Literature Review on the Impact of Utility-Scale Solar on Housing Prices

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Purpose

On August 22, 2024, the House Committee on Agriculture, Forestry, Aquaculture, and Rural Development and House Committee on Natural Resources and Environment met to "receive information on the impact and effects of solar panel installation on agricultural land and aspects of solar energy development." This meeting was conducted pursuant to House Study Request No. 2 of the Regular Session of the Louisiana Legislature. At the meeting, Chairman Brett Geymann requested the LSU Center for Energy Studies conduct a literature search on the potential effect of utility-scale solar development on adjacent property values. This short document fulfills this request.

Introduction

The relationship between renewable energy developments and housing prices has garnered significant attention in recent years, particularly as wind and solar power generation have increased significantly over the past decade in the U.S. Landowners are rationally asking questions about how these renewable energy developments might impact the value of their land. And residents of these communities are similarly asking how such developments might impact property values of adjacent or nearby properties. In this short document, we review the body of literature examining the effects of utility-scale solar. We also review the literature on the effects of rooftop solar and utility scale wind development.

Utility-Scale Solar and Local Housing Values

The impact of utility-scale solar arrays on property values has been a subject of growing interest in recent research. Gaur and Lang (2023) estimate the impact of utility-scale solar arrays[3] on housing prices in Massachusetts and Rhode Island employing a difference-in-difference approach. They find that homes within 0.6 miles of a utility-scale solar array experience a depreciation of 1.5% - 3.6%, equating to a reduction in value between $4,721 and $11,330 (2019 dollars). This impact is particularly significant in rural areas, where the installation of solar arrays on farm and forest lands impacts the open space and rural character that contribute to the desirability of these locations. In rural locations, this analysis estimates 2.5% - 5.8% reduction in housing value associated with the installation of a utility-scale solar farm within 0.6 miles.

Elmallah et al. (2023) utilize a similar empirical approach to investigate the effects of utility-scale solar facilities across six U.S. states, providing an analysis of over 1,500 projects and 1.8 million home transactions.[4] Their research estimates that properties within 0.5 miles of a large-scale photovoltaic project (LSPVP) see an average price reduction of 1.5%. However, this effect is not uniformly observed across all areas; it is particularly evident

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[3] The study defines a utility-scale solar array as a large-scale solar installation with an installed capacity of 1 MW or larger.

[4] In this analysis, these facilities are called Large-Scale Photovoltaic Projects (LSPVPs). LSPVPs are defined as ground-mounted photovoltaic generation facilities with at least 1 MW of DC generation capacity.

in rural regions, on agricultural land, and near larger solar developments. Dröes & Koster (2021) identify a similar effect and estimate a 2.6% decrease in house prices within 1 km of a solar farm.

Maddison, Ogier, and Beltrán (2023) use a property fixed-effects model and estimate a 5.4% reduction in properties located within 750 meters south of an operational solar farm greater than 5 megawatts in capacity. Note that the utility scale windfarms being considered in Louisiana are much larger than 5 MW, with a typical project ranging from 100 to 200 MW. Note that for solar farms less than 5 MW in capacity or located more than 750 m away (~1/2 mile), they do not find a statistically significant impact on property values. The authors mention that glare is the plausible mechanism for property values negatively impacted south of these facilities. Georgic et al. (2024) further examine the role of glare and the size of a solar farm by analyzing property values between Tampa Bay and Orlando, Florida. This paper finds that properties within 750 meters of an operational solar farm observe a 6.9% ($14,903) reduction in their value. This is a statistically significant decrease and is independent of properties' position relative to the solar farm, indicating that the implied effect of solar farms on property values is driven by factors other than glare.

Lastly, Abashidze and Taylor (2023) study the impact of utility-scale solar farms on nearby agricultural land values. While their study finds no direct positive or negative spillover effects of utility-scale solar farms on agricultural land value, it suggests an indirect signaling effect, where the presence of transmission lines near agricultural land increases its value once a solar farm is constructed nearby. Note that this analysis does not consider residential houses.

Empirical Estimates of Effect of Utility-Scale Solar on Housing Values

Study	Empirical Technique	Area Studied	Estimated Effect
Georgic et al. (2024)	Differences-in-Differences	Central Florida	6.9% reduction in housing values within 750 meters (~1/2 mile) of solar.
Gaur and Lang (2023)	Differences-in-Differences	Massachusetts and Rhode Island	1.5-3.6% reduction in housing values within 0.6 miles of solar. 2.5-5.8% reduction in housing values within 0.6 miles of solar. (Rural estimate)
Elmallah et al. (2023)	Differences-in-Differences	California, Connecticut, Massachusetts, Minnesota, North Carolina, and New Jersey	1.5% reduction in housing values within 0.5 miles. 4.2% reduction in housing values within 0.5 miles. (Rural estimate)
Maddison, Ogier, and Beltrán (2023)	Property fixed effects model	England and Wales	5.4% reduction in property values within 750 m south of >5 MW solar farm. Possibly attributable to glare.
Dröes & Koster (2021)	Difference-in-Differences	Netherlands	2.6% reduction in housing values within 1 km.
Abashidze and Taylor (2023)	Hedonic property value model	North Carolina agricultural land	No direct effect. Indirect signaling effect. Only agricultral land analyzed.

Rooftop Solar and Property Values

Note that previously discussed analyses investigate utility-scale solar projects. There is also a literature on the effect of rooftop solar photovoltaic installation on home values. Qiu et al. (2017) find that homes with solar panels enjoy a valuation premium[5] of $45,000 and transaction price premium of $28,000. Wee (2016) find that a PV home is worth 5.4% more on average than a non-PV home, which translates to an increase of $35,000 in home value. Hoen et al. (2017) analyze a large dataset of eight states' PV homes and find a sales price premium of $15,000 for an average-sized 3.6kW PV system. Additionally, Dastrup et al. (2012) find that houses with solar panels enjoy a 3.5% (or $23,000) premium over comparable houses without solar panels in terms of sales price using data from San Diego and Sacramento counties in California, and that the premium is larger in communities with a greater share of college graduates and of registered Prius hybrid vehicles. Please note that these studies consider effects of rooftop solar on the home for which the solar was installed, in lieu of utility scale solar on neighboring properties discussed in the prior section.

Wind Turbines and Property Values

The effect of renewable energy generation facilities on housing values is not limited to solar. There is also a literature on the impact of utility scale wind development on housing values. Dong, Gaur, and Lang (2023) find that property values decline by 7.7% in the first three years following construction of wind turbines. This effect is statistically significant for houses within a 1 km radius of the wind turbines. Jensen et al. (2018) study the impact of both onshore and offshore wind turbines on house prices. Their results suggest that adding one additional onshore wind turbine reduces house prices by 0.2% - 1.1% within a 3 km radius. They find no statistically significant effect of the addition of an offshore wind turbine on house prices. Dröes & Koster (2016) analyze Dutch housing data and find a 1.4% decrease in house prices within 2 km of a turbine. Dröes & Koster (2021) further find that tall wind turbines (>150m) decrease house prices by 5.4% as compared to 2% for a shorter wind turbines (<50m). Other studies find similar effects, Gibbons (2015); Sunak and Madlener (2016).

Hoen et al. (2015) find no statistical evidence that home prices near wind turbines were affected in either the post-construction or post-announcement/pre-construction periods. The study uses data for more than 50,000 home sales across nine U.S. states, and the results are robust to a number of different specifications. The analysis employs OLS and spatial-process difference-in-differences to account for spatial dependence in the data, i.e. how the values and characteristics of homes located near one another influence the value of those homes (regardless of the presence of a wind turbine). Lang, Opaluch, and Sfinarolakis (2014) follow a similar methodology to that of Hoen et al. (2015) and also find no statistically significant impact of the presence of wind turbines on property values in the U.S.

Conclusions

The empirical literature suggests that utility-scale solar development has the potential to reduce housing values for homes within approximately one-half mile of these installations. Empirical estimates suggest a reduction of 1.5% - 6.9% in housing values. Studies that analyze housing values in rural areas specifically find that utility-scale solar is associated with a 2.5% - 5.8% percent reduction in housing values.

[5] Estimated market values are obtained from Zillow.

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