



White Paper

Clean Energy Development: Beyond New York and California

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Shareables

- Despite the outsized attention received by California and New York, opportunities for near-term renewable development and investment span most of the country.
- The recent federal tax incentive extensions create a window of opportunity for wind and solar developers and renewable investors; the extensions also represent an excellent opportunity for new investors to enter the market.
- The renewable landscape across the United States is complex and varied, with differing drivers from region to region and state to state.

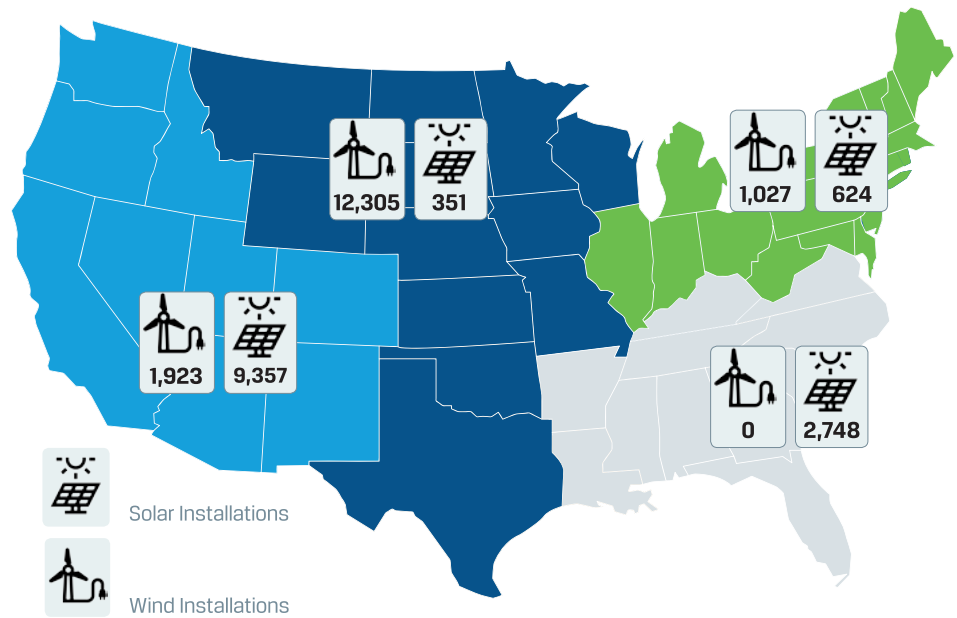
Executive Summary

With nearly a fifth of the total U.S. population and the most aggressive Renewable Portfolio Standard (RPS) requirements in the country (50 percent renewable energy by 2030), California and New York represent the two largest markets for RPS-driven renewable energy demand in the country. As such, these two states receive a lot of attention as key markets for renewable development.

However, recent utility-scale wind and solar photovoltaic (PV) installations reveal a much more extensive renewable landscape that spans the majority of the country. Since 2013, 26 states have added at least one utility-scale wind project, and PV installations over this time period have been even more prevalent, covering 33 states.



EXHIBIT 1: WIND AND SOLAR PV CAPACITY INSTALLATIONS BY REGION, 2013 THROUGH THE H1 2016 (MW)



Sources:

[1] Wind installation data were obtained from the American Wind Energy Association's quarterly "Wind Industry Market Reports."

[2] Solar installation data were obtained from Greentech Media's "Q3 2016 Solar Market Insight Report."

Aided by the long-term extension of the federal tax incentives for wind and solar passed by Congress at the end of 2015, this trend is set to continue in the coming years. Current major drivers of wind and solar development include:

- Improving Cost and Performance:** According to the U.S. Department of Energy's 2016 report "Revolution...Now," costs for land-based wind and utility-scale solar have decreased by 41 percent and 64 percent, respectively, since 2008.¹
- Federal Tax Incentives:** The federal tax incentives for wind and solar were extended in the Consolidated Appropriations Act, 2016, passed by Congress in December 2015. The Production Tax Credit (PTC), which is typically associated with wind, was extended for projects that begin construction through 2019.² The Investment Tax Credit (ITC), typically associated with solar, was extended for projects that begin construction through 2021

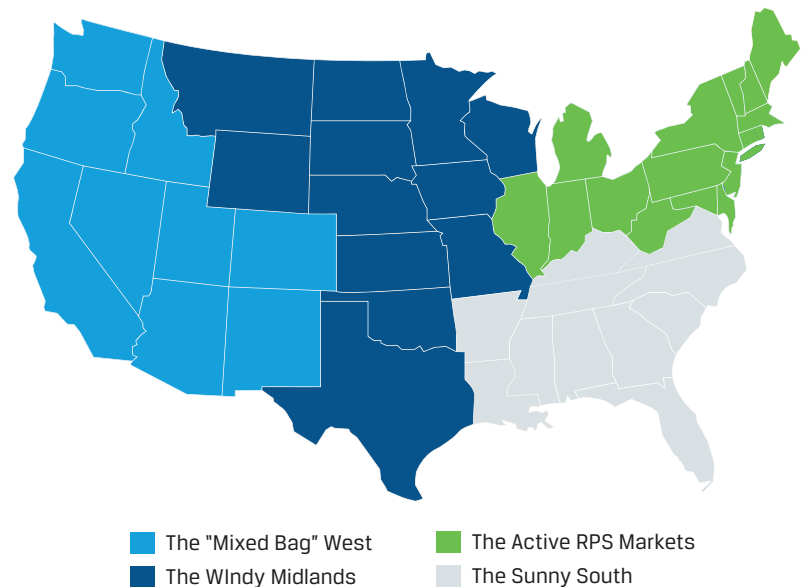
¹ As measured by levelized cost of energy (LCOE). Source: <https://www.energy.gov/eere/downloads/revolutionnow-2016-update>

² Eligible projects trigger their construction date by meeting one of two tests. The first is to begin "physical work of a significant nature." The second test is the 5 percent safe harbor test, for which a developer must spend at least 5 percent of the expected total project costs, usually by placing an order for a significant piece of equipment.

However, the election of Donald Trump does introduce some uncertainty regarding the future of the federal tax incentives. While it is unlikely that the tax incentives are cut before the current phase-out schedule, there is a non-zero chance of that occurring in the process of overall tax reform.

- Renewable Portfolio Standards and RPS Carve-Outs:** 29 states and the District of Columbia currently have mandatory RPS policies. In addition, a number of states have carve-outs that set aside a portion of their requirement for specific technologies, such as distributed generation, solar, or offshore wind. However, a number of the nation's RPS requirements are oversupplied compared to long-term targets, meaning that the existence of an RPS policy does not necessarily make it a driver of renewable energy growth.
- The Public Utilities Regulatory Policy Act (PURPA):** PURPA was created in 1978 to promote ownership of generating assets by nonutility power producers in regulated power markets. Under PURPA, utilities are required to purchase power from independent producers at their calculated avoided cost. As the costs of solar power have come down, PURPA has started to drive solar installations in select states.

EXHIBIT 2: RENEWABLE ENERGY REGIONS



Although there are a number of drivers for wind and solar development in the United States right now, the relevant drivers can vary significantly from region to region. In turn, these drivers affect the development and investment opportunities for wind and solar in the coming years.

The map in Exhibit 2 characterizes four regions of the United States based on relevant drivers and each region's propensity to develop either wind or solar. These regions are described in further detail below.



The Sunny South

With only a single mandatory RPS policy and generally poor wind resources, renewable development in the South has lagged behind the majority of the country. However, driven by improving costs and performance for renewable technologies and federal income tax credits, more substantial renewable development in this region is beginning to occur.

The heat map in Exhibit 3 displays darker states providing greater near-term opportunities for renewables than lighter states. Additional heat maps are provided for each section.

Outside of a handful of proposed wind projects in North Carolina and Tennessee, renewable development in the South will be dominated by solar PV in the coming years. The extension of the ITC for solar projects that begin construction by the end of 2021 will be especially impactful in this region and should drive solar development in the South through at least the mid-2020s. To date, at least one utility-scale solar project is operating or has been approved in each state in this region, although opportunities in Kentucky and Louisiana remain limited.

EXHIBIT 3: SOUTHEAST REGION HEAT MAP

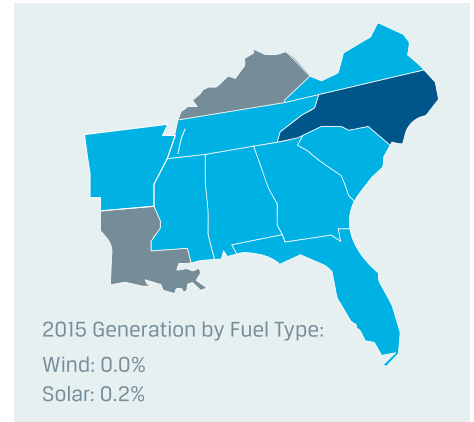


TABLE 1: RENEWABLE DEVELOPMENT FACTORS IN THE SOUTHEAST

State	RPS Policy?	Is the RPS Policy Oversupplied?	Previous Wind Devt.	Previous Solar Devt.?	Is PURPA a Significant Driver?
AL, FL, GA, TN	No	-	No	Yes	No
AR, LA	No	-	No	No	No
KY, MS, VA	No	-	No	Limited	No
NC	Yes	Yes	Limited	Yes	Yes
SC	No	-	No	Limited	Yes



The states in this region are all regulated electricity markets, which means that projects must be approved by each state's regulators. It also means that solar capacity additions may be dictated by the integrated resource planning process and may be conducted through a request for proposal (RFP). For example, Georgia Power recently reached a settlement under its long-term energy plan with its public service commission. The utility agreed to add two blocks of 525 MW of renewable capacity, most of which would be added through competitive bidding (through RFPs) in 2017 and 2019. Barring further negotiations, this settlement defines the opportunity for renewable development in Georgia through 2021.

North Carolina remains the outlier in this region for a number of reasons. Recent solar capacity additions in the state were aided by a 35 percent state income tax credit, which was eliminated for most projects at the end of 2015. However, the state should still have one of the most active solar markets in the country, even without the tax credit, due to PURPA and voluntary capacity additions. In North Carolina, utilities are required to sign power purchase agreements of up to 15 years with qualifying facilities (5 MW or less) at the utility's avoided cost.

The Windy Midlands

Home to the best wind resources in the country and more than a handful of mandatory RPS policies, the states in the Midlands region are no stranger to renewable energy development. However, with the region's RPS policies either no longer increasing in percentage or capacity terms (Michigan, Wisconsin, Iowa, Texas, and Montana), or mostly oversubscribed (Missouri and Minnesota) similar to the South, future renewable development in this region will be primarily driven by improving renewable cost and performance and the federal tax credit extensions. Unlike the South, however, renewable development in the Midlands will primarily be wind, especially through 2020 when the latest PTC extension is set to expire.

The majority of wind projects in this region are larger projects with capacities of 100 MW or more, which may necessarily limit investment opportunities for smaller market players. In addition, many of the projects in this region are developed by established utilities and renewable development firms that also intend to own their projects. However, in spite of these trends, investment opportunities remain available due to the large number of projects.

EXHIBIT 4: MIDLANDS REGION HEAT MAP

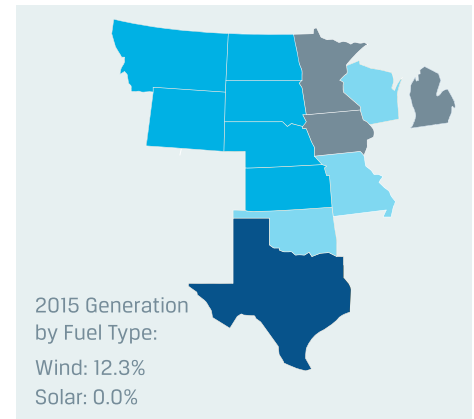


TABLE 2: RENEWABLE DEVELOPMENT FACTORS IN THE MIDLANDS

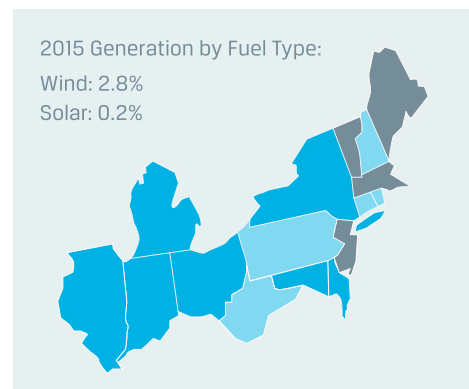
State	RPS Policy?	Is the RPS Policy Oversupplied?	Previous Wind Devt.	Previous Solar Devt.?	Is PURPA a Significant Driver?
IA, MI, MN, WI	Yes	Yes	Yes	Limited	No
MO, TX	Yes	Yes	Yes	Yes	No
MT	Yes	Yes	Yes	No	No
NE, OK	No	-	Yes	Limited	No
KS, ND, SD, WY	No	-	Yes	No	No

There are also a number of opportunities for solar in this region. Solar development is starting to pick up in select states, including Michigan, Wisconsin, Minnesota, Missouri, and Texas. While projects in Wisconsin and Missouri have been small so far (less than 10 MW), larger projects have been announced or are under construction in Michigan, Minnesota, and Texas. As the PTC phases out and as a result solar becomes more competitive against wind, the opportunities for solar development in the Midlands will continue to expand within these states and into other states as well, particularly in Texas, which has excellent solar resources in the Western part of the state.

The Active, Northeast RPS Markets

Although the federal tax extensions will still lower costs, renewable development in the Northeast will be driven—or at least supported by—the region's RPS policies. This is especially true in New England (ISO-NE), which traditionally has the highest renewable energy credit prices in the country, due to a tight balance between RPS-driven renewable energy demand and supply. While recent market developments—including lower than expected energy demand and increased renewable build rates—have dampened this somewhat, New England's RPS goals will continue

EXHIBIT 5: ACTIVE RPS MARKETS HEAT MAP



to increase in future years. In addition, the New England Clean Energy RFP, held jointly by Connecticut, Massachusetts, and Rhode Island, will assure that new renewable capacity comes online over the next several years.

In PJM, which includes portions of Illinois and Indiana and all of Ohio, Pennsylvania, West Virginia, Maryland, Delaware, and New Jersey, the supply-demand balance is less tight than it is in New England. However, RPS-driven renewable energy demand is set to increase swiftly in the coming years. That increase could rationalize a lot of the current oversupply, although the build rate for new renewables will determine how quickly that occurs. Regardless, opportunities for wind development remain, especially in Illinois, Indiana, and Ohio.

TABLE 3: RENEWABLE DEVELOPMENT FACTORS IN THE ACTIVE RPS MARKETS

State	RPS Policy?	Is the RPS Policy Oversupplied?	Previous Wind Devt.	Previous Solar Devt.?	Is PURPA a Significant Driver?
CT	Yes	No	Limited	Yes	No
DE, NJ	Yes	Near Term	Limited	Yes	No
IL	Yes	Yes	Yes	Yes	No
IN	No	-	Yes	Yes	No
MA, NY, RI, VT	Yes	No	Yes	Yes	No
MD, OH, PA	Yes	Near Term	Yes	Yes	No
ME, NH	Yes	No	Yes	No	No
WV	No	-	Yes	No	No

Solar development in this region will also be significant, despite generally poorer solar resources than the rest of the country, due to a number of solar-specific carve-outs in the region's RPS policies. Delaware, Illinois, Maryland, New Jersey, Massachusetts, New Hampshire, Ohio, and Pennsylvania all have solar-specific carve-outs. Out of these states, Maryland, Vermont, and Massachusetts will see the most significant utility-scale solar development in the near future, although there is at least one project announced in every state in the region.

The "Mixed Bag" West

Of the four regions characterized here, renewable development in the West will be driven by the most diverse set of factors over the next several years. One of the primary factors will be out-of-state builds that will be used to meet California's RPS, which, as previously mentioned, was increased to 50 percent by 2030. According to the California Public Utility Commission's RPS calculator, California will need more than 18,000 GWh of additional renewable energy generation to meet its 2030 goals, beyond the resources that are already contracted with the state's Load Serving Entities (LSEs) or that could be recontracted. This demand translates into a need for about 7,000–9,000 MW of incremental capacity, with some of that capacity being built outside California. Out-of-state resources that contribute to California's RPS are already located in every state in this region except Colorado.

The majority of the states in this region also have their own RPS policy. These are largely oversupplied in the near term, or in some cases, fulfillment is being suppressed by the cost caps built into the RPS. However, the region's non-California RPS policies can still serve as a primary or secondary driver for renewable development. For example, partially driven by the federal tax extensions and partially driven by the need to meet RPS compliance obligations in California, Oregon, and Washington, one of the region's largest LSEs, PacifiCorp, recently issued an RFP for incremental renewable capacity.

EXHIBIT 6: WESTERN REGION HEAT MAP

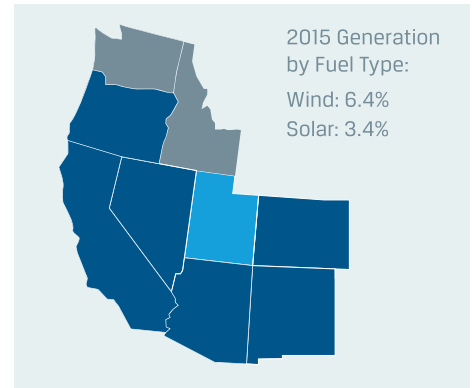


TABLE 4: RENEWABLE DEVELOPMENT FACTORS IN THE MIXED BAG WEST

State	RPS Policy?	Is the RPS Policy Oversupplied?	Previous Wind Devt.	Previous Solar Devt.?	Is PURPA a Significant Driver?
AZ, CA	Yes	Near Term	Yes	Yes	No
CO, NM	Yes	No	Yes	Yes	No
ID, UT	No	-	Yes	Yes	Yes
NV	Yes	Yes	Yes	Yes	No
OR	Yes	Near Term	Yes	Yes	Yes
WA	Yes	Yes	Yes	No	No

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In addition, there are other drivers of renewable energy in the region outside of the capacity needed to meet RPS policies. For example, New Mexico has its own production tax credit, which is currently set to expire at the end of 2017. The credit has created a large renewable queue and is driving both wind and solar capacity additions in the state. PURPA is another driver in some states, setting in motion capacity additions of 10 MW or less in Oregon and Idaho, albeit on a smaller scale. And finally, similar to the South, most of the states in the West are fully regulated, and renewable development can be driven by settlements or other actions that occur within the context of the long-term planning process.

Closing Thoughts

The federal tax extensions for wind and solar have created a window of opportunity for renewable energy developers and investors—one that spans the majority of the country, extending far beyond California and New York. However, the U.S. landscape is varied and complex, and the market drivers that create opportunities can vary from region to region and state to state. As a result, it is important to consider the market specifics presented here when identifying and pursuing investment opportunities.

About the Authors



Chris MacCracken is a Principal with ICF. He assists clients in assessing the impacts of environmental regulation on their portfolios to support the development of compliance, regulatory, and operational strategies. Chris' clients include electric utilities, IPPs, and NGOs. He has directed ICF's support in a number of regulatory analysis engagements, including for RGGI Inc. in support of the 2016 RGGI Program Review and several related to state plan design strategy under the Clean Power Plan.



Aaron Geschiere is an Associate at ICF, where he has five years of experience providing project and modeling leadership and support for the Commercial Energy Division. Mr. Geschiere's work at ICF focuses on renewable energy fundamentals and project evaluation, with previous experience forecasting Renewable Energy Credit prices in multiple U.S. markets, Power Purchase Agreement (PPA) evaluation and due diligence, and assessment of market opportunities for renewable project developers. Mr. Geschiere has B.S. degrees in Economics and Environmental Science from the University of Michigan.