

How States Can Value Pollution Reductions from Distributed Energy Resources

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Distributed energy resources (DERs) are grid-connected, small-scale electric devices, such as rooftop solar installations, micro-turbines, combined heat and power systems, customer backup generators, and distributed energy storage systems. DERs are a growing part of the U.S. electric system and many state electric utility regulators are looking to more accurately compensate them by paying for a variety of the benefits that these resources provide. Most states are currently focusing on energy and distribution-level benefits,¹ but this approach overlooks the environmental and public health impacts of DERs. Even though some states like California and New York have been working on analyses that include environmental attributes of DERs, few regulators have attempted a thorough evaluation of the environmental and public health benefits.

However, these environmental attributes provide some of DERs' largest benefits. Because DER use often displaces the use of traditional, fossil-fuel-fired generators, the substitution reduces emissions of many air pollutants, including greenhouse gases and local pollutants such as particulate matter, SO₂, and NO_x, which can contribute to climate change, worsen human health, impair ecosystems, harm crops, and make it harder for workers to be productive. Furthermore, DERs can be particularly valuable if they avoid local air pollution imposed on populations that are especially vulnerable to this pollution, such as low-income communities and communities of color.

¹ EnerKnol Research. How Utilities are Navigating the New Distributed Energy Landscape (Apr. 2018). Available at: <https://enerknol.com/how-utilities-are-navigating-the-new-distributed-energy-landscape/>.

The environmental, climate, and public health value (often called the “E value”) of a DER depends on two main factors: the emissions being avoided (i.e., what resources does the DER replace?) and the monetary value of these emissions that are being replaced. The perceived complexity of this analysis is the basis for a common criticism of including an E value in DER compensation analysis, in part because the E value is contingent on a number of variable factors, like time and location of emissions, as well as weather patterns.

The Institute for Policy Integrity at NYU School of Law (Policy Integrity) recently released a report that addresses this criticism. The report lays out a practical methodology for calculating the E value,² the highlights of which are captured here. Specifically, the report describes how to appropriately value environmental and public health benefits by monetizing the economic, health, and climate damages avoided emissions would have caused. State utility regulators can use the steps described in the report, weighing tradeoffs between accuracy and administrability, to implement their own program to holistically compensate DERs. Policy Integrity has already applied this methodology in New York State, using the best available data from state entities and making appropriate inferences.³

The E Value Method

Step 1 – Determine what generation will be displaced by DERs. The most accurate methods for determining displaced generation require working with grid operators and local distribution utilities to obtain needed data on which bulk system generators would have operated in the absence of DERs.

Step 2 – Quantify the emissions rates for displaced generators. Emission rates of existing generators can be determined based on those generators’ historical, measured emissions rates, or can be estimated using engineering analyses, given known information about fuel type, generation technology, pollution control equipment, and operational practices.

Step 3 – Calculate the monetary value of the damages from emissions identified in Step 2. Damages can be monetized by calculating the value of emissions based on:

- **The type of the pollutant.** Researchers have developed monetized damages estimates per unit of emissions for many types of pollutants, including particulate matter, SO₂, NO_x, and greenhouse gases.
- **The location of emissions.** Each unit of a pollutant emitted in densely populated areas or near highly vulnerable populations will cause more damage. Emissions can also interact with environmental conditions. Damage estimates can be modified to account for these concerns.
- **The timing of emissions.** Some pollutants only form when precursors are exposed to direct sunlight. Therefore, emissions that occur at night or in winter may cause less damage than those during the day or in the summer.

A method that accounts for all of these factors would lead to the most accurate calculations of damage per unit of emissions. Regulators can use a variety of tools to calculate these damages, including those recommended to New York.⁴

² Jeffrey Shrader, Burcin Unel, and Avi Zevin. Valuing Pollution Reductions: How to Monetize Greenhouse Gas and Local Air Pollutant Reductions from Distributed Energy Resources. Institute for Policy Integrity at NYU School of Law (Mar. 2018). Available at: <http://policyintegrity.org/publications/detail/valuing-pollution-reductions>.

³ “Value of Distributed Energy Resources – E/EJ Value Informal Subgroup – Track 1 and 2 Report.” In the Matter of the Value of Distributed Energy Resources Working Group Regarding Rate Design. 17-01277. (Hereinafter “VDER report.”) Available at: http://policyintegrity.org/documents/DER_Value_Stack_E_Value_Report_07.09.18.pdf.

⁴ E.g. COBRA, EASIUR, BenMap, see VDER Report at 11-16.

Step 4 – Use the emissions rates from Step 2 and damage estimates per unit of emissions from Step 3 to monetize the value of avoided emissions from displaced generation. If existing policies already put a price on emissions of some or all of the pollutants covered in Steps 1-3, regulators should make necessary adjustments.

Step 5 – Take into account any emissions produced by the DER itself. DERs such as diesel generators or combined heat and power generators emit pollutants. To arrive at an accurate environmental and public health value, regulators must take into account those emissions and the damage they cause.

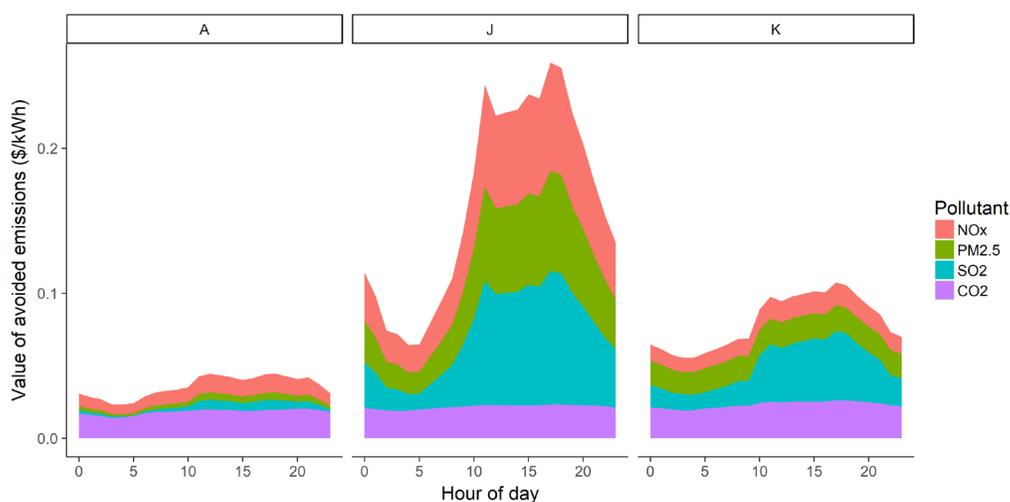
Valuing Pollution Reductions in New York State

Policy Integrity employed this methodology in New York, and the details of that analysis are available in a report that was filed with the Public Service Commission.⁵ As the report demonstrates, zonal and temporal variations can have a significant impact on the environmental and public health value of a DER. Below are two figures showing examples of how this value might change on an intra- and inter-daily basis or depending on location.

Figure 1 below shows hourly sets of environmental values (also known as “E value stack”) for three representative zones of New York’s grid, using one of the two damage values calculated by the Environmental Protection Agency’s Co-Benefits Risk Assessment (COBRA) model. The average value of avoided emissions is about 3.6 cents in Zone A, which is in upstate New York. In Zone J, where New York City is located, values are vastly higher at 16.2 cents per kWh, largely due to the high population density. In Zone K, Long Island, the value is 8.0 cents per kWh.

Most importantly, this figure reveals that the value of avoided emissions is not constant during the day. One can see that in all locations, the highest value occurs between 10 a.m. and 6 or 7 p.m. This intra-daily pattern of value occurs because as the electricity demand increases during the day, less-efficient and higher emitting generators start operating to meet that demand.

Figure 1: Hourly Zonal Environmental Value Stack Using High COBRA Damages



⁵ See VDER report for details on the exact methodology and data used in New York, and their limitations.

Figure 2: Daily Environmental Value Stack Using High COBRA Damages

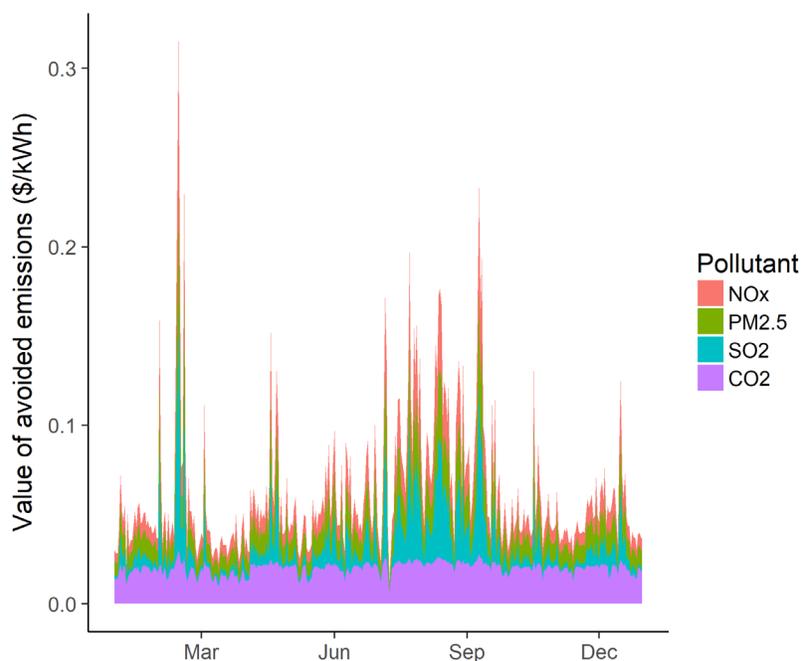
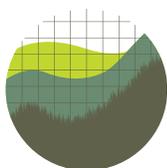


Figure 2 shows that damages also vary seasonally. The figure shows the New York State-wide average daily value stack for each day of 2016 using the high-damage COBRA model. One can see that on days when high-emitting resources are often on the margin, like in the very cold days of winter and the very hot days of summer of 2016, the value of avoided emissions can spike. Conducting a more detailed analysis that includes time variation will allow dispatchable DERs to capture this value and, therefore, provide economically efficient incentives for DER deployment and use while creating significant environmental and public health benefits.

While more comprehensive reforms such as an economy-wide tax on greenhouse gases and local air pollutants would be needed to fully value the environmental and public health benefits of all DERs, the methodology outlined here allows utility regulators to implement a DER compensation scheme that incentivizes DERs when and where they are most beneficial to society.

For more information, see Policy Integrity’s full report, [“Valuing Pollution Reductions: How to Monetize Greenhouse Gas and Local Air Pollutant Reductions from Distributed Energy Resources”](#) or contact Burcin Unel, Energy Policy Director, at burcin.unel@nyu.edu.



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