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Judging the Prudence of Constructing Nuclear Power Plants: A Report to the Oklahoma Corporation Commission

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JUDGING THE PRUDENCE OF CONSTRUCTING NUCLEAR POWER PLANTS: A REPORT TO THE OKLAHOMA CORPORATION COMMISSION

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It is not too much to expect that our children will enjoy in their homes electrical power too cheap to meter, will know of great periodic regional famines in the world only as matters of history, will travel effortlessly over the seas and under them and through the air with a minimum of danger and at great speeds, and will experience a life span far longer than ours, as disease yields and man comes to understand what causes him to age. This is the forecast for an age of peace.

*Lewis Strauss***

I. INTRODUCTION

On November 9, 1978, Congress passed the National Energy Act of 1978, one part of which is the Public Utility Regulatory Policies Act (PURPA).[1] PURPA establishes six federal electric utility ratemaking standards[2] which are designed to promote lower electric generation

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** W. LAURENCE, MEN AND ATOMS 245 (1955).

1. Public Utility Regulatory Policies Act, Pub. L. No. 95-617, 92 Stat. 3117-73 (codified in scattered sections of 15, 16, 30, 42, 43 U.S.C.) (1978).

2. 16 U.S.C. § 2621(d) (codifying § 111(d) of the Public Utility Regulatory Policies Act).

(d) ESTABLISHMENT.—The following Federal standards are hereby established:

costs and economic efficiency by ensuring that electric utility rates accurately reflect the costs of providing electric utility services. PURPA requires that each state decide within three years of PURPA's enactment whether to adopt the six federal electric utility ratemaking standards.[3] In order to understand fully the issues it should consider in deciding whether to adopt PURPA's electric utility ratemaking standards, the Oklahoma Corporation Commission (the Commission) awarded a grant to this author for a legal and regulatory analysis of PURPA's applicability to Oklahoma's utility regulation practices.

PURPA does not directly concern the issues of whether nuclear power plants should be built, and how states should regulate utility construction programs. There is, however, a direct connection between the costs of a utility's service and the electric utility system produced by its construction programs. To promote economic efficiency, a prime PURPA goal, utility rates must not only reflect accurately the utility's costs of service, but also encourage consumption behavior which is ap-

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(1) COST OF SERVICE.—Rates charged by any electric utility for providing electric service to each class of electric consumers shall be designed, to the maximum extent practicable, to reflect the costs of providing electric service to such class, as determined under section 2625(a) of this title.

(2) DECLINING BLOCK RATES.—The energy component of a rate, or the amount attributable to the energy component in a rate, charged by any electric utility for providing electric service during any period to any class of electric consumers may not decrease as kilowatt-hour consumption by such class increases during such period except to the extent that such utility demonstrates that the costs to such utility of providing electric service to such class, which costs are attributable to such energy component, decrease as such consumption increases during such period.

(3) TIME-OF-DAY RATES.—The rates charged by any electric utility for providing electric service to each class of electric consumers shall be on a time-of-day basis which reflects the costs of providing electric service to such class of electric consumers at different times of the day unless such rates are not cost effective with respect to such class, as determined under section 2625(b) of this title.

(4) SEASONAL RATES.—The rates charged by an electric utility for providing electric service to each class of electric consumers shall be on a seasonal basis which reflects the costs of providing service to such class of consumers at different seasons of the year to the extent that such costs vary seasonally for such utility.

(5) INTERRUPTIBLE RATES.—Each electric utility shall offer each industrial and commercial electric consumer an interruptible rate which reflects the cost of providing interruptible service to the class of which such consumer is a member.

(6) LOAD MANAGEMENT TECHNIQUES.—Each electric utility shall offer to its electric consumers such load management techniques as the State regulatory authority (or the nonregulated electric utility) has determined will—

(A) be practicable and cost-effective, as determined under section 2625(c) of this title,

(B) be reliable, and

(C) provide useful energy or capacity management advantages to the electric utility.

Id.

3. 16 U.S.C. § 2622(b)(2) (codifying § 112(b)(2) of the Public Utility Regulatory Policies Act).

propriate to the relationship between projected consumer demands for electricity and the utility's capacity to meet those demands. A utility facing excess capacity should adopt policies toward ratemaking and construction regulation which differ from those of a utility facing capacity shortages.[4] Also, as will be demonstrated below, nuclear power plants involve cost of service factors different from those of other types of plants. Wishing to acquire more knowledge of the methods of evaluating the prudence of constructing nuclear plants, and to develop mechanisms for encouraging electric utilities to tailor their construction programs to fit the needs of its consumers, the Oklahoma Corporation Commission requested the author to cover these matters in his analysis.[5] Here follows the Allison report to the Oklahoma Corporation Commission.

State Public Utility Commissions (PUC's) can influence the course of nuclear development within their states only through their authority to protect consumers from bearing expenses resulting from imprudent utility investments, since health and safety issues are under the exclusive jurisdiction of the Nuclear Regulatory Commission (NRC).[6] This report contains (I) an outline of economic issues relevant to determining whether a nuclear power plant is a prudent investment, (II) a general discussion of the scope of a PUC's authority to protect ratepayers from bearing the expenses resulting from imprudent utility investments, and (III) a discussion of whether Oklahoma's statutory procedure for regulating the issuance of utility securities can be used by the Oklahoma Corporation Commission to shield Oklahoma ratepayers from imprudent utility investments.

II. ARE NUCLEAR POWER PLANTS PRUDENT INVESTMENTS?

The evidence is hopelessly conflicting as to whether nuclear plants

4. For example, utilities facing excess capacity may want to defer the adoption of rate practices, such as time-of-day rates, interruptible rates, and load management programs, which retard the growth of consumer demands so that their existing capacity may be fully employed as soon as possible.

5. [Ed.] For additional issues, *see generally* A. MURPHY, THE LICENSING OF POWER PLANTS IN THE UNITED STATES 16 (1978); Breyer, Vermont Yankee *and the Courts' Role in the Nuclear Energy Controversy*, 91 HARV. L. REV. 1833 (1978); Murray, *The Economics of Electric Power Generation—1975-2000*, in THE NUCLEAR POWER CONTROVERSY 55 (A. Murphy ed. 1976); and Environmental Policy Institute, Reasons for Delay in Powerplant Licensing and Construction (Mar. 1978).

6. Northern States Power Co. v. Minnesota, 447 F.2d 1143, 1146-54 (8th Cir. 1971), *aff'd mem.*, 405 U.S. 1035 (1972).

are better investments than other types of power plants,[7] particularly since each proposed project must be judged on its own merits. Certain issues, however, must be examined in judging the prudence of a proposed nuclear plant, including capital costs in relation to demand for electricity, fuel costs, the plant's projected operational reliability, "crud" clean-up costs,[8] expended fuel disposal costs,[9] decommissioning costs,[10] and the power plant's exposure to liability for injuries to persons or property resulting from a nuclear accident.

A. *Capital Cost Issues*

Nuclear power plants are baseload plants.[11] Baseload power

7. A recent Congressional study revealed a myriad of conflicting opinions as to whether nuclear power plants were more efficient than other types of power plants. HOUSE COMM. ON GOVERNMENT OPERATIONS, NUCLEAR POWER COSTS, H.R. REP. NO. 95-1090, 95th Cong., 2d Sess. (1978) [hereinafter cited as NUCLEAR POWER COSTS]. The views of those participating in the Committee's hearings can be summarized as follows: The critics of nuclear development who appeared before the subcommittee generally testified that regulation of plant design, construction, operation, and fuel cycle will continue to affect nuclear plants more adversely than coal plants; nuclear construction costs will continue to increase faster than the inflation rate (though perhaps not as fast as in the early 1970's) and faster than coal costs; and that large nuclear plants will continue to perform less efficiently than medium sized coal plants, adding to reserve requirements and leading to replacement energy costs which will erase many of the advantages of cheaper nuclear fuel.

Supporters of nuclear development generally concluded that new regulations will decrease for nuclear but increase for coal both in mining and plant pollution control requirements; nuclear construction costs will be brought under control and will be only slightly higher than coal construction costs; and that the performance of large nuclear plants will soon improve as the industry accumulates more experience with such units.

The Wisconsin Public Service Commission stated that whether one believed that nuclear power plants were more efficient than coal-fired power plants depended upon the general economic assumptions one holds about the world's energy future. The Commission then found that under the assumptions they believed applicable to Wisconsin, nuclear power plants were more costly than coal given present uncertainties as to fuel, decommissioning, and waste disposal costs. Advance Plans for Construction, Wis. Pub. Serv. Comm'n Case No. 05-EP-1, at 15 (Aug. 17, 1978) [hereinafter cited as Advance Plans for Construction].

8. " 'Crud,' as it is referred to by nuclear engineers, consists of metal oxides which become radioactive in the cooling water and accumulate on the insides of reactor piping like rust on ordinary iron pipes. . . ." NUCLEAR POWER COSTS, *supra* note 7, at 25.

9. Expended fuel disposal costs refer to the costs of storing or reprocessing spent fuel. *See* notes 68-76 *infra* and accompanying text.

10. Decommissioning costs are those which a utility incurs in order to discontinue safely the operation of a nuclear power plant that has reached the end of its useful life. *See* notes 77-88 *infra* and accompanying text.

11. There are three basic types of power plants within a utility's electric generation system: baseload, intermediate, and peaking. Baseload power plants are large, complex power plants designed to operate at maximum capacity. Intermediate power plants are designed for variable use, operating at maximum capacity for most of the day, but capable of being operated economically at lower levels. Peaking units are designed to be operated during the few hours each day in which the utility faces peak demands. These units have quick start-up and shut-down times, enabling them to provide flexible responses to fluctuating consumer demands. Baseload power plants have the highest capital costs and the lowest operating costs when they operate at maximum

plants are characterized as capital-intensive but fuel efficient in comparison to smaller size power plants.[12] Nuclear plants are also more capital-intensive than those fired by alternative fuels.[13] This capital-intensive characteristic makes baseload nuclear power plants attractive to utilities since their return on capital increases with the size of their rate bases.[14] In order to protect ratepayers from imprudent investments in baseload nuclear plants, PUC's must develop a policy and procedural framework which permit them to determine in a timely fashion whether baseload nuclear power plants are economically desirable additions to the utility systems such PUC's regulate.

Because nuclear plants are baseload by nature, their economic desirability rests with the desirability of baseload power plants in general. Baseload plants are economical only if they can operate almost continuously throughout their useful lives,[15] so that their annual productions of electricity are large enough to result in acceptable levels of capital costs per kilowatt-hour. Otherwise, the baseload power plant will be uncompetitive with smaller power plants because its higher capital cost per unit will offset its lower per unit operating costs advantage.[16] A prerequisite, therefore, to a determination that a baseload plant is economically viable is a proper relationship between its maximum capacity[17] and projected demands on the utility system over the power plant's useful life. After this relationship is found to be proper, two additional problems must be considered. First, baseload plants in-

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capacity. Peaking units have the lowest capital costs, but are not very efficient users of premium fuels, and therefore have the highest operating costs. *See* WIS. PUB. SERV. COMM'N, GENERIC ENVIRONMENTAL IMPACT STATEMENT ON ELECTRIC UTILITY TARIFFS, Doc. No. 1-AC-10, at 10 (1977) [hereinafter cited as WISCONSIN GENERIC STATEMENT]; TEX. PUB. UTIL. COMM'N, RATE DESIGN STUDY: PRELIMINARY ANALYSIS 7-8 (1978) [hereinafter cited as TEXAS PRELIMINARY STUDY].

12. Northern States Power Co., Wis. Pub. Serv. Comm'n Case No. CA-5447, at 5 n.1 (Mar. 6, 1979). *See* NUCLEAR POWER COSTS, *supra* note 2, at 71, 75.

13. NUCLEAR POWER COSTS, *supra* note 7, at 28.

14. Averch & Johnson, *Behavior of the Firm Under Regulatory Constraint*, 52 AM. ECON. REV. 1052 (1962). *See* 2 A. KAHN, THE ECONOMICS OF REGULATION: PRINCIPLES AND INSTITUTIONS 47-59 (1971).

15. *See* NUCLEAR POWER COSTS, *supra* note 7, at 26-28.

16. *Id.*

17. Each power plant's electrical generating capacity is expressed in terms of the largest demand for electricity it can accommodate. Demand is the rate at which electric energy is produced by a generating unit, usually expressed in terms of kilowatts (kW). WISCONSIN GENERIC STATEMENT, *supra* note 11, at 300. The unit of output referred to throughout this report is the kilowatt-hour which is "the basic unit of electric energy equal to one kilowatt of power supplied to or taken from an electric circuit steadily for one hour." *Id.* at 303.

crease the system's reserve capacity requirements;[18] and second, baseload plants, especially nuclear plants, require so much construction time, that utilities have difficulty in financing them without contributions from ratepayers in the form of Construction Work in Progress (CWIP).[19]

1. The Demand Prerequisite

Because of their capital-intensive nature, baseload plants must operate almost continuously in order to reduce their capital costs per kilowatt-hour to an economically acceptable level.[20] A baseload plant should not be built unless it can be projected that its maximum capacity will be substantially equal to the constant demands on the utility system to which it belongs.[21] Even where the relationship between a utility system's constant demand and the maximum capacity of the proposed baseload plant is favorable, the baseload plant should not be built if its addition and operation will reduce the operating lives and periods of other power plants in the system so as to lower the efficiency of the system's overall generation mix.[22] In other words, what must be avoided at all costs is the creation of excess capacity, which forces the utility to use its generating equipment improperly in order to minimize the costs of idle equipment.

To ensure that the addition of a baseload power plant does not create excess capacity, utilities and PUC's must calculate the system's projected peak demands and load factors over the powerplant's useful life.[23] If a system's projected peak demand or load factor is low, its constant demand may be too low to justify a baseload plant, and a greater percentage of peaking or intermediate load power plants may

18. Advance Plans for Construction, *supra* note 7, at 13-14; NUCLEAR POWER COSTS, *supra* note 7, at 29-30.

19. NUCLEAR POWER COSTS, *supra* note 7, at 36; see note 42 *infra* and accompanying text.

20. *See* note 15 *supra* and accompanying text.

21. *See* NUCLEAR POWER COSTS, *supra* note 7, at 33-36; *id.* at 133 (Reps. Kindness, Horton, Erlenborn, Wydler, Brown, McCloskey, Corcoran, Quagle, Walker, Strangeland, and Cunningham, dissenting).

22. The utility's generation mix is its total configuration of power plants—baseload, intermediate, and peaking.

23. A system's peak demand is the level of electric energy, expressed in kilowatts, the system must generate at the moment when the sum of its customers' demand for electricity is the highest. *See* WISCONSIN GENERIC STATEMENT, *supra* note 11, at 300. A system's load factor is the ratio of the average demand supplied by the system to the peak demand imposed on the system during a specified time period. *Id.* at 303. The load factor is calculated by dividing the total number of kilowatt-hours produced during the time period by the product of the system's peak demand times the total number of hours in the time period. *See* NATIONAL ASSOCIATION OF REGULATORY UTILITY COMMISSIONERS, ELECTRIC UTILITY COST ALLOCATION MANUAL, App. A (1973).

provide a more economical generation mix.[24] In this regard, the current generating mix of the system must be carefully weighed against projected system demands and load factors to avoid prematurely scrapping a power plant or reassigning it from the base period to the peak or intermediate periods.[25]

In order to forecast accurately future system demands and load factors, projections must take into account changing price levels, tariff structures, and availability of fuels. This requires a quantification of the effects on future load growth of conservation efforts, use of load management techniques, conversion from natural gas to coal, redesigned rate structures, and improvements in end-use efficiency.[26]

A variety of conservation efforts, voluntary and involuntary, have appeared since the 1973 Arab oil embargo. The National Energy Act mandates still more conservation efforts.[27] Load management techniques which have the potential of increasing load factors by putting a cap on peak period usage are becoming available to consumers. These methods include interruptible tariffs,[28] residential water heater control, and control of residential and commercial air conditioning.[29] These efforts have retarded the rate of demand growth and will continue to do so in the future.

A shift from power plants fired by natural gas may significantly affect electric utilities in Oklahoma, which historically has had over ninety percent of its generating system powered by natural gas.[30] If the

24. *See* notes 8, 11, 12 *supra* and accompanying text.

25. Advance Plans for Construction, *supra* note 7, at 1-7, 15, 22; *id.* at 34-35 (Chairman Cicchetti, concurring).

26. *Id.* at 11.

27. For example, the National Energy Conservation Policy Act of 1978, Pub. L. No. 95-619, 92 Stat. 3206-89 (codified in scattered sections of 12, 15, 23, 42 U.S.C.) (1978), provides for plans and incentives designed to promote increased use of residential energy conservation measures, weatherization of homes and public buildings, and increased use of solar energy. The Act also provides for establishing energy efficiency standards for automobiles and other consumer products. The Energy Tax Act of 1978, Pub. L. No. 95-918, 92 Stat. 3174-3205 (codified in scattered sections of 26 U.S.C.) provides tax incentives for residential energy conservation, bus usage, van pooling, use of certain alcohol fuels, business conservation of, or conversion from, oil and gas, and developing new energy technologies.

28. An interruptible tariff is a rate schedule which is lower than the general rate level and is offered to customers who are willing to have all or part of their electrical service curtailed in the event the utility's peak demands are threatening to exceed its generating capacity. *See* TEXAS PRELIMINARY STUDY, *supra* note 11, at 64.

29. Advance Plans for Construction, *supra* note 7, at 11-12.

30. This figure was compiled from the information contained in 1978 FERC Form No. 1 filings of Public Service Company of Oklahoma and Oklahoma Gas & Electric Company, at 209.

Powerplant and Industrial Fuel Use Act[31] causes Oklahoma utilities to begin building coal and nuclear plants before their gas power plants have reached the end of their useful lives, Oklahoma will experience temporarily a projected overcapacity unrelated to demand growth. Building baseload power plants, therefore, should not necessarily be discouraged.[32] This projected overcapacity will also increase the per unit cost of electricity, because the utilities' rate bases will include the undepreciated investment in natural gas power plants plus the capital costs of the replacement power plants.

In the near future, electric rate structures in Oklahoma may be redesigned to track more closely the costs of providing electric service. This should slow the rate of growth of electricity demand, especially if time-of-use pricing, interruptible rates, and tariffs designed to encourage load management and alternative energy sources are adopted.[33] Yet, it has been suggested that such measures could increase total energy use without significantly reducing system peak demands, a circumstance that would favor building baseload power

31. The Powerplant and Industrial Fuel Use Act of 1978, Pub. L. No. 95-620, § 201, 92 Stat. 3298, provides that:

> Except to such extent as may be authorized under subtitle B—
>
> (1) natural gas or petroleum shall not be used as a primary energy source in any new electric powerplant; and
>
> (2) no new electric powerplant may be constructed without the capability to use coal or any other alternate fuel as a primary energy source.

Whether the effect of this provision will be dislocations among Oklahoma utilities is debatable, since subtitle B of the Act riddles § 201 with temporary and permanent exemptions. Among the permanent exemptions are those for (1) a lack of alternate fuel supply, *id.* at § 212(a)(1)A, 92 Stat. 3301; (2) site limitations affecting the use of coal, *id.* at § 212(a)(1)B, 92 Stat. 3301; (3) environmental prohibitions on the use of coal, *id.* at § 212(a)(1)C, 92 Stat. 3301; (4) inability to finance a coal-fired plant, *id.* at § 212(a)(1)D, 92 Stat. 3301; (5) infeasibility arising from state and local requirements, *id.* at § 212(b), 92 Stat. 3301; (6) a demonstration that coal or alternative fuels would not permit the installation of an efficient cogeneration facility, *id.* at § 212(c); (7) a demonstration that a facility must use a fuel mixture containing petroleum or natural gas to maintain plant reliability, *id.* at § 212(d), 92 Stat. 3302; (8) a demonstration that the plant will be used solely for emergency purposes, *id.* at § 212(e), 92 Stat. 3302; (9) a demonstration that the plant is needed to maintain service reliability, *id.* at § 212(f), 92 Stat. 3302; (10) a demonstration that the plant will be operated solely as a peakload generator, and for natural gas use, a showing that the plant otherwise will not meet national ambient air quality standards, *id.* at § 212(g), 92 Stat. 3302; (11) a demonstration that the plant will be used solely as an intermediate load powerplant and that the plant is necessary to comply with national ambient air quality standards, *id.* at § 212(h), 92 Stat. 3303; and (12) a demonstration that the plant is necessary to meet scheduled equipment outages. *id.* at § 212(j), 92 Stat. 3304.

32. *See* TEXAS PUBLIC UTILITY COMMISSION, INTERIM REPORT: RATE DESIGN STUDY 15, 68 (1978). If the result of the Congressionally mandated conversion is to be an optimum replacement system, there may be a justifiably temporary over-capacity resulting from the construction of nuclear or coal-fired baseload generators before the present gas-fired generators have reached the end of their useful lives.

33. Advance Plans for Construction, *supra* note 7, at 11-12.

plants.[34] End-use efficiency will also retard the growth of electricity demands. Conservation policies, appliance performance standards, and building codes will be modified to produce reductions in electricity usage.[35]

Because these factors will produce effects which are difficult to predict, utilities and state PUC's must periodically review system generation construction plans. In Wisconsin, for example, it was discovered that the proposed new generation capacity contained in one utility's system generation construction plan had to be revised downward thirty to forty percent because of the effects of various demand reducing measures which had been implemented by the Wisconsin Public Service Commission.[36]

2. Reserve Capacity Requirements

Generally, the larger a power plant is, the greater the amount of reserve capacity which must be provided to cover the periods of time when its capacity is needed and it is not operational.[37] This direct relationship between plant size and the amount of associated reserve capacity is a function of size, probability, and reliability.

Size determines the total amount of capacity subject to outage for which reserve capacity must be available. This is obvious since more reserve capacity must be brought on line to cover for a 2,000 megawatts (mw) facility than to cover for an 800 mw facility.

Probability theory determines the chance that a given amount of capacity will be non-operational for a particular time period. If three smaller power plants are built to equal the capacity of one large plant, the probability of losing temporarily the entire capacity is much greater with one large plant than when there are three smaller plants, even if all four power plants are equally reliable.[38] This is especially true since every plant is periodically shut down for maintenance.

34. Wisconsin Elec. Power Co., Wis. Pub. Serv. Comm'n Case No. 6630-ER-2, at 21 (July 20, 1978) (views expressed by Wisconsin's Environmental Decade, Inc.).

35. Advance Plans for Construction, *supra* note 7, at 12.

36. The Wisconsin Public Service Commission noted that under its new forecasts "[t]his range of capacity would require the authorization and construction of between approximately 1600 mw and 2300 mw of generating capacity not already constructed or authorized. These amounts contrast with 3130 mw most recently proposed in the advance plan." *Id.* at 6.

37. *See* note 18 *supra* and accompanying text.

38. *Id.* at 12-13. Note also, that if there is a 50 percent chance of an outage at any given moment for each plant, the chances that all three of the smaller plants would go out at the same time are four times smaller than the chances that the one larger plant would go out.

Finally, there is the question of operational reliability. The evidence is contradictory as to whether a coal plant is more reliable than a nuclear plant. Proponents of each technology have produced evidence that their competitors are less reliable.[39] There also seems to be credible evidence that the reliability factor is about the same for both technologies.[40] All sides agree that large plants are less reliable than smaller plants, whether the plant is coal-fired or nuclear-fired.[41]

That baseload power plants impose greater reserve requirements on utility systems than do smaller plants is an inescapable conclusion. The question remains whether the greater reserve capacity requirement associated with baseload nuclear plants imposes so much in additional costs on utility systems that nuclear power plants are uncompetitive generators of electricity.

3. Construction Work in Progress

Baseload plants involve such enormous capital costs and lead times between planning and financing them and putting them into operation, that they increase the chances that the building utility will have to petition the PUC for Construction Work in Progress.[42] CWIP allows utilities to add to the rate base those sums expended for constructing utility facilities as they are incurred, rather than wait until the facilities being constructed are completed and put into operation.[43] CWIP is sometimes labeled an unfair charge to current ratepayers because it forces them to pay for electric production before it is supplied to them.[44] Obviously, some ratepayers will never benefit from the output of the new facilities. Yet, CWIP is not necessarily unfair to current ratepayers since arguably they create the demands on the utility system which produce the need for new utility facilities.[45]

4. Summary

Nuclear power plants are baseload facilities which have higher

39. NUCLEAR POWER COSTS, *supra* note 7, at 27-28.
40. *Id.* at 113 (Rep. Wydler, dissenting).
41. *Id.* at 27. *See* EDISON ELECTRIC INSTITUTE, REPORT ON THE EQUIPMENT AVAILABILITY FOR THE 10 YEAR PERIOD 1967-1976 cited in NUCLEAR POWER COSTS, *supra* note 7, at 113 (Rep. Wydler, dissenting).
42. NUCLEAR POWER COSTS, *supra* note 7, at 36.
43. *Id.; see* Wisconsin Elec. Co., Wis. Pub. Serv. Comm'n Case No. CA-5491, at 6 (Mar. 2, 1979).
44. NUCLEAR POWER COSTS, *supra* note 7, at 36.
45. *Id.; see* Wisconsin Elec. Power Co., *supra* note 43, at 6.

capital costs than smaller power plants and baseload plants fired by alternative fuel sources. If, however, the proper conditions are present, the lower fuel costs of baseload nuclear plants may offset enough of their higher capital costs to make them the cheapest generators of electricity. In determining whether the proper conditions are present, state PUC's must consider:

a. whether throughout its useful life, the maximum capacity of the proposed baseload nuclear power plant approximates the firm demand that will be placed on the system it will serve;

b. whether, given the utility system's current generation mix, an addition of a baseload nuclear plant will prematurely replace or reduce the operation of existing plants and lower the efficiency of the system;

c. the effects on future system demands and load factors of energy conservation efforts, shift from power plants fired by natural gas, load management programs, changes in rate structures, and improved end-use efficiency;

d. whether periodic review of these factors require a revision in the utility system's generation expansion plans;

e. whether adding a baseload nuclear power plant to the utility system will increase its required reserve capacity to uneconomic levels; and

f. whether adding a baseload nuclear power plant to the utility system will force the state PUC to grant Construction Work in Progress.

B. *Fuel Costs*

Throughout the operating history of baseload nuclear power plants their fuel costs have been much lower than those of other types of plants. This advantage has sufficiently offset their higher capital costs, making them the least costly generators of electricity.[46] Today, rising costs of uranium and governmental inaction on the issues of fuel reprocessing and breeder reactor technology make questionable whether baseload nuclear plants will maintain this superiority over other types of power plants.

The price of uranium increased 500 to 700 percent from 1973 to

46. *See* NUCLEAR POWER COSTS, *supra* note 7, at 32; *id.* at 134 (Reps. Kindness, Horton, Erlenborn, Wydler, Brown, McCloskey, Corcoran, Quayle, Walker, Strangeland, and Cunningham, dissenting).

1978.[47] There is also a supply problem developing. Domestic reserves will not provide enough uranium to power the nuclear plants committed to as of 1975 throughout their useful lives.[48] If domestic consumers of uranium are forced to import uranium, much higher prices can be expected because a Uranium Producers Export Cartel (UPEC) has already formed.[49] The Wisconsin Public Service Commission has become so concerned over the uncertain outlook for uranium prices and nuclear fuel availability that it has imposed a moratorium on future construction of nuclear power plants in Wisconsin.[50]

Nuclear fuel cost projections cannot be judged in a vacuum. While supply and pricing problems confront the nuclear industry, coal, its chief competitor, is not without its own problems. From 1973 to 1978, coal prices increased by only six percent;[51] but since 1978 coal prices have escalated because of the combined effects of labor wage demands and more stringent mining safety and environmental regulations.[52] Coal transportation, which requires large investments in coal

47. The price of uranium has risen from $6 to $8 per pound in 1973 to $40 per pound in 1978. NUCLEAR POWER COSTS, *supra* note 7, at 32.

48. NUCLEAR POWER COSTS, *supra* note 7, at 32-33.

49. *Id.*

50. *See generally* Advance Plans for Construction, *supra* note 7, at 16-18, 27. Specifically the Commission stated:

> The nuclear fuel issue of supply/demand imbalances is influenced by federal policies, which affect mining, milling, enrichment, reprocessing, the breeder, federal uranium requirements (military), growth in generating capacity, environmental constraints, and the availability of domestic and foreign uranium. Uncertainties exist in each factor; however, *the record clearly indicates that the net effect could tend to increase the price of nuclear fuel.*

Id. at 16 (emphasis added). The Commission finally concluded that "the uncertainties at this time as to supply of nuclear fuel at a reasonable cost, together with other uncertainties named herein, are serious enough to militate against committing this state during this period of uncertainty to amounts of new nuclear capacity beyond that approved herein for planning purposes." *Id.* at 18. In his concurring opinion, Chairman Cicchetti stated:

> What tilted my decision to join my colleagues in banning new nuclear applications in Wisconsin until the federal government resolves nuclear fuel availability, waste disposal and decommissioning is two and a half decades of broken federal promises and a desire to avoid economic catastrophe if the federal government continues to promote nuclear energy with unnecessary siting laws, unrealistically strong endorsements and its own incredible inaction. I am pleased that Wisconsin now joins California, Iowa and Maine in laying the nuclear burden upon Washington, where it has belonged for almost three decades.

Id. at 38 (emphasis added).

51. NUCLEAR POWER COSTS, *supra* note 7, at 32.

52. *Id.* at 104 (Minority views of Reps. Horton, Erlenborn, Wydler, C. Brown, McCloskey, G. Brown, Thone, Kasten, Kindness, Corcoran, Quayle, Walker, Strangeland, and Cunningham). In Wisconsin, Commissioner Oestreicher, dissenting to a denial of an application to construct the proposed Tyrone nuclear powerplant, commented:

> If the coal alternative is proposed at this site the same good folks will just as earnestly remind us of coal related problems. Sulphur and nitrate emissions and the greenhouse

hopper cars, sophisticated loading and unloading equipment, and storage facilities, is scarcely cheap.[53]

In summary, fuel costs are rising for all energy sources. The critical inquiries concerning nuclear power plants therefore are: Whether uranium prices are rising so much faster than the prices of alternative fuels that nuclear plants can no longer offset enough of their higher capital costs with their lower fuel costs to remain competitive; and whether the fuel supply availability is better for nuclear plants than for other types of plants. In this regard, a reversal of the federal government's negative attitude towards fuel reprocessing and breeder reactors would dramatically improve the nuclear fuel supply outlook.

C. *Operational Reliability*

A power plant's reliability is measured by its capacity factor, which is the ratio of the plant's actual annual production to the production it would have achieved had it operated all year at full capacity.[54] The evidence is inconclusive as to whether coal-fired plants are more reliable than nuclear power plants.[55] There is common agreement, however, that larger power plants are less reliable than smaller plants.[56]

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effect for starters; trace emissions, including arsenic, lead, mercury and radioactivity are there too; and most difficult are the solid waste disposal problems. Change the site and many of the principals change but not the arguments or the agents or the attorneys.

Northern States Power Co., *supra* note 12, at 47.

53. Transportation is a major component of coal costs. *See* THE SCIENCE AND PUBLIC POLICY PROGRAM, UNIVERSITY OF OKLAHOMA, ENERGY ALTERNATIVES: A COMPARATIVE ANALYSIS 1-129 (1975); RIEBER, SOO & STUKEL, THE COAL FUTURE: ECONOMIC AND TECHNOLOGICAL ANALYSIS OF INITIATIVES AND INNOVATIONS TO SECURE FUEL SUPPLY INDEPENDENCE, CENTER FOR ADVANCED COMPUTATION DOC. NO. 163 at IV-1 (1975). Employing unit trains will help reduce this cost. RIEBER at IV-4. Utilities may also have to invest in the necessary loading and unloading facilities. General Research Corp. and International Research and Technology Corp., *Task Report II: A Study of the Competitive and Economic Impact Associated With Coal Slurry Pipeline Implementation*, 17, in TASK REPORTS: COAL SLURRY PIPELINES (Office of Technology Assessment 1978).

54. NUCLEAR POWER COSTS, *supra* note 7, at 26.

55. The Committee hearings from which the Nuclear Power Costs report was prepared produced a range of opinions concerning whether nuclear power plants were more reliable than coal. One witness testified that the average capacity factor for large nuclear plants was 55 percent as compared with the 70 percent capacity factors of coal plants with scrubbers. Another witness testified that large nuclear power plants had capacity factors approximately 63.6 percent, while the capacity factors of large coal plants ranged from 49.2 percent to 56.4 percent. NUCLEAR POWER COSTS, *supra* note 7, at 27. A dissenting opinion in the Nuclear Power Costs report cited figures from the Energy Research Development Administration (ERDA) and the Federal Power Commission (FPC) which indicated that in 1976 nuclear baseload powerplants had a net capacity factor of 59.7 percent as compared to the 56.4 net capacity factor of coal baseload plants. NUCLEAR POWER COSTS, *supra* note 7, at 133 (Reps. Kindness, Horton, Erlenhorn, Wydler, Brown, McCloskey, Corcoran, Quayle, Walker, Strangeland, and Cunningham, dissenting).

56. NUCLEAR POWER COSTS, *supra* note 7, at 27. *See* EDISON ELECTRIC INSTITUTE, REPORT

Reliability is not only important for determining the level of reserve capacity costs, but also for determining whether nuclear plants will have enough output to offset their high capital costs.[57] Whether ratepayers must bear increased fuel costs in the form of replacement power, which generally is more expensive than self-generated power and is directly charged to the ratepayers through automatic purchased power clauses, is also evaluated in terms of reliability.[58]

A related concept is the availability factor, which is a higher figure than the capacity factor because it measures the amount of time a plant is operational, not just the amount of time it is actually in service. Thus, a power plant is not penalized for times when it was not in service solely because of a managerial decision not to operate it.[59] Where a power plant's availability factor is significantly higher than its capacity factor, it is likely that the utility system as a whole has a low load factor or a peak demand significantly higher than normal demand, which could make the addition of a baseload nuclear reactor uneconomical.[60]

Reliability can drastically affect the economics of capital-intensive nuclear power plants. Therefore, it is important that state PUC's make careful comparisons of the capacity factors of each type of plant before allowing a capital-intensive plant to be added to a utility system. PUC's should also determine whether the utility has made contingent fuel purchase arrangements in case power must be acquired to replace that lost as a result of a power plant outage, and what costs will be borne by the ratepayers under the terms of the utility's purchased power arrangements and purchased power clauses.

D. *"Crud" Clean-Up*

Cleaning up "crud" is the process of removing radioactive metal

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ON THE EQUIPMENT AVAILABILITY FOR THE 10 YEAR PERIOD 1967-1976 cited in NUCLEAR POWER COSTS, *id.* at 113 (Rep. Wydler, dissenting).

57. It has been estimated that for a power plant costing $1,000 per kilowatt to construct, capital costs per kilowatt-hour will increase from 2.8 cents per kilowatt-hour to 3.7 cents per kilowatt-hour as its projected lifetime capacity factor decreases from 63 percent to 50 percent. NUCLEAR POWER COSTS, *supra* note 7, at 26.

58. For example, New York's Consolidated Edison customers were asked to pick up a $23 million surcharge for replacement fuel when one of its plants shut down for six months in 1976. The Brown's Ferry nuclear accident shut the plant down for 17 months at a cost of $240 million to Tennessee Valley Authority customers. NUCLEAR POWER COSTS, *supra* note 7, at 28. The Three Mile Island accident may cause the ratepayers' bills to increase 20 percent because of the costs of clean-up and replacement power. Wall St. J., Apr. 6, 1979, at 1, col. 4.

59. NUCLEAR POWER COSTS, *supra* note 7, at 133 (Reps. Kindness, Horton, Erlenhorn, Wydler, Brown, McCloskey, Corcoran, Quayle, Walker, Strangeland, and Cunningham, dissenting).

60. *Id.*

oxides from the cooling systems of nuclear power plants.[61] The purpose of the process is to reduce the exposure of maintenance workers to radioactive materials so as to speed up maintenance procedures.[62] In many plants now in operation, the "crud" clean-up will have to occur about half-way through their useful lives at great expense to the utility.[63] In one case, the cost of the clean-up was $36 million in 1978 for a plant which cost $51 million to build in 1960.[64] Taking inflation into consideration, the "crud" cleansing process cost the utility in excess of twenty percent of the plant's construction costs.[65]

It has been pointed out that even though the cost of cleaning up "crud" is great in absolute value, it has scant effect on the price of electricity.[66] Also, design improvements over the years may have reduced the need to conduct "crud" clean-ups in some power plants.[67] Nevertheless, PUC's should determine whether a "crud" clean-up will be required in proposed nuclear power plants, and if so, what additional costs will be imposed on ratepayers.

E. *Expended Fuel Disposal Costs*

The disposal of spent nuclear fuel presents a serious economic problem to potential operators of nuclear power plants. The problem is related to that of fuel availability in the sense that previous plans for nuclear fuel reprocessing by commercial enterprise have not come to fruition.[68] Also, the Carter Administration has discouraged nuclear fuel reprocessing out of concern that it could lead to nuclear proliferation.[69] The end result has been a dramatic increase in the operating costs of nuclear plants because the lack of reprocessing both decreases

61. *Id.* at 25.

62. *Id.* at 98 (minority views of Reps. Horton, Erlenborn, Wydler, C. Brown, McCloskey, G. Brown, Thorne, Kasten, Kindness, Corcoran, Quayle, Walker, Strangeland, and Cunningham).

63. *Id.* at 25.

64. *Id.* at 26.

65. When the 1960 $51 million construction cost is converted into 1978 dollars, the $36 million in 1978 clean-up costs represents over twenty percent of the plant's original construction, assuming an annual inflation rate of six percent from 1960 to 1978.

66. NUCLEAR POWER COSTS, *supra* note 7, at 26; *id.* at 97-98 (minority views of Reps. Horton, Erlenborn, Wydler, C. Brown, McCloskey, G. Brown, Thorne, Kasten, Kindness, Corcoran, Quayle, Walker, Strangeland, and Cunningham).

67. *Id.* at 98. It has been "determined that the careful control of the primary coolant water chemistry could deter crud formation. . . . [and] not only minimize the build up of crud but actually [contribute] to its disollution, or return to solution". *Id.* at 113 (Rep. Wydler, dissenting).

68. Wisconsin Elec. Power Co., Wis. Pub. Serv. Comm'n Case No. 6630-ER-1 at 22-23 (Aug. 5, 1976) (Comm'r Holden, concurring in part, dissenting in part).

69. Statement by the President on Nuclear Power Policy, 13 WEEKLY COMP. OF PRES. DOC. 506-07 (Apr. 11, 1977).

the supply of available fuel and increases the costs of fuel storage. Fuel storage costs arise because spent fuel not converted into reusable nuclear fuel must be stored in facilities provided by the utility.[70]

Fuel storage costs also have increased dramatically as a result of the inertia in the federal government's nuclear waste disposal program. Specifically, the problem concerns identifying and acquiring permanent sites at which nuclear wastes can be stored in a safe and environmentally sound manner. Great debate has taken place over whether any such place exists. The debate has resulted in slowed development of appropriate nuclear waste storage sites, which has forced utilities to expand their temporary nuclear waste storage facilities.[71] These temporary storage facilities have the potential of becoming perpetual burdens to the states, since the radioactive waste continues to be hazardous for periods of time which far outlive the existence of the company which owns the site.[72]

Increased fuel storage costs created forty-five percent of the needed revenue increase of Wisconsin Electric Power Companies (WEPCO) in 1975, and fifty percent of its needed revenue increase in 1976.[73] These costs were anticipated neither by the Wisconsin Public Service Commission, or evidently by WEPCO,[74] although at least one commissioner believed the utility was negligent in not providing for an economical waste storage program and therefore should absorb these surprise costs.[75] Uncertainty in the waste management area contributed heavily to Wisconsin's and Iowa's declarations of moratoria on nuclear power plant construction until such time as federal policy is clarified with respect to fuel reprocessing and nuclear waste disposal.[76]

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70. Advance Plans for Construction, *supra* note 7, at 19.

71. *See id.* at 18-19; NUCLEAR POWER COSTS, *supra* note 7, at 8-15.

72. *See* Advance Plans for Construction, *supra* note 7, at 18-19.

73. Wisconsin Elec. Power Co., Wis. Pub. Serv. Comm'n Case No. 6630-ER-1, at 14 (Sept. 15, 1975); Wisconsin Elec. Power Co., *supra* note 68, at 24.

74. Wisconsin Elec. Power Co., *supra* note 68, at 23.

75. Commissioner Holden stated his belief as follows:

> [T]hese fuel costs now being experienced reflect decisions by the company and assurances given to the Commission by the company which are turning out not to be valid in practice. These are decisions and assurances where, on the view taken here, the burden must be assumed by management and by the shareholders of the company rather than by the ratepayers. . . . It is a violation of the cost-of-service principle to assign the extra costs (due to shortage) to the ratepayers. For if we do that, then we have adopted the principle that any bill paid is a valid "cost," even if the bill ("cost") results from avoidable error on the part of management.

Id. at 41 (emphasis added).

76. *See* NUCLEAR POWER COSTS, *supra* note 7, at 22-23; Advance Plans for Construction, *supra* note 7, at 27; Wisconsin Elec. Power Co., *supra* note 43, at 4.

To avoid surprises similar to that which WEPCO suffered, state PUC's should require utilities to declare in advance their plans for nuclear waste disposal and what these plans will cost the ratepayer. Such an advance declaration will allow PUC's to judge at the outset whether a proposed nuclear plant is a prudent investment. The utility's declarations can be used as a standard against which to measure subsequent nuclear waste disposal experience. Where subsequent experience departs drastically from the utility's expectations, state PUC's may be justified in forcing the shareholders to bear any surprise increases in nuclear waste disposal expenses.

F. *Decommissioning Costs*

1. Decommissioning Methods

Nuclear power plants must be decommissioned at the end of their useful lives. Depending on the method used, the cost of decommissioning a power plant ranges from three to fifteen percent of the power plant's original capital cost in constant dollars.[77] The methods of decommissioning nuclear plants are mothballing, entombing, and dismantling.

Mothballing is the cheapest method of decommissioning a powerplant.[78] This process involves:

> removing all fuel and radioactive fluids and wastes and putting the facility in protective storage. Adequate radiation monitoring, environmental surveillance, and appropriate security procedures must be established to ensure public health and safety.[79]

Entombment is a refinement of mothballing. All fuel assemblies, radioactive fluids, and wastes are removed, and selected components are shipped offsite. Remaining radioactive or contaminated components of the facility are sealed in a structure possessing a biological shield. Continuous security is required to assure health and safety.[80]

Dismantling is the most expensive decommissioning option.[81] All on-site materials having contamination levels above acceptable levels

77. NUCLEAR POWER COSTS, *supra* note 7, at 22-23.
78. *Id.* at 97 (minority views of Reps. Horton, Erlenborn, Wydler, C. Brown, McCloskey, G. Brown, Thone, Kasten, Kindness, Corcoran, Quayle, Walker, Strangeland, and Cunningham).
79. *Id.*
80. *Id.*
81. *Id.*

must be removed and stored elsewhere.[82]

2. Selecting the Optimum Decommissioning Strategy

Choosing a decommissioning strategy should be based on criteria in addition to the mere cost of the particular method. Although mothballing and entombment are cheaper than dismantling, they require the provision of perpetual monitoring to ensure public health and safety.[83] It is questionable whether a private utility company can guarantee that it will always be in existence to provide the necessary security, which creates a risk that taxpayers will ultimately have to bear this burden.[84]

The costs of mothballing and entombment may be underestimated, since neither method will permit the plant site to be used immediately for subsequent operations.[85] Plant sites are prime areas, so the true costs of mothballing and entombment must reflect the loss of opportunity costs resulting from not being able immediately to construct a new power plant on the decommissioned plant site.[86]

The optimum decommissioning strategy may involve a combination of these procedures. If the opportunity costs of not using the decommissioned plant site are insignificant, savings may be had by mothballing or entombing the site long enough to lower its contamination levels in order to use less expensive dismantling procedures.[87]

82. The Atomic Energy Commission, the functions of which have been transferred to the Nuclear Regulatory Commission (NRC), has set allowable levels of radioactive concentrations found in air and water effluents for over 250 radionuclides. 10 C.F.R. § 20, App. B, Table II. The NRC has not yet found it possible to set allowable contamination levels for residual and contamination found on structures, equipment, and soils. It has, for the purposes of licensing nuclear powerplants, constructed models to assess the radiological effect of residual contamination. 10 C.F.R. § 50, App. I. These models "simulate the release of radionuclides from operating facilities, the environmental transport of the radionuclides, and the exposure or ingestion by man of these radionuclides, which leads to an estimate of the radiological impact (presented as a dose) to a hypothetical individual." Office of Standards Development, Nuclear Regulatory Commission, Plan for Reevaluation of NRC Decommissioning of Nuclear Facilities, at 54. (Nureg-0436, Dec. 1978). Studies conducted at Battelle on generic facility decommissioning and a methodology for determining acceptable levels of residual soil contamination proposed by the International Commission on Radiological Protection may help to provide ways to set specific levels of residual contamination. *See id.* at 55-6.

83. NUCLEAR POWER COSTS, *supra* note 7, at 97 (minority views of Reps. Horton, Erlenborn, Wydler, C. Brown, McCloskey, G. Brown, Thone, Kasten, Kindness, Corcoran, Quayle, Walker, Strangeland, and Cunningham).

84. *See id.* at 13.

85. *Id.* at 130 (Reps. Kindness, Horton, Erlenborn, Wydler, Brown, McCloskey, Corcoran, Quayle, Walker, Strangeland, and Cunningham, dissenting).

86. *Id.*

87. *Id.* at 97 (minority view of Reps. Horton, Erlenborn, Wydler, C. Brown, McCloskey, G. Brown, Thone, Kasten, Kindness, Corcoran, Quayle, Walker, Strangeland, and Cunningham).

Lower contamination levels reduce dismantling costs because the process can be carried out with less sophisticated safeguards and equipment than those required to dismantle highly contaminated plants.[88]

3. The Role of State PUC's

To ensure that utilities select the decommissioning strategy with lowest cost yet consistent with public health and safety, and state utility service goals, state PUC's must require that utilities proposing to build nuclear power plants consider the costs and effectiveness of alternative decommissioning strategies. This will give state PUC's an opportunity to help shape the decommissioning strategy which is finally submitted to the Nuclear Regulatory Commission (NRC) for approval. More important, this submission requirement will give state PUC's a reference point from which to judge the prudence of actual decommissioning expenditures.

Once the estimated costs of the selected decommissioning strategy are calculated, the state PUC must ensure that these costs are included in the costs of the proposed nuclear plant when it is measured against the costs of alternative powerplants. If the nuclear plant is approved for construction, the PUC must then decide how the decommissioning costs are to be financed.

In making this determination, the PUC must decide initially whether current ratepayers or the ratepayers at the time decommissioning is to occur should bear the expense. Two attitudes prevail on this topic. Some PUC's have ruled that decommissioning costs are too speculative to be accepted as valid costs.[89] The General Accounting Office (GAO) and the State of Wisconsin believe that these costs should be borne by those who presently benefit from nuclear generated electricity.[90] PUC's which adopt the GAO and Wisconsin approach must quantify a specific amount to be set aside to cover future decommissioning costs, and then adopt a procedure to reflect that amount in the utility's rate levels.[91]

The GAO—Wisconsin attitude toward financing decommissioning costs is the soundest economically. While decommissioning costs cannot be quantified at a specific dollar figure, a reasonable range of esti-

88. *Id.*
89. *Id.* at 23.
90. *Id.*; Advance Plans for Construction, *supra* note 7, at 20-21.
91. *See id.*

mates can be forecast. Failure to ask current consumers of nuclear generated electricity to pay for all the costs of the power they use imposes the total decommissioning cost on future generations which will never benefit from the power plant that created the expense. Moreover, the total amount of decommissioning costs may be too large to be borne in their entirety at the time they must be paid by either the utility or its ratepayers. This could result in the taxpayers having to pay the expenditures and/or abandone dismantling as a decommissioning alternative which forecloses immediate future use of the plant site.

4. Summary

Every nuclear power plant will incur associated decommissioning costs which must be considered by state PUC's in determining whether a nuclear plant is a prudent investment. These costs amount to three to fifteen percent of the nuclear plant's total capital costs on a constant dollar basis.

The three decommissioning methods are mothballing, entombment, and dismantling. Mothballing and entombment are less expensive than dismantling, but require the provision of perpetual security measures and leave the plant site unavailable for immediate use. The optimum decommissioning strategy may involve scheduling the sequential use of each decommissioning strategy, culminating with dismantling.

In conducting cost/benefit analyses of alternative power plants to determine whether a nuclear plant is a prudent investment, state PUC's must be certain the estimated costs of constructing and operating a nuclear power plant reflect decommissioning costs.

State PUC's should require utilities proposing to build nuclear power plants to submit a list of several decommissioning strategies and their estimated costs in order to ensure that the lowest cost decommissioning strategy consistent with public health and safety and state utility service goals is submitted to the NRC for approval. This submission will also provide the state PUC's with guideposts against which to measure the actual decommissioning costs, when incurred, to determine whether they are prudent expenditures.

State PUC's must adopt a procedure for funding decommissioning costs. The preferred method will reflect estimated decommissioning costs in the rates of current ratepayers so that those who benefit from current nuclear powered electricity pay for all the costs of providing it.

G. *Liability Exposure*

The Price-Anderson Act[92] limits the total liability exposure of the nuclear industry for any catastrophic accident to the greater of $560 million or the total insurance fund provided by the industry.[93] Each licensee is required to maintain the maximum level of insurance acquirable from the private sources, which amounted to a total of $140 million in 1977.[94] In addition, each licensee is subject to paying up to five million dollars in deferred premiums to cover any damages exceeding the primary level of insurance provided by the insurance industry.[95] The Price-Anderson Act also provides that any person suffering an injury caused by a nuclear accident may file a claim within three years from the time he knew, or reasonably should have known, of this injury and its cause, provided that the claim is filed within twenty years of the nuclear accident which caused his injury.[96]

The effect of the Price-Anderson Act is to keep the nuclear industry's exposure to tort liability within acceptable financial limits.[97] It does, however, also subject each individual utility to liabilities arising out of accidents for which that utility was not responsible. Thus, a utility may be subject to an assessment of up to five million dollars because of the malfunctioning of another utility's nuclear powerplant.

While the potential exposure to liability is large, the history of the nuclear industry suggests that the chances of a utility being forced to contribute an accident liability assessment are very small. In fact, until the recent Three Mile Island disaster only about $600,000 in liability claims have been paid.[98] Moreover, it must be pointed out that the assessments against individual utilities are not made until the primary level of insurance is exhausted.[99] This fund totalled in excess of $140 million prior to Three Mile Island.[100]

As of April 10, 1979, only $650,000 had been paid for losses incurred by the victims of Three Mile Island, and that amount was

92. Atomic Energy Act of 1954 Amendment, Pub. L. No. 85-256, 71 Stat. 576, (codified in scattered sections of 42 U.S.C.) (1957).
93. 42 U.S.C. § 2210(e) (1957).
94. NUCLEAR POWER COSTS, *supra* note 7, at 46.
95. 42 U.S.C. § 2210(b) (Supp. 1979).
96. 42 U.S.C. § 2210(n)(1)(iii) (Supp. 1979).
97. NUCLEAR POWER COSTS, *supra* note 7, at 45-46.
98. *Id.* at 106 (minority views of Reps. Horton, Erlenborn, Wydler, C. Brown, McCloskey, G. Brown, Thone, Kasten, Kindness, Corcoran, Quayle, Walker, Strangeland, and Cunningham).
99. *See id.* at 46.
100. Wall St. J., Apr. 10, 1979, at 4, col. 1.

mostly to cover the out-of-pocket expenses of their evacuation.[101] Whether the total amount of liability associated with the Three Mile Island accident will force contributions from other utilities depends on the success of potential litigants claiming business losses which resulted from the accident.[102] If other utilities eventually are assessed for Three Mile Island damages, this will be the only such assessment made during the industry's operating history. The effect on ratepayer's of liability claims arising out of nuclear accidents is, therefore, likely to be miniscule over the operating life of the average nuclear plant.

H. *Conclusion*

A nuclear power plant is a prudent investment in relation to other types of plants if its higher capital costs can be offset by its lower operating costs. Key issues affecting the level of capital costs include the relationship of the proposed nuclear plant's maximum capacity to the utility system's current generation mix and projected firm demand and load factor; its level of reserve capacity that must be added to the utility system along with the nuclear plant; and the likelihood that the addition of a nuclear plant will force the state PUC to grant the utility Construction Work in Progress. Issues affecting the plant's operating costs are the level of nuclear fuel costs, the level of "crud" cleansing expenses that must be incurred, the level of nuclear fuel disposal costs, the level of decommissioning costs, and the effect on rates of potential tort liability arising out of catastrophic nuclear mishaps.

To be effective in protecting ratepayers from imprudent investments in power plants, state PUC's should hold hearings at the earliest point in time they can exert jurisdiction over plant construction projects to determine with respect to capital cost issues:

1. Whether, throughout its useful life, the maximum capacity of the proposed baseload nuclear plant approximates the firm demand that will be placed on the system it will serve;
2. whether, given the utility system's current generation mix, an addition of a baseload nuclear plant will prematurely replace or reduce the operation of existing plants and lower efficiency of the system; and
3. the effects of future system demands and load factors of energy conservation efforts, conversion away from plants,

101. *Id.*
102. *Id.*

fired by natural gas, load management programs, and changes in rate structures improved end-use efficiency

4. whether periodic review of the factors listed in 3. (above) necessitates a revision in the utility system's generation expansion plans;

5. whether adding a baseload nuclear plant to the utility system will increase the utility system's required reserve capacity to uneconomic levels; and

6. whether adding a baseload nuclear plant to the utility system will force the state PUC to grant Construction Work in Progress.

With respect to operating cost issues:

1. Whether uranium prices are rising so much faster than the prices of alternative fuels that nuclear plants can no longer offset enough of their higher capital costs with their lower fuel costs to remain competitive with other types of plants; and whether the fuel supply availability is better for nuclear plants than other types of power plants. In this regard, a reversal of the federal government's negative attitude towards fuel reprocessing and breeder reactors would dramatically improve the nuclear fuel supply outlook;

2. whether the proposed nuclear plant has an acceptable operating reliability factor when compared to the operating reliability factors of other types of plants; and whether the utility has made contingent fuel purchase arrangements in case power must be acquired to replace that lost as a result of a power plant outage, and what costs will be borne by the ratepayers under the terms of the utility's purchased power arrangements and purchased power clauses;

3. whether a "crud" clean-up will be required in proposed nuclear plants, and if so, what additional costs will be imposed on ratepayers;

4. what are the utility's plans for disposing of nuclear waste and what projected costs these plans will impose on the ratepayers are;

5. decommission costs, particularly what the utility's decommissioning strategy is and whether it is the optimum decommission strategy when compared to alternative decommission strategies; whether the costs of the optimum decommissioning strategy are large enough to make the nuclear powerplant an imprudent investment; and what procedure should be adopted for funding expected decommissioning costs; and

6. what the effects on the ratepayers of potential tort liability

arising from catastrophic nuclear accidents at any nuclear facility licensed by the NRC will be.

III. PROTECTING RATEPAYERS FROM IMPRUDENT UTILITY INVESTMENTS

The procedures legally available to PUC's for protecting ratepayers from imprudent utility investments are awkward and largely ineffective. The problem stems from the contradictory legal mandate that PUC's protect ratepayers from bearing the burdens of unnecessary utility expenditures without encroaching on the utilities' management function.

A. *The Regulatory Dilemma*

Historically, monitoring demands for electric services within their service areas and planning construction programs to meet them have been considered utility management functions.[103] This permits utilities to acquire, free from PUC regulatory control, the services, materials, and land rights necessary for designing and obtaining regulatory approval of future power plants. It is only when the utility is actually ready to begin physical construction at a chosen plant site that the PUC gains regulatory jurisdiction over the construction project.[104] In some states, including Oklahoma, the PUC has no control over utility construction activities until the utility seeks to have the construction costs reflected in its rates.[105]

Once a utility commission gains jurisdiction over a construction project, it is not permitted to be an armchair quarterback and judge the propriety of the project solely with hindsight. The commission is required to put itself into the place of the utility's managers and determine whether their decisions were reasonable in light of the circumstances prevailing at the time they were made.[106] In other words, the commission must decide whether the utility's managers ac-

103. *See generally* Oklahoma Gas & Electric Co. v. Corporation Comm'n, 543 P.2d 546 (Okla. 1975); Advance Plans for Construction, *supra* note 7, at 34, 42 (Chairman Cicchetti, dissenting); Wisconsin Elec. Power Co., Wis. Pub. Serv. Comm'n Case No. CA-5491 at 8-13 (Oct. 18, 1974); *id.* at 24 (Comm'r Padrutt, concurring in part, dissenting in part).

104. Wisconsin Elec. Power Co., *supra* note 103, at 9-10; People's Counsel v. Public Serv. Comm'n, 259 Md. 409, —, 270 A.2d 105, 108 (1970).

105. Oklahoma Gas & Elec. Co. v. Corporation Comm'n, 543 P.2d 546, 549-52 (Okla. 1975).

106. Wisconsin Tel. Co. v. Public Serv. Comm'n, 232 Wis. 274, —, 287 N.W. 122, 158, 167 (1939); Waukesha Gas & Elec. Co. v. Railroad Comm'n, 181 Wis. 281, 301, 194 N.W. 846, 854 (1923); Wisconsin Elec. Power Co., *supra* note 103, at 25 (Comm'r Padrutt, concurring in part, dissenting in part).

ted as reasonably prudent managers with respect to all expenditures made to further proposed construction projects. Because it is extremely difficult to recreate for present commissioners, possessing knowledge about the current state of technology and the economy, the identical circumstances faced by utility managers at the time they made their decisions, this standard is a hard one to apply.

Obviously, many funds can be spent and committed in furtherance of a utility construction project before it is ever subjected to PUC scrutiny. When capital-intensive projects are involved, such as nuclear plants, the sunk costs can be so astronomical that they render illusory the PUC's ability to protect ratepayers from imprudent investments.[107] If a significant amount of the utility expenditures are found to be imprudent, and therefore not subject to recovery from electric rates, the loss to the utility's shareholders will soon be reflected in the capital markets in the form of higher capital costs, which are imposed on the ratepayer ultimately.[108]

B. *The Wisconsin Solution*

It is difficult to solve the regulatory dilemma of how to protect ratepayers from imprudent investments. If PUC's review every transaction associated with planning, designing, and seeking regulatory approval of a power plant, the resulting delay in constructing the plant could dramatically increase its cost.[109] Moreover, the transactions would be so numerous that the PUC could suffer an administrative breakdown.[110] It is, therefore, not worthwhile to give PUC's approval authority over every pre-construction expenditure.

Wisconsin has developed a workable compromise between illusory control and total control over pre-construction expenditure. By statute, the utilities are required to submit advanced planning programs to the Wisconsin Public Service Commission for its approval.[111] The procedure compels utilities to forecast future coincident and noncoincident demands and future energy usage, and submit system generation construction plans tailored to meet their forecasts.[112] The utilities system

107. *See* Wisconsin Elec. Power Co., *supra* note 43, at 23-24 (Comm'r Parsons, concurring in part, dissenting in part).

108. *Id.*

109. *See* Wisconsin Elec. Power Co., *supra* note 103, at 19, 22 (Chairman Eich, concurring).

110. *Id.* at 11.

111. WIS. STAT. ANN. § 196.491 (West Supp. 1979).

112. *Id.* at § 196.491(2)(a), which provides:

On or before July 1 of each even-numbered year, or such other biennial period as the

generation construction plans must contain discussions of system generation and plant site alternatives, and an analysis of why those selected were superior to the alternatives.[113]

Copies of the utility's advanced plan are submitted to each Wisconsin state regulatory agency which will exercise regulatory authority over proposed construction projects.[114] Copies of the advanced plan are sent also to all affected local governments and are made available

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commission may approve, each electric utility shall file its plan with the commission and with those persons or agencies listed in par. (b). Such plans may be appropriate portions of a single regional plan or may be prepared jointly by 2 or more utilities, and shall:

1. Describe the general location, size and type of facilities which are expected to be owned or operated in whole or in part by such utility and the construction of which is expected to commence during the ensuing 10 years, or such longer period as the commission deems necessary, and shall identify all existing facilities intended to be removed from service during such period or upon completion of such construction;

2. Identify practical alternates to the general location, fuel type and method of generation of the proposed electric generating facilities, and set forth in detail the reasons for selecting the proposed general location, fuel type and method of generation;

3. Identify the location of proposed and alternative specific sites for all bulk electric generating facilities and all large electric generating facilities over 200,000 kilowatts for which a certificate of public convenience and necessity has not been applied for under sub. (3) but the commencement of whose construction is planned within 3 years, or such longer period as the commission deems necessary and indicate the impacts of the proposed and alternative generating facilities on the environment and the means by which potential adverse effects on such values will be avoided or minimized;

3m. Identify the location of tentative and alternative routes for high voltage transmission lines on which construction is intended to be commenced in the succeeding 18 months and indicate the effect of such transmission lines on the environment and the means by which potential adverse effects will be avoided or minimized;

4. Indicate in detail the projected demand for electric energy and the basis for determining the projected demand;

5. Describe the utility's relationship to other utilities and regional associations, power pools and networks;

6. Identify and describe all major research projects and programs which will continue or commence in the succeeding three years and set forth the reasons for selecting specific areas for research;

7. Identify and describe existing and planned programs and policies to discourage inefficient and excessive power use; and

8. Provide any other information required by the commission.

(am) No local ordinance may prohibit or restrict testing activities undertaken by a utility for purposes of preparing advance plans or determining the suitability of a site for the placement of a facility. Any local unit of government objecting to such testing may petition the commission to impose reasonable restrictions on such activity.

In Wisconsin's Public Service Commission's first advance plan order, the Commission stated that "[f]or future advance plans, the commission will require both coincident forecasts for each planning group, and the group's planned response to demand growth which is either higher or lower than forecasted." Advance Plans for Construction, *supra* note 7, at 5.

113. WIS. STAT. ANN. § 196.491(2)(a) (West Supp. 1979) *see* note 112 *supra*.

114. *Id.* at § 196.491(2)(b) (West Supp. 1979) provides:

to the public through the local library.[115] Each affected agency must prepare comments detailing what administrative authority it has over any proposed construction project, what tasks the utility must undertake to obtain the agency's approval of the project, and an assessment of the likelihood that the proposed project will obtain its approval.[116]

The Wisconsin procedure provides many advantages over other procedures for protecting ratepayers from excessive power plant construction costs. First, the procedure forces utilities to consider the merits of several alternative courses of action before they pursue any particular construction plan. Thus, utility managers must adopt decisionmaking mechanisms similar to those which the discipline of competition impose on businesses within competitive industries.

Second, the PUC judges the actions of the utility manager contemporaneously rather than retrospectively years hence. The contemporaneous review should make it easier for commissioners to understand all of the variables available for the utility managers' decisions, and obvi-

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A copy of each advance plan shall, at the time it is filed with the commission, also be filed with each of the following:

1. Department of administration.
2. Department of business development.
3. Department of health and social services.
4. Department of justice.
5. Department of local affairs and development.
6. Department of natural resources.
7. Department of transportation.
8. The director or chairman of each regional planning commission constituted under s. 66.945 which has jurisdiction over any area where a facility is proposed to be located or which requests a copy of such plan.

115. WIS. STAT. ANN. § 196.491(2)(d) (West Supp. 1979) provides:

The commission shall, within 10 days after the plan is filed, send a copy of such plan, or the appliable portion thereof, to the county planner, or, if none exists, to the county cleark of each county affected by the plan, to the main public library of each such county, and to any other county planner, county clerk or public library which requests copies of such plans or portions of plans. The commission shall send a copy of the applicable portion of the plan to the clerk of each municipality and town in which a bulk or large electric generating facility is proposed to be located, and shall notify each public library in such municipality or town that copies of the plan are available upon request.

116. WIS. STAT. ANN. § 196.491(2)(c) (West Supp. 1979) provides:

Those agencies receiving copies under par. (b) shall review the plans and submit their comments to the commission within 180 days after their receipt of the plans. Comments shall include:

1. A description of any statutory permits or approvals required by the agency.
2. A description of the types and forms of information required for adequate review of an application for each permit or approval.
3. A detailed discussion as to the areas in which the plans coordinate with the agency's plans, policies, functions and programs and the areas in which the plans conflict and the significance of such conflicts.
4. To the extent practicable and consistent with its program responsibilities, a discussion of the environmental impacts of the plan.

ate the necessity to identify the relevant variables through the dim light of history.

Third, the Wisconsin procedure does not require the PUC to consider every pre-construction activity the utility will engage in on a piecemeal basis. Only major contracts for pre-construction services or materials must be reported to the commissioner.[117] Once a construction project has been approved, the utility can be confident that pre-construction expenses it incurs will be deemed prudent unless they violate other legal prohibitions.

Fourth, any delay in construction which results from the tasks required in submitting an advanced plan may be offset by reducing the time it takes to surmount other regulatory barriers. This benefit is derived from the requirement that all affected government agencies are to be informed of the plan; and they, in turn, are required to provide information with which to coordinate the policies of all affected regulatory agencies with the construction needs of the utility.[118] The information provided by the affected regulatory agencies can also provide the PUC with an understanding of what expenditures are absolutely necessary for the utility to make before its construction program will clear all mandatory regulatory hurdles.

Finally, and most importantly, the Wisconsin procedure gives PUC's a meaningful opportunity to prevent large sums from being expended on construction projects which are inappropriate in relation to the utility's demand conditions and present generation mix, or which are totally inconsistent with the goals and policies of a regulatory agency with authority to kill the project. This benefit can save the ratepayers or shareholders the millions of dollars in losses that result whenever a nuclear plant is either stopped at the construction or operation stage, or is put into service despite being inappropriate to the needs of the utility's service area.[119]

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117. WIS. STAT. ANN. § 196.491(2)(m) (West Supp. 1979) provides:

> Any major contract relating to a facility for which a certificate of public convenience and necessity has not been applied for under sub. (3), other than a contract relating to acquisition of real property, shall be reported in writing to the commission, indicating the general nature and amount of that commitment, within 30 days after it has been entered into.

118. WIS. STAT. ANN. § 196.491(2)(c) (West Supp. 1979). *See* note 116 *supra*.

119. Recently the Wisconsin Public Service Commission denied a certificate of public convenience and necessity to commence construction of a nuclear powerplant at the Tyrone Energy Park. Northern States Power Co., *supra* note 12, at 17. In his dissenting opinion, Commissioner Oestreicher noted that "[a]fter nine years of planning, development, jumping through regulatory

IV. OKLAHOMA'S RATEPAYER PROTECTION MECHANISMS

Unlike other states, Oklahoma does not require its electric utilities to obtain a certificate of public convenience and necessity before commencing construction of utility facilities.[120] While the Corporation Commission is given broad regulatory jurisdiction over the rates and practices of electric utilities,[121] the legislature declined to establish specifically a construction certificate procedure for electric utilities as it did for other types of utilities regulated by the Corporation Commission.[122] As a consequence, the Oklahoma Supreme Court has ruled:

> The Constitution simply does not confer upon the Corporation Commission, either expressly or by necessary implication, the power to regulate, supervise and control the internal management and control of a public utility *to the extent that it may prohibit the construction of [a] proposed project. . . .*[123]

Similarly, with respect to imprudent non-capital expenditures, the court has stated:

> The powers of the Commission are to regulate, supervise, and control the public service companies in their services and rates, but these powers do not extend to an invasion of the discretion vested in the corporate management. It does not include the power to approve or disapprove contracts about to be entered into nor to approve or veto the expenditures proposed.[124]

The Corporation Commission, however, is not powerless with respect to protecting ratepayers from imprudent investments and expenditures. It may exclude all imprudent costs from the utilities' allowable revenues, thereby preventing these excessive costs from being passed on to the ratepayers. The seminal case in this area is *Lone Star Gas Co. v.*

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hoops and *60 million dollars expended*, the majority is telling the applicants, "Sorry, it's too big". *Id.* at 48 (emphasis added).

120. Oklahoma Gas & Elec. Co. v. Corporation Comm'n, 543 P.2d 546, 549-52 (Okla. 1975). *See* Lone Star Gas Co. v. Corporation Comm'n, 170 Okla. 292, 297-98, 39 P.2d 547, 553-54 (1934) (reh. denied 1934; appeal to file second pet. for reh. denied, 1935).

121. *See* OKLA. CONST. art. 9, § 18; OKLA. STAT., tit. 17 §§ 152 (1971).

122. Oklahoma Gas & Elec. Co. v. Corporation Comm'n, 543 P.2d 546, 548-49 (Okla. 1975). The legislature has conferred upon the Commission the authority to certify the construction of cotton gins, OKLA. STAT., tit. 17, § 43 (1971); water transportation lines, OKLA. STAT., tit. 17, § 159.12 (1971); and radio common carriers, OKLA. STAT., tit. 17, § 202 (1971).

123. Oklahoma Gas & Elec. Co. v. Corporation Comm'n, 543 P.2d 546, 552 (Okla. 1975) (emphasis added).

124. Lone Star Gas Co. v. Corporation Comm'n, 170 Okla. 292, 297, 39 P.2d 547, 553 (1934) *reh. denied* 1934; *appeal to file second pet. for reh. denied*, 1935.

Corporation Commission[125] wherein the court ruled:

> The powers of the Commission, as respects the acts of public service companies, are limited to an investigation of these acts to determine whether or not they have a reasonable and fair effect upon the rights of the public and to take steps to avoid an unreasonable or unfair or prejudicial effect upon the public rights. . . .[126]

As an example, the court cited a Kansas case wherein the utility was prohibited from setting up in its books an expense item over a certain fixed sum for any payments made to a certain individual because the commission had ruled such payments to be excessive. In approving the Kansas commission's handling of the matter, the court stated:

> This was not an attempt to order the distributor not to pay such sums of money, but rather was an order not to charge, as an item of expense, a sum in excess of the figure found to be the reasonable cost of gas. . . . This is a distinction of vital importance in rate making. The rate-making body makes calculations entering into a rate base designed to produce an adequate return. What the company does with its income is of no concern to the rate-making body, so long as a full and complete disclosure thereof is made when called for in order that its effect under all of the circumstances may be judged properly.[127]

In other words, the Corporation Commission cannot stop a utility from making imprudent expenditures, capital or non-capital, but can prevent these expenditures from being passed on to the ratepayers and can thereby impose upon the utilities the burden of their own follies. Thus, it is clear that the Commission can exercise control over imprudent construction projects during revenue and rate-making proceedings, by excluding the costs of such projects from its revenue calculations.

Deferring control over imprudent construction projects until the utility seeks to have them reflected in its allowable revenue may be an illusory mechanism for protecting ratepayers. If the imprudent expenditures are large, as with nuclear plants, imposing the financial burdens on the stockholders may simply drive up the utility's cost of capital, which eventually is passed on to the ratepayers. It is desirable,

125. *Id.*
126. *Id.* at 297, 39 P.2d at 553.
127. *Id.* at 298, 39 P.2d at 554.

therefore, for the Commission to assert its powers to discourage imprudent utility construction before such construction is completed. Court interpretation of the Commission's constitutional and statutory powers affords several alternatives for discouraging imprudent investments before the utility seeks to have them entered into its rate base, including the use of rulemaking to examine categories of expenditures and by rule exclude those found to be inherently imprudent or improper; the use of Oklahoma's utility securities certification procedure to deny a certificate authorizing the issuance of securities to utilities seeking financing of projects found to be imprudent by the Commission; or the use of Construction Work in Progress as an incentive to utilities to comply with an advanced planning procedure like Wisconsin's.

A. *Rulemaking*

In *State v. Oklahoma Gas and Electric Co.*,[128] the Commission had adopted roles which prohibited contributions to charitable, religious, educational, civic, community, social, or public welfare associations, institutions, or organizations, and payments to cities and towns in excess of franchise taxes or charges which utilities must pay pursuant to enforceable written contracts or franchises, from being included in operating expenses. The Commission prohibited the utilities from making expenditures in furtherance of a variety of promotional and advertising practices.

The Oklahoma Supreme Court sustained the Commission with respect to the exclusion of gift expenditures, but reversed the Commission's prohibitions of advertising and promotional expenses.[129] In reversing the Commission's ban on advertising and promotional expenses, the court reiterated its earlier holding in *Lone Star* that the Commission could exclude improper expenses from the rate calculation, but could not prevent utilities from making any expense they were willing to finance without ratepayer contributions.[130] The court also found that some of the promotional expenses complained of were not inherently improper, and therefore had to be judged on their individual merits, not excluded as a class.[131]

The *State v. Oklahoma Gas and Electric Co.* case clearly permits

128. 536 P.2d 887, 891-95 (Okla. 1975).
129. *Id.*
130. *Id.* at 894.
131. *Id.* at 894, 896.

the Commission to consider whether any generic class of expenses is imprudent, and if so, to exclude them as a class from future ratemaking calculations. If the Commission so desires, it can hold hearings to consider whether expenses associated with developing nuclear plants are imprudent and therefore subject to exclusion in whole or in part from the rates of the developing utilities. Nuclear plant development expenditures made prior to the adoption of the rule cannot be subject to exclusion from the developing utilities' rates unless it can be demonstrated that at the time they were made, the developing utilities knew or should have known of the imprudence of nuclear plant development, or unless these sums are otherwise excludable because they are excessive, unwarranted, unreasonable, or were made in bad faith.[132]

This type of rulemaking with respect to nuclear power plants fails to accommodate change in economic and technological conditions. It is, therefore, impossible to state that the development of nuclear power plants will always be an imprudent or improper utility activity like the gift expenditures disapproved in *State v. Oklahoma Gas and Electric Co.* Therefore, utilities which gamble that conditions will change, and develop nuclear plants in spite of the rule excluding such development costs from rate calculations, will have the right to demonstrate in their first rate hearings after their nuclear plants are ready to go into operation that changed conditions now make nuclear plants prudent investments for ratemaking purposes.[133] Moreover, if the power plant is actually put into service, the utility has the right to have at least part of its cost put into the rate base as equipment used and useful.[134]

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132. *Id.* at 896. Wisconsin, however, has recently ruled that the expenses associated with developing a nuclear power plant that was denied regulatory approval could be imposed on the utility, notwithstanding the utility's prudence in incurring such expenses, when such expenses no longer had value to the utility or its customers by virtue of no longer furthering the denied project, or any similar project. Wisconsin Elec. Power Co., *supra* note 43, at 7-9. In his concurring opinion, Chairman Cicchetti offered the rationale that all pre-certification expenses represented risks that companies, regulated or unregulated, must bear in an uncertain world, and that such risks were reflected in the utility's rate of return. *Id.* at 13-14.

133. *See State v. Oklahoma Gas & Elec. Co.*, 536 P.2d 887, 897 (Okla. 1975). This does not mean that rulemaking offers nothing as a methodology for controlling imprudent nuclear powerplant expenses. The Commission might find it inherently inappropriate to ask ratepayers to bear all pre-certification costs of nuclear projects which have been denied regulatory approval. *See* note 132 *supra*. It would be fair to rule as to who should bear the costs arising from nuclear accidents caused by utility operational negligence or mismanagement. In Pennsylvania, the state of utility regulation law apparently will impose significant costs on the ratepayers to clean up the Three Mile Island powerplant and to purchase power to cover the power lost due to Three Mile Island's complete shutdown. Wall St. J., Apr. 6, 1979, at 1, col. 4.

134. Oklahoma Natural Gas Co. v. Corporation Comm'n, 90 Okla. 84, 86, 216 P. 917, 918 (1923).

B. *Certifying the Issuance of Utility Securities*

A more promising procedure for discouraging imprudent utility investments is Oklahoma's procedure requiring utilities to obtain a certificate of authorization from the Corporation Commission before they may issue their securities. The statutory basis for this proceeding states:

> A public utility organized under the laws of this State may, when authorized by order of the Commission, and not otherwise, issue securities when necessary for *the acquisition of property, the construction, extension or improvement of its facilities, or the improvement of its service, or for the discharge or lawful refunding of its obligations, or reimbursement of moneys actually expended from income from any source, or for any other corporate purpose authorized by the Commission.*.[135]

There is no Oklahoma case law interpreting the scope of the Commission's authority to certify utility security issues. The boundaries of the Commission's securities certification powers, however, are suggested by the language of the Public Utilities Holding Company Act,[136] and case law interpretation of similar statutory powers possessed by the Michigan Public Service Commission.[137]

Congress expressed its concern over the necessity for controlling utility holding companies by stating:

> [T]he national public interest, the interest of investors in the securities of holding companies and their subsidiary companies and affiliates, and the interest of consumers of electric energy and natural and manufactured gas, are or may be adversely affected—
>
> (1) when such investors cannot obtain the information necessary to appraise the financial position or earning power of the issuers, because of the absence of uniform standard accounts; when such securities are issued without the approval or consent of the States having jurisdiction over subsidiary public-utility companies; when such securities are issued upon the basis of fictitious or unsound asset values having no fair relation to the sums invested in or the earning capacity of the properties and upon the basis of paper profits from intercompany transactions, or in anticipation of excessive revenues from subsidiary public-utility companies; when such securi-

135. OKLA. STAT., tit. 17, § 184 (1971) (emphasis added).
136. Public Utility Holding Company Act, ch. 687, § 33, 49 Stat. 803, 15 U.S.C. § 79 (1935).
137. *See* note 140 *infra* and accompanying text.

ties are issued by a subsidiary public-utility company under circumstances which subject such company to the burden of supporting an overcapitalized structure and tend to prevent voluntary rate reductions;

(2) when subsidiary public-utility companies are subjected to excessive charges for services, construction work, equipment, and materials, or enter into transactions in which evils result from an absence of arm's-length bargaining or from restraint of free and independent competition; when service, management, construction, and other contracts involve the allocation of charges among subsidiary public-utility companies in different States so as to present problems of regulation which cannot be dealt with effectively by the States;

(3) when control of subsidiary public-utility companies affects the accounting practices and rate, dividend, and other policies of such companies so as to complicate and obstruct State regulation of such companies, or when control of such companies is exerted through disproportionately small investment;

(4) when the growth and extension of holding companies bears no relation to economy of management and operation or the integration and coordination of related operating properties; or

(5) when in any other aspect there is lack of economy of management and operation of public-utility companies or lack of efficiency and adequacy of service rendered by such companies, or lack of effective public regulation, or lack of economies in the raising of capital.[138]

This Congressional declaration recognizes the sensitive relationship between the utility's capital structure and its rates, and how lack of control over the former can destroy regulation of the latter. Specifically, the concern is the prevention of over-capitalization, which can occur whenever the utility uses the proceeds of security issues to make imprudent, excessive, unwarranted, or unreasonable expenditures. Overcapitalization reduces the soundness of the security holder's investment because the company's income may not cover enough capital costs to pay a reasonable dividend. Where utilities are concerned, the security holders are insulated from the overcapitalization problem when PUC's pass on the costs of imprudent investments to the ratepay-

138. 15 U.S.C. § 79a.(b) (1970).

ers, thus assuring that the company has enough income to keep its investors happy. Even when the PUC places the burden of an imprudent investment on the security holders, the ratepayer will still lose if the burden is large enough to have a significant effect on security holders' investments because future investors will regard the company's securities as riskier than before and will demand higher returns on their investments.[139]

In Michigan, which confers upon its Public Service Commission powers to regulate the issuance of utility securities by statutory language almost identical to the Oklahoma Statutes conferring such powers on the Corporation Commission,[140] the courts have recognized the interrelationships of securities regulation and ratepayer protection. In *Michigan Gas Storage Co. v. Michigan Public Service Commission*,[141] the Michigan Supreme Court said:

> [P]roper evaluation of a proposed offering of securities will also affirmatively take into account the interests of the customers of the utilities, the ratepayers, as directed by statute. Proper securities regulation serves the interests of the ratepayers in assuring continued service without interruption from utilities *and in receiving that service at reasonable rates*.[142]

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139. *See* Wisconsin Elec. Power Co., *supra* note 43 at 23-24 (Comm'r Parsons, concurring in part, dissenting in part).

140. MICH. COMP. LAWS ANN. § 460.301 (1979 Supp.) (amending MICH. COMP. LAWS ANN. § 460.301 (1915)). Section 1 provides:

> A corporation or association except a municipal corporation, organized or authorized to do business under the laws of this state, or a lessee or trustee thereof, a person owning, conducting, managing, operating, or controlling a plant or equipment within this state used wholly or in part in the business of transmitting messages by telephone or telegraph, producing or furnishing heat, artificial gas, light, water, or mechanical power to the public, directly or indirectly, a railroad, interurban railroad, or other common carrier, or a corporation, association, or individual exercising or claiming the right to carry or transport natural gas for public use, directly or indirectly, or petroleum oil by or through pipeline or pipelines or engaged in the business of piping or transporting natural gas for public use, directly or indirectly, or engaged in the business of purchasing natural gas for distribution may issue stocks, bonds, notes, or other evidences of indebtedness payable at periods of more than 12 months after the date thereof, when necessary for the acquisition of property, the construction, completion, extension, or improvement of facilities or for the improvement or maintenance of service or for the discharge or lawful refunding of obligations and may issue stock to represent accumulated earnings invested in capital assets and not previously capitalized, if the public service commission issues an order authorizing the issue and the amount thereof, and states that in the opinion of the commission the use of the capital or property to be acquired to be secured by the issue of the stock, bonds, notes, or other evidences of indebtedness, is reasonably required for the purposes of the person, corporation, or association, or that the issue of the stock fairly represents accumulated and undistributed earnings invested in capital assets and not previously capitalized. Approval of securities does not presume that the projects to be constructed or property to be acquired will be included in the company's rate base.

141. 405 Mich. 376, 275 N.W.2d 457 (1979).

142. *Id.* at __, 275 N.W.2d at 462 (emphasis added).

The Michigan Public Service Commission uses its powers to certify utility security issues to inquire into the prudence of the expenditures to be financed from the proceeds. One opinion illustrates the process.[143] In this case, Detroit Edison Company filed an application to issue $513 million in securities, and designated several construction projects which would be financed by the issues. The Commission held hearings on the application to take evidence from several intervenors, including Michigan's Attorney General, on the need for each project. The evidence consisted of demand and load forecasts and the comparative economics of alternative types of powerplants, all for the purpose of determining whether each project was a necessary or prudent investment.[144] Although the Commission granted Detroit Edison's application in its entirety, it did so only after deciding that the record of the hearings established a need for all the projects to be financed by the certified security issues.[145]

The lesson of the Michigan experience, in the context of the traditional purposes of the regulation of utility securities, is that the Oklahoma Corporation Commission can use its securities regulation authority to compel utilities to demonstrate a need for the projects for which they seek outside funding. The Commission should require the utilities to demonstrate a need for each construction project contained in their applications for security issues certification. The proceeding should look into all of the issues previously designated as relevant to the prudence of alternative powerplants.

C. *CWIP Incentives*

The mechanisms suggested here for controlling imprudent utility investments have a major drawback in that the utilities may make large expenditures before the investments are subject to Commission scrutiny. Because the Commission lacks authority to prohibit construction projects, it cannot implement an advanced planning mechanism like Wisconsin's which prohibits development of projects not contained in an approved construction program. The Commission can, however, use its discretion in permitting Construction Work in Progress to confine its allowance solely to utilities which submit and agree to imple-

143. Detroit Edison Co., Mich. Pub. Serv. Comm'n Case No. U-5877 (Apr. 17, 1979).
144. *Id.* at 3-9.
145. *Id.* at 10-14, 16-17.

ment an advanced plan to govern their system generation construction programs. This mechanism should survive legal attack, since the Commission would not be prohibiting the utilities from any construction. If utilities submit advanced plans and then build projects not included in their advanced plans, their rights to Construction Work in Progress could be terminated and the Commission could order a refund of the financial benefits the utilities had already received. Although current ratepayers would initially pay higher capital costs under this mechanism, they would benefit from a program with the potential of preventing imprudent expenditures rather than just excluding them from the utilities' rate calculations.

V. CONCLUSION

Significant issues must be explored before utilities undertake to develop new power plants. Whether the nuclear option is prudent depends upon the conditions faced by the utility at the time it makes its decision. Given the enormous costs involved, it is crucial that public utility commissions develop procedures with which to monitor utilities' construction programs so that ratepayers will not be saddled with the burdens of inefficient or inappropriate electric generation systems.