying the carbon dioxide produced by Pastoria, is more economically viable and environmentally beneficial.

The STS thesis focuses on the water contamination crises in Flint, Michigan and Newark, New Jersey. Actor Network Theory is used to discuss the actors that enabled the initiation and propagation of the lead contamination in these two cities. The water crisis in Flint began due to negligent decisions made by the Governor of Michigan, Rick Snyder, while the Newark crisis had no definite beginning. Both are examples of how the government on all levels failed the residents of a low-income community and how other actors must come in to support these communities. The network in this paper and the government’s inability to recruit residents is explored in this thesis. The technical and STS theses are not related.