What Regulation May be Appropriate to Support Sustainable Energy Inputs for Electric Generation?

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Abstract

Are there concepts and policies from the history of electric power regulation that bear on current efforts to build and incorporate generation derived from sustainable energy sources? We first look to see what issues have been addressed and what tools were applied to implement policies. To address unique features of renewable energy, resource economic theory applies conceptual tools of ‘nonrivalry’ and ‘nonexclusivity’ that may be useful to identify relevant market failures. As an example, can these new perspectives be applied to guide the debate over source-based versus load-based emissions allowance trading? Esty additionally argues that embracing sustainable generation enhances competitiveness.

It is broadly accepted that transmission grid upgrades are needed to link large-scale renewable sources with distant loads. Fine-grained realtime monitoring connecting generators to end users is rapidly being adopted to support effective inclusion of distributed generation. Feed-in tariffs, renewables portfolio standards and carbon taxes have been implemented to support long-term capitalization and refinement of innovative market mechanism like cap-and-trade.

1. Regulatory history of electric power

1.1. Traditional perceptions of market failures

Regulation was historically applied to electric production and distribution markets because they were generally believed to be natural monopolies, where a small number of firms most efficiently serves the market due to four groups of technical characteristics:

1. economies of scale or scope favor single suppliers
2. fixed, non-liquid capital creates investment risk
3. excess capacity is needed to serve peak demand
4. size or siting limitations

As a result, unregulated markets would not produce the efficiency benefits of competition. In addition, due largely to its non-storability and its importance in rendering essential services, electricity is “affected with a public interest.” Consumers want to be assured of reliable, instantaneous electric service despite highly variable demand. At the same time, electric energy suppliers need enough economic security to capitalize sufficient excess capacity to meet peak demand. Regulation assured supply and protected consumers from excessively fluctuating or predatory prices.

1.2. Legal foundations for regulation

According to Phillips, there are three legal constructs which form the building blocks of the system of rights which then are applied creatively: private law, police power and the power to tax. There are eight categories of private law, which apply mostly to private property (fee simple title, deed restrictions, contracts, estates in land, easements, laws of nuisance and trespass, and standing to sue). The most common is ‘fee simple title’ under which property is owned subject only to possible deed restrictions. Nuisance laws might be considered as relevant to replacing fossil generation with renewables, but private laws have a bias toward economic loss interpretation which weakens protection of non-exclusive resources.

Under private law, standing to sue is required to be heard in court. The plaintiff must have significant economic interest, usually established through property ownership, in order to seek protection from the courts. Suits over degradation of non-exclusive resources have no standing under private law. Sometimes an interested third party with standing has been able to sue the government for exceeding its authority by paying excessive compensation.

The concept of eminent domain supports natural resource and environmental policy. Under eminent domain, property can be condemned by the government ‘for the public purpose’, which has been expanded to include investor owned utilities. This provides ‘just compensation’, defined by the U.S. Supreme Court as ‘fair market value’, the price that two willing parties would agree upon in an arms-length transaction.
Police power is invested in state governments and is applied to regulate the behavior of citizens in order to protect the public health, welfare, safety and morals. Some relevant forms of police power regulation are land use zoning, health and safety codes, and air and water quality regulation. The federal government does not have police power, but can motivate states to enact and enforce regulations by denying funds to states that do not comply. Less costly than applying eminent domain, police power is usually implemented by appointed boards and commissions with the power to grant variances and exceptions to regulations. Planning and zoning commissions have substantial powers to confer economic benefits and losses.

The primary purpose of the power to tax is to raise revenues, not to be a policy tool, and tax rates are determined only legislatively. A legislature may pass enabling legislation that assigns an administrative agency the task of specifying and adopting precise regulation. But, legislatures are prohibited from allowing administrative agencies to determine tax rates.

1.3. Three eras of regulation

Due largely to scale economies, electricity providers have trended toward operating more efficiently in monopoly and oligopoly market structures. Electric energy is available in virtually every American home and comprises 2% of personal expenditures. The economic efficiency of making a single permanent physical connection to customers and the dependence on continuous service has motivated market intervention through regulation.

The primary legal basis of regulation is that the services rendered by public utilities are ‘affected with a public interest’. Rather than rely on markets to evolve toward the lowest price for adequate service, electric energy has long been characterized by private ownership that services a profit motive with public control through regulation to mitigate market power and ensure public convenience and necessity by providing desired levels of public goods.

Because electricity involves both intra- and inter-state commerce, federal policy increasingly depends on cooperation with and among states. Regulation mitigates market power and also balances the regional distribution of benefits, but it has been difficult to separately regulate intra- and interstate commerce. ‘Due process of law’ requirements are often lengthy and delayed and therefore come into conflict with immediate business decision needs.

Unlike most other countries, the U.S. has relied on private ownership controlled by state and federal agencies supervised by the judicial system to ensure the provision of essential economic services, largely by sporadically intervening to tell them what not to do. Economic aspects of electricity regulation have typically been handled by the courts, which address primarily prices and market power. Social aspects, such as health, safety, environmental protection, etc. are typically handled by state agencies. Many argue that regulation is not an adequate substitute for competition, while others like Horace Gray warn that regulation protects private capital more than it ensures public benefits.

Through 1968, regulation was characterized by six- to eight-year planning periods, which were possible due to steady growth in demand and low interest rates. Stable earnings enabled high dividend payout ratios to investors. Because technological advance and increasing scale economies produced declining rates, regulators were able to support economic growth and fairly distribute efficiency benefits with funds that came from the simple delay of rate reductions.

In the 1970s efficiency advances were outpaced by inflation, environmental protection and mandates to internalize social costs, which all led to a declining growth in funding for capacity and reserve requirements. Increased costs and inflation motivated conservation and lifeline rates, which conflicted with the historical industry culture of promoting consumption. Generators had relied on suppliers to develop new technology, which fell behind during the 1970s recession. Regulatory lag now became a problem for recovering increasing costs.

Regulatory agency roles expanded beyond ensuring utilities’ obligation to serve in return for reasonable return on investment to capacity expansion, financing and guiding policy development. The federal authority over states grew as regulatory emphasis shifted from economic efficiency to fairness – from engineering-cost based total revenue requirements to rate design and from embedded costs to incremental costs and peak-load pricing. As a result, rate cases proliferated. In the face of staffing shortages, planning commissions replaced marketing departments while energy related government departments grew as the equitable exercise of discretionary policymaking power replaced the prior administrative law role of limiting government power. Utilities faced also new negative economic pressures such as conservation, lifeline rates and inflation.

In the 1980s the effectiveness, costs and necessity of regulation was challenged leading to deregulation in order to increase the effectiveness of competition (e.g., FERC Order 636). The major public utility issues were increasing coordination...
over larger geographic areas and the recognition that interconnection enabled construction of large, efficient power plants to be staggered over time. Facing negative economic pressures for the first time due to inflation simultaneously with public mandates to internalize social costs in support of conservation and lifeline rates, utilities struggled to maintain adequate available capital to fund target reserve requirements. Generators had long relied on suppliers to develop new technology, which fell behind during the 1970s recession.

By contrast, the 1990s were characterized by growth of markets and re-organization. The major issues were:

- reducing environmental impacts from exponentially increasing CO2 concentrations
- energy efficiency and demand-side management replacing conservation
- growth of competition and non-utility generation
- retail wheeling and restructuring enabling direct access of customers to suppliers
- deregulation policies such as FERC Order 636 moved toward replacing cost-based with market-based price determination, leading to mergers and consolidations

Growing out of rich leadership from New York and Wisconsin’s early development, utility regulation has continued to adapt to evolving technology and markets. But there are concerns about recent policy initiatives that “the U.S. could do much better if the effort deregulating were spent improving regulation.” (Stoft)

1.4. Legislative & Judicial History

Throughout the history of electric generation, landmark cases and legislation have established fundamental concepts. As early as 1944 the Hope Natural Gas Company case established the definition of ‘just and reasonable rates’, shifting emphasis from rate-base to rate-of-return.

The Public Utility Act of 1935 enabled the SEC to simplify holding company structures and gave the Federal Power Commission jurisdiction over interstate wholesale markets for electricity. Also enacted that year, the Public Utility Holding Company Act (PUHCA) allowed federal and state commissions to regulate rates and service.

In 1978 Congress passed the National Energy Conservation Policy Act to provide incentives and assistance in reducing energy consumption through standards and mandates. That year, the Public Utility Regulatory Powers Act (PURPA) was passed. Also known for establishing pricing theory and practice, PURPA ordered both retail wheeling and the collection of cost-of-service information as well. It also established rate-design standards and lifeline rates and encouraged increasing the use of cogeneration and small power producers, known as Qualifying Facilities (QFs). QFs are allowed to produce up to 80 mw of electric capacity from biomass, waste, geothermal or other renewable resources. Utilities are required to buy power from QFs for at least the utility’s ‘full avoided costs’ for not generating the electricity itself or purchasing it from another source.

The 1992 Energy Policy Act (EPAct) assured QFs of 1.5 cents/kwh (inflation adjusted) for 10 years and also established a permanent 10% business energy tax credit for solar and geothermal equipment. The 2001 Economic Security and Recovery Act extended much of this for two more years adding some production tax credits for wind and some biomass.

More recently, federal funding and tax relief to develop new and necessary technology to support the integration of electricity generated from renewables is provided as part of larger bills. For example, funding for the Renewable Portfolio Standard is currently embedded in a process of passing bills in both the House and the Senate before being enacted as law. Section 9611 of H.R. 3221, as Passed in the House, requires retail electric providers to meet an increasing portion of electricity needs from renewable sources or energy-efficiency programs, rising from 2.75% of previous year’s sales in 2010 to 15% in 2020-2039. DOE administers the standard and sets regulations, but may delegate administration to states.

The Electricity Modernization Act of 2005 amends PURPA to “require each utility to make available ... net metering and time-based (smart) metering service.” QFs now have to be cogenerators and retail wheeling is mandated: Title XIII, Energy Tax Incentives of 2005 – Subtitle A: Section 1301 – extends (until 2008 for existing facilities and 5 or 10 years for new facilities) the eligibility of certain renewable energy facilities (wind, biomass, geothermal, etc.) for the tax credit from producing electricity from renewable resources; Section 1302 – authorizes cooperatives to pass rebate to members; Section 1303 – authorizes bonds for clean renewable energy.

Smart Grid and Demand Response was promoted through separate bills in the House and Senate and finally enacted as part of H.R. 6, the Energy Independence and Security Act of 2007. This act was described as “the most sweeping energy efficiency legislation ever enacted” and was signed
into law by the President in 2007. H.R. 6, Sec. 254-256 as First Passed the Senate directs DOE, FERC, and other agencies to support advanced distribution and transmission technologies, including real-time monitoring. H.R. 3221 as Passed in the House, directs EPA to develop a plan for incorporating [Smart Grid and Demand Response] technologies in EPA energy programs.

2. Economic Theory

2.1. Controlling emissions through trade

Environmental regulation generally employs one of five regulatory instruments: Pigouvian taxes, effluent standards, effluent trading schemes, mandates, or imposing liabilities. Figure 1 compares the levels of emissions abatement that would be provided by a polluter under regulatory standards and under taxation. Both fines and taxes are measured in dollars per unit emissions.

Total cost for $S_1 + S_2 + S_3$:
- Tax: $OQ_1A + OQ_2B + OQ_3C$
- Standard: $OQ_2D + OQ_2B + OQ_2E$

Under both Pigouvian taxes (which reduce negative externalities by increasing marginal cost of production) and standards regulation, a firm will either abate emissions or pay the tax, whichever is cheaper. Under an emissions standard most of the abatement is done by the person with the highest average cost, $S_1$. Under taxation most of the abatement is done by the person with the lowest average cost, $S_3$.

The total amount of abatement is the same in both cases, but the allocation of costs differs. Given $Q_2$ is a net-average abatement and $Q_{2\text{ standard}} = Q_{2\text{ tax}}$, the total cost of abatement under standards is greater than under taxes because the sum of differences here, $Q_1 ADQ_2 + 0 - Q_2 ECQ_3$, is greater than zero.

<table>
<thead>
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<th>standard minus tax</th>
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<td>$S_1$</td>
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<td>$S_2$</td>
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<td>$S_3$</td>
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This economic inefficiency due to misallocation can be alleviated by creating and allowing the trading of ‘pollution certificates’.

Certificates process:
- a. The number of pollution certificates to create is determined from the difference between an acceptable level of pollution based on an ambient air quality standard, and an efficient level of abatement (First proposed by J.H. Dales, *Pollution, Property and Prices*, University of Toronto Press, 1968)
- b. The government periodically measures point source pollution rates.
- c. Certificates are distributed through an auction, and which are purchased either by polluters or by environmental advocates.
- d. Certificates are later collected from polluters.
- e. Polluters pay penalties for excess emissions over certificates.

2.2. Utilities prefer standards over taxes

However, polluting industries favor standards over taxes because under taxes they pay the cost of providing an equilibrium level of abatement and then pay a tax on all unabated emissions (Figure 2).

$Q^*$ is the level of abatement chosen by the polluter. A government agency (1) establishes an ambient environmental quality standard for a
pollutant, (2) calculates the reduction in rate of emissions needed to attain the standard regionally, and (3) determines a supply curve for the abatement of each pollutant. At B, the tax is the same as the abatement cost. To the left of B, it is cheaper for the polluter to reduce emissions. To the right of B, it is cheaper for the polluter to pay the tax.

Even though taxes are more economically efficient, standards and fines are most common. Rather than try to estimate demand to find the ‘efficient’ level of abatement, it’s easier to determine Q^{standards} politically and then set severe penalties in order to motivate compliance regardless of cost. Typical penalties are lump sum fines, fines based on either measurement of unit emissions or the amount of time out of compliance or unit, or incarceration.

Figure 3: tax vs fine

Policy initiatives generally need cost-benefit justification. Given the concept of potential Pareto-improvement, where gainers could compensate losers, public policy should generally encourage economic growth. This justifies public investment in programs that create Pareto-improvements.

The income from certificate auctions and penalties can be used to compensate the public for the effects of pollution. Environmental groups are also able to buy certificates from the auction, which raise the ambient air standard by reducing the supply of certificates available to polluters.

Transactions costs of implementing policies, which include measuring and monitoring pollution levels as well as distributing and collecting certificates, are substantial and limiting.

2.3. Pareto-efficiency and Public Goods

Competitive markets depend on exclusive, nonattenuated property rights and relative prices to resolve conflicts from competing use of resources, allowing self-interest to motivate efficient outcomes. However, this may be infeasible when market failures create inefficient prices and motivate the wrong incentives for providing desired levels of goods. Common market failures are natural monopoly, common property resources, externalities and public goods. Government intervention attempts to compensate for market failures using tariffs, subsidies, production and trade quotas, rationing, price supports or ceilings, and taxes.

In Pareto-efficient markets any change makes at least one party worse off because all opportunities for voluntary trade have already been exhausted. Mapping individual ‘utility possibility’ curves generates a ‘grand utility frontier’ which identifies the locus of Pareto-efficient commodity mixes. Points outside the frontier are infeasible.

When Pareto-efficiency is unattainable, Pareto-safety can still be achieved if one party’s income can be increased without affecting others. This can be effected by an outward shift in the ‘grand utility frontier’ through technological advances or discovery of new resources. It also occurs when gainers can compensate losers using instruments like pollution certificate trading to create potential Pareto-improvements. Pareto-efficiency does not exist for non-renewable resources except in the short term if geologic reserve growth is greater than demand growth.

The concepts of ‘non-rivalry’ and ‘non-exclusivity’ are important for understanding issues that are common to many aspects of electric energy services such as reliability, universal access, exploitation of resource rights and the provision of environmental amenities. Rivalry, where an agent’s commodity consumption limits others’, and exclusivity, where distribution among agents can be controlled, are necessary and sufficient conditions for Pareto-efficiency in markets. Rival, exclusive goods are commonly called private goods, referring to most of the commodities we purchase in our daily lives, such as food and fuel.

By contrast, public goods are nonrival in use. This term has been used to refer to both exclusive and nonexclusive goods, so this paper uses the term pure public good for nonrival, nonexclusive goods such as lighthouses, national defense, and air.

Although common usage often attributes non-exclusivity to public goods, they can be exclusive where, for example, access fees are charged for coded TV broadcasts. These are called club goods. Nonexcludable but rival in use, clean air and crowded streets are common pool resources.

<table>
<thead>
<tr>
<th>Rival</th>
<th>Exclusive</th>
<th>Nonexclusive</th>
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<tr>
<td>Rival</td>
<td>private good</td>
<td>common pool resource</td>
</tr>
<tr>
<td>Nonrival</td>
<td>club good</td>
<td>pure public good</td>
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These categories are not necessarily discrete. Nonrival goods that become more rival as the addition of more users reduces the utility of all users are known as congestible goods. Similarly,
nonexclusive goods can become contestable under regulation or other forms of market intervention.

Changes in quality, location, time of use and the availability of capital can change the category of a good. Public education is a private good that through policy is treated in the U.S. as a public good. Once cable TV service, a private good, is in place, TV programs are a club good because giving access to them for individual viewers is costless to the provider.

Usage which diminishes quality also enhances rivalry. For example, CO2 emissions diminish the quality of air for downstream users. Air is normally considered to be a public good. But, in the presence of polluting agents, clean air is rival in use and becomes a common pool resource.

Public goods can occur as externalities to private transactions when excluding non-payers is infeasible due to overlapping cultural, political or even physical constraints. For example, is electric transmission network reliability a private good? Reliability is both a public and a private good, provided through long term transmission and baseload capital investment in excess capacity. Because electrons cannot be physically directed, a load-serving entity does not have to voluntarily contribute to the cost of network reliability. When a single agent’s investment in a public good is small relative to the total necessary investment, free riding is more likely and can cause under funding of adequate network security.

<table>
<thead>
<tr>
<th>dimension</th>
<th>Control/guide mechanisms</th>
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<tr>
<td>physical</td>
<td>fence, metering, monitoring</td>
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<tr>
<td>legal</td>
<td>property rights, license, contract</td>
</tr>
<tr>
<td>economic</td>
<td>relative values of goods and services</td>
</tr>
<tr>
<td>political</td>
<td>mandate, regulation, incentive</td>
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<tr>
<td>ecosystem</td>
<td>processes, stocks, flows</td>
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<td>financial</td>
<td>tradable certificates</td>
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Private/public goods categorization can vary among dimensions of a single good. Emissions certificates are common pool resources. They represent and connect legal and financial aspects of CO2 emissions by making them private goods for trading purposes. However financial ‘leakage’ and ‘contract shuffling’ among CO2 emissions certificates occur across political boundaries when emissions are legally a public good in one state but a private good in another.

2.4. Sustainable generation markets

Sustainability can be described as usage which does not diminish quality for subsequent use (1987 Brundtland Report). This includes consideration of intergenerational equity and resource substitutability (Toman, p140). Regulation is usually employed where free markets are inefficient due to the presence of market failures. Without market intervention, generation from sustainable resources may not address prominent market failures in electricity:

- **non-storability** – Electricity is generally not economically storable. Many renewable energy sources for electric generation are not economically storable (sun, wind) and time of availability may not match demand.
- **scale-economies** – Small scale, distributed generation does not mitigate baseload generation costs because incorporating it into the process of balancing grids is difficult or impossible.
- **necessity** – Short-run price elasticity is very high; undersupply disrupts other markets.
- **capital intensive** – This attenuates financial risk, limiting production market entry/exit.

In addition, most renewable energy sources are tied to the ownership of private goods such as land. As a result, we will try to separate the non-land attributes.

Windmill sites are private goods. Unobstructed laminar air, the fuel for windmills, is a common pool resource like clean water. The energy which drives propellers is a public good only in a large enough geographical frame that latent solar energy can dissipate turbulence and restore laminar flow, enabling needed pressure differences downstream. Laminar flow is restored through effects of solar flux. Sufficient land ownership makes wind energy a private good inside this zone.

Tied to land ownership, solar energy is also a private good. Use of solar energy on my land does not limit others’ use on their land. However, sunlight becomes a common pool resource if exposure to it is limited by nearby tall buildings or by significant air emissions from upwind sources.

Similarly, given the protection of privately owned land or mineral rights, geothermal energy is a private good as long as the maximum possible rate of extraction does not affect others’ energy flows.

2.5. Control mechanisms and interactions affect public goods classifications

As an example, let us consider the view of the scenery of Niagara Falls from the “Maid of the Mist” tour boats. This is a public good. The quality of the viewing and soaking experience is not diminished by other tour boats and generally there is nothing inherent in the flow of the Niagara River below the
Falls that enables tour boats to limit each other’s access.

However, by diverting flow upriver for power generation, the Niagara Power Project has the ability to significantly reduce the scenic quality of the falls. Because this scenery depends on a water flow, it becomes a private good between the upriver power generator and the downriver tour boats. Regulatory market intervention such as scheduling generation at night or financially compensating the tourist industry is needed to negotiate physical property rights and restore the economic nonrival and nonexclusive aspects of Niagara Falls.

As a collection of undifferentiated molecules, air flow is typically a public good. However, clean air is private good because use by one agent that alters its composition, such as by increasing \([\text{CO}_2]\), limits the availability of the reduced components, \([\text{O}_2]\), for downwind users. Some form of regulatory market intervention is needed to maintain clean air’s nonrival characteristic if it is in the common or public interest to protect it as a public good.

‘Leakage’ in \(\text{CO}_2\) emissions certificate trading markets involves a number of private transactions among generators, load-serving entities (LSE) and the government. It appears to be caused by counterfeiting that changes emissions certificates from rival, exclusive private goods to nonrival club goods.

With load-based emissions trading programs an LSE either pays compensation or provides emissions certificates to the government for pollution that is assumed by default to be associated with the power the LSE sells. This is a private good transaction exchanging either money payment for the right to pollute or proof of pollution abatement (emissions certificates) for relief from a fine.

In a separate private goods transaction, the LSE pays money compensation to and receives power from a generator. The LSE also needs to acquire emissions certificates for the power it has purchased. A sustainable generator such as solar will offset its higher cost of production relative to coal generators by selling to the LSE the emissions certificates it acquired from the government in exchange for its assurance that the power it generates is void of emissions.

A dirty coal generator will not have certificates to sell, only power.

Leakage occurs when (1) a clean generator that formerly sold power to an unregulated LSE now sells power and certificates to an ‘emissions regulated’ LSE and (2) the unregulated LSE now buys power from a dirty generator rather than from the clean generator. As a result, the emissions certificates do not represent any net emissions reduction and become counterfeit.

Money, a private good, is being exchanged in a transaction for emissions certificates that, because of leakage, are now club goods. Regulation across state borders is needed to ensure that the commodities on both sides of the emissions trading transaction are private goods. This applies to both load-based and source-based emissions regulation with the only difference being that under source-based regulation the counterfeit certificates, or club goods, are transacted directly between the generator and the regulatory authority and not through an intermediary LSE.

3. Sustainability beyond regulation

There are many institutions and people other than regulators who can impact a firm’s ‘license to operate’. In a time when anyone with a video camera and a website can break a story, organizations that impact environmental amenities are learning to avoid the ‘plaintiff’s bar’ of being sued for ecological harm and to cultivate public opinion by going beyond compliance and actively managing stakeholder relations. Social and environmental issues connect to corporate reputation. Trading markets for emissions draw public attention to environmental issues. Non-governmental advocacy organizations (NGOs) target big buyers.

New institutions complement the role of regulation in reducing environmental impacts. Major financial investment firms are endorsing the ‘Equator principles’, which require environmental assessments of major loans. Section 409 of the 2002 Sarbane-Oxley Act, aimed at improving financial liability disclosure following the collapse of Enron, includes disclosure of environmental liabilities such as costs of cleaning up contaminated sites. Business partners including suppliers and customers, local officials, stock market analysts and investors as well as the general public are being added to policymakers, regulators and environmental advocacy groups in the playing field of environmental stakeholders who advocate working with NGOs to build environmental thinking into business strategies, enhance brand value management and even compete for employees. In addition, regulators, politicians and local communities raise fewer barriers for good neighbors.

The Eco-advantage strategy (Esty and Winston, *Green to Gold*) provides a framework for posturing and marketing sustainable generation to provide a competitive edge in a world where environmental issues matter to businesses and organizations. In
addition to regulation, highly visible businesses that have environmental impacts or natural resource dependence have to deal with environmental issue advocates in order to limit cause for scrutiny. For many reasons, by building a consensus of interest, people will pay more to support added costs and capital investment in sustainable power generation:

a. Opinion leaders trust NGOs
b. Utilities stay abreast or ahead of constantly changing regulation
c. Avoid becoming a political scapegoat
d. Contribute to building a green supply-chain groundswell
e. Investors buy stocks through screening funds
f. Companies compete for employees who want more than just a paycheck
g. ‘Stretch goals’ drive creativity
h. Pairing less desirable and environmental goals keeps public focus on the big picture: long-term goals and reputation
i. Increases stock values and decreases insurance premiums

4. Conclusion

In order to both promote economic efficiency and protect the public interest, public policy and regulation evolved to address market failures such as capital intensity and economies of scale that are endemic to the electric industry. Market mechanisms like cap-and-trade are designed to maximize the rate of reducing emissions at the lowest cost.

But, generation and transmission networks are now regional and the markets they support are multi-state. As a result, new market failures like leakage and contract shuffling compromise individual state efforts to efficiently mitigate negative externalities. The public goods framework of rivalry and exclusivity identifies where new regulation can address market failures. To support effective emissions trading, federal legislation within the scope of PURPA and EPAct may be needed to create multi-state market structures that match the scope of integrated regional generation and transmission networks. And it may be in the electric industry’s self-interest to lead regulation by promoting and guiding these ecological initiatives at the regional level.

References

Boyle, Godfrey, “Renewable Energy”, 2004


Bushnell, James, “The Implementation of California AB32 and the Impact on Wholesale Electricity Markets”, University of California Energy Institute

Chen, Yihsu; Liu, Andrew L. and Hobbs, Benjamin F., “Economic and Emissions Implications of Load-based, Source-based and First-Seller Emissions Trading Programs under California AB32”, December 21, 2007


Hefland, Gloria E., “Standards versus taxes in pollution control” in Handbook of Environmental and Resource Economics, Edward Elgar, 1999

Hobbs, Benjamin, “Designing CO2 trading markets for the power sector”, PSERC Research Tele-seminar, April 1, 2008


Kiesling, Lynn and Gilberson, Michael “Electric Network Reliability as a Public Good”, 2004


Randall, Alan, “Recourse Economics”, 1987


Stoft, Steven, “Designing Markets for Electricity”, 2002

Varian, Hal, “Microeconomic Analysis”, 1992