UNPLANNED ELECTRIC SHUTDOWNS:

ALLOCATING THE BURDEN

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EXECUTIVE SUMMARY

Unplanned shutdowns occur from time to time in the United States. Such an event can be defined as the closure of facilities due to equipment failure, regulatory action, operator error, or an act of God. Operator error in this case includes management error.

A closure can affect generation, transmission, or distribution but need not result in a service interruption (outage). Whether the shutdown results in an outage or not, costs are incurred by the utility, its customers and society. These costs include equipment repairs, purchased power, and inconvenience. In the event of actual outage, costs will be substantially higher. Aside from the above, additional costs will include output losses, utility and governmental costs, as well as various social costs.

In determining the distribution of such costs among the parties involved, the regulator is chiefly concerned with the allocation of utility costs. Thus, this report is primarily concerned with such costs. This emphasis on utility costs is substantiated by an examination of the impact of the New York blackout, the San Juan equipment failure, the Three Mile Island nuclear accident, and the NRC-ordered closure of Surry One. In each instance, output losses and social costs were absorbed by those suffering the loss, covered by insurance, or met by government programs. Utility costs, on the other hand, were generally allocated by the regulatory body based on responsibility for the incident but were tempered by the need to maintain the financial viability of the utility.

It is crucial to maintain financial viability in order to assure the company's ability to provide the legally required adequate and reliable service. The provision of adequate and reliable service is a major obligation placed on a utility in exchange for franchise rights. In order to provide such service, a utility is required to purchase power when its own capacity is insufficient to meet demand, as in the case of an unplanned shutdown.

The regulator, on the other hand, is required (among other things) to set reasonable rates at a level sufficient to assure the financial viability of the utility. In any case, rates may not be set at a confiscatory level. Where property is no longer used and useful, however, it may be removed from the rate base. The resulting rate of return, no matter how onerous to the utility, would be constitutional as long as the risks to be carried by the company have been considered in establishing this rate of return.

It is generally accepted that the party carrying risk is rewarded through the rate of return. In the marketplace, if risk seems so high that potential losses appear too great for the potential reward, the risk can be shifted to those institutions best able to bear it. The regulatory body, as a substitute for the market, strives for the same result. Thus, those who assume risk must be permitted to bear the results, good or bad, and must have the prospect of sufficient earnings to make the assumption of risk worthwhile. Strict adherence to this rule will result in economic efficiency, and optimal efficiency is achieved when total welfare and consumer satisfaction are maximized. This condition is indicated when the distribution of income, as well as that of private and social costs, is perceived to be equitable, and when monopoly conditions are eliminated.

Economic efficiency, however, is only one of several competing goals that must be considered by a regulatory commission. The other goals include equity, adequate and safe service, economic efficiency, and financial viability. In accomplishing the latter, various risk-sharing mechanisms can be utilized. These mechanisms include bankruptcy, insurance, contingency funding, public ownership, debt guarantees, and direct subsidies. Contingency funding is a form of self-insurance.

All of the alternatives listed above, except bankruptcy, can result in adequate and safe service In bankruptcy, the quality of service will probably be lower. Economic efficiency, however, can be increased by most of the mechanisms except debt guarantees and direct subsidies. Debt guarantees cause capital to flow to the guaranteed enterprise in preference to other investment opportunities. Thus, a possible misallocation of economic resources can result. A direct subsidy, by keeping a marginal enterprise afloat with tax dollars, results in decreased economic efficiency. In this regard, it should be noted that insurance puts the burden on those in the business of sharing risk, and those that can do so at a lower cost than the utility. Insurance also internalizes in rates the cost of the risks, such as when an unplanned shutdown occurs, resulting in a "proper" price signal to the consumer. The result is a better allocation of economic resources.

Insofar as the equity goal is concerned, bankruptcy and contingency funding appear to be the most suitable mechanisms. Under these options, those presumed responsible for the problem pay the penalty. The insurance option, on the other hand, avoids the equity question because a third party is paid to carry the risk. The least equitable options are debt guarantees, direct subsidies, and public ownership. These all require the taxpayer to pay the cost of the shutdown. However, the public ownership option could be structured so that the original owners are required to pay an appropriate penalty if at fault or could be left with the debts of the original corporation.

In any case, virtually all of the options can assure the financial stability of the utility except for bankruptcy. The latter could exacerbate the situation by making it difficult for the utility to borrow money and by raising questions regarding the claims of creditors on assets and revenues.

On balance, insurance may be the best method of allocating the costs of unplanned shutdowns. In this regard, property insurance should be carried to the available commercial limit (approximately $300 million). The customer would cover the premium, just as is done now. Unplanned shutdown property costs over the insurance limit could be paid by utility stockholders up to some amount that the regulatory commission establishes as sufficient to encourage operating efficiency. Costs over the limit would be paid for by increased rates. Generally, the consumer would only be called on to pay this segment of cost in the case of a major accident that would threaten the financial viability of the company.

Purchased power costs accruing as a result of fossil and nuclear incidents could also be covered by insurance. In this case, only the incremental cost over the utility's own generation should be included. The policy should be structured to include a suitable deductible amount per incident as an incentive toward operational efficiency. The deductible would be paid by the utility except in the case of an act of God. Presumably, the insurance would have an upper limit. Costs over this ceiling will have to be borne by the ratepayer in order to assure adequate and safe service, as well as the financial viability of the utility.

If insurance is not regarded as suitable by a commission, a more traditional method may be in order. This could be accomplished through the hearing process operating on the principle that those who cause the problem should bear the costs. Where responsibility is difficult to determine, costs could be distributed in rough proportion to the commission's determination of benefits accruing to stockholders, management, and customers.

This method would mean costs from shutdowns caused by acts of God or regulatory orders (except where the utility is responsible) would be paid by the customers. Equipment failure costs, above normal insurance coverage, would be borne by the utility and its stockholders up to the point where financial viability is threatened. At that point, the customer would have to carry the burden.

In general, the responsible party pays the bill up to the point where the provision of adequate and safe service or financial viability is threatened. A narrative summary table displaying the several alternatives for burden sharing as measured against the tests of reliability, efficiency, equity, and financial stability appears as table 7-1 on p. 117 of the text.

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FOREWORD

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The NRRI is making this report available to those concerned with state utility regulatory issues since the subject matter presented here is believed to be of timely interest to regulatory agencies and to others concerned with utility regulation.

Douglas N. Jones
Director

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CHAPTER 1
INTRODUCTION

The recent incident at the Three Mile Island (TMI) nuclear plant emphasized the fact that unplanned shutdowns impose a cost on all the parties involved in electric power production and consumption. TMI is, however, only one of the more dramatic of these incidents. Major shutdowns are not uncommon and can involve both nuclear and fossil generating units, as well as transmission and distribution systems.

In each case, the regulator is called upon to apportion the ensuing costs among the company, its customers, the communities served, labor, investors, and so forth. In doing so, the regulatory body must strike a balance among competing goals such as equity, adequate and reliable service at fair rates, economic efficiency, and maintenance of the financial integrity of the utility. An adequate rationale upon which to base such an apportionment is lacking. The criteria currently used are, at best, little examined and still less understood, as well as unsystematically applied.

This report addresses the problem of unplanned shutdown cost allocation in an effort to clarify the rationale and to develop appropriate criteria. Subjects covered include different types of shutdowns and the magnitude of costs incurred; the regulatory treatment and results of several major shutdowns; the legal and economic concepts and criteria bearing upon the allocation of costs; and an investigation of the various options available to regulators.

CHAPTER 2

ELECTRIC POWER SHUTDOWNS--DEFINITION AND COSTS*

Shutdowns in the U.S.

The U.S. electric system is one of the best in the world in terms of reliability. Despite this, shutdowns do occur as shown in table 2-1. That table deals with first-quarter data only; in most instances, this is the period of most shutdowns. As such, use of data for the quarter is sufficient to illustrate the problem.

TABLE 2-1

BULK POWER SHUTDOWNS BY IMPACT
FIRST QUARTER OF YEARS 1976 TO 1979

Year	Power Outage or Disturbance Resulting In The Following		
	Interruption	Load Reduction	Unusual Hazards**
1976	10	2	2
1977	12	87	6
1978	11	30	5
1979	22	11	5

**Unusual hazards are defined as failures considered a possible detriment to the reliability of the bulk electric energy system, as well as reported major distribution outages and problems. The interruption data reported above deal with system problems that affect more than 100 MW of customer load or one-half of a system's peakload. The load reduction data deal with all voluntary and mandatory load reduction measures.

Source: Bulk Electric Supply System Outages and Load Reduction Measures, 1st Quarter reports, FPC & DOE (ERA), 1976 through 1979

*This chapter prepared by Alvin Kaufman.

The variation in the number of occurrences is due to a variety of factors. For example, the large number of interruptions in 1979 was the result of ice conditions causing transmission difficulties. The large number of load reductions in 1977 resulted from an extraordinary cold wave and consequent unexpected high demand. In most instances, interruptions and load reductions are necessitated by transmission failures rather than by generating problems. A transmission failure, however, may result in a subsequent loss of generation.

It is apparent that unplanned shutdowns have a variety of causes. These can be classified as equipment failures, operator errors, acts of God, and those due to regulatory actions.

In the case of a regulatory action, a unit may be ordered off the line for various reasons such as unsafe conditions. A regulatory action thus differs from a failure because the unit is able to operate but is not permitted to do so by order of a regulatory body. In some cases, the regulatory action is required as a result of design error or some other action by the company or its contractors.

Equipment failures, on the other hand, include generating unit breakdowns and the failure of other mechanical and electrical equipment. Transmission problems due to mechanical difficulties encompass the failure of circuits and associated equipment. No machine, transmission line, or distribution system is 100 percent reliable. Acts of God often occur as a consequence of weather problems. For example, lightning or an ice storm may knock out a line or an entire area.

Operator errors involve a shutdown resulting from incorrect management decisions, as well as actual errors by the operator. These errors can include items such as pushing the wrong button, overloading a line, or failing to shed sufficient load at the right time. An incorrect management decision can involve reducing or eliminating staff at specific generating sites, or reducing maintenance, and so forth.

A shutdown, from whatever cause, can result in an outage, but it need not do so. The electrical system is designed and built to prevent outages. The system is overdesigned so that increments of capacity and transmission are available above and beyond what is required to meet the anticipated peak demand. This redundancy or "reserve" is required to protect against the small but measurable probability that available facilities will be insufficient on a given day to meet the demand placed on the system. Despite this reserve, outages, load shedding, and voltage reductions will be experienced from time to time. A threat to the reliability of the system will occur on still other occasions. In the latter case, service continues and the customer may be unaware there is a problem. The shutdown, however, may necessitate the purchase of energy from other systems at higher cost than the utility's own generation, or require use of relatively high cost equipment such as combustion turbines.[1] The discussion above leads us to define an unplanned shutdown as the closure of facilities due to equipment failure, acts of God, or regulatory action. The shutdown need not result in a service interruption, and includes transmission and distribution as well as generation failure.

The Cost Of a Shutdown

An unplanned shutdown, whether an outage is experienced or not, results in additional costs. These can take the form of direct costs such as equipment repairs and purchased power or indirect costs such as customer inconvenience and output losses. Where the shutdown does not result in an outage, the utility will directly incur the cost of equipment repair and possibly the cost of purchased power, or the cost of using less efficient units to make up the deficiency. Voltage reduction and other load-saving measures, if required, may impose the cost of inconvenience on the consumer.

[1]For a more complete discussion of electric utility reliability see Alvin Kaufman et al., Are the Electric Utilities Goldplated: A Perspective on Electric Utility Reliability, CRS for the Committee on Interstate and Foreign Commerce (Subcommittee on Energy and Power), U.S. House of Representatives, Committee Print 96-IFC-12, April 1979, p. 62.

Costs will be substantially higher in the event of an outage. These include lost or deferred output, utility and governmental costs as well as social costs. The output losses include reduced manufacturing, and commercial and sales production. Wages and other costs incurred for output are encompassed in this value. A substantial portion of these "losses," however, is not actually lost but rather is a deferral of output. That is, a manufacturing plant may suffer a loss of production during an outage, and then operate overtime afterward to make up losses, or a commercial installation may see an initial decline in sales, but do more business than usual after the outage indicating the make up of some of the lost business. In the case of such deferral, losses comprise interest charges on the deferred business.

Output losses suffered outside the impacted area as a result of the outage are also important. For example, a maker of gadgets in another area may require widgets made in the impacted area but be unable to obtain a sufficient quantity due to the electrical outage. As a consequence, the output of gadgets will decline temporarily.

In addition, some busineses from the impacted area may move outside the area temporarily. For example, a stock purchase not possible in New York City due to an outage, might be made in Chicago. Such a transfer will constitute a cost to the region, but not to the nation. From the national viewpoint, it makes little difference whether the purchase is made in New York or Chicago.

Aside from the output losses, the utility will also incur costs. These include lost revenue, the cost of restoring service, the replacement and repair of damaged equipment, and purchased power. Governmental bodies will incur costs such as reduced sales tax and other tax collections, overtime, and injury compensation for police and firemen.

These costs can be compounded by the large number of social costs that can accrue. These social costs may include riots with resulting damage, stolen goods, and arrest costs, as well as environmental damage and evacuation expenses. In addition, there can be food spoilage and disruption expenses.

Shutdowns may also involve regulatory costs. These are future costs that result from more stringent oversight occasioned by the shutdown. These costs can also include mandated changes in plant design to improve safety or to avoid future shutdowns.[2]

A Survey of Major Shutdown Costs

The quantification of shutdown costs is difficult, particularly where indirect costs are significant. As a consequence, published estimates of shutdown costs tend to be limited to the larger blackouts. More limited outages create lower costs, and the costs from these, as well as from shutdowns not resulting in outages, have generally tended to be less controversial. This may well change because purchased power costs will increase as fuel costs continue to climb. As a consequence, the allocation of shutdown costs may become a matter of considerable concern regardless of outage size.

In any case, there are three different cost methods currently used to estimate shutdown costs. In the first, the estimate is based on an average value for output per kWh lost. In some instances, value added in manufacturing or personal income is used to derive a value for output per kWh. These estimates tend to assume losses are proportional to energy not served regardless of the size and timing of an outage. Smaller outages, of course, may impose a smaller unit cost. Further, these studies largely ignore capital and nonmonetary losses, as well as indirect costs. Thus, these deal exclusively with loss of income or output.

The second type of methodology is based on a series of customer surveys. The most widely known of these are by Ontario Hydro. The surveys cover industrial, commercial, residential, institutional, and retail trade and service customers. These reports indicate that costs increase as outage duration increases. Despite this, industrial customers stated a preference for longer, less frequent interruptions rather than for

[2]R. J. Profozich, Alvin Kaufman, and S. J. Bodilly, Three Mile Island: Regulatory Implications for Ratemakers and Ratepayers, CRS, 9/5/79, Report 79-192E, p. 26.

frequent, short outages totaling the same duration. Residential customers, on the other hand, preferred more frequent but shorter outages. Retail trade and service organizations expressed a similar desire. Cost estimates varied from less than $1.00 to approximately $4.00 per kW of peakload for a one hour outage, and between $7.00 and $28.00 for an eight hour outage.[3]

The third method is an effort to evaluate outage costs for a specific event, and this method has the greatest bearing on the question of risk allocation resulting from a shutdown. Therefore, we will discuss four specific studies in some detail. In doing so, our concern is with the total cost and its distribution, rather than with the specific method used to array the costs.

The two major examples are evaluations of the 1977 New York City outage and the Three Mile Island accident. The New York outage occurred on July 13, 1977. Service was interrupted for some 8 million people in New York City and Westchester County for up to 25 hours. Losses were incurred by the economy in terms of lost output, damage to equipment and spoilage, as well as in terms of inconvenience and frustration. In this particular case, the economic losses were compounded by rioting, looting, and pillage.

In view of the widespread impact of the blackout, and the large number of people affected, a number of investigations were launched. Most of these dealt with the causes of the outage, but at least two studies attempted to assess the costs. Corwin and Miles computed a total impact cost of close to $346 million, while Kaufman and Daly estimated the losses were approximately $310 million (table 2-2).

It will be noted that although the totals for the two studies are relatively close, the cost distribution is different. This results from the different treatment of the costs of riot damage and the costs of improving the Consolidated Edison Company system to avoid future blackouts.

[3]See appendix A for a list of pertinent studies.

Corwin and Miles classified riot damage as an indirect business impact and counted the capital costs of future improvements in the system as an indirect cost. Kaufman and Daly, on the other hand, classified riot damage as a social cost and did not include future costs in their estimates.

In contrast to the New York City blackout, the Three Mile Island accident imposed substantial utility costs and might have resulted in catastrophic social costs. The shutdown occurred on March 28, 1979, near Harrisburg, Pennsylvania. Some 13 days passed before the emergency was considered over. During this time, pregnant women and preschool children were evacuated, schools and airports were closed, and normal activities within the area were in a state of limbo.

TABLE 2-2

SUMMARY OF IMPACTS, NEW YORK CITY BLACKOUT
JULY 13-14, 1977

TABLE 2-2A

ESTIMATES BY SYSTEMS CONTROL, INC.

Impact Area	Direct Impacts	Indirect Impacts
	(millions)	
Business	$34	$160.4
Consolidated Edison	12	65.0
Government	--	12.5
Insurance	--	33.5
Public Health Services	--	1.5
Other Public Services	9.1	17.3
Westchester County	0.4	--
Total	$55.5	$290.2
GRAND TOTAL		$345.7

Source: Jane L. Corwin and William T. Miles, Impact Assessment of the 1977 New York City Blackout, Systems Control, Inc., July 1978

TABLE 2-2B

ESTIMATES BY CONGRESSIONAL RESEARCH SERVICE

		Millions
Social Costs		
Riot Damage		$120.0
Government Costs		16.8
	Total	$136.8
Economic Costs		
Output		$ 49.4
Utility		20.0
Government		19.8
Spoilage and Damage		10.0
National		73.5
	Total	$172.7

Source: Alvin Kaufman and Barbara Daly, The Cost of an Urban Blackout: The Consolidated Edison Blackout, July 13-14, 1977, CRS for the Committee on Interstate and Foreign Commerce, U.S. House of Representatives, June 1978, Print 95-54

The extensive damage to the nuclear reactor and the need to purchase energy over an extended period of time resulted in utility costs substantially greater than those of the New York blackout. Social costs are unknown at this time. Table 2-3 shows a summary of the Three Mile Island costs, insofar as these are known.

Regulatory costs resulting from the TMI incident are still unknown. It appears that these costs will be high, as licensing and safety requirements are revised to implement the lessons learned. Aside from the increased costs imposed by the possible need to retrofit old plants to meet new regulations, a substantial cost has already been imposed on the economy by the suspension of licensing activity throughout the U.S. by the Nuclear Regulatory Commission. This suspension had been implemented pending review

TABLE 2-3

SUMMARY OF COSTS, THREE MILE ISLAND ACCIDENT

MARCH 28, 1979

	Millions
Utility Costs	
Accident Control	$140
Cleanup and Repair	430*
Purchased Power	150**
Regulatory Costs	Unknown
Social Costs***	1
Total	$721

Source: Profozich et al., op. cit., pp. 5-7, 20

*Latest estimate for cleanup and repair is $850 million to $1.5 billion.

**Assumes Unit 1 will be out of service for one year and Unit 2 for four years. Cost covers the differential between TMI-produced energy and purchased power.

***Evacuation expenses only. Full costs are unknown.

of the regulations. As a result, the use of newly completed units was delayed. Consequently, society incurred costs for purchased power plus interest and rate-of-return charges on a facility not permitted to operate.

Aside from the above studies, a recent report presents what appears to be a combination of the customer survey and specific outage methods.[4] The report estimates shortage costs for a shortage in Key West, Florida, between July 28 and August 22, 1978. During this 26-day period, each feeder was disconnected about 6 percent of the time. In estimating the shortage cost, the measure used was the cost per kWh curtailed based on the willingness to pay to avoid the shortage. On this basis, the cost was estimated at $2.30/kWh for the nonresidential sector and $0.05 for the residential sector. The total cost of the shortage was estimated at $18.9 million compared with reduced electric system revenues of $315 thousand during the brownouts.

It should be noted that the Key West estimates presented above differ in concept from those discussed earlier. The New York and TMI estimates were developed as costs incurred as a result of a specific outage. The Key West estimates, on the other hand, were developed as willingness to pay to avoid shortages. As such, both shortage impact and shortage-coping costs are included. The impact costs are similar to outage costs, but the coping costs are those amortized over more than one shortage. For example, a utility customer installing a standby diesel unit for use during a shortage would be incurring a coping cost. Thus, shortage costs are those relating to the impacts of a shortage plus the costs customers incur to avoid those impacts. The latter item implies a presumption that there will be more than one shortage that the customer must guard against, or that a shortage will last for an extended period of time.

Shutdown costs, on the other hand, are costs incurred as the result of a discrete incident and may or may not include an outage. The shortage cost concept may be useful in developing overall governmental policy and in evaluating reliability criteria, but it is of limited usefulness in the

[4]Jack Faucett Associates, Power Shortage Costs and Efforts to Minimize: An Example, ERRI, EA-1241, December 1979, p. 27 plus appendixes.

context of shutdown cost allocation. In that case, a state regulatory body has a limited legal ability to allocate costs not related to the utility and is usually constrained to deal with costs actually incurred rather than with a less definite "willingness to pay." As a consequence, this report deals with shutdown costs rather than shortage costs.

Shutdown Costs and Regulation

From the foregoing discussion, it is apparent that shutdown costs will vary according to the type of shutdown, the location, the makeup of the economy, and other localized factors. In short, shutdown costs are specific to a particular event, and generalization is difficult. Despite this, however, it is apparent from the estimates presented above that such costs can be very substantial. As a consequence, the allocation of shutdown costs is critical.

In this regard, it is useful to turn to an examination of how the regulator apportions these costs, and which costs attract the bulk of regulatory attention.

CHAPTER 3

SOME RECENT SHUTDOWNS (CASE STUDIES)*

Unplanned shutdowns, as noted earlier, result from four major causes. These are equipment failure, operator error, acts of God, and regulatory requirements. We have selected four relatively recent examples in order to illustrate the types of shutdowns and the manner in which the regulators allocate the resulting costs. These include the New York City blackout of 1977, the San Juan Unit equipment failure, the Three Mile Island nuclear accident, and the Nuclear Regulatory Commission (NRC) ordered shutdown of Virginia Electric Power Company (VEPCO) nuclear units. The chosen cases vary by cause, plant type, scope and variety of impacts, geographic area, and in the allocation of costs by the regulator. These examples are illustrative. However, considering the number of outages that occur each year, our illustrations do not cover the wide range of shutdown causes or cost allocations. The four cases do highlight the issues that must be considered and resolved by the various regulatory bodies.

It should be noted that shutdown causes tend to cascade. That is, an act of God such as lightning striking and knocking out a transmission line, as in the New York City case, may be compounded by operator error or the failure of other equipment. For the purposes of this study, in order to simplify the classification process, the initial cause of the shutdown is taken as the cause. In other words, in our example a few lines earlier, the act of God would be classified as the cause despite the follow-on difficulties. Further, the actual shutdown cause is used as the reason for shutdown. For example, if a design error was made but the unit operated until shutdown by regulatory action, the latter would be considered as the cause rather than the design error.

*This chapter prepared by Susan J. Bodilly and Alvin Kaufman.

The Consolidated Edison outage of 1977 was chosen because of the many types of impacts that were associated with this shutdown, particularly the extensive social costs. The Virginia Electric Power Company (VEPCO) closure of Surry Unit One is a specific example of a regulatory shutdown and demonstrates one method of allocating increased fuel costs. The explosion at Public Service Company of New Mexico's (PNM) San Juan Unit Two in 1977 also illustrates the allocation of fuel costs. The shutdown had a different cause from that of the VEPCO case, and the New Mexico Commission used a different set of criteria. The final case explored is the accident at Three Mile Island (TMI). Many of the regulatory decisions have yet to be made, and the case is complex because of the four regulatory jurisdictions involved--Pennsylvania, New Jersey, NRC and FERC; however, the TMI shutdown is an excellent example of widespread social and economic costs, coupled to a precarious financial condition for the utilities. The regulator is thus presented with the need to balance a near-term cost allocation and the long-run interests of the customers. The essentials of each case are presented in table 3-1.

New York City Blackout

The blackout began with a severe lightning storm to the north of the city and ended with the total shutdown of the Con Ed system within 1 hour. Power was not restored to the full system for 25 hours. Thus, New York City and Westchester County were without power for up to 1 full day.[1]

At the time of the blackout the system was importing 2,000 MW of power, including 870 MW from Indian Point Three, a nuclear plant north of the city. Con Ed had reported extra capacity of 1,344 MW for that night, primarily combustion turbines located within the city proper. All interties were in service except the Hudson-Farragut connection to the Pennsylvania-Maryland-New Jersey Power Pool. The latter was awaiting parts prior to repair.

[1]Accounts of the blackout have been taken from two sources: Kaufman and Daly, op. cit.; and Electrical World, "Con Ed Seeks Light, Less Heat on System Blackout", August 15, 1977, p. 25.

TABLE 3-1

SALIENT DATA, UNPLANNED SHUTDOWN CASE STUDIES

Item	N.Y.C. Blackout	San Juan	TMI	Surry One
Owners	Consolidated Edison	50% Public Service of N.M. 50% Tucson Gas & Electric	General Public Utility Co. & its subsidiaries Met. Ed., Jersey Central P & L, & Penna. Elect.	VEPCO
Operator	Same	PNM	Met. Ed.	Same
Date	July 13-14, 1977	July 7, 1977	March 28, 1979	March 13, 1979
Duration	25 hours	12 months	Unknown	6 months
Capacity Impacted	Systemwide	670 MW	792 MW	822 MW
Plant Type	Systemwide	Fossil	Nuclear	Nuclear
Location	New York City - Westchester	Fruitland, New Mexico	Harrisburg, Pennsylvania	Gravel Neck, Pennsylvania
Incident Cause	Lightning strike transmission	Explosion in boiler	Pump failure	NRC order
Area Impacted	NYC & Westchester County (11 million people)	N.M. & Arizona	Pennsylvania & N.J.	Virginia, West Virginia, & North Carolina
Outage	Yes	No	No	No
Major Issues	Allocation of outage costs	Allocation of fuel and purchased power costs	Allocation of utility, fuel, and social costs	Allocation of fuel and purchased power costs
Jurisdiction	New York PSC FPC (FERC)	New Mexico PSC Arizona PSC	Pennsylvania PUC New Jersey PUC FERC NRC	Virginia SCC NRC

At approximately 8:30 p.m., lightning knocked out transmission facilities at Milkwood West and Buchanan South substations. This caused an automatic shutdown of the Indian Point Three generating station. Faulty equipment then resulted in failed transmission between Buchanan South and Ladentown. Transmission between Milkwood, Buchanan, and Sprainbrook went down at 9:00 p.m. due to another lightning strike. The Pleasant Valley lines then tripped out for unknown reasons and Con Ed reduced the voltage on the system by 8 percent blacking out portions of Westchester County. Several combustion turbines were turned on, although eight were not. These efforts did not stabilize the system. To save the intertie to LILCO from overload damage, this connection was cut. At this point one intertie remained open (Public Service Electric and Gas), but it was carrying 150 percent of emergency capacity. As a consequence, the overloaded line faulted and Con Edison was left on its own.

Rapid load shedding followed, but it was not possible to save the system. As a result of instability, the last two remaining generating plants shut down causing a systemwide blackout.

Attempts to revive the system were instituted. Initial attempts to pick up large loads, however, failed. The system was finally restored, piece by piece, over a 25-hour period. The effort was hampered by loss of cooling fluid pressure in the underground distribution system, by poor communications, and the failure of certain equipment.

Inquiry into the blackout was immediate. Several commissions were formed to study the failure and institute practices to prevent further occurrences. The consensus was that initial failure was due to lightning strikes, although some contended that better-testing practices could have avoided the failure; second, there was excessive equipment failure, possibly due to poor-testing procedures; third, due to improvements in load shedding and shutdowns instituted after the 1965 blackout, equipment may have shut down too easily; fourth, Con Ed did not have operators on duty at several combustion turbine sites, nor were these units equipped with automatic relay switches for starting; fifth, earlier load shedding on the part

of Con Ed could have prevented the total shutdown; sixth, better contingency planning could have prevented the accident.[2]

The Impacts

The blackout directly affected some 11 million people. Compared to the 1965 blackout that darkened the entire Northeast, the number of people affected was small. The costs associated with the 1977 blackout, however, appear more severe due to the rioting and looting that broke out when the city went dark.

As reviewed earlier, the costs associated with the blackout have been estimated in several studies. The impacts received widespread attention due to the extent of social disorder. The area was declared a disaster area by the state government. Utility costs, in this instance, did not include purchased power or supplemental charges because no power was available to the system. Equipment damage was confined mainly to transformers and cables. No excessive plant damage occurred. To prevent a future occurrence Con Ed was required to install certain equipment and institute certain procedures. Whether these costs should be included as part of the blackout costs or regarded as normal managerial prevention procedures is open to argument. In addition, most business activity halted for the day of July 18 except in Westchester County where power was restored earlier. National impacts were large compared to those which might have occurred in another area because New York is the business center of the nation. For instance, many national television shows were cancelled and businesses reliant on New York suppliers suffered production delays.

These impacts, however, were overshadowed by those imposed by rioting and looting. Riot losses can be measured by the amount of damage claims filed with the Small Business Administration, the insurance industry, and the Emergency Aid Commission. Approximately 55 percent of the damage occurred in Brooklyn, 25 percent in the Bronx, and 18 percent in Manhattan. Queens, Staten Island, and Westchester County escaped major damage.

[2]Carolyn Brancato, "Where Will You Be When the Lights Go Out This Summer?", New York Times, July 17, 1978, p. 29.

In addition, the government was called on to control the looting, fires, and rioting. Aside from emergency services, large numbers of people were arrested. The city was also called upon to pay for repair and clean-up of public facilities. With the closing of sewage treatment plants, untreated sewage would have been dumped into the rivers and the oceans. Contrasted to this, air pollution may have been lessened, since few cars were on the road and most industrial plants were closed. Added to all the above was the individual fear, inconvenience, and disruption felt by the population of the area.

Regulatory Decisions

The allocation of costs was accomplished largely in an automatic manner. The Public Service Commission was saved from any major decisions in this area by Con Edison's announcement that it would not try to recover, through rates, any of the utility costs related to the blackout. Of the $5.7 million in lost revenues, plus $10.0 million in repair and replacement costs, the company apparently recovered $7.7 million from insurance and salvage credits.[3] The remaining $8 million was absorbed by the utility.

Social costs were largely recovered through insurance and state and federal assistance programs. The area was declared a disaster area by the state, but not by the federal government. Nevertheless, substantial funds were available through the Small Business Administration. Additional money was raised throughout the summer for cleanup activities, funded largely through youth employment programs.

In addition, Con Ed was faced with several major law suits and a plethora of minor ones, predominantly claims for spoilage and lost pay. It refused to honor any of these claims, and court suits were filed. The outcomes of the numerous cases are unknown.

Thus, the major costs of this blackout were absorbed by the company or paid for through insurance and government programs. Those businesses

[3]New York Blackout of July 13, 1977: Costs and Preventive Action, Hearing before the Subcommittee on Energy and Power of the Committee on Interstate and Foreign Commerce, 95th Cong., 2d sess. July 10, 1978, pp. 21, 22, 23.

suffering output losses were required to bear them as a cost of doing business.

San Juan Unit Two

On July 7, 1977, an explosion occurred in the San Juan Unit Two boiler fuel box.[4] The unit is owned jointly by Public Service of New Mexico and Tucson Gas and Electric companies. The boiler is as large as a 28-story building and suffered damage in the explosion and resulting fire. As a result of quick management response, the customers of the utilities did not suffer a blackout or loss of power. The direct result of the explosion was the damage and shutdown of the plant for approximately one year while repairs were made. The plant was restored to operation in May 1978 in time for the summer peakload.

The New Mexico Public Service Commission ordered investigations to determine the cause of the explosions, but no fault was found with the utility. The cause of the explosion remains unclear.

The costs associated with the accident are straightforward: the cost of repair, and the cost of purchased fuel and power. The repair costs amounted to $17.8 million for each of the utilities. The insurance carried by Public Service of New Mexico covered the full cost of the repairs except for a deductible of $100,000 to $250,000 depending on the final cause of the accident. Purchased fuel and power costs incurred as a result of the accident are not available.

Regulatory Decisions

The San Juan Unit is under the jurisdiction of two states, New Mexico and Arizona. We will concentrate here on the actions of the Public Service Commission of New Mexico.[5]

[4]Based on an interview with Mr. Gallen Bryant, Public Service Co. of New Mexico, 5/1/80.

[5]From Case No. 1379 files.

There was little dispute over the allocation of repair costs, since these were covered by insurance. Insurance premiums are allowed costs for the utility to pass onto ratepayers. Thus, through prepayment of insurance, ratepayers actually paid for the repairs. The main point of contention was the allocation of the cost of purchased fuel and power and the proper pricing of this energy to the consumer.

The commission allowed an immediate pass through of the additional purchased fuel and power costs, as estimated by the company, until hearings could be held to determine fault or to develop a better method of cost allocation. The attorney general asked for a rehearing and clarification of the initial decision to determine whether provisions for possible refunds due to overcollection should be included in the initial pass through. The commission clarified its opinion to allow for strict accounting of the charges passed through to the customer and to allow for refunds in case of overcollection or a finding of fault with the company. The company was later ordered to submit its proposal for the pass through.

The commission then held hearings on two issues: first, the proper method for estimating the costs; second, whether the company should be allowed to recover those costs.

Public Service of New Mexico used several assumptions to develop the fuel cost estimates. First, the company used an operating history of the San Juan plant to develop a simulation of what the plant's performance would have been without the explosion. Second, it used a system of "economic dispatch in reverse" with three exceptions. Three low cost sources of power were available to the company under previous arrangement if an incident such as the explosion occurred. The company asked that these power sources be ranked as primary sources to be used before the "economic dispatch in reverse" system. Third, the company assumed that all normal system operating rules were in existence. Fourth, it added several variables to the power output estimates for which no historic data were available; for instance, it added outages due to pollution equipment shutdown to the overall down time for the unit. Fifth, the company did not

include in its estimate of losses to the ratepayer any surplus power sales from San Juan Two not made because of the shutdown.

The attorney general objected to the second, fourth, and fifth assumptions. The first and third assumptions were approved without exception by the commission. After argument, the commission ruled that the low cost sources of supply should be included before the economic dispatch in reverse system. The commission agreed with the company that its contracts made it clear that these would be available to it, and that the benefit of this low cost power should be accounted for. The commission did not uphold the addition of factors for which no data were available (fourth assumption). Calculations had to be made according to data that actually existed. The commission did, however, make future provision for inclusion of these factors when historic data became available. On the final point (fifth assumption), the commission ruled that the company had enough data to estimate the amount of sales that would have been made and noted that historically the plant had provided consumer benefits in terms of surplus sales through both the cost-of-service index and the fuel adjustment clause. The commission ruled that since these sales would normally have taken place and could be estimated by the company such items should be included in the cost to the consumer, or alternatively, a credit should be deducted from the dispatch in reverse estimations.

The commission then considered whether the company should continue to be allowed to recover the costs of the accident through the fuel adjustment clause. Intervenors claimed that normal ratemaking procedures would be a better way to recover the costs, after responsibility and actual costs had been decided. The commission noted that fuel and purchased power costs recovered by the adjustment clause were provided for by law, and that no fault had been found on the part of the operators. It did, however, find several problems with using the automatic pass through, since it did not give incentive to the company to (1) determine liability, (2) lessen the amount of incremental costs, and (3) make timely repairs to the boiler. The commission wanted to provide a regulatory incentive to the company to proceed with the above. On April 12, 1978, it allowed no further pass through of the fuel charges. The charges already collected could be

kept subject to refund. Further charges could not be collected automatically, but the company was ordered to maintain a record. These charges would be collected through a normalized or amortized charge levied after repairs to the plant were completed. San Juan Two was back on line in one month following the decision.

Three Mile Island Nuclear Accident

On Wednesday, March 28, 1979, at 4:00 a.m., a pump trip out occurred at Three Mile Island Unit Two that through a series of further equipment failures, inappropriate procedures, and operator error led to what is now known as the worst nuclear accident in the history of civilian application of nuclear power in the United States. Several of the reports of investigation have presented detailed accounts of the accident, therefore, these details will not be repeated here.[6] Suffice it to say, a "site emergency" was declared at 7:00 a.m., followed by a declaration of a general emergency three-quarters of an hour later.

Environmental monitors near Three Mile Island showed normal levels of radiation until about 9:20 a.m. when low levels of iodine-131 were mistakenly reported. By noon, all levels of government had representatives on-site, and specialists had been called in to help control the accident. During the afternoon, radiation levels in nearby Middletown began to increase from under 1 millirem per hour to up to 2 millirems per hour. It was later determined that radioactive materials from the plant escaped into the air between 11:00 a.m. and 1:30 p.m.

Throughout Thursday, March 29, the situation remained under control. Slightly radioactive water and air were emitted from the plant, but within the limits set by the NRC.

On Friday, March 30, further releases of radioactive material prompted the governor of Pennsylvania to ask all people within 10 miles of the plant to stay inside. Shortly after 12:30 p.m., the governor issued an advisory statement suggesting that all pregnant women and preschool children

[6]Report of the President's Commission on the Accident at Three Mile Island, October 1979, Washington, D.C., pp. 110-55.

within 5 miles of the plant leave the region. All schools in the area were closed. Preparations began for further evacuations. Fear was expressed that a hydrogen bubble in the reactor might ignite and explode, sending radioactivity into the environment.

By Monday, the NRC decided that there was no danger from the bubble, and President Carter visited the site to help restore public confidence. Emergency preparations slowed, and life in nearby communities began to return to normal. Aside from some releases of radioactivity, damage from the accident was confined to the plant.

Subsequent investigations indicated the responsibility for the accident lay with equipment failure, inadequate operator training, poor design of control equipment, and operator error. Commissions, such as that chaired by Kemeny, have issued findings that indicate responsibility also lay with poor management by the NRC and with the attitude of the industry toward nuclear safety.[7] The resulting costs have been discussed in an earlier section. It is enough to say that costs were also incurred by the state and federal governments during the course of the accident. The costs of regaining control over the reactor and of reducing the hazards were in part carried at the state and federal level. The expert teams sent by various agencies, the communication systems, and the costs of producing medicines for use against radioactive poisoning and of evacuation preparation all fell on the different levels of government.

The Impacts

Aside from the economic costs, social costs from the accident are widespread. They consist of impacts on the residents and businesses of the area, financial impacts on the utility and nuclear industry, and various national impacts.

Damage to property, health, life, or business is difficult to quantify. Like the Con Edison blackout, businesses, schools, tourism, and

[7]Ibid., pp. 10, 11, 19-21, 27-58.

public functions stopped during the days of the emergency. It may be that in some cases permanent movement away from the site occurred. A report commissioned by General Public Utility Company estimated the social and economic losses from the accident at $9 million.[8] Losses due to interrupted local production and lost local incomes were conspicuous during the first week following the accident but tapered off thereafter. The report found that few area residents who considered moving from the area during the accident actually did so permanently. Few "for sale" signs are noticeable, and the real estate market does not seem to have suffered.[9] This conclusion appears to be confirmed by another study. Stocker and Cohen found no appreciable effect on real estate values in the short term.[10]

Insofar as health effects are concerned, the (then) Department of Health, Education and Welfare estimated minimal physical health effects from the accident. The Kemeny Commission concurred.[11]

According to other sources, however, residents have suffered mental stress as a result of the accident and subsequent cleanup operations.[12] At least 14 different studies have found that the major health effect of the accident has been increased mental stress. Some reports found the stress to be transient, decreasing after the initial accident. New data,

[8]"Economic Effects of TMI Evaluated," Nuclear Industry, March, 1980, p. 15.

[9]Michael E. Blake "Three Mile Island One Year Later: GPU Perseveres, But to What Future," Nuclear News, March 1980, p. 51.

[10]Frederick D. Stocker, and Howard Cohen, "The Property Tax Implications of Three Mile Island," Seventy-Second Annual Conference on Taxation Oklahoma City, Okla., October 30, 1979. Also see: Attiat F. Ott, "Utility Accidents: Economic Impact and Tax Implications," tax conference as above.

[11]Nuclear Information, Atomic Industrial Forum, Inc.,No. 57 November 1979, p. 2.

[12]Ben Franklin, "Researchers Finding Anxiety in the Air Near Three Mile Island," New York Times, March 27, 1980, p. A20.

however, indicate that the mental health effects may be long lived and recurring.[13]

Financial impacts from the accident have fallen mainly on the utilities and ratepayers involved, but the nuclear industry as a whole has felt some financial strain as a result. During the first six months following the accident, utility stock prices dropped 4.9 percent relative to Standard and Poor's index of 400 industrial stocks. By mid-June, much of this loss was regained. The decline was felt to be a result of TMI. Furthermore, some utilities have noted recent increases in borrowing rates believed to be related to Three Mile Island and subsequent regulatory uncertainties.[14]

American Nuclear Insurers announced lower than normal premium credits.[15] In 1979, the credit was 29.5 percent; in 1980, credit was 2.4 percent. These figures apply to all new and renewal property insurance policies for nuclear facilities written on or before March 1, 1980. The reduction in premium credits was occasioned by losses resulting from TMI.

The financial impacts on General Public Utilities and its subsidiaries have of course been more severe. In part, this is due to state regulatory decisions barring the downed TMI plant from inclusion in the rate base in both of the states immediately involved. Neither commission has allowed full pass through of fuel adjustment charges until recently. Thus, the utilities involved must pay the financial costs of carrying the plant on the books and some of the fuel charges. A FERC administrative law judge

[13]Ben Franklin, "Long Distress Found over Atom Accident," New York Times, April 18, 1980, p. A18; and Public Utilities Fortnightly, "Financial News and Comment," July 19, 1979, p. 35.

[14]"Finance," Electrical World, April 1, 1980, p. 9.

[15]"Nuclear Insurance Premium Reduced," Public Utilities Fortnightly, March 27, 1980, p. 43.

has ruled that Metropolitan Edison Company could keep TMI Unit 2 in the rate base for federal ratemaking purposes until further investigation.[16] As a result, GPU stock prices declined from $17 per share in February 1979 to approximately $5 in August 1980. This decline represented a drop in market-to-book ratio from 76 percent in February 1979 to 22 percent in August 1980.

GPU has made several announcements about its precarious financial position and has proposed methods to strengthen it. In November 1979, GPU announced that its net earnings had declined 23.1 percent in the first 10 months of 1979. GPU was forced to cut dividends in 1979 and is not paying any as of July 1980.[21] It has further announced its intention to combine some of the operations of its subsidiaries in order to reduce costs.[18]

The customer has also been penalized. The GPU companies have been granted $570 million in annual rate increases since the accident, resulting in a 30 percent rise in retail rates. Of this amount, 62 percent is the result of TMI replacement power costs; the remainder relates to oil price increases and inflation.

The national impacts of the accident include such intangibles as regulatory reform of the NRC, the slowdown in nuclear power plant construction, and impacts on national self-perception and energy supply security. The NRC-ordered moratorium, the slowdown in nuclear construction, and adverse public reaction have added significantly to the costs of new nuclear construction.[19]

[16]Public Power Weekly Newsletter, July 23, 1979.

[17]Claire Reckert, "TMI Utility Shows Drop in Net," New York Times, November 29, 1979, p. D4.

[18]Anthony Parsi, "Three Mile Island Shaky Utility," New York Times, March 28, 1980, p. D1.

[19]See Charles Studness, "Utilities Capital in Aftermath of Three Mile Island," Public Utilities Fortnightly, March 13, 1980, p. 36; and "No Reactors Sold: More Cancellations," Electrical World, January 15, 1980.

Regulatory Decisions

Several regulatory agencies are involved in the TMI accident. These include the NRC and FERC at the federal level and the two state utility commissions on the state level.

The two state commissions have already issued several decisions concerning the allocation of the utility costs of the accident. On June 15, 1979, the Pennsylvania Public Utility Commission (PPUC) reached a decision to remove the damaged TMI reactor from the company's rate base [20] but permitted the pass through of 85 percent of the purchased power costs needed to replace the power from the downed plant for an 18-month period beginning July 1, 1979. According to the PPUC, permitting only an 85 percent pass through provides an incentive to the utilities to purchase from the most economic sources over the long term and encourages conservation policies. Removing the plant from the company's rate base assures that the customer, who was faultless in the accident, does not pay the full costs associated with the shutdown. The PPUC did not imply that fault lay with the company. It stated that the customer was faultless, so should not have to pay. The commission did believe, however, that since the customer does benefit from purchased power, the customer should have to pay these costs. Subsequently, in May 1980, the commission removed TMI 1, the undamaged reactor, from the rate base and granted a rate increase sufficient to cover all purchased power costs.

On June 1, 1980, Metropolitan Edison was authorized to impose a temporary surcharge at the annual rate of $56.4 million over an 18-month period. The surcharge is to recoup the delayed 15 percent purchased power costs. On September 18, 1980, the Pennsylvania Utilities Commission ordered Met Ed not to use operating revenues for TMI cleanup costs, but rather to use net earnings.

[20] Public Power Weekly Newsletter, July 23, 1979.

The New Jersey Board of Public Utilities reached a similar decision concerning the subsidiary, Jersey Central Power and Light Co.[21] It allowed a 6.1 percent increase in rates to cover the cost of electric power purchases. The amount of increase asked for by the company was 17 percent; the commission noted, however, that through long term bulk power purchases the company could reduce the costs of purchased power. It reduced the requested increase to encourage economical purchases. The board removed the damaged plant from the Jersey Central rate base and prohibited the company from paying dividends to the parent company. The board stated that the rationale for the decision was to assure that the costs of the accident were shared by all parties including ratepayers, the company, and stockholders, while assuring that adequate and safe service was provided by the company. In May 1980, the company was granted a $60 million interim rate increase pending a final decision on a $173 million request.

On the federal level, FERC ruled that the damaged plant could be kept in the rate base of Met Ed even though it might be out of service for several years.[22] FERC also met with the New Jersey commissioners in April 1980 to discuss the JCP & L Co. financial condition. In addition, GPU has asked FERC to review the PJM pool agreement regarding purchased power costs. Power was being purchased under a split savings arrangement.

Under split savings, energy is priced at cost to the seller plus half the savings to the buyer assuming use of the most expensive unit. Data filed in FERC Docket EL80-22 requesting a change in the cost computations indicated a PJM production cost of 4.46 cents per kwh and a split savings adder of 1.44 cents in February 1980. Thus, purchased power from PJM sources was priced at 32 percent over cost. This arrangement has been renegotiated; purchased power should be somewhat less expensive in the future.

[21]National Association of Regulatory Utility Commissioners, Bulletin, August 13, 1979.

[22]National Association of Regulatory Utility Commissioners, Bulletin, July 9, 1979.

Other costs associated with the accident have been, or will be, allocated in other ways. For instance, GPU is faced with 20 individual suits, plus 1 consolidated class action suit. As of February 1, 1980, the American Nuclear Insurers and the Mutual Atomic Energy Underwriters had paid out $1,308,494 to residents claiming evacuation expenses.[23] The plant was also insured for up to $300 million in damage. Assuming the cost of repair is $780 million, $480 million must be paid for by other means.

GPU has announced it has filed suit against Babcock and Wilcox (B & W) and its parent company in an effort to collect the costs of the accident.[28] The suit charges that B & W failed in training personnel properly, and failed to make improvements in known faults and operating procedures. The money filed for would cover $280 million in fuel charges, the costs of carrying the idle plant, and the costs of future repairs. GPU is asking for $500 million in damages already incurred and noted that the amount would increase to approximately $1 billion as repair costs are included in the case. If GPU is successful in recovering damages from B & W, the regulators will be faced with the question of how to allocate these sums among lenders, customers, and stockholders. Presumably the net proceeds will be used to reduce debt, with the remainder, if any, used to reduce or stabilize retail rates.

Surry Unit One

On March 13, 1979, the Federal Nuclear Regulatory Commission (NRC) ordered the shutdown of five nuclear power plants designed by Stone and Webster Company (table 3-2). All five plants were closed within 48 hours.[25]

[23]Michael Blake, op. cit., p. 51.

[24]Anthony Parisi, "Utility Suing Supplier over Three Mile Island," New York Times, March 26, 1980, p. D1.

[25]The details of the shutdown and reasons for the order are taken from Office of Public Affairs, NRC Staff Orders Nuclear Plant Shutdown to Resolve Piping Questions, Press Release, Nuclear Regulatory Commission, Tuesday, March 13, 1979; and U.S. Nuclear Regulatory Commission, Tuesday, March 13, 1979; and U.S. Nuclear Regulatory Commission, Docket No. 50-280, Order to Show Cause.

TABLE 3-2

PLANTS ORDERED BY NRC TO SHUT DOWN

Plant	State	Owner	Status at at Time of Order
Surry Unit One	VA	VEPCO	operating
Surry Unit Two	VA	VEPCO	down
Beaver Valley One	PA	Duquesne Light CompanyPower	down
Fitzpatrick N.P.	NY	Power Authority, N.Y.	operating
Maine Yankee	ME	Maine Yankee Atomic Power Co.	operating

Source: NRC Office of Public Affairs, op. cit.

The reason for the immediate shutdown order was the discovery of a computer error in the testing procedures for stress in some of the pipes of the plant. These pipes must be able to withstand certain strains that might occur in a seismic disturbance. Stone and Webster's computer programming to test resistance to strain was in error on the low side; thus, the pipes in all these plants might not meet the seismic stress standards of the NRC. The error was found originally in standard testing of the Beaver Valley Plant. Duquesne Light Company and Stone and Webster notified the NRC of the error. After consultation, the NRC determined that four other plants had the error incorporated into their design. Although the pipes involved were not the main coolant pipes, the NRC ordered all five plants closed until further testing could be done to determine proper corrective action.

The particular computer program involved stress calculations for safety-related pipes and pipe supports. Correction involved testing the pipes to determine the proper strength needed, correcting the computer program to eliminate the error, and making necessary changes to the pipes and supports so that they could pass the required tests.

Of the five plants ordered shut down for testing and repairs, two were already down at the time of the decision. Surry Unit One was approved for reopening by the NRC on August 22, 1979.[26] It was back up by mid-October.[27]

The Impacts

Prior to the shutdown of Surry One, VEPCO had been having some financial difficulty because of the shutdown or delays in construction of other plants, especially the nuclear plants in its system. Originally, VEPCO planned to build several nuclear plants to help cut future fuel costs. Because of construction delays and regulatory snags the nuclear plants have not operated as planned, thus increasing fuel costs rather than saving them.[28] The shutdown of Surry One added to VEPCO's difficulties. On March 20, VEPCO had been granted a fuel charge increase. With the shutdown of the plant, VEPCO was forced to go back to the commission to ask for further increases.[29]

The direct costs associated with the shutdown were of two types: the costs of repairs to the plant, and the costs of more expensive replacement fuel and purchased power. Although VEPCO was not forced to buy large amounts of purchased power to meet demand, it had to generate replacement energy using comparatively more expensive fossil fuels. VEPCO ran several plants primarily on heavy fuel oil and some coal to meet demand.

[26]Shelan Kast, "20-25% Rate Rise Sought by VEPCO," Washington Star, August 23, 1979. p. A20

[27]Conversation with Mr. Wittine, Director of the Division of Energy Regulation, State Corporation Commission of Virginia, April 1980.

[28]"VEPCO Asks to Boost Rates $215 million for Outlays on Fuel," Wall Street Journal, November 2, 1979; and "VEPCO Expects Rates to Pass U.S. Inflation," Washington Post, July 18, 1979.

[29] Ibid.

The cost of this replacement fuel for Surry One ran approximately $10 million to $12 million per month.[30]

Utility costs also include the cost of testing and repairing the pipes. So far the full costs of complying with the NRC order have not been made public. Because the shutdown was due to error on the part of Stone and Webster, presumably VEPCO will try to recoup these costs from that company. If not, the costs may be included in the rate base or recouped in some other way, perhaps through insurance. Meanwhile, VEPCO is carrying the costs of the repair on the books. Presumably this involves some financing or opportunity costs to VEPCO.

The social costs associated with the shutdown are not easily quantified. For instance, the shutdown of the plants has had an impact on the safety image of nuclear plants. In addition, the shutdown of two of VEPCO's plants does not add to the public image of the company, especially since it occurred immediately after an 11 percent rate increase to residential customers and after promises of lower fuel costs through use of nuclear power. Finally, perhaps the national aspects of this shutdown are of still greater significance.

A shutdown of nuclear power plants in the U.S. causes increased use of expensive oil, possibly imported. Thus, an indirect cost of sustained or numerous shutdowns may be the increased dependence of the U.S. on foreign oil. The five nuclear plants involved represent approximately 65,000 to 100,000 barrels per day of oil in replacement costs, [31] and approximately one-fifth of that is the Surry One share. This comes at a time of increased international instability and domestic economic woes. Therefore, the shutdown impacts on all citizens because it affects oil dependence, supply security, inflation, and national prestige.

[30]The $10 million figure is from Mr. Wittine, Director of the Division of Energy Regulation, State Corporation Commission of Virginia, April 1980; The $12 million figure is from newspaper accounts.

[31]Testimony of Charles Komanoff, Komanoff Associates, before Subcommittee on Nuclear Regulation of the Committee on Environment and Public Works, March 16, 1979.

This shutdown, unlike the Con Edison blackout, does not have heavy costs in terms of income or business transfers to the rest of the nation. Increasing rates in the VEPCO area could cause some relocation of businesses and families out of the region, but this would not occur solely as the result of the Surry shutdown.

Regulatory Decisions

Allocation of the costs of this shutdown comes under the jurisdiction of the state commissions encompassed by the VEPCO service area. We will concentrate on the Virginia State Corporation Commission.[32]

As noted, no requests for rate increases to recoup the costs of repair have been filed. VEPCO has not taken any action against Stone and Webster to recoup costs and possible damages, and the SCC has not made any decisions on this matter.

There is no automatic flow through of fuel costs (automatic fuel adjustment clause) to the consumer under Virginia law. Instead, once a year, the utility estimates the probable fuel costs for the coming year. Based on this estimate, the commission grants fuel charge changes for a future test year. Every quarter, the utility updates the yearly estimate to take account of any unpredicted increases or decreases. The commission, upon review, can grant a change. Because of the manner of filing, the specific fuel costs associated with Surry One are not distinguishable from the total fuel cost increase. Thus, these costs are being passed through, but it is difficult to know the exact amount or timing of the pass through.

On March 20, 1979, VEPCO received an 11 percent increase for fuel charges and indicated it would soon file for a further increase caused by the shutdown. In May 1979, VEPCO asked for an additional increase of 9 percent to cover fuel charges. The SCC did not allow the full increase.

[32]Interview with Mr. Wittine cited earlier.

Of $53.9 million requested, only $9.8 million was granted. In August, VEPCO was back asking for further increases.[33]

The SCC has not allowed full, immediate pass through of Surry One fuel charges to the customers. According to a commission official, immediate pass through of all fuel charges would place an excessive burden on the ratepayer. In any case, the SCC does not consider that the decision to shut down Surry One is the fault either of the ratepayer or of VEPCO. The commission has decided to try to lessen the immediate impact on the customer as much as possible, but without causing VEPCO undue hardship. The total costs of fuel charges will not be granted in a single period, but will be passed through over time to lessen the immediate impact on the consumer. Eventually, VEPCO will recoup all the costs. Rates will rise in increments until the full fuel charges have been recovered from the ratepayer.

The question of who should pay is arguable in this instance. An error was reportedly made by a contractor in the design of the unit. If this was the case the utility presumably should attempt to recover its incremental costs for fuel, power, and correction of the error from the contractor. Failing such recovery, a decision would then be required as to what penalty, if any, should be assessed against the utility relative to the ratepayer.

A Perspective

The cases reviewed above indicate that the bulk of the costs often lie outside the authority of the regulator. These costs comprise output and various social costs. Such costs were frequently absorbed by those suffering the loss or incurring the cost. In many cases, these costs were absorbed by insurance or by various governmental assistance programs (table 3-3).

[33]"VEPCO Requests 9% Rate Increase On Top of 5% Bid," Washington Post, May 30, 1979, "Virginia Electric Gets $9.8 Million Rate Boost after Cut for Penalty," Wall Street Journal, July 5, 1979, and "20-25% Rate Rise Sought by VEPCO," Washington Star, August 23, 1979.

TABLE 3-3

DISTRIBUTION OF SHUTDOWN COSTS BY SELECTED CASE STUDIES

	Case Studies			
Loss	New York	San Juan	TMI	VEPCO
Utility				
Repairs, etc.	U	I	I & U	?
Purchased Fuel and Power	X	C	C	C
Output	C	X	C	X
Social	G & C	X	G & I	X

Legend: U = utility; C = consumer; G = government;
I = insurance; X = no cost; ? = not decided.

Utility costs, on the other hand, were allocated by the regulator based on responsibility for the incident. In the case of San Juan and Surry One, the purchased fuel and power costs were passed through to the customer, presumably since the commissions found the utilities were not responsible for the problem. The New York blackout, however, was compounded by human error. No regulatory decision was required, since the company voluntarily accepted the costs. TMI costs, though, were allocated partially to the utility by removing the two units from the rate base, but permitting purchased power costs to flow through to the customer. This situation is primarily an effort to strike a balance between equity and the financial viability of the utility. The latter concern is intended to assure the utility's ability to provide the legally required adequate and reliable service.

Thus, at least in the cases under review, the major criterion in the allocation of shutdown costs is the question of responsibility for the incident,tempered by the need to maintain adequate and safe service.

In order to explore the need for balance further, the next chapter will discuss the legal concepts and constraints that impinge on regulatory decisions related to unplanned shutdowns.

CHAPTER 4

LEGAL ISSUES AND CONSTRAINTS*

The concept of an unplanned shutdown of an electric utility, as it has been defined earlier, is not a recognized regulatory term invoking a precise set of legal principles. Instead, it is a factual description of circumstances and events that raise a broad spectrum of legal issues relating to the fundamental nature of utility regulation.

Regulated utilities are unique legal creatures. While utilities operate either as traditional corporations or as quasi-public enterprises, their special legal status evolves from the economic characteristics of their business activities. Any analysis of legal issues relating to public utilities requires the basic examination of the broad legal and economic characteristics of utility regulation, the central concept of which relates to the legal obligations imposed upon utilities in exchange for the privilege of doing business. The duties to provide adequate service to utility customers and to submit to rate and other financial regulation are among these important legal obligations. The duty to provide adequate service is a significant starting point in the analysis of legal issues relating to unplanned shutdowns, for it is from this duty that many of the other legal issues flow.

The matter of economic regulation is inextricably related to all legal issues involving public utilities. Therefore, a review of major legal principles is useful to identify and analyze the specific legal issues concerning rates as they relate to unplanned shutdowns.

*This chapter prepared by Robert D. Poling.

In addition, a variety of other legal issues concerning unplanned shutdowns will be discussed, including such matters as abandonment of service, bankruptcy, noneconomic regulation, and reliability regulation.

The legal issues raised in connection with unplanned shutdowns of electric utilities involve the most fundamental aspects of utility regulation. While the nature of utility regulation may permit only the broadest of conclusions about specific legal issues, it is necessary to view a discussion of legal issues relating to unplanned shutdowns in the context of the basic elements of utility regulation.

Adequacy of Service

The imposition of the duty upon a public utility to provide adequate service to its customers is a fundamental legal obligation required in exchange for franchise rights. The obligation was generally imposed at common law,[1] and continues to be imposed upon electric utilities under the jurisdiction of both federal and state governments by statute.[2]

The federal statutory provision requiring electric service by those electric utilities wholesaling electric power in interstate commerce gives the Federal Energy Regulatory Commission broad authority to compel "proper, adequate, or sufficient" service. The commission may not, however, compel

[1]See, for example, United Fuel Gas Co. v. Railroad Commission, 278 U.S. 300, 309 (1929); and Montgomery Ward & Co. v. Northern Pacific Terminal Co., 128 F. Supp. 475 (D. Ore. 1953). See also, Note, "The Duty of a Public Utility to Render Adequate Service: Its Scope and Enforcement," 62 Columbia Law Review 312, at 312 (1962); and, Note, "Public Utility Law--Public Service Commission Ordered Rebates for Inadequate Service," 1976 Wisconsin Law Review 584, at 587 (1976).

[2]For a list of state statutory provisions imposing adequate service obligations, see Note, "Liability of Public Utility for Temporary Interruption of Service," 1974 Washington University Law Quarterly 344, at 345 footnote 9.

the enlargement of generating facilities, nor compel the sale or exchange of power under circumstances that would impair the ability of a utility to render adequate service.[3]

The state statutory provisions requiring adequate service, after which the federal requirement was undoubtedly patterned, generally impose the obligation on electric utilities to provide adequate service to retail customers.

The rationale for this requirement stems from the perceived need to substitute a legal obligation in place of the lack of competitive capability that results from the territorial exclusivity and other monopolistic rights of the utility franchise. Thus, the obligation to provide adequate service is deemed necessary in order to maintain the balance of accountability that ordinarily would occur from competition.

Although the legal duty to provide adequate service is variously defined, it may be broadly described as requiring that an electric utility provide safe, continuous, comfortable, and efficient service to its customers or within its service area.[4]

The duty is couched in terms of the reasonable exercise of business judgment in the conduct of utility business affairs and does not constitute an absolute set of precisely definable rules addressing all business

[3]Section 207 of the Federal Power Act, 16 U.S. Code Section 824f, provides as follows:

> "Section 207. Whenever the [Federal Energy Regulatory] Commission upon complaint of a State commission, after notice to each State commission and public utility affected and after opportunity for hearing, shall find that any interstate service of any public utility is inadequate or insufficient, the Commission shall determine the proper, adequate, or sufficient service to be furnished, and shall fix the same by its order, rule, or regulation; provided, that the Commission shall have no authority to compel the enlargement of generating facilities for such purposes, nor to compel the public utility to sell or exchange energy when to do so would impair its ability to render adequate service to its customers."

[4]See, Note, 62 Columbia Law Review 312, op. cit., p. 313.

contingencies. There are, however, certain generalizations that can be made.

The obligation to provide adequate service generally applies to all electric utilities, without regard to the nature of the ownership of the enterprise. With respect to service obligations, investor-owned utilities occupy essentially the same legal status as municipally owned or other governmentally owned utilities.[5]

The concept of adequate service has not been interpreted as requiring service to customers under all circumstances,[6] nor does the duty place the electric utility in the status of an insurer of constant electric service.[7] However, there are a variety of circumstances that do impose upon electric utilities legal liabilities to customers for the interruption, failure, or inadequacy of electric power.[8]

With respect to certain intended temporary shutdowns or interruptions for necessary purposes, such as regular maintenance and repairs, the legal excuse from the obligations of adequate service does not relieve the electric utility from the requirement of reasonable diligence in the completion of the activities for which the interruption was made or from the obligation to give reasonable notice to affected patrons in advance of the interruption.[9] Reasonable notice of intended interruptions may not be required under circumstances of an emergency nature or where the interruption is immediately necessary to protect the safety of the public. Where, for example, it is necessary to terminate electrical service for public safety reasons so that public injury or

[5]See for example, D. Hodel and R. Wendel, "The Duty Responsibility of Oregon Public Agencies to Provide Adequate and Sufficient Electrical Utility Service," 54 Oregon Law Review 539 (1975).

[6]See, 62 Columbia Law Review 312, op. cit., p. 315.

[7]See, Note, "Liability of Public Utility for Temporary Interruption of Service," 1974 Washington University Law Quarterly 344, p. 347.

[8]See, Annotation, "Liability of Electric Power or Light Company to Patron for Interruption, Failure, or Inadequacy of Power," 4 ALR 3d 594.

[9]1974 Washington University Law Quarterly 344, 348.

loss can be prevented, utilities may generally be justified in terminating service without notice to the affected patron.[10]

Notice requirements with regard to intended shutdowns have been the recent focus of much legal attention because of problems arising from the non-payment of utility bills. Electricity is a vital necessity to many retail purchasers.

However, the courts have been unwilling to impose, as a matter of constitutional right, the obligation of notice or hearing for residential customers before to the termination of service for such matters as the nonpayment of electric bills.[11]

The conclusion that electric utilities are not subject to constitutional requirements of notice and hearing in connection with the termination of service, for whatever reasons, does not relieve electric utilities of notice and hearing obligations imposed by statute or administrative regulation. Many states require notice to patrons of discontinuance of service or interruptions occurring for a variety of reasons. The lack of notice prior to intended and excusable interruptions or terminations may create civil liability for damages to patrons arising

[10]See, Note, "Electricity--Liability for Discontinuance of Service by Supplier," 7 South Carolina Law Quarterly 661 (1955).

[11]See, Jackson v. Metropolitan Edison Co., 419 U.S. 345 (1974); and see, Comment, "Constitutional Law--Fourteenth Amendment-Due Process--State Action--Termination of Service by a State Regulated Public Utility," 14 Duquesne Law Review 761 (1976); Comment, "Procedures for Termination of Utility Service: The Requirements of Due Process," 64 Kentucky Law Journal 180 (1975); Comment, "Constitutional Restrictions on Termination of Services by Privately Owned Public Utilities," 39 Missouri Law Review 205 (1974); Comment, "Constitutional Law--Obtaining Due Process in Public Utility Pre-termination Procedures," 76 West Virginia Law Review 492 (1974); Comment, "The Right to a Hearing prior to Termination of Utility Services," 22 Buffalo Law Review 1057 (1973); Comment, "Constitutional Law--Procedural Due Process-Notice and Hearing Required prior to Utility Termination," 6 Creighton Law Review 417 (1973); and, Comment, "Light a Candle and Call an Attorney--The Utility Shutoff Cases," 58 Iowa Law Review 1161 (1973).

under legal theories in tort and contract, even where the interruption would not by itself give rise to liability if notice had been given.[12]

Obligations arising from unplanned shutdowns of generating or transmitting facilities present a more difficult problem. Notice to patrons before unintended shutdowns is practically impossible, and the law imposes no such obligation. The liability of an electric utility for damages resulting from an unplanned shutdown appears to depend in significant degree on the cause or reason for the shutdown. Interruptions of service resulting from emergencies or acts of God beyond the control of the utility do not generally give rise to actionable liability. Case law dealing with acts of God, for example, seems to confine this category of liability limitation primarily to unforeseeable weather or natural disasters.[13]

Interruptions of service arising out of utility negligence may indeed provide a cause of action against the utility for both ordinary or special damages that occur to utility patrons. Negligence in the operation or maintenance of equipment or facilities of a utility could serve as a basis for damages caused by unintended termination of service to patrons. However, the law of negligence frequently looks to the foreseeability of adverse consequences in determining whether certain acts should have been performed in order to avoid injury or loss. It is the element of foreseeability which creates the most difficulty in determining legal liability of utilities for shutdowns because the concept of foreseeability is inextricably involved in the very nature of utility regulation. Contingency planning for loss of generating capacity is a primary management responsibility of a utility. Long-term load planning, expansion of capacity, construction of improved facilities, and other actions would have the effect of avoiding shutdowns, but they strike at the heart of utility regulatory supervision.

Where curtailments of electrical power become necessary for conservation during peakload periods because of generating capacity

[12]See, 4 ALR 3d 594, op. cit.

[13]See, for example, William L. Prosser, Law of Torts (4th ed. 1971), p. 284, 287, and 521.

limits, utilities may be required to give reasonable notice of such curtailments,[14] but there are not necessarily liabilities to patrons arising from the inability to deliver power under those circumstances.

As one aspect of the legal obligation to provide adequate service, the liability of the utility for damages for a failure to provide adequate service appears more limited by practical circumstances than it does by law. Certainly, the law has only reluctantly allowed damages for somewhat special circumstances, but no clear development of liability for bad planning has been legally acknowledged.

The relationship of adequate service to utility rates is perhaps more significant to the concept of adequate service than the deterrent value of potential damages. Contained within the concept of adequacy of service is a qualitative element of service that is frequently balanced as a significant factor in ratemaking. Various approaches have been taken to address the central regulatory issue of how best to encourage high quality of service by utilities, or conversely stated, how best to discourage poor or substandard service to patrons. One regulatory approach has been to consider operational inefficiencies and chronically poor service by utilities as a basis for denying rate increases.[15] This approach necessitates the development either of comparative criteria or subjective standards against which to judge an individual utility's performance. The disallowance of rate increases, in effect, penalizes poor service.

Another approach frequently used by state regulatory agencies attempts to balance the quality of service with rate levels by permitting the state regulatory agency to take affirmative actions that mandate adequate service through remedial directives for specific improvements to be made by the utility.[16]

[14]1974 Washington University Law Quarterly 344, op. cit.

[15]See, Note, "Public Utilities--Fair Rates for Fair Services," 53 North Carolina Law Review 1083 (1975).

[16]See, Note, "Rates Follow Service: The Power of the Public Utility Commission to Regulate Quality of Service," 28 Baylor Law Review 1137 (1976).

Alternatively, under certain circumstances, regulatory authorities may adopt a kind of review of past performance and exercise rate authority to order rebates to patrons for inadequate service.[17] Other regulatory approaches reject simultaneous consideration of rates and performance. In a leading case, Elyria Telephone Co. v. Public Utilities Commission,[18] the Supreme Court of Ohio reversed the state utility commission's decision to condition a proposed rate increase upon certain improvements in service. The court, in rejecting the commission's approach, ordered instead that the issues of quality of service and rate increases may be separated.

It would seem, however, that a more flexible mechanism has greater advantages to sound regulation. The approach of the commission in Elyria Telephone would seem to have practical validity only where the underlying financial status of the utility is adequate to undertake identified improvements in service. The establishment of a rate structure designed to permit, or to encourage, a utility to undertake improvements in service can be a very difficult task for regulators.[19]

Thus, it seems clear that each of the various approaches utilized to deal with inadequate service in the context of rates has some limitations and may not be utilized in all situations. The particular circumstances of

[17]1976 Wisconsin Law Review 584, op. cit.

[18]158 Ohio St. 441, 110 N.E.2d 59 (1953). This case has been somewhat limited by statute. See Ohio Revised Code Section 4909.154.

[19]One observer has characterized the difficulty as follows:

> "When the failure of a utility to perform its service obligations stems from adverse economic conditions and an inability to attract capital, there is little that can be done by the regulatory agencies acting alone; the causes of difficulty are beyond their ability to remedy. Occasionally, however, service deficiencies result from inefficient or uninspired management or other non-economic factors, and in those situations the many sanctions available to the commissions are usually adequate to the task if the commissions are adequately financed and properly staffed". 62 Columbia Law Review 312, op. cit., p. 331.

each utility may determine the most effective of the alternatives. Indeed, regulatory commissions have broad discretion in selecting the means to cope with inadequate service from many rate remedies.

Unplanned outages or shutdowns caused by major damages to generating or distribution equipment would likely be viewed under any of the remedial rate approaches as an extraordinary occurrence. Imposing rebate obligations or disapproving rate increases where such damages were caused by clear management negligence may only exacerbate the ability of the utility to deliver adequate service in the future. Instead, other regulatory devices, or a combination of regulatory actions, have been, and will likely continue to be, utilized to rectify utility service problems of any significant dimension.

Close regulatory scrutiny to utility planning for the actions to remedy the causes of unplanned shutdowns may provide the only realistic alternative with the long-range flexibility to restore the ability of the utility to discharge adequate service obligations.

During outages or unplanned shutdowns of service for lengthy periods while remedial regulatory decisions are being made, the immediate need to supply power to customers likely requires the utility to obtain alternative sources of electrical power. Yet, permanent decisions that cope with the problems of shutdown, say of generating facilities, may also require consideration of the realignment of service areas, new permanent wholesale or pooling relationships, or a variety of other alternatives short of simply rehabilitating the existing utility to the status quo ante.

The requirements to provide adequate service seem clearly to impose upon the utility the duty to acquire electrical power from other systems in cases where it has lost its own generating ability.[20] For the purpose of

[20]See, generally, J. Lopach and D. Lopach, "Regulation of Interconnected Electric Utilities: Some Jurisdictional Considerations," 37 Montana Law Review 1 (1976); and, Comment, "Electric-Utility Interconnections: Power to the People," 21 Stanford Law Review 1714 (1969).

restoring adequate service to curtailed customers, state regulatory commissions likely possess either express or implied statutory authority to compel purchases of substitute power, subject to federal regulatory jurisdiction. Where voluntary efforts of a utility to seek power are unsuccessful, perhaps regulatory actions that compel the sharing of scarce power supplies could be taken for the purpose of attempting to supply some power during time of emergency or crisis.

The Supreme Court's landmark decision in Otter Tail Power Co. v. United States[21] appears to operate as a significant legal obstacle preventing a utility, with excess capacity or the ability to "wheel" power, from refusing to assist a disabled utility in light of potential antitrust violations. Antitrust law may obligate utilities with excess capacity to share power with a disabled utility.

In recent years, the matter of adequate service has been viewed from the federal level primarily as a matter of electrical power reliability.[22] While federal jurisdiction has traditionally been limited to the regulation of wholesale transactions relating to electric power in interstate commerce, federal powers within that conceptual jurisdiction have not necessarily been fully authorized or fully exercised. Under the Federal Power Act,[23] the somewhat limited authority of the Federal Power Commission (now, the Federal Energy Regulatory Commission) to order interconnecting and wheeling of power was only reluctantly utilized, and then only in emergencies.

[21]410 U.S. 366 (1973).

[22]See Electric Power Reliability--1969-1970, Hearings before the Subcommittee on Communications and Power of the House Committee on Interstate and Foreign Commerce, 91st Cong., 1st and 2d Sess. (1969-70); "Blackout of Interconnected Electric Companies: Recovery and Preventive Measures," 53 Minnesota Law Review 162 (1968); and S. Breyer and P.W. MacAvoy, "Federal Power Commission and the Coordination Problem in the Electrical Power Industry, 46 Southern California Law Review 661 (1973). See, also, National Power Grid System Study--An Overview of Economics, Regulatory, and Engineering Aspects, Subcommittee on Mineral, Materials and Fuels of the Senate Committee on Interior and Insular Affairs, 94th Cong., 2d Sess. (1976), Committee Print.

[23]16 U.S. Code Section 824, et seq.

The recent enactment of the Public Utility Regulatory Policies Act of 1978, PURPA,[24] has provided significant new federal regulatory powers, that can, among other things, be used to assure greater electric reliability and adequate service. There are essentially four principal provisions of PURPA that enhance the power of FERC to provide greater reliability of service: (1) modified interconnection authority; (2) express authority for wheeling, (3) exemption authority from state requirements to prevent utility coordination, and (4) new continuance of service authority. Because of the importance of each of these new provisions to the general requirements of adequate service, each will be separately sketched.

Under Section 202 of PURPA, the FERC may require, when requested by certain utilities or on its own motion, the interconnection of utilities, or the sale or exchange of electric power that would "improve the reliability of any electric utility system or Federal power marketing agency to which the order applies."[25]

Section 203 of PURPA provides for express statutory authority for the FERC to order "wheeling" of power (the transmission of power by an intermediate utility from one utility to another) where such wheeling is in the public interest and would "improve the reliability of any electric utility system to which the order applies."[26] Although various limitations are imposed on the exercise of this power, its inclusion as a remedial power that may be used at the federal level significantly expands the federal ability to deal with power outages or shutdowns. The new interconnections and wheeling provisions of PURPA are subject to various statutory limitations specified under Section 204 of PURPA[27] that

[24]Public Law 95-617, 92 Stat. 3117 (1978).

[25]Section 210 of the Federal Power Act, as added by Section 202 of PURPA, supra.

[26]Section 211 of the Federal Power Act, as added by Section 203 of PURPA, supra.

[27]Section 212 of the Federal Power Act, as added by Section 204 of PURPA, supra.

imposes criteria for establishing rates for interconnection, sales, wheeling of power, and other reliability services extended by one utility to another.

Under Section 205 of PURPA, the FERC is authorized under certain stated circumstances to "exempt electric utilities, in whole or in part, from any provision of State law which prohibits or prevents the voluntary coordination of electric utilities, including any agreement for central dispatch."

The fourth new addition to federal powers under PURPA is the authority relating to continuity of electric service. The new provisions permit the Federal Energy Regulatory Commission to require reporting of anticipated shortages of power or capacity that would affect a utility's ability to serve wholesale customers. Also, the new provision permits the commission to require advanced submission of contingency plans for dealing with shortages; such plans would presumably be followed once in place.[28]

[28]Section 202(g) of the Federal Power Act, as added by Section 206 of PURPA, supra, provides as follows:

> "In order to insure continuity of service to customers of public utilities, the [Federal Energy Regulatory] Commission shall require, by rule, each public utility to:
> (1) report promptly to the Commission and any appropriate State regulatory authorities any anticipated shortage of electric energy or capacity which would affect such utility's capability of serving its wholesale customers,
> (2) submit to the Commission, and to any appropriate state regulatory authority, and periodically revise, contingency plans respecting:
> (A) shortages of electric energy or capacity and
> (b) circumstances which may result in such shortages, and
> (3) accommodate any such shortages or circumstances in a manner which shall:
> (A) give due consideration to the public health, safety, and welfare, and
> (B) provide that all persons served directly or indirectly by such public utility will be treated without undue prejudice or disadvantage."

These new express federal statutory provisions clarify the important federal role in assuring service during emergencies, breakdowns in equipment, or other possible events relating to an unplanned shutdown of an electric utility.[29] The federal powers to mandate wholesale interstate transactions under emergency circumstances accomplish an expansion of utility reliability beyond the intrastate retail authority of state regulatory commissions.

By more effectively coordinating the activities of utilities from a central federal vantage point, the federal government can now exercise clear powers to give meaning to the adequacy of service obligations to retail customers as required under state law, and to wholesalers of power as required under federal law.

With these new federal powers available to alleviate service problems resulting from unplanned shutdowns, utilities and state commissions would likely be in derogation of their legal responsibilities if they failed to request the use of these powers to mitigate such problems.

The concept of adequate service includes a variety of legal elements, all of which have the central purpose of assuring delivery of electricity to customers. The reality of various regulatory actions that might be called upon in the name of adequate service to deal with unplanned shutdowns is not confined by a simple set of legal devices. Broad regulatory powers exist to take actions with the object of providing continuing and adequate electric service, but their discretionary use is constrained more by the practical circumstances of an unplanned shutdown than by inadequate flexibility or authority.

When both federal and state powers requiring adequate service are considered, the authority to act in a prospective manner to require

[29]For a summary explanation of these new provisions, see House Conference Report 95-1750, 95th Cong., 2d Sess. (1978), at 88-97.

emergency capacity to deal with shutdowns, and the authority to act in a remedial fashion to direct sharing of electric power have both been given significant new meaning in recent years.

Electric power coordination authority at a national level is an important element in assisting in the discharge of the duty to provide adequate service at the local level.

Electric Utility Rates

Few, if any, regulatory issues relating to the operation of electric utilities are totally separable from the underlying economic purposes for which they were established and continue to be regulated. Utility services, and the rates received for those services, are inextricably related. So it is with the matter of unplanned shutdowns. The variety of cost considerations that relate to an unplanned shutdown inevitably raise rate issues.

The basic legal concepts governing utility rate regulation are well-known and established principles. Yet, the fundamental legal concepts of rate regulation have a direct bearing on the economic concept of risk. For this reason, it is appropriate to review utility rate law briefly.

Ever since the Supreme Court's noted decision in Munn v. Illinois,[30] it has been an accepted notion of American jurisprudence that the government could regulate the activities of private property committed to a public purpose, even to the extent of establishing the prices that could be charged for the public services, without running afoul of constitutional due process requirements.

The seminal case, and the starting point of virtually every legal analysis of utility rate regulation, is the Supreme Court's landmark

[30]Munn v. Illinois, 94 U.S. 113 (1877); see, also, The Slaughter House Cases, 16 Wall. (83 U.S.) 36 (1873). For an interesting historical analysis of Munn, see J. Johnson and J. Highsmith, "Munn v. Illinois (1877): A Centennial Evaluation," 44 I.C.C. Practitioners' Journal 618 (1977).

decision in Smyth v. Ames,[31] in 1898. In his opinion for the Court, Mr. Justice Harlan drew together a number of established legal principles in order to address the central question presented by the case; that is what legal criteria should govern the setting of rates for a public utility under state law so as to avoid an unconstitutional taking of property in violation of the due process clause of the Fourteenth Amendment.[32]

The legal dilemma created by state establishment of public utility rates (in Ames, rates for railroad transportation) is whether states could establish inadequate rates having the effect of taking property without due process. Thus, the case raised the problem of balancing rates with service to the public, thereby avoiding the constitutional prohibition.[33]

Prophetically acknowledging that the ascertainment of "just compensation" would "always be an embarassing question," Justice Harlan set forth in Ames the general legal rules that continue to guide in the calculation of the reasonableness of utility rates. Those rules require a

[31]Smyth v. Ames, 169 U.S. 466, 42 L. Ed. 819 (1898).

[32]The Fourteenth Amendment provides, in pertinent part, that "No State shall . . . deprive any person of. . . property, without due process of law. . ."

[33]The balancing of rates with service was summarized in the case in this fashion (pp. 544-45):

> "It cannot, therefore, be admitted that a railroad corporation maintaining a highway under the authority of the state may fix its rates with a view solely to its own interests, and ignore the rights of the public. But the rights of the public would be ignored if rates for the transportation of persons or property on a railroad are exacted without reference to the fair value of the property used for the public or the fair value of the services rendered, but in order simply that the corporation may meet operating expenses, pay the interest on its obligations, and declare a dividend to stockholders. . . .
>
> "A corporation maintaining a public highway although it owns the property it employs for accomplishing public objects, must be held to have accepted its rights, privileges and franchises subject to the condition that the government creating it, or the government within

case-by-case determination of the value of utility property and the amount of operating expenses.[34]

Thus, the Court in Ames established a range of factors that could lawfully be considered to set the level of compensation for utility services without actually specifying the portion that each of the identified factors, or other factors, might contribute to the final rate. In effect, the Ames decision set forth a list of economic considerations that were to be balanced against the public interest in determining a fair level of rate. The consideration of simply one criterion, to the exclusion

whose limits it conducts its business, may by legislation protect the people against unreasonable charges for the services rendered by it. It cannot be assumed that any railroad corporation accepting franchises, rights and privileges at the hands of the public, ever supposed that it acquired or that it was intended to grant to it, the power to construct a public highway simply for its benefit, without regard to the rights of the public. But it is equally true that the corporation performing such public services and the people financially interested in its business and affairs, have rights that may not be invaded by legislative enactment in disregard of the fundamental guarantees for the protection of property. The corporation may not be required to use its property for the benefit of the public without receiving just compensation for the services rendered by it."

[34]"We hold, however, that the basis of all calculations as to the reasonableness of rates to be charged by a corporation maintaining a highway under legislative sanction must be fair value of the property being used by it for the convenience of the public. And, in order to ascertain that value, the original cost of construction, the amount expended in permanent improvements, the amount and market value of its bonds and stock, the present as compared with the original cost of construction, the probable earning capacity of the property under particular rates prescribed by statute, and the sum required to meet operating expenses, are all matters for consideration and are to be given such weight as may be just and right in each case. We do not say that there may not be other matters to be regarded in estimating the value of the property. What the company is entitled to ask is the fair return upon the value of that which it employs for the public convenience. On the other hand, what the public is entitled to demand is that no more be exacted from it for the use of a public highway than the services rendered by it are reasonably worth." Smyth v. Ames, supra, at 546-47.

of all others, might yield a vastly different result than would the balancing, case-by-case evaluation called for in Ames.

The significance of Ames to the discussion of risk in the operation of public utilities is that in establishing the broad constitutional framework for utility rates Ames spoke in terms that are economically associated with risk. In broad terms, the rights associated with equity interests were deemed to be an important element in judging a fair return. The market value of bonds was deemed to be a factor in rate levels.

Without saying so in haec verba, the factors that are legally permissible to consider in ratemaking include elements involving the financial assessment of the risks of operating a utility enterprise; and, as will be analyzed later, the risk of the enterprise contemplates the possibilities of events, including unplanned shutdowns.

The general rules established under Ames still continue essentially to describe utility rate procedures today. It should not be surprising, therefore, that Ames has spawned a progeny of refinements through nearly 100 years of the individual application of its criteria to rate proceedings.[35]

The potential presence of confiscation issues, issues relating to constitutionally inadequate rates that amount to a taking of property without just compensation, inevitably led the courts to permit the judicial review of both the rate criteria established by law and its application to the facts and circumstances of a utility in a particular case.[36] Thus, from the beginning of judicial review of rates, confiscation without

[35]See, Note, "Public Utility Rate Regulation: The End of the Rule of Smyth v. Ames," 51 Yale Law Journal 1027 (1941); Note, "Does the Ghost of Smyth v. Ames Still Walk?" 55 Harvard Law Review 1116 (1941); and W. Mendleson, "Smyth v. Ames in State Courts, 1941 to 1951," 37 Minnesota Law Review 158 (1953).

[36]See, Ohio Valley Co. v. Ben Avon Borough, 253 U.S. 287 (1920).

adequate compensation was not an easily definable legal limit based upon precise legal criteria but was judged instead on the basis of the overall effect of the rate.

For nearly 50 years, the courts wandered through a seemingly endless series of conflicting rate formulations designed to strike the balance sought under Ames. In 1923, for example, the Supreme Court had occasion in Bluefield Water Works & Improvement Co. v. Public Service Commission,[37] to address the constitutionally necessary elements of fair and nonconfiscatory rates more specifically:

> Rates which are not sufficient to yield a reasonable return on the value of the property used at the time it is being used to render the service are unjust, unreasonable and confiscatory, and their enforcement deprives the public utility company of its property in violation of the Fourteenth Amendment. (emphasis added)[38]

In holding that the state commission's approved rate was too low, and by implication confiscatory, the Court in Bluefield seemed to suggest that reproduction cost was a preferable determinate of reasonable return than was original cost. Similarly, a series of other rate formulation techniques and criteria used during the early part of this century could also be analyzed,[39] but the decisions of the Supreme Court under the Natural Gas Act in the 1940s have had a more significant impact.

In Federal Power Commission v. Natural Gas Pipeline,[40] the Supreme Court upheld the constitutionality of the Natural Gas Act as within the power under the Commerce Clause and found that the act did not violate

[37]Bluefield Water Works & Improvement Co. v. Public Service Commission, 2672 U.S 679 (1923).

[38]Id., at 690.

[39]See J. Killian, ed. The Constitution of the United States of America: Analysis and Interpretation, Senate Document 92-82, 92d Cong. 2d Sess. (1973), at 1343, footnote 10.

[40]Federal Power Commission v. Natural Gas Pipeline, 315 U.S. 575 (1942).

constitutional due process requirements. By upholding the Commission's finding that a 6.5 percent rate of return on fair value was adequate, the decision had the effect of sustaining the broad authority of the commission's discretion to establish "just and reasonable rates," so long as the rates were not confiscatory. The Court observed that the "Constitution does not bind ratemaking bodies to the service of any single formula or combination of formulas."[41]

Two years later in Federal Power Commission v. Hope Natural Gas Co.,[42] the Supreme Court upheld the rate methodology used by the Federal Power Commission under the Natural Gas Act in establishing "just and reasonable" rates. The Court permitted the calculation of rates on the basis of "actual legitimate cost" of interstate property, less depreciation and depletion, plus allowances for unoperated acreage, working capital, and future net capital additions:

> . . . it is the result reached not the method employed which is controlling. . . because it is not the theory but the impact of the rate order that counts, if the total effect of the rate order cannot be said to be unjust and unreasonable, judicial inquiry under the Act is at an end.[43]

Although the Court did not surrender its power to declare a particular rate unconstitutional as violative of due process requirements, the Court did confine the scope of its own scrutiny by noting that a presumption of validity of established rates exists by virtue of the expert judgment exercised by regulatory commissions.[44]

By suggestion that a variety of rate formulas might be constitutionally adequate to achieve a lawful "end result," the Court only generally

[41]Ibid., at 586.

[42]Federal Power Commission v. Hope Natural Gas Co., 320 U.S. 591 (1944).

[43]Ibid., at 602.

[44]Ibid., at 603.

addressed the means of striking the balance between utility and consumer interests:

> From the investor or company point of view it is important that there be enough revenue not only for operating expenses but also for the capital costs of the business. These include service on the debt and dividends on the stock. . . . By that standard the return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks. That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital. (emphasis added)[45]

Within these broad constitutional limits, the courts have left open the rate criteria to legislative development and the ultimate responsibility for ratemaking for electric utilities to administrative application. The constitutional limit, however difficult it may be to define precisely, remains that rates may not be confiscatory.

However, perhaps the most significant aspect of Hope as it pertains to this discussion is its specific reference to the concept of judging rate of return for electric utilities on the basis of corresponding risks encountered in other similar enterprises.

The Hope case clearly suggests that the nature of the risk involved in the operation of a specific electric utility should determine the return on investment. Thus, a strong legal foundation exists for the establishment of differing rates of return for the operation of individual utilities where there are different economic risks involved in the operation thereof. In short, the utility business as a whole need not be the basis for the establishment of comparable rates of return. Individual utilities might have different levels of risk associated with their particular operation that would legally entitle them to a different rate of return on investment.

[45]Ibid., at 603.

Factors such as the type of generation, scale of operation, prevalent weather conditions, historical outages, and other differences in operation that might lead to unplanned shutdowns are all elements that may be lawfully considered in determining the level of risk associated with the operation of an individual utility.

A variety of approaches to the procedures used to set rates and to develop more specific rate criteria have been taken by the states.[46] In general, though, state rate-of-return determinations have been typified by the exercise of such broad administrative discretion, and the basis of the determinations are frequently very difficult to ascertain with precision. In a specific rate case, just how the broad elements of permissible considerations have been weighted is often unclear.

However, a separate set of rate considerations arises in connection with an unplanned shutdown to the extent that events occur removing useful property from the rate base or otherwise affecting the financial integrity of the utility. The temporary purchase of power from other utilities because of disabled generating capacity would potentially require the recalculation of utility revenues, since purchased alternative power could be regarded as an operating expense and the value of facilities out of operation could be removed from the rate base.

Similarly, the anticipation of major construction or rehabilitation costs might ultimately raise the elements calculated in the rate base much higher than the historic rate base of the individual utility. How best to deal with those expenses and financial considerations ultimately involves the reconsideration of the balance to be struck between investors and ratepayers.

[46]See, for example, P.H. Mullin, "Rate of Return Determination in Nebraska," 7 Creighton Law Review 206 (1974); Comment, "Determination of Allowable Rate of Return by the Texas Public Utilities Commission," 57 Texas Law Review 289 (1979); Comment, "Due Process: Applicability to Utility Rates," 42 Missouri Law Review 152 (1977); E.B. Levin, "Illinois Public Utility Law and the Consumer: A Proposal to Redress the Imbalance," 26 DePaul Law Review 259 (1977); F. J. Demet and M. M. Demet, "Legal Aspects of Rate Base and Rate of Return in Public Utility Regulation," 42 Marquette Law Review 331 (1959); Comment, "Reassessing 'Confiscation' under Section 305 of Maine's Public Utility Law," 29 Maine Law Review 194 (1977).

The impact of an unplanned shutdown on the legal aspects of ratemaking can obviously be quite significant. The notion that responsibility or burdens of an unplanned shutdown should be shared by investors, management, suppliers, consumers, and perhaps even taxpayers generally has a great deal of appeal; but from the legal perspective, it is the balance between adequate service and fair return that must continue to be struck in a broad constitutional sense.

Presumably, the legal determination of the rate of return to be permitted to an individual utility reflects, if only in a rough manner, some assessment of the risk of operation of that utility.

However, the economic considerations involved in ratemaking and the levels of risk, which in legal theory are measured to establish rate of return, are not static concepts; and, by their nature, these concepts require a prospective estimation. Clearly, a reconsideration of returns (hence rates) is certainly permissible, and may be legally required, because of the experience gained from an unplanned shutdown. This reconsideration should be made not only for the purpose of determining whether there have been increased risks attending the operation of the shutdown utility, but also, whether in a larger sense, greater risks have been incurred by the industry as a whole as the consequence of a shutdown.

For all of these reasons, the legal aspects of utility ratemaking become central issues in the consideration of economic alternatives available to deal with unplanned shutdowns.

Discontinuance of Service

While there is no significant recent precedent that involves an electric utility, the partial or total termination of business is certainly one of the options available to a utility as the consequence of a variety of circumstances associated with an unplanned shutdown. The practical inability of a utility to continue to provide service might lead to a management preference to withdraw from business.

An example of circumstances that might lead to such a management preference is not difficult to conceive. A utility suffering the irreparable loss of significant generating facilities may be faced with the difficult burden of temporarily purchasing expensive power from alternative sources, while it simultaneously attempts to raise needed capital for major new construction. The choice of whether to continue in business at all, or perhaps on a reduced scale, may be a viable option for a utility overwhelmed with these difficult problems.

A permanent termination of business or a permanent discontinuance of service is an act that might be viewed as an adjunct of the duty to provide adequate service. Generally, so long as a utility possesses rights of public service under its franchise, it may legally be charged with the obligation to provide adequate service to its customers. As we have observed, the long-term obligation to provide adequate service entails some obligation to seek alternative sources of power during the interim period until damaged or disabled facilities can be replaced.

The legal notion of discontinuances or abandonment of service is, in effect, a description of the legal dissolution of responsibilities to provide adequate service. Although most states appear to impose statutory obligations of one variety or another requiring permission of the regulatory commission prior to abandonment or discontinuance of service, either partially or completely, very little case law has developed with regard to electrical utilities. The applicable legal principles have historically developed in connection with abandonment or discontinuance of service by railroads.[47] While many of the particular aspects of discontinuance or abandonment requirements that might apply to railroads may not be

[47]See, generally, O. P. Field, "The Withdrawal from Service of Public Utility Companies," 35 Yale Law Journal 169 (1925); and F. P. Hall, "Discontinuance of Service by Public Utilities," 13 Minnesota Law Review 181 and 325 (1929).

directly applicable to electrical utilities,[48] the principles generally appear to be the same.

The practical reality is that a discontinuance of service by an electric utility is a final act, taken with the legal approval of the jurisdictional regulatory body that permits the utility to withdraw from service. Although the permissible causes for authorizing such a discontinuance of service have never been fully developed as precise legal criteria, presumably a discontinuance of service would follow an unsuccessful series of other regulatory events designed to forestall the discontinuance. Assuming an existing and continuing demand for electricity, a commission conceivably could find a variety of reasons (ineffective management, loss of energy supplies, financial insolvency or other matters) that would allow the withdrawal of the utility from service on its own initiatives.

The public service commission, by permitting a withdrawal of service to even a small service area, would be required to make some provision for service by another electric utility. Thus, unless an entire area is to be without permanent service, the public service commission will likely find itself in a balancing position, weighing the importance to the public interest of substituting one utility for another. The point is that discontinuance of service cannot be viewed in the abstract.

In short, the concept of discontinuance of service as a legal concept is designed not to substitute one utility for another, but permanently to terminate service to the discontinued customers. Viewed in that light,

[48]Railroads, of course, offer a variety of separable services that can be individually terminated in many cases without affecting other operations. For example, passenger service to a particular point might be discontinued, even though through service to other locations is continued. Some adjustment of the category of service by electric utilities is possible. Interruptible service to certain noncritical patrons might be substituted for more regular categories of service. However, these minor adjustments cannot change the basic character of electrical service to customers: the electricity is either on or off. Thus, there is much less latitude with electrical utilities to permit partial abandonments of service. The only significant option appears to be the reduction of service areas of the encumbered utility, with the replacement of that service by neighboring utilities.

discontinuance of service is one of several last-resort resolutions of utility problems.

Utility Bankruptcy

As a practical matter, the possibility of bankruptcy for an electric utility is, very similar to permanent discontinuance of service.

Little of special significance to public utilities is established under the new federal bankruptcy law.[49] Bankruptcy of railroads, for example, is governed by special statutory provisions, as was the case under the prior federal bankruptcy statutes.[50] Participation by the Secretary of Transportation[51] and by state and local officials[52] in the bankruptcy procedures is statutorially assured. However, similar treatment of electric utilities is not established under bankruptcy law.

One significant provision of the bankruptcy laws that establishes a kind of exception to the general requirements imposed upon private corporations is the provision that is applicable to municipal debt.[53] Essentially, a separate procedure reserves a special role for state supervision and the retention of certain powers of state authorities with respect to bankruptcy proceedings subject to state jurisdiction.[54]

In general, however, electric utilities, which are not municipally owned, have essentially the same legal status in bankruptcy proceedings as would any other private business enterprise.

[49]The Bankruptcy Reform Act of 1978, Public Law 95-578, 92 Stat. 2549, Title 11 United States Code, effective October 1, 1979.

[50]See 11 U.S. Code Sections 1161 et seq.

[51]11 U.S. Code Section 1161.

[52]11 U.S. Code Section 1164.

[53]See 11 U.S. Code Section 901 et seq.

[54]See 11 U.S. Code Sections 903 and 904.

Two basic alternatives applicable to utilities exist under federal bankruptcy law: utilities may voluntarily initiate,[55] or utility creditors may initiate,[56] either a utility reorganization under Chapter 11[57] or a liquidation under Chapter 7[58] of the bankruptcy code.

Under a Chapter 11 reorganization proceeding, the federal court would appoint a trustee to account for the utility's property, examine certain claimed debts, furnish information about the utility, make reports to the court, and if the business of the utility is to be operated, account for business transactions.[59]

It is essentially a matter of discretion with the court whether to permit the continuation of the operation of the utility.

A Chapter 11 reorganization requires that a plan for the reorganization of the utility be submitted, considered, and approved by the court. The plan must contain certain legally required elements addressing the financial obligations of the debtor utility. Specifically, a plan must contain the following:

(1) retention by the debtor of all or any part of the property of the estate

(2) transfer of all or any part of the property of the estate to one or more entities, whether organized before or after confirmation of such plan

(3) merger of consolidation of the debtor with one or more persons

(4) sale of all or any part of the property of the estate, either subject to or free of any lien, or the distribution of all or any par

[55]For voluntary bankruptcy, see 11 U.S. Code Section 301.

[56]For involuntary bankruptcy, see 11 U.S. Code Section 303.

[57]11 U.S. Code Sections 1101-46.

[58]11 U.S. Code Section 701 et seq.

[59]11 U. S. Code Section 1106.

of the property of the estate among those having an interest in such property of the estate

(5) satisfaction or modification of any lien

(6) cancellation or modification of any indenture or similar instrument

(7) curing or waiving any default

(8) extension of a maturity date or a change in an interest rate or other term of outstanding securities

(9) amendment of the debtor's charter or

(10) issuance of securities of the debtor, or of any entity referred to in subparagraph (1) or (2) of this paragraph, for cash, for property, for existing securities, or in exchange for claims or interests, or for any other appropriate purpose.[60]

One major difference between bankruptcy treatment of an electric utility and a private enterprise is that a specific role is defined for any regulatory authority that has ratemaking responsibilities over a debtor utility in bankruptcy. Because a reorganization plan for a utility could result in court-directed rate increases, the bankruptcy law requires that any regulatory commission with rate jurisdiction over a debtor in bankruptcy give its approval to rate increases required under a Chapter 11 reorganization.[61]

Under a reorganization, property of the bankrupt that is burdensome to the enterprise could be abandoned by the trustee[62] and other actions taken to ease the financial difficulties of the enterprise.

The inability to develop an agreeable reorganization plan that is confirmed by the court could convert a Chapter 11 proceeding into a Chapter 7 liquidation.

[60]See 11 U.S. Code Section 1123 (a) (5)

[61]11 U.S. Code Section 1129 (a) (6)

[62]11 U.S. Code Section 721.

The chief characteristic of a Chapter 7 liquidation is that the bankruptcy trustee is legally directed to collect the property of the debtor and reduce it to money for the purpose of dispersing cash to the creditors of the bankrupt.[63]

Obviously, a Chapter 7 liquidation would be the last act in the life of an electric utility. The sale of property to discharge debts would probably destroy the operating plant or the other equipment of the utility and render it unable to perform as a utility. In short, a significant liquidation of property would require a termination of service by that utility. It is possible that the facilities might be purchased by another utility, that could continue utility operations for the service area with state commission approval and the issuance of a certificate of convenience. However, such a result depends not only on the outcome of the bankruptcy, but also upon the separate and concurrent decisions of the state regulatory commission.

In order for a financially disabled utility to continue in business, bankruptcy under Chapter 11 reorganization is the only realistic possibility. However, the success of a reorganization in bankruptcy may depend in large part upon the jurisdictional regulatory commission's willingness to grant a rate increase, an act, that might have averted the need to consider bankruptcy had it occured before the initiation of bankruptcy.

Thus, the determination by a utility commission not to award a rate increase adequate to restore sound financial operation of a utility disabled by an unplanned shutdown might precipitate the need to consider bankruptcy, but such a determination by a utility commission would amount to implied approval to discontinue service by necessitating liquidation and eliminating reorganization as an alternative.

Reorganization provides the opportunity to spread the losses among creditors (through discharge of debt), equity interest holders (through reduction of equity interests), and consumers (via a rate hike).

[63] 11 U.S. Code Section 554.

Liquidation initially imposes the losses on the creditors and equity interest holders. However, liquidation may require utility commission determination of what enterprise will perform the needed utility service following the dismantling of the utility and its discontinuance of service, the start-up of a new enterprise may ultimately result in levels of investment that justify higher rates to consumers by the replacing utility.

Perhaps, more significant to what the bankruptcy alternative can accomplish for a financially disabled utility is what bankruptcy cannot accomplish. Bankruptcy reorganization does not avoid the fundamental rate increase issues. The apparent rarity of utility bankruptcies appears to arise from the fact that the financial inability of a utility to continue as a going enterprise would conceptually occur only after the regulatory agency had refused to provide for rates that would generate adequate operating revenues. Such a refusal of rate increases could not operate to be confiscatory; that is, a requested rate hike that provided a fair return on used and useful property could not be denied constitutionally.

However, for example, where facilities were no longer useful, the exclusion of disabled property from the rate base might not result in a confiscatory action in the denial of rates needed for return to financial solvency. Under those circumstances, a denial of rate increases, while constitutionally valid, would undoubtedly precipitate liquidation in bankruptcy.

Most state regulatory commissions possess broad powers to govern the sale of utility property, securities, and to approve mergers and other reorganizations. Although these powers do not permit state commissions to discharge debts, the state reorganization alternatives approximate many of those available in bankruptcy.

Because of its role in bankruptcy, and because of its other regulatory powers, state commissions play an initial and central role over the economic vitality of electric utilities. As a device to deal with the financial difficulties arising out of an unplanned shutdown, bankruptcy

does not provide a mechanism to avoid this central economic regulatory role of the utility commission.

Noneconomic Regulation of Utilities

It is appropriate to discuss legal issues relating to regulatory shutdown briefly because a regulatory shutdown of utility facilities is an important factor in assessing economic risk in the operation of the utility.

Generally, state public utility commissions and the Federal Energy Regulatory Commission engage in economic regulation of public utilities. Quite obviously, this economic regulation is not the exclusive form of utility regulation. A variety of both state and federal laws apply to utilities and are often administered by regulatory agencies other than public utility commissions.

This noneconomic regulation includes such matters as siting restrictions, environmental regulations, and safety regulation. Specifically, the regulation of nuclear power falls broadly within the category of safety regulation. It is noneconomic in nature--no rates are set, and the primary object of the regulation is to assure the safe public utility operation of a highly technical and potentially dangerous activity.

In essence, noneconomic regulation, while it may properly take economic considerations into account in its decision making, is directed by law to address ultimate problems of public health and safety.

Thus, the decision to close a facility because of potential nuclear hazards or because of high levels of air pollutant emissions is an external factor to the economic regulatory process. As given factors in the conduct of the utility business, economic regulators are obliged to take these collateral forms of regulation into account.

The proper measure of the risk component of utility rates might lead to a higher rate of return on investment for extremely technical types of utility operations such as the generation of electricity by nuclear power. Such a measure would consider not only the technical, but the regulatory, risks of operating the utility.

Thus, regulatory shutdowns may indeed raise issues that require reconsideration of the rates involved for a given type of operation. Generally, regulatory actions do not create new liabilities or excuse the attendant obligations of adequate service. As with other aspects of shutdowns, such regulatory actions may indeed have enormous consequences on utility rates. The inability to operate existing equipment or to bring new equipment online in a timely fashion obviously affects load capacity. Also, it may necessitate the temporary purchase of power and the modification of the rate base to remove inoperable equipment from the rate base and may further require a full reexamination of the financial vitality of the utility. Each of these problems constitutes one element of the broader issues of adequate service and rates that have already been discussed.

One example of legislatively mandated public policy that illustrates the regulatory problems of this type occurs under the Powerplant and Industrial Fuel Use Act of 1978 (FUA).[64] In order to achieve the important public objective of diminishing reliance upon imported petroleum in the face of dwindling domestic supplies, the FUA mandates that certain existing and new public utility power plants use of alternative sources of fuel (principally nuclear power or coal) instead of natural gas and petroleum.

The requirement to convert existing facilities to a capability of burning coal, for example, carries with it the potential threat of a regulatory shutdown of the facilities that are not in proper compliance. Thus, the FUA presents a variety of legal issues both to utilities and regulatory commissions with respect to the achievement of compliance. Conversion cost factors obviously raise significant rate issues. Further,

[64]Public Law 95-620 (1978).

although the FUA provides for prospective deadlines to permit transition into conversion requirements, capacity planning and other regulatory decision making would be required to consider the legislatively imposed shutdown directive.[65]

Obviously, legislative and administrative decisions that have the effect of a shutdown of electric utilities are important factors within the entire regulated framework of public utilities and can arise as the consequence of pursuing a host of public policies. The response of the utilities in dealing with additional permanent or temporary shutdown directives is likely to raise traditional economic issues for affected electric utilities.

Other Legal Issues

In addition to the general legal issues that have already been discussed, there are a myriad of other legal issues that might be raised in connection with the unplanned shutdown of an electrical utility, depending upon the causes of the shutdown and the many possible attending circumstances resulting from the shutdown.

The following three topics will be considered here to address some of the other more significant legal issues: (1) miscellaneous liability issues arising from unplanned shutdowns, (2) public condemnation of electric utilities, and (3) the use of public funds to rectify shutdown problems.

Although the initial legal responsibility, if any, for damages arising from certain types of unplanned shutdowns of electric utilities rests with the utility itself, other liabilities may occur. Probable negligence on the part of operating officials or utility engineers may under the ordinary legal rules hold them accountable, at least to the utility, for the damages

[65]Presently, the Senate Committee on Energy and Natural Resources is considering S. 2470, 96th Cong., 2d Sess. This bill would specify by name certain generating units targeted for conversion under FUA and would provide some public funding for the conversions.

occurring to the physical plant as the consequence of their negligence.[66]

Shutdowns that occur as the consequence of certain defects in the design or operational capability of plant equipment may give rise to strict liabilities on the part of designers or manufacturers of plant equipment for damages to the equipment or may even give rise to strict liability for consequential damages both to the utility and to the public for the loss of generating capacity or service.[67]

Irrespective of the potential legal responsibility for damages that these parties may have, utility personnel and others may be judgment proof in cases involving extensive damages or injury; that is, they may not have adequate financial assets to make a meaningful contribution to damages even if liability is established as a matter of law.

The degree of liability, if any, of utility personnel or manufacturers of equipment will be determined through the application of traditional legal principles to the particular facts of each case. Thus, generalizations about potential liability are difficult. Suffice it to say that where negligence is provable, some liability may exist for utility personnel, and where defects in products can be established, strict liability of manufacturers may be imposed.

Another aspect of liability relates solely to the nuclear generation of electric power. Under the Price Anderson Act,[68] Congress has constitutionally limited the liability for certain nuclear accidents to $560

[66]See, for example, G.M. Bell, "Professional Negligence of Architects and Engineers," 12 Vanderbilt Law Review 711 (1959).

[67]See, for example, G. Calabresi and J. Hirschoff, "Toward Strict Liability in Torts," 81 Yale Law Journal 1055 (1972).

[68]42 U.S. Code Section 2210.

million,[69] and has left open for congressional actions any compensation that may be appropriate.

A major legal device that may be pertinent to unplanned shutdowns is public condemnation of the utility, in whole or in part.

An alternative that may exist for the state is to condemn the utility property and convert the property into some other form of utility operation, assuming that there is indeed property to condemn that would have some usefulness to a subsequent utility enterprise.

Consistent with the requirements of due process, either the state under the Fourteenth Amendment of the U.S. Constitution, or the federal government under the Fifth Amendment, could condemn the property of a utility for a "public use" by providing just compensation. The condemning entity could then utilize the property to continue the service to the patrons by reorganizing it or taking other actions, such as direct operation of the property itself, in order to assure service to the public. Although there has been historical reluctance for governments to condemn property that could be operated privately to discharge the public service, some consideration has been given to the legal aspects of condemnation in emergency circumstances or adverse economic circumstances.[70]

Although most states and the federal government do not possess a permanent statutory authority to condemn utility property (and at any level statutory authorization would probably have to be enacted to authorize an individual condemnation), the real issues involved in condemnation turn on

[69]Duke Power Co. v. Carolina Environmental Study Group, Inc., 438 U.S. 59 (1978).

[70]See F. V. Lowden, Jr., "Public Utility Seizure in Virginia," 41 Virginia Law Review 397 (1955); and, Note, "Going Concern Value in Condemnation of Unprofitable Public Utilities," 52 Cornell Law Quarterly 752 (1967).

the constitutional obligation of providing "just compensation" to the condemned utility. Establishing the appropriate value for the property might take on characteristics somewhat different from establishing elements of a utility's rate base. The condemnation value might be set lower than the value that would otherwise be required for the rate base, since the constitutional requirement for condemnation value would not necessarily be the value determined in contemplation of future earnings potential, but rather a fair value of the property in light of its marketability at that time and its cost of acquisition.[71] The condemnation alternative would initially involve, in essence, a public buy out, then a reorganization of the utility and its operation under appropriate state and federal regulation, either by a public or a private enterprise.

Finally, it is useful to consider briefly the legal possibility of the use of public funds to offset costs associated with utility shutdowns caused by a variety of circumstances.

As a legal matter, there are few limitations upon the use of public moneys to provide assistance to utilities because of damages or financial losses, or because of regulatory actions. The practical willingness of legislators to provide funds, in general, or with respect to specific shutdowns, obviously involves important public policy issues that can only be approached on an individual basis. Few permanent funding mechanisms permit the discretionary allocation of money in general, although certain disaster relief financing authorities may be available.

Thus, legislated financial assistance for utilities suffering unplanned shutdowns will involve the broadest public debate of many of the traditional regulatory and legal issues. It is difficult to conceive of any legislative approach other than a case-by-case consideration because of the divergent legal and regulatory issues that attend unplanned shutdowns.

[71]See, for example, Comment, "Eminent Domain Valuations in an Age of Redevelopment: Incidental Losses," 67 Yale Law Journal 61 (1957); Note, "Cost of Facilities as a Measure of Just Compensation When There is a Private Condemnee," 1975 Duke Law Journal 1133 (1975); Comment, "The Substitute Facilities Measure of Just Compensation: A Cautionary Remark," 62 Iowa Law Review, 1158 (1977).

Legal Concepts and Unplanned Shutdowns

Many of the legal issues raised in connection with the unplanned shutdown of an electric utility, or with a partial shutdown of a utility's facilities, are the same issues that are raised in connection with the continuing regulatory supervision of utilities. The principal regulatory issues of adequate service and rates are inextricably involved in matters relating to shutdowns.

While unplanned shutdowns arising from damaged equipment may involve potential liability on the part of various participants in utility activity, the liability questions appear to be determined by law that has not been uniquely tailored to utilities but that is broadly applicable to commercial enterprises generally.

The central legal and regulatory questions that are raised involve the traditional legal balancing of the public and private interests that have always come into play in the regulation of utilities. The law provides no quick formulated solution but approaches each event as separate, thereby attempting the delicate balance of economic considerations with other policy considerations. This process discharges the legal obligation to consider the public interest.

A legal definition of the public interest is, of course, difficult to state in precise terms. As Justice Harlan attempted in Ames, the public trust can be articulated in terms of a variety of separate factors, but it is the weighing and assessing of those factors together that constitutes responsible regulation.

The concept of the public interest has not been static. It has constantly been redefined by legislative, regulatory, and judicial bodies.

The fundamental legal concepts of utility regulation establish the broadest of regulatory frameworks within which the discussion of issues arising from unplanned shutdowns must occur. While a wide range of both

anticipatory and remedial regulatory alternatives exists to address unplanned shutdowns, the law itself mandates no clear course for regulatory action. Instead, it permits enormous discretion by decision makers.

In considering our earlier review of examples of electric utility shutdowns, it is important to bear in mind that the regulatory options and practical results of efforts to deal with unplanned shutdowns occur within the context of the legal framework presented here. Thus, the treatment of individual cases of utility shutdown describes merely one response within a broader range of legally permissible regulatory actions.

Similarly, the conceptual discussion of economic risk that follows in the next chapter also points toward the legal framework of utility regulation. As we have indicated, risk is, or should be, a central regulatory consideration in exercising legal powers to address unplanned shutdowns.

CHAPTER 5

ECONOMIC ISSUES AND CRITERIA*

A Review of Risk Theory

The preceding chapter discussed the legal concepts relating to unplanned shutdowns, including utility law and risk. However, an analysis of the costs of unplanned shutdowns and who should pay for them also requires a discussion of the economic and financial theories of risk; for it is upon these theories--coupled to law--that regulators must base their decisions as to who should bear the responsibilities and the costs occasioned when a facility is unexpectedly forced out of service by events other than an act of God. These theories imply a direct correlation between risk assumption on the one hand, and the responsibility for the outcome of that assumption on the other.

Some authors make a conceptual distinction between the terms "risk" and "uncertainty." Uncertainty is taken to denote unknown and unknowable future outcomes while risk is defined as an outcome that can be estimated through statistical means. What we are concerned with here is the general concept of uncertainty; that is, the unknown future outcomes of current business activities. These future events cannot be predetermined accurately. They result from current business activities and operations that include management decisions and operational activities and from general economic conditions such as availability of production inputs, shifts in demand for the organization's products, overall economic activity, social and political events, and other factors that may affect a company's profitability. Collectively, these factors may be termed "operational risk," and they represent the uncertainty inherent in any business activity that is noninsurable. It is this uncertainty (or risk) that the owners and operators of a business enterprise agree to "take on"

*This chapter prepared by Russell J. Profozich.

in exchange for an opportunity to earn a profit. Therefore, while the terms "risk" and "uncertainty" are used interchangeably throughout this report, it is this concept of "operational risk" with which we are dealing.

In general, there are two major, but related, theories of risk. One, which we will call the financial theory, deals with risk accounting in financial markets. The second, which we will call the economic theory, deals with the relationship between risk and profits and the ultimate impact on the efficient allocation of economic resources.

Financial Theory of Risk

Our discussion of the financial theory of risk will be abbreviated and will attempt only to deal with those elements of use in the effort to allocate shutdown costs. In general, the theory holds that the efficient allocation of capital resources will occur if the future earnings potential of a productive organization is reflected in the capital markets' valuation of its investment securities.[1]

The purpose of financial markets is to allocate capital resources among competing uses. An efficient capital market will ensure that financial resources flow to those sectors of the economy having the greatest potential to earn the highest rate of return on investment.[2] Therefore, financial markets are supposed to allocate investment capital to the most productive and efficient segments of the economy and thus have a direct impact on the productive capability and efficiency of the national economy. This impact is achieved through the rating of a company's debt and preferred stock issues. The market value of its equity issues must adequately reflect the real earnings potential of the company. This potential

[1]William J. Baumol, The Stock Market and Economic Efficiency University Press, New York, 1965.

[2]It is true that non profit institutions (including governments) also compete in the financial markets for capital resources. These institutions, however, undergo scrutiny and acquire financial ratings similar to those of for-profit companies. Also, only profit-oriented establishments compete for investment capital in the equity markets.

can be evaluated in a number of ways and reflects many aspects of the company's operations including the type of products it produces, the type of market it operates in, its capital structure, and so on. In general, these factors are reflected in the market's evaluation of the level of risk associated with each company's operations; this risk is ultimately reflected in the market value of the company's securities. A number of studies have been performed that use empirical evidence to measure the pricing efficiency of capital markets. In general, these analyses conclude that the financial markets operate in an efficient manner. Therefore, market values of securities are believed to accurately reflect the earnings potential of the securities traded.[3]

In an efficient capital market, prices of securities at any point in time should reflect fully all available relevant information necessary for the determination of security values.[4] The information used is reflected in the risk evaluation of the company's securities: the market value of those securities varies inversely with their level of risk, and the rate of return earned on an investment in those securities varies directly with the market determination of risk. As we know, investors require a higher rate of return on an investment associated with a relatively high level of risk than on an investment associated with a lower level of risk; that is, investors are said to be "risk averse," There is well defined in the economic and financial literature a theoretical rationale for the risk averse behavior of investors; and this theory--based on the premise that rational investors seek to maximize their level of satisfaction or "utility" from a given level of income and investment opportunities--has generally been supported by empirical evidence.[5]

[3]Seha M. Tinic and Richard R. West, Investing in Securities: An Efficient Markets Approach Addison-Wesley Publishing Company, Reading, Mass. 1979, p. 94.

[4]Ibid., pp. 489-512.

[5]The interested reader is referred to those references listed in appendix B.

Given the fact that investors (including investors in public utilities) tend to be risk averse, efficiently priced securities will have various market values and expected rates of return depending on the level of risk associated with each particular investment. The expected rate of return on investment is based on the earnings potential of the company and is comprised of the cash flows accruing to each investment security. These cash flows are made up of dividends or interest payments plus the increase in the market value of the security over and above that at which it was purchased. The flows are affected by a number of factors that taken together comprise "risk."

Risk is affected by factors directly related to the circumstances of a particular company (unsystematic risk), and by factors affecting all companies (systematic risk). Systematic risk includes general economic activity and movements within the financial markets as a whole. Each of these risk components contains elements of business and financial risk.[6] Business risk is associated with the operations of a particular company and is determined by factors such as the type of products the company produces, the type of market it operates in, the prices of its products and the demand for them, the costs of its factor inputs, the level of technology of its productive process and its managerial and marketing efficiency. In turn these factors are influenced by the general level of economic activity, by various government policies, the rate of inflation, and so on.

Financial risk is determined partly by the capital structure of the particular company, that is the combination of debt and equity financing. This combination influences the cash flows accruing to the security holders. Substitution of debt for equity can lower the overall cost of capital. By doing so, however, the company increases the level of its fixed charges. A decrease in cash flow to the company may make it unable to meet its fixed financial obligations. Thus, the risk to lenders is increased. In contrast to debt, equity issues have no fixed rate of return but require a higher expected return on investment because any

[6]Seha M. Tinic and Richard R. West, op. cit., pp. 155-87.

payment to stockholders occurs only after payment of interest on debt. Therefore, both debt and equity holders are affected by the organization's capital structure, since the greater the proportion of debt to equity, the greater the potential variation in return on stockholder investment.

Utility companies claim that they also face a unique type of risk, identified in a previous chapter as "regulatory risk." Briefly, the argument is as follows: unlike other private corporations, utilities are subject to the authority of various regulatory commissions. These commissions, among other things, exercise control over the prices and profits of these companies. Several investment companies have a rating system whereby the various regulatory commissions are characterized according to the "quality" of their regulatory procedures. These ratings are used in conjunction with other estimates of the "quality of earnings" of utility companies (that is, evaluations of the risk of investment) so that investors may evaluate the total risk associated with an investment in utility company securities. For our purposes, however, "regulatory risk" may be included as a part of a utility's business risk.

Because the variability in returns from investment securities are affected both by factors directly related to the circumstances of a particular company and also by other factors that affect all companies in general, total risk of investment is said to be comprised of a "systematic" and an "unsystematic" risk component. Both components contain elements of business and financial risk.

Unsystematic risk is that portion of total risk of investment unique to the particular company in question; it is that portion of the total variability of return of a particular security not related to the variability of returns on other securities in any systematic way. On the other hand, systematic risk is the remaining portion of total variability of return directly related to the variability of returns of other securities in general, that is, it is the portion of total risk of investment that tends to vary with general economic activity and

with movements within the financial markets as a whole. Unsystematic risk is affected largely by the business and financial risk associated with the individual company, while systematic risk is influenced by the business and financial conditions affecting all companies in general.

A company's expected return on investment can be defined in terms of systematic and unsystematic risk. The return is assumed to be directly related to the return earned by the market in general, plus unsystematic risk. The latter can be reduced or eliminated through diversification of the investors' portfolio. Thus, systematic risk becomes the focus of concern: the volatility of the return on a specific security relative to the market as a whole. Investors can use this concept in making their decisions. Capital will then be allocated to companies, based on perceived risk in relation to expected rate of return. Presumably, an efficient allocation of society's capital resources will result from the operation of the market.

The financial theory of risk states that an investor, through the purchase of a security, assumes the risk associated with the uncertain future return on his investment, and for which he expects to be compensated. As an owner, the investor is partially responsible for the actions of the company in terms of its investment, production, and management decisions. If these actions prove to be productive, the investor earns a competitive return on his investment; if they prove to be nonproductive, the investor may suffer a loss or earn a return that is below his expectations and possibly below that rate of return available from other investment opportunities. He is free, then, to dispose of his ownership interest and invest his funds elsewhere where the reward for risk assumption is, hopefully, greater.

Through this procedure, the capital market's valuation of an inefficient company's securities will fall until the return earned on those investments adequately reflects their risk. At the same time, the market value of the efficient company's securities will rise, reflecting the

declining level of risk associated with those securities or increased expected earnings resulting from the efficient operation of the company.[7] The investor is responsible for the outcome of his investment decision and must accept the result of his decision. If he has no chance of earning a competitive return on his investment in exchange for his risk assumption, he will not participate in the activities of the financial markets. On the other hand, if the investor has no chance of loss, or no uncertainty as to the rate of return actually earned, then he bears no risk and has little incentive to invest or to manage his investments. All investment opportunities would offer the same rate of return in the absence of uncertainly. The impetus to invest is based on uncertainty and the investor's responsibility for his decision.

Economic Theory of Risk

The economic theory of risk follows a somewhat similar line to that expressed above. It is based on the work of well-known economists from Frank H. Knight to Joseph A. Schumpeter to Kenneth J. Arrow, and of course, other contributors. Knight theorized that the same relationship between risk and responsibility displayed in financial markets must also hold within the productive enterprise. His analysis explains that the advancement of society (that is, the development of efficient and productive enterprises that produce goods and services through technological advancements that society demands and that in turn earn a profit on their investment) depends on uncertainty of the future and a direct correlation between the action of assuming risk and the responsibility for that action.[8]

Knight's analysis is based on the concept contained in economic theory of a "purely competitive" market. This is so because in a static state,

[7]It should be noted here that the term "efficient" is used in an economic sense. That is, it implies "efficiency" in all the activities of the organization, not merely efficiency of production.

[8]Frank H. Knight, Risk Uncertainty and Profit (Boston: Houghton Mifflin Company, 1921; reprint ed., Chicago: University of Chicago Press, 1971).

purely competitive market (that is, a market not subject to change), no "pure" or "economic" profit can be earned. Dr. Knight's analysis demonstrates that an economic profit can be, and is, earned by a purely competitive corporation and its owners, due to the uncertain nature of the productive enterprise.

All companies--including purely competitive ones--must secure for themselves land, labor, capital, and entrepreneurial (management ability) inputs in order to produce a product in the hope of earning a profit. Land, labor, and capital are "ordinary" inputs to the production process and demand a price determined in the marketplace in order to secure their availability for the productive process. Entrepreneurial ability is likewise a scarce resource and demands a competitively determined price. This price, then, becomes a cost of production like that of land, labor, and capital--and therefore must be included in the total cost of production. Thus, total cost of production includes not only wage and salary payments for labor and interest, and rental payments for capital and land, but also payments to the entrepreneur (manager-owner) for the function he performs. The cost payment to the enterpreneur for these contributions is called a "normal profit," and is determined in a competitive market by the "opportunity cost" of entrepreneurial ability, that is, the amount of salary or wage rate the entrepreneur could earn in the next best alternative employment. If total receipts from the sale of a company's product more than cover all production costs, including a "normal profit" (that is, a competitive return to the entrepreneur), the remainder will accrue to the entrepreneur as the risk taker in the going concern. This return above total cost is called "pure" or "economic" profit.

In a static state, purely competitive market, no "economic" profit can be earned. Because no individual company can exercise any influence within the marketplace in terms of prices demanded for its products, no company can earn a profit above that established by the market. Each company and its entrepreneur will earn only "normal" profits, or that amount that will just compensate the entrepreneur for the risks associated with his

employment in the enterprise. Market imperfections, (the ability of company's to affect the price, quantity, and terms of sale of its products), allow company's and their owners to earn profits above this purely competitive rate. The operation of risk and uncertainty in a dynamic market allows a corporation and its owners to earn an "economic" profit.

Earlier, economic theory had given exclusive credit to the process of dynamic change itself for the production of "economic" profits within the marketplace. This dynamic change, or advancement in technology, gives rise to new products and new productive processes that allow companies to earn "economic" profits at least temporarily until these advancements are copied by competitors. Once this occurs, profits in a competitive market will return to "normal" levels as the new technology disperses throughout the market or new companies enter, thereby increasing output and forcing prices down to their competitive level. Dynamic change is, however, a continuous process and constantly gives rise to new inventions and new processes that allow companies, however temporarily, to earn "economic" profits. Dynamic change, then, becomes the driving force of advancement within society, and corporations will strive to achieve advancements in technology so that they may earn an "economic" profit.[9] The mechanism by which these advancements are eventually incorporated into the productive processes of competitive companies, however, ensures that each organization must constantly strive for new methods through which to achieve an advantage over its competitors and thus earn an "economic" profit.

[9]This point of view is essentially that expressed by Joseph A. Schumpeter. In his essays on corporate capitalism, Schumpeter asserts that "imperfect competition" (that is, a market system where corporations have some degree of control over output and prices) is a necessary condition to dynamic efficiency. According to his theory, the static efficiency of pure competition is largely irrelevant in a dynamic economy. What is relevant is the rate at which corporations can create new products, new production techniques, and new marketing techniques in order to earn an economic profit while inreasing real per capita income. Only companies operating under imperfect competition, according to Schumpeter, are able to achieve the size and profits necessary to invest in new productive innovations. See Capitalism, Socialism, and Democracy. London: George Allen and Unwin, 1923.

Knight's "fatal criticism" of this procedure as the explanation and cause of profit (in an economic sense) is that "it overlooks the fundamental question of the difference between change that is foreseen a reasonable time in advance and one that is unforeseen," It is this unforeseen change or uncertainty that gives rise to "economic" profits. Thus, in economic theory, as in financial theory, uncertainty coupled with the responsibility for taking actions that encompass that uncertainty, is the driving force leading to an opportunity to earn "economic" profits and resulting in an efficient allocation of society's scarce resources. This is the same concept of uncertainty or "uninsurable risk" with which the discussion was opened. It is a nontransferable risk, that is, it cannot be shifted onto other parties through insurance mechanisms or other means. It is that risk inherent in the operations of any business enterprise or investment decision; it is that risk which investors and entrepreneurs agree to take on in exchange for an opportunity to earn a profit and for which they are responsible.

It is obvious that seen far enough in advance, the competitive market mechanism will adequately reflect the knowable future in the present value of the company and will allow all companies in the market the opportunity to achieve the same degree of technological advancement. Without the possibility of translating a technological gain into an economic one, the company has no incentive to achieve. It is thus ignorance of the outcome of present decisions--the unknown and unknowable future--that allows "economic" profit to be earned. However, this in itself is not enough because this uncertainty of outcome of entrepreneurial activity--this entrepreneurial risk assumption--must be accompanied with responsibility for that activity, otherwise the activity itself will not take place. For with no chance of economic gain, no technological advancement will take place; and with no chance of loss, the future becomes certain, again resulting in a lack of entrepreneurial activity.

With no chance of loss resulting from management decisions, the manager has little, if any, incentive to be efficient. Poor decisions will

not be reflected in the marketplace even in the presence of uncertainty if the "costs" associated with those decisions are borne by others. If there is no opportunity for gain, no risk-taking activity will be undertaken in the first place. However, if there is a chance for gain but none for loss, all actions with any likelihood of gain will be taken because the "cost" of failure to the company is zero (or nearly so), while the benefit associated with a "success" is potentially large. Since the actual "cost" of failure is real, it must be borne by society at large--although a greater share of this "cost" may be borne more directly by a particular segment of society--in the form of allocative inefficiencies resulting in higher prices and lower output than would be the case with more efficient organizations and proper correlation of risk with responsibility.

This review and discussion of early risk theory points out the interrelationship between the financial and economic theories of risk. Both require a direct correlation between uncertainty of action and responsibility for that action. Entrepreneurial activity affects the future earnings potential of a company. This earnings potential is also reflected in the capital market's valuation of the company's securities, thereby influencing financial resource allocation and ultimately productive resource allocation.

Kenneth J. Arrow, in his famous essays on risk, discusses the universality of risk in the economic system, the mechanisms designed to deal with risk, and the limitations of those mechanisms.[10] Risk is an integral part of any economic activity, and he agrees that consequences of such activity that occurr in the future cannot be known or accurately measured in advance. Statistical probability analysis can provide information on the range of future events and even point to the most likely future outcome and its probable value, but it cannot totally eliminate risks nor accurately measure the future outcome or consequences of a current decision or event.

[10]Kenneth J. Arrow, Essays In The Theory of Risk-Bearing,(Chicago: Markham Publishing Company, 1971.

Risk is evident in company operations through such phenomena as coordination of complex production processes that are subject to machine malfunctions and general coordination problems, estimating product demand that is subject to change due to varying consumer tastes or development of substitute products, and technological change and advancement that by its very nature is unpredictable. Utility company operations are characterized by each of these phenomena. Individuals are, in general, also risk averse. However, there are certain instances when they are quite willing to assume a risk even when the present value of the outcome of that risk assumption is less than the value of the sum paid to undertake the risk. This occurs, for example, when individuals engage in gambling; an instance where an individual prefers the small probability of a large gain and a large probability of a small loss to the certainty of a present income greater than the mathematical probability of the gamble. Individuals also engage in risk avoidance activities, exemplified by the fact that people pay insurance premiums; an instance where they prefer a certain small loss (the insurance premium) to the small chance of a future large loss (large medical payments or loss of income).

Entrepreneurs and investors also engage in risky activities. They prefer the chance of a potentially large gain through the opportunity to earn "economic" profits and the chance of a loss of investment to a more certain but smaller gain obtainable through a riskless investment or occupation. (In this case, however, the probability of loss or gain is less well defined than in the case of gambling or insurance.) Arrow notes that this entrepreneurial and investment activity is "perhaps the least understood phenomena associated with the occurrence of risk in economic institutions." He continues, "It has long been vaguely contended that 'profits are the reward for risk-taking' in the sense that the expectation of profits is a necessary inducement for risk-bearing. The exact nature of this interrelation is far from being understood."[11]

The consequences of a specific action cannot always be known in advance or even measured objectively. It is this unknown and unknowable

[11]Ibid., p. 6.

future that gives rise to the notion that those who purposely bear risk should be rewarded, and that the subjective expectation of a future reward must be high enough to induce the risky behavior.

Risk-shifting Mechanisms

Several risk shifting mechanisms exist. One is insurance. Insurance is a well established mechanism for risk shifting, it involves the exchange of money now for money payable in the future contingent on the occurrence of certain events. This type of transaction involves the realization that those who become involved in a business activity need not bear all of the risks associated with that activity. A portion of those risks can be borne by others in exchange for a payment or fee. The types of risks transferred through this process, however, must be known or at least estimated through statistical means. This measurability of certain risks coupled with the fact that a large number of individual institutions are insured by a single insurance company allows the company to offer protection against such hazards as fire and accident at a cost less than that which could be achieved by the institutions themselves.

There are other mechanisms within the economy that allow companies to share a part of the risks of operation. The financial markets are perhaps the most important of these. By issuing stocks and bonds, a corporation distributes a part of the risks of doing business. A bondholder receives a fixed rate of return on his investment in a corporation. That rate of return is partially determined by the degree of risk associated with the company. Corporations receive a benefit through this process by increasing the amount of financial capital available for investment in the corporation's activities and by limiting the amount of financial liability (risk) of the company's owners.

Common stock owners are in a somewhat different position. The nature of their risk assumption is less well defined than that of a bondholder. Shareholders receive no fixed or predetermined rate of return on their

investment. In order to induce them to share in the risks of operation, companies must offer shareholders a portion of their profits. The undefined rate of return on investment is compensated for by the possibility of higher returns than those paid to bondholders. Shareholders, however, must also bear the risk of loss of their investment or at least the possibility of earning a rate of return below that available to bondholders or in other investment opportunities. While all investors share in some of these uncertainties, the likelihood of corporate profits must be high enough to induce investors to purchase common stock.

Other mechanisms available to companies that allow them to shift or reduce risks include long-term contracts, cost-plus contracts, and vertical and horizontal integration. The contracts mechanism allows companies to acquire a secure source of supply (including supply of labor) or a secure market for its output through long-term commitments. Cost-plus contracts free companies from the uncertainty of production cost overruns. Vertical integration also provides secure supplies and/or output markets, and horizontal integration provides product differentiation that allows the company to spread its risks of operations over many product lines.

Benefits and Limits of Risk Shifting

Risk-shifting among economic parties must, of course, provide a benefit to those involved or else the activity would not take place. This process allows certain types of risk to be borne by those parties most capable of bearing them. For example, insurance companies can protect corporations from loss due to fire at a cost less than that available to the corporation if it provided this protection itself. Thus, society also benefits through the operation of productive processes that would not take place if a portion of the risks of those processes could not be shared by other parties.

Although risk shifting takes place in society in many forms, as outlined above, there is always a limit on the degree or type of risk which an individual or institution is willing to bear. For instance, a company

cannot insure itself against loss due to mismanagement or technological change or a loss of markets for its products due to changing consumer taste. These risks must be borne by the corporation itself (and its shareholders) in exchange for which it has the opportunity to earn a profit.

The major reason for the limitations on risk shifting is the concept known as "moral hazard."[12] This means that the process of risk shifting may alter the incentives of the party whose risks are reduced to the point where the impetus to succeed or to be efficient is reduced below an appropriate level. For example, an insurance company will insure an organization against loss due to fire, but will place a limit on that coverage equal to the value of the loss, and will also institute safety requirements to which the insured company must adhere to. If these limits were not enforced, the insured company might alter its incentives toward safety and protection from loss if it found that it could receive a greater reward from a "loss" due to fire. This same type of phenomenon can occur in other risk-shifting activities. Cost-plus contracts are known for reducing incentives toward efficiency, since any cost overruns can simply be passed onto the purchasing agent.

Arrow points out that if the absence of risk shifting is harmful because it inhibits the undertaking of risky enterprises that may benefit society, and if total risk shifting is also harmful because it reduces incentives for success and efficiency, then perhaps some method of partial risk shifting would be best. This is the concept of "coinsurance" where the insurer pays some stated portion of the loss, and the insured pays the remainder. The problem here is to determine what portion of total risk should be borne by the insured company and what should be borne by the insurer. Note that this concept is applied to all types of risk shifting activity. For our purposes, the "insurer" is any party that assumes part of the risk of utility operations, including insurance companies, stockholders, and ratepayers.

[12]Kenneth J. Arrow, op. cit., p. 142.

Applicability to Utility Regulation

Limits in risk shifting can be devised so that incentives of the insured toward efficiency are not reduced beyond appropriate levels.

It is important that any type of risk shifting or risk allocation be transacted within the marketplace. Only then can a reasonable assessment of the degree of risk and its associated costs and benefits be accomplished. Only through the operation of competitive markets can the parties involved determine to the best of their ability which is most capable of bearing risk and the amount of payment or reward for doing so.

When utility companies allocate some undefined portion of total risks of operation onto their ratepayers no market mechanism is involved. Utilities contend that shifting a portion of uninsurable risks of operation onto their ratepayers--for example by passing through to customers the costs of unplanned shutdowns and increases in fuel costs, by including construction work in progress (CWIP) in the rate base, and by other mechanisms--leads to a reduction in the company's cost of capital and thus ultimately results in lower electric rates for its customers. However, the problem for regulators and other parties of interest is to determine if this asserted benefit is in fact the case, and when time and other factors are taken into account, is it best to have these costs borne by present customers?

In an essay on utility regulation under conditions of uncertainty, Stewart C. Myers notes that ". . . the regulatory strategy which results in "the lowest cost of capital (to the utility) is not necessarily best. The best scheme may entail a high cost of capital if this leads to a good allocation of risk bearing or to other advantages."[13] While making the observation that the existing theory of risk allocation does not offer firm

[13]Stewart C. Myers, "On Public Utility Regulation under Uncertainty," in Risk and Regulated Firms R. Hayden Howard,(East Lansing, Mich: Michigan State University, 1973) p. 38

guidance on the design of an optimal regulatory strategy, Myers proposes that the relevant principle seems to be that risks should be borne by those economic units specialized in this function. This implies that risks should be borne by investors rather than by consumers. Investors have the benefit of capital markets that offer a wide variety of alternatives for diversification and for tailoring investment portfolios to particular risk preferences. Utility customers have no such mechanism, and therefore, cannot adequately determine if the risk they bear is worth its cost.

The regulatory process deals with uninsurable risk in utility company operations through those mechanisms that affect the companies' rate of return on investment. The most obvious of these mechanisms is determining the required rate of return on equity capital and ultimately the rate of return on total invested capital (debt, and preferred and common stock). Once this determination is made, the regulatory commissions allow utilities to set rate schedules that permit the collection of revenues to cover all justifiable costs and provide a "just and reasonable" rate of return on invested capital.

A second method of allowing for risks involves commissions' determination of the companies' legitimate costs of providing service. Commissions can affect the risks of operation of utilities and investors' perception of those risks by allowing or disallowing certain costs in the companies' revenue requirement, or by permitting faster collection of certain cost items. For example, most regulatory commissions permit the inclusion of a fuel adjustment clause in utility rate schedules. These clauses allow the companies to recover fuel costs with minimal lag, then, by increasing their cash flow, reduce the uncertainty of operations and supposedly lower the companies' cost of capital. Further, including all or a portion of CWIP in the rate base, another regulatory practice that has proliferated over the past decade, has a similar effect. It improves cash flow, lessens the risk of company operation, and presumably reduces the ultimate cost of capital.

Many analysts argue that because of the relatively high level of capital investment, as well as the uncertainties involved in the regulatory process, utility companies are subject to greater risk than are some nonregulated companies, particularly during inflationary periods. On the other hand, the relatively stable demand for their service and their territorial exclusivity, coupled with regulatory mechanisms that allow recovery of all legitimate operating expenses and amortization of various costs, are favorable factors not enjoyed by most nonregulated companies. All things considered, and in light of the previous discussion on risk and associated rates of return, it appears that utility companies still face relatively less risk than do other companies. This assertion stems mainly from the fact that regulatory mechanisms are uniquely available, allowing utilities to shift a significant portion of the risk of doing business to their customers.

Through the competitive market mechanism, society derives the advantages of an efficient productive process and an efficient allocation of resources. It is through this "discipline of the marketplace" that economically efficient companies earn a rate of return on investment sufficient to compensate them for the risks associated with their operations, while inefficient companies earn a lower return or suffer a loss. They ultimately either become more efficient or go out of business.

As we know, in theory, the regulatory process is intended to substitute for the competitive marketplace. As such, it is supposed to produce similar end results. In this regard, regulated utilities are obligated to supply adequate service in exchange for an opportunity to earn a "just and reasonable" return on investment.

Arguments have occasionally appeared in the regulatory literature making the point that, in the past, ratepayers have received the benefit of efficient utility company operations (for example, through the selection of the lowest cost alternative generation facility) in the form of low-cost service, that is, rates lower than they would be had the utility not acted in an efficient manner. From this, it is argued that these same ratepayers

should pay the costs of forced outages when they occur.[14] The above discussion shows this reasoning to be faulty. A competitive firm must supply a quality product or service at a minimum price. This price includes a "just and reasonable" rate of return. If inefficiecy or management error leads to cost increases, the competitive company cannot simply pass these costs onto its customers. It must absorb these costs and eliminate its inefficiencies if it is to continue to compete in the marketplace.

Likewise, as long as the regulatory mechanism allows utilities the opportunity to earn a fair return on their investment, they (the utilities) should also operate in an efficient manner. Efficiency, in this sense, includes keeping up with consumer needs, instituting innovative changes in the production process, good management, and reliable and efficient service. Ratepayers are only required to compensate the utility for legitimate (competitive level) expenses, including a fair rate of return on the assets devoted to the operation of the business; in exchange for which, they are entitled to the lowest cost of service consistent with efficient operation. The same result is obtained through the competitive marketplace. It cannot be achieved if the costs of inefficiencies or management errors are passed onto ratepayers. These costs are properly a part of the risks that utilities should bear as part of doing business.

As noted earlier, economic and financial principles require that those who assume risk must be responsible for what eventuates from that assumption. If an undue portion of the risk of failure is shifted to the ratepayers, this basic principle would be violated, assuming that regulators have fairly apportioned earnings levels in the first place. Such an action would imply that a company would enjoy the "risks" only on the upside, that is, if the company is efficient, earns a competitive return on its investment, and bad happenings do not eventuate. This is not the result intended from the regulatory process, and such a circumstance would result in a misallocation of economic resources as well as injure the

[14]Terry A. Ferrar, "Three Mile Island--The Regulatory Challenge of 1979", Public Utilities Fortnightly, July 10, 1979, pp. 15-18.

concept of fairness. This is, in effect, Arrow's principle of "moral hazard" in operation.

We can sum up by noting that in the competitive marketplace, there is no apportionment of uninsurable risk to the customer along the lines that appear to exist in the utility industry. The rate of return to other industries, on the average, is higher than that for regulated utilities. In exchange for this higher rate of return on investment, these companies must also bear the risk associated with their operations. If utilities are to bear the risks of operation, the quid pro quo would be an increase in the required rate of return on investment. This in turn would result in higher rates unless the companies are able to increase their efficiency.

One alternative procedure would be to give the ratepayer some voice in company management decisions (say, by a public member being on the board of directors) in exchange for having him bear a portion of the company's risk. All other risk takers within the enterprise have some control over company operations and/or an ownership interest in the company. Only the ratepayer bears a portion of the company's risk without receiving a direct involvement or ownership interest in the firm. In exchange for his risk assumption, he receives only the benefit of purchasing the company's output; a benefit that is available to him in any case where utilities are required to provide service.

Another alternative is to have government assume the risks and costs for unplanned shutdowns, either by outright ownership of the production process or by a full underwriting. In this case, society as a whole bears the risk and pays the cost of production, and receives the benefits. The argument runs that the utility company, through its private ownership of the productive process, provides a service of benefit to society as a whole. If it did not, the service would have to be performed by the government. It can be argued that society as a whole should bear a portion of the risks associated with the operation of the company, since it receives a portion of the benefits. This is the rationale behind government efforts to assist financially troubled corporations such as

Chrysler and Lockheed Aircraft. It can further be argued that society as a whole, or some portion of it that receives the direct benefit of utility company operations, should pay some portion of the costs of unplanned shutdowns in direct relation to the benefits received. Since all companies produce some benefit to society for which they are not directly compensated, the degree of responsibility and cost assumption of society on behalf of utility companies should, in general, be no more and no less than that provided to other companies as well.

This discussion indicates again that the regulatory process has only imperfectly replaced the competitive market mechanism. One deviation occurs when extraordinary costs of service--such as the costs of unplanned shutdowns--are quickly passed onto ratepayers making the incentives toward company efficiency less than optimal. It may be that current state regulatory mechanisms are not well suited to deal alone with the many, diverse, and immediate issues and the magnitude of expenses involved in a major utility company accident or unplanned shutdown. The costs involved in this type of occurrence can total hundreds of millions of dollars, and outage time for a major facility can be two or three years, or longer. It is understandably difficult for regulators to tell companies that they must bear full responsibility and full cost for a major forced outage, when in the past (when outages occurred less frequently and at less cost), expenses related to unplanned shutdowns were, more or less, routinely handled by commissions with most of the costs involved eventually borne by the ratepayers.

Such an outcome, today, is being sharply questioned. The stance of the economic purist would be that a utility company should be held accountable for its actions, even if this means a higher cost of capital to the company and higher service rates in the near term. If, in the long run, increased efficiency on the part of the industry and an improved allocation of scarce resources would result, this could more than offset any short-term price rise occasioned by the granting of higher returns in compensation for higher risks. In this event, regulators could articulate

to the utility industry that costs involved in major forced outages, when found to be due to management, design, or operational error--and even when due simply to general business uncertainties--must be largely borne by the company or some self-imposed and self-financed industry insurance mechanism.[15] If this is a proper goal, in the meantime, some transitional method should be devised to deal effectively, with the costs involved in these occurences so that after-the-fact improvisations do not always become an awkward pulling and hauling on regulators by the several parties attempting to dodge financial responsibilities.

What is needed, and what regulation and the utility industry should seek, are methods to heighten fairly the correlation between risk taking and the opportunity for profit and loss rather than counting on ad hoc methods that serve to cloud this critical relationship.

[15]Since the occurrence of the Three Mile Island accident, the utility industry has been working on a type of self-insurance plan that would share the risks and costs of a major unplanned shutdown. See, for example, "The Costs of Nuclear Accidents and Abandonments in Rate Making," Public Utilities Fortnightly, November 8, 1979, pp. 17-23.

CHAPTER 6

OPTIONS FOR THE ALLOCATION OF SHUTDOWN COSTS*

In the discussion in the earlier chapters of this report, it is apparent that the allocation of unplanned shutdown costs has generally been accomplished through the traditional ratemaking process. This method is time consuming, costly, inherently controversial, and an after-the-fact process.

While this method presumably will be a part of the mechanism ultimately established to deal with these costs, it need not be the primary one. That is, regulators in conjunction with utility companies and the public can develop means so that costs associaed with unplanned shutdowns can be prepared for adequately and allocated properly in advance of the event. These mechanisms could then be almost routinely incorporated into the regulatory process.

Another method of allocating forced outage costs is through the courts. This procedure suffers from difficulties similar to those experienced in the regulatory process. Nevertheless, this method has a place in the process. Regulatory commissions should encourage utilities to pursue this method of cost recovery with suppliers if there is reason to believe that faulty operations, design, manufacture, or construction of plant or equipment was a major contributing factor to an unplanned shutdown. Allowing utilities to recover all such costs through pass-through mechanisms quickly discourages them from actively pursuing this method of cost recovery. In any case, the length of time involved in legal action assures that the majority of costs involved in an unplanned shutdown will have already been recovered through some cost allocation mechanism by the time the legal process has concluded. In that case, the damages recovered through the legal process should be distributed among those parties that

*This chapter prepared by Alvin Kaufman.

originally bore the expense. That is, if ratepayers absorbed a part of the expense, they should share in the financial awards obtained through the legal process. Regulators can encourage legal action of this sort on behalf of utility companies by tying full recovery of shutdown costs through rates to at least presumptive consideration by the company of this method of cost recovery and by assuring that any award obtained through this procedure is equitably distributed among the interested parties.

A third approach to absorbing the costs of an unplanned shutdown is for government itself to stand the burden. When a shutdown involves a large dollar investment and relatively higher cost of replacement power, as in the case of nuclear shutdowns, it is almost certain that various government organizations must participate. Further, in the event of a nuclear accident, only government agencies can prepare for and carry out large-scale evacuation procedures adequately and can provide other assistance to impacted communities. The public pays these costs through general tax revenues and assessments charged against the utilities.

Aside from government involvement in absorbing these costs, there is still the question of appropriate cost allocation in the case of a "regulatory induced" shutdown. A shutdown of a facility ordered by a regulatory authority due to error on the part of the utility or its contractor should be borne by the company. On the other hand, regulatory commissions represent the public at large and are charged with protecting the public welfare; in those cases where the shutdown is due to changes in safety requirements, design modifications, and the like ordered by the regulator, it seems appropriate for a utility's ratepayers or the public at large to bear those costs. It is the public that can be assumed to receive the direct benefit of the commission's action, and thus it is a candidate to carry the cost. Therefore, it is this group that should pay the costs. Such costs would include replacement energy costs and the costs of necessary design or safety modifications. There should be provisions, however, to assure that these modifications are carried out in a timely fashion, and that replacement energy costs are provided by the least expensive alternative source. This latter provision may necessitate the alteration of purchased energy tariffs so that replacement energy is

provided on a cost basis rather than on a "split savings" basis, or through a surcharge per kWh purchased. "Split savings" is a method whereby the difference in cost of energy supplied by the two companies is "split" between them. For example, if the purchasing utility could produce energy at six cents per kilowatt-hour (kWh) whereas the supply utility produces it at four cents per kilowatt-hour the companies would split the difference, with the purchasing utility paying five cents per kilowat-hour.

Aside from the traditional ratemaking process and the use of the courts to allocate costs, there are a number of other alternatives that should be considered. These include bankruptcy, contingency funding, insurance, debt guarantees, tax benefits, or public ownership.

Bankruptcy

A regulatory body could refuse to permit the consumer to carry any of the risk from an unplanned shutdown. Such an approach could throw a utility into bankruptcy. In such a case, the utility would be protected from its creditors while it sought to restructure its debt. When an electric utility is involved, this restructuring of debt allows the parties to negotiate the distribution of shutdown costs.

Bankruptcy penalizes the stockholders and company management for inefficiency or error. In such a case the creditors may also be penalized by losing all or part of their investment. The consumer may also be penalized by reduced service quality, and possibly through higher rates. The utility may have difficulty in borrowing money except at premium rates and may also find itself unable to obtain funding for new plants, with a consequent possible decrease in service reliability.

These difficulties may, however, be short term in nature and orderly in process. This conclusion is contradicted, however, by a recent study indicating additional costs to customers of Jersey Central Power and Light Company if bankruptcy were taken ranging between $645 and $815 million over

10 years. These estimates include increased cost of capital, loss of inexpensive old debt, and administrative and litigation costs.[1]

While bankruptcy is not the optimal situation, it is unlikely that the company would be permitted to cease operations. An ample history of such situations abounds in the transport sector. The utility probably would continue to operate under court-appointed trustees, much in the manner in which the Penn Central Railroad continued providing service during the period of its bankruptcy.

On June 21, 1970 the railroad filed a voluntary petition for reorganization under Section 77 of the Federal Bankruptcy Act. Under this section, operations could continue while claims from creditors and investors were resolved. The company had attempted, but failed, to obtain a federally guaranteed loan. The collapse shook the financial community and ultimately convinced key members of Congress that help was needed to prevent liquidation. In March 1973, the presiding judge in the bankruptcy proceeding ordered the trustees either to submit a plan for reorganization or to liquidate the railroad. Liquidation appeared to be the most likely. In view of this situation, compounded by the bankruptcy of most of the remaining railroads in the Northeast, Congress passed the Regional Rail Reorganization Act of 1973. This act established, among other things, the Consolidated Rail Corporation (Conrail). The corporation was to operate the bankrupt properties and to continue transportation services in the area.[2] Subsequently, on April 1, 1976, the Penn Central freight properties were transferred to Conrail. Passenger operations had been turned over to Amtrak earlier.

The road was run by three trustees under the supervision of the courts during the six years of its operation under bankruptcy. Rail service continued, although the quality was somewhat lower as a result of insufficient revenues and high costs. The latter resulted from the severe deterioration of the railroad roadbed and facilities.

[1]Arthur Young and Company, Report on Analysis Of The Potential Effects Of Bankruptcy, New Jersey Board of Public Utilities. September 1980, p. 17.

[2]Gary F. Pastorius, Railroad Industry Reorganization in the Northeastern United States, CRS, Library of Congress, September 9, 1977, 77-205 CR, pp. 2-5.

In any case, if Conrail had not absorbed the railroad facilities, they would have continued to operate under the trustees until the court approved an agreement between the creditors and stockholders. Other railroad cases, as well as motor carriers and bus lines, provide additional examples. The point is that though bankruptcy is unpleasant, service to customers can be continued.

Insurance

Another alternative is the use of insurance. Insurance, of course, is used by all companies as protection against certain property losses, equipment damage, and accidents. It can also be used to cover shutdown costs. Insurance is a form of prepayment and a method of spreading costs among all who may incur those costs. It is also a way of protecting against catastrophic losses.

Insurance has been an integral part of the nuclear power picture since its inception. This includes both property and liability insurance. In the case of the latter, most governments believed the development of nuclear power was worth some risk and established a limit on liability. In general, the company limit was set low and insurance was required to cover up to that limit. The government covered liability over the limit. For example, in Great Britain, the company limit was set at L5 million ($12.5 million) for one facility and L10 million ($25 million) for two or more.

The U.S. system is somewhat different in that total liability is currently limited by law to $560 million per incident (Price-Anderson Act).[3] This liability is covered in part by insurance, in part by an assessment on the utilities of up to $5 million per nuclear plant, and a contribution, if needed, by the federal government. For example, in the case of TMI the utility carried $140 million in insurance, the assessment could raise an estimated $355 million, and the federal treasury would contribute up to $65 million to meet the limit. The liability limit can increase as the number of nuclear licensees and the availability of private insurance increases.

[3]642 U.S.Code Section 2210.

The basic policy is written under an industry risk-rating plan, that is, substantial premium relief is possible, if exposure is favorable over an extended period. As a consequence, 99 percent of the reserve premium collected in 1966, 1967, and 1968, as well as 85 percent in 1969, was returned. The reserve premium is 67 percent to 75 percent of the total premium collected, depending on size.[4] The TMI incident has resulted in a 10 percent increase in liability insurance premiums in 1980, and the premiums are expected to be higher in 1981.

The limitation on liability was established because potential liability was considered a principal deterrent to the development of commercial nuclear power. This limit was necessary because nuclear risks negate the fundamental insurance tenet requiring a large number of independent exposure units with no one loss producing a catastrophe. A single nuclear loss can be catastrophic. The problem has been further mitigated by the creation of an insurance pool to cover nuclear property and liability losses. This pool spreads the risk among a large number of insurance companies. In addition, nuclear property coverage is limited to $300 million per unit. A company experiencing a nuclear accident can thus lose several hundred million dollars of its one billion dollar investment, depending on the amount of uninsured damage to the plant. It should be noted that the TMI property loss will wipe out the insurance pool's nuclear damage reserves. Further, property insurance rates have increased 36 percent in 1980.[5] It has been suggested that the liability limit be adjusted to reflect inflation in order to provide adequate protection. In 1980, indexing to inflation would mean a four to six billion dollar limit. The limit could also be set as a per capita figure. This would result in a higher liability limit and higher premiums for plants located in more highly populated areas.[6]

[4]Francis X. Boylan, "A Conference Prologue--The Lessons of Three Mile Island--Insuring the Risks," Atomic Industrial Forum, Inc., International Conference on Financing Nuclear Power, Copenhagen, Denmark, September 24, 1979.

[5]Dan R. Anderson, "Risk Management and Insurance Problems of Large Complex Technologies: The Case of Nuclear Power," American Economic Assn. Annual Meeting, Denver, Colorado, September 1980, p. 20.

[6]William C. Wood, "Responses of Electric Utilities to Changes in Liability for Nuclear Accidents," AEA Annual Meeting, Denver, Colorado, September 1980, p. 7.

The basic insurance has been supplemented by an extra expense plan offering up to $156 million in coverage for the extra outage costs of an accident at nuclear plants. These extra costs are primarily for purchased power. The plan, known as Nuclear Electric Insurance, Ltd. (NEIL), is pending, subject to various approvals. This plan does not cover generic outages or those ordered by regulatory authorities, nor will it make a payment for the first 26 weeks of outage. After this period, the insurance plan will pay $2 million per week for the next 52 weeks and $1 million per week for the following year. Premium cost is estimated at $1.7 million per year per reactor, assuming that half the operating nuclear units in the U.S. sign up.[7] Each participant is subject to an assessment of approximately $7.5 million.[8] The six-month deductible is provided as an incentive to good maintenance and efficient operation.

The nuclear insurance extra expense scheme, with appropriate modifications for other generating sources, might be extended to cover all unplanned outages. The creation of such a pool spreads the risk among all consumers of electricity in the U.S. rather than placing it on those in a limited geographic area. The general rule is that if there is a small but measurable probability of a catastrophic occurrence happening, insure it.

The American Public Power Association has sponsored the creation of the American Power Insurance Corporation (APIC). This insurance will cover fixed costs that must be paid by the utility despite a shutdown. These costs are defined as principal and interest payments on debt and the ongoing cost of maintenance and plant security. The utility can purchase insurance up to $150,000 per day with a maximum of $50 million per unit. Claims will be paid for two years after a 120-day deductible period.

Insurance can be purchased by any electric utility owning an interest in a nuclear unit. The unit must have been in commercial operation for at least one year. Premium cost is not yet available.

[7]"Nuclear: Its Political, Societal Woes Overshadows Its Advances", Nuclear Industry, December 1979, pp. 17-18.

[8]"Replacement Fuel Insurance Launched by Industry Group," Nuclear Industry, April 1980, pp. 11-13.

A serious question that requires resolution is the problem of who pays the premium for these various insurance schemes. If these charges are included in rates, the customer is carrying the risk. On the other hand, since most plans provide for some amount to be borne by the utility as an incentive to maintain and manage equipment properly, it may make sense to continue to consider the insurance premium as a cost of doing business as is usually done. The utility would then be held responsible for the deductible. For example, in the case of the nuclear plan, the utility would have to pay the purchased power costs for a six-month period in the event of a shutdown. The customer, however, would have paid the annual premium through rates. These premiums would be offset by any rebates that fall due.

The utility could be required to put funds aside on a contingency basis to cover its share of the potential liability. These funds would be charged to revenues "below the line." Thus, the company and its stockholders would be forced to carry some of the risk and would be responsible for some of the results.

Contingency Funding

As discussed above, contingency funding can be considered as a form of self-insurance. Regulators could require the creation of a fund to cover the costs of unplanned shutdowns in advance of an occurrence. This procedure would involve the setting aside of cash each year to cover emergencies. The amount and the rules governing the fund, including expenditure and collection, would be set after a hearing.

A major question to be decided is whether the cost of the fund should be "above or below the line." That is, who should pay the bill the customers or the stockholders? If permitted above the line, the future risk would be shifted to the consumer with the customer paying into the fund through his rates. If carried below the line, the risk would be levied on the stockholder, but in small amounts. Also, if a contingency did not occur when anticipated, the stockholder would have the earnings on the fund as a reward.

Contingency funding could be a problem if an unplanned shutdown occurs before the fund reaches an adequate level. This would also be a problem if shutdowns occurred more frequently than anticipated. As a result, contingency funding may be most useful in conjunction with insurance. The insurance would cover shutdown costs over the amount in the fund. As a result, the premium would be lower than if insurance were "the first line of defense."

Public Ownership

A regulatory body may also decide to revoke the company franchise and allow the property to be converted from an investor-owned to a publicly-owned utility. Such a step could result in the losses from the unplanned shutdown remaining with the company while service quality was maintained under new ownership. Thus, the full risk for the one incident would be borne by the utility. Presumably, there would be legal efforts to prevent the switch and considerable legal effort involved in establishing the price to be paid for the converted property.

Those in favor of public ownership contend that such systems are more efficient, have lower costs, and are more responsive to the public. Others maintain that the rates are lower because publicly owned utilities pay no taxes nor certain other costs and need not earn a profit. In addition, such utilities can issue tax-free bonds that usually carry a lower interest rate than do taxable bonds. These savings are a form of subsidy to publicly owned bodies. In general, these lower costs are often offset by higher depreciation rates, contributions to the municipal general fund, and provision of various free services such as streetlighting and water pumping.

The switch from private to public ownership would have minimal impact in terms of the allocation of unplanned shutdown costs. It could serve as a warning to other companies to improve maintenance and take such preventive measures as are possible. Other than this, progress toward a fair cost allocation solution to the problem would be minimal.

The Federal Role

The federal government can be asked to help in the event of a shutdown. As discussed below, this help can be accomplished through provision of debt guarantees or through direct subsidy.

Debt Guarantees

A guarantee system requires a governmental body to assure payment of the utility debt. This would permit the utility to borrow funds to cover the cost of the unplanned shutdown. Assuming that the regulators allowed sufficient rate increases to cover the debt service, no out-of-pocket costs would be imposed on the government other than those required for administration. In the event the company defaults, the guarantor would have to make good on the debt. The government would be responsible for the errors of the company on a contingent basis. Further, since sufficient revenue must be provided to assure repayment of the debt, the consumer would effectively be forced to pay the shutdown costs, either through electric rates or through taxes. While the consumer pays in either case, the distributional impacts are different.

Loan guarantees are a governmental tool of long standing but generally have been used to encourage actions believed to be in the public interest. Such small-scale guarantees include FHA and VA mortgage loans, small business loans, farm-operating loans, and loan guarantees to shipbuilding. Loan guarantees to individual private companies on an emergency basis have been rare. Within the past 10 years or so, there have only been three requests. Of these, Penn Central Railroad was turned down and Lockheed and Chrysler Corporation were granted. In those instances where guarantees were undertaken, substantial management reorganization or financial restructuring has been required as a condition of the guarantee. For example, in the case of Chrysler, $1.5 billion in federal loan guarantees were made available if the company could raise $2 billion on its own. This was to include concessions from employees, help from state and local governments, loans from suppliers and dealers, the sale of assets, and new loans from current lenders. In addition, a special federal board was set up

to approve the guarantees and to assure that the conditions established by law were met.

Loan guarantees are sometimes considered to be appropriate when the activity is in the national interest, the company is willing to reorganize its management or finances, and financial help from private markets is unlikely.

Direct Subsidies

Direct subsidies include payments to the utility, loans at less than market interest rates, and special tax benefits. All of these would stabilize utility rates and shift the risk burden to the government, that is, the taxpayer.

Tax benefits are the most popular and most likely direct subsidy. They are essentially interest free loans in the sense that if the company becomes profitable it may pay enough taxes to make up for the tax benefit. Such payment is not certain, and the tax benefit would never be offset if the company went bankrupt. Such a benefit also has an immediate impact on the federal budget but requires no oversight of operations. This kind of benefit was granted to American Motors Corporation in 1967.

CHAPTER 7

SUMMARY AND CONCLUSIONS*

As mentioned in Chapter 2, the U.S. electrical system is one of the most reliable in the world. Despite this, unplanned shutdowns occur from time to time. For example, there were 22 interruptions and 11 load reductions in the first quarter of 1979. They can occur as a result of equipment failures, operator error, transmission problems, regulatory actions, and the like. Shutdowns can be classified as acts of God, equipment failures, and those due to regulatory action. They can relate to generation, transmission, or distribution but need not result in a power outage. In classifying shutdowns, the initial course is taken as the assigned cause for purposes of this study.

Unplanned Shutdowns and Their Costs

Whether or not an unplanned shutdown results in a power outage additional costs are incurred by the utility, its customers, and society. These costs include equipment repairs, purchased power, and inconvenience. In the event of a power outage, costs will be substantially higher, and will include output losses, utility and governmental costs, as well as social costs. Social costs include inconvenience, riot damage, environmental damage, and evacuation and disruption expenses. Utility costs include purchased power, as well as equipment repairs, and revenue lost during the outage.

*This chapter prepared by Alvin Kaufman.

The quantification of shutdown costs is difficult, but estimates have been prepared for the larger outages. For example, the 1977 New York blackout that lasted 25 hours was estimated to cost between $310 and $346 million. The Three Mile Island Accident, on the other hand, imposed utility costs of at least $720 million and might have resulted in catastrophic social costs. It is apparent that shutdown costs will vary according to the type of shutdown, its location, the make up of the regional economy, and other localized factors. Clearly, such costs can be very substantial.

In allocating shutdown costs, a regulatory commission is required to strike a balance amoung competing goals. These include equity, adequate and reliable service at fair rates, economic efficiency, and maintenance of the financial stability of the utility. In an effort to determine how a regulatory body accomplishes this task, four examples were examined. The New York City blackout (an act of God), the San Juan equipment failure, the Three Mile Island nuclear accident, and the NRC-ordered shutdown of Surry One.

In each case, as discussed in an earlier chapter, the regulatory body dealt solely with utility costs. Output and social costs, where they occurred, were absorbed by those suffering the loss. In some instances, such losses were covered by insurance or government programs. Utility costs, including purchased power, were allocated on the basis of responsibility for the accident, tempered by the need to maintain the financial viability of the company. The latter item is an effort to assure continuation of adequate and safe service.

Legal Issues and Constraints

The provision of adequate and safe service is a major legal obligation placed on utilities in exchange for franchise rights. Liability, on the part of the utility, for damages resulting from an unplanned shutdown depends on the cause of the shutdown. Interruptions of service due to acts of God do not generally result in such liability.

Negligence, on the other hand, can result in damages, depending on whether the utility might have foreseen the possibility of the occurrence of the shutdowns and taken action to prevent it. In this regard, there is no clear legal liability for bad planning. Conceivably, a regulatory body could impose a penalty through denial of a portion of a rate increase. However, this action could make it difficult for the utility to provide adequate service in the future and could be considered as taking property without due process. Some other requirement, such as pooling arrangements, may be necessary.

A utility is legally required to purchase power in those instances where its own capacity is insufficient to meet demand. It is unclear whether a utility with excess power is permitted to refuse help to a disabled company. Recent law, however, gives the federal government authority to coordinate utility activity. Therefore, utilities and state commissions may be neglecting their legal responsibilities if they do not request the use of those powers to help alleviate problems from unplanned shutdowns.

In the exercise of its authority to assure adequate and reliable service, a commission is legally required to balance reliable service with the need to maintain the financial viability of the utility. These economic considerations must be balanced against the public interest on a case-by-case basis. Thus, in the case of an unplanned shutdown, events occur that may change utility costs. That is, property may no longer be useful, and purchased power costs may be greater than the original generating costs. These changes may require reconsideration of the balance between investors and ratepayers, but in a legal sense, it is the balance between adequate service and a fair return on investment for the utility that must be struck. Where property is no longer useful and is removed from the rate base, the resulting rate of return, however onerous to the utility, would be constitutional. That rate must consider the risks to be borne.

The utility could request approval to withdraw from service in those instances where it finds the balance achieved by the commission wanting.

If permitted to do so, the regulatory body would be required to make some provision for the continuance of service by another company.

Alternatively, the regulatory actions could, in the extreme, result in the bankruptcy of the utility. In this case, assuming liquidation was not called for, the court would appoint a trustee to oversee reorganization subject to judicial approval. Court-ordered rate increases under bankruptcy would be subject to regulatory approval, but burdensome property could be abandoned by the trustee. Presumably, the approval of an adequate rate increase by the commission before to bankruptcy would have averted the action. By permitting bankruptcy, it could thus be assumed that the regulators have given implied consent to dissolution. Bankruptcy, however, does not avoid the issue of rate increases, nor any other major regulatory decision. As a consequence, it does not provide a legal mechanism to avoid the central economic role of the utility commission.

Economic Issues and Criteria

A central role of the commission is to assess economic risk and decide who should bear what portion of that risk. This is largely accomplished through adjustment of the rate of return. The concept of risk, however, is illusive to define and is imperfectly understood. In general, it is accepted that profits are the reward for bearing risk. The relationship between these two items has not been fully explored, although risk can be considered as a driving force for innovation and the consequent earning of an "economic" profit. Too high a risk, however, could stifle productive enterprises by making the potential loss too great for the potential reward. In order to avoid this problem, risk is shifted within the economy to those institutions most capable of bearing the load. These institutions skilled at risk carrying, can do so at a cost below that of the company. In most instances, a limit is placed on the risk-shifting device in order to provide the entrepreneur with an incentive to be efficient. Insurance with a liability limit, corporate bonds with limited face value and contractual requirements for debt limitation, and common stock with limited stockholder liability are examples of such risk shifting.

In its effort to distribute risk, the regulatory body is substituting for the competitive market and should strive for the same result. In essence, this means that those who assume risk must bear the results of that assumption, good or bad, and must have the prospect of sufficient earnings to make the risk assumption worthwhile. Strict adherence to this rule would result in economic efficiency, one of the goals of regulation, but could result in violation of some of the other goals. In particular, the legally required goal of adequate and reliable service might be unachievable.

In view of the above, in the case of an unplanned shutdown, regulators will attempt to achieve a balance amoung their various goals by allocating risk among all of the involved parties, including the ratepayer. The company rate of return presumably could be adjusted downward in the same measure that risk is lessened. In this circumstance, the customer, in return for carrying part of the risk, pays a lower price for electricity than might otherwise result. Some analysts, however, contend that the best scheme is one that leads to a "good" allocation of risk even if the cost of capital is higher. "Good" allocation can be defined as placing the risks on those specializing in carrying out this function, such as investors. Investors can diversify and tailor their investment portfolios to achieve their desired overall level of risk and compensating rate of return. The customer, on the other hand, cannot do so. In this view, therefore, the customer should not be asked to carry risk. In return, the utility and investors would earn higher profits, and the customer would pay higher prices unless increased productivity resulted.

The regulatory body, however, has a legal mandate to consider other goals as well as economic efficiency and is faced with the economic need to shift the risk of an unplanned shutdown onto those best able to bear the burden. To accomplish the latter, various risk-sharing mechanisms are available. We will now explore them as they apply to an unplanned shutdown.

Risk-Sharing Mechanisms

The allocation of unplanned shutdown costs, in line with the regulators perceived priorities, can be achieved through the usual regulatory processes or through the courts. These procedures, however, are time consuming, costly, and after the fact. Other alternatives include bankruptcy, insurance, contingency funding, public ownership, debt guarantees, and direct subsidies. These mechanisms are outlined in terms of regulatory goals in table 7-1.

It will be noted that except for bankruptcy, all of the mechanisms can do the job if adequate and reliable service is an overriding priority. The quality of service will probably be lower in bankruptcy.

Bankruptcy, on the other hand, probably will not cause a misallocation of economic resources, since those presumably responsible for the problem (management) and those who assumed the risk (stockholders and bondholders) will pay a penalty in the event of a sustained shutdown. Thus, the utility has an incentive to be efficient. Debt guarantees can result in a misallocation of resources, and direct subsidies surely will. The other options can be structured to provide an incentive toward efficiency. The insurance option also puts the burden on those in the business of sharing risk and thus best able to bear this burden. It also internalizes the cost of a potential shutdown, giving the customer the appropriate price signal.

Insofar as the equity goal is concerned, bankrupty and contingency funding appear to be the most suitable mechanisms. Under these options, those presumed responsible for the problem pay the penalty. The insurance option, on the other hand, avoids the equity question because a third party is paid to carry the risk. The least equitable options are debt guarantees direct subsidies, and public ownership, for they require the taxpayer to pay the cost of the shutdown. Public ownership could be structured so that the original owners are required to pay an appropriate penalty if at fault, or could be left with the debts of the original corporation.

TABLE 7-1

REGULATORY GOALS AND ALTERNATIVE RISK ALLOCATION MECHANISMS FOR UNPLANNED SHUTDOWNS

Risk Allocation Mechanism	Adequate & Reliable Service	Economic Efficiency	Equity	Financial Stability
Bankruptcy	Quality probably lower	Forces those making the error to pay	Puts the burden on the utility	Very unstable
Contingency Funding	Could be poor quality if shutdown occurs before fund reaches an appropriate level	Can force those making errors to pay penalty if treated "below the line"	Puts burden on stockholder if taken from dividends	Can assure stability
Debt Guarantees	Can be adequate, no assurance	No penalty for error	Burden shifted to taxpayer	No assurance, but easier to borrow
Direct Subsidies	If large enough would assure service	No penalty for error	Burden shifted to taxpayer	Assured if subsidy large enough
Insurance	Can assure cash for prompt repair and for power purchases	No error penalty unless deductible is adequate	Puts burden on ratepayer and insurance co.	Can assure stability if large enough
Public Ownership	Can assure quality of service if rates are raised or tax revenues are used	Owners paid value of property; can suffer an error penalty	Shifts burden to taxpayer	Can assure stability

Source: Based on information in chapter 6

In any case, except for bankruptcy, virtually all of the options can assure the financial stability of the utility. Bankruptcy could exacerbate the situation by making it difficult for the utility to borrow money and by raising questions regarding the claims of creditors on assets and revenues.

Conclusions

On balance, insurance may be the best way to share the risks of an unplanned shutdown. Commercial policies, depending on the perception of the risk, usually have an upper limit in order to reduce the insurance underwriters exposure to catastrophic claims. For example, property insurance policies on nuclear plants are unlikely to be written for more than $300 million. Such a limit might be adequate for a fossil-fired plant but is not sufficient for a major nuclear accident such as occurred at Three Mile Island. Further, liability in a nuclear case is limited under the terms of the Price-Anderson Act and can probably be accommodated adequately under current insurance policies in fossil-fired incidents. Purchased power insurance covers only nuclear accidents and is still untried. In view of these differences, we now turn to a discussion of the various means of meeting the need.

Liability Insurance

In the case of fossil-fired plants, insurance arrangements appear adequate. For nuclear units, the question of adequacy is controversial but mooted by the Price-Anderson Act. The latter limits liability to $560 million. Approximately $140 million of this amount is available in commercial insurance; the remainder is provided by an assessment against all nuclear units in the U.S. and by the federal government.

Property Insurance

Utilities should be required to carry property insurance just as they do now, preferably up to the limit available. The premium would be

considered a cost of doing business, just as it is now, and thus paid for by the customer. In the event of an unplanned shutdown, the property costs not covered by insurance would be paid by the utility up to some limit, say $100 million, and not flowed through to the customer by an increase in rates. This would give the company an incentive to operate efficiently and utilize adequate maintenance procedures. Damages over the insurance and company limit would be paid for by an increase in rates, but would only occur in the case of a major accident that would threaten the financial viability of the utility without such an increase.

Purchased Power Insurance

The nuclear purchased power insurance arrangement could be extended to cover unplanned shutdowns from all types of plants. Coverage should be restricted to the incremental cost of purchased power compared with the utility's own generation. The latter cost is already built into rates, and only the increment requires coverage. A deductible amount per incident, say $100 million, should be required. This sum could be provided for through contingency funding levied against the stockholders in an effort to force the company to carry part of the risk and would thus encourae efficiency. Alternatively, in those instances where it was at fault, the utility could be required to pay up to the deductible with no increase in revenues. In all other cases, such as acts of God, the deductible purchased power costs would be flowed through to the customer. The purchased power insurance would also have a limit. In some instances, such as another Three Mile Island accident, this limit might be exceeded. Costs over the ceiling would also have to be paid by the customer in order to assure adequate and reliable service.

A self-insurance scheme including all of the utilities in the U.S. could be developed to provide coverage for property and purchased power costs over and above that paid by commercial insurance. This could simply take the form of an obligation to pay a proportionate amount of such costs if needed, or it could be a full-blown insurance arrangement.

In the event a commission does not feel that insurance is a suitable mechanism for risk sharing, more traditional responses may be in order. That is, through the hearing process, responsibility for the incident could be fixed and costs apportioned accordingly. In short, those who cause the problem should bear the costs. Admittedly, such an apportionment is a value judgment, but that is what commissions do best.

To illustrate how this might work, let us look at each of the types of shutdown and how the above would apply.

Acts of God and Regulatory Shutdowns--In such cases, where the shutdowns have not been compounded by operator error, the costs of purchased power, equipment repairs, and so forth, should be borne by ratepayers. To achieve a wide cost distribution the ratepayers would pay for the necessary equipment modifications and for purchased power. This could be accomplished through a special surcharge on bills so that customers would understand that the extra charges result from regulatory actions or an act of God. Purchased power, in these cases should be bought at no more than actual cost and preferably at average cost to the seller. This would tend to spread some of the regulatory risks to a wider public.

Equipment Failure--All equipment failure costs, other than those considered an act of God and above normal insurance coverage, should be borne by the utility. In return, the utility should be allowed a rate of return appropriate to the risks. Thus, the ratepayer covers the normal cost of insurance as he is already doing, and the utility and its stockholders are required to cover costs above these amounts. The latter would normally occur only in catastrophic or near-catastrophic instances.

Nuclear Accidents--These types of unplanned shutdowns may differ from others because there can be catastrophic consequences, and because of special insurance programs and legal limits on liability. Government should be prepared to assume the responsibility for the catastrophic consequences, since it is the only group able to organize and cover the costs of such an event. Other than this, the ratepayers can be called on to cover

the costs of insurance premiums, but the utility should clearly understand that it is responsible for all costs not covered by insurance, including the purchased power deductible period. In return, the utility should be allowed a rate of return appropriate to the risks.

APPENDIX A

STUDIES OF OUTAGE COSTS

Presented below is a list of studies dealing with outage costs, as noted in chapter 2.

Output Value per kWh Lost

1. FPC, The Adequacy of Future Electric Power Supply: Problems and Policies, Technical Advisory Committee on the Impact of Inadequate Electric Power Supply. p. 75.
2. Kaufman, Alvin. Reliability Criteria--A Cost Benefit Analysis. N.Y. Department of Public Service, O.R. Report 75-9, August 1975.
3. Shew, W.B. "Costs of Inadequate Capacity in the Electric Utility Industry," Energy Systems and Policy 2 (1977): 85-110.
4. Shipley, R.B.; A.D. Patton; and J.S. Denison. "Power Reliability vs. Worth." IEEE Transactions on Power Apparatus and Systems, July-December 1972, pp. 2204-7.
5. Sigma Research, Inc. Workshop Proceedings: Environmental and Social Impacts of an Electricity Shortage. EPRI, June 1978, EA-796-SE, WS-77-24.
6. Telson, M.L. "The Economics of Alternative Levels of Reliability for Electric Power Generation Systems," The Bell Journal of Economics (1975): 679-94.

Customer Surveys

Ontario Hydro Survey on Power System Reliability:

"Viewpoint of Government and Institutional Users." R & U 78-1.
"Viewpoint of Small Industrial Users." R & U 78-3.
"Viewpoint of Customers in Retail Trade and Service." July 1979.
"Electric Power Supply Reliability Survey II"(by Market Facts of Canada, Ltd.).

Specific Outage Studies

1. Corwin, Jane L., and William T. Miles. Impact Assessment of the 1977 New York City Blackout. Systems Control, Inc., July 1978, p. 112.
2. Kaufman, Alvin, and Barbara Daly. The Cost of An Urban Blackout: The Consolidated Edison Blackout, July 13-14, 1977. CRS for the Committee on Interstate and Foreign Commerce (U.S. House of Representatives, June 1978, Print 95-54).

APPENDIX B

BIBLIOGRAPHY OF RISK LITERATURE

Presented below is a list of pertinent literature, as noted in Chapter 5.

Abendroth, Timm. "Public Utility Law--Public Service Commission Ordered Rebates for Inadequate Service." Wisconsin Law Review. 1976: 584-606.

Arrow, Kenneth, J. Essays In The Theory of Risk-Bearing. Chicago: Markham Publishing Co. 1971. 278 pp.

Avery, George A. "The Costs of Nuclear Accidents and Abandonments in Rate Making." Public Utilities Fortnightly, September 8, 1979, pp. 17-23.

Baumol, William J. The Stock Market and Economic Efficiency, New York Fordham University Press. 1965, 95 pp.

Behrens, Carl E. Nuclear Insurance/Indemnification: The Price Anderson Act. Issue Brief IB75013. The Library of Congress, Congressional Research Service, February 25, 1975. (updated April 8, 1977) 6 pp.

Boylan, Francis X. "A Conference Prologue--The Lessons of Three Mile Island--Insuring the Risks," International Conference onFinancing Nuclear Power, Atomic Industrial Forum, Copenhagen, Denmark, September 24, 1979.

Copeland, Basil L., Jr. "Alternative Cost-of-Capital Concepts in Regulation." Land Economics 54. (August 1978) 348-61.

Ferrar, Terry A. "Three Mile Island--The Regulatory Challenge of 1979," Public Utilities Fortnightly. July 19, 1979, pp. 15-18.

_____ . "Regulation, Financial Markets and Quality of Service." Public Utilities Fortnightly. September 13, 1979, pp. 31-33.

Fraser, Donald R., and R. Malcolm Richards. "Risk and The Required Rate of Return in the Electric Utility Industry." Akron Business and Economic Review, (Spring 1977) pp. 41-44.

Friend, Irwin and Marshall Puckett. "Dividends and Stock Prices." The American Economic Review 65, (September 1964) 656-82.

Gordon, Myron J. The Cost of Capital to a Public Utility. East Lansing, Mich.: Michigan State University, 1974.

Grainey, Michael W., and David A. Kubichek. "Electric Utility Regulation: New Directions in Environmental and Energy Law." Denver Law Journal 56 (Winter 1979) 95-126.

Harrington, Diana R. "The Changing Use of the Capital Asset Pricing Model in Utility Regulation." Public Utilities Fortnightly, February 14, 1980, pp. 28-30.

Hills, John J. "A Reappraisal of Public Utility Responsibility In The Electric Utility Industry." Environmental Law 9 (Winter 1979) 407-39.

Knight, Frank H., Risk, Uncertainty and Profit. Boston: Houghton Mifflin Co., 1921; reprint ed., Chicago: University of Chicago Press, 1971.

Kovan, Dick. "Nuclear Insurance and Indemnity." Nuclear Engineering International. 21 (April/May 1976) 51-53.

Lerner, Eugene M. "Competition for the Funds of Investors and the Cost of Capital for Utilities." Public Utilities Fortnightly, February 28, 1980, pp. 15-18.

Levy, Robert E. "Fair Return on Equity for Public Utilities." Business Economics. 13 (September 1978) 46-57.

McConnell, Campbell R. Economics: Principles, Problems, and Policies. 3rd. ed. McGraw-Hill Book Co. 1966.

National Regulatory Research Institute. Analysis of Selected Financial Aspects of the Electric Utility Industry. Columbus, Ohio, 1979

New York Public Service Commission. Opinion and Order Regarding Operation of Fuel Adjustment Clause During Outage. Opinion 79-1, Case 27123, January 16, 1979.

Ott, Attiat F. "Utility Accidents: Economic Impact and Tax Implications." Paper Presented at the Seventy-Second Annual Conference on Taxation, Okla. City, Oklahoma, October 30, 1979.

Profozich, Russell J. Alvin Kaufman and Susan J. Bodily. Three Mile Island: Regulatory Implications For Ratemakers and Ratepayers. Report No. 79-192, Library of Congress, Congressional Research Service, September 5, 1979.

Risk and Regulated Firms. edited by R. Hayden Howard. East Lansing, Mich., Michigan State University, 1973.

Robicheck, Alexander A., and Steward C. Myers, Optimal Financing Decisions. Englewood Cliffs, N.J. 1965.

Robichek, Alexander A. "Regulation and Modern Finance Theory." The Journal of Finance, 33 (June 1978) 693-705.

Special Commission of Inquiry into Energy Failures, Report of the Special Commission. vol.I New York Public Service Commission, December 1, 1977.

Tinic, Seha M., and Richard R. West. Investing in Securities: An Efficient Markets Approach. Reading, Mass. Addison-Wesley Publishing Company, 1979.

Trout, Robert R., "The Regulatory Factor and Electric Utility Common Stock Investment Values." Public Utilities Fortnightly. November 22, 1979, pp. 28-31.

U.S. Congress, Joint Economic Committee. Nuclear Powerplant Shutdowns--Who Pays? Hearing before the Subcommittee on Energy, 96th Congress, 1st Session, April 5, 1979.