BEHIND THE METER: IMPLEMENTING DISTRIBUTED ENERGY TECHNOLOGIES TO BALANCE ENERGY LOAD IN VIRGINIA

BUYING A GREEN CONSCIENCE: THE DEVELOPMENT AND STABILIZATION OF CARBON OFFSETS

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SOCIOTECHNICAL SYNTHESIS

Climate change presents a systemic risk to all citizens on Earth; it threatens the basic elements of life: access to food and water, health, land use, and physical and natural resources. In response to this global crisis, the University of Virginia and the Commonwealth have made commitments to achieve carbon neutrality by 2030 and 2050. To help meet these goals, the STS technical portion looks at the application of load shifting technologies at the microgrid level, then scaled to the state. The paper then transitions into the loosely coupled STS research which analyzes carbon offsets, a common tool often associated with achieving carbon neutrality commitments. The coupled topics will help paint a clarifying picture on different environmental strategies that aim to achieve the same goal. However, the different methods behind both processes may highlight the key motivations of attaining such goals.

One of the principal challenges associated with decarbonization is the temporal variability of renewable energy generation. The technical team analyzed how load-shifting technologies can be used by large institutions to shift load and support statewide efforts to decarbonize. To do this, the study focused on the University's plans for expansion of the Fontaine Research Park, which is a good model for understanding how these technologies could distribute load behind the meter. The team developed a predictive model to forecast when peak demands will occur and understand how interventions, including heat recovery chillers and thermal energy storage tanks, might be used to balance load. The findings were

then extended to a statewide energy systems model to simulate the ways in which these types of interventions might be scaled to the whole state.

The study found that implementing distributed energy sources on a state-scale had insignificant effect on balancing load. However, on a microgrid scale, such technologies prove to be a useful resource to decrease peak demand, which would allow for further clean energy projects and possible cost reductions.

Institutions, companies, states, or individuals use carbon offsets as an accounting mechanism to balance their own pollution with third party reductions. Though offsets offer flexibility, researchers in the field pose serious issues with the certification and verification of offsets, which results in over-estimating reductions and in some instances have led to an increase in emissions. The paper applied Bijker and Pinch's Social Construction of Technology as a framework to analyze the dimensions of the artifact's development and stabilization in order to answer this question. Their idea of interpretative flexibility plays a key role in understanding the motives that influence the establishment of carbon offsets and how the innovation has molded to fit these multiple goals.

Rather than trading offsets privately, one company called CME aims to restructure the offset market by making the market more transparent via a trading platform and using future contracts to hedge against devaluing risk. However, in the long run, carbon offsets are not the answer and the globe will have to restructure their incentive programs to make sure motives align with actual reductions. Using technologies analyzed in the technical portion, could help transition to a mainly electric globe operating on renewable energy.

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