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Jonathan Raab

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Three views on utility-generated externalities

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"Externalities" are costs imposed on third parties without compensation. Pollution is the archetypical externality. It is the pollution externality that has prompted the emerging national debate over whether public utility regulation should be modified to account for externalities. Jonathan Raab, Myrick Freeman, and Ralph Townsend discuss the arguments surrounding the externality debate. These three authors earlier presented similar material at a Legislative Institute, sponsored by the Margaret Chase Smith Center for Public Policy's Project for the Study of Regulation and the Environment, for the Utilities Committee of the Maine State Legislature.

Why include externalities?

by Jonathan Raab, Consultant

There are at least two compelling reasons to include environmental externalities in utility decision making. The first is an efficiency argument, and the second involves the prudent anticipation of the more stringent future environmental regulation. But, as both a theoretical matter and as a practical matter, there is not any right way to internalize environmental externalities in utility decision making. Rather, there are numerous options, each with its own strengths and weaknesses.

The first argument for the inclusion of externalities in utility decision making is an efficiency argument. Even if environmental regulation is set perfectly, (where the marginal cost of additional pollution reduction equals the marginal benefits from doing so), there will still be residual emissions, and, most likely, environmental damages. When these residual damages are not priced in some way, they are externalities. Without an explicit method to capture these external costs in resource decision making, utilities are unlikely to select resources that result in the lowest social cost. This is simply inefficient from a societal perspective.

Secondly, even without this efficiency argument, it still makes sense to anticipate potentially more stringent federal or state regulation on environmental issues. Over the past twenty years, environmental regulation of the pollutants associated with electricity generation has become stricter and stricter. Under the Clinton administration, this trend is likely to continue. In fact, there is some probability that regulation will eventually include either a tax or a cap on carbon emissions because of the concern about global warming. Failure to require utilities to anticipate more stringent federal and state environmental regulations will probably result in higher electricity costs in the future.

Resources should both be selected and operated not only to comply with existing regulations, but also with an eye to future regulations. This is not different from the prudent business hedge against future uncertainty that we expect of public utilities. About ten years ago, the State of Wisconsin required that utilities look at acid rain, because of sulfur dioxide and other pollutants, when they made resource decisions. Wisconsin regulators expected that those regulations would get stricter over time, which in fact they have. With the Clean Air Act Amendments, Wisconsin

utilities and their ratepayers will benefit significantly by being long on emission credits that they can eventually sell. Once again looking ahead, Wisconsin has recently issued a new environmental externality rule that focuses on global warming. They are requiring adders for greenhouse gases. It was primarily for prudent anticipation reasons that Wisconsin acted both on the Clean Air Act pollutants in the early 1980s and now on global warming pollutants.

We can agree that, all else being equal, we prefer to choose the generation resource that pollutes less. The difficult question is how to compare a resource that has a relatively high direct cost but low emissions with a relatively low cost resource with higher emissions. We have to decide how much to pay for the cleaner resource.

The Vermont Legislature passed a law a few years ago that required integrated resource planning. That statute states that a least-cost, integrated plan for a regulated electric or gas utility must plan to meet the public's need for energy services at the lowest present value, life cycle cost, including environmental and economic cost. The legislature provided a clear mandate to regulators that externalities should be included when comparing integrated resource plans. However, the legislature did not tell the Vermont Public Service Board how to do it. So the Board has undertaken a negotiated rule-making to determine what approach it will use. Although the Board already has a very simplified approach, it is trying to enact the directions from the legislature. I am currently mediating that negotiated rule-making.

Alternative approaches

There are many different ways to include environmental externalities in resource decisions, and there are some advantages and disadvantages of each. One approach is what I call the "qualitative approach." That generally means, all else being equal, choose the cleaner resource. Most states actually use this approach. New Hampshire is a good example. When they examine the resource plans, if the costs of two sources are pretty similar but one is dirtier, they try to choose the cleaner facility. This has the advantage of being highly flexible, but it is extremely judgmental. It is easier to compare resources with fairly similar environmental impact and similar costs than to review really diverse resources like hydro, coal, or energy conservation.

The second, and the most controversial, approach is the "adder" approach. An adder approach places an explicit cost to be added to the price of a dirtier resource (or subtracted from the price of a cleaner resource) when determining which resource to use. The adder is used in the planning process. Once a resource is chosen, the adder does not directly increase the cost of the chosen resource to the utility or its customers. Many states are using these approaches. They fall into two general categories: resource-based adders and emission-based adders.

Most of the current attention is on adders for air emissions. In principle, the same type of estimates could be applied for waste disposal (e.g., nuclear waste), for recreational losses (e.g., hydro), and for the unwanted effects of siting generation plants and transmission lines. For most current purposes, however, air emission is the primary concern.

Resource-based adder

A resource-based adder takes an entire category of resources (e.g., coal generation) and assigns a blanket adder to that resource. For instance, Vermont's current approach, which was approved a few years ago, gives energy conservation a five percent credit when compared to supply-side resources. The Northwest Power Planning Council, which oversees the planning for the Bonneville Power Administration for the states of Washington, Oregon, half of Montana, and Idaho, has a similar approach. It has a ten percent discount for energy conservation compared to the supply-side resources. Wisconsin, until recently, had a fifteen percent discount for non-fossil fuel burning supply and for energy conservation.

The advantage of the resource-based adder approach is ease of application. Resource-based adders to date have been pretty primitive. They have not really distinguished among alternative supply-side options or alternative demand-side resources. This approach is also criticized because it is not very rigorously derived. One state is using five percent, another is using ten percent, and somebody else is using fifteen percent. They have been essentially "placeholders" that give some preferred set of resources an advantage.

Emission-based adders

A second, and increasingly common, approach is the emission-based adder. This approach puts a dollar per ton cost on different pollutants. Those are then added to the direct costs for purposes of comparing resources. Five states - New York, Massachusetts, Nevada, part of California, and Wisconsin - have adopted emission-based adders. Table 1 shows the cost per pollutant for these states. There is a large discrepancy among adders used by these different states. California is an outlier for every pollutant except for carbon dioxide. It should be noted, however, that California's numbers only apply to the Los Angeles basin. The actual state numbers that are proposed for California are smaller and more in line with the other states.

Table 1: Emission-Based Externality Values Adopted by States

($1990) dollars per ton

	New York	Mass.	Nevada	California	Wisconsin
Sulfur Oxides	$832	$1,560	$1,560	$21,306	
Nitrogen Oxides	$1,851	$6,760	$6,800	$28,524	
Carbon Dioxide	$1	$23	$22	$7	$14
Methane		$229	$220		$136
Volatile Organics		$5,512	$1,180	$20,374	
Particulates	$333	$4,160	$4,160	$6,171	
Carbon Monoxide		$905	$920		
Nitrous Oxide		$4,158	$4,140		$2,449

(Note: Blank spaces mean state has not adopted a value.
California numbers are those proposed by PUC for Southern California.
California PUC numbers for rest of state much lower except for carbon dioxide.)

The numbers for carbon dioxide (CO_2), which is closely associated with global warming, should be highlighted. CO_2 emissions are not regulated by the federal government and this Table depicts a wide range in the adders assessed for CO_2 emissions. For example, New York uses $1 per ton, while Massachusetts uses $23 a ton. Wisconsin falls in the middle at $14 per ton. The debate over global warming continues.

Part of the disagreement over CO_2 adder values is related to a debate on how to choose adders. Currently, they are usually based - except for carbon dioxide - on the marginal cost of control as revealed by federal regulation. Federal regulation determines the amount of a pollutant, and there is a cost associated with achieving that reduction. Carbon dioxide has been much harder to value with this approach because no federal target has been set. Tree planting in Guatemala and similar approaches are being used to determine the carbon dioxide number.

Generally, economists are in agreement that a better approach than abatement cost is to use the marginal damage cost. Economists have produced estimates of how to value the costs that air pollution causes through poorer health, greater health-care cost, reduced worker productivity, property damage (e.g., acid damage to buildings) and agricultural and forestry losses. But these estimates are inherently imprecise and subject to dispute. Thus, it has been politically easier to use control costs.

The numbers in Table 1 could have substantial impact. For instance in Massachusetts, an existing coal plant could face an adder of four to five cents per kilowatt-hour if the adders, which are currently only applied to new resources, were ever applied to existing resources. Even though these numbers are not charged directly to the ratepayers, they can have a substantial effect upon the choice among resources.

The next approach is a multi-attribute analysis that ranks and weights different pollutants. This is a hybrid between a qualitative approach and an adder approach. In Massachusetts, for instance, the New England Electric System (NEES) proposed a weighting and ranking scheme. Using a 100-point scale, NEES would weight the various externalities. For example, global warming might be assigned nine percent of the weight. Next, based on the weight, NEES would set a point value for various emissions levels. A certain amount of carbon dioxide emission might be assigned four points. A lower level might get one point. NEES would go through a number of resources and multiply these ranks times the weight and arrive at a discrete ordering for an entire portfolio of different resources. Next, NEES proposed to compute a dollar value by assuming that the worst plant has a 15 percent cost penalty compared to the direct cost.

Under this type of approach, diverse resources can be compared and ranked using the best technical information available. Once established, the approach is fairly easy to apply (except perhaps for energy conservation programs). But the approach may be viewed as arbitrary, because it does not directly monetize environmental externalities. For instance, NEES developed weights and ranks by interviewing everybody within the company and by polling a few experts. But it was not a cohesive political process that involved the ratepayer groups and various state agencies. It is very important how one derives such numbers.

Criticism of approaches

Several broad criticisms can be made of these four approaches. First, they have been applied only to new resources. Yet, the older plants are much dirtier than the newer plants, because the newer plants meet stricter environmental standards. If we want to decrease environmental damages, then we should not ignore these existing systems. This includes decisions about repowering, early retirement, and dispatch of the system. But there are a lot of political reasons why it is difficult to tamper with the existing system.

The second criticism of the four approaches is that they only apply to the electric utility sector. There may be cheaper pollution reduction in other sectors. There may be some anti-competitive or even some counterproductive effects when we focus only on electric utilities.

The third criticism involves "offsets." Offsets allow resource developers and utilities to include in their calculations the beneficial effects of any reduction of pollution from other sources. In both Wisconsin and Massachusetts, a provision allows utilities to offset some of the pollutants from new plants with reductions in other places. The advantages are obvious. Offsets can be used separately, or in conjunction with other strategies that cut across sectors, to reduce the cost of pollution reduction. The caution about offsets is that they must be real, permanent, and incremental. They must also be verifiable and enforceable. There is great interest in offsets, but there needs to be careful thinking on how to guarantee these reductions.

We also need to consider how the adoption of a pre-determined set of emission targets over time can impact alternative externality approaches. The Clean Air Act Amendments, for instance, set such an emission timetable for SO_x on a national basis. Reduction targets create a clear public policy. This approach provides flexibility for utilities to plan to achieve reductions at the lowest cost. It may also happen that a reduction target for one pollutant (e.g., CO_2) will cause other pollutants (e.g., SO_x and NO_x) to fall. If we reduce carbon dioxide, we also reduce SO_x and NO_x However, by reducing SO_x you do not necessarily reduce carbon dioxide. An alternative approach to considering externalities in utility planning is pollution taxes. For instance, we could tax carbon content at a state or federal level. A tax can be designed to generate general revenue, or revenue for an environmental trust fund. It can also be revenue-neutral (e.g., to replace a state utilities or gross receipts taxes). Such taxes directly price the externalities and thus provide incentives to reduce pollution efficiently. They also cut across industries. Disadvantages arise if the tax is only focused on one or two pollutants. Finally, if the taxes are set too low, we will not internalize the externality sufficiently to decrease pollution.

A final option is to target cleaner resources. Maine has been a leader in developing renewable resources for electricity. It is possible to directly promote energy conservation and renewable technology without going to a more complicated adder approach. Strategies targeted at renewable energy technologies or energy conservation can create specific targets that might exceed what a least-cost energy plan (with or without externalities) might dictate. Green pricing is another option that has recently been suggested. Customers get more renewables than least-cost energy plans alone dictate by agreeing to pay a slightly higher rate. We might actually observe what people are willing to pay to obtain more renewable resources. This targeting, in my opinion, may work best as a supplement to one or more of the other approaches.

In thinking about externalities, there are many "boundary" questions. What pollutants are included? Does the process apply just to new resources or also to existing resources? Does it apply to the electric utility sector or is it more all encompassing? Should non-air polluting externalities be included? How do you compare a coal plant with, for example, Hydro Quebec or an existing nuclear plant? Finally, should you look at externalities from the entire fuel cycle, extraction to disposal, or only at what comes out of the smoke stacks?

In conclusion, I want to emphasize that there is not one right approach to answering the externality question. Nonetheless, state lawmakers and regulators need to move to internalize externalities somehow, or they are implicitly favoring relatively dirty resources. This will probably cost society more in the long run. And utilities and ratepayers may face higher electricity and gas bills anyway, if utilities fail to properly anticipate future regulation.

Jonathan Raab is currently an independent energy consultant. His chief clients are the Vermont Public Service Board and the Rhode Island Utilities Commission. He has been mediating an environmental externality rulemaking for the Vermont PSB since September 1992. Dr. Raab holds a doctorate in Resource Economics and Energy and Environmental Policy from Massachusetts Institute of Technology.

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