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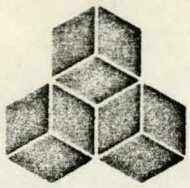

SYSTEMS, SCIENCE AND SOFTWARE

SSS-R-77-3024
Revision 1

FEDERAL REGULATION OF THE PIPELINE INDUSTRY: A SUMMARY REVIEW

by

William F. Banks

TECHNICAL REPORT - TASK 2.2

CONTRACT E(04-03)-1171

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31 May 1977

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REA

DISCLAIMER

ACKNOWLEDGEMENTS

This report incorporates the work of several individuals. Mr. Robert Austin of Pipe Line Technologists, Inc. (Pipetech) interviewed personnel at the regulatory agencies and prepared the initial draft of Section 5.0. Mr. Wayne Wildenradt of Pipetech provided the initial draft of Section 4.0. The parts of Section 3.0 which treat oil pipelines were developed from a paper by Mr. J.D. Durand, General Counsel, Association of Oil Pipelines. The computer simulation studies were performed by Dr. Joseph Masso of Systems, Science and Software (S^3) from system designs and analytical studies performed by Mr. O.N. Bradford and Mr. V.J. Mallu of Pipetech, using Pipetech computer models.

In developing Sections 2.0 and 7.0, I have been assisted by consultations with Mr. R.D. Hull, Vice President-Engineering, Pipetech.

W.F. Banks

5/31/77

Federal Regulation of the Pipeline Industry
A Summary Review

Abstract

The principal purposes of this report are: one, the identification of the jurisdiction areas of the federal pipeline regulating agencies, and two, an examination of the amenability of the regulatory system to the introduction of energy-conservative new technology into the pipeline industry. The history, scope, and agency structure of state and federal regulation are recounted and some gaps, overlaps, and ambiguities are identified. The only significant inhibitory effects upon technological innovation are found to derive from the FPC and ICC limits upon profit, the 1941 Justice Department consent decree limiting dividends to shipper-owned pipelines, and the income tax rules governing recovery of investment credits and startup losses. Effects of these limits are explored by simulation studies using the Systems, Science and Software pipeline economic model (PEM). Two new concepts of regulation are proposed which would neutralize the inhibitory effect of the present regulatory system and would motivate pipeline operators to conserve energy: one, the use of a "national equivalent value" in the economic tradeoff analyses which justify entry of a technological innovation into the rate base (valuation), and two, a "valuation allowance" which would reverse the presently often-existing situation and insure that the pipeline operator would realize a greater profit from saving energy than from wasting it.

Federal Regulation of the Pipeline Industry

A Summary Review

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1.0 OBJECTIVES

1.1 Purpose of the Project

The work reported here is a part of a project which is being carried out by the team of Systems, Science and Software (S^3) of San Diego, and Pipe Line Technologists, Inc. (Pipetech) of Houston, under the contract which is identified on the cover page as "Energy Study of Pipeline Transportation Systems." The primary objectives of the project are to assess the susceptibility of the oil, gas, and other pipeline industries to technological innovations and to identify the associated research, development, and demonstration (R, D, & D) requirements. The project final report will be published in early 1977 as S^3 report SSS-R-77-3020, "An Energy Study of Pipeline Transportation Systems." That final report will be in summary form, combining the results from the seven task reports listed in Table 1.1-1. As will be noted from the table, this present report is one of those task reports.

1.2 Purpose of this Report

This report presents the results of Task 2.2, which has two primary objectives: one, the identification of the jurisdictional areas of the federal regulatory agencies, and two, an examination of the amenability of the regulatory system to the introduction of energy-conservative new technology into the pipeline industry.

This report is primarily devoted to reviews of the regulatory agencies who exercise influence upon pipeline construction and operation. However, there are two additional areas of government influence which are not specific to pipelines but apply to all industries - the income tax laws and the antitrust laws. It is seen in Section 7.2 that the former are very important objectives of this study. It may well be that the latter are also important, i.e., that introduction of certain innovations might place the pipeline operator in a position which the Department of

Table 1.1-1

Project Reports

SSS-R-77-	Title	Associated Task
3020	An Energy Study of Pipeline Transportation Systems	All
3021	Economic Models of Pipeline Transportation Systems	1 (partial)
3022	Summary Survey of Energy Consumption in the Pipeline Industry	1 (partial)
3023	Slurry Pipelines - Economic and Political Issues - A Review	2.1
3024	Federal Regulation of the Pipeline Industry	2.2
3025	Potential Efficiency Improvements in Pipeline Transportation Systems	3
3026	Recommendations for Energy-conservative Research and Development in Pipeline Transportation	4 (partial)
3027	Opportunities for Future Energy Conservation in the Pipeline Industry	4 (partial)
3069	S^3 Financial Projection Model - Preliminary User's Manual and System Overview	1 (partial)

Justice would regard with suspicion. As specific innovations and scenarios are explored in Task 3, this possibility must be reviewed in each case, and the results presented in the final report or in a revision to this report.

2.0 SUMMARY

2.1 History of Regulation

Oil pipelines have been subject to the tariff provisions (Part I) of the Interstate Commerce Act since the passage of the Hepburn Act in 1906. The Transportation Act of 1920 eliminated some ambiguous language of the Hepburn Act and flatly declared pipelines to be common carriers. A series of court decisions established that the tariff provisions and the other requirements of the ICC act are separately applicable. Where an interstate pipeline operates in actual fact as a purely private carrier, it has been held not to come under the tariff requirements of the Act, but it is, nevertheless, subject to the reporting, valuating, and uniform system of accounts requirements of the Act. On the other hand, when the pipeline is in fact operating as a common carrier, and in particular when it enjoys a monopoly situation, it invariably finds itself also under the Act.

In addition to tariffs, the other significant aspect of interstate regulation, which developed in the early 1940's, is in limitations upon operating income. Crude oil pipelines are limited to 8% per annum of their rate base, which is essentially the total of their assets, while product pipelines are limited to 10%. Operating income for purposes of regulation is net income after taxes. A third important limitation which evolved in this period is a limit of 7% upon dividends paid to shipper-owners.

Gas pipelines are treated as utility companies and therefore are regulated by the FPC instead of the ICC. However, they are in fact basically transporters and may be regarded as similar to oil pipelines, though there are important differences between FPC and ICC regulation. The principal distinctions are that the FPC does not allow interest as a charge before net income, and that the rate base (valuation) is computed in a straightforward accounting manner under FPC rules. Under ICC rules, the valuation is set by a more complicated and subjective process.

The important historical events in pipeline regulation listed in Tables 2.1-1 and 2.1-2 are described in detail in Section 3.0.

Table 2.1-1

Important Regulatory Actions Affecting Oil Pipelines

Interstate Commerce Act - 1887

Initially applied only to railroads

- o Principal objective - just and reasonable charges
- o Prevent undue preference
- o Abolish pooling of freight

Elkins Act - 1903

Designed to strengthen ICC Act

- o Prosecution for rebating
- o Require publishing of rates

Hepburn Act - 1906

- o Made pipelines subject to Part I of the ICC Act

Transportation Act - 1920

- o Legislated common carrier status

Court decisions

- o Pipelines in monopoly situation found subject to ICC Act
- o Purely de facto private carriers exempt from the reporting, valuation and uniform system of accounts requirements of the Act.

ICC Order - 1940

Applied to crude oil pipelines

- o Return over 8% per annum on investment held unreasonable
- o Reduced minimum tender to 10,000 barrels

ICC Order - 1941

Applied to product pipelines

- o Return over 10% per annum on investment held unreasonable
- o Reduced minimum tender to 25,000 barrels

Consent Decree - 1941

Applied to shipper-owned pipelines

- o Dividend payments limited to 7% per annum on the ICC valuation of the pipelines.

Table 2.1-2

Important Regulatory Actions Affecting Gas Pipelines

Public character of gas sale and transport

1858 - Opposite conclusions by New Jersey and Wisconsin state courts on issue of gaslight companies' obligations to serve without discrimination all who apply

1889 - Supreme Court settled issue
- o gaslight companies affected with public interest
- o gaslight companies subject to regulation

Limits of state regulation

1904 - Congress declared natural gas properly in interstate commerce

1911 - Supreme Court voided Oklahoma law to prevent export of natural gas

1923 - Supreme Court voided West Virginia attempt to prioritize intrastate/interstate shipments

1919 - Several Supreme Court decisions evolved doctrine that no state had power to regulate activity over which its power was incomplete

Federal Regulation

1935 - Public Utilities Act
- o Broadened FPC power over electric utilities

1938 - Natural Gas Act
- o Placed gas pipelines under FPC
- o Intended to fill regulatory gaps created by Supreme Court doctrine that neither state of origin or state of destination could rule

1940 - FPC jurisdiction over production asserted

1942 - Supreme Court upheld FPC authority over rates

1947-64 - FPC jurisdiction over sales asserted, upheld, expanded

1942-63 - FPC jurisdiction established over intrastate transactions including gas in the "stream of interstate commerce"

2.2 Scope of Regulation

In addition to regulation of the financial aspects of the business, i.e., tariffs and income, pipelines are regulated in other respects, primarily with regard to safety and environmental impact. There are three cabinet-level departments of the federal government (Transportation, Interior, Labor) and four independent agencies (ICC, FPC, FEA, EPA) with some form of jurisdiction over pipelines. Within the Department of the Interior, there are a half-dozen subunits which have approval authority, intervenor status, or an obligation to comment upon pipeline construction and operations, and within the Department of Transportation there are at least two.

These agencies, and the scope of their jurisdictions, are discussed in Section 5.0 below, and the jurisdictional incompatibilities are identified in Section 6.0. Although numerous incompatibilities are identified, they are not found to be important for the purposes of this study. The important question here is whether such incompatibilities exert any inhibitory effect upon the introduction of energy-conservative technological innovations. As will be seen later in this report, certain of the regulations themselves may in some circumstances be strongly inhibitory; no inhibitory effect has been identified which arises from jurisdictional incompatibilities alone, however.

It is worth taking passing note of the complexity of the task of dealing with jurisdictional inconsistencies. The suggestion is often made that, where more than one or two agencies regulate an activity, all such regulation be placed within a single agency. However, it is in fact often not desirable to do this for fundamental reasons, which lead to the concept of what is call here "legitimate jurisdictional overlap."

As an example of legitimate overlap, consider the case of a pipeline crossing a coastal waterway. In addition to the regulation of the operating business aspects of pricing, which are regulated by the FPC or the ICC, it is easy to hypothesize circumstances under which the Office of Pipeline Safety, DoT, and the EPA might have valid regulations to be enforced. In this case, three agencies might be regulating the same activity, each acting to serve a different interest. While it is true that these three interests (price, safety, and environmental impact) are different, they are all public interests under acts of Congress, and their regulations under the law should all apply. Additionally, it is easy to visualize a situation in which the Fish and Wildlife Service might be required, under yet another act of Congress, to impose regulations to save the fish if the pipeline constructor were to propose some detrimental action. Such overlaps of jurisdiction may be termed legitimate overlaps in that they are all intended to be exercised in a public interest of one kind or another.

Now, while it may be tempting to conclude that one or the other of the regulating agencies should be given the overall jurisdiction, there are good reasons to question that course of action. The different interests represented by the different agencies, while they are all declared to be public interests under act of Congress, are nevertheless conflicting. For example, it is obviously not possible to achieve the lowest price, the greatest safety, and the least environmental impact simultaneously, whether in a pipeline or any other enterprise. Although there is an abundance of evidence to show that the pipeline far exceeds any other mode of transportation in all three of these criteria, in every practical situation there must be compromises between what are basically conflicting requirements. Therefore, giving overall responsibility to the protector of one interest may preclude any reasonably optimum compromise. If overall responsibility were given

to the safety regulator, for example, the result might be a system which would never cause an injury throughout the rest of eternity, but at unbearable financial and environmental penalties. A similarly unbalanced result could be anticipated if the overall responsibility were placed in the hands of any other appointed protector of a particular point of interest.

2.3 Inhibitory Influences of Laws and Regulations

In considering the potential adoption of efficiency improvements and other energy-conservative innovations, there are two bodies of law and regulation which exert important inhibitory influences upon the adoption decision:

(1) The federal income tax provisions with respect to investment credits and loss carry-forwards;

(2) The limitations upon operating income and dividends.

Oil pipelines operate as common carriers and are regulated by the ICC. Their income is limited to 8% for crude lines and 10% for products. A further limitation upon oil lines is that dividends to shipper-owners are limited to 7% by a 1941 consent decree. Since dividends are taken after interest payments, and since the ICC allows interest as an expense before computing the 8% or 10% return, these limits operate in a manner which is similar to, and redundant upon, the ICC limits of 8% and 10%. As a practical matter, since most all U.S. oil pipelines are shipper-owned, the 7% limit generally applies, and any suggested application of the results of this study to oil lines will have to be examined primarily under this, the most stringent of the three limits.

With these limits upon profitability, it is easy to visualize situations in which energy-conservative innovations, even very effective ones, may not offer sufficient attraction to the pipeline operator to induce such adoption.

Because of the combination of capital-intensiveness and limited return, full recovery of investment tax credits is an important contributor to RoI. Since the life of an investment credit is seven years, an efficiency improvement cannot possibly recover its own credit. Therefore, the decision to accept or reject a prospective improvement can almost never be made on a stand-alone basis, even in the first approximation, since it may be strongly

influenced by the way in which its tax credit life overlaps others, either already on the books or contemplated. It may depend upon whether the owning company has other enterprises which can absorb the tax credit.

Also, a pipeline with a large initial investment and a low initial throughput may find that if it is highly leveraged, it cannot recover all of its initial tax credit. In this case, the RoI can be improved by reducing leverage, and the optimum initial equity position, i.e., that which maximizes RoI, may be as high as 40 or even 50%. During these early years, at least until the operator can see how this situation is likely to resolve itself, it may be very difficult to interest the operator in efficiency improvements, even those for which a solid case can be made on paper. These influences are discussed in Section 7.0 below.

In summary, then, the effect of laws and regulations upon innovations is indeterminate in the sense that it depends upon the specifics of the situation into which the innovation is to be introduced. Depending upon those specifics, the regulatory effect may range anywhere between completely neutral and prohibitively inhibitory.

2.4 Recommendations

The conclusion which emerged from the preceding section was that if changes to the regulatory process are to be made which will effectively promote energy conservation, they must be sufficiently strong in the motivation which they stimulate, and in the breadth of their applicability, that the confusion and ambiguity just described is neutralized and overcome. Section 7.4 presents two new regulatory concepts for achieving this objective which are also summarized below.

(1) Introduction of what is termed a "national equivalent value" for natural gas into the tradeoff studies upon which the acceptability of energy-conservative innovations for entry into the pipeline companies' rate base is judged. The result would be that any innovation that would be cost effective at the national equivalent value would be acceptable as a legitimate addition to the rate base. Under the present dispensation, the cost-effectiveness of a prospective innovation must be established under the price actually paid for the gas. That price in many cases was established by contract years earlier at what is by comparison today a very low price. The result is that, even though new gas is presently valued at $1.46 per Mcf, an innovation may have to prove its cost-effectivity at a price of 35¢ per Mcf in order to be an acceptable addition to the rate base. In other words, gas whose replacement is recognized as worth at least $1.46 continues to be wasted simply because an artifically low value is used in determining its admissibility into the rate base.

(2) Introduction of what is termed a "valuation allowance", above the regularly approved cost of an energy-conservative innovation, into the rate base along with the approved cost itself. While this allowance could of course be any amount, it is suggested that the allowance be equal to the approved cost, so that the addition to the rate base would be twice the cost. The result would be that the company could then make up to twice as much profit by saving energy as would otherwise be the case.

The philosophy underlying the first measure is that gas which is saved is equal in value to new gas which, eventually at least, must replace it. A foot of gas saved is equal in value to the first foot of extracted gas from a new well. In fact, a persuasive argument can be made that, since the natural gas resource will certainly be totally depleted before the coal resource, the equivalent replacement value is the cost of converting coal to high-BTU gas, which at 1977 prices and technology is approximately $3.30/Mcf.

The philosophy underlying the second proposal is simply to allow the companies to realize sufficient potential profit from energy conservation to ensure that they are motivated to do it. Since, under present regulation, they may or may not be so motivated, something must be done to ensure that motivation, no matter how confusing or ambiguous their particular tax situation may be.

An important advantage of these proposals is that they require only a single change in the law. Thereafter, the ICC and FPC procedures, and the operation of the consent decree, proceed just as they do now. After the insertion of the new values into the rate base, nothing else changes in any procedural way.

It is of course recognized that considerable further research is necessary to develop the foregoing recommendations into practical legislative proposals. It is strongly recommended that such research be undertaken immediately.

These recommendations deal only with the motivation of energy-conservative capital investments. Also needed is a recommendation to stimulate energy-conservative operational techniques, i.e., those which increase operating cost. At present, such innovations are introduced only if the energy saved offsets the operating cost burden, at the regulated value of energy. In the recommendations above, only a

single change in the law is needed; once the rate-base allowance is made, nothing is done differently than before. No such simple and straightforward device has been conceived in the course of this study. However, with further study, a mechanism may well be devised. Accordingly, the research recommended above should also address the possibility of stimulation of energy-conservative operational measures.

3.0 EVOLUTION OF PIPELINE REGULATION

Virtually every country in the world exercises some form of regulation over its pipeline industry. Regulations in Canada are promulgated by the National Energy Board and closely resemble those in the United States; other countries have similar laws. Major events in the evolution of the United States regulation of oil pipelines have been summarized earlier in Table 2.1.1.

3.1 Economic Regulation

3.1.1 Regulation of Oil Pipelines

3.1.1.1 The Interstate Commerce Act

The legal basis for economic regulation of oil pipelines in the United States is Part I of the Interstate Commerce Act (Title 49, Chapter 1, US Code). The primary purposes of the Act were to establish reasonable rates, prevent discrimination or pooling, and require that tariff rates be openly published and continuously maintained. The original Interstate Commerce Act of 1887 did not provide for regulation of pipelines, but the Hepburn Act of 1906 extended Section I of the Interstate Commerce Act to include them, by the following clause:

> "The provisions of this Act shall apply to any corporation or any person or persons engaged in the transportation of oil or other commodity, except water and except natural or artificial gas, by means of pipe lines, or partly by pipe lines and partly by railroad, or partly by pipe lines and partly by water, who shall be considered and held to be common carriers within the meaning and purpose of this Act." (34 Stat. 584)

This Hepburn Act had been originally intended as a "Railroad Rate Regulation Bill" to further strengthen the Interstate Commerce Act. How-

ever, while the bill was still pending, the Garfield Report was received by Congress. That report dealt primarily with discrimination by the railroads in favor of the old Standard Oil Company. However, the final section of the report showed how Standard was able to locate its refineries on the coast and transport the oil to them by its own pipelines, thus avoiding the high rail costs paid by its competitors. The report further showed how Standard exercised the leverage thereby provided to purchase oil from other producers in the field at depressed prices, thus creating a monopoly situation in restraint of trade. Largely as a result of this report, the Hepburn Act was amended to make the Interstate Commerce Act applicable to the transportation of oil by pipeline in interstate commerce.

As it exists today, Part I of the Interstate Commerce Act applies to railroads and oil pipelines. Some provisions which apply to both carriers are listed below:

(1) Rates must be just and reasonable

(2) Undue preferences are forbidden

(3) Tariffs must be filed with the Commission and posted for public inspection

(4) Reasonable facilities for the interchange of traffic must be provided

(5) Carriers may not charge greater compensation for a shorter than for a longer distance over the same line, without Commission approval

(6) Except with Commission approval, pooling of traffic or earnings is prohibited

(7) Carriers must comply with accounting, reporting, and valuation requirements of the Commission

(8) Since 1965, carriers are subject to safety regulations of the Act.

The oil pipelines are not subject to certain burdensome requirements of Part I of the Act, which are applicable to the railroads. Among these are the following:

(1) Oil pipelines are not required to obtain a Certificate of Public Convenience and Necessity from the Interstate Commerce Commission before commencing or extending their operations.

(2) Oil pipelines are not required to obtain Commission approval for the abandonment of a line.

(3) The Commission does not pass on the issuance of securities of pipeline companies.

(4) Oil pipelines are not subject to the Commodities Clause, which in general prohibits railroads from transporting articles which they own, either directly or indirectly, except timber.

(5) Extension of credit to shippers is left entirely in the hands of the pipelines, which is not the case with other carriers.

After pipelines were made subject to Part I of the Interstate Commerce Act in 1906, there were numerous cases in the courts to decide whether a line was a common carrier or a private carrier. In an attempt to evade Federal jurisdiction, the old Standard Oil Company established its pipelines as separate companies in each state. Each company would own the oil it transported and sell the oil to the next carrier. These and other actions of resistance and evasion by the companies resulted in a judicial test of the law, which came as a result of a ruling by the ICC that the tariffs of all the affected carriers would have to be filed with the Commission. Some companies had complied with this provision immediately upon passage of the Act. It was not until 1911, however, that the ICC began a study of the problem of what to do with those pipelines not yet accepting its jurisdiction. It concluded in 1912 that tariffs from the non-compliers should be filed by September

of that year and so ordered. (In the Matter of Pipe Lines, 24 I.C.C. 1 (1912)).

In their defense, the companies alleged the taking of private property without due process of law and the taking of property for public use without compensation, and argued that the law should apply only to those pipelines who were already common carriers or those who chose to become such. The arguments of the Government were to the effect that the Hepburn Act was a valid exercise of authority over interstate commerce for the reason that these instrumentalities, the pipelines, tended inevitably toward monopolies.

In the Commerce Court which first heard the arguments, the Federal Government's theory was not well received and its case was lost, However, the Supreme Court,when called upon to rule on the matter,in 1914 found for the Government and upheld the ICC's requirement that tariffs be filed. (The Pipe Line Cases, 234 U.S. 548, 34 S.Ct.956(1914)). This finding was basically on the grounds that the pipelines and their owners were operating a public market, since they had been compelling sale of independently produced oil to themselves before it was transported. However, this did not obscure the fact that they had at hand the only real means of transportation, and therefore the pipelines were engaging in transportation and, of course, at the interstate level. The findings of the court, in an opinion by Justice Holmes, were that the pipelines were in fact engaged in common carrier business and the intent of the Act was to bring under its terms all pipelines who though perhaps not technically, but in fact, were engaging in interstate transportation.

Questions have been raised as to whether it was the intent of Congress to force all interstate lines into a common carrier status whether carrying their own oil or that of others. However, it seems reasonable to conclude that, had the Supreme Court held other than it did, a legis-

lative drive could have accomplished the same result with a clarifying statute.

The competitive drive of the growing industry also might well have forced the development of a carrier type of service available to the whole oil industry. There were attempts by groups to create competitive lines, including some with aid sought or offered by the legislatures of some of the oil states. In any case and for whatever reason, virtually all of the interstate oil pipelines operate today as common carriers.

One of the cases decided in the group of the so-called Pipeline Cases, but with different results, also remains today a guidepost. This is known as the "Uncle Sam" case, from the name of one of the defendant oil companies. The court held in the case of Uncle Sam that because this company was engaged solely in transporting its own production, from its own wells, through its own lines, to its own refineries, it was not engaged in transportation within the meaning of the Act. Uncle Sam Oil Company was not engaged in the purchase of crude oil from others, and thus it was held that its lines were private in fact and in law, and it was therefore not amenable to the ICC jurisdiction fastened upon the others.

The Uncle Sam doctrine has been cited in later cases in which the decisions have seemed to turn upon the matter of purchase of oil from others, so that the purchasing of oil from others by pipeline owners has become an important test in determining ICC jurisdiction. However, though persuasive, it is not a controlling test.

The Transportation Act of 1920, among other things, modified the Hepburn Act of 1906 by eliminating from Section 1 of the Interstate Commerce Act the controversial phrase "who shall be considered and held to be common carriers within the meaning and purpose of this Act." The Transportation Act of 1920 amended Section 1 to read, " ... the provisions of this part shall apply to common carriers engaged in ... (b) the

transportation of oil ... by pipeline," and amended Section 3(a) to read, "The term common carrier ... shall include all pipeline companies." This change has been an important factor in the later decisions which extended the ICC's jurisdiction over pipelines.

The next important Supreme Court decision was Valvoline Oil Co. v. United States (308 U.S. 141, 60 Sup.Ct. 160 (1939)). The facts are interesting here, for Valvoline was operating several lines in Pennsylvania and West Virginia. In both situations, however, the lines were used only to carry oil produced in that state to destinations in that same state. There was no transportation from one state to another. On that ground the Valvoline company resisted the jurisdiction of the ICC when it ordered valuation data to be filed by the company.

Here the court in finding against the company and for the ICC found a difference with the Uncle Sam case in that the lines were carrying oil produced by many different wells owned by hundreds of different owners. Moreover, the court found that Valvoline was operating in what amounted to a monopoly situation. This arose from the fact that many of the wells using Valvoline facilities were "strippers" and their production was at a rate in many cases of a fraction of a barrel per day. Other carrier connections were not available to these wells due to a requirement of a minimum daily rate of five barrels' production in order to justify new connections.

It is generally felt that the court found for the ICC in this case mainly on the proposition that a monopoly situation existed and that there was a large number of producers requiring the service. And, as distinguished from the Uncle Sam case, there was a great deal of purchasing by Valvoline from other parties rather than production and transportation by the producer for its own use.

It is important to note there, however, that the decision in this case was a limited one in that it merely held that the Valvoline company would

be required to meet the demands of the ICC only in filing valuation data and information. No decision was rendered on the matter of Valvoline's duties to other shippers for it never had transported for them, nor had any tenders been made to it by other shippers. The court held that valuation proceedings were separable from regulatory proceedings, avoiding the constitutional question of the taking of property.

These cases seem to show that the role of the monopoly situation in affecting a court's decision on matters of ICC jursidiction is important. In the Pipeline Cases and the Valvoline cases, the presence of a monopoly or near-monopoly situation of pipeline service to a producing field appears to have substantially influenced the court toward finding for ICC jurisdiction. The courts seem inclined to render a decision of ICC jurisdiction in a case in which monopoly or substantial control is being exercised over a producing field through pipeline ownership, though it may limit somewhat the area of Commission jurisdiction to matters other than regulatory.

The last two key cases in the constitutional area are the two Champlin cases. Champlin Oil Company had built a private line transporting its own refined products from its refinery at Enid, Oklahoma, to Rock Rapids, Iowa, with intermediate points in Kansas and Nebraska. Champlin had made no dedication to public use of its facilities and no one had tendered to it.

The first Champlin case (Champlin Refining Co. v. U.S., 329 U.S. 29, 67 Sup. Ct. 1 (1946)) arose from an order from the ICC to Champlin to file certain information with the Commission which it wanted in order to complete its valuation duties as prescribed in Section 19a of the Act. Champlin resisted this order and sought an injunction in a Federal Court in Oklahoma, which was denied. It was upon this denial of injunction that the issue went to the Supreme Court.

Here the Court appears to have found that the Act applied to Champlin largely on the theory developed in the Valvoline case that the definition in the Act included "all pipeline companies" engaged in the interstate transportation of oil. They found that the company was engaged in transportation mainly because it was transporting goods, interstate, not for its own use but for sale. In the Uncle Sam case it was crude oil being moved from the field to the refinery before sale. To reverse the reasoning here, the Court felt that Champlin was engaging in transportation because its refined products were for sale rather than for its own use.

It should be added that the sales methods of Champlin were helpful to the Court in this finding in that they involved a spot sale contract at Enid, plus a differential approximating a rail charge to the destination, less certain allowances. Thus, having found that Champlin was engaged in "transportation," it was easy to look back to the Act, which by definition applied to "all companies engaged in transportation," etc. Thus, it seems to have been held in the Champlin case that the Congress had the right to regulate a private line that was engaged in interstate commerce.

However, the Court avoided the question of conversion of this private line to a public carrier open to others. It held that the only matter before it was the requirement of the company to file reports and other information with the ICC. Nothing in the action, it said, was concerned with opening the line to all comers and making the service available to the public. Thus, the majority concluded that the issue of the taking of private property without due process was not before the Court and would not be decided.

At this juncture, then, the law seems to be clear that a pipeline can be found subject to the jurisdiction of the ICC for the purposes of

meeting some parts of the Act but not necessarily for other sections.

The so-called "second Champlin case" will now be considered (Champlin Refining Co. v. U.S., 341 U.S. 290, 71 Sup. Ct. 715 (1951)). After the decision just described, the ICC undertook to compel Champlin to file annual reports, to maintain the Uniform System of Accounts required of common carriers, and to file tariffs as required of common carriers under Section 6 of the Act. Note particularly this ICC request upon the company to file tariffs. Champlin resisted these orders and argued them before the Commission to no avail. Losing their case there, Champlin proceeded to a Federal District Court again for an injunction. This injunction was granted when the Court found that Champlin was not a common carrier engaged in transportation within the meaning of the Act.

On appeal, the Supreme Court decided that the Interstate Commerce Act was severable. It held that the authority of the ICC to require the filing of valuation reports and information in the case of Champlin was proper. Also, that they could be required to maintain the Uniform System of Accounts. But, the Court ruled, Section 6 of the Act was not meant to apply to private lines and Champlin did not by the Act have imposed upon it the duty of serving the public at regulated rates. This derives from the fact that the filing of tariffs with the ICC would constitute an undertaking to serve the public at those rates; hence the private line would immediately become a common carrier upon the filing of its tariffs.

In effect, the constitutional question of the power of Congress to compel a private carrier to assume the role of a common carrier remains doubtful. The second Champlin decision simply holds that the Congress intended that certain sections of the Act were to apply to all pipelines, i.e., the filing of valuation reports and information, Uniform System of Accounting to be maintained, etc. But it holds that Congress

did not intend by the Hepburn Amendment to compel all pipelines to assume common carrier duties insofar as serving the public is concerned. In this case, the Court did not determine, however, whether or not the Congress could do so should it undertake it. It held here simply that Congress had not intended to do so in passing the Hepburn Act in 1906.

This, of course, takes us back to The Pipeline Cases. There it seemed that what Justice Holmes had to say was clear. The determination was that those pipelines then engaged in transportation as carriers in fact could be compelled to assume the form of common carriers. On the constitutionality of the Act, he went on to deliver this dictum: "So far as the statute contemplates future pipe lines and prescribes the conditions under which they may be established there can be no doubt that it is valid." On the basis of this pronouncement it had been widely felt that future pipelines, that is, those built after the enactment of the Hepburn Act, could be compelled to assume the duties of the common carrier.

Quite clearly, the Champlin Line is one of those "future" lines, since it was built many years after the enactment of the Act. Thus, the Champlin case seems to approach a resolution of the constitutional question involved, but in the end does not attain it. Here in the Champlin case the Court held that the Congress did not intend to compel all interstate lines to assume all the duties of a common carrier when it enacted the Hepburn Amendment. But the question of whether Congress could do so remains.

The foregoing discussion has reviewed briefly the history of the legislation and court decisions that regulate the oil pipelines. This is the regulatory act known as the Interstate Commerce Act, enacted first in 1887 and amended to include the oil pipelines in 1906 by the Hepburn Act. In broad form, what this legialation and the subsequent interpre-

tations by the Supreme Court accomplished was this: All pipelines at the time of the Hepburn Amendment's enactment engaged in interstate transportation of oil were compelled to accept the legal status of common carriers principally on the basis that they were such already in fact. Much of the impetus behind this legislation was provided by the monopolistic control which it was alleged the pipeline owners exercised over the producing fields when they represented the only available means of moving that production. Anti-monopoly feeling was high at the time and Standard Oil, with the railroads, was a prime target. Congress was clearly held in The Pipeline Cases to have the power to exercise this authority in the regulation of interstate commerce.

As reflected in subsequent court decisions, much weight was placed upon the presence or absence of a monopoly situation regarding pipeline service to a given producing field. A similarly significant fact in such decisions was the matter of whether or not the carrying lines were engaging in transportation by virtue of their owners buying oil from other producers in the same field. In the presence of both of these factors, the courts held that the lines are subject to ICC jurisdiction under the terms of the Act.

The Act was interpreted in the Valvoline case as being severable in its application to the pipelines. That is, there are certain sections of the Interstate Commerce Act which apply to all the interstate pipelines, public and private alike, but not all sections apply to the private interstate lines. Most important, the Act was held as not intended to convert true private lines to common carriers with the comcomitant duty of public service. These are the principal elements of the Act and court decisions under which the ICC and the pipeline industry have operated.

Following the decisions by the Supreme Court in 1914 in The Pipeline Cases, pipeline carriers filed tariffs with the ICC, but it was not

until 1920 that the first formal proceeding involving such tariffs was instituted. In that year, on complaint of a petroleum shipper, the Commission considered the reasonableness of minimum tenders, commonly 100,000 barrels, which pipelines were publishing in their tariffs and thus requiring from shippers as a prerequisite to shipment. The Commission decided that tenders in excess of 10,000 were unreasonable. Brundred Brothers v. Prairie Pipe Line Co., 68 I.C.C. 458 (1922). This decision affected oil movements from points in Kansas, Oklahoma and Texas to points in Pennsylvania.

In 1934, the I.C.C. undertook an exhaustive investigation of the reasonableness of crude oil pipeline rates, gathering charges, regulations and practices. This investigation was the outgrowth of a complaint lodged with the Commission by a group of refiners asking for suspensions of reductions in rates that had been made by Stanolind (now Amoco) Pipe Line Company. The suspensions were asked on the grounds that the reduced rates gave Stanolind's shipper-owner an advantage over the compoainants who had only rail facilities available to them. The Commission refused to suspend the reduced rates and announced a general investigation on its own motion of all pipeline rates, charges and practices.

The investigation dragged out over a number of years. Meanwhile, the Commission undertook to value pipeline property as of December 31, 1934. The valuations ultimately found for all pipelines in the period 1939-1943 provided a basis for judging the reasonableness of rates. It should be noted in this connection that now the ICC finds an annual valuation for each pipeline under its jurisdiction.

Late in 1940, the Commission rendered a decision in the rate investigation which had started in 1934, holding that crude oil pipeline rates yielding more than eight percent return on the value of carrier

property were unreasonable, and reaffirming and extending the effect of the decision in the Brundred Brothers case that minimum tenders in excess of 10,000 barrels were unreasonable. Reduced Pipeline Rates and Gathering Charges, 243 I.C.C. 115 (1940). Most of the pipeline companies which had not already voluntarily reduced rates did so in 1940 and early 1941. The Commission's final order in the case was entered in 1948, directing a few companies which had not complied with the minimum tender requirement to do so, but finding that in the interim, rates had generally been voluntarily reduced to the eight percent return level. Reduced Pipeline Rates and Gathering Charges, 272 I.C.C. 375 (1948).

Meanwhile, attention had also turned to the rates of products pipelines. In Petroleum Rail Shippers Ass'n. v. Alton & Southern R.R., 243 I.C.C. 589 (1941), several rail carriers and two products pipelines, Great Lakes Pipe Line Company and Phillips Pipe Line Company, were defendants. The Commission ordered reductions in the rates of Great Lakes and Phillips and established a minimum tender of 5,000 barrels of the same specifications from one shipper to one consignee, subject to delay until the carrier had accumulated 25,000 barrels of the same specifications. In this case, the Commission established the principle of a rate of return of ten percent as being reasonable for products pipelines. The distinction between the ten percent maximum return allowed for products lines and eight percent maximum permitted on crude lines was attributed to the greater hazards and risks involved in products line operations.

In the case of Minnelusa Oil Corporation v. Continental Pipe Line Company, et al., 258 I.C.C. 41 (1944), the Commission reaffirmed the eight percent return on crude line valuations established in its earlier decision in Reduced Pipeline Rates and Gathering Charges, supra. The case involved the reasonableness of joint rates for the movement of crude oil from Wyoming origins to Salt Lake City. In

addition to the decision that rates should not exceed an eight percent return, the complainant also was awarded reparation for the period after filing of the complaint when rates were found to be unreasonable. This was the only time a pipeline carrier had been ordered to pay reparation.

3.1.1.2 The Elkins Act

In 1903, three years before the Hepburn Act brought the oil pipelines under the Interstate Commerce Act, Congress had amended the latter by

(1) Providing criminal penalties if a carrier willfully failed to publish and file tariffs as required by the Interstate Commerce Act or failed to strictly observe such tariffs;

(2) Providing criminal penalties for both carrier and shipper if either knowingly affered, granted, solicited, accepted, or received any rebates, concessions, or discrimination. Shippers found guilty of this were subject to further civil liability to the government for a sum of money three times any amount received as a rebate.

At the hearings of the Temporary National Economic Committee in 1939, the Federal Trade Commission and the Department of Justice testified in effect that pipeline earnings were too high and that in the case of pipelines owned by oil companies who shipped over those lines (so-called integrated pipelines) the payment of dividends by the pipelines to stockholding oil companies constituted illegal rebates under the Elkins Act (32 Stat. 847, 49 U.S.C.A. Sections 41-43). When passed, this Act had been intended to stop certain discriminatory practices of railroads but it was written broadly enough to be applicable to all carriers regulated under Part I of the Interstate Commerce Act, and when in 1906 the pipelines were brought under Part I by the Hepburn Act, they automatically became subject to the Elkins Act. Section 41(3) of the

Elkins Act prohibits a shipper from receiving from a common carrier "any sum of money or other valuable consideration as a rebate or offset against the regular charges for transportation" of property. As has been seen above, the penalties for violating the Elkins Act are severe, providing, in addition to criminal penalties, authority for the U.S. Attorney General to bring forfeiture suits against shipper-violators for three times the amount of rebates received.

As a followup to its testimony on September 30, 1940, the Department of Justice filed suit in the U.S. District Court in Washington, D.C., against 20 major oil companies and 59 pipeline companies, charging violations of the Elkins Act, seeking to enjoin such dividend payments, and asking for treble damages for dividends paid since January 1, 1939, a total estimated at between $1.5 and $2 billion. This amount was more than 15% of the total assets of the oil pipeline industry, and more than 50% of the total assets of some companies.

The result was that the pipeline and oil company defendants agreed to a consent decree, effective December 23, 1941. (United States v. Atlantic Refining Co. et al., Civil Action No. 14060, District Court for the District of Columbia (1941).

Consent decrees, for the benefit of those readers who are not familiar with them, are decrees agreed upon by the parties in settlement of a cause of action before trial. In this case, the parties were the Department of Justice and the defending oil and pipeline companies. Such a decree, when negotiated between the parties, is then offered to the court as a settlement agreeable to all. Upon review and acceptance by the court, as occurred in this case, it becomes the decree of that court.

In legal effect, these decrees have been described as most like a contract. They are binding upon the parties and usually prescribe

a form of future conduct or performance. However, such a decree does not represent any finding of guilt or blamelessness upon the parties in reference to charges that have been made. The decree simply resolves the differences of the parties and prescribes a future pattern of performance.

The heart of the consent decree in the Atlantic case was that each pipeline would be limited to the payment of dividends to each of its shipper owners to "its (the shipper owner's) share of 7% of the valuation of the carrier property." Further provisions of the decree provided that any monies earned by the carriers but not payable to the owners by virtue of the terms of this decree are to be retained in a special account by the pipeline. These can be spent for improvements and enlargements of the carrier's facilities. However, such enlargements and improvements paid for out of these monies may not be included in the valuation base against which the 7% dividend limitation is calculated. Thus was established another element of regulation under which the oil pipelines now operate.

By thus limiting the dividends available to the owners, it was apparently the belief of the Department of Justice that it could impel lower rates charged to shippers, there being no point to the pipelines' management earning more than could be returned to the owners.

There are several interesting aspects to this case. First, the Department of Justice is seen apparently attempting to affect pipeline rates, though admittedly in an indirect fashion, thereby entering an area wherein the ICC is specifically charged with responsibility. Second, the rate of return as measured by the Department of Justice in terms of dividends is set at a different rate from that of the ICC, which had determined upon 8% return for crude lines and 10% return for products lines only months before this action was begun. Third, this is believed

to be the first time the Government had contended that dividends paid by a carrier to its shipper owner constitute a rebate.

A special antitrust subcommittee of the House Committee on the Judiciary, known as the Celler Committee, conducted a series of hearings from 1956-1959 relative to the overall consent decree program of the Department of Justice. One of the matters considered was the pipeline decree. During the course of these hearings, on October 11, 1957, the Justice Department reopened the original Elkins Act (Atlantic) case by filing four motions in the U.S. District Court for the District of Columbia, alleging that several of the pipeline companies were paying dividends in excess of those allowed by the consent decree in that they had included pipelines built with borrowed money in their valuation base for dividend purposes. The trial court rejected the Government's interpretation of the decree and the United States appealed the case directly to the Supreme Court, which affirmed. (United States v. Atlantic Refining Co., 360 U.S. 19, 79 Sup. Ct. 944 (1959)). Justice Black, in his opinion, pointed out that not only was the Government urging a "strained construction," but that the Government had accepted the contrary construction for 16 years. This case became known in the industry as the Arapahoe case, since that pipeline company was the principal target of the action.

3.1.2 Regulation of Gas Pipelines

The Federal Power Act (16 USC 791a-825r), as amended, is the basic authority under which the Federal Power Commission (FPC) operates in regulation of natural gas pipelines. The Act was first enacted as the Federal Water Power Act of 1920 (41 Stat 1063), and subsequently amended by Title II of the Public Utility Act of 1935 (49 Stat 838) and the Natural Gas Act of 1938 (52 Stat 821-833, as amended; 15 USC 717-717w). Additional responsibilities have been assigned by subsequent legislation and by Executive Orders.(1)

It will be seen in Section 7.0 below that from the point of view of this study, i.e., inhibitory effects of regulation upon innovations, the regulation of gas pipelines by the FPC has virtually an identical effect to the ICC regulation of oil pipelines.

3.1.2.1 Issues Leading to Regulation

3.1.2.1.1 Public Nature of Gas Sale and Transport

Local distribution of manufactured gas through mains laid in city streets began in the United States in 1817. The city of Baltimore granted a franchise to the Baltimore Gas Light Company in 1816, a charter of incorporation was obtained in 1817, and operations began in that same year. Gas light companies were subsequently formed in several communities in the years preceding the Civil War.

The first tests of the public character of a manufactured gas distribution company came in 1858. In that year, state courts in New Jersey and Wisconsin arrived at opposite conclusions regarding the obligations of gas light companies to serve without discrimination all who apply. In the case of Patterson Gas Light Company v. Brady, 27 NJL 245, the company was allowed to pick and choose its customers at its own discretion on the grounds that its charter did not specifically impose upon it any obligation to serve all applicants. In Shepard v. Milwaukee Gas Light Company, 6 Wis. 539, however, in a deeply considered and extremely revealing decision, the fact that the charter empowered the company to lay its mains along the public rights-of-way was taken to indicate an affectation with public convenience and necessity, and was held to imply an obligation to serve all applicants.

Other cases in several states in following years at first evidenced uncertainty regarding the public status of manufactured gas distribution

companies, but by the 1870's indicated increased unanimity in favor of public affectation. The issue was settled in the Supreme Court decision in 1889 in the case of Gibbs v. Consolidated Gas Co., 130 US 396. There the Supreme Court concluded that the distribution company was affected with a public interest and that it might be made subject to public regulation. The latter decades of the Nineteenth Century also saw other cases in various state and Federal courts determining specific issues growing out of regulation of gas distribution companies. Of particular note is an 1889 appeals court decision in Missouri which set forth some early attitudes regarding rate design. In that case, State v. Sedalia Gas Light Co., 34 Mo. App. 501, the company was permitted to include a fixed monthly meter rental which also entitled the customer to a volume of gas free each month before additional volumetric charges were encountered.

These and other cases make it quite apparent that the regulatability of gas distribution companies was tested and established beyond doubt before the widespread introduction of natural gas. When natural gas was introduced into the local mains in mixture with and in replacement of manufactured gas, there was no essential alteration of the status of such companies in a regulatory respect.

Although natural gas was reportedly used in Fredonia, New York by 1825 to light some local shops, economic exploitation of such gas had to await technological developments which permitted its transportation from the wells to the communities in which it could be used.

An attempt to use wooden pipes in 1870 by the Bloomfield and Rochester Natural Gas Light Company was not successful. Two years later, a two inch iron pipe of five and a half miles length was laid near Titusville, Pennsylvania. A compressor station was installed by the Bradford Gas Company in 1880. In 1891 the Indiana Natural Gas and

Oil Company built an iron pipeline of eight inches diameter and one hundred twenty miles length. With the organization of the Hope Natural Gas Company in 1902 to serve Cleveland, Ohio, the natural gas pipeline industry may fairly be said to have arrived.

The question of pipeline regulation had received attention from the beginning. The abortive pipeline laid in 1870 had immediately given rise to questions of the character of the activity. In the case of Bloomfield and Rochester Natural Gas Light Company v. Richardson, decided in 1872, 63 Barb. 437, there was an immediate finding that a natural gas pipeline was indeed affected with a public interest, could be declared to be public service corporation, and might be granted the right of eminent domain. It is interesting to note that in the same year, in West Virginia Transportation Company v. Volcanic Oil and Coal Company, 5 W. Va. 382, a petroleum pipeline was also found to be public in nature and similarly eligible to receive the right of eminent domain. The period from 1870 to 1900 saw several other cases involving the status of pipelines, and their affectation with a public interest seems never to have been seriously in doubt. The analogy between a pipeline and a railroad was, in fact, pursued far enough that oil pipelines were considered to be common carriers and natural gas pipelines at one time seemed destined to be placed in the same category. In the case of Griffin v. South West Pennsylvania Pipe Lines, 172 Pa. St. 580, decided in 1896, the pipeline was actually found to be a common carrier.

3.1.2.1.2 Jurisdictional Limitations of State Regulation

The states in which natural gas occurred came very quickly to an appreciation of its immense value to their commerce. The testimony of Indiana, in the previously mentioned proceeding of Ohio Oil Co. v. Indiana, contains extensive references to

the amount of trade and manufacture which before the end of the Nineteenth Century had developed and that was felt to be wholly dependent upon local fields of natural gas.

The widely held conviction that natural gas was a resource of great importance to the localities of its occurrence resulted not only in conservation laws, but also in other ordinances attempting to prohibit outright any transport of natural gas out of the state of its occurrence. In Pennsylvania and Indiana, the state courts found that laws which prohibited interstate transportation of natural gas were void by reason of the interstate commerce clause of the Constitution of the United States. In 1904, Congress went on record with a declaration that natural gas was a fit subject for interstate commerce and might lawfully be conveyed across state lines in suitable pipelines, 33 Stat. 65. In 1907, the state of Oklahoma attempted to circumvent the interstate commerce clause by an act which forbade out-of-state corporations to own or operate natural gas pipelines in the state and simultaneously required domestic pipelines to obtain a permit to cross state highways by surrendering their right to engage in interstate commerce or to connect their pipelines with any other parties engaged in interstate commerce. The Kansas Natural Gas Company fought this law in the courts. The Supreme Court, in 1911, in 221 US 229, took the Oklahoma law as a whole to be a deliberate attempt to prevent interstate commerce and voided it entirely.

When shortly after the end of World War I, some of the earliest gas fields in the eastern states began to decline, local shortages were experienced in some of the eastern cities and many diverse attempts to control shortage conditions occurred. In this period, yet another attempt to inhibit interstate commerce in natural gas arose but was quashed. The state of West Virginia, at that time a major supplier of natural gas to several eastern cities, attempted to meet a shortage being experienced

in one part of the state by requiring a pipeline serving other intrastate and interstate markets to connect with the shortage stricken area and serve its needs before shipping natural gas to other states. The states of Ohio and Pennsylvania brought suit and the Supreme Court in 1923 declared the law void on the ground that it worked an unlawful hindrance upon interstate commerce and would result in injury to the states which depended upon West Virginia for supplies of gas (262 US 553).

The question of state jurisdiction, of course, did not stop with the establishment of the lack of power to prevent interstate commerce in natural gas. The development of more powerful state regulatory agencies, beginning with New York and Wisconsin, having ratemaking power over the prices charged by public utilities, created a potential for conflicts among the several state public service commissions, corporation commissions, railroad commissions, and other bodies with different titles but similar functions. The definition of jurisdictional limits on state rate-making powers was to have important consequences for the Natural Gas Act when it was later enacted.

The first approach to a definition of the extent and limits of interstate commerce in natural gas occurred in 1919. In that year the Supreme Court rendered its decision in PUC Kansas et al. v. Kansas Natural Gas Co., 249 US 236. The sale of natural gas from an interstate pipeline to a local distribution company was, in the view of the court, an act in interstate commerce. Subsequent resale of the same gas by the distribution company to its final consumers, however, was found to be by its nature an act of intrastate commerce, even though the physical flow of gas from wellhead to burner was a continuous and uninterrupted flow across state lines.

One year later, in 1920, the Supreme Court expanded its holding by distinguishing between the sale of gas to a local distributor for resale

and the sales by a pipeline through its own distribution operations directly to the final consumers. The Pennsylvania Gas Company obtain its natural gas from wells near Warren, Pennsylvania and operated a combined pipeline and distribution system to the city of Jamestown, New York. When the Public Service Commission of New York sought to exercise rate control over the sales of the company, the case was brought to the Supreme Court on the ground that the state commission was inhibiting interstate commerce. In an interesting decision which was soon to have repercussions, the Supreme Court, in Pennsylvania Gas Co. v. PSC New York, 252 US 23, found that the sales of natural gas were indeed in interstate commerce, but that lacking congressional action to regulate the interstate sales, the New York commission might exercise authority over the rates charged New York customers by the company.

Using the decision in the Pennsylvania Gas Company case as a guide, the state of Missouri attempted to exercise ratemaking control over sales of gas from Kansas Natural Gas Company, an interstate pipeline company, to distribution companies in Missouri. In 1924 the Supreme Court, in Missouri v. Kansas Natural Gas Co., 265 US 298, made an important distinction between this situation and that in the New York case. The Court found that when natural gas was sold by an interstate pipeline to a distribution company for eventual resale to final customers, even the absence of congressional action in the matter did not justify a state commission in taking authority over the rates charged for the interstate sale.

During this same period, another and closely related question of jurisdiction was also being explored. If the state in which gas was consumed had no power to regulate the prices charged by interstate pipelines to the local distributors, then did a state in which gas was produced and sold to interstate pipelines for transportation to other states have any power to regulate the price of natural gas? The first answer

to this question was given in the same decision that had denied rate control to the state-of-destination. The Missouri v. Kansas Natural Gas Co. case was in fact a consolidated hearing covering three separate disputes, one of which was Kansas Natural Gas Co. v. Kansas. In this latter case the state of Kansas had attempted to establish rate control of the sale of natural gas which was produced in Kansas before its shipment to Missouri. The Supreme Court's decision denied Kansas any ratemaking power over the wellhead sale of natural gas destined for interstate commerce.

Subsequently, in 1927, the issue of ratemaking power of the state-of-origin was the main issue when the state of Rhode Island attempted to set electric rates for power sold by a Rhode Island company to a Massachusetts company. The decision of the Supreme Court in this case, PUC Rhode Island v. Attleboro Steam and Electric Company, 273 US 83, reaffirmed the ruling in the earlier Kansas Natural Gas Company case. The state in which an item entered the flow of interstate commerce had no more power to regulate its price than had the state in which the item left that stream. So long as natural gas was part of the stream of interstate trade, neither producing nor consuming state had the power to oversee the rate charged for it.

In 1931 the Supreme Court reviewed the distinction it had made between interstate and intrastate commerce in natural gas. Its analysis indicated that a contradiction existed between the doctrine propounded in the 1911 Kansas Natural Gas Company case that the city gate marked the end of interstate commerce, and the doctrine expounded in the 1920 Pennsylvania Gas Company case that interstate commerce extended to the point at which the interstate transporter sold the natural gas to the consumer. In an attempt to promulgate a uniform delineation between interstate and intrastate commerce independent of corporate structure, the Court turned to the technical engineering differences between high pressure transmission pipelines and lower pressure distribution mains.

The East Ohio Gas Company, like the Pennsylvania Gas Company but on a vastly larger scale, was both interstate transporter of gas with lengthy high pressure transmission pipes and also local distributor throughout a large portion of the state with low pressure facilities in many communities. The Tax Commission of Ohio was pressing the question of the dividing line between the interstate operations of the company which could not be taxed by the state, and the intrastate operations which were taxable. In adopting the city gate or other point at which high pressure gas was expanded and delivered at lower pressures into distribution mains as the terminus of interstate commerce, the Court's decision in East Ohio Gas Co. v. Tax Commission, 283 US 465, knowingly and deliberately disapproved its earlier Pennsylvania Gas Company doctrine. However, as will be seen below, the Supreme Court's attempt to use the technical differences between high pressure and low pressure facilities was to become as unsatisfactory as the doctrine it supplanted.

One central question dominated the discussion of state jurisdiction over natural gas, i.e., whether a given sale of gas was of a distinctly local character, or of a national character. The earliest opinions on the matter, towards the end of the Nineteenth Century, had leaned in the direction of a purely local occurrence and significance. As the technical and economic feasibility of longer distance transportation of gas was gradually demonstrated, however, the national importance of natural gas as a whole became less and less disputable. Even then, there remained the question of whether given sales to different users were local or national in character. The analysis finally evolved by the Supreme Court is, perhaps, best revealed in the Attleboro case and especially noteworthy even though not strictly speaking a gas case. The Court viewed the completeness or incompleteness of each given proposed regulatory act as determinative. Where, as in the case of distribution sales to ultimate consumers, the jurisdiction of a given state reached all sales to consumers,

the regulation of the state was complete and did not open the possibility of discriminatory end results growing out of selective evasion of its regulations. Where, however, as in the case of direct interstate sales to main line industrial customers or interstate pipeline sales to distribution companies, similar sales were made by the same pipeline in different states, the regulation of any one state was found to be incomplete. In this latter case, any one state which imposed more stringent regulation upon sales made within its borders than were imposed by other states served by the same pipeline, could potentially cause discrimination of end results as between similar gas consumers buying similar gas from the same pipeline, but in different jurisdictions.

The doctrine that no state had power to regulate an activity over which its power would be incomplete left a gap in the chain of regulation. So long as Congress failed to act on some form of regulation over interstate transportation of natural gas, the powers of state regulation over local distribution would be of very limited effectiveness.

3.1.2.2 The Natural Gas Act

Federal regulation of natural gas might be considered to have its origin, at least indirectly, with the passage in 1906 of the Hepburn Act, an amendment to the Interstate Commerce Act of 1887 which was discussed in Section 3.1.1.1 above. As noted there, the Hepburn Act not only strengthened the authority of the Interstate Commerce Commission over railroads, but gave the ICC jurisdiction over pipelines as well. Although the language of that act confined itself to liquid, or more particularly, oil pipelines and regulated them as common carriers, the fact of ICC jurisdiction over one kind of pipeline created the potential for a future extension to natural gas pipelines as well.

Two events in 1920 also presaged eventual imposition of regulation over natural gas. Passage of the Transportation Act of 1920, which

further defined the responsibilities of the ICC in railroad rate regulation, and of the Federal Water Power Act of 1920, which established the Federal Power Commission, demonstrated that the Congress was not through imposing regulations and set the stage for the later passage of the Natural Gas Act.

Eight years later, continued Congressional concern over public utility operations impelled the Senate to direct the Federal Trade Commission to conduct an exhaustive study of conditions and practices prevailing in the several public utility industries. Publication of the resulting report on public utilities in 1935 initiated the next wave of regulatory enactments.

Shortly after the release of the FTC report upon public utilities early in 1935, Congress passed the Public Utilities Act of 1935. Separate titles of this act created the Securities and Exchange Commission, and drastically broadened Federal Power Commission jurisdiction over electric power. It should be noted that, between the Senate mandate in 1928 which initiated the FTC study and the enactment of the Public Utilities Act in 1935, the composition of the FPC had been completely reshaped. In 1930, the original FPC, composed of three cabinet officers who held ex-officio posts on the Commission, was dropped and replaced by a five-man team of full-time commissioners who were nominated by the President and approved by the Senate. It is significant that this period, which eventually saw enactment of the Natural Gas Act was one of general Congressional activity on utility regulation. Federal control over wire-borne and wave-borne communications was brought together in a single agency by the Federal Communications Act of 1934. The aviation industry was also brought under Federal control in this same period by enactment of the Civil Aeronautics Act of 1938 which created the Civil Aeronautics Authority.

Any one of several existing agencies might reasonably have been given jurisdiction over the natural gas industry when Congress finally saw

fit to establish surveillance and control over its operations. The Interstate Commerce Commission already exercised power over oil pipelines and might easily have been given similar control over the natural gas pipelines. The Department of the Interior controlled lands and resources in the Federal domain and could reasonably have been given jurisdiction over the natural gas industry by means of a semi-independent board within the department along lines similar to those soon to be adopted for aviation regulation within the Department of Commerce. The Federal Power Commission - by now a barely recognizable descendant of the extremely limited FPC created in 1920 - was responsible for regulation of electric power and could potentially become the main Federal repository for energy control through acquistion of jurisdiction over natural gas.

In 1938, Congress enacted the Natural Gas Act which placed regulation of the industry in the hands of the FPC. Experience soon illuminated features of the industry and of the Act which presented perplexing regulatory dilemmas, but at the time there appeared to be little truly new regulatory pioneering attempted in an act whose provisions for certificate and rate regulation were drawn from similar features of state public service commission bills and from ICC regulation of railroads. The Natural Gas Act was clearly intended to fill the regulatory gap which had been identified as a result of the several Supreme Court decisions denying jurisdiction over gas sales to either the state-of-origin or to the state-of-destination. Whether the Congress had more than gap-plugging in mind was not then clear.

3.1.2.3 Identification of Congressional Intent

In formulating regulatory policies, the FPC has not had far to look for other supplementary sources of guidance. Created by Congress, commissioned as an administrative aide to that body and bearing implicitly understood orders to exercise a continuing day-to-day surveillance over the regulated industry in the legislature's stead;

the FPC has obviously had to attempt to discover and put into practice any objectives intended by Congress. Several factors must be kept in mind regarding Congressional guidance. Expressions of legislative intent may come from many directions. The language of the enacting legislation, the transcript of hearings conducted in preparation for drafting of bills, remarks made before public gatherings, interviews; these are but a few sources useful in discovering the intent of Congress. Conversely, however, it is frequently impossible to discern a consensus from among the many and conflicting opinions of individual legislators. Unless a policy is clearly grounded upon language found within the act itself, there is a presumption that a given statement is not an expression of Congressional intent that may be relied upon authoritatively. As a direct result, legislative guidance is a sporadic occurrence, forthcoming only when a specific issue catches the attention of enough Congressmen to unite them behind one interpretation.

Unmistakably, the intent of Congress can play a very significant role in determining the form and content of regulatory practice. Under some circumstances a hint found in legislative language may be interpreted and even accepted as a valid indication of Congressional intent. In other circumstances, however, an ambiguity of language in the original act may permit conflicting interpretations to arise. In the event of such conflicts, there is no assurance that significant weight will be accorded to informal evidence of probable intent or statements by individual legislators. The only authoritative indicators of the will of Congress are the words actually found in the original act or in amendments to the act. Moreover, failure of Congress to make its intent adequately clear at the outset may never be rectified. Even in the event that further legislative guidance is forthcoming, years may very well pass before an issue is settled.

3.1.2.4 Implementation of the Natural Gas Act

The Natural Gas Act provided that the Act shall apply to transportation of natural gas in interstate commerce, that the Act shall further apply to sale of natural gas in interstate commerce for resale, and the Act shall finally apply to "natural gas companies" engaged in such transportation or sale. The Act stated that distribution of natural gas at the local level, facilities devoted to such local distribution, and both production and gathering of natural gas are all exempt from regulation by the FPC under the Act. In regard to the power to require an application for a certificate of public convenience and necessity, the Act stated that a natural gas company could not construct, acquire, or operate facilities to transport natural gas into a market already served by another natural gas company, nor could such a company transport or sell gas in such a market without first obtaining a certificate from the FPC authorizing it to do so.

The first decisions handed down by the Commission under the Act came in 1939. In Kansas Pipe Line & Gas Company et al, 2 FPC 29, a case involving competing applications for certificates of public convenience and necessity, the principal jurisdictional question was not whether or not the companies were natural gas companies under the meaning of the Act, but what Congress meant by the phrase "market already being served by another natural gas company." The Commission chose to interpret the phrase broadly enough to include communities in proximity to the lines of an existing pipeline but not actually served by it at the time. The greatest significance of the case, though, is probably not jurisdictional, for the Commission here gave form to the criteria which it would apply in evaluating the merits of certificate applications.

The FPC decided two jurisdictional rate cases in 1940. The first of these, Mississippi River Fuel Corp., 2 FPC 170, affirmed the jurisdictional character of the company and of its operations but did not include a

finding of fair and reasonable rates and was not tested in court. The second of these two cases was Illinois Commerce Commission v. the Natural Gas Pipeline Company of America and the Texoma Natural Gas Company. An interim order issued by the FPC in 1939, 2 FPC 636, required the company to file new rate schedules with lower rates. The company appealed the interim order and, though the court upheld all other aspects of the Commission's action, it vacated the order for absence of any specific going-concern allowance. The Supreme Court, however, in FPC v. Natural Gas Pipeline Company, 315 US 575, in 1942, upheld the validity of the interim order in every respect and removed any doubts of the constitutionality of the Natural Gas Act and FPC jurisdiction over interstate pipelines.

In another pair of cases decided by the FPC in 1940, the Commission's initial attitude towards jurisdiction over gas production was formulated. In the Columbian Fuel Corporation decision, 2 FPC 200, of 1940, the majority of the Commission found that it did not have jurisdiction over the sales of a company which engaged solely in production and gathering. Commissioner Scott here wrote the first of his dissenting opinions on the subject of producer regulation and maintained that the producer does make a sale of gas in interstate commerce for resale and is thus within the definition of a natural gas company.

The question of jurisdiction over a company which produces, gathers, and transports gas in interstate commerce arose in the case of Billings Gas Co., Ohio Oil Co. & Mountain Fuel Supply Co., 2 FPC 288. Where the question had been implicit though uncontested in the Natural Gas Pipeline Co. case decided earlier in the year, Billings, et al. chose to contest FPC jurisdiction over the production and gathering portion of their operations and maintained that the two portions should be separated in order that the Commission might impose its regulatory surveillance over only

the interstate transportation and sales. The Commission refused to indulge in separation of the two portions of the business and held that the entire business became jurisdictional.

By 1942 the right of the Commission to regulate interstate pipeline sales was well established. The right to regulate additions to and deletions from existing facilities was being exercised, though it had not been tested by the Supreme Court. The first abandonment proceeding, involving application for authorization to remove a short line which served only a direct industrial customer who had become bankrupt and had voluntarily terminated service, had been decided in 1941, Panhandle Eastern Pipe Line Company, 2 FPC 1048.

The year 1942 was, in many respects, an extremely important one for the Natural Gas Act. In order to trace the most important events from that date forward, it is convenient to establish two areas of potential jurisdictional ambiguity which were to be litigated and clarified in the years to come. Thus, we shall consider separately, and shall consider in turn, the areas of Direct Industrial Sales and Intrastate Sales.

3.1.2.4.1 Direct Industrial Sales

The basis for exercise of control over direct industrial sales had been laid in 1939 in the Louisiana-Nevada Transit Company case already discussed. It may be concluded that this power was legitimate from the fact that when Congress substantially rewrote the sections of the Natural Gas Act dealing with certification in 1942, it did not include any language removing certification of these facilities from the Commission or implying that power over them was not intended. Moreover, the next few years did not see any test of FPC power over certification of facilities for direct sales. In the Tennessee Gas and Transmission Company case of 1943, 3 FPC 574, the Commission went so far as to indicate that it had no real authority to consider the nature

or implications of the sales which the proposed facilities would serve. The impact of the war emergency undoubtedly played a significant part in delaying tests of FPC power over new direct industrial sales. Commission treatment of the many certificate applications during the war years reveals an extreme reluctance to scrutinize critically any project which had been awarded defense priority for very tightly controlled steel supplies and given authority to acquire pipe and related physical material.

If the FPC was unwilling to exercise control over direct sales through the certification process, it did not have the same war-induced reluctance in regard to the returns earned from those sales. In the Detroit v. Panhandle Eastern Pipe Line Company, et al. case, 3 FPC 273, of 1943, the allowed operating expenses of jurisdictional operations were reduced by an amount equal to the returns on direct industrial sales which the Commission found in excess of a 6 ½% return on that portion of the business. On appeal to the Supreme Court, there was no finding that the FPC had exceeded its authority in treating the returns from direct sales in this manner. (Panhandle Eastern Pipe Line Company v. FPC, 324 US 635)

The years immediately following the end of the war saw a shortage of pipeline capacity to satisfy rapidly growing markets in many parts of the nation. The Commission experimented with curtailment orders and other devices aimed at an orderly control over the maximum volumes taken from pipelines at peak periods. Of the many novelties inherent in the attempts to establish control over the gas shortage being experienced by customers, one was the question of whether or not the FPC had authority to order curtailments of direct industrial sales by interstate pipeline companies. In 1947, the Supreme Court, in Panhandle Eastern Pipe Line Company v. Public Service Commission of Indiana, 332 US 507, ruled that the Commission could set aside pipeline delivery obligations

contained in private direct sales contracts. This same case is also notable in another matter. The Court here found that, where the FPC did not exercise jurisdiction over prices charged for natural gas sold to direct industrial users, the state-of-destination could lawfully engage in regulation of such sales at its discretion. Thus, in the latter aspect of the case, the Supreme Court in effect qualified the earlier rulings that neither state could regulate prices of goods which traveled in interstate commerce.

Having already found a distinction between jurisdiction over sales and jurisdiction over other actions - construction in particular- a further distinction was eventually drawn between sales and transportation. Once more, Panhandle Eastern was a principal party in the proceeding which clarified the issues. The Commission denied Panhandle Eastern a certificate to transport natural gas for a direct industrial sale. In 1956, in Panhandle Eastern Pipe Line Company v. FPC, 232 F. 2d 467, the Court of Appeals held that transportation was a thing separate from sale and that the provision of the Natural Gas Act which denied the Commission jurisdiction over sales to industrial customers did not remove from the FPC authority over transportation. The Commission had the right to pass upon and certificate or refuse or certificate transportation of gas for a direct industrial sale.

Later, jurisdiction over direct sales was again extended. In 1964, an industrial user which had purchased gas from an interstate pipeline began to operate a new facility which it thought would remove it from control by the FPC. The customer purchased natural gas from a producer at the producer's processing plant and carried the gas from the point of purchase in a pipeline owned and operated by the customer itself which served the customer's own consumption alone. Thus, it appeared that all commerce in the gas was complete before transportation began, and moreover transportation was not carried out by a natural gas company.

In the 1969 International Paper Company, 42 FPC 248, decision, the Commission ruled that it did have authority to require applications for certificates to cover construction and operation of the facilities involved and also to cover transportation of the gas itself. In 1971, on an appeal by the company, the FPC interpretation was affirmed in court in the International Paper Company v. FPC, 438 F. 2d 1349. The Supreme Court has since given finality to the FPC opinion by refusing to hear further appeal.

3.1.2.4.2 Intrastate Sales

The Natural Gas Act was originally silent regarding intrastate matters. Congress provided only for the regulation of the transportation and sales of natural gas for resale in interstate commerce. Presumably, the doctrines decreed by the Supreme Court during the 1920's were regarded as sufficiently illuminating. In any case, further guidance would have to come from the courts, not from Congress. The FPC did not undertake at the outset to test the limits of the phrase "interstate commerce." However, guidance did come from the Supreme Court in a case decided in 1942 between an Illinois company and the Illinois regulatory agencies. Though the company purchased its gas within the borders of the state and sold it inside the state to both direct customers and to local distribution companies for resale and consumption within Illinois, the Supreme Court ruled that the controlling fact was the purchase of gas from an interstate natural gas company. Thus, in Illinois Natural Gas Company v. Public Utilities Commission of Illinois and Illinois Commerce Commission, 314 US 498, the Court found that the operations of the company constituted transportation and sale of natural gas for resale in interstate commerce. Thus, the state regulatory agencies had no jurisdiction. This strict interpretation of the earlier city gate doctrine gave the FPC clear jurisdiction over what would superficially appear to be only intrastate distribution operations.

At about this same time, in the Canadian River Gas Company and Colorado Interstate Gas Company case of 1942, 3 FPC 32, the Commission chose to regard the operations of three closely related companies as a single system for ratemaking purposes. In so doing, sales of natural gas by the Colorado-Wyoming Gas Company which occurred in Colorado before the pipeline crossed into Wyoming were treated as sales in interstate commerce. Colorado-Wyoming objected that it purchased its natural gas within Colorado from Colorado Interstate and that its sales in the state of Colorado were not sales in interstate commerce. In 1945, the Supreme Court decision in Colorado Interstate Gas Company and Canadian River Gas Company v. FPC, 324 US 581, repeated the finding from Illinois Natural Gas Company that a single, uninterrupted flow across state lines for ultimate sale for resale was transportation and sale of gas in interstate commerce.

In another case which again involved a company purchasing out-of-state gas and transporting it within a single state, the FPC repeated its position that such operations were within its jurisdiction. In this case, East Ohio Gas Company, et al., 6 FPC 176, which the Commission decided in 1947, the company claimed not only that its operations were not in interstate commerce, but that it was not a natural gas company within the meaning of the Act because it sold its gas directly to all types of customers. The Commission based its jurisdictional finding upon the fact that the East Ohio company operated many hundred miles of distinctly transmission-type pipeline which served its local distribution activities. Here then, the company was found to be engaged in the transportation of natural gas in interstate commerce even though no sales were made for resale. Once more the Supreme Court had ultimately to make the final ruling in the matter. In its 1950 decision in FPC v. East Ohio Gas Company, 338 US 464, the Court found the uninterrupted flow of natural gas across state borders and into the company's transmission lines to be

the controlling factor. The East Ohio Gas Company did transport gas in interstate commerce. Moreover, the company was regarded as a natural gas company within the meaning of the Act and thus subject to regulation by the FPC even in the absence of sales for resale.

These cases giving the FPC considerable authority over activities which were wholly confined to a single state created opportunities for jurisdictional conflicts between state agencies and the Commission. As each case reaffirmed the interstate character of transportation of out-of-state gas and extended the scope of FPC authority further into in-state activities, pressure inevitably grew for a renewed and clarified expression of the intent of Congress. Action from Congress was forthcoming and 1954 saw enactment of the Hinshaw Amendment. With this Amendment, the Act now provides that companies which transport out-of-state gas within a single state for ultimate consumption there may become exempt from regulation by the FPC, provided that an appropriate state agency certifies to the Commission that it is exercising surveillance over the rates and service of the in-state company.

The years following passage of the Hinshaw Amendment have seen activity in defining the authority of the FPC within the state-of-origin. In 1961, the Commission ruled in Lo-Vaca Gathering Company, 26 FPC 606, that it had authority to regulate the price at which a producer sold gas to a pipeline for specific uses within the state. The company argued that these sales were intrastate in character and were separable from other sales to the pipeline for interstate transportation and ultimate sale for resale. While admitting that the sale of a specific volume of gas to the pipeline solely for its own consumption within the state in its compressor stations was a separate sale, the FPC found that this sale lost its identity by the physical commingling of that gas in the pipeline with the other gas admittedly being sold and transported in interstate commerce. In California v. Lo-Vaca Gathering Company, 379 US 366, the Supreme

Court in 1965 supported the FPC and held that the price of gas sold in this manner was subject to the jurisdiction of the Commission.

A United Gas Pipe Line Company case decided by the FPC in 1963 has since extended Commission authority to gas taken from an interstate pipeline within the state-of-origin and sold there. In United Gas Pipe Line Company, 30 FPC 560, the Commission ruled that the gas was in a stream of gas in interstate commerce and was within FPC jurisdiction, regardless of the state in which it was extracted from the pipeline and sold. This interpretation was subsequently upheld in Louisiana Public Service Commission, et al. v. FPC, 359 F. 2d 525.

3.1.2.5 The Determinants of Regulatory Practice

3.1.2.5.1 The Received Tradition of Public Utility Regulation

Though passage of the Natural Gas Act of 1938 required the FPC to face regulatory tasks and problems for which its previous experience provided scant preparation, it does not follow that the Commission faced a situation entirely without precedent. For example, the Commission had recourse to the already substantial body of received doctrine which had accumulated over many decades in the United States regarding regulation of businesses considered to be public utilities. The tradition of public utility regulation has evolved in an unbroken stream which thus provided a broad framework within which regulation of interstate commerce in natural gas has been exercised. In practice, the received doctrine of public utility regulation has played a dominant role in determining the forms within which regulation has been carried out and has played a significant role in determining the content of regulation as well.

3.1.2.5.2 The Rate Function

To the extent that public utility regulation has from its very inception focused inevitably upon control of the rates or prices charged the consumers for the commodity or service provided, the conceptual methodology through which that control is implemented has been a dominating feature of regulation. Thus, what has come to be called the cost-of-service concept of rate regulation has from the passage of the Natural Gas Act to the present played an important part in determining both the form and the substance of regulation. Growing from and being an accounting expression of late Nineteenth Century Supreme Court rulings that regulated firms were under normal market conditions entitled to earn revenues which recovered prudently incurred operating expenses and additionally a fair return on investment, the cost-of-service concept in practice involved more methodological technicality and philosophical difficulty than appears from a superficial consideration of its ostensibly rather simple basis. Significant procedural crystallization had occurred by 1938 and as a result, cost-of-service regulation was universally recognized as a fundamentally quadripartite creature.

A cost-of-service revenue allowance required four strictly compartmentalized findings. First, is the operating expenses to be recovered. Second, is the investment in the regulated portion of the enterprise. Third, is the allowance for deterioration and obsolescence to be included annually with the operating expenses and also to be accumulated and collectively deducted from the investment findings. Finally, a rate at which the regulated firm is allowed to earn returns upon the net investment must be established.

No similar degree of agreement existed, however, concerning an economically valid and socially just measure of investment in the enterprise

and return to be allowed. While the so-called fair-value issue of enterprise valuation had for nearly four decades taken undisputed prominence over all other regulatory issues, it does not follow that there was any lack of disputable material. In approaching rate regulation over natural gas sales in interstate commerce, the FPC inherited both the general structural framework provided by the cost-of-service concept and also the attendant philosophical dilemmas concerning the proper method for determining rate base or the value of utility investment and the rate of return to be allowed on that rate base or investment.

3.1.2.5.3 The Certificate Function

Just as the cost-of-service approach directly required surveillance over operating expenses to be recovered, it implied indirectly a necessity for corresponding surveillance over plant and equipment admitted to the rate-base upon which the regulated firm was allowed to earn a return. Provision for this latter sort of surveillance was in fact available in the form of yet another aspect of traditional public utility regulation. The instrument through which control of the rate-base could be exercised - that is to say, the certificate of public convenience and necessity - had come into existence in the last decade of the Nineteenth Century. Several regulatory objectives were achieved simultaneously by requiring utilities to obtain certification from the appropriate agency before altering their plant. A very flexible tool, the certificate of public convenience and necessity applied equally to proposed additions to and also to deletions from plant in service.

Taken collectively, the traditions of regulation which had evolved in conjunction with the public utility concept did, in large measure, determine not only the administrative procedure through which regulatory functions would be expressed, but also the theoretical model and conceptual mechanism within which regulatory alternatives would be evaluated

and dictrines formulated. When the FPC assumed jurisdiction over interstate commerce in natural gas in 1938, there could be little doubt that its functions would be exercised within the framework provided by these traditions.

3.2 Safety Regulation of Pipelines

3.2.1 Oil Pipeline Safety Regulation

The Explosives and Combustibles Act of 1909 was amended in 1921 to include flammable liquids and solids. This amendment gave the ICC safety jurisdiction over oil pipelines. In 1930, the Commission commenced a proceeding to determine the need for safety regulations for oil pipelines. This proceeding extended over a 10-year period and included surveys made in 1930, 1935, and 1940. These surveys embraced all of the pipeline common carriers transporting liquid petroleum and its products. On February 24, 1942 (ICC Docket No. 3666), the Commission decided

> "that no regulation for oil pipelines should now be established, but that pipeline service should be kept under observation and when the need for regulations becomes more pressing, it may be promptly met by appropriate action. Such regulations doubtless would reflect in large measure the high standards already set by the petroleum industry as a valuable contribution to the work."

In 1960, the Explosives and Combustibles Act was amended, designated the Explosives and Other Dangerous Articles Act, and expanded to include: (a) contract and private carriers, as well as common carriers, and (b) radioactive substances and etiologic agents (live bacteris). When these 1960 amendments were made, the section of the law which indicated what carriers were covered by the statute was inadvertently amended to remove pipelines from the class of carriers covered by the Act. This amendment was made without the knowledge of the industry and, after thorough research on the point, the industry and the Congressional committees concerned concluded that the omission

of oil pipelines from the statute was the result of oversight. The result was that from 1960 to 1965, neither the Interstate Commerce Commission nor any other federal agency had any authority or obligation to regulate oil pipelines in the field of safety. There appears to have been no pressing need for such regulation. A study made by the American Petroleum Institute early in 1966 estimated that during the 10-year period 1955 through 1964, there were only six deaths and 13 injuries to members of the public resulting from the release of liquid from oil pipeline systems.

Despite this excellent safety record, the absence of regulatory authority at the federal level resulting from the 1960 amendment caused a number of states to consider the need for state action in this area. This was also encouraged because some gas pipelines were trying to avoid federal safety regulation by seeking the enactment of state safety laws and the oil pipelines might have been caught in the backwash. Several states enacted pipeline safety codes which included oil pipelines, causing the oil pipeline industry to be concerned that, unless there were an overriding federal statute and safety code, the industry could expect a patchwork of varying and often conflicting regulations at the state level.

The industry, therefore, cooperated with the Congress in amending the Explosives and Other Dangerous Articles Act to reinsert oil pipelines under that law. This legislation, which was supported by the Department of Commerce, the Interstate Commerce Commission, and an interagency study released September 30, 1963, by the Office of the Under Secretary of Commerce for Transportation, became law July 27, 1965 (Public Law 89-95). In testifying in support of this legislation, then ICC Chairman Charles A. Webb testified:

> "Continuing with my prepared statement, we must say that the accident experience does not disclose any pressing need for federal safety regulation, but the proposed legislation does seem desirable in that it would protect interstate carriers.

> against the threat of conflicting safety legislation by the States. ... I should think it the bill which became Public Law 89-95 would relieve the carriers from attempting to comply with a multiplicity of state rules and regulations." (House Report No. 588, 89th Congress, 1st Session, p.4.)

Having twice been given safety jurisdiction over oil pipelines, the ICC commenced a proceeding late in 1965 for the purpose of formulating a safety code for the oil pipeline industry. Naturally, this was a time-consuming process and a safety code had not yet been completely formulated when the Act creating the Department of Transportation (DoT) on April 1, 1967 (Public Law 89-670), among other things, transferred the ICC's safety jurisdiction over oil pipelines to that Department.

The first action of the new Department was to promulgate, effective December 31, 1967, a requirement that DoT be promptly notified of all "reportable accidents" involving oil pipelines. Such accidents were defined to include all those involving the release of 50 or more barrels of liquid or five or more barrels of liquid petroleum gas from a pipeline, any explosion or fire, any serious injury or death, or property damage (to another's property) of $1,000 or more. Following this reporting requirement, the Department issued a number of proposed regulations relating to the design, construction, operation, and maintenance of oil pipelines. These culminated in a safety code adopted and made effective by the Department on April 1, 1970.

The code adopted on that date is comprehensive, covering the design, construction, operation and maintenance of oil pipelines. The Department has under consideration additional regulations on specific subjects with regard to which it feels more study and research are needed.

The pipeline industry is quick to point out the fact that the regulations adopted to date rely substantially on the voluntary industry code

which has been in effect for many years, the so-called B31.4 Code, sponsored by the American Society of Mechanical Engineers and published by the American Standards Association.

The oil pipeline industry's pride in its safety experience appears to be justified by the record, particularly when it is remembered that the volume of petroleum and petroleum products which moves through the pipeline amounts to 23% of all of the intercity freight and cargo moved by all forms of transportation. This fact, taken together with the accident figures quoted above, clearly establishes oil pipelines as the safest of all major modes of commodity transport.

3.2.2 Gas Pipeline Safety Regulation

The authority for federal regulation of gas pipeline safety derives from the Natural Gas Pipeline Safety Act of 1968 (Public Law 90-481). Prior to the Act, the only nationwide regulation was through voluntary industry compliance with the ANSI B31.8, Gas Transmission and Distribution Piping Systems, sponsored by the ASME. This situation was of course similar to that which was described in the preceding section in connection with oil pipelines. As with oil pipelines, gas pipeline safety is administered by the Office of Pipeline Safety Operations (OPSO), which is further discussed in Section 5.3.2 below.

3.3 Environmental Regulation

The National Environmental Policy Act of 1969 was passed by Congress in an attempt to "recognize the profound impact of man's activity on the interrelation of all components of the national environment, particularly the profound influences of . . . industrial expansion, resource exploration and new expanding technological advances, and recognizing further the critical importance of restoring and maintaining environmental quality to the overall welfare and development of man . . . ." Congress went on to declare that "it is the continuing policy of the Federal Government, in cooperation with state and local governments, and other concerned public and private organizations, to use all practical means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic and other requirements of present and future generations of Americans."

The key phrase in the preceding quotations is "to use all practical means and measures." Even a cursory review of the seven years' experience since passage of the Act indicates that practical means and measures have not been easy to identify and agree upon.

Congress authorized and directed that all agencies of the Federal Government in complying with the National Environmental Act shall:

1. "Utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on man's environment.
2. "Identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by Title II of this Act, which will insure that presently

unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical considerations.

3. "Include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible officer on

   i) The environmental impact of the proposed action,

   ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,

   iii) alternatives to the proposed action,

   iv) the relationship between local short-term uses of man's environment and the maintenance and finance-ment of resources which would be involved in the proposed action should it be implemented."

Under the Act, this authority and direction were given to all agencies of the Federal Government. Therefore, as will be seen in Section 5.0 below, a number of controlling authorities are responsible for the implementation of this act over pipeline systems, since the environmental impact assessment is the concern of all Federal agencies in which some type of contact is involved.

4.0 PIPELINE TARIFFS

Pipeline tariffs are the public documents which are posted by a common carrier pipeline to describe the rates, terms, and conditions under which the carrier offers to provide pipeline service to customers. The tariff is the basis for determining relationships between the carrier and the shipper. This section discusses several aspects of tariffs, including the requirements of regulatory bodies, provisions covering product and crude oil movements, the actions of carriers in posting joint tariffs to cover through-hauls, and the divisions of such joint tariffs.

Common carriers are those carriers which accept tender from the public of a specified quantity of a commodity at an origin point and deliver it to a consignee at the destination. Contract carriers accept tender from a shipper only under contract. Neither common carriers nor contract carriers buy or sell the commodity. It is held in their custody only for transportation.

The ICC regulates all interstate common carriers and contract carriers. As will be seen below, the question is still not completely resolved as to whether a company which moves only its own property (commodity) through its own property (pipeline) is subject to ICC regulation.

Gas pipelines, unlike oil pipelines, operate as utilities, not as common carriers. They purchase the gas at one place and sell it at another. It is for this reason that they are regulated by the FPC, which also regulates electric utilities, rather than the ICC, which regulates common and contract interstate carriers. Gas pipeline companies therefore do not publish tariffs as do the oil pipelines. Therefore, the discussion herein of tariffs applies only to oil pipelines.

4.1 Regulatory Requirements

Most, though not all, of the pipeline mileage in the United States is subject to the jurisdiction of a state or federal regulatory agency. The federal regulatory agency is the Interstate Commerce Commission, which also has jurisdiction over interstate transportation by railway, highway, and waterway carriers. Most states have regulatory commissions with generally comparable jurisdiction over intrastate transportation, e.g., the Railroad Commission of Texas and the Public Utilities Commission of California. These state commissions generally require petroleum pipeline companies to file tariffs following the same general rules that apply to the other agencies of transportation, such as railroads. However, these agencies do not require detailed reporting, such as that required by the ICC, nor do they process data and publish statistical abstracts. Although the precise requirements of regulatory bodies vary considerably, they tend to follow a general pattern of which the following requirements of the Interstate Commerce Commission are typical:

(1) Each tariff must be prepared in the format and style prescribed in I.C.C. Tariff Circular No. 20 - Rules to Govern the Construction and Filing of Freight Rate Publications, Including Pipe Line Schedules and Classifications. Its face carries information as to the carrier(s) involved, the services covered, the issuing authority (i.e., the name and title of the officer of the company issuing the tariff), the tariff number, the date of issuance, and the effective date.

(2) Tariffs are open to public inspection at the Commission's offices and are posted at the principal office of the pipeline

carrier and such other places as the Commission may designate.

(3) Any proposed modification of an original tariff requires the pipeline carrier to follow the same procedure as with the original tariff. Tariffs filed with an agency may not be used until they become effective. The Interstate Commerce Commission prescribes a 30-day waiting period, except for newly constructed lines, which may become effective after 10 days. The Commission occasionally, though rarely, grants special permission for waiting periods of less than 30 days upon proper showing by the carrier. The purpose of the waiting period before a filed tariff becomes effective is to allow any interested party to express disagreement with its provisions, and further, to give the Commission opportunity to consider them.

(4) A 1972 ICC order requires that tariffs and tariff changes be sent to shippers at the same time they are filed with the Commission, and that that fact be certified to in the letter of transmittal. The burden of proof in justifying the terms of a tariff lies with the carrier. The power of suspending a tariff rests with the Commission, which may take such action either upon complaint or upon its own initiative. A regulatory commission cannot hold a tariff in suspense indefinitely, however, and seven months is the maximum period provided by law for an interstate tariff.

(5) Agreements between pipeline carriers covering their concurrence in joint rates for through movements by two or more carriers must also be filed with the Commission, but the carriers

are not required to disclose the division of the total rate; that is a matter of private negotiations between them. These tariffs are defined as joint tariffs as differentiated from a single carrier's tariff, called a local tariff, which names origins and destinations on that carrier's lines only. A carrier may issue a tariff containing both local and joint rates and/or both inter- and intrastate rates; however, many carriers divide them into separate tariffs.

When pipeline carriers agree to provide through routes and joint rates - and there are many of these - the carriers must record their concurrences with the ICC and usually with the state regulatory agencies. ICC Tariff Circular No. 20 prescribes the form and manner in which concurrences are to be filed. Generally, the participants share in the through-rate in proportion to the service that each carrier provides, although occasionally one of them may receive a higher portion. Regardless of the manner in which a joint rate is divided, it is a contract between the carriers that is not filed with the Commission and is not public information.

4.2 General Provisions of Tariffs

Tariffs specify that oil shall be gauged for quantity and tested for quality prior to acceptance for transportation. The actual gauged volume is corrected for temperature to the common industry basis of "volume at 60 degrees Fahrenheit" temperature, and is adjusted to a "net oil" basis by deducting the measured content of basic sediment and water (BS&W).

A pipeline carrier normally is not an insurer of the oil held in custody for transportation. Carriers universally state in their tariffs that liability for loss or damage is limited to that resulting from their negligence. A carrier generally excepts itself from loss or damage

caused by acts of a public enemy, quarantine, the authority of law, strikes, riots, or the default of the shipper or owner.

When an oil loss is experienced which is not due to the carrier's negligence, the shippers share the loss in a manner essentially similar to the adjustment of a general average loss in marine transportation. A typical clause specifies that a shipper shall suffer in the proportion that its shipment bears to the whole amount of the consignment of which it is a part, and the shipper shall be entitled to receive only such portion of its shipment as is left after deducting its due proportion of the loss.

Pipeline tariff charges are assessed on the volume delivered at destination, not on the volume tendered. Pipeline rates are usually quoted on a point-to-point basis. Where movement is from an origin not designated by name, an intermediate application of rates applies and the rate from the next more distant specified is used. However, carriers do not usually consider themselves obligated to accept oil at unnamed origins or to stop movements at unnamed destinations.

Pipeline rates are either "local," "joint," or "proportional." A local rate applies to movements over the lines of a single carrier. A joint rate applies to movements over the lines of two or more connecting carriers. A proportional rate applies to movements which are only part of a larger movement. In collecting charges for services performed, the pipeline is entitled to payment before making physical delivery of the oil in the carrier's custody. The pipeline has a lien on the oil transported and, in the event of nonpayment of legitimate charges, may auction the crude involved and reimburse itself from the proceeds. As a further protection to the carrier, it may require an indemnity bond from the shipper if the oil offered for shipment is in litigation or dispute as to ownership. Somewhat akin to the collecting of charges by the carrier is the collection or pressing of action by the shipper for damages incurred from the

carrier. Written claims must be filed by the shipper within a reasonable time after delivery should have been completed by the carrier, and any legal action undertaken must be initiated within two years from the time of the written claim. The "reasonable time after delivery" may range variously from one jurisdiction to another, being typically from 90 days to nine months.

4.2.1 Crude Oil Tariffs

The tariff clauses dealing with the specifications of the oil to be transported serve somewhat the same purpose as the classification feature of railroad tariffs. They also introduce certain limitations as to the service that the carrier will provide. To be acceptable for transportation, the oil offered for shipment must fall within the range of prescribed specifications. A typical clause covering crude oil tendered for shipment in a crude oil line requires that the oil must be the direct product of oil wells, or a mixture of the direct and/or indirect products of the same in such proportion that the resulting blend can be transported through the carrier's existing facilities. This actual specification may, of course, vary. High vapor pressure products generally are not acceptable in crude lines because they tend to cause vapor lock and suffer high in-transit and storage losses. Vapor pressures of crudes vary greatly and it has become common practice to blend natural gasoline or butanes into low vapor pressure (and high viscosity) crudes for transportation because these diluents decrease the viscosity of the stream. The vapor pressure of such blends, however, must be held within the limit prescribed by the tariff.

It is customary also for a pipeline tariff to stipulate that the crude oil offered for transportation shall be a "marketable oil." This clause is interpreted to mean that the crude oil or blended petroleum product is suitable physically for refining or fuel purposes, and usually refers more particularly to a stated requirement that the crude shall be properly

settled and contain not more than a specified percentage (one percent in most cases) of BS&W.

Crude oil pipeline tariffs usually specify that oil accepted for movement will be transported only with the understanding that the oil shall be subject to such changes in gravity or quality while in transit as may result from the mixture of the shipment with other oil in the pipelines or tanks of the carrier or any connecting carrier. This clause recognizes the ordinary conditions of pipeline operation in which there is some tendency for mixture at the interface of adjoining or successive batches of dissimilar oils in the line. Such may be due to some clingage of preceding oils to the lines, traps, pumps, and tanks of the pipeline carrier, or may be tank bottoms left from a preceding movement in tank farm storage. The mixture of dissimilar oils which may have preceded or followed a given batch of crude may render the latter less suitable for refining than if such mixture had not occurred, but in modern pipeline practice this is the exception rather than the rule. For example, it is possible that a batch of lubricating type crude can be damaged or even ruined for lube manufacture by contamination of a high sulphur content crude or a low pour point crude. More often, however, the contaminated ends of a batch are so small in volume in comparison with the total batch that the contamination is neither discernable, even by test, nor significant. The transporter cannot guarantee this, however, and its tariff provision is to put the shipper on notice as to the extent of the carrier's ability to segregate oils.

The pipeline carrier may retain the option of delivering to the consignee a "common stock" crude rather than the actual oil accepted for transportation and, unless it represented that it would undertake to segregate certain grades for batch movement, the shipper might receive something quite different than it tendered for shipment. As indicated above, this practice is passing and the modern pipeline

company expects to batch crudes of widely different characteristics if their volumes are large enough to make this possible, and deliveries from "common stock" can be expected to be of substantially like kind and market value to the oil accepted for shipment.

The carrier may also require the consignee to start receiving oil at destination at a specified time, such as within 24 hours after the carrier accepted the oil in the field, even though there may be several days' actual transit time between the points of origin and destination. This clause recognizes that oil if a fungible good in which commercially identical oils have similar acceptability.

The tariff usually contains a pipeage clause calling for a separate "pipeage contract" covering the adequacy of facilities provided by shippers and consignees at origin and destination. Such facilities must be able to handle the flow and pressure of the pipeline in order that the line may be operated efficiently, which generally means at a high flow, in accordance with its design.

The tender clause of pipeline tariffs specifies the minimum quantity that will be accepted for movement. Practice varies from one carrier to another, and has changed considerably over the years in the direction of permitting smaller tenders. A typical provision states that orders for the shipment of any specified kind of crude petroleum will be accepted for transportation in quantities of not less than 10,000 barrels from one shipper consigned to one consignee and destination. This is coupled with the further proviso that the shipment will be moved forward when other shipments of crude oil of the same kind and quality consigned to the same destination shall aggregate a total batch of 25,000 barrels. The minimum tender and batch provision takes into consideration the interest of some shippers in moving oil in small quantities. It also reflects the practicalities of the physical operation

of a pipeline in which the percentage of interbatch admixture increases as the size of the batches decreases, and in which the minimum size of a batch has to be related to the size and capacity of the line, with larger diameter lines requiring higher minimums.

When the demand for pipeline service exceeds the capacity of the carrier, it is the practice to prorate the pipeline's capacity. Such capacity proration is made mandatory by some regulatory agencies. A "proration of capacity" clause typically stipulates that, when more oil is offered for shipment than can be transported immediately, the transportation will be apportioned among all shippers in proportion to the amounts tendered by each. The latter usually is interpreted to mean the amounts that the shippers actually have on hand accessible to and ready for shipment.

In addition to gathering services and trunk line services, crude oil pipeline tariffs provide for certain auxiliary and related services and activities. Reference is usually made to the carrier's communication facilities, and the shipper customarily is permitted to transmit messages pertaining to oil tendered for shipment or in-transit. The tariff may describe loading services that the carrier may provide, such as for the loading of oil into tankers or, on accasion, into tank cars.

When the consignee fails to accept delivery of oil within the time designated in the tariff, provision is normally made for the assessment of demurrage charges on such oil not accepted at destination. In lieu of this provision, some pipelines' tariffs require that the consignee, upon 24 hours' notice, be prepared to receive oil as it arrives at destination. If the consignee is unable or refuses to receive oil, the carrier reserves the right to clear its pipeline and to charge the consignee for any additional expenses incurred as a result. If the carrier offers an in-transit storage service, the terms and charges are defined. Most tariffs also permit in-transit change of consignees.

The pipeline tariff is also a transportation price list, since it tabulates the charges for the services offered. The charges for gathering service are uniform in a gathering system. Five cents per barrel charge prevails in new, prolific producing areas. Gathering system economics sometimes require that they be higher in other less prolific areas; often they are as much as fifteen cents per barrel and more in stripper-well areas.

Trunk line transportation charges vary to a considerable extent with the distance and the cost of providing the service, but market competition is also an important factor. Although the same general level of rates tends to prevail among competing pipelines between the same producing fields and refining centers, there are actual variations in rates of competing carriers for almost every major trunk line haul.

Common practice among crude oil pipeline companies is to set the same rate from all fields in a definable producing area to a given destination even though the trunk line distance from each to the destination may differ considerably. The origin and destination to which a tariff charge applies are stated in the tariff document, and the routes of movement between origin and destination usually are stated as to sequence of junction points of connecting carriers are involved and are parties to the joint tariff.

4.2.2 Petroleum Products Pipeline Tariffs

Product pipeline tariffs have very similar provisions to those in the crude oil tariffs covering scheduling, gauging, testing, minimum shipments, proration of capacity, liability of carrier, and for filing claims.

Services other than the trunk line movements vary widely from one carrier to another, and require tariff provisions to cover these services. Some lines deliver only to shipper facilities, some operate public ter-

minals, provide storage, and perform the services of loading and billing transport trucks, rail cars, and/or barges. Some do both.

Most product lines accept and transport any product in the refining range from motor gasoline to diesel fuel, and some also transport liquefied petroleum gases. Product lines do not transport crude oil, residual, or other so-called "black oils."

Product pipeline tariffs either provide for the maintenance of separate identify of shipments or permit a limited substitute of similar products. The maintenance of the separate identity of shipments and fairly large minimum tenders go hand-in-hand. Some carriers have minimums of 25,000 and 75,000 barrels. Other carriers accept much smaller tenders, but only with the understanding that transportation will take place at the time when the carrier is moving other product of similar quality and color. Certain products pipelines serving several shippers of "branded" products (such as housebrand or premium gasolines) ship a basic blending stock as common stream, and blend the stock at destinations with each shipper's additives and to his brand specifications.

Usually, product pipeline tariffs have origin group rates, i.e., the rates from several origins in an area are the same to a given destination, even though there may be a considerable difference in the distances. Some tariffs have a single charge for each destination that covers all the services performed by the carrier. Others allocate the charges between line haul, storage, terminal services, blending, stop-in-transit, etc.

Cost of service is an important factor in establishing rates and charges, but competitive forces are also important. In planning a new line or an extension, the total transportation charges from origin to consumer via existing transportation methods must be considered in determining optimum rates. For example, if the terminus of a proposed line is in a market area now served primarily by an inland waterway 100 miles

away, the barge charges plus the truck cost for 100 miles must be compared with pipeline costs plus the short-haul truck cost. If trucking 100 miles is 70¢ and the short haul is 20¢, the pipeline charges could be barge cost plus 50¢ and be competitively equal. Conversely, if the line also wants to compete for the market close to the waterway, its rates would have to be 50¢ less than the barge rates. In practice, several rate levels in between will be studied by the prospective pipeline owner to determine if the transportation market is sufficient at each level to support the pipeline. The pipeline will be built only if these studies confirm the economics of the project.

5.0 FEDERAL REGULATORY AGENCIES

In this section, the seven federal agencies which have significant regulatory jurisdiction over pipelines are identified (Fig. 5.0-1) and briefly described. The seven agencies were visited and the individuals who were interviewed are identified in Fig. 5.0-1. The purposes of the interviews were:

(1) To determine whether any significant changes have been made recently, or are in process, regarding regulatory jurisdiction and/or practice;

(2) To determine whether any regulation, jurisdiction, and/or activity existed beyond those already known to the study team.

(3) To determine whether the agencies' own perceptions of their jurisdictions differ from those of the study team or of the other regulatory agencies;

(4) To identify jurisdictional overlaps, gaps, and ambiguities.

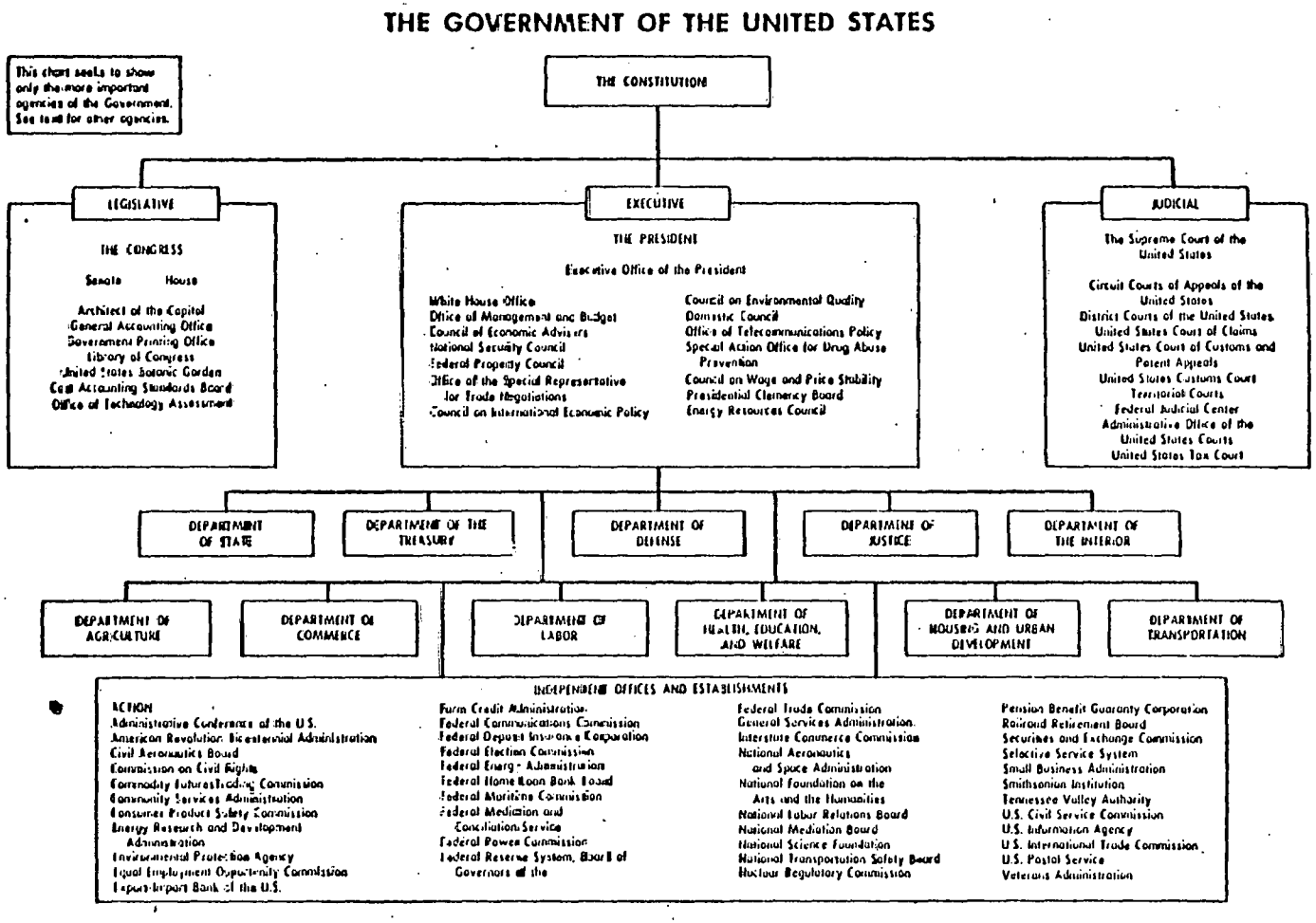
THE GOVERNMENT OF THE UNITED STATES
This chart seeks to show only the more important agencies of the Government. See text for other agencies.
THE CONSTITUTION
LEGISLATIVE
THE CONGRESS
Senate
House
Architect of the Capitol
General Accounting Office
Government Printing Office
Library of Congress
United States Botanic Garden
Cost Accounting Standards Board
Office of Technology Assessment
EXECUTIVE
THE PRESIDENT
Executive Office of the President
White House Office
Office of Management and Budget
Council of Economic Advisers
National Security Council
Federal Property Council
Office of the Special Representative for Trade Negotiations
Council on International Economic Policy
Council on Environmental Quality
Domestic Council
Office of Telecommunications Policy
Special Action Office for Drug Abuse Prevention
Council on Wage and Price Stability
Presidential Clemency Board
Energy Resources Council
JUDICIAL
The Supreme Court of the United States
Circuit Courts of Appeals of the United States
District Courts of the United States
United States Court of Claims
United States Court of Customs and Patent Appeals
United States Customs Court
Territorial Courts
Federal Judicial Center
Administrative Office of the United States Courts
United States Tax Court
DEPARTMENT OF STATE
DEPARTMENT OF THE TREASURY
DEPARTMENT OF DEFENSE
DEPARTMENT OF JUSTICE
DEPARTMENT OF THE INTERIOR
DEPARTMENT OF AGRICULTURE
DEPARTMENT OF COMMERCE
DEPARTMENT OF LABOR
DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
DEPARTMENT OF TRANSPORTATION
INDEPENDENT OFFICES AND ESTABLISHMENTS
ACTION
Administrative Conference of the U.S.
American Revolution Bicentennial Administration
Civil Aeronautics Board
Commission on Civil Rights
Commodity Futures Trading Commission
Community Services Administration
Consumer Product Safety Commission
Energy Research and Development Administration
Environmental Protection Agency
Equal Employment Opportunity Commission
Export-Import Bank of the U.S.
Farm Credit Administration
Federal Communications Commission
Federal Deposit Insurance Corporation
Federal Election Commission
Federal Energy Administration
Federal Home Loan Bank Board
Federal Maritime Commission
Federal Mediation and Conciliation Service
Federal Power Commission
Federal Reserve System, Board of Governors of the
Federal Trade Commission
General Services Administration
Interstate Commerce Commission
National Aeronautics and Space Administration
National Foundation on the Arts and the Humanities
National Labor Relations Board
National Mediation Board
National Science Foundation
National Transportation Safety Board
Nuclear Regulatory Commission
Pension Benefit Guaranty Corporation
Railroad Retirement Board
Securities and Exchange Commission
Selective Service System
Small Business Administration
Smithsonian Institution
Tennessee Valley Authority
U.S. Civil Service Commission
U.S. Information Agency
U.S. International Trade Commission
U.S. Postal Service
Veterans Administration

Fig. 5.0-1

Table 5.0-1

Visits to Federal Regulatory Agencies

1. Interstate Commerce Commission

   (a) Raymond Mauk, Bureau of Operations
   Phone: 202-275-7495

   (b) Bill Love, Chief of Railroad Section
   Phone: 202-275-7846

2. Federal Power Commission, Bureau of Natural Gas

   Lewis Brubaker, Head of Transportation Section
   System Operations Division
   Phone: 202-275-4493

3. Department of Transportation, Office of Pipeline Safety Operation

   Joe Caldwell, Asst. Director for Pipeline Safety Policy
   Phone: 202-426-9642

4. Federal Energy Administration, Oil and Gas Division

   Earl Ellerbrake
   Phone: 202-961-6117

5. Environmental Protection Agency: Office of Federal Activities

   David Schaller, Resource Development Liaison Staff
   Phone: 202-755-0770

6. Department of Interior, U.S. Geological Survey

   Henry Coulter, Asst. Director Environmental Conservation
   Phone: 202-860-7491

7. Department of Labor, Occupational Safety and Health Admin.

   Ms. Karen Mann, Lead Negotiator
   Phone: 202-523-8055

5.1 Interstate Commerce Commission (ICC)

The ICC headquarters are at Twelfth Street and Constitution Avenue N.W., Washington, D.C. 20423, Telephone 202-343-1100. The organization chart is shown in Fig. 5.1-1.

5.1.1 General Responsibilities

The ICC was created as an independent establishment by the act to regulate commerce of February 4, 1887 (24 Stat. 379, 383; 49 U.S.C. 1-22), now known as the Interstate Commerce Act. The Commission's authority has been strengthened and the scope of its jurisdiction has been broadened by subsequent legislation, such as the Hepburn Act, the Panama Canal Act, the Motor Carrier Act of 1935, and the Transportation Acts of 1920, 1940, and 1958.

The Commission was created by Congress to regulate, in the public interest, carriers subject to the Interstate Commerce Act which are engaged in transportation in interstate commerce and in foreign commerce to the extent that it takes place within the United States. Surface transportation under the Commission's jurisdiction includes railroads, trucking companies, bus lines, freight forwarders, water carriers, oil pipelines, transportation brokers, and express agencies.

The Chairman is designated by the President from among the Commissioners. The Commissioners elect their own Vice Chairman annually. The other nine Commissioners serve on one of three divisions: Operating Rights (Division One); Rates, Tariffs and Valuation (Division Two); and Finance and Service (Division Three). The entire Commission acts on matters of national transportation importance. The Commission may delegate certain duties and functions to individual Commissioners or to boards consisting of not less than three eligible employees. The three divisions function as appellate divisions for action on petitions for reconsideration or rehearing of decisions of divisions or boards of employees.

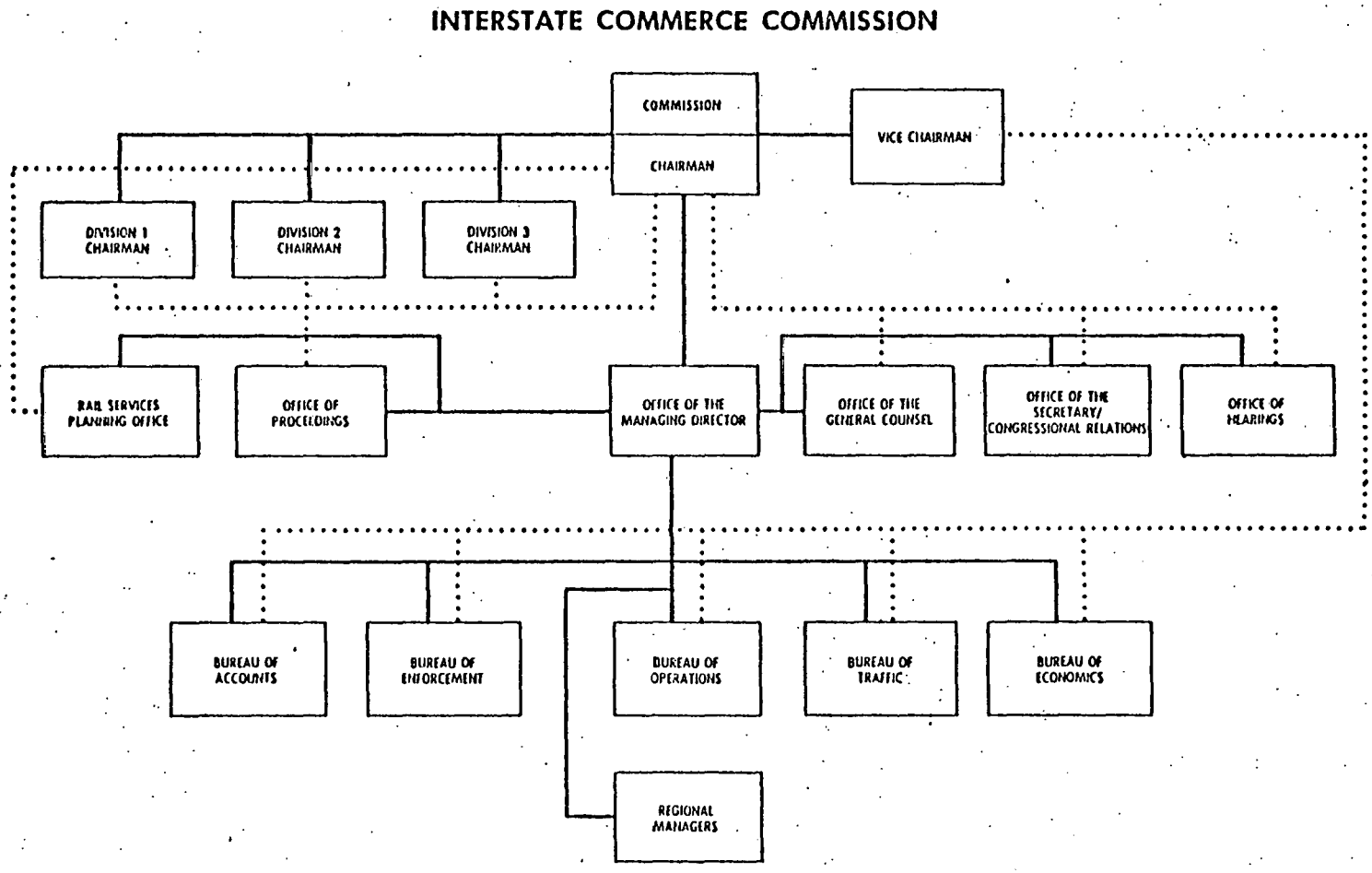
INTERSTATE COMMERCE COMMISSION
COMMISSION
CHAIRMAN
VICE CHAIRMAN
DIVISION 1 CHAIRMAN
DIVISION 2 CHAIRMAN
DIVISION 3 CHAIRMAN
RAIL SERVICES PLANNING OFFICE
OFFICE OF PROCEEDINGS
OFFICE OF THE MANAGING DIRECTOR
OFFICE OF THE GENERAL COUNSEL
OFFICE OF THE SECRETARY/ CONGRESSIONAL RELATIONS
OFFICE OF HEARINGS
BUREAU OF ACCOUNTS
BUREAU OF ENFORCEMENT
BUREAU OF OPERATIONS
BUREAU OF TRAFFIC
BUREAU OF ECONOMICS
REGIONAL MANAGERS

Fig. 5.1-1

Field offices are maintained in 79 cities to audit carrier accounts, monitor the utilization of railroad freight cars in order to avoid severe shortages, investigate violations of the Interstate Commerce Act and related laws, and provide assistance to the public in its use of regulated carriers which provide transportation by railroad, highway, waterway, and oil pipeline.

In broad terms and within prescribed legal limits, Commission regulation encompasses transportation economics and service. In the transportation economics area, the Commission settles controversies over rates and charges among competing and like modes of transportation, shippers, and receivers of freight, passengers, and others. It rules upon applications for mergers, consolidations, acquisitions of control, and the sale of carriers and issuance of their securities. It prescribes accounting rules, awards reparations, and administers laws relating to railroad bankruptcy. It acts to prevent unlawful discrimination, destructive competition, and rebating. It also has jurisdiction over the use, control, supply, movement, distribution, exchange, interchange, and return of railroad equipment. Under certain conditions, it is authorized to direct the handling and movement of traffic over a railroad and its distribution over other lines of railroads.

In the transportation service area, the Commission grants the right to operate to trucking companies, bus lines, freight forwarders, water carriers, and transportation brokers. It approves applications to construct and abandon lines of railroad, and it rules upon discontinuances of passenger train service.

Although public hearings on matters before the Commission may be held at any point throughout the country, final decisions are made at the Washington, D.C., headquarters in all formal proceedings. These cases include rulings upon rate changes, applications to engage in for-hire trans-

port, carrier mergers, adversary proceedings on complaint actions, and punitive measures taken in enforcement matters.

Consumer protection programs involve assuring that the public obtains full measure of all transportation services to which entitlement is guaranteed by the Interstate Commerce Act. This law ensures that rates will be fair and service will be reasonable. Discrimination, preferential treatment or prejudicial actions by carriers is illegal and instances of such violations should be brought to the attention of the Commission at its headquarters or any field office.

The Regional Rail Reorganization Act of 1973 created in early 1974 a Rail Services Planning Office to assure that public interest is represented in the restructuring and revitalization of railroads in the Northeast and Midwest.

5.1.2 Pipeline Responsibilities

ICC responsibility and authority over pipelines is described in Section 3.1 above. Slurry pipelines are presently under ICC jurisdiction, by virtue of the reference in Section 1 of the Act to "transport of commodities," although at least two measures considered and rejected by the 94th Congress would have placed that authority elsewhere. The only interstate coal slurry pipeline in operation, Black Mesa Pipeline, Inc., was added to Part 6 of the annual ICC publication, "Transport Statistics in the United States" in 1971. Accordingly, Part 6, which formerly was designated "Oil Pipe Lines" is now simply "Pipe Lines."

The ICC authority is restricted to the rather narrow range of tariff jurisdiction. The ICC does not prescribe such things as distribution of products or volumes of products produced within an area or moving in or out of an area. Hence, it seems unlikely that any significant jurisdictional ambiguities exist. None were discovered in the conduct of this study.

5.2 Federal Power Commission (FPC)

The FPC headquarters are at 1100 L Street N.W., Washington, D.C. 20573, telephone 202-655-4000. The organization chart is shown in Fig. 5.2-1.

5.2.1 General Responsibilities

The FPC regulates the interstate operations of the electric power and natural gas industries. It is an independent agency operating under the Federal Power Act (16 U.S.C. 791a-825r), as amended. This act was originally enacted as the Federal Water Power Act of June 10, 1920 (41 Stat. 1063), and subsequently amended by title II of the Public Utility Act of 1935 (49 Stat. 838), and the Natural Gas Act, enacted June 21, 1938 (52 Stat. 821-833, as amended, 15 U.S.C. 717-717w). Additional responsibilities have been assigned by subsequent legislation and by Executive orders (see Federal Power Commission Laws and Hydroelectric Power Development Laws, Govt. Printing Office, 1966).

The FPC is empowered to issue permits and licenses for non-Federal hydroelectric power projects; regulate the rates and other aspects of interstate wholesale transactions in electric power and natural gas; issue certificates for interstate gas sales and construction and operation of interstate pipeline facilities, conduct continuing investigations of the electric power and natural gas pipeline industries and their relationships to national programs and objectives, including conservation and efficient utilization of resources; require protection of the environment in the construction of new hydroelectric projects and natural gas transmission lines; and allocate resources consistent with the public interest under the Federal Power Act and the Natural Gas Act.

In addition, the FPC prescribes and enforces a uniform system of accounts for regulated electric utilities and natural gas pipeline companies.

FEDERAL POWER COMMISSION

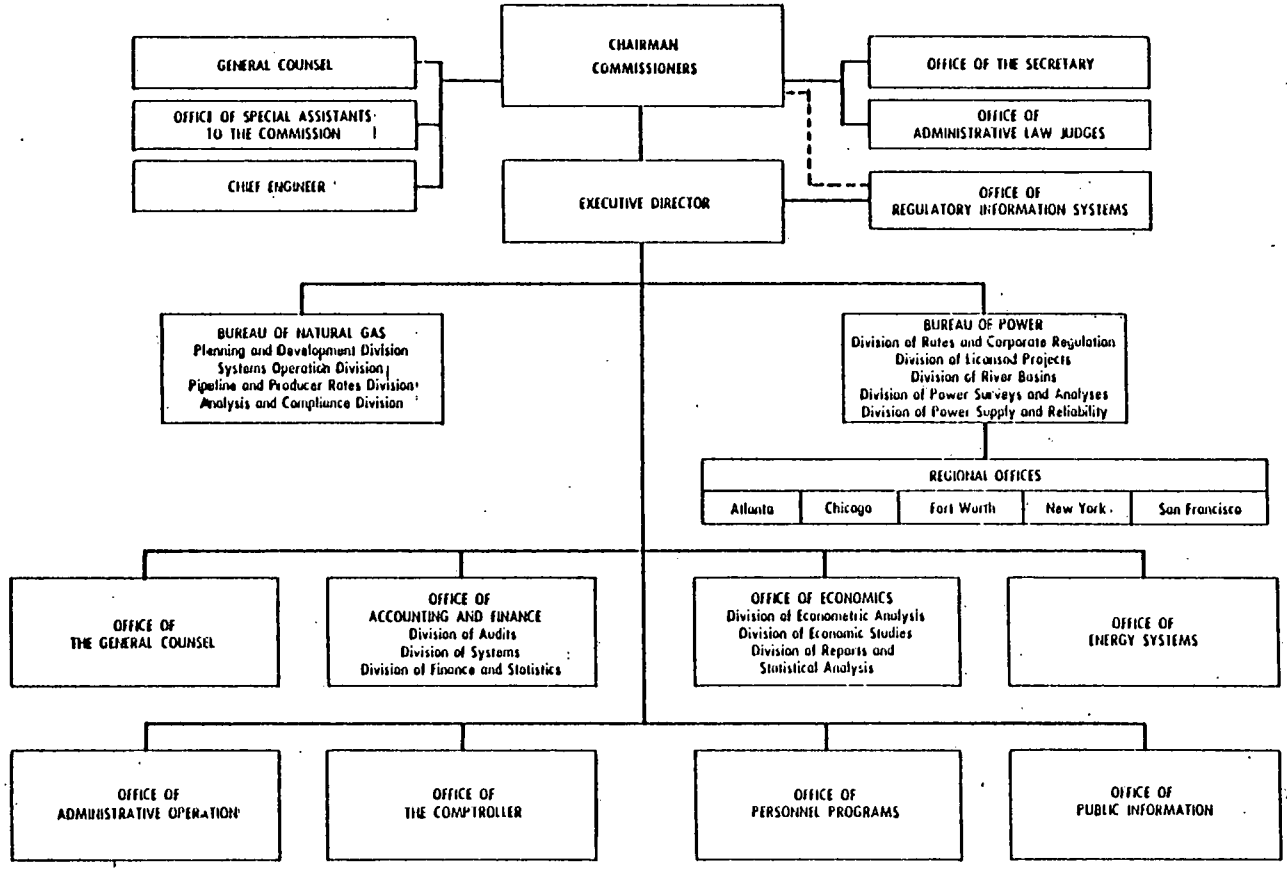

Fig. 5.2-1

The FPC has the authority to divide the Nation into regional districts for the voluntary interconnection and coordination of facilities for generation, transmission, and sale of electric energy. The FPC reviews the electric utility industry's long-range planning for bulk power supply reliability and adequacy as required by the Regional Reliability Councils and investigates instances of unreliable operation. Primary electric power consumption, costs, requirements, and supply capabilities, and the relationship of electric energy to over-all national energy use, are analyzed and projected. The Commission also regulates some securities, mergers, consolidations, and acquisitions of electric utilities, as well as their Accounting.

The FPC publishes river basin appraisals for use in licensing projects. It also reviews plans for dams proposed by other federal agencies, and makes recommendations concerning facilities for the development of hydroelectric power. The Commission reviews rates for the sale of electric power from certain federal hydroelectric projects. In addition, it participates with other agencies in coordinating development and utilization of the Nation's water and related land resources. In 1971, the Commission initiated a Regulatory Information System to assist it in organizing and analyzing the massive amount of data which it receives and generates. RIS will be fully electronic and will serve all levels of management. It is partially implemented and is expected to be fully operational by 1976. The System will make records promptly available to the public and will permit the Office of Public Information to respond expeditiously to specific inquiries from individuals, state regulatory commissions, and other government agencies.

5.2.2 Pipeline Responsibilities

The FPC issues certificates of public convenience and necessity for the transportation and sale of natural gas in interstate commerce and for the importation and exportation of gas. It deals with broad

aspects of the public interest, including prevention of undue discrimination, protection of the environment, adequacy of supplies and safety of facilities, proper financing, and rate form and level. The Commission also allocates available supplies of interstate natural gas, on the basis of end use, during periods of shortage to assure the best use of available supplies. It has established a set of priorities of service, based on how the gas is ultimately used, for pipelines to follow when it is necessary to curtail deliveries of gas to their wholesale or industrial customers. When these matters are contested, or the public interest otherwise so requires, it holds public hearings so that issues can be resolved in the overall public interest.

The FPC reviews proposed changes in rates by interstate pipelines and independent producers, and initiates rate investigations on its own motion or on the filing of a complaint. It determines just and reasonable rates for interstate sales by independent producers and has established just and reasonable rates for various producing areas of the country. In June 1974, it instituted a nationwide rate for gas from wells commenced after January 1, 1973, and new dedications after that date. The Commission also provided for biennial reviews which will be concerned with the most recent cost of finding and producing new gas dedicated to interstate commerce. A nationwide rate for gas flowing from wells commenced before January 1, 1973, and sold in interstate commerce is currently under consideration in a rule-making proceeding. Until a nationwide flowing gas rate becomes effective, sales are governed by the previously established area rates.

The FPC collects data and prepares reports on national gas supply and demand, supplemental supplies of gas such as liquefied natural gas and synthetic gas, research and development expenditures. It also conducts special studies of gas reserves, including auditing of reserves reported to be shut in or uncommitted.

In FY'71 the Commission initiated a National Gas Survey to compile extensive information on the natural gas industry. Four volumes of the Survey report have been published, with the remaining volume, the Commission's own report, issued in preliminary chapter form. The data gathered by the Survey is used in the Commission's regulatory decisionmaking, as well as in the formulation of future natural gas policy.

The FPC regulates only wholesale rates, not those to the retail, or ultimate, consumer. Retail rates are controlled by the state public service commissions. Obviously, by controlling the wholesale cost, the FPC exerts strong influence upon what the ultimate rate must be. Thus, different pipelines may charge different prices for gas which originates from a single area and is consumed in single areas.

Gases other than natural gas, e.g., SNG from coal, liquid hydrocarbons, biomethane, etc., are not under FPC jurisdiction unless they are mixed with natural gas.

The FPC has jurisdiction over the wellhead sale of the natural gas to the pipeline utility (recall that natural gas pipelines are utilities, as opposed to common carriers.) It is the wellhead price that is prescribed by the Commission. To that may be added the cost of transportation plus a reasonable return on investment (ROI), which is also prescribed by the Commission. The price to the local or distributing utility is the sum of these two.

The jurisdiction of the FPC overlaps that of the Federal Energy Administration (FEA) in the collection of statistics and other information. The two agencies have cooperated, with the FEA collecting some information and transmitting it to the FPC. No other overlaps were identified in the course of this study, although of course several agencies may simultaneously influence a project.

On December 18, 1972, the FPC issued the statement of General Policy to Implement Procedures for Compliance with the National Environmental Policy Act of 1969. This act requires, among other things, all federal agencies to include a detailed environmental statement in every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment. The FPC in its policy statement requires an environmental impact statement be submitted with all applications for the construction of pipeline facilities and producer applications for the sale of gas.

If the proposed project is determined to be a major federal action significantly affecting the quality of the human environment, the Commission staff conducts a detailed independent analysis of the action and prepares its own environmental impact statement. These statements are made available to the Council of Environmental Quality (CEQ), the Environmental Protection Agency (EPA), other appropriate governmental bodies, and to the public for comment.

5.3 Department of Transportation (DoT)

The DoT headquarters are at 400 Seventh St. S.W., Washington, D.C. 20590, telephone 202-426-4000. The organization chart is shown in Fig. 5.3-1.

5.3.1 General Responsibilities

The Department of Transportation (DoT) was established by the act of October 15, 1966 (80 Stat. 931; 49 U.S.C. 1651 note) "to assure the coordinated, effective administration of the transportation programs of the Federal Government" and to develop "national transportation policies and programs conducive to the provision of fast, safe, efficient, and convenient transportation at the lowest cost consistent therewith." It became operational in April 1967 and is comprised of elements transferred from eight other major departments and agencies. It presently consists of the Office of the Secretary, and seven operating administrations , whose heads report directly to the Secretary and who have highly decentralized authority (Fig. 5.3-1). This official organization chart does not go to sufficient level of detail to display all the organizational units, e.g., the Office of Pipeline Safety, which will be discussed below.

The central management concept of the department is that operating programs are carried out by the operating administrations, which are organized generally by mode (e.g., air, rail, etc.). The Secretary and Deputy Secretary are responsible for the overall planning, direction, and control of all departmental activities and the Office of the Secretary focuses its attention largely on policy formulation, resource allocation, interagency and intradepartment coordination, evaluation of programs and on matters of an intermodal nature which require integration and balancing of modal interests. The Assistant Secretaries and the General Counsel are essentially staff officers, each of whom has one or more functional areas in which he assists the Secretary in matters of department-wide scope. These officials do not exercise line control over the operating administrations.

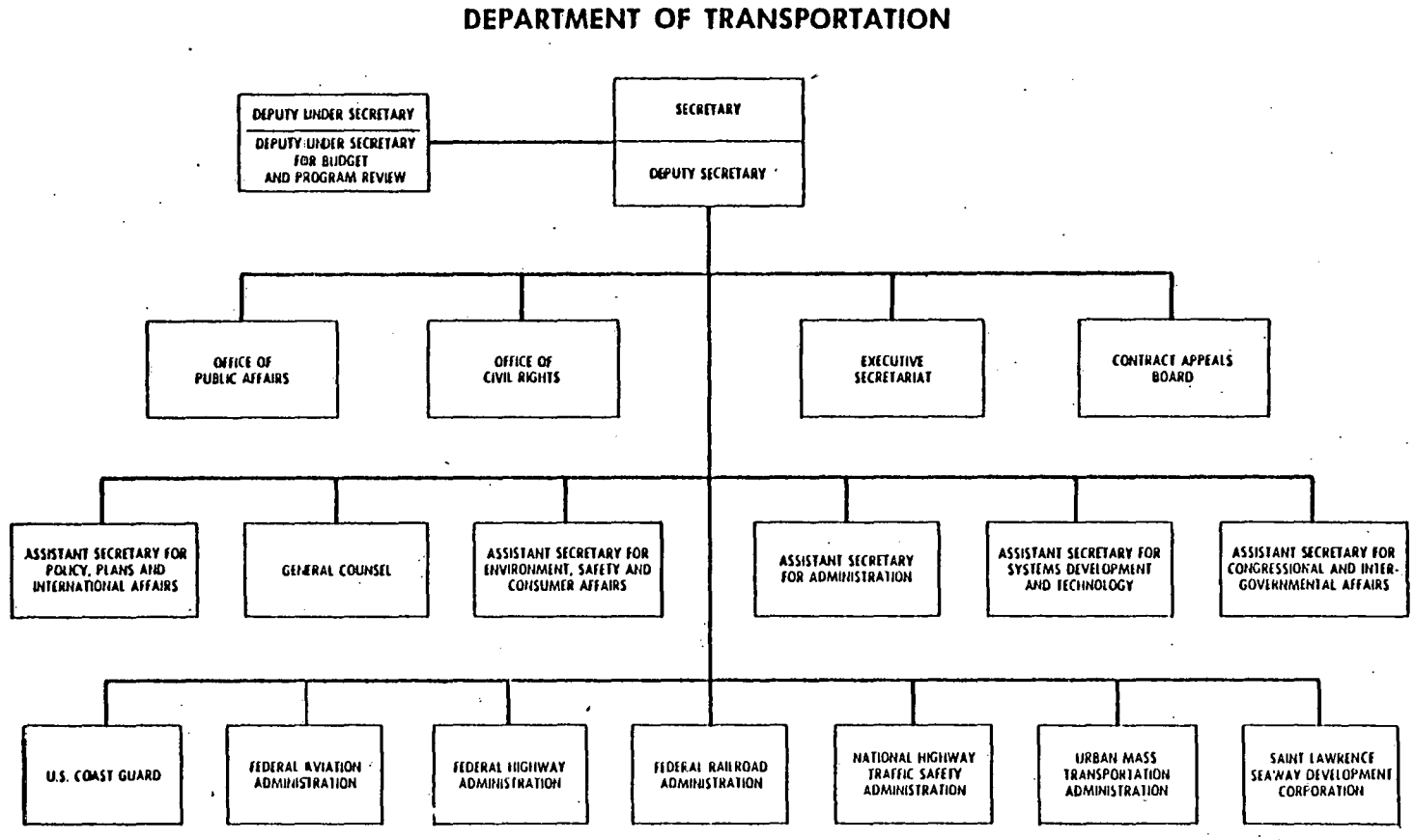
DEPARTMENT OF TRANSPORTATION
SECRETARY
DEPUTY SECRETARY
DEPUTY UNDER SECRETARY
DEPUTY UNDER SECRETARY FOR BUDGET AND PROGRAM REVIEW
OFFICE OF PUBLIC AFFAIRS
OFFICE OF CIVIL RIGHTS
EXECUTIVE SECRETARIAT
CONTRACT APPEALS BOARD
ASSISTANT SECRETARY FOR POLICY, PLANS AND INTERNATIONAL AFFAIRS
GENERAL COUNSEL
ASSISTANT SECRETARY FOR ENVIRONMENT, SAFETY AND CONSUMER AFFAIRS
ASSISTANT SECRETARY FOR ADMINISTRATION
ASSISTANT SECRETARY FOR SYSTEMS DEVELOPMENT AND TECHNOLOGY
ASSISTANT SECRETARY FOR CONGRESSIONAL AND INTER-GOVERNMENTAL AFFAIRS
U.S. COAST GUARD
FEDERAL AVIATION ADMINISTRATION
FEDERAL HIGHWAY ADMINISTRATION
FEDERAL RAILROAD ADMINISTRATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
URBAN MASS TRANSPORTATION ADMINISTRATION
SAINT LAWRENCE SEAWAY DEVELOPMENT CORPORATION

Fig. 5.3-1

Effective management of the department is dependent for its efficient operation on a high degree of teamwork between the Assistant Secretaries and the Administrators. Although operating generally within the standard regional boundaries, the field organizations of the various operating administrations differ widely in character primarily because of the nature of their work. Some essentially provide funds to state and/or local governments for transportation undertakings such as road building, airport development, etc., while others provide a vital, nationwide, public service such as air traffic control. The department relies on Secretarial Representatives and other committee-type mechanisms of intra-departmental cooperation.

5.3.2 Pipeline Responsibilities

DoT jurisdiction over interstate natural gas pipeline safety was established by the enactment of the Natural Gas Pipeline Safety Act of 1968. This Act required the Secretary of Transportation to adopt within three months, in each state, the State safety standards for gas pipelines as interim regulations and to establish within 24 months, minimum federal safety standards. The interim standards adopted were essentially the ANSI B31.8: Gas Transmission and Distribution Piping Systems sponsored by the American Society of Mechanical Engineers. These standards were already the minimum safety standards being used in the natural gas pipeline industry and therefore did not reflect any immediate major change in the industry.

The Office of Pipeline Safety Operations (OPSO) was established by DoT and given the function of developing comprehensive federal pipeline safety standards for interstate natural gas pipelines. The OPSO is in the Material Transportation Bureau, which on July 1975 was established as a line element reporting to the Secretary. (The Bureau is not shown in Fig. 5.3-1, which is taken from the 1976 Government Manual.) These standards were developed by OPSO using the B31.8 as a guideline and also by seeking

the advice and comments from the pipeline industry and others. Adoption of the standards developed came in 1970 and established minimum federal safety standards for design, construction, operation and maintenance for transportation of gas and pipeline facilities (see DoT, Part 192, Title 49, Code of Federal Regulations).

Minimum federal standards for liquid (oil) pipelines were developed similar to those for natural gas pipelines. These standards were developed by OPSO using the ANSI B31.4 - Liquid Petroleum Transportation Piping Systems sponsored by the American Society of Mechanical Engineers. These standards also were already in use by the petroleum liquids pipeline industry and therefore did not reflect any immediate significant change to the industry. Adoption of federal standards came in 1972 with the enactment of Part 195, Title 49, Code of Federal Regulations - Minimum Federal Safety Standards for Liquid Pipelines. Part 195 prescribes rules governing transportation of liquid petroleum and petroleum products and does not, among other things, apply to water or natural gas and other gases.

The present jurisdiction of the Office of Pipeline Safety Operations (OPSO), therefore, is the enforcement and monitoring of minimum federal safety standards for interstate natural gas and other gases, and petroleum and petroleum products pipelines. The OPSO has every state except New Jersey acting as its agent in enforcement of DoT regulations over the applicable interstate pipelines. These states have adopted the DoT regulations Part 192 and Part 195 as their minimum safety standards.

The scope of the DoT regulations, by covering minimum acceptable standards in design, construction, operations and maintenance, places the OPSO in the position of having the most encompassing regulatory control over the pipeline industry. The federal regulations themselves have incorporated by reference standards, codes and specifications from the American Petroleum Institute, the American Society for Testing and

Materials, the American National Standards Institute, the American Society of Mechanical Engineers, Manufacturer's Standardization Society of the Valve and Fitting Industry, National Fire Protection Assn., and others. These references were being used by the industry prior to the enactment of the federal regulations, but the status of use has been changed from a "should" to a "shall" basis.

In addition to the above scope of regulatory coverage, the OPSO is responsible for implementing the National Environmental Policy to assure that applicable department programs will protect and enhance the nation's environment.

In another area, offshore pipeline construction, and onshore construction adjacent to navigable waters, would be under the jurisdiction of the Coast Guard , which has responsibilities in the prevention, detection, and control of pollution in and adjacent to the navigable waters of the United States. Offshore pipelines, and onshore pipelines adjacent to navigable waters, are under the jurisdiction of the Coast Guard as their design, construction, operation, and maintenance applies to the prevention, detection, and control of pollution. This jurisdiction overlaps those of the EPA and of the DoT. However, this overlap is not of significance to the purposes of this study.

5.4 Federal Energy Administration (FEA)

The FEA headquarters are at Twelfth Street and Pennsylvania Avenue N.W., Washington, D.C. 20461, telephone 202-961-6216. The organization chart is presented in Fig. 5.4-1.

5.4.1 General Responsibilities

The FEA was established by the Federal Energy Administration Act of 1974 (88 Stat. 96), effective June 28, 1974. The Federal Energy Office, which was established by Executive Order 11748 of December 4, 1973, was abolished and its functions transferred to the FEA by Executive Order 11790 of June 25, 1974.

The purpose of the FEA is to ensure that the supply of energy available to the United States will continue to be sufficient to meet the total energy demand. The FEA also attempts to assure that in the case of energy shortages, priority needs for energy are met and that the burden of shortages is borne with equity.

The Office of Regulatory Programs is responsible for the design, implementation, and operational effectiveness of the national energy programs designed to assure the lawful and equitable distribution of crude oil, petroleum products, and other energy resources, and to preserve the competitive viability of the independent sectors of the petroleum industry. The Office formulates, executes, and enforces national level policy for all energy-related regulatory programs, and participates in the formulation of national pricing and conservation policies and ensures their effective implementation and execution. The Office exercises operational direction over FEA regional offices with respect to regulatory program functions. The Office also verifies compliance with FEA regulations and takes appropriate remedial action in cases of noncompliance.

The Office of Energy Resource Development develops and implements national policies and programs to increase production and utiliza-

FEDERAL ENERGY ADMINISTRATION

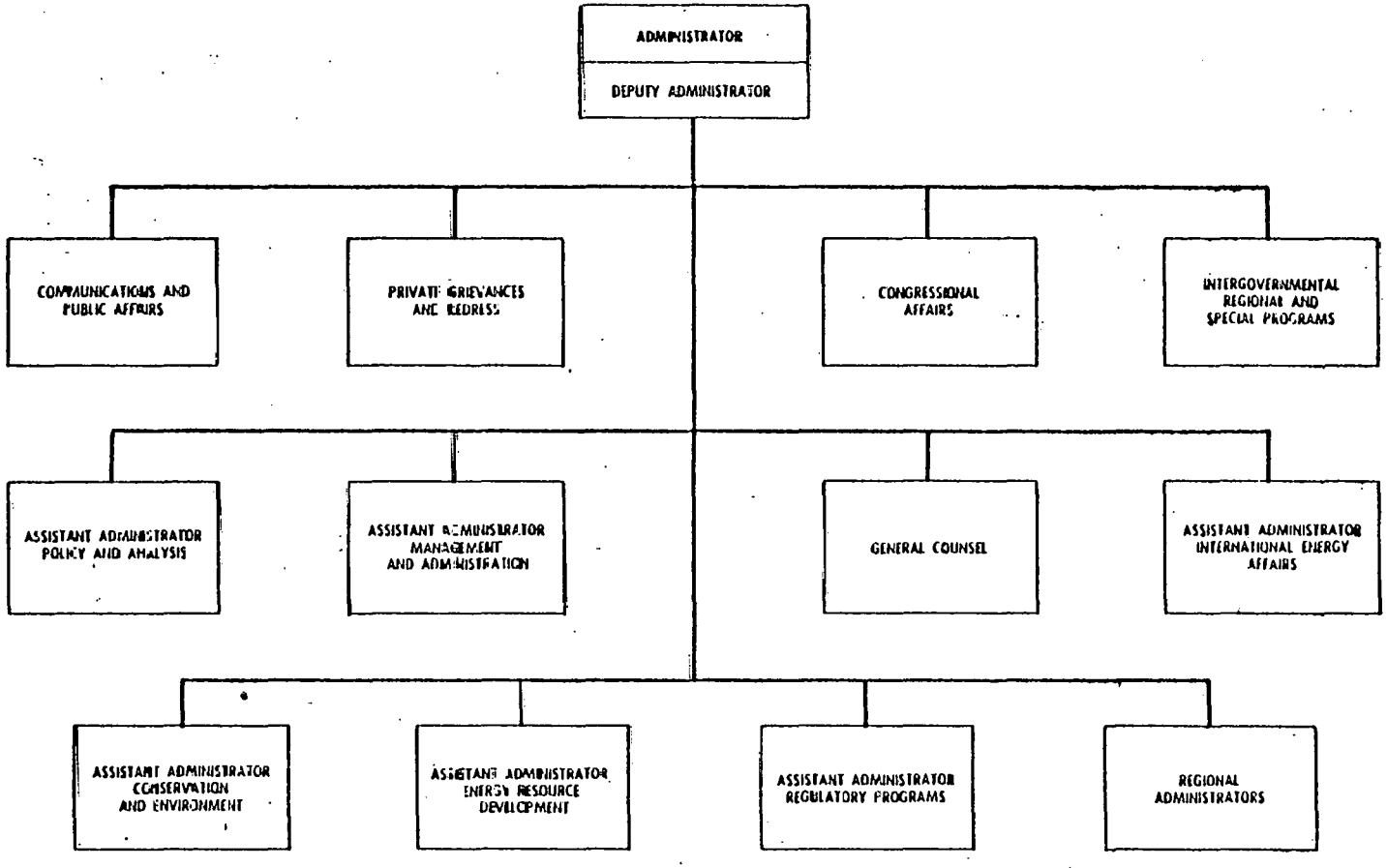

Fig. 5.4-1

tion of energy from domestic sources, including coal, petroleum, natural gas, nuclear fuels, and other energy sources. This Office also develops and implements policies and programs for facilitating the siting, licensing, and construction of domestic energy facilities, utilizing environmentally sound practices.

5.4.2 Pipeline Responsibilities

The FEA does not have any direct jurisdictional authority over pipeline operations. However, a new pipeline is not built nor is an old one converted without FEA approval. For example, at this writing, FEA has under consideration the conversion of the Sohio-El Paso gas line to movement of Prudhoe Bay crude from Valdez to the lower Forty-eight.

The FEA has been a controversial administration since its establishment, having grown in less than two years to a staff of over 3500. In the Editor's page of the April 1976 Pipeline Industry, Texas Congressman Bill Archer, Chairman of the House Republican Study Committee's Task Force on Regulatory Reform, was quoted as follows:

> "The paperwork burden (of regulatory overkill) alone has driven many independent energy-related companies out of business and has needlessly forced up the costs that consumers pay for vital fuels."

The Editor's Page went on to say, "In support of his statement, Archer cited figures showing that the Federal Energy Administration alone has added bureaucratic cost of some $10 billion a year to consumer outlays for petroleum products."

This study is not directly concerned with the validity of this particular criticism, but the general point raised is of interest because the rigidity of the regulatory system may well prove to be a strong deterrent to the introduction of energy-conservative innovations into the pipeline industry. It may be observed that the criticism just quoted, directed by a

Congressman against an agency controlled by an administration of his own party, would not appear to have been politically motivated.

5.5 Environmental Protection Agency (EPA)

The EPA headquarters are at 401 M Street S.W., Washington, D.C. 20460, telephone 202-755-2673. The organization chart is shown in Fig. 5-5.1.

5.5.1 General Responsibilities

The EPA was established in the executive branch as an independent agency pursuant to Reorganization Plan No. 3 of 1970, effective December 2, 1970. The Agency was created to permit coordinated and effective governmental action on behalf of the environment. EPA endeavors to abate and control pollution systematically by proper integration of a variety of research, monitoring, standard setting, and enforcement activities. As a complement to its other activities, EPA coordinates and supports research and antipollution activities by State and local governments, private and public groups, individuals, and educational institutions. EPA also reinforces efforts among other federal agencies with respect to the impact of their operations on the environment, and it is specifically charged with making public its written comments on environmental impact statements and with publishing its determinations when those hold that a proposal is unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA is designed to serve as the public's advocate for a livable environment.

The Office of the Assistant Administrator for Enforcement provides policy direction to enforcement activities in air, water, pesticides, solid waste management, radiation, and noise control programs, plans and coordinates enforcement conferences, public hearings, and other legal proceedings, and engages in other activities related to enforcement of standards to protect the Nation's environment.

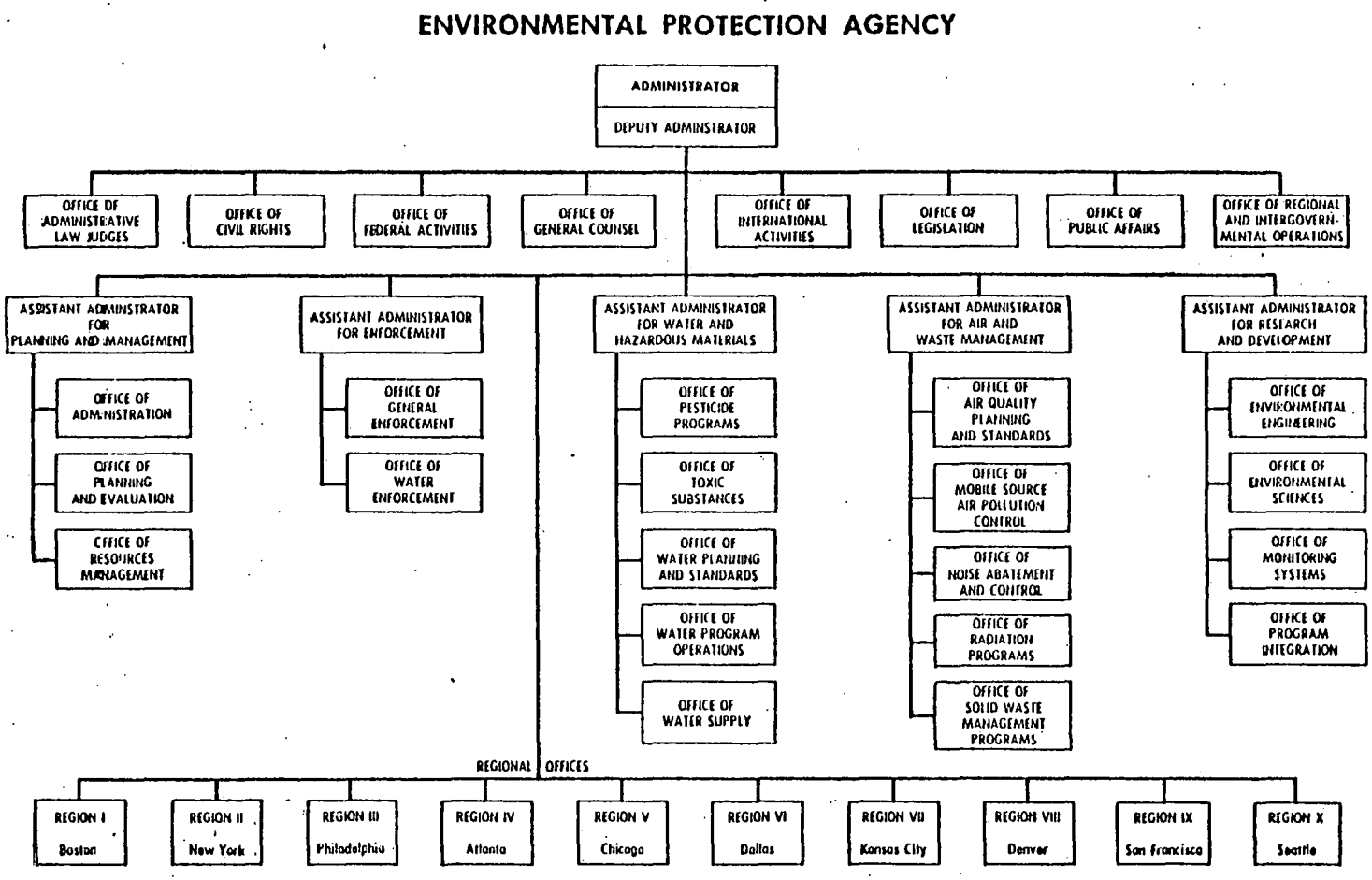
ENVIRONMENTAL PROTECTION AGENCY
ADMINISTRATOR
DEPUTY ADMINISTRATOR
OFFICE OF ADMINISTRATIVE LAW JUDGES
OFFICE OF CIVIL RIGHTS
OFFICE OF FEDERAL ACTIVITIES
OFFICE OF GENERAL COUNSEL
OFFICE OF INTERNATIONAL ACTIVITIES
OFFICE OF LEGISLATION
OFFICE OF PUBLIC AFFAIRS
OFFICE OF REGIONAL AND INTERGOVERNMENTAL OPERATIONS
ASSISTANT ADMINISTRATOR FOR PLANNING AND MANAGEMENT
OFFICE OF ADMINISTRATION
OFFICE OF PLANNING AND EVALUATION
OFFICE OF RESOURCES MANAGEMENT
ASSISTANT ADMINISTRATOR FOR ENFORCEMENT
OFFICE OF GENERAL ENFORCEMENT
OFFICE OF WATER ENFORCEMENT
ASSISTANT ADMINISTRATOR FOR WATER AND HAZARDOUS MATERIALS
OFFICE OF PESTICIDE PROGRAMS
OFFICE OF TOXIC SUBSTANCES
OFFICE OF WATER PLANNING AND STANDARDS
OFFICE OF WATER PROGRAM OPERATIONS
OFFICE OF WATER SUPPLY
ASSISTANT ADMINISTRATOR FOR AIR AND WASTE MANAGEMENT
OFFICE OF AIR QUALITY PLANNING AND STANDARDS
OFFICE OF MOBILE SOURCE AIR POLLUTION CONTROL
OFFICE OF NOISE ABATEMENT AND CONTROL
OFFICE OF RADIATION PROGRAMS
OFFICE OF SOLID WASTE MANAGEMENT PROGRAMS
ASSISTANT ADMINISTRATOR FOR RESEARCH AND DEVELOPMENT
OFFICE OF ENVIRONMENTAL ENGINEERING
OFFICE OF ENVIRONMENTAL SCIENCES
OFFICE OF MONITORING SYSTEMS
OFFICE OF PROGRAM INTEGRATION
REGIONAL OFFICES
REGION I Boston
REGION II New York
REGION III Philadelphia
REGION IV Atlanta
REGION V Chicago
REGION VI Dallas
REGION VII Kansas City
REGION VIII Denver
REGION IX San Francisco
REGION X Seattle

Fig. 5.5-1

5.5.2 Pipeline Responsibilities

EPA is not directly responsible for pipelines. Many pipelines are being built without comment or other influence from EPA. The EPA emission standards apply to both internal combustion and external combustion (turbine) engine drivers, wherever such are used. Since engine drivers are not often used in liquid pipelines, most of which have electric drivers, the EPA involvement, when it does occur, is usually with gas pipelines. For oil pipelines, the EPA is not involved unless there is a particular question raised by the impact statement, e.g., consequences of an underwater break. EPA involvement with the Alaska pipeline followed from its review of the Department of the Interior (DoI) impact statement. The EPA authority for approval of impact statements derives from

(1) the National Environmental Policy Act,

(2) the Clean Air Act, and

(3) the Federal Water Pollution Control Act.

EPA has no other involvement with pipelines than review of other agencies' impact statements.

5.6 Department of the Interior (DoI)

The DoI headquarters are on C Street, between Eighteenth and Nineteenth Streets N.W., Washington, D.C. 20240, telephone 202-343-1100. The organization chart is shown in Fig. 5.6-1. The divisions of the DoI which are of interest in this study are the Geological Survey, located in the National Center, 12201 Sunrise Valley Drive, Reston, VA 22092, the Bureau of Land Management (BLM), and the Ocean Mining Administration.

5.6.1 General Responsibilities

The DoI was created by act of March 3, 1849 (9 Stat. 395; 43 U.S.C. 1451), which transferred to it the General Land Office, the Office of Indian Affairs, the Pension Office, and the Patent Office. The Department also had responsibility for supervision of the Commissioner of Public Buildings, the Board of Inspectors, and the Warden of the Penitentiary of the District of Columbia, the census of the United States, and the accounts of marshals and other officers of the United States courts, and of lead and other mines in the United States. Over the 126 years of its existence, other functions have been added and removed, so that its role has changed from that of general housekeeper of the Federal Government to that of custodian of the Nation's natural resources.

The jurisdiction of the Department includes the administration of over 500 million acres of Federal land, and trust responsibilities for approximately 50 million acres of land, mostly Indian reservations; the conservation and development of mineral and water resources; the promotion of mine safety and efficiency; the conservation, development, and utilization of fish and wildlife resources; the coordination of Federal and State recreation programs; the preservation and administration of the Nation's scenic and historic areas; the operation of Job Corps Con-

DEPARTMENT OF THE INTERIOR

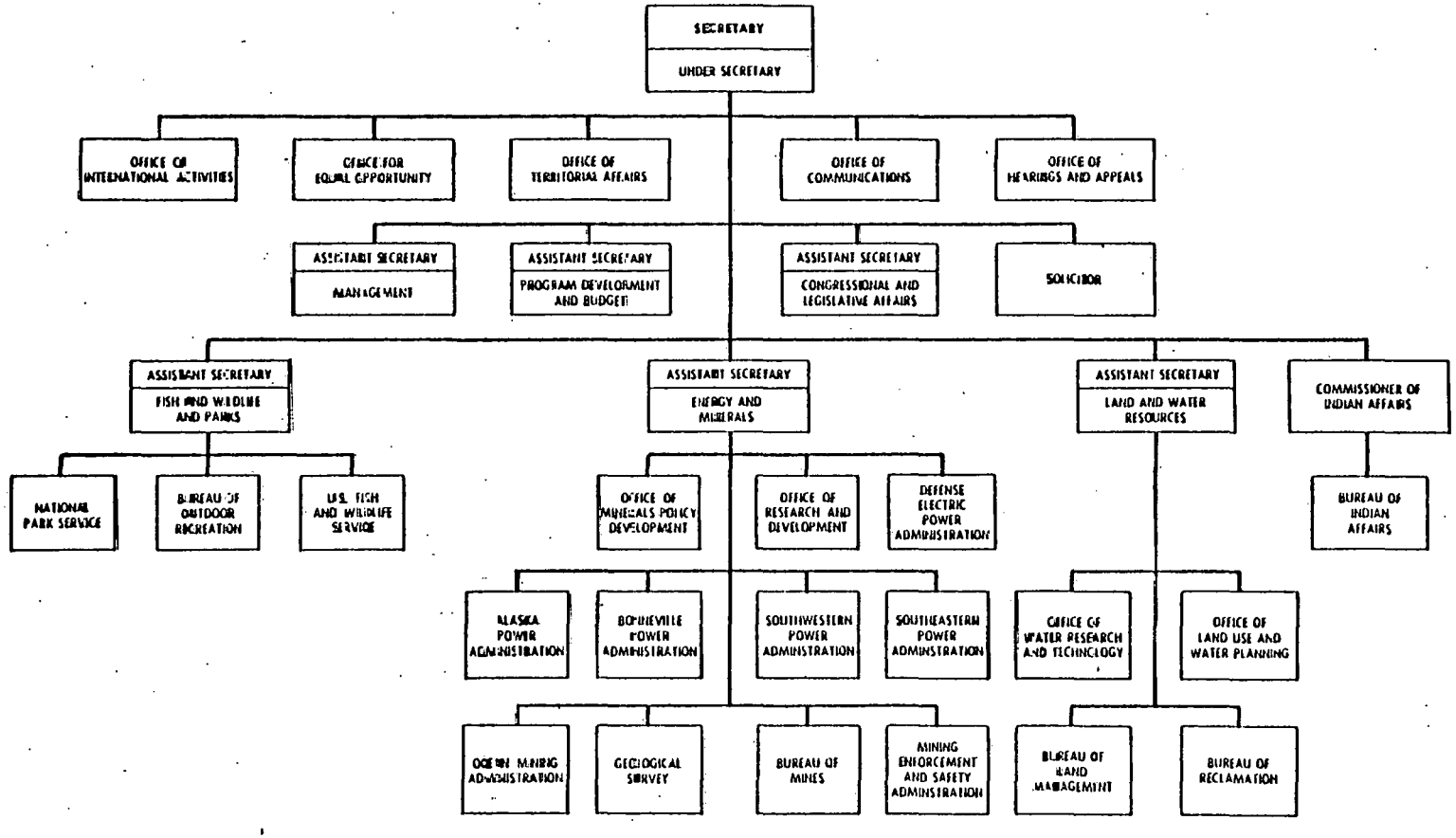

Fig. 5.6-1

servation Corps Camps, and coordination of other manpower and youth training programs; the reclamation of arid lands in the West through irrigation; and the management of hydroelectric power systems. The Department is also concerned with the social and economic development of the territories of the United States and in the Trust Territory of the Pacific Islands; and administers programs providing services to Indians and Alaska Native people.

The Geological Survey was established by the act of March 3, 1879 (20 Stat. 394; 43 U.S.C. 31), which provided for "the classification of the public lands and the examination of the geological structure, mineral resources, and products of the national domain." The act of September 5, 1962 (76 Stat. 427; 43 U.S.C. 31(b)), expanded this authorization to include such examinations outside the national domain. Topographic mapping and chemical and physical research were recognized as an essential part of the investigations and studies authorized by the Organic Act, and specific provision was made for them by Congress in the act of October 2, 1888 (25 Stat. 505, 526).

The broad objectives of the Geological Survey are to perform surveys, investigations, and research covering topography, geology, and the mineral and water resources of the United States; classify land as to mineral character and water and power resources; enforce departmental regulations applicable to oil, gas, and other mining leases, permits, licenses, development contracts, and gas storage contracts; and publish and disseminate data relative to the foregoing activities.

The Bureau of Land Management was established July 16, 1946, by the consolidation of the General Land Office (created in 1812) and the Grazing Service (formed in 1934). This was done in accordance with the provisions of sections 402 and 403 of the President's Reorgan-

ization Plan 3 of 1946 (5 U.S.C. 133y-16). The Bureau manages the national resource lands and their resources. It also administers the mineral resources connected with acquired lands and the submerged lands of the Outer Continental Shelf (OCS). The Bureau organization consists basically of a headquarters in Washington, D.C., one detached office having Bureau-wide support responsibilities, and a field organization of State, District, and Outer Continental Shelf offices.

The Bureau is responsible for the total management of 450 million acres of national resource lands located primarily in the Far West and Alaska. However, scattered parcels are located in other States. In addition to minerals management responsibilities on the national resource lands and the Outer Continental Shelf, the Bureau is also responsible for subsurface resource management of an additional 310 million acres where mineral rights have been reserved to the Federal Government.

Resources managed and leased by the Bureau include timber, minerals, geothermal energy, wildlife habitat, livestock forage, recreation and cultural values, and open space. Bureau programs provide for the protection, orderly development, and use of the national resource lands and resources under principles of multiple use and sustained yield, while maintaining and enhancing the quality of the environment. The Bureau also manages watersheds to protect soil and enhance water quality; develops recreational opportunities on national resource lands; and makes land available through sale to individuals, organizations, local governments, and other Federal agencies when such transfer is in the public interest. Lands for certain purposes may be leased to State and local government agencies and to nonprofit organizations. The Bureau is responsible for the survey of Federal lands and maintains public land records.

The Ocean Mining Administration (OMA), under the supervision of the Assistant Secretary-Energy and Minerals, was established by

Secretary's Order 2971 of February 26, 1975. It is responsible for policy formulation on the development of ocean mineral resources, the implementation of a domestic ocean mining development program with special emphasis on its relationship to on-going and future international negotiations on the law of the sea and ocean mining, supervision of ocean minerals technology and resource assessments, supervision of ocean mineral resources environmental studies, liaison with other Federal agencies concerned with ocean mineral resources development and regulatory aspects of ocean mining. To the extent that the functions of the Ocean Mining Administration involve the leasing of lands for the recovery of minerals, it makes use of the expertise and facilities of the Assistant Secretary - Land and Water Resources, and ensures effective consultation and coordination with the Bureau of Land Management.

It is anticipated that this organization and its functions will be transferred intact to the United States Geological Survey upon conclusion of international negotiations on ocean mining and enactment of appropriate legislation and regulations, not later than June 30, 1977.

5.6.2 Pipeline Responsibilities

The only direct responsibility of the DoI for pipeline regulation is exercised by the Geological Survey in the leased regions of the Outer Continental Shelf (OCS), i.e., three miles out from the coastline. Royalties are computed at the first destination point, not at the platform. Therefore, government ownership is maintained to the central processing or measuring area onshore.

The BLM issues all Right of Way (RoW) permits across federal lands, whether on- or off-shore. There is, of course, no right of eminent domain across federal land. The Fish and Wildlife Service may intervene in cases which involve potential violations of the Endangered Species Act, the National Environmental Policy Act, and the Historical

Preservation Act; the Service has proposed the issuance of rules and regulations containing special requirements for pipelines on or over lands designated as National Wildlife Refuges (Federal Register, Vol. 41, No. 54, March 18, 1976) to amend 50CFR29. Off-shore RoW permits could also involve the OMA, so that it is possible for several units of the DoI to become involved in pipeline routing. No direct relationship with the principal subjects of this study is apparent.

5.7 Department of Labor (DoL)

The Department of Labor headquarters are at Third Street and Constitution Avenue, Washington, D.C. 20210, telephone 202-393-2420. The organization chart is shown in Fig. 5.7-1.

5.7.1 General Responsibilities

The DoL ninth executive department, was created by act approved March 4, 1913 (37 Stat. 736; 5 U.S.C. 611). A Bureau of Labor was first created by Congress in 1884 under the Interior Department. The Bureau of Labor later became independent as a Department of Labor without executive rank. It again returned to bureau status in the Department of Commerce and Labor, which was created by act of February 14, 1903 (32 Stat. 827; 5 U.S.C. 591).

The DoL is charged, among other things, with administering and enforcing statutes designed to advance the public interest by promoting the welfare of the wage earners of the United States, improving their working conditions, and advancing their opportunities for profitable employment. The Assistant Secretary for Occupational Safety and Health has responsibility for occupational safety and health activities. The Occupational Safety and Health Administration (OSHA), established pursuant to the Occupational Safety and Health Act of 1970 (84 Stat. 1590), develops and promulgates occupational safety and health standards; develops and issues regulations; conducts investigations and inspections to determine the status of compliance with safety and health-standards and regulations; and issues citations and proposes penalties for noncompliance with safety and health standards and regulations.

5.7.2 Pipeline Responsibilities

The OSHA is concerned for the health and safety of people working within the pipeline industry. As discussed in Section 6.x.y below, this may constitute an overlap with the OPSO of DoT and

DEPARTMENT OF LABOR

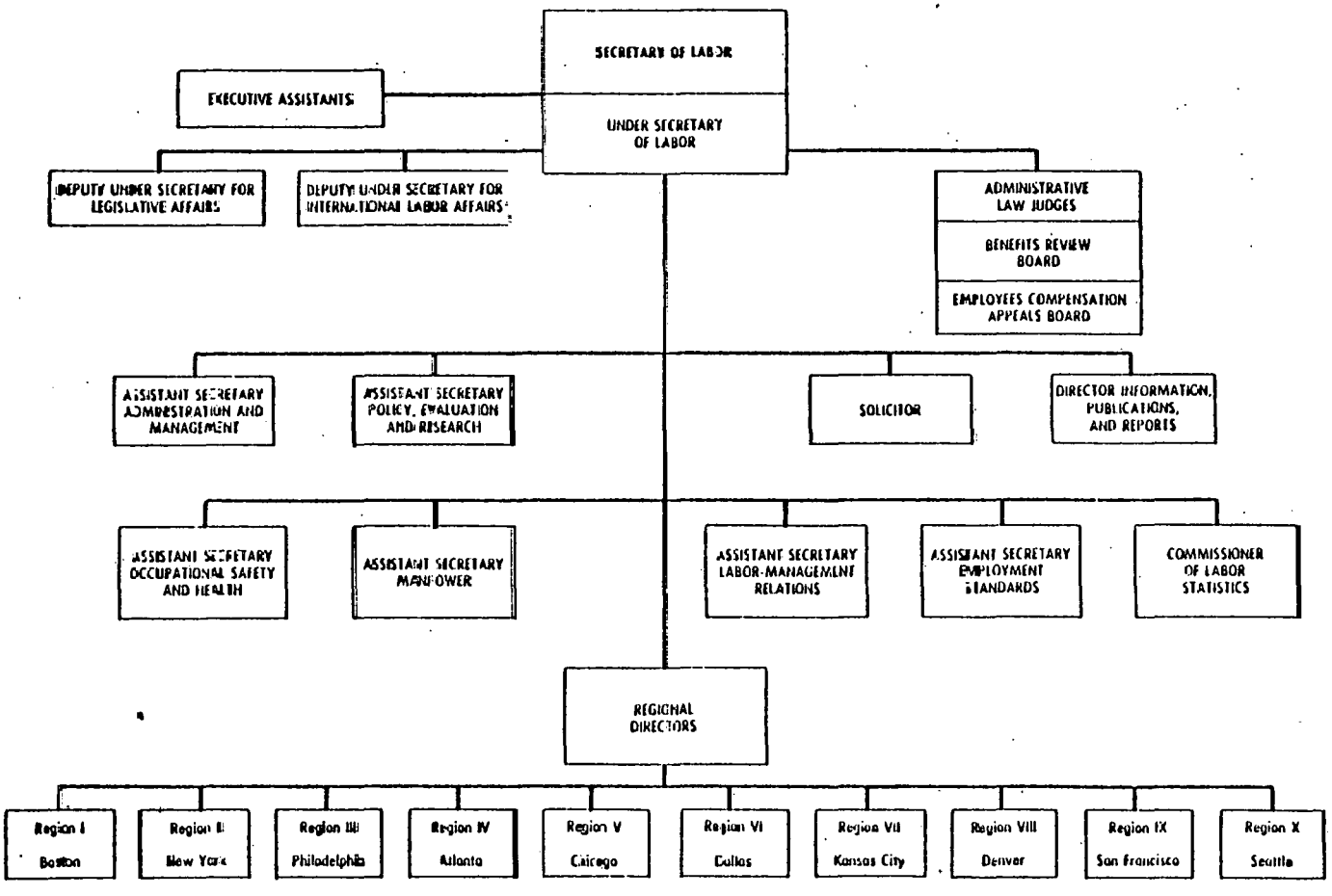

Fig. 5.7-1

a clarifying agreement will be needed. No direct relationship with the principal subjects of this study is apparent.

6.0 JURISDICTIONAL INCOMPATIBILITIES

This section identifies the jurisdictional incompatibilities, i.e., ambiguities, gaps, and overlaps which became apparent in the course of this study, of which there are a fair number. However, as will be seen in 7.0 below, there are very few which are important to the purposes of this study, i.e., which strongly inhibit the introduction of technological innovations into the industry. Accordingly, this section does not expend in any elaborate way upon the incompatibilities which have been identified. Moreover, as is discussed in Section 6.2 below, there appear to be very few serious overlaps, in the hard sense which is defined in that section.

The reader is cautioned that the identification of incompatibilities presented below is intended to be neither normative nor invidious, a point which is further discussed in Section 6.2.

6.1 Examples of Jurisdictional Incompatibilities

6.1.1 Federal Energy Administration (FEA)

The stated purpose of the FEA is to ensure that the supply of energy available will continue to be sufficient to meet the national total energy demand. A secondary purpose is to assure that in the case of energy shortages, priority needs for energy are met and that the burden of shortages is distributed equitably. FEA goals overlap seven functions and activities of the FPC in the areas listed below:

(1) conservation and efficient utilization of resources,

(2) allocation of resources consistent with the public interest,

(3) importation and exportation of natural gas,

(4) adequacy of suppliers,

(5) collection of data and preparation and publishing of reports on natural gas supply and demand, supplemental supplies of gas such as LNG and synthetic gas, and research and development expenditures,

(6) conduct of special studies of gas reserves, and

(7) allocation of available supplies of interstate natural gas on the basis of end use, during periods of shortages.

For example, the FEA Office of International Affairs evaluates the adequacy of the energy resources in physical terms, the stability of contractual arrangements for their acquisition, the firms acquiring such resources for the United States, and the collateral logistics and refining systems. These functions directly overlap the jurisdictional area of the FPC, which issues Certificates of Public Convenience and Necessity for the importation of natural gas. The particular industry member involved evaluates the adequacy of the energy resource, stability of contractual arrangements, and the collateral logistics and refining systems prior to its commitment of the funds required.

FEA overlap with the ICC is not quite as extensive since the ICC primarily is responsible to prevent unlawful discrimination and to assure that rates are fair and service is reasonable.

The FEA Office of Policy and Analysis is responsible for the formulation and coordination of allocation and price policies. This function overlaps the jurisdiction of both the ICC and FPC. In addition, this office is involved in impact analysis, analyzing long-term energy supply and demand by geographic region, and producing short-term energy forecast.

The FEA Office of Regulatory Programs formulates, executes, and enforces national level policy for all energy-related programs, and participates in the formation of national pricing and conservation policies and ensures their implementation and execution. The office also is responsible for the design, implementation and operational effectiveness of the national energy programs designed to assure the lawful and equitable distribution of crude oil, petroleum products, and other energy resources, and to preserve the competitive viability of the independent sections of the petroleum industry. These functions appear to overlap the jurisdiction of both the ICC and the FCC.

6.1.2 Environmental Protection Agency (EPA)

The EPA was created to permit coordinated and effective action on behalf of the environment by serving as the "public advocate for a livable environment." As previously noted, the National Environmental Policy Act of 1969 gave all federal agencies the responsibility for implementation of this Act within each agency's jurisdictional authority.

The EPA, along with the ICC, FPC, and DoT, is charged with making public its written comments on environmental impact statements, which is also the responsibility of ICC, FPC, and DoT. EPA endeavors to abate and control pollution by "proper integration of a variety of research, monitoring, standard setting, and enforcement activities, e.g., air pollution control, emission standards, noise abatement, and water pollution control. These activities have resulted in regulatory requirements associated with design, construction, operation, and maintenance of pipeline systems, thus directly overlapping the jurisdiction of DoT.

6.1.3 Department of the Interior (DoI)

The fundamental role of the DoI is Custodian of the nation's natural resources. It has been seen in Section 5.6 above that DoI comprises many offices and bureaus, some of which now, and others may in the future, have regulatory control over certain types of pipeline transportation systems. The DoI is primarily concerned with conservation and development of mineral, fish, wildlife, and water resources, and the preservation and administration of the nation's scenic and historic areas. Additional concerns are the environment, regulation of oil and gas and other mining leases, both onshore and offshore, and conservation supervision of private industry activities in connection with oil, shale, mining, and oil and gas leases on federal regulated lands, including the Outer Continental Shelf.

Proposed legislation by the Fish and Wildlife Service within the DoI is presently being submitted which would overlap jurisdictional areas of the DoT and the EPA. Overlap already exists among its offices and other federal agencies such as the EPA and the FEA. In addition, when pipelines cross federal regulated lands or locations offshore, overlap exists with the DoI, the ICC, and the DoT.

Some of the subgroups of the DoI whose jurisdictions appear to overlap other agencies are identified below.

The Office of Land Use and Water Planning is responsible for the preparation of documents necessary for implementation of land use legislation, serving as a department focal point for discussion and coordination of land use and water planning policies for federal and nonfederal agencies. The need for water which is dictated by present technology of slurry pipelines will require coordination and clarification with this office.

The Office of Minerals Policy Development oversees the development of policies, programs and legislative initiatives regarding mineral development and conservation, recycling and substitution. This function is also an activity of FEA, as well as being somewhat ambiguous with the functions of DoI's Office of Research and Development.

The U.S. Fish and Wildlife Service has as its objective to assure maximum opportunity for the American people to benefit from fish and wildlife resources as a part of their natural environment. Fulfillment of this purpose would seem to make the Service, at the very least, a valid and respected intervenor in any matter which significantly affects fish or land animal life, or which affects any part of the "natural environment" needed by those animals. Examples are matters of routing pipelines across open spaces, both land and water, and

displacing large amounts of water by slurry pipelines. The Service has proposed legislation and regulations for pipelines that would apply in some of these cases.

6.2 Observations on Jurisdictional Incompatibilities

It has been noted earlier that the primary reason in this study for interest in regulatory jurisdictional incompatibilities is to explore their inhibitory impact upon the introduction of energy-conservative innovations. It will be seen in Section 7.0 below that the incompatibilities identified above, and the additional minor ones which have not been discussed, are not important in this sense. Accordingly, the discussion here is limited to a few general considerations.

Although not of primary impact upon this study, it is of interest to note that one apparent jurisdictional gap has been identified. In the discussion with the various agencies, the interviewer could not find where the responsibility lies for preparation of environmental impact statements for oil pipelines. It appears that every agency which has a responsibility with respect to the pipeline is responsible for the impact in their area, e.g., Corps of Engineers for water crossing, BLM across federal lands, Bureau of Indian Affairs across Indian lands, USGS if three miles offshore, Coast Guard out to three miles, EPA if under Clean Air Act, etc. There may be circumstances in which none of these apply, or the converse may also occur.

An example of an overlap that occurred, and was resolved by interagency agreement, arose in the area of offshore pipeline safety. Beyond the three-mile limit DoT responsibility begins at the outlet

flange of the production facility. Within the three-mile limit, DoT has full responsibility.

It is necessary to draw some distinctions in terms and to define the term "overlap" somewhat more precisely. It is in fact helpful to define it in more than one way. First, the distinction should be made between what may be called jurisdictions of concern and jurisdictions of regulation, the former being those in which an agency is chartered or otherwise expected to take an interest in an activity such as the construction and/or operation of a pipeline. An example is the publishing of comments upon an environmental impact statement, or the action of the Fish and Wildlife Service in proposing (as opposed to imposing) regulations for pipeline construction which would be imposed by another agency.

On the other hand, jurisdictions of regulation may be regarded as those under which an agency has the authority to order something done or to prevent something from being done. This latter authority (approval authority) usually is intended to be exercised from a particular point of interest, so that several agencies may quite legitimately overlap in their regulatory authority over a given activity.

As an example of such a legitimate overlap, consider the case of a pipeline crossing a coastal waterway. In addition to the regulation of the operating business aspects of pricing, which are regulated by the FPC or the ICC, it is easy to hypothesize circumstances under which the Office of Pipeline Safety, DoT, and the EPA might have valid regulations to be enforced. In this case, three agencies might be regulating the same activity, each acting to serve a different interest. While it is true that these three interests (price, safety, and environmental impact) are different, they are all public interests under acts of Congress, and their regulations under the law should all apply. Addi-

tionally, it is easy to visualize a situation in which the Fish and Wildlife Service might be required, under yet another act of Congress, to impose regulations to save the fish if the pipeline constructor were to propose some detrimental action. Such overlaps of jurisdiction may be termed legitimate overlaps in that they are all intended to be exercised in a public interest of one kind or another.

On the other hand, it is also easy to visualize situations in which two or more agencies might be attempting to regulate the same public interest, which for simplicity can be termed an illegitimate overlap. For example, considering further the case hypothesized above, after reading the charters of the EPA, Coast Guard, and Fish and Wildlife Service as summarized in Section 6.1 above, one could easily further hypothesize all of these agencies regulating the pipeline from the point of interest of protecting the environment. If this were to happen, it would seem to constitute an illegitimate overlap, in the sense defined above.

Returning to the case of the legitimate overlap, it is tempting to conclude that one or the other of the regulating agencies should be given the overall jurisdiction. However, there are two good reasons to question that course of action. First, the different interests represented by the different agencies, while they are all public interests, are nevertheless conflicting. For example, it is obviously not possible to achieve the lowest price, the greatest safety, and the least environmental impact simultaneously, whether in a pipeline or any other enterprise. Although there is an abundance of evidence to show that the pipeline far exceeds any other mode of transportation in all three of these criteria, in every practical situation there must be compromises between what are basically conflicting requirements. Therefore, giving overall responsibility to the protector of one interest may preclude any reasonably optimum compromise. If overall responsibility were given to the safety regulator, for example, the result might be a system which would never cause an

injury through the rest of eternity, but at unbearable financial and environmental penalties. A similarly unbalanced result could be anticipated if the overall responsibility were placed in the hands of any other appointed protector of a particular point of interest.

Another factor militating against simply handing all regulatory responsibilities to one of the agencies is that of basic capability and qualifications. For example, if all the safety engineers were spread through all the agencies, it is possible that there would be a great many of them but that they would be very ineffective because they would be single, isolated individuals of junior status, low in the heirarchy. Only by collecting the activity and the responsibility into a single organization can the strength be mustered to perform effectively.

It may be that the best resolution of the problem, i.e., achievement of balance between agencies who are charged with protection of different public interests that are in fundamental conflict, lies in stronger and more effective policy coordination within the Executive Branch. However, in many cases the Executive does not have such coordinating authority. Some agencies, e.g., FPC, FRB, and others, are not under direct control of the President. Perhaps it would be best to establish a court of compromise within the Executive Branch, before which the protector agencies would argue out the issues, and receive policy guidance.

Of course, none of this is helpful to the distraught pipeline builder or operator, who pleads that his task is difficult enough with the government telling him a hundred things he must do or cannot do, and asks why he must also contend with a dozen different agencies, some of which are in adversary positions against each other.

These questions are important and interesting, but they are not peculiar to pipelines nor are they directly related to the basic objectives of this study. The discussion will therefore pass on to the subject of energy-conservative innovations and how their introduction may be influenced by the regulatory systems.

7.0 INFLUENCE OF REGULATIONS AND LAWS UPON INNOVATIONS

It has been emphasized earlier that the principal subject of this study is the susceptibility of the pipeline industry to energy-conservative technological innovations. It was recognized at the outset that such susceptibility might be influenced strongly by the regulatory system, which was the reason for performing the part of the study which is described here.

The discussion in Section 6.0 above has shown that the pipeline industry is subject to what has been termed "jurisdictions of regulation" by several government agencies, and that in certain situations and in certain aspects of operation many other agencies exercise what has been termed "jurisdictions of interest." It has further been seen that numerous incompatibilities of jurisdictions exist, overlaps in particular, between many agencies. However, in terms of offering either encouragement or discouragement to the introduction of energy-conservative innovations, there are only three areas of regulation and/or law that are important:

(1) Federal income tax laws, along with state tax laws, to the extent that the latter are patterned after the former;

(2) The limitations imposed by the ICC and the FPC upon the operating income that a pipeline is allowed to retain; and

(3) The limitation upon dividends which derive from the Interstate Commerce Act, as amended by the Elkins Act and applied by the Justice Department in obtaining the consent decree of 1941.

In the first of these areas of influence, the pipeline industry is subject to the same basic federal and state tax laws and IRS rulings that apply to industry in general, there being no special provisions of the tax laws, either favorable or otherwise, that apply only to pipelines. However, the pipeline industry is heavily capital-intensive, and

it will later be seen that the tax treatment therefore tends to exert a heavy inhibitory influence against innovations which require further capital outlay before the initial investment credits and the operating losses of the startup period have been recovered. The effect of the second area of influence, regulation of tariffs and prices, will be seen from what follows. The effect of the third area is not further discussed here, since it operates in such a way as to have almost exactly the same effect as the profit limitations.

To explain the inhibitory effects of these influences, it is necessary to first examine the economics of pipeline operation, and for this purpose the operation of gas pipelines will be discussed. The same general inhibitory principles would operate in the case of oil pipelines, although important differences would be encountered in practice due to differences in the regulations and practices between the FPC and the ICC and due to differences in the allowable rates of return that are discussed below.

7.1 The Economics of Gas Pipelines

The economic models of pipelines which were used in this project are described in detail in Task Report SSS-R-77-3021, Economic Models of Pipeline Transportation Systems, of this series. The energy-conservative innovations which were considered are discussed in Task Report SSS-R-77-3025, Potential Efficiency Improvements in Pipeline Transportation Systems. For present purposes, it is unnecessary to repeat those discussions. Figures 7.1-1, 7.1-2, 7.1-3, and 7.1-4 present the output from the model for a particular case of interest, and for the reference gas pipeline system. These figures will be used to illustrate the effects of the tax laws and the

Fig. 7.1-1, sheet 1

SYSTEMS, SCIENCE, AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE SEPTEMBER 14, 1976 16:47:48 #5 090176
RUN ID THE NATURAL GAS REFERENCE SYSTEM
BASELINE CASE

JFM REPORT NO. 10 CONSOLIDATED STATEMENT OF INCOME •••• PROFIT AND LOSS PROJECTION ••••

TIME PERIOD	1976	1977	1978	1979	1980	1981	1982	1983
REVENUES								
NET SALES AND OPERATION REVENUES	.000	37991.023	42228.454	46942.505	51842.370	57340.993	63306.632	69786.962
REVENUE REDUCTION	.000	.000	-1034.762	-5513.486	-8504.514	-13431.607	-18972.759	-22545.350
TOTAL REVENUE	.000	37991.023	41193.692	41429.019	43337.855	43909.386	44333.873	47241.612
COST AND EXPENSES								
OPERATION AND MAINTENANCE EXPENSES	.000	6242.000	6567.000	7159.000	7722.000	8078.000	8550.000	9606.000
GENERAL AND ADMINISTRATIVE EXPENSES	.000	.000	.000	.000	.000	.000	.000	.000
SEGREGATED EXPENSES -	.000	2213.897	2989.640	3543.579	4896.529	5708.731	6741.059	8373.357
TAXES, OTHER THAN FEDERAL INCOME	.000	.000	.000	.000	.000	.000	.000	.000
COSTS, EXCL DEPREC & INTEREST	.000	8455.897	9556.640	10702.579	12618.529	13786.731	15291.059	17979.357
GROSS OPERATING INCOME	.000	29535.125	31637.053	30726.449	30719.327	30122.655	29034.814	29262.255
INTEREST EXPENSES	.000	19769.000	19769.000	19769.000	13661.278	17563.556	16465.833	15368.112
FINANCIAL DEPRECIATION	.000	5761.444	5761.444	5761.444	6008.500	6184.722	6184.722	6282.305
AMORTIZATION OF FINANCIAL EXPENSES	.000	333.139	333.139	333.139	333.139	333.139	333.139	333.139
TOTAL EXPENSES	.000	34309.480	35410.222	36556.153	37621.445	37868.146	38282.753	39962.913
INVESTMENT INCOME, NET	.000	.000	.000	.000	.000	.000	.000	.000
NET INCOME BEFORE TAXES	.000	3681.543	5703.470	4872.866	5716.410	6041.239	6051.120	7278.700
FEDERAL INCOME TAX								
TAX DEPRECIATION	.000	10855.636	17141.488	15583.171	14975.069	14190.422	12900.384	12046.985
TAXABLE INCOME	-10225.000	-9079.510	-5263.435	-4615.721	-2917.016	-1631.322	-331.403	1847.159
UNUSED TAX LOSS	-8377.841	-6955.796	-5225.400	-576.443	.000	.000	.000	.000
TAX LOSS CARRYFORWARD	.000	-10225.000	-19304.510	-25567.943	-29183.666	-32100.681	-33732.003	-34063.406
TAX LOSS APPLIED THIS YEAR	.000	.000	.000	.000	.000	.000	.000	-1847.159
INVESTMENT TAX CREDIT	20741.200	.000	.000	889.400	634.400	.000	351.300	2106.100
UNUSED INVESTMENT TAX CREDITS	-20741.200	.000	.000	889.400	384.002	.000	.000	.000
TAX CREDITS CARRIED FORWARD	.000	20741.200	20741.200	20741.200	21630.600	22265.000	22265.000	22616.299
TAX CREDITS APPLIED THIS YEAR	.000	.000	.000	.000	.000	.000	.000	.000
CURRENT INCOME TAX	.000	.000	.000	.000	.000	.000	.000	.000
DEFERRED INCOME TAX	5113.000	6300.527	5523.452	4744.294	4316.713	3836.201	3191.262	2715.771
TOTAL FEDERAL INCOME TAX	5113.000	6300.527	5523.452	4744.294	4316.713	3836.201	3191.262	2715.771
NET INCOME (BOOK PROFIT)	-5112.000	-2698.984	260.018	128.572	1399.697	2204.959	2859.859	4562.929

Fig. 7.1-1, sheet 2

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE SEPTEMBER 14, 1976 16:47:48 #5 090176
RUN ID THE NATURAL GAS REFERENCE SYSTEM.
BASELINE CASE

JFM REPORT NO. 10 CONSOLIDATED STATEMENT OF INCOME •••• PROFIT AND LOSS PROJECTION ••••

TIME PERIOD	1984	1985	1986	1987	1988	1989	1990	1991
REVENUES								
NET SALES AND OPERATION REVENUES	75999.933	83345.776	91214.742	99812.914	108691.813	118674.064	128929.953	139709.234
REVENUE REDUCTION	-26663.444	-30912.785	-34803.541	-41312.428	-45759.500	-47039.742	-46499.002	-51053.315
TOTAL REVENUE	49336.489	52432.992	56411.201	58500.486	62932.314	71634.322	82430.951	88655.920
COST AND EXPENSES								
OPERATION AND MAINTENANCE EXPENSES	10052.000	11545.000	12084.000	12653.000	13409.000	14038.000	16966.000	17793.000
GENERAL AND ADMINISTRATIVE EXPENSES	.000	.000	.000	.000	.000	.000	.000	.000
SEGREGATED EXPENSES - TYPE C	8924.424	10322.299	11664.140	14302.996	16661.721	19739.403	25606.156	29842.332
TAXES, OTHER THAN FEDERAL INCOME	.000	.000	.000	.000	.000	.000	.000	.000
COSTS, EXCL DEPREC & INTEREST	18976.424	21867.299	23748.140	26955.996	30270.721	35777.402	42592.156	47635.332
GROSS OPERATING INCOME	30360.065	30605.694	32663.062	31544.540	32661.594	35856.920	39838.795	41020.589
INTEREST EXPENSES	15369.910	13870.895	15231.815	13488.691	11708.146	10285.743	13201.868	11291.313
FINANCIAL DEPRECIATION	6867.333	6867.333	7710.222	7710.222	7710.222	7028.500	9248.000	9378.416
AMORTIZATION OF FINANCIAL EXPENSES	333.139	333.139	333.139	333.139	333.139	333.139	333.139	333.139
TOTAL EXPENSES	41546.806	42930.665	47024.315	48487.997	50022.227	54224.784	65375.163	68636.199
INVESTMENT INCOME, NET	.000	.000	.000	.000	.000	.000	.000	.000
NET INCOME BEFORE TAXES	7789.683	9534.327	9387.886	10012.489	12910.088	17409.539	17055.709	20017.721
FEDERAL INCOME TAX								
TAX DEPRECIATION	12066.441	11696.765	13391.968	12174.516	11067.742	11049.473	15291.411	14928.900
TAXABLE INCOME	2123.714	5038.034	4039.279	5881.334	9885.707	14521.704	11345.517	14800.376
UNUSED TAX LOSS	.000	.000	.000	.000	.000	.000	.000	.000
TAX LOSS CARRYFORWARD	-23336.406	-14753.896	-9495.462	-4879.740	.000	.000	.000	.000
TAX LOSS APPLIED THIS YEAR	-2123.714	-5038.034	-4039.279	-4879.740	.000	.000	.000	.000
INVESTMENT TAX CREDIT	.000	3034.400	.000	.000	925.800	5110.200	469.600	.000
UNUSED INVESTMENT TAX CREDITS	.000	.000	.000	.000	.000	.000	.000	.000
TAX CREDITS CARRIED FORWARD	3981.200	3981.200	7015.600	6126.200	5491.600	3446.173	4925.947	2559.068
TAX CREDITS APPLIED THIS YEAR	.000	.000	.000	250.398	2471.427	3630.426	2836.379	2559.068
CURRENT INCOME TAX	.000	.000	.000	250.398	2471.427	3630.426	2836.379	4841.120
DEFERRED INCOME TAX	2832.985	2240.146	2674.304	2065.578	1512.191	1443.417	2855.136	2608.672
TOTAL FEDERAL INCOME TAX	2832.985	2240.146	2674.304	2315.976	3983.617	5074.343	5691.515	7449.792
NET INCOME (BOOK PROFIT)	4956.698	7285.181	6713.582	7696.513	8926.471	12335.196	11364.274	12567.928

Fig. 7.1-1, sheet 3

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE. SEPTEMBER 14, 1976 16:47:46 #5 090176
RUN ID THE NATURAL GAS REFERENCE SYSTEM
BASELINE CASE

JFM REPORT NO. 10 CONSOLIDATED STATEMENT OF INCOME •••• PROFIT AND LOSS PROJECTION ••••

TIME PERIOD	1992	1993	1994	1995	1996	TOT	AVG
REVENUES							
NET SALES AND OPERATION REVENUES	146690.373	164024.891	181726.135	199812.439	178305.061	2026415.203	101320.760
REVENUE REDUCTION	-47830.932	-53971.299	-58219.904	-64128.515	-70544.487	-690741.344	-34537.067
TOTAL REVENUE	98859.441	100053.592	103506.232	105683.926	107756.574	1335673.859	66783.691
COST AND EXPENSES							
OPERATION AND MAINTENANCE EXPENSES	18639.000	19526.000	20458.000	21418.000	22446.000	266979.000	13348.950
GENERAL AND ADMINISTRATIVE EXPENSES	.000	.000	.000	.000	.000	.000	.000
SEGREGATED EXPENSES - TYPE C	31469.182	33042.641	34694.773	36429.511	38250.986	345617.285	17280.864
TAXES, OTHER THAN FEDERAL INCOME	.000	.000	.000	.000	.000	.000	.000
COSTS, EXCL DEPREC & INTEREST	50108.182	52568.641	55152.773	57847.511	60696.986	612596.273	30629.813
GROSS OPERATING INCOME	46751.260	47484.951	48353.460	47836.415	47061.588	723077.576	36153.879
INTEREST EXPENSES	8802.498	6195.196	3453.032	2195.446	1097.724	253527.992	12676.400
FINANCIAL DEPRECIATION	9378.416	9378.416	9378.416	9378.416	9378.416	152156.906	7607.845
AMORTIZATION OF FINANCIAL EXPENSES	333.139	333.139	333.139	234.972	234.972	6466.444	323.322
TOTAL EXPENSES	68622.234	68475.341	68317.359	69656.345	71408.097	1024747.609	51237.380
INVESTMENT INCOME, NET	.000	.000	.000	.000	.000	.000	.000
NET INCOME BEFORE TAXES	26237.207	31578.251	35186.873	36027.561	36350.478	310926.254	15546.313
FEDERAL INCOME TAX							
TAX DEPRECIATION	14198.288	13552.473	12965.367	12441.811	12026.658	273345.152	13016.436
TAXABLE INCOME	23750.474	27737.334	31935.061	33199.159	33937.009	185978.449	8856.117
UNUSED TAX LOSS	.000	.000	.000	.000	.000	-16135.401	-768.356
TAX LOSS CARRYFORWARD	.000	.000	.000	.000	.000	.000	.000
TAX LOSS APPLIED THIS YEAR	.000	.000	.000	.000	.000	-17927.926	-853.711
INVESTMENT TAX CREDIT	.000	.000	.000	.000	.000	33762.298	1607.728
UNUSED INVESTMENT TAX CREDITS	.000	.000	.000	.000	.000	22014.601	1048.314
TAX CREDITS CARRIED FORWARD	.000	.000	.000	.000	.000	.000	.000
TAX CREDITS APPLIED THIS YEAR	.000	.000	.000	.000	.000	11747.698	559.414
CURRENT INCOME TAX	11075.237	13868.667	15967.531	16599.579	16968.504	89309.266	4252.822
DEFERRED INCOME TAX	2243.367	1920.459	1626.906	1414.211	1206.735	62473.899	2974.948
TOTAL FEDERAL INCOME TAX	14118.604	15789.125	17594.437	18013.791	18175.239	151783.168	7227.770
NET INCOME (BOOK PROFIT)	14118.604	15789.125	17594.437	18013.791	18175.239	159143.086	7578.242

Fig. 7.1-2, sheet 1

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE SEPTEMBER 14, 1976 16:47:40 05 090176
RUN ID THE NATURAL GAS REFERENCE SYSTEM
BASELINE CASE

JFM REPORT NO. 20 CONSOLIDATED STATEMENT OF CHANGES IN FINANCIAL POSITION •••• CASH FLOW PROJECTION ••••

TIME PERIOD	1976	1977	1978	1979	1980	1981	1982	1983
SOURCES OF FUNDS								
NET INCOME (BOOK PROFIT)	-5112.000	-2698.984	200.018	120.572	1399.697	2204.959	2859.859	4562.929
FINANCIAL DEPRECIATION	.000	5761.444	5761.444	5761.444	6000.500	6184.722	6184.722	6282.305
AMORTIZATION OF FINANCIAL EXPENSES	.000	333.139	333.139	333.139	333.139	333.139	333.139	333.139
DEFERRED INCOME TAX	5113.000	6380.527	5523.452	4744.294	4316.713	3836.281	3191.262	2715.771
PROVIDED BY OPERATIONS	.000	9776.126	11878.053	10967.449	12058.049	12559.100	12568.981	13894.144
SHORT-TERM BORROWING	.000	.000	.000	.000	.000	.000	.000	10995.208
LONG-TERM BORROWING	197590.000	.000	.000	.000	.000	.000	.000	.000
NET ADDITIONS TO EQUITY	21956.000	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS SOURCES OF FUNDS	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL SOURCES OF FUNDS	219546.000	9776.126	11878.053	10967.449	12058.049	12559.100	12568.981	24889.352
APPLICATION OF FUNDS								
ADDITIONS TO PLANT & EQUIPMENT	207412.000	.000	.000	8894.000	6344.000	.000	3513.000	21061.000
SHORT-TERM DEBT RETIREMENT	.000	.000	.000	.000	.000	.000	.000	.000
LONG-TERM DEBT RETIREMENT	.000	.000	.000	10977.222	10977.222	10977.222	10977.222	10977.222
FINANCIAL AND DEBT EXPENSE	10226.000	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS APPLICATION OF FUNDS	.000	.000	.000	.000	.000	.000	.000	.000
SUBTOTAL	217638.000	.000	.000	19871.222	17321.222	10977.222	14490.222	32038.222
CASH DIVIDENDS PAID	.000	.000	.000	.000	.000	.000	.000	.000
NET INCREASE IN INVESTMENTS	.000	9776.126	11878.053	-8903.773	-5263.173	1581.878	-1921.241	-7148.870
TOTAL APPLICATION OF FUNDS	217639.000	9776.126	11878.053	10967.449	12058.049	12559.100	12568.981	24889.352
INCREASE IN WORKING CAPITAL	1907.000	.000	.000	.000	.000	.000	.000	.000
TOTAL DISPOSITION OF FUNDS	219546.000	9776.126	11878.053	10967.449	12058.049	12559.100	12568.981	24889.352
CASH BENEFITS LESS INVESTMENT COSTS	-219544.000	9776.126	11878.053	2073.449	5714.049	12559.100	9055.981	-7166.856
NET CASH GENERATED DURING THE PERIOD	.000	9776.126	11878.053	-8903.773	-5263.173	1581.878	-1921.241	-7148.870
CUMULATIVE NET CASH GENERATED	.000	9777.126	21655.179	12751.406	7488.233	9070.111	7148.870	.000

Fig. 7.1-2, sheet 2

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE SEPTEMBER 14, 1976 16:47:48 #5 090176
RUN ID THE NATURAL GAS REFERENCE SYSTEM
BASELINE CASE

JFM REPORT NO. 20 CONSOLIDATED STATEMENT OF CHANGES IN FINANCIAL POSITION •••• CASH FLOW PROJECTION ••••

TIME PERIOD	1984	1985	1986	1987	1988	1989	1990	1991
SOURCES OF FUNDS								
NET INCOME (BOOK PROFIT)	4956.698	7286.181	6713.582	7690.513	8926.471	12335.196	11364.274	12567.928
FINANCIAL DEPRECIATION	6867.333	6867.333	7710.222	7710.222	7710.222	7820.500	9248.000	9378.416
AMORTIZATION OF FINANCIAL EXPENSES	333.139	333.139	333.139	333.139	333.139	333.139	333.139	333.139
DEFERRED INCOME TAX	2832.985	2240.146	2674.304	2065.578	1512.171	1443.917	2855.136	2608.672
PROVIDED BY OPERATIONS	14990.155	16734.799	17431.247	17805.452	18482.022	21940.751	23800.548	24888.155
SHORT-TERM BORROWING	.000	24586.423	.000	.000	.000	40138.471	.000	.000
LONG-TERM BORROWING	.000	.000	.000	.000	.000	.000	.000	.000
NET ADDITIONS TO EQUITY	.000	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS SOURCES OF FUNDS	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL SOURCES OF FUNDS.	14990.155	41321.222	17431.247	17805.452	18482.022	62079.222	23800.548	24888.155
APPLICATION OF FUNDS								
ADDITIONS TO PLANT & EQUIPMENT	.000	30349.000	.000	.000	4258.000	51102.000	4695.000	.000
SHORT-TERM DEBT REDIREMENT	4012.933	.000	6454.024	6826.229	3246.800	.000	8128.326	13910.933
LONG-TERM DEBT REDIREMENT.	10977.222	10977.222	10977.222	10977.222	10977.222	10977.222	10977.222	10977.222
FINANCIAL AND DEBT EXPENSE.	.000	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS APPLICATION OF FUNDS	.000	.000	.000	.000	.000	.000	.000	.000
SUBTOTAL	14990.155	41321.222	17431.247	17805.452	18482.022	62079.222	23800.548	24888.155
CASH DIVIDENDS PAID	.000	.000	.000	.000	.000	.000	.000	.000
NET INCREASE IN INVESTMENTS	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL APPLICATION OF FUNDS	14990.155	41321.222	17431.247	17805.452	18482.022	62079.222	23800.548	24888.155
INCREASE IN WORKING CAPITAL	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL DISPOSITION OF FUNDS	14990.155	41321.222	17431.247	17805.452	18482.022	62079.222	23800.548	24888.155
CASH BENEFITS LESS INVESTMENT COSTS	14990.155	-13659.201	17431.247	17805.452	14224.022	-29161.249	19105.548	24888.155
NET CASH GENERATED DURING THE PERIOD	.000	.000	.000	.000	.000	.000	.000	.000
CUMULATIVE NET CASH GENERATED	.000	.000	.000	.000	.000	.000	.000	.000

Fig. 7.1-2, sheet 3

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE SEPTEMBER 14, 1976 16:47:48 #5 090176
RUN ID THE NATURAL GAS REFERENCE SYSTEM
BASELINE CASE

JFM REPORT NO. 20 CONSOLIDATED STATEMENT OF CHANGES IN FINANCIAL POSITION •••• CASH FLOW PROJECTION ••••

TIME PERIOD	1992	1993	1994	1995	1996	TOT	AVG
SOURCES OF FUNDS							
NET INCOME (BOOK PROFIT)	14116.604	15789.125	17594.437	18013.791	18175.239	159193.086	7578.242
FINANCIAL DEPRECIATION	9378.416	9378.416	9378.416	9378.416	9378.416	152156.906	7607.845
AMORTIZATION OF FINANCIAL EXPENSES	333.139	333.139	333.139	234.972	234.972	6466.444	323.322
DEFERRED INCOME TAX	2243.367	1920.459	1626.906	1414.211	1206.735	62473.699	2974.948
PROVIDED BY OPERATIONS	26073.525	27421.139	28932.897	29041.390	28995.362	380240.324	18106.682
SHORT-TERM BORROWING	.000	.000	.000	.000	.000	75720.103	3605.719
LONG-TERM BORROWING	.000	.000	.000	.000	.000	197590.000	9409.048
NET ADDITIONS TO EQUITY	.000	.000	.000	.000	.000	21955.000	1045.476
MISCELLANEOUS SOURCES OF FUNDS	.000	.000	.000	.000	.000	.000	.000
TOTAL SOURCES OF FUNDS	26073.525	27421.139	28932.897	29041.390	28995.362	675505.398	32166.924
APPLICATION OF FUNDS							
ADDITIONS TO PLANT & EQUIPMENT	.000	.000	.000	.000	.000	337623.000	16077.286
SHORT-TERM DEBT RETIREMENT	15096.303	16443.917	1598.637	.000	.000	75720.102	3605.719
LONG-TERM DEBT RETIREMENT	10977.222	10977.222	10977.222	10977.222	10977.222	197589.986	9409.047
FINANCIAL AND DEBT EXPENSE	.000	.000	.000	.000	.000	10226.000	486.952
MISCELLANEOUS APPLICATION OF FUNDS	.000	.000	.000	.000	.000	.000	.000
SUBTOTAL	26073.525	27421.139	12575.860	10977.222	10977.222	621159.055	29579.002
CASH DIVIDENDS PAID	.000	.000	.000	.000	.000	.000	.000
NET INCREASE IN INVESTMENTS	.000	.000	16357.038	18064.168	18018.139	52439.345	2497.112
TOTAL APPLICATION OF FUNDS	26073.525	27421.139	28932.897	29041.390	28995.362	673598.398	32076.114
INCREASE IN WORKING CAPITAL	.000	.000	.000	.000	.000	1907.000	90.810
TOTAL DISPOSITION OF FUNDS	26073.525	27421.139	28932.897	29041.390	28995.362	675505.398	32166.924
CASH BENEFITS LESS INVESTMENT COSTS	26073.525	27421.139	28932.897	29041.390	28995.362	30484.340	1451.635
NET CASH GENERATED DURING THE PERIOD	.000	.000	16357.038	18064.168	18018.139	52439.345	2497.112
CUMULATIVE NET CASH GENERATED	.000	.000	16357.038	34421.206	52439.345	171109.512	8148.072

Fig. 7.1-3, sheet 1

SYSTEMS, SCIENCE AND SOFTWARE
LAC PROJECTION MODEL.
PIPLLINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE SEPTEMBER 14, 1976 16:47:48 #5 090176
RUN ID THE NATURAL GAS REFERENCE SYSTEM
BASELINE CASE

P38 REPORT NO. 38 CAPITAL INVESTMENT PLANNING AND ENERGY CONSERVATION IMPACT PROJECTION (DOLLARS IN THOUSANDS)

TIME PERIOD	1976	1977	1978	1979	1980	1981	1982	1983
ACTIVITY								
ANNUAL THROUGHPUT MEASURED IN MILLION MMCSF. - MILES	.000	57.562	60.936	64.512	67.854	71.477	75.155	78.903
TARIFF - UNIT TRANSPORTATION CHARGE	.000	660.000	693.000	727.650	764.032	802.234	842.346	884.463
TRANSPORTATION REVENUES	.000	37991.023	42228.454	46942.505	51842.370	57340.993	63306.632	69786.962
REVENUE REDUCTION	.000	.000	-1034.762	-5513.486	-8504.514	-13431.607	-18972.759	-22545.350
TOTAL REVENUE	.000	37991.023	41193.692	41429.019	43337.855	43909.386	44333.873	47241.612
TARIFF CONSTRAINT FACTOR	.000	1.000	.975	.883	.836	.766	.700	.677
LEVERAGE								
LONG-TERM (FUNDED) DEBT TO EQUITY	11.731	13.970	13.718	12.841	11.024	9.078	7.319	5.583
LONG-TERM (FUNDED) DEBT TO CAPITAL	.921	.933	.932	.928	.917	.901	.880	.848
LONG-TERM (FUNDED) DEBT TO ASSETS	.900	.665	.863	.837	.807	.774	.740	.663
PROFITABILITY								
OPERATING INCOME (FPC RULES)	-5112.000	17156.163	20117.184	19985.739	20159.142	19866.681	19423.859	20029.207
ANNUAL FPC RATE BASE	106108.000	206933.279	201171.836	199857.389	201591.418	198666.809	194238.586	200292.070
RATE OF RETURN ON RATE BASE (%)	-4.818	8.292	10.000	10.000	10.000	10.000	10.000	10.000
RATE OF RETURN ON PAID-IN CAPITAL(%)	.000	-12.293	1.184	.586	6.375	10.043	13.026	20.783
RATE OF RETURN ON TOTAL EQUITY (%)	.000	-19.082	1.805	.885	8.785	12.157	13.620	17.852
RATE OF RETURN ON TOTAL CAPITAL (%)	.000	-1.275	.123	.064	.731	1.206	1.637	2.712
ENERGY CONSUMPTION								
ANNUAL ENERGY USAGE OF GAS (MMCSF)	.000	1559.083	2005.124	2263.467	2978.737	3307.456	3719.575	4400.231
ANNUAL ENERGY COSTS	.000	2213.897	2989.640	3543.570	4896.529	5708.731	6741.059	8373.357
UNIT COST OF ENERGY (¢)	.000	1.420	1.491	1.566	1.644	1.726	1.812	1.903
ANNUAL ENERGY WASTED IN GAS (MMCSF)	.000	.000	.000	.000	.000	.000	.000	.000
ANNUAL ENERGY WASTED COST. ($)	.000	.000	.000	.000	.000	.000	.000	.000
PRESENT VALUE OF ENERGY WASTED	.000	.000	.000	.000	.000	.000	.000	.000
OTHER MEASURES								
ANNUAL UNIT COSTS (TOTAL)	.000	596.042	581.108	566.652	554.450	529.798	509.383	506.480
PRESENT VALUE OF AVERAGE UNIT COSTS	.000	541.857	480.254	425.734	378.697	328.963	267.533	259.904
NET INCOME (BOOK PROFIT)	-5112.000	-2698.984	260.018	128.572	1399.697	2204.959	2859.859	4562.929
PRESENT VALUE OF BOOK PROFITS	-5112.000	-2453.621	214.891	96.598	956.012	1369.106	1614.316	2341.504
NET CASH GENERATED DURING THE PERIOD	.000	9776.126	11878.053	-8903.773	-5263.173	1581.078	-1921.241	-7148.870
PRESENT VALUE OF NET CASH GENERATED	.000	8887.387	9816.573	-6689.536	-3594.618	982.222	-1084.491	-3668.501

SYSTEMS, SCIENCE AND SOFTWARE
LAC PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

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BASELINE CASE

P38 REPORT NO. 38 CAPITAL INVESTMENT PLANNING AND ENERGY CONSERVATION IMPACT PROJECTION (DOLLARS IN THOUSANDS)

TIME PERIOD	1984	1985	1986	1987	1988	1989	1990	1991
ACTIVITY								
ANNUAL THROUGHPUT MEASURED IN MILLION MMCSF - MILES	81.335	85.513	89.088	92.843	96.288	100.124	103.597	106.913
TARIFF - UNIT TRANSPORTATION CHARGE	928.585	973.121	1023.677	1075.070	1126.824	1185.265	1244.528	1306.755
TRANSPORTATION REVENUES	75999.933	83385.776	91214.742	99812.914	108691.813	118674.069	128929.953	139709.234
REVENUE REDUCTION	-26663.444	-30912.785	-34803.541	-41312.428	-45759.500	-47039.742	-46499.002	-51053.315
TOTAL REVENUE	49336.489	52473.992	56411.201	58500.486	62932.314	71634.322	82430.951	88655.920
TARIFF CONSTRAINT FACTOR	.649	.629	.618	.586	.579	.604	.639	.635
LEVERAGE								
LONG-TERM (FUNDED) DEBT TO EQUITY	4.317	3.194	2.466	1.892	1.436	1.046	.776	.563
LONG-TERM (FUNDED) DEBT TO CAPITAL	.812	.762	.711	.654	.590	.511	.437	.360
LONG-TERM (FUNDED) DEBT TO ASSETS	.639	.523	.492	.460	.416	.302	.264	.229
PROFITABILITY								
OPERATING INCOME (FPC RULES)	20424.775	21255.242	22043.564	21283.370	20752.782	22719.106	24664.309	23957.408
ANNUAL FPC RATE BASE	204247.754	212552.418	220435.645	212725.422	207144.203	227054.640	246415.092	239449.383
RATE OF RETURN ON RATE BASE (%)	10.000	10.000	10.000	10.005	10.009	10.006	10.009	10.005
RATE OF RETURN ON PAID-IN CAPITAL (%)	22.577	35.187	30.579	35.056	40.658	56.184	51.762	57.244
RATE OF RETURN ON TOTAL EQUITY (%)	16.243	19.274	15.061	14.741	14.600	16.788	13.595	12.903
RATE OF RETURN ON TOTAL CAPITAL (%)	3.056	4.595	4.351	5.097	5.993	8.206	7.541	8.252
ENERGY CONSUMPTION								
ANNUAL ENERGY USAGE OF GAS (MMCSF)	4466.495	4920.097	5294.936	6183.640	6942.746	7740.591	9563.023	10614.371
ANNUAL ENERGY COSTS	8924.424	10322.299	11664.140	14302.946	16861.721	19739.403	25606.156	29842.332
UNIT COST OF ENERGY ($)	1.998	2.098	2.203	2.313	2.429	2.550	2.678	2.812
ANNUAL ENERGY WASTED IN GAS (MMCSF)	.000	.000	.000	.000	.000	.000	.000	.000
ANNUAL ENERGY WASTED COST ($)	.000	.000	.000	.000	.000	.000	.000	.000
PRESENT VALUE OF ENERGY WASTED	.000	.000	.000	.000	.000	.000	.000	.000
OTHER MEASURES								
ANNUAL UNIT COSTS (TOTAL)	507.664	502.128	527.832	522.257	519.508	541.574	631.050	642.000
PRESENT VALUE OF AVERAGE UNIT COSTS	236.638	212.952	203.502	183.048	155.531	156.875	166.175	153.690
NET INCOME (BOOK PROFIT)	4956.698	7286.101	6713.582	7696.513	8926.471	12335.196	11364.274	12567.928
PRESENT VALUE OF BOOK PROFITS	2312.336	3090.052	2566.377	2697.581	2844.249	3573.067	2992.569	3008.662
NET CASH GENERATED DURING THE PERIOD	.000	.000	.000	.000	.000	.000	.000	.000
PRESENT VALUE OF NET CASH GENERATED	.000	.000	.000	.000	.000	.000	.000	.000

SYSTEMS, SCIENCE AND SOFTWARE
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PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

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P38 REPORT NO. 38 CAPITAL INVESTMENT PLANNING AND ENERGY CONSERVATION IMPACT PROJECTION (DOLLARS IN THOUSANDS)

TIME PERIOD	1992	1993	1994	1995	1996	TOT	AVG
ACTIVITY							
ANNUAL THROUGHPUT	106.910	106.910	106.910	106.910	106.910	1767.152	88.358
MEASURED IN MILLION MMCSF - MILES							
TARIFF - UNIT TRANSPORTATION CHARGE	1372.092	1440.697	1512.732	1588.368	1667.787	21824.527	1091.226
TRANSPORTATION REVENUES	146690.373	154024.691	161726.135	169812.439	178303.061	2026415.203	101320.760
REVENUE REDUCTION	-49830.932	-53971.299	-58219.904	-64126.515	-70544.467	-690741.344	-34537.067
TOTAL REVENUE	96859.441	100053.592	103506.232	105683.926	107758.574	1335673.644	66783.691
TARIFF CONSTRAINT FACTOR	.660	.650	.640	.622	.604	.659	.659
LEVERAGE							
LONG-TERM (FUNDED) DEBT TO EQUITY	.394	.259	.152	.067	.000	1.683	1.683
LONG-TERM (FUNDED) DEBT TO CAPITAL	.282	.206	.132	.063	.000	.627	.627
LONG-TERM (FUNDED) DEBT TO ASSETS	.191	.150	.097	.047	.000	.480	.480
PROFITABILITY							
OPERATING INCOME (FPC RULES)	23019.266	22062.437	21145.635	20209.236	19272.962	414438.070	20721.903
ANNUAL FPC RATE BASE	230070.969	220692.551	211314.137	201935.719	192557.305	4334545.625	216772.730
RATE OF RETURN ON RATE BASE (%)	10.005	10.006	10.007	10.008	10.009	9.559	9.559
RATE OF RETURN ON PAID-IN CAPITAL (%)	64.307	71.916	80.139	62.049	62.784	34.517	34.517
RATE OF RETURN ON TOTAL EQUITY (%)	12.660	12.462	12.142	11.057	10.036	11.786	11.786
RATE OF RETURN ON TOTAL CAPITAL (%)	9.083	9.653	10.544	10.359	10.036	4.393	4.393
ENERGY CONSUMPTION							
ANNUAL ENERGY USAGE OF GAS (MMCSF)	10660.011	10660.011	10660.011	10660.011	10660.011	129259.623	6462.981
ANNUAL ENERGY COSTS	31469.162	33042.641	34694.773	36429.511	38250.986	345617.265	17280.869
UNIT COST OF ENERGY (%)	2.952	3.100	3.255	3.417	3.588	46.954	2.346
ANNUAL ENERGY WASTED IN GAS (MMCSF)	.000	.000	.000	.000	.000	.000	.000
ANNUAL ENERGY WASTED COST (%)	.000	.000	.000	.000	.000	.000	.000
PRESENT VALUE OF ENERGY WASTED	.000	.000	.000	.000	.000	.000	.000
DISCOUNTED VALUE OF ENERGY WASTED (@ 10.00 %) = .000							
OTHER MEASURES							
ANNUAL UNIT COSTS (TOTAL)	641.869	640.495	639.018	651.542	667.927	11478.797	573.940
PRESENT VALUE OF AVERAGE UNIT COSTS	139.669	126.719	114.933	106.532	99.283	4768.709	238.435
DISCOUNTED AVERAGE (ANNUAL) UNIT COSTS (LONG-RUN AVERAGE COSTS) (@ 10.00 %) = 238.435							
NET INCOME (BOOK PROFIT)	14118.604	15789.125	17599.437	18013.791	18175.239	159143.086	7578.242
PRESENT VALUE OF BOOK PROFITS	3072.620	3123.795	3164.514	2945.399	2701.634	37141.658	1857.083
DISCOUNTED VALUE OF BOOK PROFITS (@ 10.00 %) = 37141.658							

Fig. 7.1-4

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    NET CASH GENERATED DURING THE PERIOD          .000      .000   16357.036   18064.166   18018.139   52439.345    2497.112
    PRESENT VALUE OF NET CASH GENERATED           .000      .000    2941.957    2953.636    2676.282   13223.711     661.186

    DISCOUNTED NET CASH FLOW (@ 10.00 %) =          13223.711

    DISCOUNT FACTOR (@10.000 %) =                   .218      .198      .180      .164      .149      .000      .000

  ****** INTERNAL RATE OF RETURN ******

  DCF - ROI OF $      .000  (FROM YEAR  1  OVER 10 YEARS) =    .00 %
  DCF - ROI OF $      .000  (FROM YEAR  1  OVER 15 YEARS) =    .00 %
  DCF - ROI OF $      .000  (FROM YEAR  1  OVER 20 YEARS) =   5.50 %

  ******  AND THAT'S THE WAY IT WILL BE ****          THIS IS THE S-CUBED FINANCIAL PROJECTION MODEL *JFM* VERSION #5    090176

  TICKER =   2.9020(SEC)

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FPC regulations. The reference pipeline was designed by Pipetech, based on earlier system designs from the Pipetech files. Some of these designs were actually built, and the reference designs for this study therefore represent typical, realistic situations. The costs are based upon actual system costs, and are therefore quite accurate, extremely so in terms of the requirements of this study. The gas dynamics of the line are calculated using a (proprietary) model previously developed by Pipetech, which is used by them in the design of actual pipelines and is therefore more than sufficiently accurate for this study. The economics model is an adaptation of a business projection model previously developed by S^3, modified to reasonably simulate pipeline operation and bench-marked against a highly detailed pipeline-peculiar financial model previously developed by Pipetech.

Most of the sales of gas pipeline companies are sales for resale made to distribution companies and to other pipeline companies. Statistics of interstate natural gas pipeline companies for 1974 [3] show that the volume of this type of sale by the 34 major companies in 1974 was 14.8 trillion cubic feet, which was equal to 2.5 percent of total sales. An interstate natural gas pipeline company is defined by law as one which is engaged in transportation of natural gas in interstate commerce, or the sale in interstate commerce of such gas for resale. Total production expenses of the major gas pipeline companies were $5.446 billion, of which $5.355 billion were for purchased gas, the remainder constituting costs of natural gas production and gathering, products extraction and exploration and development. From these figures it is evident that nearly all of the cost of the gas delivered by the major gas pipeline companies can be attributed to transportation.

Although both gas and oil products pipelines are subject to the same nominal annual earnings limit of 10% of valuation, there

are important differences. First, the FPC limitation is not an inflexible 10%, but is established by the Commission on a case-by-case basis which recognizes the individual company's capital structure and interest rates. Second, the FPC valuation (rate base) is established by a relatively straightforward accounting-type procedure, which reflects the book value plus inventory and working capital. The ICC valuation, on the other hand, is arrived at by a complicated process, partly subjective, which includes some consideration of industry-wide statistics. The effects of these differences are discussed further in Section 7.2 below.

In the approach taken here, i.e., of developing a reference system design, modeling it on the computer, and then exercising the model, a problem which is encountered early is that of establishing a representative value for the equivalent tariff. However, it develops that this difficulty is only minor because of the FPC limit, which for this case was taken as 10% of the rate base. The rate base is known quite precisely, so that the limit upon profit is known precisely. For a given throughput, the limit upon the equivalent tariff is simply the result of dividing the throughput into the limiting profit. It is seen in Fig. 7.1-3, sheet 1, line 12, that the 10% limit is reached in the second year of operation, i.e., 1978 (1977 is the first year of operation; the figures under 1976 simply display the initial conditions as of December 31, 1976). Hence the only question with regard to the equivalent tariff is the value to be assigned for the first year. For that purpose a figure of \$660,000 per 10^{12} cubic foot-mile was used, since it appears to be somewhere near the industry average (a 1972 study by the AEC is reported to have estimated \$510,000[2]).

In drawing inferences from these long-term projections, the greatest uncertainty naturally arises from the hypothesis as to market growth that is input to the model. For this reference system, the throughput (Fig. 7.1-1, line 1) was assumed to begin at 57.56×10^{12} standard cubic foot-miles growing at just under 6% per year for the first few years, then by

growing at just under 6¢ per year for the first few years, then by approximately 4% until the fifteenth year, when it levels at 106.9 $\times 10^{12}$ scf-miles. The project life was taken as 20 years. This is conservative, but follows general industry practice in evaluating such projects.

It is interesting to note that while the postulated inflation rate increases nominal unit tariff from $660,000 in 1977 (Fig. 7.1-3, sheet 1, line 2) to $1,667,787 in 1996 (Fig. 7.1-3, sheet 3, line 2), the tariff constraint factor (line 6, same figure) is 0.604 in 1996. This is the constraint factor that must be applied to the nominal tariff to reduce revenue sufficiently that the earnings limit is not exceeded. Thus, while the assumed inflation rates result in a near-quadrupling of per-unit operating costs and expenses, the unit revenue increases from $660,000 to $1,067,384, an increase of only 53%.

It must be noted that the gas pipeline industry is no longer a growth industry. The steady growth that was postulated for these illustrative cases is therefore a sound basis for drawing conclusions relative to only a limited part of the industry. In considering a particular energy-conservative innovation, it is therefore necessary to examine the conclusions in the nongrowth case also.

7.2 Effects of Regulation

7.2.1 FPC Profit Limitation

It has been noted earlier that the FPC limits the profit of each gas pipeline to a level of approximately 10% of the valuation. For the postulated reference system throughput described above, it has also been seen (Fig. 7.1-3) that the income limit was reached in the second year of operation. Thereafter, as income attempts to increase, a reduction of revenue (Fig. 7.1-1, line 2) is made to comply with the FPC limit, in effect reducing the equivalent tariff. In practice, this reduction is made as a rebate to customers or as a reduction in selling price of the gas. The FPC formula for calculating allowable income is

Profit (per FPC) = net income after taxes + interest expense
+ amortization of financial and debt expense
+ amortization of interest during construction.

As this formula makes clear, the FPC does not recognize interest as an expense, the rationale presumably being that the profit is allowed against the total assets. If the operator then wishes to borrow to purchase the assets, he must share his profit with his banker in some proportion, but that proportion is irrelevant to the level of the allowed profit.

Assessment of a potential improvement customarily begins with an estimate of the probable RoI. Two cases must be distinguished. First is the case in which the line is operating below the applicable profit limitation, whatever it may be. In this situation, any innovation which increases profit will be welcome, and there will be some cost at which the operator will be willing to make the investment. If the profit increase is not sufficient to invoke the applicable limitation, the regulatory system exerts no effect. If the line is already operating at the limit, or if the adoption of the innovation would cause the limit to be exceeded, then the regulatory effect may be strongly inhibitory.

If the operator of a pipeline which has reached the limit adopts an energy-saving improvement, he is only allowed to retain the additional profit which the device generates up to a limit of 10% per year of the capital cost of the device. If the operator borrows money to make the installation, the profit from the device that he is able to retain is reduced below the 10% level by the amount of interest paid. He may therefore find an improvement attractive that yields 10% of its cost per year, but it may be equally attractive with one that is less efficient than that. Whether he is interested at all probably depends heavily on the money market and the nature of his debt structure. For the moment, setting this latter effect aside for later consideration in the next section, it is now possible to calculate rather precisely, for a specified money market condition, the incentive for introduction of the improvement.

If the adoption of the improvement can be financed at less than 10% of its installed capital cost, the return on the total investment is simply 10% less than the cost of the financing. The return on actual cash investment, i.e., equity, is given by the generally accepted formula

$$\text{RoI} = \frac{0.1(E+D) - rD}{E} = 0.1 + (0.1-r)\frac{D}{E}$$

where

$E \triangleq$ equity

$D \triangleq$ debt

$r \triangleq$ annual cost of financing the new debt, i.e., interest plus amortization of financing expense.

Thus, if 90% of the cost of the improvement can be financed at 8%, the RoI is 28%. If 95% is borrowed, the RoI is 48%, and if 100% is borrowed, the RoI is infinite. So if the debt structure and the money market are such that most or all of the investment can be borrowed at less than 10%, the RoI can be extremely attractive.

Generally, prudent managements study the RoI of a proposed investment both ways, i.e., upon the total investment and also upon equity. The ability of any company to borrow is subject to some finite limit. It therefore has the character of a resource and it is therefore guarded and committed with care. Thus, while almost any healthy business can enter a few highly leveraged situations, the number and extent of these are strictly limited. Individual commitments of corporate borrowing ability and the extent of leverage in each instance are therefore carefully scrutinized, including an assessment of the return on total investment as well as the return on equity.

Unfortunately, but not surprisingly, it is seldom possible to consider the adoption of an efficiency improvement on the basis of these simple considerations alone, for a number of reasons. One of the most important is the effect upon investment tax credits and tax loss carryforwards, which will now be addressed.

7.2.2 Tax Effects

In launching almost any new enterprise, it is usually desirable to borrow half or more of the money for the capital investment. The fundamental reason for this is simply that the enterprise is not worth the trouble of operating if it will not return more than the money would earn at interest. However, there are fundamental limitations upon leverage, as was discussed in the preceding section. Moreover, in the regulated pipeline business, there is an additional reason to limit borrowing. That is to say, borrowing all of the capital (100% leverage, or a debt-to-equity ratio of infinity) does not necessarily maximize the RoI, particularly if tax benefits are thereby foregone. The effect may be seen in operation by further examination of the case which was presented in Section 7.1, illustrated in Figs. 7.1-1 through 7.1-4.

For this highly leveraged case, the D/E ratio is seen to be 13.97

in the first year of operation (Fig. 7.1-3, sheet 1, line 7). Also, the most rapid writeoff for tax depreciation, i.e., by the double-declining balance method, was used (Fig. 7.1-1, line 16). Additions to capital after the initial construction investment are taken from earnings (Fig. 7.1-2, lines 7, 11, and 18). From Fig. 7.1-1, lines 18 and 22, it is seen that over the 20 years of the project, there is an unused tax loss of $16 million and unused tax credits of $22 million. At an overall tax rate of approximately 50%, there is $76 million of earnings that would avoid taxation if they could be realized.

The impact of this highly leveraged situation upon the internal return on investment (internal RoI) is seen in Fig. 7.1-4. The RoI is zero over the first 15 years and only 5.5% over 20 years. The internal RoI, often called the DCF, is defined as the discount rate which makes the lifetime present value of the stream of cash returned to the investor equal to that of the investor's cash out-of-pocket stream. In the terminology of Fig. 7.1-2, it is the discount rate which makes the present value of the net cash generated, line 23, equal to that of the additions to equity, line 8. It is the break-even interest rate at which the investor's out-of-pocket payments could be borrowed and be exactly repaid by the cash payments returned to the investor.

For comparison with the case discussed above, a much lower-leveraged case was run and the results are presented in Figs. 7.2.2-1 through 7.2.2-4. The two cases were not intended for direct comparison, and they contain some other minor differences. However, the only major difference is in the leverage, so that comparison between the two is appropriate for present purposes. The initial D/E ratio for this case is approximately 1.5, i.e., about 60% debt and 40% equity (Fig. 7.2.2-3, line 7), with straight-line depreciation. After the initial investment credits expire in 1981, additions to capital are funded by long-term borrowing (Fig. 7.2.2-2, lines 7 and 8). The effect is seen in Fig.7.2.2-1. There is nc unused tax loss carry-forward (line 18, sheet 3), and only $6.3 million of unused investment credits (line 22, sheet 3), all of which arises from year 0 (line 22, sheet 1). From Fig. 7.2.2-4,

Fig. 7.2.2-1, sheet 1

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE SEPTEMBER 16, 1976 13:47:28 MS 090176
RUN ID THE NATURAL GAS REFERENCE SYSTEM
BASELINE CASE

JFM REPORT NO. 10 CONSOLIDATED STATEMENT OF INCOME •••• PROFIT AND LOSS PROJECTION ••••

TIME PERIOD	1976	1977	1978	1979	1980	1981	1982	1983
REVENUES								
NET SALES AND OPERATION REVENUES	.000	37991.023	42228.454	46942.505	51842.370	57340.993	63306.632	69786.962
REVENUE REDUCTION	.000	.008	-1271.347	-4642.782	-6420.772	-11481.220	-16391.635	-19006.969
TOTAL REVENUE	.000	37991.023	40957.107	42299.723	45421.597	46859.773	46914.998	50779.993
COST AND EXPENSES								
OPERATION AND MAINTENANCE EXPENSES	.000	6242.000	6567.000	7159.000	7722.000	8078.000	8558.000	9606.000
SEGREGATED EXPENSES - TYPE C	.000	2213.897	2989.640	3643.570	4896.529	5708.731	6741.059	8373.357
TAXES, OTHER THAN FEDERAL INCOME	.000	.000	.000	.000	.000	.000	.000	.000
COSTS, EXCL DEPREC & INTEREST	.000	8455.897	9556.640	10702.570	12618.529	13786.731	15299.059	17979.357
GROSS OPERATING INCOME	.000	29535.125	31400.468	31597.153	32803.068	32073.042	31615.939	32800.636
INTEREST EXPENSES	.000	13172.700	13172.700	13172.700	12440.883	11709.067	10977.250	10596.733
FINANCIAL DEPRECIATION	.000	5900.055	6054.778	6054.778	6498.861	6498.861	6498.861	6601.222
AMORTIZATION OF FINANCIAL EXPENSES	.000	98.167	98.167	98.167	98.167	98.167	98.167	98.167
TOTAL EXPENSES	.000	27626.819	28882.283	30028.214	31656.440	32092.824	32873.336	35275.479
INVESTMENT INCOME, NET	.000	.000	.000	.000	.000	.000	.000	.000
NET INCOME BEFORE TAXES	.000	10364.204	12074.824	12271.509	13765.158	13766.949	14041.662	15504.514
FEDERAL INCOME TAX								
TAX DEPRECIATION	.000	10452.182	10821.719	10642.207	11932.378	11651.698	11396.915	11500.113
TAXABLE INCOME	-1767.000	5930.245	7406.049	7782.246	8429.807	8712.079	9241.774	10703.790
UNUSED TAX LOSS	.000	.000	.000	.000	.000	.000	.000	.000
TAX LOSS CARRYFORWARD	.000	-1767.000	.000	.000	.000	.000	.000	.000
TAX LOSS APPLIED THIS YEAR	.000	-1767.000	.000	.000	.000	.000	.000	.000
INVESTMENT TAX CREDIT	20394.300	557.000	.000	1598.700	.000	.000	368.500	2370.500
UNUSED INVESTMENT TAX CREDITS	6292.052	.000	.000	.000	.000	.000	.000	.000
TAX CREDITS CARRIED FORWARD	.000	20394.300	19917.988	18066.476	17719.615	15612.163	13434.143	11492.200
TAX CREDITS APPLIED THIS YEAR	.000	1033.311	1851.512	1945.562	2107.452	2178.020	2310.444	2675.948
CURRENT INCOME TAX	.000	1033.311	1851.512	1945.562	2107.452	2178.020	2310.444	2675.948
DEFERRED INCOME TAX	883.500	2231.980	2334.387	2244.631	2567.675	2527.435	2399.944	2400.362
TOTAL FEDERAL INCOME TAX	883.500	3265.291	4185.900	4190.193	4775.127	4705.455	4710.387	5076.310
NET INCOME (BOOK PROFIT)	-883.500	7098.913	7888.924	8081.316	8990.031	9061.494	9331.274	10428.205

Fig. 7.2.2-1, sheet 2

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE SEPTEMBER 16, 1976 13:47:28 #5 090176
RUN ID THE NATURAL GAS REFERENCE SYSTEM
BASELINE CASE

JFM REPORT NO. 10 CONSOLIDATED STATEMENT OF INCOME •••• PROFIT AND LOSS PROJECTION ••••

TIME PERIOD	1984	1985	1986	1987	1988	1989	1990	1991
REVENUES								
NET SALES AND OPERATION REVENUES	75999.933	83385.776	91214.742	99812.914	108691.813	118674.069	128929.953	139709.234
REVENUE REDUCTION	-22957.804	-27697.452	-34235.540	-38240.275	-39510.900	-46119.386	-46494.162	-51003.872
TOTAL REVENUE	53042.129	55688.324	56979.202	61572.640	69180.914	72554.679	82435.791	88705.363
COST AND EXPENSES								
OPERATION AND MAINTENANCE EXPENSES	10052.000	11545.000	12084.000	12653.000	13409.000	16038.000	16986.000	17793.000
SEGREGATED EXPENSES - TYPE C	8924.424	10322.299	11664.140	14302.946	16861.721	19739.403	25606.156	29842.332
TAXES, OTHER THAN FEDERAL INCOME	.000	.000	.000	.000	.000	.000	.000	.000
COSTS, EXCL DEPREC & INTEREST	18976.424	21867.299	23748.140	26955.946	30270.721	35777.402	42592.156	47635.332
GROSS OPERATING INCOME	34065.705	33821.026	33231.062	34616.693	38910.193	36777.276	39843.635	41070.032
INTEREST EXPENSES	11971.017	11239.200	13522.267	12653.928	11785.589	11174.473	15247.756	14680.339
FINANCIAL DEPRECIATION	7259.694	7259.694	7512.250	7607.944	8027.694	8027.694	9348.527	9440.889
AMORTIZATION OF FINANCIAL EXPENSES	98.167	98.167	98.167	98.167	98.167	98.167	98.167	98.167
TOTAL EXPENSES	38305.302	40464.359	44880.823	47315.984	50182.170	55077.735	67266.605	71854.725
INVESTMENT INCOME, NET	.000	.000	.000	.000	.000	.000	.000	.000
NET INCOME BEFORE TAXES	14736.827	15223.965	12098.379	14256.655	18998.744	17476.943	15149.186	16850.639
FEDERAL INCOME TAX								
TAX DEPRECIATION	13413.929	12990.762	13447.883	13342.811	14307.836	13862.866	17797.210	17353.931
TAXABLE INCOME	8680.759	9583.064	6260.913	8619.955	12816.769	11739.938	6798.670	9036.263
UNUSED TAX LOSS	.000	.000	.000	.000	.000	.000	.000	.000
TAX LOSS CARRYFORWARD	.000	.000	.000	.000	.000	.000	.000	.000
TAX LOSS APPLIED THIS YEAR	.000	.000	.000	.000	.000	.000	.000	.000
INVESTMENT TAX CREDIT	.000	909.200	344.500	1511.100	.000	4755.000	332.500	392.100
UNUSED INVESTMENT TAX CREDITS	.000	.000	.000	.000	.000	.000	.000	.000
TAX CREDITS CARRIED FORWARD	4894.700	2724.510	1237.944	17.216	.000	.000	1820.015	452.648
TAX CREDITS APPLIED THIS YEAR	2170.190	2395.766	1565.228	1528.316	.000	2934.984	1699.667	644.948
CURRENT INCOME TAX	2170.190	2395.766	1565.228	2781.662	6408.385	2934.984	1699.667	3673.183
DEFERRED INCOME TAX	3028.034	2820.451	2918.733	2818.350	3090.988	2868.503	4175.258	3907.188
TOTAL FEDERAL INCOME TAX	5198.224	5216.217	4483.961	5600.012	9499.372	5803.487	5874.925	7580.371
NET INCOME (BOOK PROFIT)	9536.603	10007.749	7614.418	8656.643	9499.372	11673.456	9274.260	9270.267

Fig. 7.2.2-1, sheet 3

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE SEPTEMBER 16, 1976 13:47:28 #5 090176
RUN ID THE NATURAL GAS REFERENCE SYSTEM
BASELINE CASE

JFM REPORT NO. 10 CONSOLIDATED STATEMENT OF INCOME **** PROFIT AND LOSS PROJECTION ****

TIME PERIOD	1992	1993	1994	1995	1996	TOT	AVG
REVENUES							
NET SALES AND OPERATION REVENUES	146690.373	154024.891	161726.135	169812.439	178303.061	2026414.203	101320.710
	-54158.203	-59595.094	-65248.852	-71078.809	-77256.341	-692811.398	-34640.570
TOTAL REVENUE	92532.170	94429.797	96477.283	98733.631	101046.721	1333602.812	66660.141
COST AND EXPENSES							
OPERATION AND MAINTENANCE EXPENSES	18639.000	19526.000	20458.000	21418.000	22446.000	266979.000	13348.950
SEGREGATED EXPENSES - TYPE C	31469.182	33042.641	34694.773	36429.511	38250.986	345617.285	17280.864
TAXES, OTHER THAN FEDERAL INCOME	.000	.000	.000	.000	.000	.000	.000
COSTS, EXCL DEPREC & INTEREST	50108.182	52568.641	55152.773	57847.511	60696.986	612596.273	30629.813
GROSS OPERATING INCOME	42423.988	41861.156	41324.511	40886.120	40349.734	721006.539	36050.327
INTEREST EXPENSES	13619.767	12275.295	10904.740	9534.184	8163.629	242014.207	12100.710
FINANCIAL DEPRECIATION	9549.805	9549.805	9549.805	9549.805	9549.806	156340.820	7817.041
AMORTIZATION OF FINANCIAL EXPENSES	98.167	98.167	98.167	.000	.000	1767.000	88.350
TOTAL EXPENSES	73375.920	74491.907	75705.482	76931.499	78410.419	1012718.281	50635.914
INVESTMENT INCOME, NET	.000	.000	.000	.000	.000	.000	.000
NET INCOME BEFORE TAXES	19156.250	19937.890	20771.801	21802.132	22636.302	320884.523	16044.226
FEDERAL INCOME TAX							
TAX DEPRECIATION	17050.487	16418.628	15844.211	15332.688	14936.332	274514.473	13072.118
TAXABLE INCOME	11753.735	13167.233	14575.561	16019.249	17249.775	202710.867	9652.698
UNUSED TAX LOSS	.000	.000	.000	.000	.000	.000	.000
TAX LOSS CARRYFORWARD	.000	.000	.000	.000	.000	.000	.000
TAX LOSS APPLIED THIS YEAR	.000	.000	.000	.000	.000	-1767.000	-84.143
INVESTMENT TAX CREDIT	.000	.000	.000	.000	.000	33533.397	1596.628
UNUSED INVESTMENT TAX CREDITS	.000	.000	.000	.000	.000	6292.052	299.622
TAX CREDITS CARRIED FORWARD	.000	.000	.000	.000	.000	.000	.000
TAX CREDITS APPLIED THIS YEAR	.000	.000	.000	.000	.000	27241.346	1297.207
CURRENT INCOME TAX	5876.868	6583.617	7287.781	8009.624	8624.867	74114.088	3529.242
DEFERRED INCOME TAX	3701.257	3385.328	3098.120	2891.442	2693.264	59086.827	2813.658
TOTAL FEDERAL INCOME TAX	9578.125	9968.945	10385.900	10901.066	11318.151	133200.914	6342.901
NET INCOME (BOOK PROFIT)	9578.125	9968.945	10385.900	10901.066	11318.151	187683.605	8937.314

Fig. 7.2.2-2, sheet 1

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE SEPTEMBER 16, 1976 13:47:28 H6 090176
RUN ID THE NATURAL GAS REFERENCE SYSTEM
BASELINE CASE

JFM REPORT NO. 20 CONSOLIDATED STATEMENT OF CHANGES IN FINANCIAL POSITION **** CASH FLOW PROJECTION ****

TIME PERIOD	1976	1977	1978	1979	1980	1981	1982	1983
SOURCES OF FUNDS								
NET INCOME (BOOK PROFIT)	-883.500	7090.913	7888.924	8081.316	8990.031	9061.494	9331.274	10428.405
FINANCIAL DEPRECIATION	.000	5900.055	6054.778	6054.778	6498.861	6498.861	6498.861	6601.222
AMORTIZATION OF FINANCIAL EXPENSES	.000	98.167	98.167	98.167	98.167	98.167	98.167	98.167
DEFERRED INCOME TAX	883.500	2231.980	2334.387	2244.631	2667.675	2527.435	2399.944	2400.362
PROVIDED BY OPERATIONS	.000	15329.115	16376.256	16478.892	18254.733	18185.957	18328.246	19527.955
SHORT-TERM BORROWING	.000	.000	.000	.000	.000	.000	.000	.000
LONG-TERM BORROWING	131727.000	.000	.000	.000	.000	.000	3513.000	21061.000
NET ADDITIONS TO EQUITY	87818.000	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS SOURCES OF FUNDS	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL SOURCES OF FUNDS	219545.000	15329.115	16376.256	16478.892	18254.733	18185.957	21841.246	40588.955
APPLICATION OF FUNDS								
ADDITIONS TO PLANT & EQUIPMENT	212402.000	5570.000	.000	15987.000	.000	.000	3685.000	23705.000
SHORT-TERM DEBT RETIREMENT	.000	.000	.000	.000	.000	.000	.000	.000
LONG-TERM DEBT RETIREMENT	.000	.000	.000	7318.167	7318.167	7318.167	7318.167	7318.167
FINANCIAL AND DEBT EXPENSE	1767.000	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS APPLICATION OF FUNDS	.000	.000	.000	.000	.000	.000	.000	.000
SUBTOTAL	214169.000	5570.000	.000	23305.167	7318.167	7318.167	11003.167	31023.167
CASH DIVIDENDS PAID	.000	.000	.000	.000	.000	.000	.000	.000
NET INCREASE IN INVESTMENTS	3469.000	9759.115	16376.256	-6826.275	10936.567	10867.790	10838.079	9565.789
TOTAL APPLICATION OF FUNDS	217638.000	15329.115	16376.256	16478.892	18254.733	18185.957	21841.246	40588.955
INCREASE IN WORKING CAPITAL	1907.000	.000	.000	.000	.000	.000	.000	.000
TOTAL DISPOSITION OF FUNDS	219545.000	15329.115	16376.256	16478.892	18254.733	18185.957	21841.246	40588.955
CASH BENEFITS LESS INVESTMENT COSTS	-216076.000	9759.115	16376.256	491.892	18254.733	18185.957	14643.246	-4177.045
NET CASH GENERATED DURING THE PERIOD	3469.000	9759.115	16376.256	-6826.275	10936.567	10867.790	10838.079	9565.789
CUMULATIVE NET CASH GENERATED	3469.000	13228.115	29604.371	22778.096	33714.663	44582.453	55420.532	64986.320

Fig. 7.2.2-2, sheet2

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE SEPTEMBER 16, 1976 13:47:28 #5 090176
RUN ID THE NATURAL GAS REFERENCE SYSTEM
BASELINE CASE

JFM REPORT NO. 20 CONSOLIDATED STATEMENT OF CHANGES IN FINANCIAL POSITION •••• CASH FLOW PROJECTION ••••

TIME PERIOD	1984	1985	1986	1987	1988	1989	1990	1991
SOURCES OF FUNDS								
NET INCOME (BOOK PROFIT)	9538.603	10007.749	7614.418	8656.643	9499.372	11673.456	9274.260	9270.261
FINANCIAL DEPRECIATION	7259.694	7259.694	7512.250	7607.944	8027.694	8027.694	9348.527	9440.688
AMORTIZATION OF FINANCIAL EXPENSES	98.167	98.167	98.167	98.167	98.167	98.167	98.167	98.167
DEFERRED INCOME TAX	3028.034	2820.451	2918.733	2818.350	3090.988	2868.503	4175.258	3907.188
PROVIDED BY OPERATIONS	19924.498	20186.060	18143.567	19181.104	20716.220	22667.820	22896.212	22716.510
SHORT-TERM BORROWING	.000	.000	.000	.000	.000	.000	.000	.000
LONG-TERM BORROWING	.000	30344.000	.000	.000	4258.000	51102.000	4695.000	.000
NET ADDITIONS TO EQUITY	.000	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS SOURCES OF FUNDS	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL SOURCES OF FUNDS	19924.498	50530.060	18143.567	19181.104	24974.220	73769.819	27591.212	22716.510
APPLICATION OF FUNDS								
ADDITIONS TO PLANT & EQUIPMENT	.000	9092.000	3445.000	15111.000	.000	47550.000	3325.000	3921.000
SHORT-TERM DEBT RETIREMENT	.000	.000	.000	.000	.000	.000	.000	.000
LONG-TERM DEBT RETIREMENT	7318.167	7513.333	8683.389	8683.389	10369.167	10369.167	10369.167	10605.722
FINANCIAL AND DEBT EXPENSE	.000	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS APPLICATION OF FUNDS	.000	.000	.000	.000	.000	.000	.000	.000
SUBTOTAL	7318.167	16605.333	12128.389	23794.389	10369.167	57919.167	13694.167	14526.722
CASH DIVIDENDS PAID	.000	.000	.000	.000	.000	.000	.000	.000
NET INCREASE IN INVESTMENTS	12606.332	33924.727	6015.179	-4613.285	14605.054	15850.653	13897.045	8189.788
TOTAL APPLICATION OF FUNDS	19924.498	50530.060	18143.567	19181.104	24974.220	73769.819	27591.212	22716.510
INCREASE IN WORKING CAPITAL	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL DISPOSITION OF FUNDS	19924.498	50530.060	18143.567	19181.104	24974.220	73769.819	27691.212	22716.510
CASH BENEFITS LESS INVESTMENT COSTS	19924.498	11094.060	14698.567	4070.104	20716.220	-24882.181	19571.212	18795.510
NET CASH GENERATED DURING THE PERIOD	12606.332	33924.727	6015.179	-4613.285	14605.054	15850.653	13897.045	8189.788
CUMULATIVE NET CASH GENERATED	77592.651	111517.378	117532.557	112919.272	127524.326	143374.979	157272.023	165461.811

Fig. 7.2.2-2, sheet 3

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE SEPTEMBER 16, 1976 13:47:28 #5 090176
RUN ID THE NATURAL GAS REFERENCE SYSTEM
BASELINE CASE

JFM REPORT NO. 20 CONSOLIDATED STATEMENT OF CHANGES IN FINANCIAL POSITION •••• CASH FLOW PROJECTION ••••

TIME PERIOD	1992	1993	1994	1995	1996	TOT	AVG
SOURCES OF FUNDS							
NET INCOME (BOOK PROFIT)	9578.125	9968.945	10385.900	10901.066	11318.151	107683.605	8937.314
FINANCIAL DEPRECIATION	9549.805	9549.805	9549.805	9549.805	9549.805	156340.820	7817.041
AMORTIZATION OF FINANCIAL EXPENSES	98.167	98.167	98.167	.000	.000	1767.000	88.350
DEFERRED INCOME TAX	3701.257	3385.328	3098.120	2891.442	2693.264	59086.827	2813.658
PROVIDED BY OPERATIONS	22927.354	23002.245	23131.992	23342.312	23561.219	404878.246	19279.916
SHORT-TERM BORROWING	.000	.000	.000	.000	.000	.000	.000
LONG-TERM BORROWING	.000	.000	.000	.000	.000	246700.000	11747.619
NET ADDITIONS TO EQUITY	.000	.000	.000	.000	.000	87818.000	4181.810
MISCELLANEOUS SOURCES OF FUNDS	.000	.000	.000	.000	.000	.000	.000
TOTAL SOURCES OF FUNDS	22927.354	23002.245	23131.992	23342.312	23561.219	739396.219	35209.344
APPLICATION OF FUNDS							
ADDITIONS TO PLANT & EQUIPMENT	.000	.000	.000	.000	.000	343793.000	16371.095
SHORT-TERM DEBT RETIREMENT	.000	.000	.000	.000	.000	.000	.000
LONG-TERM DEBT RETIREMENT	13444.722	13705.555	13705.555	13705.555	13705.555	178769.270	8512.822
FINANCIAL AND DEBT EXPENSE	.000	.000	.000	.000	.000	1767.000	84.143
MISCELLANEOUS APPLICATION OF FUNDS	.000	.000	.000	.000	.000	.000	.000
SUBTOTAL	13444.722	13705.555	13705.555	13705.555	13705.555	524329.242	24968.059
CASH DIVIDENDS PAID	.000	.000	.000	.000	.000	.000	.000
NET INCREASE IN INVESTMENTS	9482.632	9296.689	9426.437	9636.757	9855.664	213159.986	10150.475
TOTAL APPLICATION OF FUNDS	22927.354	23002.245	23131.992	23342.312	23561.219	737489.219	35118.534
INCREASE IN WORKING CAPITAL	.000	.000	.000	.000	.000	1907.000	90.810
TOTAL DISPOSITION OF FUNDS	22927.354	23002.245	23131.992	23342.312	23561.219	739396.219	35209.344
CASH BENEFITS LESS INVESTMENT COSTS	22927.354	23002.245	23131.992	23342.312	23561.219	57411.256	2733.869
NET CASH GENERATED DURING THE PERIOD	9482.632	9296.689	9426.437	9636.757	9855.664	213159.986	10150.475
CUMULATIVE NET CASH GENERATED	174944.441	184241.131	193667.566	203304.322	213159.986	2250295.906	107156.947

SYSTEMS, SCIENCE AND SOFTWARE
LAC PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE SEPTEMBER 10, 1976 13:47:28 #5 090176
RUN ID THE NATURAL GAS REFERENCE SYSTEM
BASELINE CASE

P38 REPORT NO. 38 CAPITAL INVESTMENT PLANNING AND ENERGY CONSERVATION IMPACT PROJECTION (DOLLARS IN THOUSANDS)

TIME PERIOD	1976	1977	1978	1979	1980	1981	1982	1983
ACTIVITY								
ANNUAL THROUGHPUT MEASURED IN MILLION MMCSF - MILES	.000	57.562	60.936	64.512	67.854	71.477	75.155	78.903
TARIFF - UNIT TRANSPORTATION CHARGE	.000	560.000	693.000	727.650	764.032	802.234	842.346	884.463
ANNUAL FPC RATE BASE	.000	37991.028	42228.454	46942.505	51842.370	57340.993	63306.632	69786.962
REVENUE REDUCTION	.000	.000	-1271.347	-4642.782	-6420.772	-11481.220	-16391.635	-19006.969
TOTAL REVENUE	.000	37991.028	40957.107	42299.723	45421.597	45859.773	46914.998	50779.993
TARIFF CONSTRAINT FACTOR	.000	1.000	.970	.901	.876	.800	.741	.728
LEVERAGE								
LONG-TERM (FUNDED) DEBT TO EQUITY	1.515	1.401	1.292	1.131	.984	.857	.771	.810
LONG-TERM (FUNDED) DEBT TO CAPITAL	.532	.583	.564	.531	.496	.462	.435	.447
LONG-TERM (FUNDED) DEBT TO ASSETS	.530	.576	.551	.514	.476	.438	.410	.420
PROFITABILITY								
OPERATING INCOME (FPC RULES)	-883.500	20369.780	21159.791	21352.183	21529.000	20868.727	20406.691	21123.104
ANNUAL FPC RATE BASE	108603.000	214638.973	211446.557	213385.277	215101.961	204603.100	203946.738	211091.697
RATE OF RETURN ON RATE BASE (%)	-.813	9.490	10.007	10.006	10.009	10.004	10.006	10.007
RATE OF RETURN ON PAID-IN CAPITAL (%)	.000	8.084	8.983	9.202	10.237	10.318	10.626	11.675
RATE OF RETURN ON TOTAL EQUITY (%)	.000	7.549	7.740	7.346	7.555	7.076	6.792	7.055
RATE OF RETURN ON TOTAL CAPITAL (%)	.000	3.144	3.376	3.447	3.808	3.610	3.634	3.898
ENERGY CONSUMPTION								
ANNUAL ENERGY USAGE OF GAS (MMCSF)	.000	1559.003	2005.124	2263.467	2978.737	3307.456	3719.575	4400.231
ANNUAL ENERGY COSTS	.000	2213.897	2989.640	3543.570	4896.529	5708.731	6741.059	8373.357
UNIT COST OF ENERGY ($)	.000	1.420	1.491	1.566	1.644	1.726	1.812	1.903
PRESENT VALUE OF ENERGY USED	.000	2012.634	2470.777	2662.337	3344.395	3544.673	3805.152	4296.856
ANNUAL ENERGY WASTED IN GAS (MMCSF)	.000	.000	.000	.000	.000	.000	.000	.000
ANNUAL ENERGY WASTED COST ($)	.000	.000	.000	.000	.000	.000	.000	.000
PRESENT VALUE OF ENERGY WASTED	.000	.000	.000	.000	.000	.000	.000	.000
OTHER MEASURES								
ANNUAL UNIT COSTS (TOTAL)	.000	479.948	473.980	465.464	466.540	448.997	437.406	447.073
PRESENT VALUE OF AVERAGE UNIT COSTS	.000	436.316	391.719	349.710	316.653	278.792	246.904	229.419
NET INCOME (BOOK PROFIT)	-883.500	7098.913	7888.924	8081.316	8990.031	9061.494	9331.274	10428.205
PRESENT VALUE OF BOOK PROFITS	-883.500	6453.557	6519.772	6071.613	6140.312	5626.475	5267.261	5351.318
NET CASH GENERATED DURING THE PERIOD	3469.000	9759.115	16376.256	-6826.275	10936.567	10867.790	10838.[illegible]	9565.789
PRESENT VALUE OF NET CASH GENERATED	3469.000	8871.923	13534.095	-5126.681	7469.622	6746.043	6117.[illegible]	4908.762

SYSTEMS, SCIENCE AND SOFTWARE
LAC PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE SEPTEMBER 16, 1976 13:47:28 #5 090176
RUN ID THE NATURAL GAS REFERENCE SYSTEM
BASELINE CASE

P38 REPORT NO. 3H CAPITAL INVESTMENT PLANNING AND ENERGY CONSERVATION IMPACT PROJECTION (DOLLARS IN THOUSANDS)

TIME PERIOD	1984	1985	1986	1987	1988	1989	1990	1991
ACTIVITY								
ANNUAL THROUGHPUT MEASURED IN MILLION MMCSF - MILES	81.836	85.513	89.088	92.843	96.288	100.124	103.597	106.913
TARIFF - UNIT TRANSPORTATION CHARGE	928.686	975.121	1023.877	1075.070	1128.824	1185.265	1244.528	1306.755
ANNUAL FPC RATE BASE	75999.933	83385.776	91219.742	99812.914	108691.813	116674.064	128929.953	139709.234
REVENUE REDUCTION	-22957.804	-27697.452	-34235.540	-38240.275	-39510.900	-46119.386	-46494.162	-51003.072
TOTAL REVENUE	53042.129	55688.324	56979.202	61572.640	69180.914	72554.679	82435.791	88705.363
TARIFF CONSTRAINT FACTOR	.698	.668	.625	.617	.636	.611	.639	.635
LEVERAGE								
LONG-TERM (FUNDED) DEBT TO EQUITY	.714	.608	.723	.642	.579	.745	.686	.610
LONG-TERM (FUNDED) DEBT TO CAPITAL	.417	.447	.420	.391	.367	.427	.407	.379
LONG-TERM (FUNDED) DEBT TO ASSETS	.367	.415	.386	.356	.331	.388	.367	.338
PROFITABILITY								
OPERATING INCOME (FPC RULES)	21607.787	21345.115	21234.851	21408.738	21383.128	22946.095	24620.183	24048.773
ANNUAL FPC RATE BASE	216013.740	213300.045	212182.576	213900.477	213638.162	229385.465	246134.857	240363.150
RATE OF RETURN ON RATE BASE (%)	10.003	10.007	10.008	10.009	10.009	10.003	10.003	10.005
RATE OF RETURN ON PAID-IN CAPITAL(%)	10.862	11.396	8.671	9.857	10.817	13.293	10.561	10.556
RATE OF RETURN ON TOTAL EQUITY (%)	6.062	5.980	4.352	4.714	4.919	5.700	4.332	4.151
RATE OF RETURN ON TOTAL CAPITAL (%)	3.536	3.307	2.525	2.871	3.116	3.267	2.570	2.578
ENERGY CONSUMPTION								
ANNUAL ENERGY USAGE OF GAS (MMCSF)	4466.495	4920.097	5294.936	6183.640	6942.746	7740.591	9563.023	10614.371
ANNUAL ENERGY COSTS	6924.424	10322.299	11664.140	14302.946	16861.721	19739.403	25606.156	29842.332
UNIT COST OF ENERGY ($)	1.998	2.098	2.203	2.313	2.429	2.550	2.678	2.812
PRESENT VALUE OF ENERGY USED	4163.310	4377.662	4497.031	5013.096	5372.664	5717.802	6742.902	7144.017
ANNUAL ENERGY WASTED IN GAS (MMCSF)	.000	.000	.000	.000	.000	.000	.000	.000
ANNUAL ENERGY WASTED COST ($)	.000	.000	.000	.000	.000	.000	.000	.000
PRESENT VALUE OF ENERGY WASTED	.000	.000	.000	.000	.000	.000	.000	.000
OTHER MEASURES								
ANNUAL UNIT COSTS (TOTAL)	468.074	473.194	503.703	509.634	521.169	550.093	649.501	672.085
PRESENT VALUE OF AVERAGE UNIT COSTS	218.360	200.680	194.230	178.623	166.061	159.342	171.034	160.692
NET INCOME (BOOK PROFIT)	9538.603	10007.749	7614.418	8656.643	9499.372	11673.456	9274.260	9270.267
PRESENT VALUE OF BOOK PROFITS	4449.829	4244.263	2935.688	3034.101	3026.793	3381.385	2442.203	2219.228
NET CASH GENERATED DURING THE PERIOD	12606.332	33924.727	6015.179	-4613.285	14605.054	15850.653	13897.045	8189.788
PRESENT VALUE OF NET CASH GENERATED	5880.947	14387.396	2319.112	-1616.928	4653.620	4591.370	3659.527	1960.570

SYSTEMS, SCIENCE AND SOFTWARE
LAC PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE SEPTEMBER 16, 1976 13:47:28 #5 090176
RUN ID THE NATURAL GAS REFERENCE SYSTEM
BASELINE CASE

P38 REPORT NO. 38 CAPITAL INVESTMENT PLANNING AND ENERGY CONSERVATION IMPACT PROJECTION (DOLLARS IN THOUSANDS)

TIME PERIOD	1992	1993	1994	1995	1996	TOT	AVG
ACTIVITY							
ANNUAL THROUGHPUT MEASURED IN MILLION MMCSF - MILES	106.910	106.910	106.910	106.910	106.910	1767.152	88.358
TARIFF - UNIT TRANSPORTATION CHARGE	1372.092	1440.697	1512.732	1588.368	1667.787	21823.527	1091.176
ANNUAL FPC RATE BASE	146690.373	154029.891	161726.135	169812.439	178303.061	2026414.203	101320.710
REVENUE REDUCTION	-54158.203	-59595.054	-65248.852	-71078.809	-77256.341	-692811.398	-34640.570
TOTAL REVENUE	92532.170	94429.797	96477.283	98733.631	101046.721	1333602.812	66680.141
TARIFF CONSTRAINT FACTOR	.631	.613	.597	.581	.567	.658	.658
LEVERAGE							
LONG-TERM (FUNDED) DEBT TO EQUITY	.527	.449	.376	.309	.247	.670	.670
LONG-TERM (FUNDED) DEBT TO CAPITAL	.345	.310	.273	.236	.198	.401	.401
LONG-TERM (FUNDED) DEBT TO ASSETS	.305	.271	.237	.203	.169	.366	.366
PROFITABILITY							
OPERATING INCOME (FPC RULES)	23266.059	22342.406	21388.806	20435.250	19481.780	431464.801	21573.240
ANNUAL FPC RATE BASE	232838.301	223278.496	213728.691	204178.887	194629.082	4440379.000	222018.949
RATE OF RETURN ON RATE BASE (%)	10.006	10.007	10.007	10.009	10.010	9.717	9.717
RATE OF RETURN ON PAID-IN CAPITAL (%)	10.907	11.352	11.827	12.413	12.888	10.177	10.177
RATE OF RETURN ON TOTAL EQUITY (%)	4.112	4.104	4.101	4.126	4.108	5.055	5.055
RATE OF RETURN ON TOTAL CAPITAL (%)	2.693	2.833	2.979	3.152	3.296	3.027	3.027
ENERGY CONSUMPTION							
ANNUAL ENERGY USAGE OF GAS (MMCSF)	10660.011	10660.011	10660.011	10660.011	10660.011	129259.623	6462.981
ANNUAL ENERGY COSTS	31469.182	33042.641	34694.773	36429.511	38250.986	345617.285	17280.864
UNIT COST OF ENERGY ($)	2.952	3.100	3.255	3.417	3.588	46.954	2.348
PRESENT VALUE OF ENERGY USED	6848.611	6537.311	6240.160	5956.517	5685.766	96433.670	.000
DISCOUNTED VALUE OF ENERGY USED (@ 10.00 %) =	96433.670						
ANNUAL ENERGY WASTED IN GAS (MMCSF)	.000	.000	.000	.000	.000	.000	.000
ANNUAL ENERGY WASTED COST ($)	.000	.000	.000	.000	.000	.000	.000
PRESENT VALUE OF ENERGY WASTED	.000	.000	.000	.000	.000	.000	.000
DISCOUNTED VALUE OF ENERGY WASTED (@ 10.00 %) =	.000						
OTHER MEASURES							
ANNUAL UNIT COSTS (TOTAL)	685.334	696.773	708.124	719.591	733.425	11111.184	555.559
PRESENT VALUE OF AVERAGE UNIT COSTS	149.366	137.853	127.362	117.659	109.019	4341.994	217.100
DISCOUNTED AVERAGE (ANNUAL) UNIT COSTS (LONG-RUN AVERAGE COSTS) (@ 10.00 %) =	217.100						
NET ONE (BOOK PROFIT)	9579.125	9968.945	10385.900	10901.066	11318.151	187683.605	8937

Fig. 7.2.2-4

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PRESENT VALUE OF BOOK PROFITS          2084.479   1972.303   1867.996   1782.412   1682.371  76669.853   3783.493
DISCOUNTED VALUE OF BOOK PROFITS (@ 10.00 %) =      75669.853

NET CASH GENERATED DURING THE PERIOD   9482.632   9296.689   9426.437   9636.757   9855.664 213159.986  10150.475
PRESENT VALUE OF NET CASH GENERATED    2063.697   1839.301   1695.428   1575.687   1464.982  90465.479   4523.274

DISCOUNTED NET CASH FLOW (@ 10.00 %) =              90465.479

DISCOUNT FACTOR (@10.000 %) =              .218       .198       .180       .164       .149       .000       .000

******     INTERNAL RATE OF RETURN     ******

DCF - ROI OF %      .000  (FROM YEAR  1  OVER 10 YEARS) =   5.08 %

DCF - ROI OF %      .000  (FROM YEAR  1  OVER 15 YEARS) =   8.83 %

DCF - ROI OF %      .000  (FROM YEAR  1  OVER 20 YEARS) =  10.43 %

******     AND THAT'S THE WAY IT WILL BE ....          THIS IS THE S-CUBED FINANCIAL PROJECTION MODEL *JFM* VERSION #5    090176

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the 20-year internal RoI or DCF has almost doubled to 10.43%. By lowering the initial D/E ratio until all the investment credit is used, this return could be further improved.

Now, it is important to note that the life of an investment credit is seven years. Thus, if the payback period were seven years, or an earning rate of 14.3%, the improvement would recover all of its investment credit. In these circumstances, the decision to install the improvement might be made independently of any tax credits from other parts of the pipeline system. But since the maximum allowed payout rate is 10%, the improvement cannot be considered as a stand-alone decision.

If an improvement is proposed as part of the original plant, then the initial investment credit is increased by the cost of the improvement. The result is to further increase the problem of recovering the credit, and as has been seen above, the solution lies in reducing the D/E ratio. And since the credit for the improvement cannot be recovered in seven years, the amount of the equity must be increased by more than just the cost of the improvement. While this may be acceptable in principle, it has the effect of forcing the operator further into the banking business. To an operator who wants to concentrate on the pipeline business, this may not be acceptable for a number of reasons, one of which might be that he cannot afford to be his own banker.

The retrofit situation may be quite different. After the recovery of initial investment credits and loss carry-forwards has been resolved, it may be possible to install the improvement without losing any other investment credits then on the books or anticipated. And, as has been seen in the previous section, if this is done with borrowed capital, the RoI associated with the investment may be extremely high.

7.2.3 ICC Profit Limitation

The distinctions between ICC and FPC rules were briefly identified in Section 7.1 above. To explore more quantitatively the effects of these differences, two sets of comparison cases were run. None of these cases is identical with those previously presented, but among themselves they are identical in all respects except in the comparison variables. A 10% limit on profit was taken, with initial equity of 40%. Both 8% and 10% interest rates were used. The resulting RoI's are presented below.

Internal RoI (DCF)

	FPC		ICC	
Interest (%)	8	10	8	10
10 years	7.34	3.34	14.56	13.47
15 years	10.98	7.27	17.86	16.98
20 years	12.43	9.04	18.82	18.02

As would be expected, when the interest rate equals the profit limit, the FPC case does very poorly because of the difference in treatment of interest expense. This case probably represents an overly severe situation. That is to say, in actual practice a gas pipeline with 40% equity which had to pay 10% for money would be able to obtain approval for a better rate of return. The 8% interest case, on the other hand, probably represents something better than could be expected, and the relative advantage under ICC rules is accordingly much less.

The small difference in RoI's under ICC rules between two such drastically different interest rates is illustrative of the fact that once the 10% limit on return is reached, there is little more that can be done to improve matters.

7.2.4 Modifications of the Regulatory System

A general conclusion which emerges from the preceding discussion is that in many cases, possibly a large majority, a pipeline operator has little or no financial incentive to adopt energy-conservative innovations because of regulatory laws and policies. This observation naturally raises the question, what changes in the regulations would provide such incentive? Unfortunately, as is clear to the reader who has carefully studied the examples presented, there is no general or straightforward answer to that question, although some suggestions appear to be in order.

7.2.4.1 The National Replacement Value of Fuel

Consider first the case of a gas pipeline which is in the fortunate position of having large reserves. Since the demand for gas is universally strong, such a pipeline will operate at the FPC-decreed limit upon return of approximately 10% of valuation. Even under that limitation, such a pipeline, operating at or near capacity, is a very attractive enterprise, i.e., it is a cash generator. The money which it yields is likely to be invested in diversification ventures which offer prospects of return greatly exceeding 10%. In considering an energy-conservative innovation, the decision may well be reduced to a choice of reinvesting in the pipeline at 10% return or of diversifying at returns considerably exceeding that. If the decision is based upon the single criterion of profit, energy conservation loses.

However, the decision may well be based upon several criteria, for several reasons. First, good cash generators, like good racehorses, deserve good care and usually receive it, even though each such individual expenditure may not be justified by a rigorous tradeoff analysis. Second, gas pipeline managements in general are sensitive to pressures for energy conservation to a degree much greater than the economics alone would dictate.

In the conduct of this study, it has been found that every company of the nearly a dozen with whom the subject was discussed has a strong and definite policy of conserving gas. The policies invariably emanate from the highest management level, i.e., president and/or board chairman, and in some cases are quite formalized. An instance was encountered of an engineering director who was ordered, against his recommendation, to proceed with a gas-saving project despite a payout which even at current new gas prices required many years.

There are other reasons why the discussion of the earlier sections, which proceeded much as though it were the financial vice president or controller who would make the determination regarding innovations, does not completely reflect the actual case. While a behavioristic study of pipeline management has not been a part of the present program, the strong impression has been acquired that such decisions lie primarily with the operating department. Almost every company has a vice president for operations who is responsible for getting the gas to the customers. Virtually nothing, no matter how attractive, economically or otherwise, is done to the system if that individual opposes it. Conversely, if the system is operating at high throughput, anything that he wants in the system generally goes in, provided that its addition to the rate base is acceptable to the FPC.

The situation with a high throughput gas company, then, will generally be that management will be receptive, as a matter of policy, to a proposed energy-conservative innovation. The strongest obstacle to acceptance is likely to be the projected impact upon the quantity and/or reliability of deliveries. If the proposal overcomes that obstacle, and if the economics are reasonable, the proposal may well be adopted even though the return is somewhat less than the best obtainable elsewhere.

In the case of a line which is operating at low throughput, and thus earning less than the allowed limit upon return, the same general

considerations apply. The differences are that the economics will be more favorable to the innovation because the realized profit on the innovation itself can be much greater than the overall limit of approximately 10%.

It must be noted that there are two important operative processes in the FPC regulation. First is the effect of the limitation upon return (profit) which has been discussed earlier. This limitation is applied as a specified fraction, approximately ten percent, of the valuation (rate base). The second operative process is that by which a capital expenditure is approved for addition to the rate base or valuation. The FPC reviews all such additions for reasonableness to ensure that the companies do not inflate their rate base and hence their profit. In the case of an energy-conservative device, the reasonableness is judged upon an economic study which charges gas consumed in pipeline operations to those operations at the price actually paid for the gas.

Consider now the case of an innovation which meets the company criteria. The next step is to obtain FPC approval to add the cost of the improvement to the rate base. The engineers' tradeoff studies which support this proposal will use as the cost of gas consumed (or saved) the cost which is reflected in their accountants' books. That cost, by FPC rule, is the price actually paid for the gas at its point of entry into the system. In many cases, that price reflects a regulated price in existence many years earlier when a contract was signed and is an order of magnitude below the new interstate and/or intrastate price. Thus, worthwhile improvements may be rejected simply because the benefit is being compared with what it would have been years earlier when the contract was signed.

The way to avoid such rejections is to instruct the companies to use as the cost of gas in their economic studies justifying additions to the rate base, the present replacement value of the gas to the nation as a whole. The effect would be to make it easier for energy-conservative innovations to enter the rate base. The result would be a national energy

savings for which the consumers would pay an increased cost equal to the amortization of the rate base increase plus approximately 10%, the latter amount representing the annual allowed profit on the rate base increase.

This appears to be an eminently fair way to encourage energy conservation, and it is therefore recommended that further research into its ramifications be performed so that a definitive legislature recommendation can be developed. And while it requires some (subjective) determination of the appropriate replacement value of gas to the nation as a whole, its application is otherwise simple in that, once that value is determined, neither the FPC nor the companies are required to do anything differently than at present. The replacement value determination could be made by the FEA, or the proposed DoE, and transmitted to the FPC and the companies, and the regulatory system would proceed with business as usual.

The foregoing recommendation was developed from considerations relating to gas pipelines. The situation with the oil pipelines is similar, but with several differences. Besides the different treatment of interest cost discussed in Section 7.2.3, there is the fact that, rather than consuming their own cargo which, in the case of the gas lines, is also their own property, the oil lines must purchase their pumping energy from others. Even those few product lines using diesel-driven pumps and therefore consuming cargo directly from the line usually do not own the fuel. Thus, conservation of energy in an oil pipeline does not permit increased deliveries to customers, so that the oil line operator does not have that incentive, as is the case with gas.

Additionally, while the concept of replacement value of natural gas to the nation as a whole is certainly clear and does not seem excessively difficult to apply, the determination of the replacement value of electricity is more complex. Whether the electric power plant which powers the pumps is fueled by natural gas, petroleum, or coal will certainly make a difference. And since transportation cost of the electric plant fuel is not

reflected in the liquid pipeline operating cost, as is the case with gas, location must also be considered. Nonetheless, the concept appears to hold sufficient merit to justify further research, and it is strongly recommended that such research be performed.

7.2.4.2 The Rate Base Allowance

The concept which has just been introduced regarding a national replacement value for fuel was designed to encourage entry of energy-conservative innovations into the rate base. However, the basic limitation upon the pipeline operator's incentive which derives from the profit limitations still applies. The gas pipeline operator can still enjoy a return of only 10% on the cost of the energy-conservative device. The liquid line operator is even worse off. The reader will recall from Section 3.1.1.2 that the consent decree of 1941 limits dividends to shipper-owners to 7% of valuation (rate base). Since most of the liquid lines are shipper-owned, the practical effect of the consent decree is that most of the products and crude pipeline operators are limited to 7% profit.

Now, if it is desired to stimulate energy conservation in the most straightforward way, i.e., by making it more profitable than otherwise, then a mechanism is needed to allow the companies to keep some of the profit, beyond the regular limit, which the energy-conservative innovation will generate. The mechanism should be simple to apply and should operate equally for all companies. Also, it appears undesirable to have the issue entangled with the income tax laws, which are already an unintelligible maze of needlessly complex and discriminatory provisions and which are a never-ending source of controversy.

It is proposed to accomplish the objective and avoid the pitfalls identified above through the mechanism of what will be termed a "rate base allowance for energy conservation." The basic concept is to allow the operator to make twice his regular profit on an energy conservative

innovation. The mechanism is simply to permit an addition to the rate base in the form of an allowance which would be equal to the cost of the innovation. In other words, for purposes of rate-making valuation the innovation would be capitalized, and depreciated, at twice its approved (for valuation purposes) cost. Advantages of this approach include the fact that, once the allowance is made, no further accounting or auditing is necessary.

It was noted earlier, in Section 7.1, that the ICC valuation (rate-base) is not established by customary, straightforward accounting procedures. Table 7.2.4.2-1 shows an example, taken from the public record, of an actual ICC valuation. It is seen that the process inflates the book value depreciable assets to a weighted average between depreciated original cost and depreciated reproduction cost. Thus, a new addition only raises the rate base by the ratio of original cost less depreciation to reproduction cost less depreciation, which in this case is 38% of its cost during the first year of its life. Thereafter, its part of the rate base is continually escalated to allow for inflation of reproduction cost, so that in the last year of its life the fully inflated cost is allowed.

It is also apparent that since the valuation process is applied to the entire aggregate assets, the effect of relatively small improvements is likely to be lost in the process noise, and discussions with pipeliners confirm this inference. Among the engineering and operating people, who do the ground work of justifying such additions, and the middle management levels, who approve them, the primary concern is RoI, and projects rarely stimulate their enthusiasm unless returns above 15% are anticipated. Of course, within large projects, which becomes the subject of discussion between operating and financial officers, the effect upon rate base is sure to be a consideration.

Table 7.2.4.2-1

Shell Pipe Line Corp. I.C.C. Valuation
(December 31, 1967)

1.	Physical property other than land and rights-of-way		
	a. Reproduction cost new		$241,689,607
	b. Reproduction cost new, less depreciation		123,555,475
	c. Percent new		51.122%
	d. Original cost		149,292,952
	e. Original cost less depreciation (d x c)		76,321,543
	b - $123,555,475	61.816%	76,377,052
	e - 76,321,543	38.184%	29,142,618
	Total - $199,877,018	100.000%	$105,519,670
2.	Going concern value - 6%		6,331,180
3.	Present value of rights of way		2,045,728
4.	Land:		
	PV $260,190		
	OC 488,386		
	$748,576 ÷ 2		374,288
5.	Working capital		756,700
	Total		$115,027,566
	Rounded to		$115,027,600
	Issued by Commission		$115,028,300

It is also recognized that a considerable amount of other research is necessary to develop a definitive proposal for legislation to accomplish the objective or providing incentive for pipeline energy conservation. Similarly, the other new regulatory concept that was presented in Section 7.2.4.1 also requires further research. It is strongly recommended that such research be performed.

7.2.4.3 Recommendations for Further Research

The preceding recommendations addressed only the objective of stimulation of capital investment for energy conservation. As was noted, strong advantages of the mechanisms proposed are:

(1) Only a single change in the law is needed. Once the improvement has been admitted to the rate base and the rate base allowance has been granted, it is not necessary to change anything else. The FPC and ICC regulations, and the consent decree, still apply and in the same way.

(2) No change in procedures is needed. The FPC and ICC continue to evaluate justifications for rate base additions in exactly the same way, without changing any of their procedures.

However, in the area of energy-conservative operational techniques no such straightforward mechanism was found. For example, if an additive was developed that would reduce friction and save energy, it would not require any significant capital investment - only the additional operating cost of buying the additive. Another example is the royalty on computer software to optimize pump use (see SSS-R-77-3025 of this series, discussion of pump motors and duty cycles). At present such improvements simply are not adopted until they justify themselves at whatever price is being charged on the books for energy. A straightforward mechanism for encouraging such devices at the true national value of energy is needed, but has not been found thus far in this study. Further research is strongly recommended.

REFERENCES

1. Federal Power Commission Laws and Hydroelectric Power Development Laws, Government Printing Office, 1966.

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