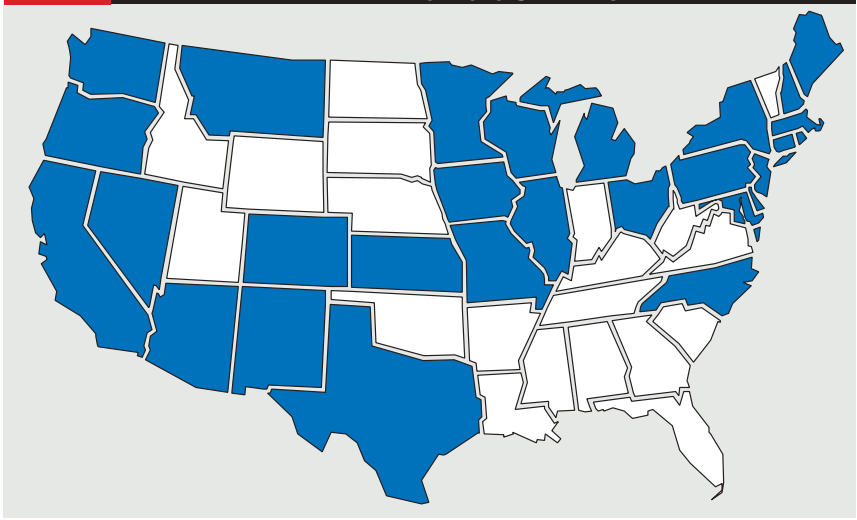
Renewable Overload

Waxman-Markey RES creates land-use dilemmas.

By Tom Hewson and Dave Pressman

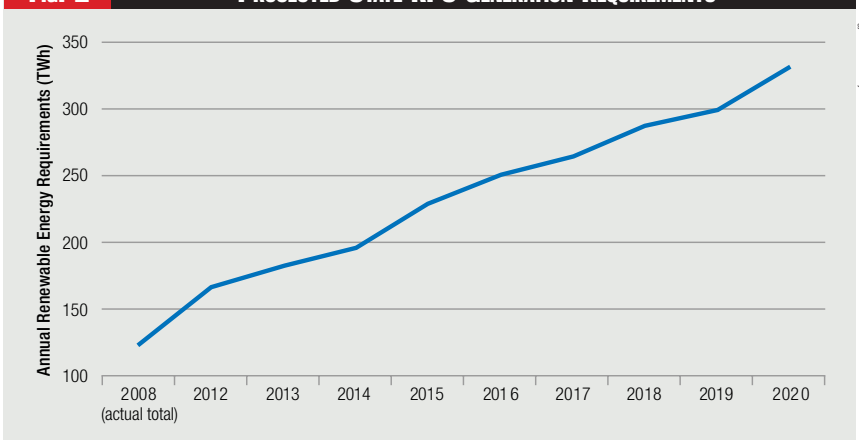
Most policymakers consider renewable energy incentives as a cost-competitive approach to reduce fossil-fuel generation and reduce future greenhouse-gas (GHG) emissions from the utility sector. Because of renewable's much higher production costs, 29 states have adopted renewable energy standards (RES) that close a portion of their retail electricity markets to only qualifying renewable energy generation sources—namely biomass, wind, solar, geothermal and in some cases new hydro (*see Figure 1*). These state standards have triggered the rapid expansion in non-hydro renewable generation that has grown by more than 50 percent from 81 TWh in 2000 to 123 TWh in 2008. Non-hydro renewable sources now account for 3 percent of U.S. power generation.

Fig. 1 **29 States and the District of Columbia Have Adopted Renewable Portfolio Standards**



Source: Energy Ventures Analysis

Fig. 2 **Projected State RPS Generation Requirements**



Source: Energy Ventures Analysis

The full cost and impact of these state standards have yet to be felt since they are initially set at low market shares and are gradually increased over time. By 2020, the state renewable set-aside market is anticipated to reach 335 GWh (*see Figure 2*). This protected market will represent 7.9 percent of the 2020 U.S. retail power market.

Congress has taken interest to adopt a national RES as a strategic element in its efforts to control future GHG emissions. In June 2009, the House of Representative passed the American Clean Energy and Security Act, which contained a national RES. Starting in 2012, this standard would require 6 percent of qualifying retail sales to come from a combination of renewable sources and incremental energy efficiency measures, with the standard steadily increased to reach 20 percent by 2020. Given the exemptions for small utility systems (*i.e.*, those with less than 4 TWh of annual retail sales, representing 26 percent of the U.S. market and totally eliminating five states—Alaska, Hawaii, North Dakota, South Dakota and Vermont) and baseline exclusions (hydroelectric and new nuclear generation), the net effect of this provision is to require between 335 and 560 TWh of non-hydro renewable generation by 2020 (*see Figure 3*). Since utilities can use incremental energy-efficiency programs to meet up to 40 percent of the bill's renewable requirements, the generation number will fall within this range, depending on the savings gained from energy-efficiency programs. In essence, Waxman-Markey would set aside an additional 135 GWh of new retail power demand by 2020 (beyond current state requirements) that must be met through qualifying renewable generation or incremental energy-efficiency measures.

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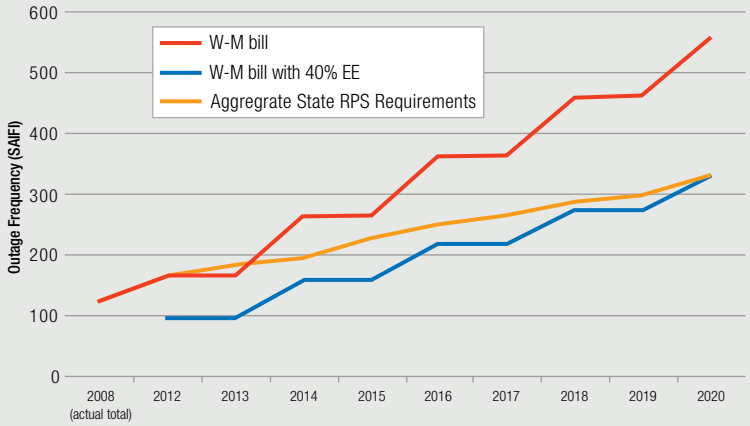
Where, within this range, the final requirement falls depends upon the incremental energy-efficiency savings utilities can gain, since certified energy savings can be used to meet up to 40 percent of the bill's renewable requirements.

These state and national renewable electricity standards likely will pose a significant challenge to the electric utility industry and have significantly different regional impacts. Based upon current DOE-EIA and EVA studies, the vast majority (80 to 90 percent) of the expanded renewable energy requirements will come from biomass and wind resources. Each renewable option faces significant technical, economic and resource challenges.

Fig. 3 Aggregate State RPS Requirements vs. Waxman-Markey Bill



Source: Energy Ventures Analysis

Fig. 4 National Renewable Energy Standard Effect on Renewable Power Generation

	Existing State RPS	American Clean Energy & Security Act of 2009 w/o energy efficiency	American Clean Energy & Security Act of 2009 w/max energy efficiency
RES requirement (TWh)			
2020	346	577	346
2025	421	596	358
Biomass power generation (TWh)			
2020	170	290	170
2025	221	320	209
Land required for sustainable energy crop harvest (million acres)			
2020	35	60	35
2025	45	66	43
Percent Class I-IV Max non-federal forested land dedicated to sustaining energy crop harvest			
2020	20.1 percent	34.3 percent	20.1 percent
2025	26.1 percent	37.9 percent	24.8 percent
Wind generation (TWh)			
2020	100	211	101
2025	122	198	113
Wind generation ridgeline requirement (miles) (if 100 percent Mountain ridge siting)			
2025	4,672	7,579	4,337
Wind generation ridgeline requirement (million acres)(If 100 percent flat land siting)			
2025	0.99	1.61	0.92

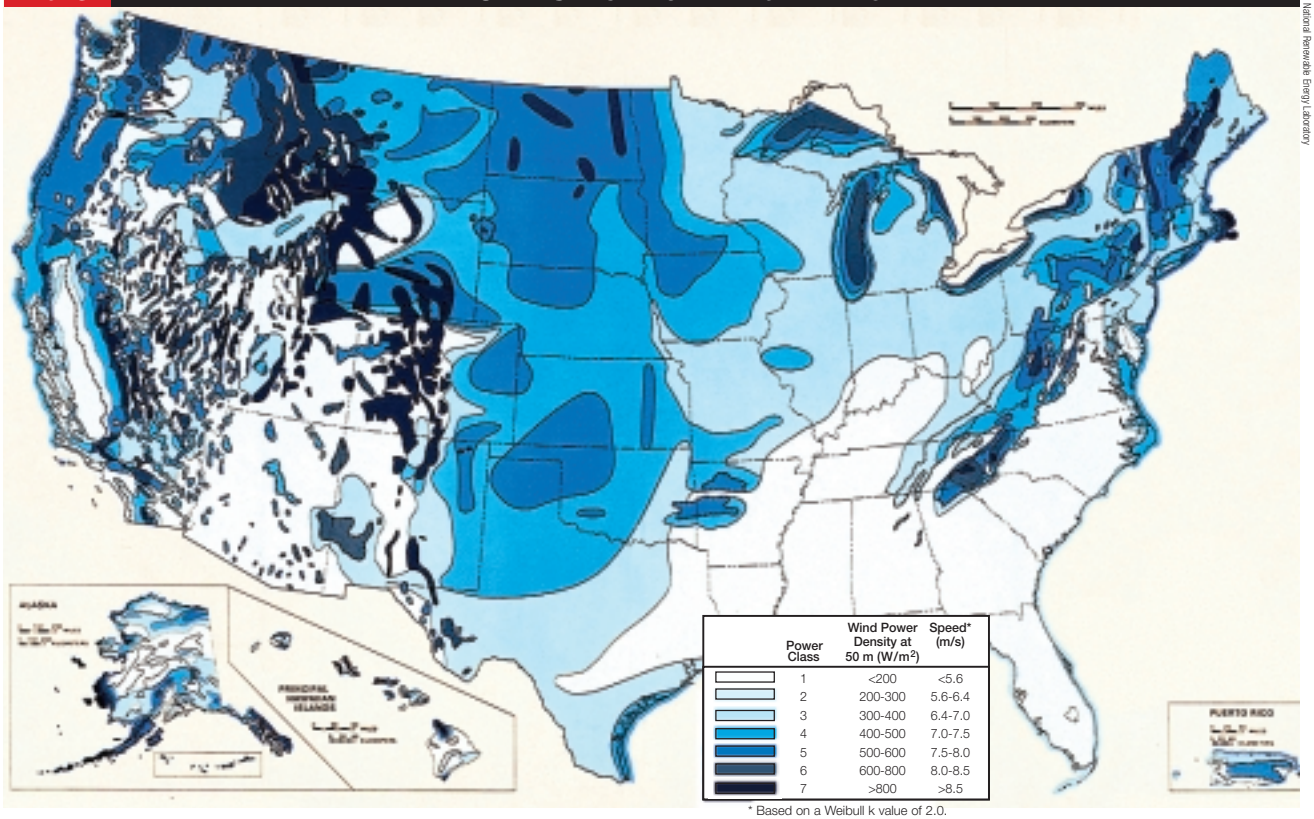
Source: Energy Ventures Analysis

Biomass Requirements

Biomass remains the largest renewable power source after hydro power. In 2008, biomass sources produced 58 TWh of power for the grid—primarily (70 percent) from burning wood and wood waste. In both DOE-EIA and EVA studies, they find biomass should play the largest role in renewable expansion because of its lower incremental power production costs and its ability to gain full capacity credit towards power pool reliability requirements. However, biomass generators will need to compete directly for the same wood resources as other major wood consumers (*e.g.,* pulp and paper, construction materials, furniture, chemicals, *etc.*). Some concerns already have arisen as proposed biomass generating facilities are being increasingly challenged by other existing biomass users, notably the pulp and paper industry, who are concerned about rising wood demand pushing higher prices and narrowing operating margins.

In addition to inter-industry competition for biomass fiber, the biomass growers also will need to compete against renewable transportation fuel feedstock suppliers and food crops for available open land. The land needed to harvest biomass for energy production alone is a significant portion of the total U.S. inventory of Class 1, 2, 3, and 4 non-federal forested areas (*see Figure 4*). The existing federal ethanol and biodiesel fuel standards also create additional competition for this same resource and consumes an additional 23 million acres or 13-percent more to grow feedstock for cellulosic ethanol for transportation fuels. If one also includes the expanding need to convert forest land into cropland to plant the additional corn to meet the ethanol

FIG. 5 **UNITED STATES ANNUAL AVERAGE WIND POWER**



* Based on a Weibull k value of 2.0.

Source: National Renewable Energy Laboratory

standard (34 million acres need to be converted in 2020, 44.5 million acres converted in 2025) as well as meet the existing needs of the paper and forest products industry, a national renewable electricity standard (RES) creates a material risk of forest land shortages and skyrocketing wood, ethanol and food prices. Bottom line: The greater the RES, the greater its market disruption and the more severe the forest land destruction.

Wind Requirements

A rapid expansion of wind power generation also will be required to meet a national RES. This expansion will require development of wind capacity in increasingly remote areas and will require a large transmission investment to connect into the grid. In the May 2008 DOE report entitled, *20 Percent Wind by 2020*, DOE estimated that "using optimistic assumptions," transmission investments exceeding $60 billion would be required for wind to reach a 20-percent market share. In Texas alone, the transmission investment needed to access Texas high-quality wind resources would reach $10 billion.

Outside these large transmission investments, the expanded capacity would need to be placed into areas with diminishing wind resources that will adversely affect their output performance. Only limited areas provide Class 4 winds or higher—considered the minimum needed to develop a viable wind power project (*see Figure 5*).

Unfortunately, the existing studies that have evaluated expanding wind power outputs to as high as 20 percent of U.S. retail power sales have contained serious methodological flaws. These flaws have included, for example, assumptions of 33-percent capital cost reductions from current investment levels (due to learning curve technology developments), and improved output performance more than 50-percent higher than current wind project performance. From the combination of these two assumptions, the studies have vastly underestimated the cost and technology challenges created by a rapid wind-development expansion.

RES Pressure

More than 346 TWh of 2020 power sales already have been set aside for renewable resources by 29 existing state RPS standards. In prior studies, EIA and EVA have concluded these existing standards will be difficult to meet given current renewable resources, industry capability and their higher production costs. A higher national RES will place additional pressure on renewable markets and would require additional development of most of the U.S. non-federal forested land. With competition for limited biomass and open land resources (to grow biomass) with ethanol feedstocks (required to meet existing renewable fuel standards), food crops and forest industry products, higher RES requirements will materially increase the risk of forest land shortages and higher prices for food and feedstocks. F