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Research Statement

My main research focus is examining the interaction of environmental economics, energy economics, energy policy and behavioral economics. One of my current projects aims to model the long run and short-run effects of different emission policies in the northeastern United States and Canada using a reduced-network DC model of the area. I am looking at the magnitude of carbon dioxide “leakage” caused by the Regional Greenhouse Gas Initiative, and the effects of other proposed or theoretical policies, such as the Kerry-Lieberman act, taxing emissions based on marginal damages, or shutting down nuclear generation in response to the Fukushima Daiichi nuclear disaster. A completed paper looked at incorporating long-run demand response in an earlier version of the network model. My other current project, which looks at how culpability for carbon footprints affects willingness to pay for green energy, combines all four of these topics. My Master’s Thesis examined energy economics and energy policy, studying the effects of wholesale deregulated auction markets on electricity prices.

Currently, my research on modeling the effects of various policies is using a model that is based on a network reduction of the northeastern states participating in the Regional Greenhouse Gas Initiative. This work is unique because it combines an economic model that incorporates a long-run demand response with a physical engineering model based on a network reduction of the included states. Real-world information about physical power producers including emissions rates, power output, emissions prices and electricity prices are used to estimate production equations for pollutants and electricity prices.

In the future, I hope to expand the geographic scope of this analysis, first by incorporating the entire Eastern Interconnect, then adding ERCOT and the western United States to make a unified model of the power grid of the United States. As well, features could be added to this model. Currently, we assume only a few types of generation could be built: coal, natural gas, nuclear and wind power. However, we could add different existing or speculative technologies as options: geothermal, solar, or fossil fuel plants which utilize carbon capture and storage.

The culpability model looks at the demand side of greenhouse gas emissions. This project currently consists of two parts, a contingent valuation (CV) study performed via a web survey and a context-free experiment in the laboratory. In the CV study, participants answered questions about their household, which allowed us to estimate their carbon footprint based on automobile use, heating use, electricity use, and other factors. Participants in the control group were shown their carbon footprint and then asked how many kilowatt-hours of carbon-free electricity they would hypothetically like to purchase. Participants in the treatment groups were shown their carbon footprint and then the carbon footprint of a previous group that was either higher or lower, and then asked the same question about purchases of green electricity. Our hypothesis, validated in the study, was that people who saw a lower average footprint than their own footprint would feel more culpable for their environmental damage and thus opt to purchase more green energy; those who saw a higher footprint than their own would feel less culpable and opt to purchase less. Another interesting facet of this CV study is the wealth of demographic data we were able to record, which allowed us to examine the heterogeneity of response of our participants to our stimuli. For example, Democrats, people with children, and people who are

more educated are all more affected by this “culpability” than Republicans, people without children and people who have not finished college.

The laboratory portion of the model attempts to replicate the CV survey in an experimental economics laboratory with a context-free setting, in which participants are put into groups and then allowed to make decisions regarding the purchase of a commodity. That commodity provides each person with a private benefit but produces a negative externality by reducing the amount in a group fund which is shared by all participants at the end of the experiment. Those in the treatment are told how much others have purchased of the commodity before being allowed to offset some of their damage. Our analysis seems to confirm the findings from the CV survey with regard to the effects of culpability, though we could not replicate the heterogeneity of responses due to the limited nature of laboratory sample (mostly undergraduate students at Cornell).

The work could be expanded to look at the effects of information or even policy formulations on acceptance and efficacy of environmental regulations. For example, in some Nordic countries, energy and emission taxes have been coupled with stipulations that some portion of the revenues generated must be invested into green energy sources, which presumably reduces the cost of supplying green energy in the future. Would such instruments receive majority support in the United States?

A related question is whether or not allowing the purchase of offsets might in fact increase carbon output. If, for example, offsets were very cheap compared to abatement, individuals might spurn efficiency and instead allay their guilt with offset purchases. Furthermore, given the “warm glow effect” common to purchases of environmental goods, many

people might relieve their culpability while not fully offsetting their carbon output. An extension of our experiment, which allowed several rounds of purchasing goods that contributed to a public bad, then alternated rounds of that purchase with the offset round, could tell us whether people would change their behavior in response to the introduction of an offset.

Finally, the results of the two projects could be combined to give a clearer picture of the costs of supplying carbon reductions, and the willingness of the public to buy them, which has important ramifications for the success of any kind of policy designed to limit carbon emissions.