Why Distributed? How to Think about the Value and Cost of Distributed Energy Resources

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In a talk in Monday's energy policy seminar, Harvard University Center for the Environment Fellow Jesse Jenkins discussed the potential benefits and the tradeoffs associated with support for distributed energy resources.

Jenkins began by explaining the term "distributed energy resources," which refers to any kind of energy asset that interacts with the grid at the distribution level—often, rooftop solar panels, but also electric vehicles, small-scale storage, and demand response. Jenkins noted that distributed energy resources have received "significant" support in the form of expenditures at the state level—with states like California and Massachusetts providing hundreds of millions of dollars per year of support for these resources. Most of this spending has been directed at support of distributed solar power, motiviated in part by concerns about pollution and climate change.

Do DERs provide value proportional to this support? Jenkins made a distinction between two ways in which DERs can provide value. First, there are some ways they provide value precisely *because* they are distributed resources—for example, by avoiding losses or providing relief for distribution congestion, which may also allow utilities to defer distribution upgrades. Second, DERs provide value in the same way larger, centralized energy resources can—energy or capacity value, and also, in the case of solar or other renewables, values associated with environmental benefits. For this second class of value, however, being distributed is not advantageous. Economies of scale apply to resources like solar PV or battery storage, with the result that centralized, utility-scale resources can be significantly more cost-effective than smaller distributed resources. Spending on distributed energy resources, Jenkins suggested, should therefore consider not only the locational value provided, but also any relevant incremental costs—that is, what is given up by forgoing the economies of scale possible with more centralized investments.

To complicate the analysis, Jenkins explained, the value provided by distributed generation will vary greatly, depending on where it is located—it may provide significant value in an area that is frequently congested or where grid upgrades must soon be made, but very little value in most areas. Even in the high-value case, the value provided may not be enough to offset the incremental cost of smaller-scale resources, leading to a "distributed opportunity cost," Jenkins found.

Overall, Jenkins concluded, better optimization tools are needed to do the kind of analysis required to determine where exactly investment in DERs might be beneficial—an analysis that would need to include information about planning for generation, transmission, electricity dispatch, and the relevant distribution network. Public policies should also consider whether approaches, such as incentives for more price responsive demand, could realize the locational values of DERs at a lower cost.

Choosing the most cost-effective approach to DERs could be important for environmental policy, Jenkins argued in concluding his talk, both because there may be a limit to the public's "willingness to pay" for decarbonization, and because deep decarbonization may require a transition from oil and natural gas used in transportation, heating, and industry to electricity, a transition which might be discouraged if significant electricity price increases are caused by uneconomic DER support.

Jenkins spoke as part of the Kennedy School's Energy Policy Seminar Series, which is sponsored by the Consortium for Energy Policy Research of the Mossavar-Rahmani Center on Business and Government.