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effective after passage of more centralized climate policies—that is, whether voluntary and mandatory initiatives are complements or substitutes—is an important question for future research.

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## Comment Lucas W. Davis

The chapter by Matthew Kotchen examines voluntary initiatives to reduce greenhouse gas emissions. In particular, Kotchen considers a green electricity program in Connecticut in which households may volunteer to pay a monthly premium of about ten dollars in exchange for receiving electricity from wind and other renewable energy sources. To encourage households to sign up, a state-run program called Connecticut Clean Energy Communities (CCEC) rewards municipalities that reach certain enrollment targets with free photovoltaic panels or other clean energy technologies that are installed in highly visible public locations within the municipality. Kotchen

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documents the success the program has had in signing up households and argues that such programs can serve as a model for how voluntary initiatives can be used to reduce carbon emissions.

This chapter is relevant to a substantial literature in economics that has emerged over the last thirty years on private provision of public goods. See, for example, Bergstrom, Blume, and Varian (1986) and Andreoni (1988). This literature is relevant to carbon policy because voluntary reductions are likely to continue to be an important component of total carbon abatement, particularly if international cooperation cannot be reached on a carbon tax or cap-and-trade program. The starting point in these models is the standard public goods problem; individuals decide how to allocate a fixed amount of resources between a private good and a public good. When deciding how much to contribute to the public good individuals do not take into account the benefits of their contributions to others, so the total level of provision is inefficiently low. This “free rider” problem is particularly severe in this case because carbon abatement is a global public good.

Viewed in this context, green electricity programs are a bit of a puzzle. Kotchen shows that as of December 2009, 23,000 households had signed up with Connecticut’s green electricity program. Even though this is not a large fraction of the 1.4 million total households in the state, any private provision of a global public good is difficult to reconcile with the neoclassical model. Perhaps the simplest explanation for this behavior is that households care not only about the overall level of greenhouse gas reductions, but also about their personal contributions. In the “warm glow” model first described in Andreoni (1989) and Andreoni (1990), households derive utility directly from their personal contributions to a public good, so households will contribute even if these contributions have no perceptible change on the total level of contributions.

Even more interesting, Kotchen finds that the participation rate responds sharply to the CCEC program, increasing by 35 percent within municipalities that chose to enroll in the program. These increases in enrollment come in response to modest government investments, raising the possibility that other incentive-based projects could represent similarly “low hanging fruit,” yielding sizable decreases in carbon emissions at relatively low cost. An important priority for future work will be to confirm this finding in other real-world settings. Again, the existing theoretical literature provides a roadmap. For example, Andreoni (1998) examines charitable organizations that use leadership grants to encourage private giving. Whereas the neoclassical model would suggest that these grants would crowd out private contributions, the chapter shows that leadership grants can increase private contributions when there are increasing returns to giving such as in the case in which households are trying to reach a municipality-level enrollment target. There is also a fascinating literature in experimental economics that examines giving effects of seed money (List and Lucking-Reiley 2002) and

matching grants (Karlan and List 2007). This chapter and related work by Matthew Kotchen is a welcome addition to this rich literature.

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