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before the
Department of Environmental Regulation
on Behalf of
Legal Environmental Assistance Foundation Incorporated,
December 16, 1992

1. Introduction

Currently, Florida's electrical power plant approval process overlooks two important elements of utility planning: the environmental externalities of the plant under consideration -- and of its alternatives--, and the level of effort made by the applicant utility to meet its customers' needs for energy services through demand-side management (DSM) first, before seeking to build a new plant.[1] Section 403.519, Florida Statutes, has not been interpreted by the Public Service Commission to require applicant utilities to maximize efficiency savings prior to seeking approval of new power plants. Furthermore, the Siting Act does not specify how environmental and health values are to be balanced with the Public Service Commission's need determination.

This written summary provides background information on externalities and DSM. The summary itself is relatively brief. Appendices A and B contain more extensive discussions of externalities and of DSM, respectively.

2. Externalities

a. Overview

This section begins with a definition of externalities, followed by an explanation of the rationale for including externalities in utility planning. It then lists several ways in which utility planners can account for externalities. The section ends with an overview of the externality

[1] Customers are not interested in purchasing kWh from a utility, they are interested in purchasing the services that those kWh can provide: light, heat, a cold drink, and so on. Through DSM programs, a utility can provide its customers with the same level of energy service, for fewer kWh.

values used in other jurisdictions. The text in this section provides but a brief introduction to externality valuation. Appendix A contains a more thorough discussion of the topic.

b. Definition of externalities

Externalities are usually defined as uncompensated costs or benefits of an action that are borne by a party other than the person causing the costs. Classic examples of externalities of power plant operation include air pollution and water consumption. Running the plant imposes costs (dirty air, water shortages) on a large number of people. These costs would not normally be paid by the utility, or included in its computations of the costs of power from various sources. Nor would the external costs be included in the prices charged to the utility's customers.

Environmental externalities include costs imposed on human health, the quality of life, and the health of other species and ecosystems. Some effects are easily measured, but many are difficult to model and forecast. Some effects are relatively easily valued, such as health care costs and economic damages to crops, forests, fisheries and materials. Other effects are difficult to value, such as pain and suffering, visibility reduction, and ecosystem effects of air or water pollution. Social and economic externalities potentially include such effects as changes in employment, balance of trade, national security, and depletion of finite resources; again, both measurement and valuation can be complicated and inherently difficult.

The most important characteristic of externalities is that they are not normally included in decision-making, either by the utility or by the customers. The utility's evaluation of the cost-effectiveness of building or operating the plant would normally include only the direct costs, those costs paid directly by the utility and then repaid by utility customers for the service they receive. Similarly, if customers do not pay the costs they impose on others, their decisions to use or conserve electricity are not likely to reflect those costs.

c. Rationale for including externalities in utility planning

Historically, most utilities, including those in Florida, have not been willing to change any decisions based on external costs. Ignoring externalities in utility resource decisions implicitly values the environmental benefits of cleaner resources at zero. Clearly, this is wrong; all else being equal, society will always prefer a cleaner resource over a more polluting one, and good decision-making should maximize public health, safety, and welfare.

Valuation allows externalities to be taken into account explicitly in utilities' resource selection process. Through externality valuation, planners and regulators assign a value to the external costs of a resource. By adding this value to a resource's direct costs, they can compare resource options on a societal cost basis, and thus select the resource with the lowest net societal costs. Several options are available for dealing with externalities, but they all involve explicit or implicit valuation.

d. Methods for valuing externalities

i. Qualitative methods

Qualitative methods for valuing externalities encompass any method that purports to incorporate externalities without explicitly estimating the value of environmental benefits. Two methods that fall under this category are percentage adders, and rating and weighting of environmental factors.

By applying percentage adders to resource costs, planners can favor DSM and other resources which cause relatively little environmental harm. A drawback of this method is that there is no direct relationship between a resource's direct cost and its externalities. Therefore, the result of the adder is somewhat arbitrary.

The second method assigns a non-price score to environmental effects by rating and weighting the externalities of resource options. This method's most important shortcomings are that it is subjective, and that because it is subjective, its results cannot be consistently reproduced from one utility or jurisdiction to the next.

Qualitative treatment of externalities tends to mask the treatment of environmental effects, undervalue environmental benefits, overvalue known economic benefits of existing resources, and discriminate against new and clean resources.

ii. Quantitative methods

State utility commission generally must choose between two prevalent methods for valuing externalities, damage costing and regulatory cost of control (also known as implied valuation). Unlike qualitative methods, quantitative methods can easily be applied to proposed new plants or can be applied to the dispatch of a utility's entire system.

Damage costing is an extremely complex and time-consuming task that requires assessing the damage caused by pollutants, and evaluating the cost of that damage. Because of the level of environmental science involved, this method is best suited for environmental regulators and planners, rather than for utility regulators and planners.

As its name suggests, the regulatory cost of control method relies on the cost of required controls, using the cost of the marginal, or most expensive, control for a particular pollutant to imply its externality value. This method relies on environmental regulators to either perform damage costing (perhaps informally and judgementally) or determine the marginal cost of meeting regional emissions caps or ambient air quality standards. Because this method is relatively straightforward to apply, it has been adopted by four U.S. utility commissions.

For the DER, these two methods collapse to a single approach. Unlike utility commissions, the DER has the resources to evaluate the damage caused by pollutants and determine the measures required to meet emission caps, and has the authority to require emission controls. The DER can simply review the incremental costs of the control measures it requires for each pollutant; the highest of these incremental costs of control represents the marginal cost of control, and DER's estimate of either the marginal damage cost or the cost of meeting a Federal standard. The price DER is willing to have Florida pay to avoid emissions is also a measure of the cost of the residual emissions from a new plant, after all required controls. These externality costs can be applied to both the proposed project and the alternatives.

e. Summary of other jurisdiction's externality valuation

Table 1 summarizes the values that other jurisdictions have assigned to the better known externalities of energy generation. Several other jurisdictions are in the process of determining externality values. These jurisdictions include (as of October 1992) Arizona, Georgia, Illinois, Oregon, South Carolina, and Washington.

3. Demand-Side Management

a. Overview

An electric or gas utility's mandate is to meet its customers' need for energy services, reliably, and at lowest cost. Traditionally, utilities have met their customers' needs through supply-side means --that is, as load has grown, utilities have built new plants to meet their higher demand. Over the past few years, however, utilities have learned that it is often cheaper to meet customers' needs through demand-side means -- using energy efficiency, conservation, and load management to reduce the growth in energy requirements and in peak demand.[2]

Although Florida's utilities have been effectively pursuing load management, their efforts in energy efficiency and conservation have been weak. This is partially a result of the regulatory link between revenues and kWh sales.

The text in this document serves as a brief overview of energy efficiency and conservation issues in Florida. The material in Appendix B contains more substantive discussions of the issues.

b. DSM: A vast, valuable resource for utilities

Most energy efficiency and conservation measures can be installed for 4¢/kWh to 6¢/kWh. They have significant benefits: they save energy and peak demand, reduce transmission and distribution expenses, and decrease emissions.

Florida has a very large and mostly untapped conservation "resource." A July 1991 report by Howard Geller and Steven Nadel of the American Council for an Energy- Efficient Economy projected that by the year 2000, Florida utilities could secure savings of 14,305 GWh and 3,058 MW.

c. Poor DSM performance of Florida's Investor-Owned Utilities

Unlike their load management efforts, the energy efficiency and conservation efforts of Florida's largest investor-owned utilities (IOUs) has been inadequate, hampered in part by the regulatory link between revenues and kWh sales. The IOUs are barely scratching the surface of their service territory's conservation potential.

For example, FP&L, Florida's largest and the country's 5th largest electric utility could increase its total peak-demand savings from conservation to 1,026 MW by 1999, for an increase of 604 MW over the 422 MW of conservation savings the Company projects in the load forecast associated with its recent petition for certificate of need. FPL's intensified acquisition of

[2]Energy efficiency measures, such as a higher efficiency air conditioner, rely on engineering improvements to reduce the amount of energy drawn by equipment or appliances. Energy conservation measures, such as improved insulation, reduce the need for the level of service provided by equipment or appliances. Load management, such as water heater timers, generally shifts load from on-peak hours to off-peak hours. As they merely <u>shift</u> load, and do not actually <u>reduce</u> load, load management programs do not save energy. In some cases (e.g., thermal storage) they can actually increase a utility's energy requirements.

demand-side resources could produce even larger increases in energy savings from conservation. By 1999, FPL's conservation programs could generate energy savings of 5,086 GWh/yr, more than a 5-fold increase over the level contained in its forecast.

By 1996, TECo, another large IOU, could increase its total peak demand savings by 96 MW through aggressive implementation of DSM programs. The associated energy savings would be on the order of 700 GWh/year, more than a three-fold increase over the energy savings TECo projected in 1991.

d. Problems with current DSM practice in Florida

i. Sanctioned use of the RIM test

There are several economic perspectives a utility can use to determine the cost-effectiveness of DSM. Florida utilities rely primarily on the Rate Impact Measure test (RIM, also known as the no-losers test) instead of the more appropriate test, the total resource cost test, or TRC. They use the RIM to pre-screen individual programs. Thus many worthwhile energy efficiency and conservation programs are removed from consideration early on in the planning process.

The TRC measures cost-effectiveness from a societal perspective. In the TRC, costs include outlays for energy-efficiency measures themselves, plus utility program delivery costs. Benefits include the avoided costs of utility supply, plus any non-electric savings (such as natural gas, water, labor, etc.). A DSM measure or program satisfies the total resource test if its benefits exceed its costs. A cost-effective measure will lower the total costs of providing electric service.

The RIM test adds another dimension to the comparison: the revenue shifts caused by the sales reductions from energy conservation. Revenue shifts involve a loss to one group of customers, but a gain to another. The RIM effectively adds the losses to the costs of DSM (subtracts them from its benefits), but does not account for the gain.[3] DSM that passes the total resource cost test will usually appear less attractive under the RIM test. Depending on the relationship between avoided costs and retail rates, the RIM test can completely rule out DSM, no matter how little its acquisition costs.

[3] If this same principle were applied to rate design, rates would never be changed, because a rate change creates gains for one group of customers but losses to another.

Although many jurisdictions have rejected the RIM test because of its inherent bias against DSM, the Florida PSC currently sanctions the use of the RIM test. This has significantly decreased the amount of conservation Florida utilities have implemented.

ii. Ineffective DSM program design

Florida utilities are several years behind their California and New England counterparts in their ability to design and implement effective DSM program portfolios. Florida's utilities have not yet learned certain fundamental principles of DSM program design. Trying to capture high levels of savings through their programs is like trying to haul water with a sieve -- some water does come out of the well, but most is left behind, and it ends up costing a lot more to extract the water you need.

Florida's utilities generally do not comprehensively identify or implement energy-efficiency resources. Their DSM portfolio omits DSM market segments, end-uses, and measures that are significant sources of cost-effective savings.

The most important of these are opportunities that arise during the construction of a residential or a commercial building. These are low-cost, long-lived savings that are far more costly -- or even impossible -- to obtain later as retrofits. The IOUs are either ignoring these opportunities, or only addressing them through weak programs.

The Florida utilities' DSM program designs are generally too weak to overcome the pervasive market barriers that obstruct customer investment in cost-effective efficiency measures. Incentives are not high enough to maximize participation. Program delivery methods will not break down the pervasive market barriers that discourage customers from investing in conservation resources.

Finally, Florida utilities tend to have piecemeal, rather than comprehensive, DSM program portfolios. The piecemeal nature of their DSM efforts will unnecessarily raise costs and reduce savings achieved from demand-side resources. Florida's utilities need a systematic approach to designing and implementing energy efficiency and conservation programs.

Table 1 : Summary of Externality Values (1989$ per ton unless otherwise noted) Dec-92
Part 2: California Energy Commission's in-state values

Externality	South Coast [1]	Bay Area [2]	San Diego [3]	San Joaquim Valley [4]	Sacramento Valley [5]	North Coast [6]	North Central Coast [7]	South Central Coast [8]	Southeast Desert [9]
SO2	7,425	3,482	2,676	1,500	1,500	1,500	1,500	1,500	1,500
NOx	14,483	7,345	5,559	6,473	6,089	791	1,959	1,647	439
VOC/ROG	406	90	98	3,711	4,129	467	803	286	157
PM10/TSP	47,620	24,398	14,228	3,762	2,178	551	2,867	4,108	715
CO	3	1	1	0	0	0	0	0	0
CO2	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
CH4									
N2O									
water use (c/kWh)									
land use (c/kWh)									

Source:California Energy Commission Electricity Report, November 1992, Table 4-1.
[1]:Includes Ventura County.
Note: a blank space indicates that a value for that externality was not estimated.

Table 1 : Summary of Externality Values, Part 1 of 2 (1989$/Ton unless otherwise noted)

Dec-92

Externality	Calif. PUC SCE&SDGE [1]	Calif. PUC PG&E [2]	Calif. ER-92 out-state Northwest [3]	Calif. ER-92 out-state Southwest [4]	Mass. DPU [5]	Nevada PSC [6]	New York PSC [7]	New York SEO [8]	BPA West [9]	BPA East [10]	Wisc. PSC [11]	Pace Univ. [12]
SO2	20,253	4,483	1,500	1,500	1,500	1,560	832	858	1,500	1,500		4,060
NOx	27,114	1,956	730	760	6,500	6,800	1,832	4,204	884	69		1,640
VOC/ROG	19,367	3,652	0	5	5,300	1,180						
PM10/TSP	5,866	2,634	1,280	1,280	4,000	4,180	333		1,540	167		2,380
CO					870	920						
CO2	7.6	7.6	7.6	7.6	22	22	1	74			14	13.6
CH4					220	220					137	
N2O					3,960	4,140					2,472	
water use (c/kWh)						site-spec.	0.1					
land use (c/kWh)						site-spec.	0.4		0-0.2	0-0.2		

Notes: See Part 2 of Table for California Energy Commission in-state values.

Blank space indicates that a value for that externality was not estimated.

[1],[2],[3]: California Energy Commission, "In-state Criteria Pollutant Emission Reduction Values," Testimony of Buell, Diamond, Magalletti and Tanton, Table 2, November 19, 1991.

[3],[4]: California Energy Commission Electricity Report, November 1992, Table 4-2.

[5]: Massachusetts DPU Decision in Docket 89-239. August 31, 1990.

[6]: Nevada PSC Docket No. 89-752. January 22, 1991. Values expressed in 1990$. NOx and VOC values are for ozone non-attainment areas. NOx value for non-attainment area would be higher, and VOC value would be $5,500/ton.

[7]: 1991 Biennial Update of the New York State Draft Energy Plan, Issues Report, July 1991. Values expressed in $1990.

[8]: NYPSC, "Consideration of Environmental Externalities in New York State Utilities Bidding Programs," 1989. Values are: 0.25 c/kWh for SO2, 0.55 c/kWh for NOx, 0.1 c/kWh for CO2, 0.005 for TSP, 0.1 c/kWh for water discharge, and 0.4 c/kWh for land use impacts for a total of 1.405 c/kWh total for a NSPS coal plant. Values are translated to $/ton by Sury Putta, "Weighing Externalities in New York State," The Electricity Journal, July 1990.

[9],[10]: 1990$. Bonneville Power Administration, "Application of Environmental Cost Adjustments During Resource Cost Effectiveness Determinations," May 15, 1991. "Land and other" values vary from 0 for DSM to 0.2 c/kWh for coal and new hydro. SO2 value is zero if offsets are purchased.

[11]: Wisconsin Public Service Commission, Docket No. 05-EP-6, Sept. 15th 1992. original values in 1992$: CO2 $15/Ton; CH4 $150/Ton; N2O $2700/Ton.

[12]: Ottinger et al., "Environmental Costs of Electricity," Pace University, 1990.

Appendix A: Additional Material on Externalities

Ontario Hydro Vols 1 + 2 of [illegible], report

Appendix B: Additional Material on the Status of Utility DSM Efforts in Florida

Time of Inclusion of FPL + TECO [illegible]