Missouri Gas Energy
Regulatory Jurisdictions Including Environmental Costs in Rates

California

Colorado

Connecticut

Delaware

Florida

Georgia

Illinois

Iowa

Kentucky

Maine

Maryland

Massachusetts

Michigan

Minnesota

Montana

New Hampshire

New Jersey

New York

North Carolina

North Dakota

Pennsylvania

Rhode Island

South Carolina

Vermont

Wisconsin

Schedule MRN-1

Surrebuttal Schedule MRN-2
Page 1 of 9

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

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REGULATORY COMMISSION

Williams Natural Gas Company) Docket No. RP93-109

COMMENTS OF THE
MISSOURI PUBLIC SERVICE COMMISSION
IN SUPPORT OF STIPULATION AND AGREEMENT

Pursuant to Rule 602(f) of the Federal Energy Regulatory Commission's ("Commission") Rules of Practice and Procedure, 18 C.F.R. §385.602(f), the Missouri Public Service Commission ("MoPSC") hereby submits its comments in support of the Stipulation and Agreement of Settlement ("Stipulation") filed on January 31, 2001 in the above captioned proceeding.

The MoPSC is a "state commission" within the meaning of Section 1.101a(k) of the Commission's general regulations. The MoPSC has actively participated in this proceeding to protect the interests of Missouri's natural gas consumers who receive service from Williams Gas Pipelines Central, Inc., formerly known as Williams Natural Gas Company (Williams).

This Stipulation is the result of extensive negotiations between the parties in this case. If the Commission approves this Stipulation, it will settle the issue of Williams' recovery of its environmental clean-up costs. The Stipulation establishes an annual environmental cost of service allowance of $1,700,000 for the rates associated with this docket's locked-in period. This means that Williams is due an additional $1,012,150, which will be offset against the $2,808,519 refund Williams owes customers for environmental cost recoveries from third-party insurers during calendar year 2000.

Since Williams refunded the balance of the environmental cost recovery moneys on January 31, 2001, the Stipulation is considered to be consistent with the public interest and to be a fair and reasonable resolution of the remanded environmental cost issue in this docket.

WHEREFORE, for the foregoing reasons, the MoPSC respectfully requests the January 31 Stipulation and Agreement be certified by Presiding Administrative Law Judge Harfeld and approved by the Commission.

Respectfully submitted,

DANA K. JOYCE
General Counsel

Lera L. Shemwell TRS
Lera L. Shemwell
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CERTIFICATE OF SERVICE

Pursuant to Rule 2010 of the Commission's Rules of Practice and Procedure, I hereby certify that I have this day served a copy of the foregoing document on all persons designated on the official service list compiled by the Secretary in this proceeding,

Dated at Jefferson City, Missouri this 16th day of February, 2001.

Lera L. Shemwell TRS
Lera L. Shemwell

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Williams Natural Gas Company) Docket No. RP93-109

STIPULATION AND AGREEMENT
(January 31, 2001)

Pursuant to Rule 602 of the Rules of Practice and Procedure of the Federal Energy Regulatory Commission (Commission), 18 C.F.R. § 385.602, Williams Gas Pipelines Central, Inc., formerly named Williams Natural Gas Company (Williams), submits this Stipulation and Agreement in settlement of the remaining contested issues in the captioned proceeding.

DESCRIPTION OF PROCEEDING

On April 30, 1993, Williams made a general Section 4 rate filing (Docket No. RP93-109). The Commission suspended the effective date of the proposed rate increase until November 1, 1993, and set the matter for hearing.[1] Evidentiary hearings before an ALJ were conducted in 1994. Initial and reply briefs were filed by various parties. Among the many issues addressed at the hearing was the issue of Williams' recovery of its environmental costs. Williams proposed to amortize over a three-year period actual past period costs of $4.2 million instead of projecting environmental costs under a test period methodology. By amortizing these costs over three years, Williams would have been allowed to recover $1.4 million each year. On November 22, 1995, the Presiding Judge issued an Initial Decision which approved the three-year amortization with a procedure for refunding any amounts Williams recovered from third parties, such as liability insurance carriers or the suppliers of the PCB-laden material.[2] Several parties filed exceptions to the Initial Decision. Williams filed a new Section 4 rate case in 1995,

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[1] Williams Natural Gas Co., 63 FERC ¶ 61,241 (1993).

[2] Williams Natural Gas Co., 73 FERC ¶ 63,015 (1995).

with the result that the instant rate case covers a locked-in period of November 1, 1993, through July 31, 1995.

On December 19, 1996, the Commission affirmed in part and reversed in part the ALJ's Initial Decision.[3] The Commission rejected Williams' proposed amortization in favor of the "test period" method.[4] The Commission determined that the $1.4 million annual amount that the participants and the ALJ arrived at using an amortization method was a reasonable equivalent of Williams' actual Polychlorinated Biphenyl (PCB) clean-up related test period costs for use as a projection of Williams' future annual PCB costs under the test period methodology.[5]

On rehearing, Williams did not contest the Commission's requirement that it recover these costs based on a test period methodology but it did assert that the Commission erred in adopting an annual allowance of $1.4 million for PCB clean-up costs. The Commission ruled that the $1.4 million was a reasonable representation of the level of these costs to be recovered in rates given the record that had been developed.[6] Williams appealed that decision to the D.C. Circuit Court of Appeals.

The court granted Williams' petition and remanded the PCB issue to the Commission finding that it had not adequately explained why it had approved use of the $1.4 million figure. The court found that an allowance developed under an amortization method is not useful for applying past experience to project future costs as required by the test period method. The court

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[3] Williams Natural Gas Co., 77 FERC ¶ 61,277 (1996).

[4] 18 C.F.R. § 154.303.

[5] Williams Natural Gas Co., 77 FERC ¶ 61,277 at 62,181-183 (1996).

[6] Id. at 61,679-80.

also found that the Commission had not explained why Williams' $3.9 million "test period actual" figure was inadequate.

On October 13, 2000, the Commission directed the Chief Administrative Law Judge to appoint an Administrative Law Judge to preside over a hearing in this matter and encouraged the parties to reach a settlement. Williams has filed direct supplemental testimony, the Staff and Intervenors have engaged in discovery, and the parties have spent considerable time discussing settlement. This Stipulation and Agreement is a product of those discussions.

This Settlement is supported by all parties active in these proceedings and resolves all outstanding issues in this docket.

SETTLEMENT PROVISIONS

ARTICLE I

Environmental Cost of Service

Williams will be entitled to recover an annual environmental cost of service of $1,700,000 for the locked-in period applicable in this docket. The Commission originally allowed Williams to recover an annual cost of service of $1,355,813 for the locked-in period applicable in this docket. Applying the settlement environmental allowance to the original amount authorized by the Commission for the locked-in period results in a net additional amount due Williams of $1,012,150 including interest at the Commission's established rates through January 31, 2001.

ARTICLE II

Collection

Williams will collect the net cost of service increase of $1,012,150 by set-off against the pass-through of insurance proceeds due on January 31, 2001. During calendar year 2000, Williams collected $2,808,519 from third-party insurers related to its environmental costs, including interest at the Commission's established rates through January 31, 2001. Under the Commission's prior orders in this proceeding, Williams is required to pass through to its customers 90% of any such third-party collections.[7] Williams has therefore allocated to its customers $2,527,667 of its third-party collections. To effect the set-off provided for herein, Williams will refund a total of $1,515,517 to its customers on January 31, 2001.

ARTICLE III

Allocation and Payment

A. Williams will allocate its net pass-through of third-party proceeds to its firm customers based on firm reservation revenues during the twelve months ended September 30, 2000. The allocation, reflected on Appendix A, sets forth the amount to be refunded to each party under the terms of this Settlement.

B. Williams will make the refunds on Appendix A to each of the customers listed thereon on or before January 31, 2001.

C. If the Commission should issue a final and non-appealable order directing Williams to pass-through the net amount due under this Settlement in a manner inconsistent with Appendix A, Williams will have the right to correct each party's net refund by adjusting the amount of any future pass-through of third-party environmental collections, if any.

D. The parties agree that Williams' future pass-through of third-party environmental proceeds, if any, should be allocated to Williams' customers based on firm reservation revenues for the twelve months ended on the September 30 immediately preceding the date on which the

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[7] Williams Natural Gas Co., 77 FERC ¶ 61,277 at 62,182 (1996); Williams Natural Gas Co., 73 FERC ¶ 63,015 at 65,075 (1995).

pass-through payments are made. Any future payments related to third-party environmental proceeds shall continue to be refunded to customers by the 31st of January following the calendar year in which Williams receives the third-party proceeds. Williams will file a refund plan consistent with the allocation set forth in this paragraph no less than 30 days prior to the date on which refunds are required.

ARTICLE IV

Refund Report

This Stipulation and Agreement will serve as Williams' refund report in this proceeding related to its obligation to pass-through a portion of the third-party proceeds it received during calendar year 2000. The Commission's Order approving this Stipulation and Agreement will constitute approval of Williams' refund report and will resolve all remaining issues in this docket.

ARTICLE V

Effective Date

The Commission's order approving this Stipulation and Agreement shall constitute a waiver of the Commission's Rules and Regulations, including 18 C.F.R. Part 154, Subpart C, to the extent necessary to effectuate all of the provisions of this Stipulation and Agreement. This Stipulation and Agreement shall be effective on January 31, 2001, regardless of the date on which the Commission approves this Stipulation and Agreement.

ARTICLE VI

General Reservations

This Settlement Agreement is submitted for Commission approval pursuant to Rule 602 of the Commission's Rules of Practice and Procedure. If it does not become effective for any reason it shall be considered privileged and not admissible in evidence or made a part of the record in any proceeding.

ARTICLE VII

Waiver of Regulation

Commission approval of this Settlement Agreement shall constitute the requisite waiver of any and all otherwise applicable Commission regulations to permit the implementation of the provisions hereof and a determination that the settlement is fair, reasonable, and in the public interest and consistent with NGPA § 502.

Respectfully submitted,

WILLIAMS GAS PIPELINES CENTRAL, INC.

Gary W. Boyle/TLW

Gary W. Boyle
The Williams Companies, Inc.
P. O. Box 2400
Tulsa, OK 74102

January 31, 2001

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

FILED
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In Reply Refer To:
Williams Natural Gas Company
Docket No. RP93-109

Williams Gas Pipelines Central, Inc.
P. O. Box 2400
Tulsa, OK 74102

Attention: Gary W. Boyle, Senior Counsel

Reference: Offer of Settlement (January 31, 2001)

On January 31, 2001, Williams Gas Pipelines Central, Inc., formerly known as Williams Natural Gas Company ("Williams"), submitted for filing with the Commission an offer of settlement including a Stipulation and Agreement ("Agreement") dated January 31, 2001. The offer of settlement is in the public interest and is accepted and approved.

On April 30, 1993, Williams filed a general Section 4 rate filing proposing, among other things, to amortize over a three-year period actual past period costs of $4.2 million. On November 22, 1995, the Presiding ALJ issued an Initial Decision approving the three-year amortization of environmental costs with a procedure for refunding amounts which Williams recovered from third parties. On December 19, 1996, the Commission affirmed in part and reversed in part the ALJ's Initial Decision rejecting Williams' proposed amortization in favor of the "test period" method and ruling that the $1.4 million was a reasonable representation of the level of environmental costs to be recovered in rates. Williams appealed that decision to the D. C. Circuit Court of Appeals. This Agreement arises out of The D.C. Circuit Court of Appeals remanded the environmental cost issue to the Commission finding that it had not adequately explained why it had approved a $1.4 million annual environmental allowance. The active parties engaged in discovery, Williams filed direct testimony and all parties spent time discussing settlement. The Agreement represents a final, comprehensive resolution of environmental costs in this proceeding.

Pursuant to Rule 602(f) (18 C.F.R. § 385.602(f)(2000)) of the Commission's regulations, initial comments were filed on February 20, 2001, and reply comments were filed on March 2, 2001. Presiding Administrative Law Judge David I. Harfeld certified the offer of settlement to the Commission with the filed comments.

The Commission finds that settlement offer reflected in the Agreement is in the public interest and it is accepted and approved. The Commission's approval of this settlement does not constitute approval of, or precedent regarding, any principle or issue in this proceeding.

By direction of the Commission.

David P. Boergers
Secretary

xc: All Parties on restricted service list

The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC UTILITIES

May 25, 1990

D.P.U. 89-161

Generic investigation of the facts surrounding and the ratemaking treatment of the costs of investigating and remediating hazardous wastes associated with the manufacture of gas during the period 1822-1978.

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<u>Intervenor</u>

I. INTRODUCTION

A. Procedural Background

In Berkshire Gas Company, D.P.U. 89-112, the Department of Public Utilities ("Department") issued an Interlocutory Order on Environmental Cleanup Issues ("Interlocutory Order"), dated August 18, 1989. The Order was occasioned by a request from Berkshire Gas Company ("Berkshire") in that rate case to include expenses in its cost of service for cleanup of hazardous material at a site owned by Berkshire. Contamination of the site resulted from disposal of coal-tar wastes and other residues from the now-discontinued process of manufacturing illuminating and heating gas from coal and other feedstocks.[1]

The Interlocutory Order directed Berkshire to present evidence and argument on at least ten issues related to cleanup of such sites. In brief, the required information concerned (1) site descriptions, (2) description of gas manufacturing conducted at such MGP sites, (3) industry knowledge, standards, and practice about MGP waste disposal and environmental hazards, (4) legal requirements concerning MGP waste disposal, (5) conformity of MGP waste disposal practices to the gas industry's knowledge and practice and to the law, (6) manner of site

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[1] These processes are referred to collectively as the manufactured gas process or "MGP" for short: hence, hereafter, "MGP plant sites," "MGP era," "MGP wastes," etc. See Section III of this Order for a description of the processes and their by-products and wastes.

acquisition, (7) insurance coverage in place, (8) description of environmental site reviews conducted preparatory to cleanup, (9) detailed cost estimates of cleanup work, and (10) appropriate ratemaking treatment of cleanup costs. Interlocutory Order, pp. 15-16.

B. Petition for a Generic Investigation

On July 18, 1989, Bay State Gas Company ("Bay State") petitioned the Department to initiate a generic investigation into the entire question of gas manufacture and environmental cleanup. The Department allowed that petition and opened the present docket. The Department designated James Connelly, Esq., as hearing officer. Technical staff of the Department's Rates and Research Division assisting in the investigation included Andrew Greene, Director, Paul Osborne, Linda Latham, and José Rotger.

On November 2, 1989, Bay State filed an amended petition ("Joint Petition") for a rulemaking proceeding in which it was joined by the Attorney General of the Commonwealth ("Attorney General"), Berkshire, Boston Gas Company ("Boston Gas"), Colonial Gas Company ("Colonial"), Commonwealth Gas Company ("ComGas"), Essex County Gas Company ("Essex"), and Fitchburg Gas & Electric Light Company ("Fitchburg"). The Joint Petition sought a generic inquiry, leaving apart site-specific investigations, into four of the issues listed in the Interlocutory Order: Issue 3, industry knowledge, standards, and practices; issue 4, legal requirements; issue 7, insurance;

and issue 10, appropriate ratemaking treatment. The Department also allowed the late-filed petitions of North Attleboro Gas Company ("North Attleboro") and Fall River Gas Company ("Fall River") to join in the petition and permitted the Energy Consortium, an association of industrial ratepayers, to intervene. On October 10, 1989, the Department issued an Order of Notice, requiring each gas company petitioner to publish notice, in accordance with the terms of G.L. c. 30A, § 2, and 220 C.M.R. 2.00 <u>et</u> <u>seq</u>., of the first public hearing in the docket on November 3, 1989.

Evidentiary hearings began on February 15, 1990 and ended on April 5, 1990 after seventeen days of testimony. The gas company petitioners jointly sponsored four witnesses to present in their case in chief: Kenneth F. Abraham, Esq., professor, University of Virginia Law School, Charlottesville; Andrew C. Middleton, principal, Remediation Technologies Inc., Pittsburgh, Pennsylvania; and William W. Hogan and A. Lawrence Kolbe, principals, Putnam, Hayes & Bartlett, Inc., Cambridge, Massachusetts. The Attorney General offered the direct testimony of Ronald H. Hill, industrial hygienist, Guilford County Health Department, Greensboro, North Carolina; and Timothy Newhard, financial analyst, utilities division of the Department of the Attorney General. The gas company petitioners also offered two rebuttal witnesses: Mr. Middleton and Barbara D. Beck, principal, Gradient Corporation, Cambridge. In addition to testimony given in the hearings, the evidentiary record consisted of 59 documentary exhibits sponsored by the gas company petitioners, 236 sponsored by the Attorney General, and 33 by the Department. The petitioners submitted simultaneous initial briefs on May 7, 1990.

C. Joint Motion to Approve a Settlement Agreement

On May 1, attorneys for the petitioner gas companies and the Attorney General ("Settling Parties") filed a Settlement Agreement ("Settlement Agreement") and accompanying Joint Motion for Approval of a Settlement Agreement and Termination of the Proceedings ("Joint Motion"). Ratification of the Settlement Agreement by their principals followed on May 4 and May 7 when executed copies of the agreement were filed with the Department. The Settlement Agreement is described and analyzed at length in Sections IV and V of this Order. In brief, the Settlement Agreement sets forth a detailed cost recovery mechanism to allow recovery over time of cost incurred to clean up MGP waste sites as directed by the cognizant environmental enforcement authorities. No objection to the Settlement Agreement was raised by any party to the investigation.

A second motion filed by the settling parties on May 10 sought extension of the date by which the Department would have to act upon the Joint Motion before the Joint Motion and the Settlement Agreement would expire on their own terms. The Department allowed the extension from May 15 to May 25. On May 18, the Settling Parties filed an amended second version of the Settlement Agreement. The amendments clarified possible ambiguities regarding the intended inclusion of the calendar year 1978 within the scope of Settlement Agreement. The amendments made no material change in the accord. On May 7, the Energy Consortium filed comments on the Settlement Agreement. The Energy Consortium expressed agreement with "the concept embodied in the Settlement Agreement," but suggested several modifications (Energy Consortium Comments, pp. 4-7).[2]

The remaining sections of this Order outline the legal, historical, and technical background of the production and cleanup of MGP wastes; describe the Settlement Agreement's provisions on recovery of MGP waste cleanup costs; analyze the Settlement Agreement in the context of the record assembled on the four issues that were the subjects of the Joint Petition; evaluate the Settlement Agreement against traditional ratemaking principles; and, finally, rule on the Joint Motion.

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[2] Because the Joint Motion requires the Department to consider the Settlement Agreement in its entirety, we do not endeavor to rule on whether the individual modifications suggested by the Energy Consortium are appropriate. Rather, we consider the Energy Consortium's comments in the context of whether the Settlement Agreement, as presented, should be approved.

II. THE LEGAL IMPETUS FOR CLEANUP OF MGP SITES

The investigation in this docket entailed an assessment of acts of the petitioner gas companies (or others for whom they may be responsible) relating to manufacturing gas during the period 1822-1978, which acts may result in future legal liability. The legal impetus behind MGP site cleanup arises from environmental protection and remediation legislation developed over the past twenty years and enacted in both Federal and Massachusetts jurisdictions. This legislation seeks to arrest and reverse actual and potential environmental damage resulting from the disposal of hazardous material on land.

At the Federal level, the key enactments are the Resource Conservation and Recovery Act ("RCRA"), 42 U.S.C. § 6901 <u>et</u> <u>seq</u>. (1982 & 1987 Supp. V), passed in 1976, and the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. § 9601 <u>et</u> <u>seq</u>. (1982 & 1987 Supp. V), passed in 1980. In order to promote expeditious remediation of contaminated sites, CERCLA imposes joint and several liability, without regard to fault,[3] for investigation and cleanup of any

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[3] Liability without fault under CERCLA and G.L. c. 21E is conceptually similar to, but, in fact, significantly distinguishable from the rule of strict or absolute liability under <u>Rylands</u> v. <u>Fletcher</u>, Law Rep. 3 H. L. 330, as adopted in <u>Ball</u> v. <u>Nye</u>, 99 Mass. 582 (1868). The distinction is important for purposes of our analysis, and so we note it early to emphasize it. Under <u>Rylands</u> and <u>Ball</u>, a plaintiff may recover damages for nuisance injury to his land without proof of (footnote continued)

such site on any person who generated, transported, or disposed of hazardous material there, who owned or operated the "facility" (42 U.S.C. § 9601[9]) where the hazardous material was generated, stored, or disposed, or who simply owned the land. The United States Environmental Protection Agency and Justice Department need make no showing of fault for liability

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negligence where a defendant "collects and keeps on his own land anything likely to do mischief if it escapes" and such escape, in fact, occurs. The defendant, it is said, "must keep it in at his peril[,] . . . is damnified without any fault of his own, and . . . should be held responsible to make good all damages, if he should not succeed in confining it to his own property." Fletcher v. Rylands, Law Rep. 1 Ex. 265 (Blackburn, J.), quoted in Shipley v. Fifty Associates, 106 Mass. 194, 198 (1870). Thus, since Ball was handed down, strict liability has effectively become a branch of nuisance (i.e., tortious interference with another's use of real property). Under CERCLA and G.L. c. 21E, on the other hand, escape of hazardous material from a landower's property onto that of another is not a necessary condition for liability to attach. The presence of such material in that part of the environment comprised by the landowner's property is alone sufficient. But cf. the observation of Mr. Justice Blackburn that the landowner's act of bringing "something on his property not naturally there" may be "harmless so long as it is confined to his own property." Id. Thus CERCLA and G.L. c. 21E extend strict liability well beyond the Rylands rule, which concerns the duty owed by landowners to one another, and establishes, in effect, the duty of each landowner to the sovereign to refrain, at his peril, from certain injuries to his own land as well as the land of others, all to advance the objective of environmental protection. Making a landowner liable to the state for injury to his own land (as distinct from restricting or enjoining uses obnoxious to neighbors or awarding damages for nuisance injury to a neighbor's land) is a great leap for the law and, arguably, a genuine discontinuity in its development (Tr. II, pp. 77-78).

to attach to a person in any of these categories. Dedham Water Co. v. Cumberland Farms, Inc., 689 F. Supp. 1223, 1225 (D. Mass. 1988). CERCLA seeks to protect against any release or threatened release of hazardous material, "release" being defined as "any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment." 42 U.S.C. § 9601(22).

The Massachusetts analogue of CERCLA is the Massachusetts Oil and Hazardous Material Release Prevention Act, G.L. c. 21E (1987), enacted in 1983.[4] Like its Federal counterpart, CERCLA, Section 5 of Chapter 21E establishes categories of person who may be strictly liable for costs or damages from the release or threatened release of hazardous material subject to certain exceptions long familiar in Massachusetts law. See Gorham v. Gross, 125 Mass. 232, 238 (1878); Cork v. Blossom, 162 Mass. 330, 333 (1894). Exceptions include acts of God, acts of war, and unforeseeable acts or omissions of third parties.

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[4] The record in D.P.U. 89-161 has benefited from the filing, at the hearing officer's request, of "Comments Regarding M.G.L. c. 21E Liability with Specific Reference to Coal Gas Sites" by Willard R. Pope, General Counsel, Massachusetts Department of Environmental Protection ("DEP") (Exh. DPU-32). Following the lead of G.L. c. 30A, § 14, the Department gives "due weight to the experience, technical competence, and specialized knowledge" of the DEP in setting forth our treatment of G.L. c. 21E in this Order. Bournewood Hospital v. Massachusetts Commission against Discrimination, 371 Mass. 303, 317 (1976).

G.L. c. 21E, § 5(c).

The Chapter 21E enforcement agency is the Massachusetts Department of Environmental Protection ("DEP"). That agency notifies persons who fit the statutory classes of liability known as Potentially Responsible Parties ("PRPs") of their potential liability by issuing a Notice of Responsibility ("NOR"). The DEP acts under what is known as the Massachusetts Contingency Plan ("MCP"), 310 C.M.R. 40.00 et seq., to identify, evaluate, and clean up sites contaminated by hazardous materials. Ideally, the DEP and PRPs work cooperatively to plan a voluntary evaluation and cleanup by the PRPs under DEP oversight. But DEP may also undertake to clean up the site on its own and seek recovery of its costs from the PRP later (Exh. DPU-32).

Cleanup of a site typically occurs in five phases. The first phase is the preliminary assessment to determine whether the property should be classified as a hazardous waste site under G.L. c. 21E and what priority status should be assigned to the site. The second phase systematically assesses the type, amount, and concentration of hazardous material on site and evaluates the threat to people or the environment posed thereby. The final three phases concern developing and effecting a plan for site remediation. If the threat is deemed imminent, short-term measures of may be warranted (id.). The remediation process is generally considered complex and costly (Exh. CO-2, pp. 43-50).

III. HISTORICAL AND TECHNICAL BACKGROUND

To establish the record context against which we have evaluated the Settlement Agreement, we trace the history of the MGP industry's development, identify the processes and feedstocks employed in manufacture, and discuss the process residuals that required disposal during the production years and may require remediation in the 1990s. The details are important to our analysis of the Settlement Agreement set forth in Section V.

A. Development of the Manufactured Gas Industry

The first practical application of gas produced by destructive distillation of coal is generally attributed to William Murdoch in 1792 (Exh. DPU-1, "Gas-Light," Encyclopaedia Britannica, 7th ed. [1842], p. 349, col. a). The first public exhibition of the MGP was made in 1802 by Phillipe Lebon in Paris (id., "Gas," Encyclopaedia Britannica, 11th ed. [1910], p. 483, col. a). In 1812, the Chartered Gas Light and Coke Company was authorized to light the streets of London with gas (id., col. b). In 1822, Boston Gas Light Company, the first gas company in Massachusetts and the second in the United States, was formed by a special act of the General Court (Exh. DPU-15-A, p. 7; Tr. III, p. 20). In the ensuing years, other gas companies were organized to supply gas to other cities and towns throughout Massachusetts through either special acts of the General Court or general corporation statutes (Exh. DPU-15-A).

Initially, the demand for gas was restricted to street lighting (Tr. III, p. 12). As technology developed, gas became available for indoor lighting, cooking, heating, and industrial demand (Exh. CO-2-A, p. 11). By 1900, manufactured gas works existed in many towns. Because the distribution mains of the time were of low pressure, gas works were only able to serve customers within a few miles of the plant (id., p. 14). Therefore, some larger cities had more than one gas works operating in the community (id.). Over the years, technological improvements allowed larger plants to be constructed, and many smaller plants were either consolidated or retired (id., pp. 14-15).

With the development of electricity in the late nineteenth century, the gas industry gradually lost its lighting business and concentrated on other markets, including domestic and commercial heating and cooking (id., p. 11). The development of gas appliances in the early 20th century made gas available for water heating, domestic laundry needs, and refrigeration (id., p. 13). Multiple industrial applications also created their demand during this period (id.).

The introduction of natural gas pipelines throughout the United States, starting in the late 1940s, sounded the death knell for the MGP. Because natural gas was a less costly fuel and had a higher British Thermal Unit ("Btu") content, it quickly supplanted manufactured gas as a base load supply source (Exh. DPU-18, p. 1). With the extension of natural gas pipelines into Massachusetts by the early 1950s, gas utilities generally converted to natural gas distribution. See Tatten v. Department of Public Utilities, 330 Mass. 360 (1953) (facts surrounding establishment of gas pipeline and eminent domain taking pursuant to St. 1950, c. 462). The gas utilities ceased manufactured gas production, with the exception of some high-BTU oil gas plants which were used for peak-shaving purposes into the 1960s and early 1970s (Exh. CO-2-A, pp. 13-14). The last operational manufactured gas works in Massachusetts, a high-Btu oil gas facility in Lowell, was retired in 1975 (Exh. DPU-6).

To make space available for other purposes, and to reduce property taxes, manufactured gas works were dismantled after their retirement (Exh. CO-2-A, p. 9). Decommissioning consisted of razing the above-ground structures to grade and using demolition rubble to fill in resulting holes (id., pp. 9-10). Below-ground tanks and pipes were purged of gas and left in the ground (Exh. DPU-29; Tr. XVII, pp. 91-93). Cinders and tar liquids were disposed of on-site, and spent oxides were disposed of both on- and off-site (Exh. DPU-29).

In 1985, the Radian Corporation issued a report ("Radian Report") listing 89 former manufactured gas works in Massachusetts (Exh. DPU-17). During the investigation in this docket, the petitioner gas companies reported that they had found an additional seven sites (Exh. DPU-6). This does not exhaust the list of MGP sites in Massachusetts, for the record indicates the existence of other gas utilities and MGP sites that are not found in the Radian Report and at least one additional MGP site in Brockton (Exhs. DPU-7; DPU-15-A). While many of the former manufactured gas works were operated by the petitioning gas companies or their corporate predecessors, other sites were operated by companies that are no longer in operation and have no relationship to the petitioning gas companies (Exh. DPU-6). A number of sites established by the gas company petitioners or their predecessors are still in use for utility purposes (id.). Other sites had been sold over the years, and are no longer used in the gas industry (id.). At the present time, there are 24 former MGP plant sites on DEP's list of sites to be investigated and 17 sites where manufactured gas wastes were disposed (Exhs. DPU-4; DPU-5).

B. Manufactured Gas Processes

1. Coal Carbonization

The first significant method of manufacturing gas was the coal-carbonization process. Coal carbonization entailed burning a carbon in a closed retort, in the absence of oxygen. This method drove off volatiles (Exh. CO-2-A, pp. 17-13). The resulting gas was rich in hydrogen and methane and had a heat content of about 600 Btu per cubic foot (Exh. DPU-18, p. 25). Coal gas was used throughout the manufactured gas period (Exh. CO-2-A, Sch. 3).

The feedstock for the coal-carbonization process was coal or coke. Coal was extensively used until the 1890s, when the United States steel industry introduced by-product coke ovens

(Exh. DPU-18, p. 17). The development of the by-product coke oven made ample supplies of coke readily available as a feedstock in the coal-carbonization process (id., pp. 17, 19). The first by-product coke oven installed in the United States devoted to manufactured gas production was in Everett, Massachusetts, in 1898 (Tr. III, p. 45). Eventually, coke from by-product coke ovens became the major source of feedstock for manufactured gas operations (Exh. DPU-18, pp. 17-18).

2. Water Gas

Although there were experiments as far back as the 1780s concerning the effect of steam on heated carbon, a process for manufacturing gas by passing steam over a bed of incandescent carbon was first sucessfully developed by T.S.C. Lowe in 1873 (Exh. DPU-1, "Gaseous Fuel," Encyclopaedia Britannica, 10th ed. [1902], p. 602, col. a). In this process, steam reacts with the carbon to produce a fuel gas composed primarily of carbon monoxide and hydrogen (Exhs. AG-72; DPU-18, p. 24). As the resulting gas had a low heat content of about 300 Btu per cubic foot and contained few illuminants, or bright-burning hydrocarbons, water gas was produced primarily for heat rather than for illumination (Exh. DPU-18, p. 24). Because water gas burned with a clear or blue flame, it was commonly referred to as "blue" gas (Tr. III, pp. 108-109).

Shortly thereafter, it was discovered that by spraying a petroleum oil into water gas and running the mixture through a superheater, the molecules of vaporized oil and petroleum would chemically "crack" and break down into products that would remain in the gas steam, thereby raising the Btu content of the gas (Exhs. AG-73; DPU-18, pp. 110). The resulting gas had a heat content of about 600 Btu per cubic foot and was therefore suitable for illumination (Exh. DPU-18, pp. 109-110). Gas produced by this method was technically called "carbureted water gas," but was widely known as "water gas" (Exh. DPU-13, Tr. of September 10, 1888, pp. 2-3). Because the carbureted water gas process used equipment that had a longer useful life than coal carbonization retorts and because the process initially produced fewer residuals and provided for almost complete conversion of feedstocks to gas, carbureted water gas eventually became the predominant gasification process in the United States (Exh. DPU-1, "Gaseous Fuel," Encyclopaedia Britannica, 10th ed. [1902], p. 602, col. a).

3. Oil Gas

Carbureted water gas required both oil and a form of carbon as feedstocks. Although oil was readily available along the Pacific Coast, it was expensive to transport coke or coal to the region (id., pp. 15-16). This economic disadvantage led to the modification of the carbureted water gas process to eliminate the need for coal or coke (Exh. DPU-18, p. 42). Oil gas was made without coal or coke. The oil gas process involved injecting a mixture of steam and oil into a previously heated generator (Exh. AG-74). Oil gas was initially discovered in England in 1815, and the New York Gas Light Company relied exclusively on oil gas distilled from retorts until 1829 (Exhs. DPU-18, p. 42; DPU-1, "Gas," Encyclopaedia Britannica, 9th ed. [1879], p. 100, col. a). An oil gas technique using refractory materials was developed in 1889, and the first modern oil gas plant was installed in California in 1902 (Exh. DPU-18, p. 42). Oil gas was eventually used throughout the country (Exh. DPU-17). However, oil gas found only limited use in Massachusetts until after World War II (id., Exh. DPU-18, p. 46).

Because of the availability of natural gas starting in the late 1940s, a number of carbureted water gas plants were converted to high-Btu oil gas facilities to make a product compatible with natural gas (Exh. DPU-18, p. 43). The coke feedstock used in the water gas generator was replaced with a high-temperature refractory brick, and oil sprays and other oil-handling equipment were added (id., p. 51). These plant modifications enabled the production of a high-Btu content oil gas for peak demand at a relatively low cost (id.).

4. Other Processes

Other manufactured gas processes were used throughout the manufactured gas period. Some were variations of the processes just described, and others were distinct on their own terms. Exh. DPU-1, "Gaseous Fuel," Encyclopaedia Britannica, 10th ed. [1902], pp. 603-604) The latter included rosin gas, whale oil gas, acetylene gas, wood gas, peat gas, and petroleum gas (id., "Gas," Encyclopaedia Britannica, 9th ed. [1879], p. 100, col. a;

DPU-18, p. 57). Rosin gas, created by burning pine resin in heated retorts, and whale oil gas, created by burning whale oil in heated retorts, were used to a certain extent during the beginning years of the manufactured gas era, until the development of bituminous coal deposits in the United States around 1840 (Exh. DPU-18, pp. 54, 57). Because gas works using these processes tended to be small-scale operations which produced a mimimal level of wastes, sites that exclusively used these processes are expected to pose minimal hazards (id., p. 54).

Acetylene gas was produced by burning limestone and coal in an electric furnace, producing calcium carbide, which was then reacted with water (Exh. DPU-16, pp. 3-22). A number of small-scale gas works produced acetylene gas in Massachusetts at the turn of the century, but all of these had ceased operations by 1921 (Exh. DPU-15-A). The major waste product associated with acetylene gas was lime sludges, which, according to Mr. Middleton, do not pose an environmental danger (Tr. IV, pp. 111-112).[5]

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[5] In addition, Buzzards Bay Gas Company manufactured butane-air gas from 1930 until 1946, when it added propane-air to its supply mix. 1946 Annual Return to the Department.

C. Residual Products From Manufactured Gas Operations

1. Description

The different production methods produced a variety of residuals.[6] The coal-carbonization process produced coke, coal tars, ammoniacal liquor, ash, and "clinkers."[7] (Exh. CO-2-A, Sch. 3). The introduction of by-product coke ovens required additional purification measures that resulted in the production of residuals including ammonium sulfate, naphthalene, light oil, and sludges (id., p. 20).

Besides ash, clinker, and spent oxides, water gas production left a variety of residuals, depending upon the feedstock used. These included water gas tars and water-tar emulsions (Exh. CO-2-A, Sch. 3). The initial use of naphtha as a feedstock in the carbureted gas process produced only traces of tar (Exh. DPU-18, p. 78). With the advent of the internal combustion engine, the increased demand for naphtha to blend with gasoline made naphtha less available for manufactured gas feedstocks (Exh. CO-2-A, p. 22). Light oils, and later, as these became less available, heavy oils, were substituted (id.,

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[6] This section (Section III.C) of the Order catalogues MGP residuals and disposal practices. Section III.D discusses the evidence concerning the hazardous properties of MGP residuals and the risks attendant on the disposal practices. See infra, p. 24.

[7] "Clinkers" are lumps of congealed ash (Exh. DPU-18, p. 153).

pp. 22-23). These feedstocks, particularly the heavy oils, increased the amount of tar produced and the need to remove sulfur from the manufactured gas (id.).

Major by-products from the oil gas process included lampblack, water-tar emulsions, and light oil (id., Sch. 3). Small amounts of ammonia, cyanides, tar bases, and tar acids were also produced (Exh. DPU-18, p. 46).

2. Composition of Residuals

MGP residuals contain a variety of chemicals, many of which are hazardous materials under CERCLA, 42 U.S.C. § 9601(14) and G.L. c. 21E, § 2. For instance, spent oxides contain sulfur, sulfide, sulfate, and tar (Exh. AG-106). For those spent oxides created by coal carbonization and by-product coke ovens, thiocyanate and cyanide are also present (id.). Polynuclear aromatic hydrocarbons, including benzopyrenes and tetracene, are present in water gas tar, coal tar, oil tar, and lampblack (id.; Exh. DPU-16, sec. 4, p. 30). Volatile aromatics are also found in these same tars and in light oil (Exh. AG-106). Phenolics are present in coal tar; and ammonia, cyanide, sulfide, and thiocyanate are present in ammoniacal liquor (id.).

3. Gas Purification Processes

Depending on the particular process used, various residuals associated with manufactured gas had to be removed prior to gas distribution. Certain components of raw or unpurified gas would condense in distribution mains, corrode pipes, or produce noxious gases at the burner tip (Exh. DPU-18, p. 54). Various cleaning and purification processes were used to prepare the gas for distribution, depending on the method of gas production and specific raw materials used (id.).

Water vapor and heavier tars were removed from coal gas by driving the raw gas through a hydraulic main, which was cooled to remove the water and heavy tars through condensation (Exh. DPU-18, p. 59; Tr. III, p. 64). In the case of water gas and oil gas, these vapors and tars were removed by passing the raw gas through a washbox. Lighter tars were removed both with direct and indirect condensers (Exh. DPU-18, p. 62). The remaining aerosols of tar were removed with either tar extractors or, after 1924, electrostatic precipitators (Exhs. AG-80; DPU-18, p. 62). At smaller plants, aerosols were removed by shavings scrubbers (Exh. DPU-18, p. 65). Tar from coal-gas works could be resold to industry, but tar produced at carbureted gas and oil gas plants generally contained petroleum derivatives which made them less suitable to industry (Tr. III, p. 102). Tars produced by coal carbonization were often recycled as process fuel where the water component was proportionately small enough not to retard combustion (Exh. DPU-18, p. 133).

Tars with a high water content were referred to as tar-water emulsions (id., p. 136). Emulsions were not generally a problem at coal carbonization plants, for the tar separated cleanly from the condensates and each could be readily recovered (id.). However, tar-water emulsions produced by carbureted water gas and oil gas facilities often contained too much water either to sell or to burn (id., p. 136). In these cases, the tar-water emulsions were simply disposed of on-site into holding lagoons or pits, or off-site into streams or along railroad tracks (id., p. 134).

Naphthalene was frequently removed from the gas by scrubbing with oil (Exhs. AG-77; DPU-18, p. 69). The naphthalene-enriched oil could then be distilled to recover the naphthalene for resale, if market conditions warranted it, or used in the carbureted water gas or oil gas process (Exh. DPU-18, p. 69).

Initially, light oils were not removed from the gas (id., p. 72). In later years, the demand for benzene and xylene chemicals during World War I spurred the recovery of light oils in the same manner as was used for naphthalene recovery (id., p. 69). Scrubbers were used to recover the oil, which was then either mixed with light oils or carburetion stocks for resale or use as a feedstock, or merely discarded with condensate water (Tr. III, pp. 149-150; Exh. DPU-18, p. 67).

Condensate water was also produced by the tar-extraction process (id.). Because retorted coke could spontaneously combust, it had to be quickly quenched with water to preserve the coke as it left the anoxic environment in the retort (Exh. AG-236). This need provided a use for the condensate water as a coke quencher (Exh. DPU-18, p. 67). Otherwise, the condensate was recycled or disposed of in streams (id.).

Ammonia was removed through several methods, including treatment with sulfuric acid or through ammonia stills (Exhs. AG-78; DPU-18, pp. 78, 81). Phenols were either discharged into city sewers, used as a quenching agent for coke removed from the ovens, or, if recovery was desired, extracted by washing or vapor recirculation (id., pp. 84, 86).

Hydrogen sulfide was initially removed with lime (id., p. 88). Because lime could only be used once, it was an expensive process (id., p. 90). Beginning around 1870, it was discovered that iron oxide could remove hydrogen sulfide, and be reused (id., p. 190; Tr. III, p. 87). Iron oxide could be regenerated either by exposure to air over several months or by blowing air through the purifier box (Tr. III, pp. 152-153). Eventually, the iron oxide became so contaminated with sulfur that it could no longer regenerate and was itself discarded (id., p. 152). During the 1920s, several liquid purification processes were developed for hydrogen sulfide removal (Exh. DPU-18, pp. 92-93, 193).

Cyanide was produced by coal carbonization and removed from coal gas by the same equipment that removed hydrogen sulfide (id., p. 99). Only trace quantities of cyanide were generated by carbureted water gas and oil gas, so its recovery for resale was profitable only at larger plants (id.).

4. <u>Disposition of Residuals</u>

Residuals may be broken down into two categories: by-products and wastes (Tr. III, p. 16). If by-products had the proper chemical constituents and energy content, they could be recycled as a feedstock in the manufactured gas process (Exh. CO-2-A, p. 23). Alternatively, certain residuals, including coke, various tars, and ammonia, could be used in other industries (Exh. DPU-18, p. 132). By selling by-products, gas companies could reduce net production costs, and thereby offer customers a lower-cost product and encourage greater sales (Exhs. CO-2-A, p. 26; DPU-13, Tr. of September 10, 1888, p. 5). Despite the benefits to gas customers and utilities that could be accrued through the sale of by-products, the extent to which by-products could be sold was influenced by available recovery technologies and by whether sufficient by-products could be generated to make resale economically practical (Exh. CO-2-A, p. 26). The prevailing market that existed from time to time for a particular by-products also influenced the decision as to resale or disposal (<u>id</u>.).

Certain residuals, such as ash and clinkers, had little, if any, market value. These wastes were often discarded either on- or off-site as fill material (Exh. DPU-18, p. 153). Even for those residuals with resale value, prevailing market conditions dictated whether the residual could be sold. Although spent oxides were reclaimed in Europe for sulfuric acid, the abundance of brimstone in this country made sulfur readily available and left spent oxides with little, if any, market (<u>id</u>., p. 144).