Renewable Electricity Standards:

Good Practices and Design Considerations

A CLEAN ENERGY REGULATORS INITIATIVE REPORT

Leonardo ENERGY

CLEAN ENERGY SOLUTIONS CENTER
ASSISTING COUNTRIES WITH CLEAN ENERGY POLICY

21st Century POWER PARTNERSHIP

Sadie Cox and Sean Esterly
National Renewable Energy Laboratory

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Accelerating the Transition to Clean Energy Technologies

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NOTICE

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Introduction

In widespread use globally, renewable electricity standards are one of the most widely adopted renewable energy policies and a critical regulatory vehicle to accelerate renewable energy deployment (REN21 2015). As of 2014, 98 national and subnational governments had adopted RESs or similar renewable energy quota policies, a nearly ninefold increase from 2004 (REN21 2015). Also, several countries revised their standards in 2013 to align with evolving economic and market conditions. Clear, ambitious, and achievable RESs have been critical in driving global renewable energy market growth and investment (Brown and Muller 2011). This policy brief provides an introduction to key RES design elements, lessons from country experience, and support resources to enable more detailed and country-specific RES policy design.

Renewable electricity standards are regulatory mandates that require a specified amount of electricity that is sold or generated within a given area to come from eligible renewable resources. Renewable electricity standards can be established at the national or subnational level (For example, India—see ireeed.gov.in.), and can be designed as a part of broader annual or multi-year plans, or as stand-alone mandates. In many cases, RESs are ramped up over time, allowing for steady progression to a final goal. Electricity suppliers can typically comply with an RES by:

- Owning a renewable energy facility and its output generation
- Purchasing renewable energy certificates (a REC is a tradable right to claim the environmental and other attributes associated with one megawatt-hour of renewable electricity from a specific generation facility) or guarantees of origin
- Purchasing electricity from a renewable facility inclusive of all renewable attributes (sometimes called bundled renewable electricity) (EPA 2015).

Text Box 1. RESs in Place

California, United States
33% by 2020
50% by 2030

India
17% by 2017

Nova Scotia, Canada
25% by 2015

Republic of Korea
10% by 2020

Romania
20% by 2020

Source: IEA 2015a and DSIRE

Legislative mandates for RESs often include defined penalties for non-complying entities. This process places the burden of procuring renewable power on the electric buyers, often utilities, and it may define a process through which funds to procure renewable electricity are recovered (NREL 2015). Given these enforcement mechanisms, RESs are often more effective at driving deployment than voluntary renewable energy targets or goals (WRI/WWF 2013).

Building on government experience developing and implementing RESs, several key policy design elements and good practices have emerged. Each of these design elements, described below, should be considered as flexible and within the context of specific needs of a country or jurisdiction.

Policy Design and Good Practices

Conducting Technical and Economic Analysis to Inform Policy Design

Setting specific RES requirements involves complex consideration of resource availability and technology market conditions within the context of broader economic, social, and environmental development goals. To set an appropriate RES and ensure achievability, it is important to assess:

- Availability of supply using geospatial and resource assessments
- Cost estimates
- Siting considerations
- Transmission and distribution requirements and renewable energy access provisions
- Other policies at the national and subnational level.

Analysis can also support consideration of the relative contributions of central and distributed generation and various geographic areas in relation to meeting the RES. Assessing possible social, economic, and environmental impacts of various RES options is also critical to ensuring broader development goals are achieved (WRI/WWF 2013).

Text Box 2. Chile: Increasing Targets over Time to Support a Long-term Vision for Solar Deployment

In 2008, Chile enacted the Non-Conventional Renewable Energy Law requiring electricity providers to use renewable energy, including PV and CSP, for 5% of total generation from 2010 to 2014. Beginning in 2015, the requirement will increase by 0.5% each year through 2024, with monthly fees levied for non-compliance. These targets support Chile's overall vision for solar deployment and send a consistent and long-term policy signal (IEA 2015b).

Identifying Eligible Resources and Technologies

In the absence of specific provisions, RESs will typically support the development of renewable energy technologies with the lowest project development costs. Policymakers can, therefore, identify technologies that may require targeted support to align with certain policy goals (EPA 2015). Based on this assessment, "set-asides" or "carve-outs" can be used to provide specific mandates for certain technologies or resources such as solar. On the other hand, policymakers may also choose to exclude certain well-established renewable energy technologies, such as large-scale hydropower. Based on these considerations, eligibility of technologies and resources can be well defined within an RES (NREL 2015; Leon 2012).

Setting RES Requirements

Using the technical and economic analysis described above, policymakers can set specific RES targets appropriate for their circumstances, balancing the economic costs of increasing renewable energy use against the societal benefits, such as supporting local economic development and reducing greenhouse gas emissions. Renewable electricity standard are normally defined as a percentage of generation, a specified installed capacity or a combination of each, and they can be ramped up over time to allow the market to expand gradually yet ensure entities are meeting interim steps towards compliance. Effective RES targets send a stable policy signal, avoiding unpredictable shifts, and support long-term finance through contractual agreements rather than relying solely on shorter-term REC markets described below. However, length of program does not ensure that procurement will not occur on a short-term basis (NREL 2015).

Stakeholder engagement processes can be used to bring together government, industry and communities to discuss critical issues and opportunities that can inform goal setting. Effective processes are inclusive of diverse perspectives and include regular opportunities for provision of feedback to support policy refinement and achievement of goals over the long term (WRI/WWF 2013).

Text Box 3. South Korea: Assessing Policy to Support Cost-effective Outcomes

The Republic of South Korea adopted an RES to support 10% renewable energy generation by 2020. In partnership with the Clean Energy Solutions Center, the Korea Electric Power Corporation (KEPCO) assessed actions to successfully meet and exceed the renewable energy requirements associated with the country's recently implemented national RES. Key design elements of the RES include differentiation of targets by technology, including a solar set-aside, and establishment of a robust REC system and non-compliance mechanism. The assessment focused on actions to meet the standard's percentage requirements overall (10% renewable electricity by 2020), as well as a mandate to produce a set percentage of renewable electricity within the country. Ultimately, the partnership and assessment sought to support cost-effective achievement of the RES for both the utility and its customers. For more information, see Clean Energy Solutions Center (2015).

Clearly Defining the Standard

Renewable electricity standards vary in definition, often linked to either installed power plant capacity or total electricity generated (or sold). These definitions greatly impact policy outcomes. For example, an RES requiring 20% of installed power plant capacity to come from renewables can have much different outcomes than an RES requiring 20% of total electricity generation (or sales) to be met with renewables. The latter will result in greater support for renewables. This is true because solar and wind technologies depend on variable resources, and while their "rated" power plant capacity (in megawatts) may be the same as a conventional power plant, the overall power output (in kilowatt-hours) will be much lower on an annual basis. Therefore, defining the standard in relation to total renewable energy generated (or sold) will lead to greater renewable energy deployment.

Establishing a Compliance Mechanism and Cost Control Provision

Effectively designed RES also include compliance mechanisms and ensure that compliance costs are fairly allocated across electricity customers (NREL 2015). Entities can comply with the RES by purchasing electricity generation through long-term contracts or on the spot market (Philibert 2011), buying renewable energy certificates (described below), or paying a fine called an alternative compliance payment (ACP) (Brown and Muller 2011); Typically levied based on shortage of megawatt-hours in meeting the RES requirement or specific solar set aside (Hurlbut 2008). Alternative compliance payments may also differ by technology and generation start date. For instance, in Massachusetts, the broadest ACP for various renewable energy sources is 67 USD per megawatt-hour (MWh). However, to incentivize certain technologies and generation facilities, Massachusetts also designed tailored ACPs for solar PV installations, under the solar set-aside program, set at 375 USD per MWh, and for generation sources that began operation before 1998 set at 27 USD per MWh (Commonwealth of Massachusetts 2015).

An ACP also serves as a cost control mechanism (Brown and Muller 2011), as entities can choose not to meet the RES if the cost of doing so is higher than the cost of the ACP. Proper design can minimize costs and ratepayer impacts if the availability of affordable renewable energy becomes restricted. Policymakers can set the ACP at a level sufficiently above the expected compliance costs to motivate entities to comply rather than simply pay the ACP. However, the ACP should not be set at a level that could have significant economic impacts if compliance costs become higher than anticipated. Policymakers can balance cost of compliance against the overall benefit of compliance (e.g., local economic growth) (Hurlbut 2008). ACP levels can also be varied over time in relation to decreasing technology costs (Hamrin 2014). Costs and benefits associated with ACPs will be unique to various national and subnational circumstances.

Finally, it is important to establish and provide clear, well-defined guidance on compliance to participating entities, design a robust accounting and monitoring system, and develop a plan for redistributing compliance payments, such as a renewable energy fund to support other renewable energy initiatives (WRI 2013; Wiser et al. 2010).

Designing a Tradable Renewable Energy Credits (RECs) System

Renewable Energy Credit (REC): The environmental attributes associated with one megawatt-hour MWh of electricity production. RECs can be traded, bought and sold separately from commodity electricity.

Policymakers can consider developing a REC system to support a market-based and flexible approach for RES compliance. RECs are typically defined as the environmental attributes of one MWh of renewable energy generation (RECs can be bundled with the electricity generation itself or unbundled and sold separately, with one entity purchasing the electricity generation itself and the other purchasing the renewable characteristic of the generation [Brown and Muller 2011]). And, in many cases, RES compliance is demonstrated by the use of RECs. RECs can be bundled with the electricity generation itself or unbundled and sold separately, with one entity purchasing the electricity generation itself and the other purchasing the renewable characteristic of the generation (Brown and Muller 2011). Using unbundled RECs can reduce costs associated with RES compliance, as renewable resources can be sited in areas with the highest resource. Using RECs as a way to prove compliance may also lower administration and verification costs (Hurlbut 2008; Leon 2012; Heeter et al. 2014). Effectively designed REC systems support robust, accurate, and efficient tracking and accounting of renewable energy generation (NREL 2015).

Text Box 4. United States: Designing an RES to Meet Specific Subnational Needs and Goals

As of March 2015, 29 U.S. states and Washington, DC had adopted an RES (DSIRE 2015). Specific state-level goals and needs provide the foundation for RES design and inform procurement targets, timetables, and renewable sources targeted for incentives. For example, New Jersey established a goal to support solar deployment, and thus designed a solar set-aside requiring 4.1 percent of generation from solar technologies. The state also established a solar REC trading program, and it enforces a specific solar alternative compliance payment. In alignment with the state's broader policy goal to develop a "model" program and become a leader in integrated solar development, these policy design elements have driven substantial solar deployment in New Jersey. This case highlights the need to tailor policies in relation to specific contextual goals and circumstances. For more information, see NREL (2015) and New Jersey Clean Energy Program (2015).

Combining RESs with Other Actions to Ensure a Robust and Effective Policy Environment

Renewable electricity standards are often developed as one element of broader renewable energy policy packages that can include other critical elements such as provisions to ensure renewable energy grid access, establishment of project finance support mechanisms (e.g., power purchase agreements), and the design of complementary policies (e.g., feed-in-tariffs, tax incentives, and net metering). Renewable electricity standards can also work in conjunction with climate policies, such as carbon cap and trade systems (Bird et al. 2010). Evaluating interactions across policies is also critical and can be supported by some resources highlighted below. Developing robust renewable energy support packages can help both ensure long-term sustainable outcomes and achieve broader policy goals. For instance, in the United States, combining RESs with federal production tax credits has supported a broader enabling environment for renewable energy in several states (NREL 2015).

Conclusion

Renewable electricity standards continue to be a crucial policy instrument to support scaled-up renewable energy deployment and broader development goals. Ultimately, policy development will unfold differently in each national or subnational context, but policymakers can draw from key policy design elements, international lessons, and good practices highlighted in this brief to develop policies unique to their national and subnational circumstances.

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Appendix. Additional Support and Resources

Targeted technical assistance regarding the design and implementation of renewable energy policies is provided by:

- Clean Energy Solutions Center Ask an Expert—The Solutions Center Ask an Expert service is available at no cost to government agency representatives from any country and the technical institutes assisting them. If your request qualifies for assistance, you will be matched with the Solutions Center expert who is most qualified to help you, for up to 40 hours of assistance. For more information, see cleanenergysolutions.org/expert.
- Climate Technology Center & Network (CTCN)—Climate Technology Center & Network (CTCN)—The CTCN provides technical assistance in response to requests submitted by developing countries via their National Designated Entities (NDEs). Upon receipt of such requests, the CTC quickly mobilizes its global Network of climate technology experts to design and deliver a customized solution tailored to local needs. The CTCN does not provide funding directly to countries, but instead supports the provision of technical assistance provided by experts on specific climate technology sectors. For more information, see ctc-n.org/technical-assistance.

Additional resources—including good practice resources and publications, policy examples and databases, webinars and training resources, and a glossary—are available at cleanenergysolutions.org/policy-briefs/res/resources.