Overview

This study primarily aims to estimate the value of distributed solar generation at the consumer level and compares them to utility valuations of solar, providing likely context through archival research. In addition, it measures the approximate community benefits in terms of monetized environmental benefits compared against public costs such as government incentives.

Methods and Data

The study utilizes the 2018 Tracking the Sun database to determine utilities and zip-codes associated with those utilities that account for a significant share of residential sector distributed solar generation systems in the United States. Average data in terms of installation size and cost for every eligible zip code are modelled with typical residential demand curves associated with those sizes, costs, and zip-codes in HOMER Grid to optimize electricity bill savings with respect to the tariff rates and demand charges faced given all the parameters. The electricity bills savings value is added to zip-code level data from TTS on costs and various financial incentives to determine the consumer value-of-solar (VoS). The electricity saved is multiplied to average fuel prices faced by the utility to determine the fuel savings part of the utility VoS, while the remaining parts are estimated based on existing studies at the state and national level. Sensitivity analysis is performed to ensure that a range of utility VoS are considered for. In the absence of distributed generation projects, the cost of alternative infrastructure is calculated based on VoS for each utility based on aggregated and extrapolated zip-code level data, assuming varying levels of penetration. The cost of implementing utility-led distributed generation projects is determined based on aggregated installation cost of zip-code and then compared to that of alternative infrastructure costs. Based on known rate of returns offered for the utilities under consideration, alternative rates of return are considered for distributed generation projects which may encourage utilities to invest in such projects. Following research by Vaishnav et al. (2017), community returns are calculated on the basis of monetized environmental gains obtained by spending public money on rooftop solar incentives.

Preliminary Results

Preliminary results indicate that in a number of states, consumers tend to be under compensated for rooftop solar generation in comparison to estimated utility value of solar. However, this is greatly dependent on tariff structure as well. Generally speaking, utilities will require 2-3 percentage points of higher returns compared to the usual rate of returns offered in order to invest in distributed generation projects. Additionally, we find similar results to that of Vaishnav et al. in terms of community rate of returns, in the sense that only with fairly high prices and low discount rates, monetized environmental benefits are worthwhile compared to incentives availed.
Conclusions and Further Research

Further research is required on a more dynamic scale, given the static nature of the results (based on a single point of TTS database and assuming no real growth or changing financial or technical assumptions over the years). However these results do highlight that consumer benefits and utility value of solar are rarely aligned, while community benefits at the current scale are generally not significant given the public cost of incentives.