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Solar set asides and renewable electricity certificates: Early lessons from North Carolina's experience with its renewable portfolio standard

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HIGHLIGHTS

- Assesses developments in NC's solar industry from renewable portfolio standard.
- Comparisons between the SREC markets in North Carolina, Pennsylvania, New Jersey.
- Transparency in prices and limits on utility self-ownership are necessary.
- More aggressive solar set-aside targets would also help develop the solar market.

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ABSTRACT

This paper assesses the market developments in North Carolina's solar energy industry following the state's adoption of a renewable portfolio standard (RPS). It first reviews how solar renewable electricity certificates (SRECs) are intended to act as a support mechanism for the installation and financing of solar power in North Carolina's RPS compliance market. The paper then analyzes why SRECs have not precipitated growth in the solar industry thus far. Instead of attracting a diversity of solar installation and SREC trading businesses to create a competitive market to North Carolina, the RPS has only enabled a few large solar power producers to compete with utility companies to finance, install, and operate solar generating systems. A comparison between the SREC markets in North Carolina, Pennsylvania, and New Jersey reveals that transparency in prices and volumes of SRECs, limits on utility company self-ownership of solar generators, and more aggressive solar set-aside targets are required to create a competitive market environment that will attract a sustainable and growing solar industry.

1. Introduction

While few individuals in the energy industry would argue that there is a "silver bullet" to the current energy and climate predicament, many would admit that solar energy is one of the more promising alternative energy technologies currently in existence. The sun is a non-depletable resource and its photons are free and ample. Yet the upfront costs of solar technologies, particularly those that produce electricity, is more expensive than the majority of alternative energy options, and as such has mainly relied on additional incentives that target relatively high upfront costs to even the playing field between solar and other resources.

Over the past decade, research findings about one of the most common state-level renewable energy policies, the renewable portfolio standard (RPS), has revealed that solar is not one of the leading sources of energy that utilities develop to comply with RPS mandates (Buckman, 2011; Wiser et al., 2011). Out of all new renewable capacity additions between 1998 and 2009 in states with RPS policies, 94% was wind, 3% biomass, 1.4% geothermal, and only 1.5% solar (Wiser et al., 2011).

To encourage development and the growth of a solar industry, several states have enforced mandates that require a specific portion of the RPS renewable energy to come from solar. These RPS-driven solar mandates are often referred to as "set-asides" or "carve-outs".[2] As of March 2011, 13 states and the District of Columbia have solar set-asides and four states have distributed generation set-asides that will likely rely on solar energy technologies (Wiser et al., 2011). The RPS with solar set-asides is

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[2] A second trend among states with RPS policies is the use of "multipliers," whereby states give extra renewable energy certificate credit for solar generation. For instance, instead of one solar MW h counting as one renewable energy certificate, it may count as three. See (Buckman, 2011) for an extensive comparison between the effects of set-asides and multipliers, also referred to as "banding".

intended to not only attract installers and investors in solar energy production to a specific state, but to create a competitive market that will sustain future growth in the solar industry.

The RPS supports renewable energy development more generally by requiring utility companies to purchase renewable electricity certificates, or RECs.[3] A REC is a tradable credit for each megawatt-hour (MWh) of generation that is sold separately from the electricity a system generates (Gillenwater, 2008a,b). A solar REC, or SREC, is a REC that is specifically associated with solar power generation, and is affiliated with RPS programs that include solar set-asides. The added revenue from selling SRECs compensates power generators for added costs of producing solar energy (Agnolucci, 2006).

As is the case with most markets for environmental and ecosystem services that aim to internalize social costs or benefits of externalities, SREC markets are in early stages of development. Recent evidence in the literature suggests that experience with SRECs is mixed and, while some states have experienced notable success with the use of SREC and related solar policies (Hart, 2010), others have identified problems with a lack of market transparency, price volatility, non-compliance with solar mandates, and lack of SREC availability (Wiser et al., 2011).[4] With the increasing trend towards the use of state RPS set-asides and SREC compliance markets, the need for information and assessment on the strengths and limitations of these policy design features is necessary, and, indeed, has been the focus of several recent analyses (Buckman, 2011; Hart, 2010; Wiser et al., 2011).

This study examines North Carolina's renewable portfolio standard, and its ability to support local solar power production and foster a solar industry. North Carolina is the focus of study because it is the first and only state in the Southeast to adopt and implement an RPS. The Southeast is less endowed with wind potential than other regions across the country and, albeit arguably, most in need of developing a strong solar energy industry if it wishes – or is eventually forced via national mandates – to comply with renewable energy policies. Furthermore, the preliminary trends in North Carolina's solar industry development are emerging; after several years since the RPS became law, the opportunity to analyze these trends is now available. As such, we examine whether barriers to solar development and market maturity exist and, if they do, how the North Carolina solar set-aside can more effectively support the initial stages of growth in the solar industry.

Utilities began reporting their compliance plans and engaging solar photovoltaic (PV) developers in 2008 in anticipation of their first compliance year in 2010. Given the relatively short time frame of these trends, our case study of North Carolina also compares the structure of SREC markets in New Jersey and Pennsylvania, states that have created competitive solar markets and achieved notable growth in their local solar industries. Examining the differences in market structures, not just in overall targets, but also with respect to the different buyers and transactions in each market, allows us to draw more substantive conclusions about whether SRECs will support the growth of a local solar industry.

This analysis reviews information gathered from online databases and trading platforms that register SREC generation and installed renewable power systems, as well as from 28 interviews conducted with participants that are active in solar and SREC markets, including installers, aggregators, utility representatives, and government officials. The question that we seek to answer is whether North Carolina's RPS has thus far fostered a transparent and competitive compliance market for solar developers, traders, and investors or, conversely, if it has it created barriers for entry and stifled potential competition? While the North Carolina SREC market and solar industry is still in early stages, the findings from our interviews with market entrants, buyers, and administrators underline areas of potential improvement of the policy mechanism intended to jump-start a robust solar industry. Drawing our conclusions in contrast to the New Jersey and Pennsylvania SREC markets, which have decidedly different structures in overall targets, size limitations, and buyer markets, provides a broader context in which to analyze the effectiveness of the North Carolina SREC market in supporting the growth of a localized solar industry.

The following section presents background information on renewable portfolio standards, renewable energy certificates, and other important RPS policy design features that may accompany solar set-asides. The third section reviews North Carolina's RPS policy, and compares it with RPS policies in New Jersey and Pennsylvania. We then discuss the methodological approach, explain the results and findings, and conclude in the last section.

2. Background

2.1. Renewable portfolio standards

As state governments address environmental and social harms associated with fossil fuel combustion, there is a growing interest in expanding renewable energy generation and diversifying states' electricity portfolios. In pursuit of these objectives, the most popular energy policy instrument adopted by state governments to date is a regulation with some market-oriented design features, the renewable portfolio standard. An RPS policy mandates electric utility companies to generate a certain percentage – or, in some cases, total MW of capacity – of their retail electricity from renewable resources by a given date. For instance, a state may mandate 20% renewable energy generation by 2030. An RPS policy creates a minimum, fixed annual amount of renewable energy (RE) that is demanded by electric utility companies and supplied mostly by independent power producers; although in many states, electric utility companies may also develop new RE technologies on their own to satisfy state-imposed RE mandates. This "compliance market" for RE generation is intended to attract installers and investors to compete to supply renewable power, and spur local growth in renewable industries.

Each state varies in how it structures its RPS, including which technologies it allows or mandates, whether all electric utilities are mandated to comply, and which policy design features are included in the legislation (see Wiser and Barbose, 2008 for a detailed discussion of the differences in RPS policies across states; Holt et al. (2006) and Crandall (2010) provide additional information on policy design features). Table 1 lists policy design features states typically choose among, and tailor to their specific circumstances, with brief descriptions of each.

The present analysis is concerned primarily with RECs and, more specifically, solar REC markets; we, therefore, focus our discussion below on REC and SREC attributes, and other policy design features that determine the transparency, efficiency, and accuracy of SREC market price signals.

2.2. Renewable energy certificates

Wind generation has only recently become cost-competitive with other more conventional sources of energy. Other

[3] In addition to the compliance market, North Carolina has a voluntary market, where buyers are voluntary contributors that purchase RECs. NC Green Power administers this market by acting as a third-party broker that receives private contributions to pay renewable generators for each kilowatt-hour their system produces.

[4] Ryan Wiser and his colleagues (2011) found that, out of all states with solar set-asides in 2008, the average rate of compliance was 68%.