

CAPACITY AND ENERGY BASED RPS POLICIES

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INTRODUCTION

There are several ways to apply an RPS on affected electricity suppliers. At the request of CRED, this memorandum reviews the relative merits and disadvantages of these various approaches. We place particular emphasis on the complexities of applying a capacity-based renewable energy purchase obligation, and review Texas experience with this approach.

APPLYING AN RPS: ENERGY VS. CAPACITY REQUIREMENTS

Various approaches have been considered and used in the application of RPS policies on affected electricity suppliers. These approaches may be summarized as follows:

- **Energy-Based Requirement.** Under this approach, electricity suppliers are required to purchase a certain amount of renewable electricity generation on (typically) a yearly basis. As a practical matter, the energy-based requirement might be applied as:
 - A **percentage** of retail electricity sales established in advance. This is the most common approach. A retail suppliers' purchase obligation in any given year is the pre-established percentage requirement multiplied by their retail electricity sales in that year. While common, this approach imposes a significant uncertainty on retail suppliers that are unable to accurately forecast their retail electricity supply in advance; this is particularly problematic with retail competition where suppliers may have a hard time estimating demand for their product. Not able to predict their own retail sales, the MWh renewable energy requirement of individual electricity suppliers may not be known until year end. To minimize this uncertainty for retail suppliers, some states have established an earlier, historic test year for retail sales on which to apply the percentage requirement. Wisconsin, for example, uses total retail sales as determined by calculating a 3-year rolling average of an electric power provider's retail sales. This approach reduces the uncertainty for the retail supplier in estimating their renewable energy purchase obligation in advance.
 - A **fixed MWh** requirement. Another approach, used in Australia, is to establish a fixed renewable energy supply requirement, expressed in MWh of a state-wide basis. Each year, electricity suppliers calculate their own renewable energy purchase requirement by multiplying the overall MWh requirement by their

portion of total electricity sales. This approach is quite similar to the percentage approach, but unlike the percentage approach the overall renewable energy obligation would not increase with electricity load growth.

- **Capacity-Based Requirement.** Under this approach, electricity suppliers might be required to install or support a certain amount of installed renewable capacity. The requirement could be applied on a percentage or fixed MW approach, similar to the energy-based requirements discussed above. Only one U.S. state – Texas, and no other country to our knowledge, approximates this approach. And even in Texas’ case, as discussed in a moment, it was deemed necessary to translate their installed capacity requirement into an energy-based RPS.

THE CHALLENGES OF A CAPACITY-BASED REQUIREMENT

At first glance, a capacity-based requirement appears simple and effective. Simply require that electricity suppliers install a certain amount of renewable electricity capacity. Administration and verification should be easy as the regulator could easily determine whether the requisite capacity had been installed.

Despite the perceived effectiveness and ease of this approach, there are good reasons for its avoidance. Consider:

1. **The Value of Renewable Energy.** Renewable electricity provides numerous benefits – price stability, fuel diversity, environmental protection, rural economic development. Nearly all of these benefits, however, are only gained to the extent that renewable electricity is generated. Installed capacity is not a meaningful indicator of such social benefit. Logically, public policy should create incentives to support social benefits. An energy-based RPS is far more consistent with the public benefits provided by renewables than an installed capacity-based obligation.
2. **Performance Incentives.** Perhaps more importantly, a capacity-based RPS provides poor performance incentives to renewable generators. In fact, under a pure capacity-based RPS there are no incentives to maximize the efficiency of electrical generation from renewable facilities. After all, an electricity supplier can meet its requirement by installing the lowest cost renewable capacity. Whether or not that generator operates or operates effectively is immaterial. One could easily see how a capacity-based RPS creates, at the worst, incentives for gaming by installing renewable capacity that does not operate. At the best, a pure capacity based RPS provides limited incentives for efficient operation.
3. **Allocating Capacity Appropriately.** For renewable generators that sell their output to multiple electricity suppliers (for example, two utilities), allocating the capacity benefits of the plant between the two suppliers for RPS compliance purposes could prove complex. Should capacity be allocated based on electricity delivery, support

for construction, or some other means? Under an energy-based RPS these complications are minimized.

4. **Fairness.** A capacity-based RPS may further create perceptions of unfairness among renewable generators and among electricity suppliers. Among renewable generators, a capacity-based RPS makes a 10 MW wind plant and a 10 MW biomass plant equivalent in “value,” even though the biomass plant will generate perhaps three times as much renewable electricity over its life than the wind plant, due to different capacity factors. Similarly, among electricity suppliers, a supplier that met its RPS obligation by supporting 10 MW of biomass generation may perceive it to be unfair that another electricity supplier was able to comply with their RPS with 10 MW of wind, despite the fact that the biomass generator will be creating far more electricity supply.

THE TEXAS SOLUTION

As already noted, to our knowledge only Texas has approximated a capacity-based RPS. In particular, Texas legislation specified certain capacity targets for the State, including 2,000 MW of new renewable electricity by 2009. The Texas legislation further gave the state utility regulatory body the responsibility for designing and implementing the details of the RPS policy.

To minimize some of the concerns raised above about capacity-based purchase obligations, two options were considered in Texas.

1. **Maintain a capacity-based RPS but establish technical performance standards.** Under this option, electricity suppliers in Texas would face a renewable energy capacity installation requirement, but certain performance standards would apply to renewable generators to ensure that such generators perform to industry standards. For example, wind generators might have to exceed a 25% capacity factor to be counted towards the capacity requirement of an electricity supplier. This approach was considered as a way of thwarting the performance incentive problems of a capacity-based obligation.
2. **Translate the capacity goal into an energy-based requirement.** Under this approach, the regulatory body would establish yearly energy-based purchase requirements (based on MWh) that would be designed and amended over time to ensure that the State’s capacity goals are met. For example, with a 400 MW capacity goal and an assumed capacity factor of 50% for renewable generators, the overall energy-based purchase requirement would be 1,752,000 MWh ($400 \times 0.5 \times 8760$). If the annual usage was 36,000,000 MWh, then the RPS requirement for that year would be 5% ($1,752,000 \div 36,000,000$). Because the capacity factor could not be known in advance, continual amendments to the yearly energy-based requirements would be needed to ensure that the capacity goals were met with some precision.

While Texas ultimately chose the second approach, both of these approaches create certain problems. In the first case, the complexity of designing a performance standards regime should be obvious. Performance standards would need to vary by technology and resource conditions. The standards would further require changes or variances in bad wind or hydro years. Moreover, while such an approach may alleviate the performance incentive problem associated with capacity-based requirements, it does not address many of the other problems linked to capacity-based RPS requirements, discussed above. The weight of these arguments created broad consensus in Texas that this approach would be unworkably complex.

Though Texas ultimately opted to translate its capacity targets into an energy-based RPS, Texas did recognize that there were certain difficulties in using this approach. In particular, while energy-based RPS requirements were viewed favorably, translating the capacity targets into energy-based purchase requirements posed some problems. Most importantly, how would the regulator ensure that the capacity-based requirement was without knowing in advance the average capacity factor of renewable generators?

Ultimately, Texas adopted an approximation, and established an assumed average capacity factor for the initial 2 years of 35%. Accordingly, the yearly aggregate energy-based purchase requirement would equal the yearly capacity goal multiplied by a capacity factor of 35%.

Acknowledging that the ultimate capacity factor was unknown, and that with an assumed 35% the state could not assure that its capacity targets would be met, Texas allows for periodic revisions to the assumed capacity factor based on actual evidence of renewable energy performance. Such revisions will only be made every 2 years, however, and will apply on a forward basis. This latter requirement was put in place to ensure that electricity suppliers have the ability to manage their renewable energy purchase obligations without undue uncertainty of the magnitude of their overall requirement.

CONCLUSION

Based on this discussion, what can be said about the conditions under which a capacity-based RPS might be applied? We conclude that a capacity-based RPS should be avoided in nearly all cases. If a capacity-based requirement is to apply, a system of performance standards or a translation of the capacity-based goal to an energy-based standard appears to us to be essential. And yet, neither of these approaches can be applied simply, as demonstrated by the Texas case.

On net, we believe that if a capacity-based requirement is established that the best alternative would be to translate the capacity targets into energy-based requirements, as was accomplished in Texas. While not ideal, it is our opinion that such an approach is preferable to the alternatives. Care does, of course, need to be taken in designing a system to translate the capacity targets into energy requirements. Overall, such an approach would allow the broadest political goals of an RPS to be described based on installed capacity, but would still apply the ultimate requirement on the preferred energy basis.