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Least Cost Electricity for Texas

Karl R. Rábago
Elisabeth Haub School of Law at Pace University, krabago@law.pace.edu

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by
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I. Global Climatic Change

The effects of consuming fossil fuels have disproportionately elevated human importance by the collective impact made on the world environment. Even the most buoyant optimist can be depressed by adding the global climactic changes of the greenhouse effect to a list that already includes air pollution, water pollution, soil contamination, health effects, balance of trade deficits, declining technological competitiveness, and vanishing natural resources. In Texas the primary source of electricity, and a major source of environmental problems, is the combustion of fossil fuels. This article introduces the reader to some of the environmental, economic, and regulatory challenges involved in responding to the greenhouse effect through regulation of electric utilities.

II. The Greenhouse Facts

Human activity is putting more greenhouse gases -- carbon dioxide (CO_2), methane (CH_4), chlorinated fluorocarbons (CFCs), and nitrous oxides (NO_x), -- into the atmosphere than at any time in our history.[1] Carbon dioxide emissions make up about 50% of the total greenhouse emissions, with the electric power industry and the use of motor vehicles each accounting for about a third of carbon dioxide emissions. The ambient level of carbon dioxide has grown substantially in the last few decades.[2] For 160,000 years before the Industrial Revolution, the amount of CO_2 in the atmosphere was between 190 and 290 parts per million (ppm). By 1959, the level reached 316 ppm. In 1988, the concentration was recorded at 350 ppm. And the level is still rising. In all, the level of carbon dioxide has risen about 25% over the last 100 years, and at the same time, an average temperature increase of 1° F.[3] Current opinion is divided over the relationship between these two phenomenon.[4]

Texas combustion of fossil fuels resulted in total CO_2 emissions in 1988 of about 575 million tons. If Texas were a nation, it would be the seventh largest CO_2 emitter in the world. Based on CO_2 output in 1988, Texas ranks twelfth per capita, seventh per dollar of industrial output, and first in total emissions in the nation. From Texas' electric utilities, carbon dioxide emissions rose by 11.3% between 1983 and 1988 to 167 million tons and are still rising.[5]

III. Other Fossil Fuel Problems

Carbon dioxide is not the only problem associated with the unabated consumption of fossil fuels. Sulphur dioxide (SO_2) and nitrous oxide compounds (NO_x) aid in the formation of acid rain, which in turn contributes to the formation of ground level ozone, the "bad" ozone smog. Additionally, coal burning emits particulate matter into the atmosphere. Fossil fuel consumption causes adverse land and water effects, and the exploration and production of coal, oil, and gas disturbs landscapes and ecosystems. Coal-pile rainwater runoff, gas leaks, and petroleum spills are continuing problems despite all efforts. Ash disposal and mine reclamation related to coal and lignite consumption produce ground water contamination and other effects that may last for decades.

IV. Inefficiencies and Ecology

The problems caused by greenhouse gases and fossil fuel consumption are evidence of inefficiencies in our society. Garrett Hardin's famous essay *The Tragedy of the Commons*, introduced the problem many years ago.[6] Drive a car that gets 10 mpg instead of one that gets 20 mpg, and your inefficiency burdens you, in the form of higher gas expenses, and also society at large, by producing more pollution. Lower the thermostat from 75° to 65° in the summer, and you pay the power company more. You also dump more pollutants into the atmosphere. Light your living room or office with a 75-watt incandescent bulb instead of a 18-watt high efficiency fluorescent, and the charges on your electric bill, and to the atmosphere, are higher than they need to be. Virtually everyone contributes to global climactic change, and to environmental problems in general, through the consumption of electricity. The question, then, is how to create the electricity we need to run everything from air conditioners to industry while minimizing adverse environmental consequences.

In simplifying the rules of ecology, Barry Commoner explained that everything has to go somewhere and that there is no such thing as a free lunch.[7] Applying these principle to electric service, we can derive some axioms: If we had to pay what energy *inefficiencies* really cost, it would be much more expensive. If energy *efficiency* is desirable, we must be prepared to pay for it. To make intelligent decisions about our choices, we need to compare things on a level playing field.

V. The Texas Regulatory Framework

Investor-owned electric utility companies are basically monopolies. With the exception of a few large industrial customers who can afford to supply their own power, electric companies are the exclusive providers of electricity to customers in their designated service territories. The State allows this monopoly situation because the alternative would be chaos.[8] The State requires a utility to provide reliable electric service for the right to exist as a monopoly, and, in return, allows the electric company to earn a reasonable rate of return on their investments in plants, transmission lines, and other facilities. This arrangement is termed the "regulatory compact." In Texas, the compact is supervised by the Public Utility Commission of Texas (PUCT) under the Texas Public Utility Regulatory Act (PURA)[9] and the substantive administrative rules[10] that the PUCT has adopted. From this arrangement, two main problems begin to surface.

The first problem is that the PUCT has not aggressively used the legal tools at its disposal. Generally, the PURA provides the tool that the PUCT could use to perform "Least-Cost Planning." Least-Cost Planning attempts to provide the least expensive yet most environmentally sound electricity possible without compromising either the utility companies' requirements for revenue or the public's need for reliable electricity. Most significantly, Least-Cost Planning shifts the traditional emphasis from supply-side management as a way to provide electric service to management of the demand-side as well. In essence, Least-Cost Planning is pro-active rather than reactive. In some states, this planning has led to the institution of bidding schemes

in which utilities solicit both supply and demand sources for the least-cost source way to meet electric demand. When the current version of the PURA was adopted in 1983, Texas emerged as a leader in adopting a statutory Least-Cost Planning program. Today, however, the PUCT practice is "least-cost" in name alone.[11]

The second problem with Texas' regulatory scheme is the rate making formula and the way it works.[12] Electric rates are the product of dividing the utility's revenue requirements by forecasted electricity sales. Revenue requirements are defined as invested capital times a rate of return (a percentage intended to represent the utility's cost of capital including reasonable profit), plus approved expenses incurred in providing electric service. These definitions are critical in electric rate cases heard and decided at the PUCT. These costly, protracted proceedings attempt to determine the accuracy of the utility's forecasts of sales, the legitimacy of its expenses, and the prudence of its investments.

In the end, the utility is awarded an appropriate rate of return (to enable the company to compete for financing) and the rates (a price per kilowatt hour of electricity) are set. Utilities then rush to sell more electricity to customers than forecasted because every kilowatt hour sold over the forecasted amount generates virtually pure profit as it is not needed to satisfy revenue requirements. Utilities also try to build electric generating plants because investments in power plants are the kind of capital investments that earn the utility a rate of return. Of course, plant investments are justified by the increasing electricity sales. Additionally, tax incentives and allowances make fossil fuel artificially cheaper than clean technologies. Thus, Texas' regulatory framework encourages global warming, environmental degradation, and unwarranted increased consumption of energy.

VI. The Supply Side: Choosing Environmentally Sound Generation

The solutions to society's fossil fuel addiction lie in clean, renewable energy sources and aggressive pursuit of conservation and efficiency. Despite a huge potential for each, Texas is the biggest energy hog in the nation.[13] Although the utility companies should do more, and the PUCT should require more, the lack of effort in Texas is defined by economic realities.

Environmentally sound renewables (wind, passive solar, photovoltaic, biomass) appear at first to be more expensive than many fossil technologies. As a result, electric rates appear lower with a regulatory preference for less expensive fossil fuel. But consumers directly pay only for extraction, delivery, disposal, and regulatory compliance. The cash price and utility decisions do not, in Texas, reflect the real costs in terms of environmental, social and health costs. Several studies have quantified externality costs,[14] and several states mandate consideration of these costs in utility planning.[15] When these costs are factored, clean technologies become competitive with fossil fuels and may even change fuel choices.[16]

Even a rough estimation of externality costs and benefits can be encouraging. Natural gas is a more efficient fuel than coal and, therefore, more environmentally friendly. In addition, production of Texas' own natural gas creates benefits in terms of severance taxes and jobs that make it the fuel of choice for electricity generation in our state. Conservation and efficiency—doing the same work with less electricity—are virtually free of externality costs and have real costs that make them competitive with supply-side options. These conclusions have been corroborated in a ground-breaking study conducted by the Pace University Center for Environmental Studies.[17] Aggressive pursuit of alternative energy sources, including conservation and efficiency improvements, will create a demand for cost and technological improvement that could help the United States regain its leadership posture in the world and create new jobs in Texas—all externality benefits.

To build a new power plant, a utility in Texas must first obtain a Certificate of Convenience and Necessity ("CCN") from the PUCT.[18] To apply for a CCN, the utility must first file a notice of intent to file an application for certification.[19] The PUCT's new Notice of Intent Rule ("NOI Rule") requires consideration of externalities when a utility proposes to build generating plants.[20] In the first major case under the NOI Rule, a Texas utility has argued that compliance with the Rule is impossible.[21] The PUCT's ultimate decision will test the validity of this argument and, more importantly, whether the Commission will act "to protect the public interest inherent in the rates and services of public utilities,"[22] as required by PURA.

Utility representatives often argue that the environmental costs of electricity are equal only to the cost of complying with laws and regulation. But, the cost of legal compliance does not include externalities. Basically, the utilities argue that if a ton of SO_2 has a permit attached to it (making it a residual emission), then that SO_2 cannot hurt anyone. Since CO_2 is not yet regulated by the federal or Texas governments, the argument continues that CO_2 emissions do not have any environmental cost at all. Even if carbon taxes are adopted to encourage reductions in CO_2 emissions, compliance costs are still only the cost to comply with extant law, and may not reflect damage costs. What planners and regulators must also consider are the damage costs associated with residual emissions. When damage costs are unavailable, carefully determined control costs may serve as a reasonable proxy.[23]

VII. The Demand Side: Choosing Conservation and Efficiency

Conservation is economically disfavored under the current Texas regulatory scheme and the traditional rate making formula. Monies spent on conservation programs are, at best, merely operating expenses and never get multiplied by the rate of return percentage. Even when costs are passed to electric customers as expenses, the utilities realize that generating plants earn more revenue than conservation and efficiency programs. This relationship is also the reason many so-called "efficiency" programs run by Texas utilities do nothing more than sell electricity. Incentives to replace efficient gas heaters with electric heat pumps are a classic example. "Mr. Redi-Kilowatt" now lives in the "Good Cents Home."

Conservation reduces the number of kilowatt hours a power company sells. This result of conservation means that the utility has to obtain its revenue requirement from fewer kilowatt hours sold, and consequently, rates could go up. Likewise, if conservation programs are not made available to the broadest possible range of participant customers or are poorly designed, they may increase rates. Also, non-participant conservation to keep bills low in the face of rising rates creates a free-rider effect for utilities that can jeopardize the company's bottom line.[24] To prevent these effects, while justifying a lack of real conservation effort, some Texas utilities pre-screen conservation programs under a "no-losers" test. No matter how much participants in the conservation program save, if non-participant ratepayers realize rate increases, the test labels non-participants as losers. If the program produces any losers, it is not adopted. Erroneous assumptions underlying this test are the reason some call it the "hardly any winners" test. First, the whole "no losers" idea assumes that everyone cares what they pay per kilowatt hour for electricity, but what customers really care about are *bills*—rates times usage. Even if rates go up, bills can still shrink as long as usage is reduced. Second, conservation does not produce losers—all citizens benefit from the reduced pollution that comes from reductions in electricity consumption. Last, utility companies are able to give virtually every customer an opportunity to participate in conservation programs. (They prove their skill at reaching all consumers when they try to sell more electricity.) Utilities must seek to involve all customers in effective conservation programs and not waste resources on justifying a lack of program effort.

Virtually all utility excuses for why conservation and efficiency programs should not be adopted are designed to obscure one basic truth—for utility companies, conservation does not pay. Therefore, regulatory initiative to overcome economic biases and create incentives for desirable utility behavior is crucial. The PUCT must demonstrate a commitment to a cleaner environment, lower total cost for electric service, and a desire to avoid costly investments in large generating plants.

Again, current Texas law allows these results, but the PUCT has demonstrated little leadership. Substantive rules allow incentive awards to utilities for implementing conservation programs,[25] but utilities cannot be certain as to when an award will be granted, how much the award will be, or which specific programs will merit award. Economically rational incentive programs, some designed by utilities themselves, are in place in several states and are producing results. In the Northeast, some utility companies are giving high efficiency light bulbs to residential and commercial customers. In California, one utility provides a $10 rebate for bulbs a customer buys.

High efficiency light bulbs are an example worth examining in a little more detail because the benefits associated with an efficient lighting program can be dramatic.[26] If one 75-watt incandescent bulb is replaced with one 18-watt high efficiency compact fluorescent, the savings in energy amount to 570 kilowatt hours over the life of the bulb. The high efficiency bulb costs about $15.00, compared to about $1.50 for the incandescent, but lasts about 10 times as long. The energy savings produce environmental savings. If the electricity for the old bulb would have come from a coal plant, about a ton of CO_2 and about 8 kilograms of SO_2 are avoided, as well as NO_X, heavy metals, and other pollutants. If the electricity would have come from a nuclear plant, the high efficiency bulb saves about 1/2 curie of strontium-90 and cesium-137, both high level radioactive wastes, and about 25 mg of plutonium. That much plutonium is equivalent to almost a half ton of TNT, and, if evenly distributed in human lungs, equals about 2,000 cancer-causing doses. Additional economic savings are available as well. The high efficiency bulb avoids about $20.00 in replacement bulb costs plus installation and labor for those bulbs, about $20.00 in utility fuel, and some $200-300 in deferred generating plant capacity required at the utility company. In all, efficiency is not just good for the environment, it makes sense for the economy, too.

VIII. The Sunset Opportunity

Fortunately for Texas, an opportunity will soon be available to address the legal and regulatory problems. The PUCT is about to undergo its second Sunset review, and the PURA is set to expire in September 1993.[27] The necessary changes are relatively minor and, more importantly, politically palatable. In the consideration of proposals to build new generating plants, the PUCT need only hold utilities to the plain language of its current Notice of Intent Rule. To resolve doubt, the Rule should be revised to clearly state that a utility must quantify (*i.e.* monetize) the externality costs and benefits of all supply-side and demand-side

alternatives that can meet demand, including conservation and efficiency programs. Optimally, the PUCT would adopt a set of default externality values by rule, but utilities should be free to proffer more accurate quantifications. Then the PUCT could truly ensure the least costly electric service possible.

The most important changes would have to be made in the way utilities consider, and are rewarded for, conservation. The PURA should be changed to require a "total societal costs and benefits" test instead of the "no-losers" test. This change would preclude premature exclusion of conservation and efficiency programs from utility consideration. In addition, and most importantly, the PURA should mandate that "a kilowatt hour saved is at least as profitable to the utility as a kilowatt hour sold."[28] Under such a regime, utilities could put conservation in their rate base and earn a return on their conservation investments. Details could be worked out in substantive rules, but it is clear that utilities will not pursue conservation until they see a business advantage in doing so.[29]

IX. Conclusion

As with many environmental issues, those arising from the production and consumption of electricity are susceptible to a disabling polarity of interest. Wise, economically informed law and regulation, however, offers a true potential for "win-win" solutions. With electricity conservation and efficiency, doing the right thing can and should be made the most profitable choice—profitable for ratepayers, for utilities, for Texas, and for the environment. If the scientists are right about global climatic change, and we must assume that they are, the future of our planet lies in the balance.

Mr. Rábago is an Associate Professor of Law, University of Houston Law Center; B.B.A. (Management), Texas A&M University, 1977; J.D. with honors, University of Texas at Austin, 1984; LL.M. (Military Law), The United States Army Judge Advocate General's School, 1988; LL.M. (Environmental Law), Pace University School of Law, 1990. Professor Rábago teaches environmental and criminal law and lives with his wife and three children in Friendswood.

Table 1

THE AMAZING ONE-NEGATON LAMP

(Conservation Everyone Can Practice at Home or Work)

THE SWITCH:

IN:	One 18-watt high efficiency fluorescent bulb, about $15.00.
OUT:	One 75-watt incandescent bulb, about $1.50.
HOW LONG?:	The efficient bulb lasts 10 times as long.
ENERGY SAVED:	570 kilowatt hours, over the life of the bulb.
MONEY SAVED:	$35.00 (at $0.07/kWh), over the life of the bulb.

ENVIRONMENTAL SAVINGS, DEPENDING ON THE SOURCE:

Coal plant - 1 ton of CO_2, 8 kilograms of SO_2, plus NO_X, heavy metals and other pollutants.

Nuclear plant - 1/2 curie of strontium-90 and cesium-137 (two major components of high-level waste), plus 25 mg of plutonium (equivalent to 0.4 tons of TNT, and if uniformly distributed in human lungs, about 2,000 cancer-causing doses).

ADDITIONAL ECONOMIC SAVINGS:

$20.00 - for the cost of a dozen ordinary bulbs, plus their installation and labor; *and*
$20.00 - for utility fuel; *and*
$200-$300 - for deferred generating plant capacity required at the electric company.

NOT QUITE A FREE LUNCH, BUT PRETTY CLOSE!

Source: Rocky Mountain Institute.

ENDNOTES

1 U.S. DEP'T. OF ENERGY, ATMOSPHERIC CARBON DIOXIDE AND THE GREENHOUSE EFFECT (May 1989).

2 *Id.* at 8.

3 *Id.* at 18.

4 Essentially, three positions can be taken regarding the relationship between greenhouse gases and climate change. First, some people see a direct cause and effect relationship, and therefore, counsel immediate action to reduce emissions. Second, some people, while not ready to recognize a relationship, are nonetheless unwilling to risk its verification by waiting for climate change to wreck havoc upon the planet. These people counsel "prudent avoidance." Third is the group that includes people like our President and most utility executives in Texas. They have taken essentially a "show me" approach.

5 TEXAS CITIZEN FUND, THE HEAT IS ON: TEXAS' CO_2 POLLUTERS (1990).

6 162 SCI. 1243 (1968). Commonly abstracted in environmental law or policy text, Hardin's essay describes the problems that arise when humans seek to exploit limited resources. He concludes that the only effective solution may be "mutual coercion mutually agreed upon."

7 BARRY COMMONER, THE CLOSING CIRCLE: NATURE, MAN AND TECHNOLOGY (1971).

8 Imagine a hundred electric companies erecting transmission lines, building plants, and advertising "join us" deals. The assumption that chaos will result from competition, however, is falling into question as utility regulators explore the "unbundling" of electric services. *E.g.*, increased competition among energy service companies offering efficiency retrofits and competition among bulk power providers (like industry) would be beneficial to society.

9 TEX. REV. CIV. STAT. ANN. art. 1446c (Vernon Supp. 1991).

10 Tex. Pub. Util. Comm'n, 16 TEX. ADMIN. CODE ch. 23 (West June 25, 1991) (Substantive Rules).

11 *See* ELEC. POWER RESEARCH INST., STATUS OF LEAST-COST PLANNING IN THE UNITED STATES (EPRI EM-6133, Dec. 1988).

12 The following is a simplified version of the formula:
REVENUE REQUIREMENT = E + (C x R)
E is operating expenses (*e.g.*, labor, maintenance)
C is capital investment (*e.g.*, cost of utility plants)
R is rate of return (the cost of money plus profit)

Once a RATE (in $ per kilowatt hour) is set in a rate case, the utility charges that rate regardless of whether they sell more or less electricity than FORECAST SALES (in kilowatt hours). Utilities are also allowed to make direct charges to customers for fuel cost changes (called fuel cost adjustments).

13 A report by Public Citizen bestows this ignominious title upon Texas on the basis of categories such as energy derived from alternative sources, total and per capita energy consumption, and total and per capita petroleum consumption. JONATHAN BECKER, ENERGY AUDIT: A STATE-BY-STATE PROFILE OF ENERGY CONSERVATION AND ALTERNATIVES (1990) (report of the Public Citizen Critical Mass Energy Project).

14 Externality effects are broadly defined as the costs and benefits not internalized by the regulatory process and imposed directly upon the utility and its ratepayers. Externality costs are borne by society at large. A classic example is the acidification of lakes in Canada resulting from SO_2 and NO_x emissions in Ohio.

15 No fewer than twenty-seven states are currently studying externality costs and formulas to incorporate these costs in resource planning for the future. *See* KEY EXTERNALITIES ECONOMIST DEFENDS "DAMAGE COST" APPROACH, 1 ELECTRIC POWER ALERT T-10 (1991).

16 An issue of current debate centers on whether externality values should be derived from estimates of "damage" or "control" costs. Damage costs reflect the actual adverse effects of the pollutant not captured by regulatory control. These costs are very difficult to quantify reliably, but, in an ideal world, would be most appropriate source of values. Control costs use the cost of eliminating even permitted pollution as a proxy for the damage costs. Control costs are easier to determine but, unless carefully analyzed, carry a risk of undesirably altering resource allocation decisions. *See* Karen L. Palmer & Alan J. Krupnick, *Environmental Costing and Electric Utilities' Planning and*

Investment, RESOURCES, Fall 1991, at 1, 2. (Publication of Resources for the Future).

17 PACE UNIVERSITY CENTER FOR ENVIRONMENTAL LEGAL STUDIES, ENVIRONMENTAL COSTS OF ELECTRICITY (1990) (Richard A. Ottinger, et al., eds). *See also* Steven R. Sim, *How Environmental Costs Impact DSM*, 128 PUB. UTIL. FORTNIGHTLY 24 (July 1, 1991).

18 TEX. REV. CIV. STAT. ANN. art. 1446c, § 50 (Vernon Supp. 1991). Certificates may be granted "only if the [PUCT] finds that the certificate is necessary for the service, accommodation, convenience, or safety of the public." *Id.* § 54(b).

19 *Id.* § 54(d).

20 Tex. Pub. Util. Comm'n., 16 Tex. Reg. 2734 (1991) (prop. amend. to 16 TEX. ADMIN. CODE § 23.31(h). The rule requires that utilities assess, among other factors, the "operating and capital costs, cost of related facilities, environmental costs and benefits, and any cost and benefits accruing to persons other than the utility and its ratepayers (for example, environmental, social and health)." *Id.* at 2735 (prop. amend. to 16 TEX. ADMIN. CODE § 23.31(h)(4)(B)(ii)).

21 "Application of Texas Utilities Electric Company for Approval of Its Notice of Intent," Docket No. 10,400 (Pub. Util. Comm'n). The final order hearing for this docket is set for Jan. 22, 1992.

22 TEX. REV. CIV. STAT. ANN. art. 1446c, § 2 (Vernon Supp. 1991).

23 *See supra* note 15.

24 This result is not the usual free-rider effect, but arises when a utility adopts a conservation measure as a formal utility program. In Texas, most expenses related to such programs may be recovered in rates. A customer who conserves "outside" the utility program causes reduces electricity sales not "covered" by the expense adjustment.

25 Pub. Util. Comm'n, 16 TEX. ADMIN. CODE § 23.21 (West June 25, 1991) (Cost of Service).

26 The analysis is derived from materials provided by the Rocky Mountain Institute.

27 TEX. REV. CIV. STAT. ANN. art. 1446c, § 5a (Vernon Supp. 1991).

28 Similar language appears in the § 404(f)(2)(B)(iv) of the federal Clean Air Act as a prerequisite for earning conservation allowances under the new acid rain title. 42 U.S.C.A. § 7651c(f)(2)(B)(iv) (West Supp. 1991).

29 Additional changes include a streamlining of regulatory processes and the development of incentive mechanisms to encourage utility purchases of power generated as a byproduct of industrial operations. These more complex issues are beyond the scope of this article, but no less important items for regulatory reform.