ROOFTOP SOLAR

OVERVIEW OF A HIGH-IMPACT DRAWDOWN SOLUTION

Solar photovoltaic systems convert solar energy into electricity. Rooftop solar systems are small-scale installations that can produce electricity primarily for onsite use. When combined with storage, additional benefits can accrue.

TECHNOLOGY AND MARKET READINESS

The technology is mature and market ready. In Georgia, the United States and globally, rooftop solar is “market ready” and is growing rapidly. With technology breakthroughs and cost reductions from “learning by doing,” costs have been declining rapidly. Solar panels have become economically feasible, with the average price for a 6 KW solar system dropping from $51,000 to $17,880 in the past decade (Matasci 2019).

LOCAL EXPERIENCE AND DATA AVAILABILITY

Ample data are available for rooftop solar. NREL publishes maps of solar radiation, and there are rigorous and numerous assessments of the performance of rooftop solar in the United States and the Southeast.

At the end of Quarter 3, 2019, Georgia had 1,202 MW of installed solar on rooftops (residential and commercial) [7]. Solarize programs have been successful in Decatur-Dekalb (850 program participants), Atlanta (1,103 program participants), Athens (701 program participants), Carrollton-Carroll (239 program participants), Newton-Morgan (230 program participants), Roswell (148 program participants), Middle Georgia (291 program participants), and Dunwoody (inactive, 282 program participants) [8]. There are 304 solar companies in Georgia and 3,696 jobs are supported by the solar industry in Georgia (The Solar Foundation, 2019) [6].

TECHNICALLY ACHIEVABLE CO2 REDUCTION POTENTIAL

In 2030, it is assumed that 388 tCO2 will be emitted per GWh of electricity generated in Georgia. At this projected carbon intensity, 1 MtCO2 could be avoided in 2030 by adding 2,580 GWh of zero-carbon electricity (source: GT-NEMS modelling).

The median single family home floor area in Georgia is 2,200 square feet [1]. A 5-kW solar installation can use as little as 400 square feet and is therefore viable on the average home, assuming sufficient sunlight exposure and a sturdy roof. Assuming a capacity factor of 20% (or nearly 5 hours/day), a 5-kW rooftop system would generate 8.76 MWh/year. To generate 2,580 GWh of zero-carbon electricity in 2030 and displace 1 Mt CO2 would require 295,000 5-kW solar rooftops. Fewer new systems would be needed if the industry continues to experience improvements to the efficiency of rooftop solar systems over the next decade.

The Solar Energy Industries Association (SEIA) ranked Georgia 11th in potential for future growth. Lopez, et al. (2012, Table 4) estimates that the total technical potential for rooftop photovoltaics in Georgia is 25 GW and 31,116 GWh. Therefore, the goal of a 1 Mt CO2e reduction in 2030 appears challenging, but achievable.

COST COMPETITIVENESS

Using the price estimate of $2.50 to $3.38 per watt, a 5 kW solar panel installation in Georgia would cost $12,500 to $16,900 each; and $1.95- $2.6 billion to reduce 1 Mt CO2-e by 2030 [3]. Lazard (2018) estimates U.S. average LCOE for residential solar rooftop is $160-$267/MWh and for commercial and industrial solar rooftop, costs are lower at $81-$170 /MWh. EIA (2019) estimates slightly higher costs.

BEYOND CARBON ATTRIBUTES

Environmental benefits of rooftop solar relate to air quality improvements from the reduction of fossil fuel pollution, particularly SO2 (a major contributor to acid rain), PM2.5 (a respiratory health concern), and NOX, besides CO2 (Millstein et al., 2017).

From an economic development standpoint, construction and operation of solar solutions offer local and statewide employment. According to Georgia Solar Job Census 2018, there are 304 solar companies operating in Georgia. In 2019, Georgia was second to Florida in the number of new solar jobs, with 30% growth, bringing the total solar employment in Georgia to 4,798 [4]

Rooftop PV systems with battery solutions have the potential to supply electricity during grid outages resulting from emergency situations, which offers benefits for electricity system resilience. Additionally, rooftop panels have been found to have a positive impact on property values (Adomatis, et al., 2015).

Given the scale of current and potential solar panel installations, end-of-life disposability of PV panels is a pertinent environmental issue (Chowdhury et al., 2020) due to toxic materials contained within the cell, for example, cadmium, arsenic, and silica dust. 13,000 tons of PV panel waste is expected to be produced by the US in 2020 [5].

In terms of potential adverse impacts related to equity and solution accessibility, Sunter et al. (2019) found significant racial and ethnic differences in rooftop solar adoption in the US, even after accounting for income and household ownership. NREL (2015) also analyzes the impact of rate design to recover fixed utility costs arising from lower net electricity consumption after residential PV penetration, which may exacerbate the "energy burden" experienced by lower income households who, without access to solar, continue to purchase all of their electricity from the grid.

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