

NEW TOOLS FOR REGULATORS IN ADDRESSING THE IMPACT OF RENEWABLE ENERGY AND ENERGY EFFICIENCY POLICY

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The role of renewable energy sources and energy efficiency is changing in the global energy marketplace. Regulators and operators around the world are facing questions regarding the costs and benefits of implementing policies related to these resources in heterogeneous electricity systems. The Public Utility Research Center at the University of Florida is expanding the Body of Knowledge in Infrastructure Regulation with responses frequently asked questions on renewable energy and energy efficiency policy. In this paper, we explain the value of this knowledge in implementing public policy, and the evaluation of these resources from the perspective of cost, reliability of service, and energy security. We find that a clear consistent regulatory framework where the roles and responsibilities of market participants are defined offers the best chance of the success of these policies. Further, the value of renewable resources and energy efficiency measures can be understated if their role as a hedge against the volatility of other fuel supplies, and their ability to displace transmission and distribution investment is not taken into consideration. Finally, it is important to understand any unintended consequences of the interaction between these policies.

Introduction

Growing concerns about climate change and the need for developing countries to substantially expand their investment in infrastructure to support sustainable economic development have created consensus on the need to promote environmentally sustainable infrastructure. In energy, renewable sources are expected to play a key role in the transition of the sector to a future low carbon structure. Many developing nations are turning to the private sector as a source of finance and expertise to implement their large investment programs in energy. To expand the scope of the resources available to market participants, the Public Utility Research Center at the University of Florida contracted with the World Bank in 2011 to update the Body of Knowledge on Infrastructure Regulation (BoKIR) web site with content related to clean energy and energy efficiency.

The role of renewable energy and energy efficiency measures extends beyond the traditional role of the national energy regulator in balancing the interests of the utility and the customer in the provision of safe, reliable electricity service at just and reasonable rates. While the responsibility of the regulator may be to implement, rather than enact, energy policy, its input on the policy, as the subject matter expert, may be critical to the long term success of the policy.

The Body of Knowledge on Infrastructure Regulation is the largest online repository of research and training material on infrastructure regulation. It offers the most relevant publications on regulatory topics in energy, water and sanitation, telecommunications and transport, and serves to map recent developments in utility regulation. This comprehensive online resource includes introductions for newcomers to the topic, tutorials, updated literature surveys, self-paced tests, and more than 500 downloadable references for regulatory reform and performance improvements in the infrastructure sectors. The BoKIR was initially created to complement regional and international training initiatives, and

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to enable professionals to stay abreast of recent analytical developments and lessons emerging from cross-country studies. The web site also features a section of Frequently Asked Questions (FAQ's) to provide guidance to regulation practitioners about ways in which to approach some of the most common regulatory challenges encountered in their work. The glossary of regulatory terms has been translated from English into Chinese, French, Italian, Japanese, Portuguese, Spanish, and Thai. (Arabic and Japanese translations are under development. The new content will focus on regulatory reform and regimes that encourage clean energy and energy efficiency in the major infrastructure sectors, and will be added to the web site in 2012 in the form of Frequently Asked Questions.

The Role of the Regulator in Promoting Renewable Energy and Energy Efficiency

The first of the new FAQs, authored by Sanford Berg and Ashley Brown², focuses on the role of the regulator in promoting renewable energy (RE) and energy efficiency (EE). The focus is not on the relative costs and benefits of promoting renewable energy and energy efficiency measures themselves, but instead assumes that these programs will be implemented exogenously.

“The renewable technologies include solar, wind, geothermal, biomass, and hydropower. The RE policies include feed-in tariffs, net metering, renewable portfolio standards, auctions (tendering), power purchase agreements, direct investment support (including loan guarantees and tax incentives), and other incentives for RE development (resource mapping and encouraging NGO involvement). The policies are not mutually exclusive. For example, projects for feed-in tariffs can be awarded via auctions that involve standard power purchase agreements, and those tariffs might be differentiated by technology. Also, Energy Efficiency can be promoted via utility actions (incentivized by the regulator and actions by other agencies. The former include reduced line losses, improvements in load patterns and system reliability, decision-relevant customer billing information, energy audits, and smart grids. The latter include setting appliance standards, providing government financial support, creating tradable certificates, awarding tenders, and establishing government programs like improving EE in schools and hospitals. First, we need to start with the regulatory functions that lay a foundation for how specific policies affect incentives for investments in RE technologies or EE for customers.

Regulatory Functions Affecting RE/EE

Energy sector regulators often have authority to carry out a number of functions that have implications for RE/EE:

- **Issuing licenses related to regulatory functions:** In many jurisdictions, the electricity regulator has responsibility for issuing a “certificate of use” when a capital investment has been completed. Generally, existing capacity is issued a “certificate of use” stating the standards under which the facility is to be operated. Such licensing generally specifies operating standards that have impacts on cost and tariffs. For example, power quality problems with particular generating units will have cost implications for the entire system. Intermittent supply introduces back-up issues for the utility, so contractual arrangements also become relevant. Thus, operating standards are specified

² The first part of this answer draws upon “Designing an Independent Regulatory Commission,” by Berg, Memon, and Skelton (PURC Working Paper, 2000). The NARUC/USAID Handbook (prepared by Pierce Atwood) lists six issues facing regulators: licensing, grid codes, pricing, net metering, power purchase agreements, and green certificates. Since that report included instruments specific to renewable power, we utilize a more inclusive set of regulatory functions.

in advance of operation. This process requires ongoing monitoring by the regulatory commission. New plants (whether representing Independent Power Producers or system expansion by incumbent generators) that have been approved by appropriate authorities still require a license indicating compliance with regulations. Licensing of new generation, transmission, and distribution facilities or approval of sites can be contentious given citizen concerns over *Not In My Back Yard* (NIMBY) facilities. For example, wind power has been a source of complaints for those affected by new sites.

- **Setting performance standards:** Performance standards on quality/reliability have cost/tariff implications since these involve resources. Consumers are willing to pay for a defined standard of service quality; however, performance standards have implications for the cost of service. To protect consumers from excessive prices while ensuring that reliability and other performance standards are adhered to, the regulator will need to prescribe procedures and standards for companies' investment programs. This includes criteria for least-cost expansion and competitive bidding for resources. As renewable penetration within the system increases, the commission will need to adapt existing codes of conduct and eventually develop new ones for generation, transmission and distribution companies, ensuring that market participants have access to information in a timely manner. Performance standards will be set for system reliability; regulators need to identify the implications of new types of electricity generators that are added to the grid—especially those supplying intermittent power. In addition, regulators often oversee network expansion targets (including renewable portfolio standards and the issuance of green certificates).”³

While existing market rules may specify the party responsible for maintaining particular aspects of the overall reliability of the system, economic principles of cost causality also suggest that the costs for this maintenance be assigned to the parties that cause it to be incurred. This may require an expansion or revision of current operating procedures to accommodate these new technologies. Regardless of how responsibility for the cost causality is assigned, specifying in advance helps market participants make informed long term investment decisions. For example, the feed-in tariff in Kenya includes a payment for a resource that many jurisdictions would consider an oxymoron - firm solar energy. While it is understood that the supplier cannot control when and where the sun shines, the supplier that chooses to take payment under this designation assumes the responsibility for compensating for the intermittent nature of the solar resource by providing back up generation. The lower payment received for non-firm solar under the tariff recognizes that the system operator must compensate for this intermittency. In this manner, both parties are aware of their responsibilities.

- **“Monitoring the performance of regulated firms:** Collecting and analyzing data on costs, revenues and performance is essential for tariff determination. Although regulatory commissions need to avoid micro-management of firm activities, it is essential that they be authorized to request information and receive appropriate responses. It is standard practice for regulated firms to prepare audited financial reports on an annual basis to facilitate regulatory review. The commission also needs the authority to penalize firms that do not comply with data requests. Similarly, regulators need the capability to benchmark operations and provide incentives for cost-containment. Ensuring that Purchase Power Agreements (PPAs) are consistent with model PPAs

³ From www.regulationbodyofknowledge.org

would be another regulatory task. Thus, monitoring RE/EE activities falls under the purview of the regulator.

- **Establishing the price level and the structure of tariffs:** The *rate level* is based on revenues required for financial sustainability, including fair returns to invested shareholder capital. It is appropriate that consumers pay for the diversification of utility generation if excessive dependence upon one fuel source makes them vulnerable to input price changes or if public policy mandates a shift away from fossil fuels. However, the higher cost of some renewables affects the affordability electricity, which suggests that regulators must address trade-offs among policy objectives. *Rate structure* refers to rate designs that allow the opportunity to recover prudently-incurred costs, incentivize the efficient use of scarce resources, and promote fairness. In the context of RE/EE, this means that regulators analyze, evaluate, and approve rate designs, including time of use rates and feed-in tariffs. As these technologies are being scaled up worldwide, capital costs have been dropping significantly. Thus it is important that the regulator follows closely the trend in capital costs of renewable technologies to avoid windfall profits, especially when these technologies are benefitting from regulated tariffs.
- **Establishing a Uniform Accounting System:** Operators should be required to file reports in formats determined by the regulator. Income statements, balance sheets, statements of cash flows, and operating statistics are all essential inputs in managerial decision-making and regulatory review. These reports include financial and operating data needed to evaluate corporate performance. Furthermore, accounting separations according to functions facilitate benchmarking—so performance comparisons can be made across firms facing comparable production conditions. Evaluating the cost-effectiveness of renewables policies and energy efficiency programs requires that operators provide data and reports and that regulators have the capacity to review those studies.”⁴

The adherence to a uniform system of accounts not only allows the regulator and operator to compare the costs of operation over time, but across operators as well. By ensuring that costs are accounted for in a consistent manner across operators, cross subsidies can be identified and accounted for when payment transfers are implemented. Failure to do so can result in critical revenue shortages to key components of the electricity supply chain. For example, if some costs related to the distribution system are being allocated to affiliated generators, the true costs of generation will be overstated. A net billing system that rebates the cost of generation to customers supplying their own generation from distributed solar or wind will result in payments that are greater than the true avoided cost of generation, and an under recovery of distribution costs. This under recovery can jeopardize the long term reliability of the system.

- **“Arbitrating disputes among stakeholders:** Regulators ensure that facts are well documented and that different interests are well represented. Disputes may arise in a number of areas, including tariffs and competitive access. This particular role underscores the need for the commission to have the authority to rule on matters within its jurisdiction. Siting of new facilities (including distributed generation such as photovoltaics), cost allocation among different customer classes, and rules for interconnection have differential effects on stakeholders. The regulatory

⁴ Ibid

commission is in a position to organize workshops and promote dispute resolution. Delays in decisions are not neutral in their impacts on the various parties to disputes.

- **Performing (usually via independent consultancy) management audits on regulated firms:** Typically, the regulator reviews the organizational elements of generation, transmission and distribution companies on a regular basis to ensure cost effectiveness and a continuous and efficient supply of services. On an agreed schedule, the commission also reviews companies' performance effectiveness (achieved through incentive plans and management contracts) to reach acceptable efficiency benchmarks. Thus, the commission needs to review the performance of RE and EE initiatives: are the goals being met in a cost-effective manner?
- **Developing human resources for the regulatory commission:** Recruitment and staff training warrant particular attention as part of regular managerial responsibilities, since the implementation of RE/EE policies depends on the quality of the people conducting regulatory analyses. In addition, compensation policy needs to be flexible enough to recruit able staff and retain the expertise that is developed.
- **Reporting sector and commission activities to appropriate government authorities:** A regulatory agency should submit reports regarding sector activities to a higher authority. Given the expertise assembled at a commission, the agency is in a position to provide information and advice to appropriate government departments that are concerned with RE/EE. Publically-available reports provide clarity in regulatory priorities, transparency for sector stakeholders, and accountability to political structures.

Thus, regulatory rulings affect the financial feasibility of RE/EE activities by operators and by customers.

Policy-Making vs. Regulating

Although the boundaries between “policy-making” and “regulating” are inherently fluid and uncertain, the role of the regulator in promoting RE/EE is limited by legislative and executive decisions. RE/EE policies and frameworks are policy decisions that are customarily and perhaps, preferably, taken by policy makers and not regulators. For instance, decisions regarding energy mix (RE) depend on key policy issues such as energy security, environmental policy and rules, how consumers will pay for a cleaner energy mix, and funding sources if the technology requires subsidization from an external agency or cross-subsidization from customers. Similarly in the case of energy efficiency, policy-makers need to identify targeted sectors, financial support for EE, and source of funding. Policymakers, however, may choose to delegate these decisions, or a subset of them to regulators, or they may choose to remain silent on such issues. In the former case, of course, regulators have the power to exercise their discretion, while, in the latter, the scope of regulatory discretion depends on what the legal system provides. In some jurisdictions, regulators have wide discretion unless the law specifically precludes them from making certain decisions within their general area of competence, while in other legal systems, the regulators can only exercise their discretion where the law explicitly provides them with the authority.

Nevertheless, both policy makers and regulators make policy. The distinction is that policy makers define the fundamentals and determine the parameters within which policy making is delegated to regulators. The real question about the government establishment of RE/EE policy is about the level of detail provided by government policy makers, the stability of established policy, and the means by which policy is articulated and communicated. It is more useful to think, not in terms of policy making versus regulation, but, rather, as macro policy versus micro policy. Micro policy consists of any policies or rules that regulators articulate in order to carry out their duties to implement macro policy. In making this distinction, it is useful to think in terms of the following key concepts:

1. **Basic and macro policy, optimally, is set by the Government:** for RE/EE, that means that new programs and targets (such as percent of generation that involves renewables--renewable portfolio standards) should have a broad political consensus, since the implications for energy costs (and therefore prices) and resource utilization can be significant. Thus, new regulatory RE/EE goals specified in legislation are likely to require the agency to balance fundamental goals of affordability, cost recovery (for sustainable utility operations), and fairness (since implicit cross-subsidies may be required to meet new policy mandates).
2. **Government policy must be set and altered only on a prospective basis:** thus, companies should not be penalized for past managerial decisions related to RE/EE if those decisions were consistent with regulatory rules applicable at that time. Regulators must follow and enforce policies articulated by the Government: setting targets that exceed those identified in public policy is likely to create political problems for the regulator; particular stakeholders engage in the appellate process if a specific technology is perceived as receiving excessively generous support from the regulator. "In cases where regulated utilities are responsible [for carrying out energy efficiency programs], the parameters of prudence review should be defined in advance."
3. **Regulators are creatures of the state and not necessarily of the Government:** There is no debate whether the party in power (the Government) has the power and the obligation to set basic policy. It not only has the capability, but its action vests legitimacy, credibility, and legal authority to the regulatory regime. In fact, regulators, except in the rare circumstance where regulatory authority derives directly from the constitution (e.g. California), possess only those powers specifically delegated to them by the Government. At the same time, previous governments passed laws and future governments can alter public policy prospectively. In this sense, the State can be characterized as the people, constitution, laws, resources, and other elements that have greater continuity than the government currently in power.
4. **Policy vacuums are an inherent in infrastructure and are to be expected:** Indeed, political authorities should always have a means of transparently offering their views to regulators. The problem is not the transparent offering of viewpoints, but, rather, the non-transparent bypass of the regulatory processes that seems likely to occur if regulators are not in a position to decide micro policy issues on their own. Parties seeking to advance their own interests will almost inevitably, whenever it suits their interest, seek out political officials to support their point of view. For example, advocates of particular technologies or products will often present agendas that are based on forecasts that might lack a strong scientific basis. Input suppliers (including land and resource owners) standing to benefit from a particular initiative will lobby for that program. It would be grossly unfair to have all of the parties in a case present their evidence and arguments to the regulators through the

prescribed process while another party to the same proceeding seeks out the clandestine support of a minister or other high political figure in order to secure a favorable decision. Success in such a maneuver would render the entire regulatory process a sham.

5. **Some policy issues require technical expertise to be resolved:** If requested, the regulator could provide technical support and inputs to the agency responsible for planning on matters such as expected costs of renewable energy, impact of renewables on security of supply, and quality of service in the case of RE. Policy making, of course, is legislative in nature and is, therefore, a type of activity within which regulators routinely engage in. Their ability to do so, however, is governed by the scope of authority granted to them by the government. Once that authority is delegated, and, until it is rescinded, the regulators should be free, subject to appellate review, to apply their expertise and exercise their lawful authority free of governmental interference.

6. **Regulatory decision making, policy or otherwise, must be subject to appellate review:** If regulators, in deciding a matter, fail to follow obligatory laws and/or policies, then the offending decision should be reversed and reconsidered. In fact, there are two appeals processes, one for resolving specific cases in dispute, and the other, for resolving policy issues on a prospective (going forward) basis. In the first type of appeal, a party who feels aggrieved by a decision by the regulator may ask that an appellate body (usually a Court or tribunal of some sort) reverse the decision in that case. The appellate body, among its other obligations in reviewing the decision of a regulatory agency, must make certain that the regulators neither exceeded their authority nor failed to follow policies set forth by macro policy makers. This form of appeal should be carried out in an independent, transparent, apolitical manner. The other form of appeal, however, is to the macro policy makers. An appeal to macro policy makers, however, is merely to review relevant policy in order to determine whether policy needs to be altered or supplemented. However, because such an appeal can be carried out within the political process, any policy determinations will have an effect only on future matters. In other words, it cannot affect the outcome of specific cases decided by the regulators prior to the re-formulation of basic policy. This point is particularly important when investors in renewable energy follow the rules in place and enter into contracts with operators, but public policies (or social priorities) change at a later date. If the courts start playing politics with regulatory decisions, the availability of private funds will dry up, and public policy is likely to be thwarted.

7. **Sector regulators need to coordinate their decisions with other government agencies:** Clean and renewable energy and energy efficiency are likely to be of concern to a number of organizations. “The regulator should enter into memorandums of understanding (MOUs) with other entities that are promoting electrification, such as ministries and electrification funds. Such MOUs should clarify respective roles and responsibilities and the sequence of needed approvals. The overall goal should be to streamline the regulatory process by minimizing unnecessary duplication and delays.” (Reiche, et. al.) In the area of RE/EE, such coordination is extremely important. “Given the dispersed and often isolated location of electrification projects, the regulator is encouraged to use other government and nongovernment entities to monitor a supplier’s performance relative to quality-of-service standards.”

Bringing Transparency to the Process

While perhaps it cannot be said that the motives of regulators are always pure, the discipline imposed by the process can at least compel transparency. The same cannot be said when the process becomes

politicized. While the motives of the government in interfering may well be for such legitimate policy reasons as controlling inflation, promoting investment, promoting specific resources, the opportunity of bypassing an established, transparent regulatory process by political officials also opens the door to politicization, corruption and/or de-legitimization. It is important, therefore, as elementary fairness to all parties, for the integrity of the process, and for transparency that the regulators themselves make the decisions themselves, and that any effort by the government or any of its officials to influence the outcome only is carried out in ways that are open and transparent. Certainly, advocating legitimate RE/EE goals can be done transparently without embarrassment. More importantly, if the goals being advocated by political authorities are meritorious, then the government is always empowered to change policies prospectively. It need not intervene in the regulatory process in specific cases in order to effectuate policy. Doing so is to effectively alter the rules in the middle of the game. By making policy on a prospective basis only, the integrity of the process is preserved without sacrificing the ability of political authorities to make policy.

One overview of public policy addressing RE concluded: “Regardless of the decision-making circumstances, key decisions on how to set and implement renewable energy policies with conflicting objectives fall into one of six stages. These include the following:

1. Defining and prioritizing objectives and constraints
2. Establishing jurisdiction and authority
3. Defining boundaries for policy evaluation
4. Defining decision-making standards
5. Specifying decision-making metrics
6. Addressing uncertainty and risk” (Grace, Donovan, and Melnick p. iv)

The authors point out: “The differing perspectives of players in the policymaking arena—legislators, administrative agencies, and regulators; renewable energy industry participants; policy advocates; and ratepayers—influence the state renewable energy policy landscape and contribute to the tension among policy objectives. The perspectives of legislators—who commonly prioritize securing local benefits—are sometimes not well-aligned with the just-and-reasonable rate mandate of utility rate regulators.” (p. ii)

In summary, governments should set basic, macro policy related to RE/EE, but filling in the details of that policy, micro policy making, is an inherent part of what regulators have to do in order to carry out their mission. Policy making by regulators, however, is limited by two critical factors. The first is that policy made by regulators is subsidiary to government policy and is done only under some type of delegation of authority from the state. Secondly, the making of policy by regulators is incidental to and inherent in their duty to decide specific cases or disputes. Such micro policy making role is derived entirely from the fact that macro policy cannot reasonably be expected to anticipate all aspects of policy that will have to evolve for the regulatory process to be fully functional. Gaps will have to be filled and it is the regulators, with technical expertise and hands on experience that are best positioned to accomplish that. Their role in doing so, however, is subject to two checks. The first is appellate review that determines if the regulators were acting within their lawful authority, followed policies they were obliged to follow, whether they were acting reasonably, and whether they followed fair and correct procedures. The second check is that the government retains the ability to alter micro policy determinations. In order to safeguard the integrity of the regulatory process, however, it is vital that that power be exercised only on a prospective basis.

Recognition of the realities and limits of regulatory policy making will both safeguard the process and allow for a more orderly and predictable regulatory regime.”⁵

Standards of Evaluation

Another FAQ addresses the standards that regulators can use in the evaluation of different approaches in promoting renewable energy development and energy efficiency. The author, Sanford Berg, details the role of regulatory governance and regulatory substance in the promotion of renewable energy and energy efficiency measures.

“*The Handbook for Evaluating Infrastructure Regulatory Systems* provides an extensive set of checklists detailing principles for evaluating the effectiveness of regulation. Brown, Stern and Tenenbaum (BST), the authors, emphasize that “Any evaluations of regulatory effectiveness must examine the entire system—not just the characteristics and actions of the formally designated regulatory entity.”(p. 17) BST propose three meta-principles for all infrastructure regulatory systems (p. 7):

1. **Credibility:** investors must have confidence that the regulatory system will honor its commitments.
2. **Legitimacy:** Consumers must be convinced that the regulatory system will protect them from the exercise of monopoly power, whether through high prices or poor service, or both.
3. **Transparency:** The regulatory system must operate transparently, so that investors and consumers “know the terms of the deal.”

To these principles they would add an additional meta-principle:

4. **Efficiency:** Producers must deliver the right levels, mixes and qualities of outputs, given the limited resources available. Similarly regulators must operate in a cost-effective manner as well: adhering to schedules, establishing sound incentives systems, and providing clear rules and expectations regarding outcomes.

Thus, regulators should develop, incentivize, and implement programs promoting renewable energy and energy efficiency with these values in mind.

These standards are quite consistent with the terms of reference set by the Norwegian Agency for Development Cooperation (NORAD) for a study prepared on energy development in Tanzania (Cowi, et. al.). The TOR expands upon the meta-principles by identifying seven issues raised by any innovative energy program, including those directed at promoting renewable energy:

1. **Efficiency:** activities undertaken by regulators should promote cost containment and the appropriate mix of energy outputs (including service quality). Policy-makers should recognize that resources have values in other uses, so studies need to quantify (to the extent possible) the costs and benefits of different generation mixes and energy efficiency initiatives. The monetary benefits can be computed in terms of net present value (NPV), with uncertainty regarding inflows and outflows captured in the discount rate. Efficiency involves establishing a standard and

⁵ Ibid

determining how close the operator comes to meeting the standard (such as least cost production).”⁶

This problem is exacerbated by the potential for different parties in the compact to provide utility service to operate under vastly different decision horizons. Utilities and their customers make decisions with 30 to 40 year horizons, reflecting the long-lived nature of their capital investments. Politicians, on the other hand, may only operate within horizons that extend to the next election cycle. A responsibility of the regulator, then, is to reconcile these differences in implementing energy policy while maintaining stewardship of present and future market participants. For example, the current debate over the long term price of CO₂ emissions offers a glimpse into the attitudes that different governments around the world hold towards the magnitudes and effects of any externalities that relate to the emission of CO₂.

While politicians debate the magnitude of any future price of CO₂ emissions, utilities and their customers around the world are making investments in long-lived assets. Some make these investments assuming that these prices will be relatively low, while others assume they will be rather high. When this policy is eventually implemented⁷, a cohort of these market participants is going to realize that their assumptions on the level of prices was incorrect, and that they are now left with an investment that has little value in the marketplace. The resolution of these stranded costs will leave either investors or ratepayers responsible for the indecision related to this policy. Some of the value derived from energy efficiency measures might be the opportunity offered to defer investments in new generating units until the implementation of uncertain policy becomes clearer, that is, they allow infrastructure investors a degree of flexibility, or optionality.

2. **“Effectiveness:** refers to the extent to which an organization reaches its stated objectives. The *NARUC Handbook* (p. 9) recommends that regulators “identify any international commitments in which the government has entered, and review the targets, priorities and strategies that may be part of such commitments. Review energy policies or national programs for the same. This process will assist regulators in understanding what steps governments are likely to take in support of the different paths for RE development, and also to understand any constraints.” Note that if the goals are unrealistic, the targets are meaningless. If the goals are easily achieved, they are unnecessary. Thus, metrics must be developed and measurements obtained to ensure the effectiveness of programs. For example, NPV of monetary benefits could be one metric, jobs created and sustained could be another—if sector employment is identified as an objective of RE programs. It is important that policy-makers prioritize the objectives so that alternative policies can be compared. In addition, processes (and methodologies) utilized by the regulator in reaching decisions need to draw upon internal expertise and from lessons learned elsewhere.

3. **Impact Analysis:** the regulator should periodically compare the intended results of each program with the actual outcomes, determining whether the information and analysis of the initial decision were appropriate, whether implementation was handled effectively, and to ensure that objectives are being met. Determining the appropriate metrics depends on the objectives of the program. Standard tools of finance provide a key technique for evaluating proposed programs as well as their impacts. Net Present Value is the best indicator, since it captures monetary inflows and

⁶ Ibid

⁷ A decision that the price of emissions is zero is still a policy decision.

outflows. However, part of the justification of RE and EE programs is from the environmental benefits which are difficult to quantify. Nevertheless, some attempt must be made so that programs can be compared and evaluated. Reviewing the impacts of earlier programs is crucial if decision-makers are to benefit from the lessons of the past. When unintended consequences of actions begin to be noted, the policies should come under immediate review.”⁸

There are several different tests that regulators employ to attempt to quantify the relative impact of these programs. Five popular measures are outlined in Figure 1, with a summary of the approach used by each standard, and the question it attempts to address. The particular measure employed will depend on the scope and priorities of the energy policy, but it is likely that one measure alone will not provide a definitive answer to regulators. The best approach might be to use the methods that best address the focus of the policy and compare the results of the analysis.

Table 2-2. The Five Principal Cost-Effectiveness Tests Used in Energy Efficiency

Test	Acronym	Key Question Answered	Summary Approach
Participant cost test	PCT	Will the participants benefit over the measure life?	Comparison of costs and benefits of the customer installing the measure
Program administrator cost test	PACT	Will utility bills increase?	Comparison of program administrator costs to supply-side resource costs
Ratepayer impact measure	RIM	Will utility rates increase?	Comparison of administrator costs and utility bill reductions to supply-side resource costs
Total resource cost test	TRC	Will the total costs of energy in the utility service territory decrease?	Comparison of program administrator and customer costs to utility resource savings
Societal cost test	SCT	Is the utility, state, or nation better off as a whole?	Comparison of society's costs of energy efficiency to resource savings and non-cash costs and benefits

Source: Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects.

Figure 1: Comparison of Five Evaluation Methods⁹

4. **“Coherence (Relevance):** the internal consistency of programs is essential if they are to be successful. Unfortunately, stated policy objectives may not be prioritized, so regulators need to check the links between programs and objectives to ensure that beneficiaries are clearly identified. For example, subsidies may not be well targeted, so progress towards the goal of universal access is limited. If the affordability objective is applied very broadly, cash flows to the investor in renewables might be reduced. Regulators are in a position to evaluate the internal

⁸ From www.regulationbodyofknowledge.org

⁹ From *Understanding Cost-Effectiveness of Energy Efficiency Programs: Best Practices, Technical Methods, and Emerging Issues for Policy-Makers*

consistency of RE programs, so that the incentives (established by a number of agencies) reinforce one another.”¹⁰

In addition to the internal consistency of the programs, regulators must be aware of the effects of interactions between these programs, as these interactions may produce unintended consequences. Parmesano and Kury (2010) have shown that there may be unintended consequences with the interaction between policies which mitigate environmental concerns and the shifting of load from on peak to off peak periods. For example, if energy during the off peak periods is produced using fuels that emit larger amounts of CO₂ than the on peak periods (such as a system that relies primarily on coal generation during the off peak periods and natural gas during the on peak periods), then the effect of a price on CO₂ emissions will be to increase the marginal costs during the off peak hours relative to the on peak hours. The gap between on and off peak costs can collapse, either ruining the incentive to shift load from on peak to off peak periods, or ruining the economic value of equipment (such as storage) that functions to shift load from on peak to off peak periods.

5. **“Sustainability:** current regulatory rules (affecting price and other aspects of electricity) may not be feasible in the future or may involve stakeholder disputes. Regulators can assist in the dispute resolution process involving specific investments, promoting the timely resolution of claims. The on-going success of regulatory initiatives associated with renewables requires secure funding sources (via operator revenues, government outlays, or donor support). When funding is viewed as uncertain, the cost of capital increases for investors, thus raising the cost of RE projects. In addition, the *NARUC Handbook* (p. 9) recommends that regulators “Review legal and administrative processes in other sectors that may impact RE advancements, including environmental siting and permitting restrictions, environmental standards, and investment and procurement rules.”

6. **Risk Recognition and Risk Management:** project analysis requires that stakeholders identify all the risks and then for regulators to ensure that they are mitigated by parties most able to absorb the risk or most able to adopt measures to reduce the risk. Characterizing the relevant risks of intermittent versus dispatchable generation underscores the importance of avoiding leveled cost comparisons, which are inappropriate (Joskow, 2011). This point is especially important for new technologies associated with renewable energy and energy efficiency. Working with regulators in the region (who share similar resource and economic conditions) promotes capacity-building for addressing this issue.”¹¹

All else equal, the intermittent nature of renewable solar and wind energy makes it an imperfect substitute for dispatchable generation with regard to generation reliability. However, investment in renewable energy sources may be accompanied by opportunities to improve the distribution grid. Upgrades to the distribution grid may be necessary to facilitate the integration of the new resource, and these upgrades may convey the ancillary benefit of increased reliability in the form of reduced distribution losses or general failure of the distribution grid. Additionally, higher electricity prices in systems that rely on oil may result in the ability of wind generation, for example, to provide electric

¹⁰ From www.regulationbodyofknowledge.org

¹¹ Ibid

service at a reasonable price. Wind energy is competitive on the margin in only a few regions in the United States, yet may be more cost competitive in the Caribbean. Investments in renewable energy may also yield renewable energy certificates, or reduce the amount of carbon emissions if global energy policies to promote renewable energy and reduce carbon emissions are implemented. Wind and solar generation do not require fuel, so they also allow the utility a hedge against volatile oil or gas prices, as well as provide electricity generated from a local fuel source to increase energy security. If a regulator or policy maker has attributed economic value to hedging or energy security – such as a regulator that allows a utility the recovery of costs required to hedge its fuel costs – then a portion of this value can be credited to the renewable energy or energy efficiency measure that confers a similar benefit.

7. **“Transparency (Honesty):** infrastructure decision-makers are in a position to give favors to well-connected input suppliers, political cronies, and others. Corruption, as reflected in bribery and fraud, raises the cost of doing business and reduces the credibility of government officials promoting energy efficiency and renewable energy. If citizens do not trust regulatory and corporate leaders, then the legitimacy of the system is called into question. This observation implies that bidding procedures, the development of Feed-in Tariffs, and other activities must be perceived as totally transparent.

An additional issue is the importance of collaborations with other government entities. The coherence of a Renewable Energy Program depends on consistency among programs and sustainable funding (both noted above). Generally, other agencies will have overlapping or related responsibilities; regulators need to interact with these agencies (and the legislature) in a systematic (and open) way.

8. **Interagency Coordination:** The *NARUC Handbook* (p. 9) urges regulators to “establish mechanisms, formal or informal, for coordinating activity with other governmental bodies with responsibilities in the field, and promote methods for “one-stop shopping” by interested RE investors. Ensure operational transparency, predictability and clarity of regulatory processes. The temptation to provide support for one project is significant when targets are international and national priorities. Sector stability requires transparent and nondiscriminatory policies that offer oversight and monitoring, informed by economic and social priorities along with sector and economic analysis, but not favoring individual projects in an unpredictable or subjective manner. Reiche, Tenenbaum and Torres (2006) outline principles for coordination with other government entities.

- a. “The regulator should enter into memorandums of understanding (MOUs) with other entities that are promoting electrification [or renewables], such as ministries and electrification funds. Such MOUs should clarify respective roles and responsibilities and the sequence of needed approvals. The overall goal should be to streamline the regulatory process by minimizing unnecessary duplication and delays.
- b. Any MOUs should be publicly available documents so that consumers and potential suppliers of electrical service will have clear understanding of the responsibilities and processes of the regulator and other entities that are promoting electrification.

- c. Two to three years after these standards are adopted, the government should require an independent and publicly available evaluation of its electrification program, which should include an assessment of the regulatory system as it affects electrification.”

These eight issues must be addressed regulators attempting to implement public policy that promotes renewable energy and energy efficiency.”¹²

Conclusions

When they are completed and posted, the new FAQs will represent an important addition to the Body of Knowledge on Infrastructure Regulation. They can provide a valuable resource for regulators, as well as provide a reminder of the necessary steps. Thus, a clear consistent regulatory framework where the roles and responsibilities of market participants are defined offers the best chance of the success of these policies. Further, the value of renewable resources and energy efficiency measures can be understated if their role as a hedge against the volatility of other fuel supplies, and their ability to displace transmission and distribution investment is not taken into consideration. Finally, it is important to understand any unintended consequences of the interaction between these policies.

¹² Ibid

Resources

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