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REVIEW OF GAZ METRO'S COST OF SERVICE AND RATE DESIGN PHASE 1 COST OF SERVICE

DR. H. EDWIN OVERCAST DIRECTOR MANAGEMENT CONSULTING

OUTLINE OF PRESENTATION

- Background
- Cost of Service
- Rate Design
- Conclusions

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BACKGROUND

- Black & Veatch responded to a Request For Proposal (RFP) issued by Gaz Metro
- The RFP sought an external expert review of issues related to cost of service and tariff review
- Black & Veatch was selected to assist Gaz Metro on the elements of the RFP
- The project was to provide a report on the issues identified on the following pages

GLOSSARY

- Design Day Demand—Corresponds to Gaz Metro's «jour de pointe» or «capacité» concept or the expected maximum system capacity requirement on the coldest expected day used to plan the system
- Peak Day—the highest actual daily volumes
- City Gate—the point of interconnection between the transmission system and the distribution system
- Commodity—the volume of gas measured in cubic meters or GJs
- Farm Tap- service to a customer from a high pressure main for convenience of the utility
- Demand- a measure of capacity

REQUEST FOR PROPOSAL REQUIREMENTS-PHASES ONE AND TWO

Phase One—Cost of Service Review

- A literature review related to cost of service and the reasonable level of cross-subsidization between customers in different rate classes
- An analysis of distribution costs behavior for each rate class and this analysis requires examination of existing cost allocation methods
- Make recommendations as needed related to a sound cost allocation methodology based on cost for each rate class

REQUEST FOR PROPOSAL REQUIREMENTS
(CONT'D)

Phase Two—Rate Design

- An analysis of Gaz Metro's customer base historical evolution and their grouping into rate classes
- A benchmark of distribution rate structures for other gas distributors (Canada, USA)
- An appreciation of Gaz Metro's existing distribution rate structure, all related to Gaz Metro's ability to serve customers consistent with the regulatory compact
- Make recommendations as needed

THE PROCESS

- Black & Veatch met with Gaz Metro staff
- Collected information related to the issues
- Identified sources of information external to Gaz Metro and collected that information
- Prepared a detailed report addressing the issues Gaz Metro identified in the RFP
- On-going assistance to Gaz Metro related to the regulatory review such as information request responses

THE REGULATORY COMPACT

OBLIGATIONS	RIGHTS
Obligation to serve	Right to reasonable return
Safe and reliable service	Service subject to reasonable rates, rules and regulations
Non-discriminatory rates	Protection from competition
Just and reasonable rates	Eminent domain

CONTENTS OF THE REPORT

- **Introduction**
- **Phase 1**
  - Cost of Service Theory
  - Gaz Metro Cost of Service
- **Phase 2**
  - Theoretical Issues in Rate Design
  - Recommendations for Gaz Metro Rate Changes
  - Review of Other Company Rate Designs
- **Appendix A — Theoretical Literature Related to Cost of Service and Pricing**
- **Appendix B—Rate Survey of Canadian and Regional U.S. LDC Delivery Rates**

INTRODUCTION

- **This presentation relates to Phase One – The Cost of Service**
- **Discuss the recommendations related to the best cost of service methodologies for gas utilities**
- **Explain the Black & Veatch proposed changes and the basis for those changes**

GAZ METRO COST OF SERVICE

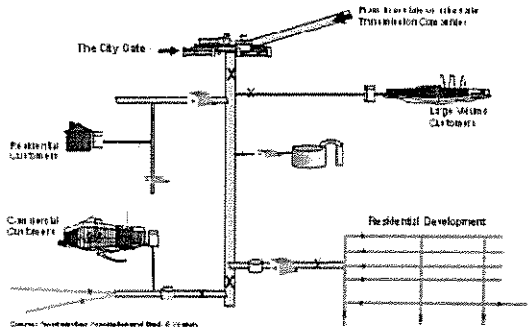
- The gold standard of cost of service is cost causation
- Cost causation is not a static or historical concept because cost causation changes with time as customer requirements change
- "In non-mathematical language, the independent variable *x* in an algebraic equation corresponds to a cause. Sometimes this is an admissible translation and sometimes it is not. For *cause*, colloquially speaking, must necessarily come before its effect." Vilfredo Pareto
- Review focused on understanding the elements of cost causation for Gaz Metro
- Cost Causation is conceptually easy because it requires answering the question "Does a change in some variable cause costs to change?"

GAZ METRO COST OF SERVICE

- Cost causation is more difficult in practice because the process is driven not by a thorough analysis but by objectives resulting from the zero sum nature of cost studies
- Cost causation is measured by the average costs to serve groups of customers
- The Black & Veatch approach is driven by a detailed understanding of the planning, construction and operation of a gas system with the only objective of allocating costs to the customers who cause costs

GAZ METRO COST OF SERVICE

LDC Distribution System Behind the City Gate



GAZ METRO COST OF SERVICE

- Mains –Transmission and Distribution- represent the largest single cost component of a gas LDC system (excluding gas costs)
- If we ask the basic question about cost causation the answer is that mains are caused by both customer and design day demand
- Annual volume does not cause any main costs

GAZ METRO COST OF SERVICE

- To use both customers and demand to allocate distribution main costs requires a split of the investment based on the amount classified as customer and the amount classified as demand
- For example, we could just say since both elements cause costs we could split the investment 50/50 but there is no basis either in theory or in practice that such a split is sound

GAZ METRO COST OF SERVICE

- There are two recognized methods for classifying costs between demand and customer
  1. Zero Intercept Method
  2. Minimum System Method
- Both of these methods are discussed in the NARUC *Gas Distribution Rate Design Manual*
- The Minimum System Method is used in the NARUC Manual sample cost study
- The AGA *Gas Rate Fundamentals* text also supports the classification of mains between customer and demand and illustrates the concept in its sample cost of service study

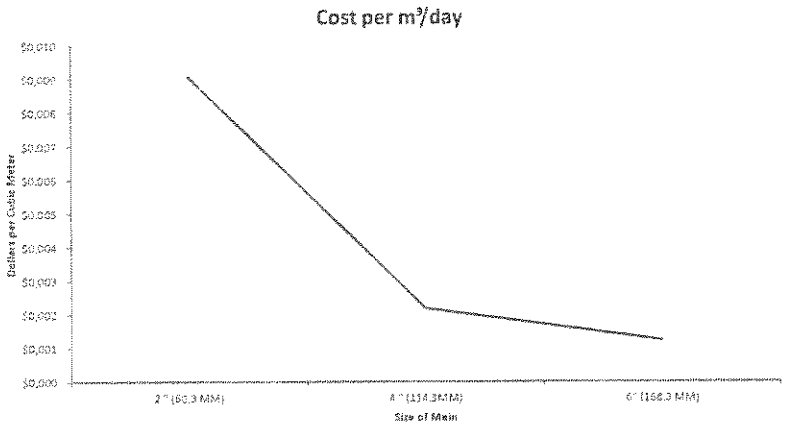
THE ZERO INTERCEPT METHOD

- The Zero Intercept Method is based on the assumption that the customer or access classification may be approximated by a statistical analysis of the relationship between a dependent variable the cost of pipe and the independent variable the capacity of the pipe
- The cost of a hypothetical zero capacity pipe is used in the calculation of the amount of mains cost to be classified as customer related

THE ZERO INTERCEPT METHOD

- Pipe capacity varies by size of pipe and operating pressure which is assumed to be the normal distribution operating pressure
- The statistical analysis must be tested as with any statistical study to determine if the results of the analysis produce reasonable results
- The analysis must also be consistent with the concept of a zero capacity pipe.

RELATIONSHIP OF PIPE SIZE TO CAPACITY



THE MINIMUM SYSTEM METHOD

- The Minimum System Method uses the smallest pipe installed for the distribution system to estimate the component of mains cost that is classified as customer.
- Unlike the concept of a zero capacity pipe that is purely hypothetical, the Minimum System pipe is actually installed.
- The typical or average cost of installing the minimum size of pipe need not be estimated since the data is available in utility records.

THE MINIMUM SYSTEM CLASSIFICATION IS SUPERIOR TO OTHER CLASSIFICATION METHODS FOR MAINS COST

- Reflects cost causation and particularly where no design day demand costs are allocated to those customers whose load is fully served by the minimum system
- Any other classification methodology requires also allocating design day demand to every class of service
- Customer's benefit from access only to the extent that access provides enough capacity to serve the design day connected load

MINIMUM SYSTEM AND ZERO INTERCEPT

Minimum System

- Dual obligation- attach customers and have adequate capacity to meet the design day demand of the system
- Design day demand reliability is the most important delivery consideration for a gas utility
- Unlike electric service or any other utility service, inadequate design day capacity is catastrophic (social costs, individual costs and restoration costs)

Zero Intercept

- Phantom attachment component to classify costs
- Inconsistent with both considerations of attachment and design day requirements because a zero capacity pipe cannot deliver any capacity and thus provides no delivery access

UNDERSTANDING THE ROLE OF SCALE ECONOMIES

- As main size increases with constant operating pressure the amount of gas delivered increases exponentially while installed costs increase fractionally
- If pipes are not operating at maximum operating pressure, pressure increases make this difference even larger
- The result of understanding size and pressure is that size, pressure and density of customers allows the utility to serve the design day capacity of all its residential customers with the minimum system size of pipe

IMPLICATIONS OF MINIMUM SYSTEM

- The single most important implication of this approach is that on average it costs the same to deliver gas to all residential customers
- Delivery service excludes other costs such as transmission, peaking supply services, and miscellaneous costs
- Any class that can be served by the minimum system needs no allocation of the demand component of distribution

MISCONCEPTIONS ABOUT THE MINIMUM SYSTEM

Allocation between urban and suburban customers is unfair (Montreal City and rural)

Co-location Illustrated

MISCONCEPTIONS ABOUT THE MINIMUM SYSTEM

- Economies of scale are not recognized
- Concept not supported in theory (Typically use selected quotes from Bonbright, for example *«the inclusion of the costs of a minimum-sized distribution system among the customer-related costs seems to us indefensible»* page 492)
  1. Bonbright quote refers to electric system
  2. Bonbright also concludes "In actual practice the vast majority of utilities (electric) utilize some form of the minimum system to classify costs..."
  3. Empirical evidence supports the concept of the customers causing mains costs as demonstrated below

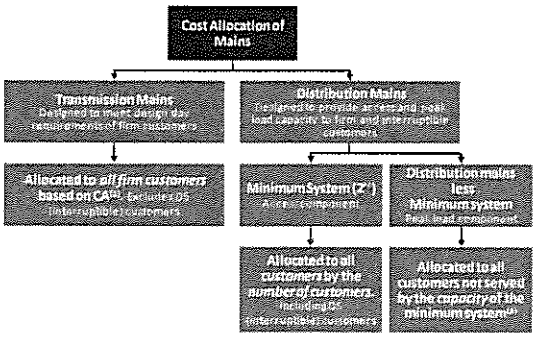
EMPIRICAL SUPPORT FOR COST CAUSATION

- Main costs are caused by customers and not by volume
- Study 1—1400+ LDCs 2005-2009 services explain 93% of the variance in miles of main
- Study 2—100+ LDCs 2005-2009 customers explain 87% of the variance in miles of main
- Study 3—100+ LDCs 2005-2009 customers and volume explain 87% of the variance in miles of main
- Study 4—53 LDCs 9-21 years of data, time series analysis for each utility customers explains on average 97.7% of the variance in the cost of mains. Volume makes no contribution to the explanation of the cost of mains beyond the effect of adding an additional variable

FACTS ABOUT THE MINIMUM SYSTEM

- Based on all the gas LDCs in the United States for year 2013 over 83% of all mains were two inches or less. (Pipeline and Hazardous Materials Safety Administration Distribution Report 2013)
- The minimum system approach is about classifying main investment (a common cost) between customer and demand
- The results and implications of the minimum system are consistent with empirical analysis of cross section studies of the gas LDCs and time series studies for individual LDCs

MAINS ALLOCATION

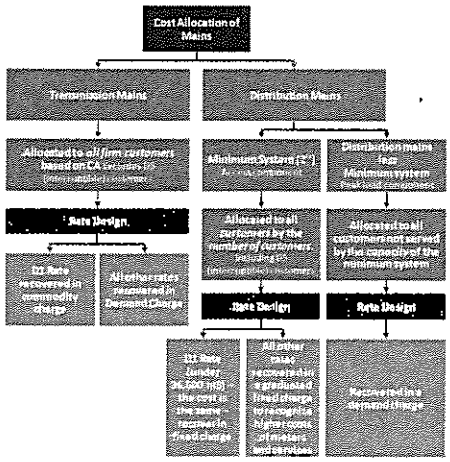


Notes:

(1) CA (Capacity Attributed) is the measure of the design day capacity required to meet the firm load obligation on the coldest day expected for the system. Also referred to as Maximum Design Day (MDD)

(2) Uses CA for firm customers and maximum D1 over 36,500 m3, D3, D4, and peak load for D5 (interruptible)

COST OF SERVICE AND RATE DESIGN



RATE DESIGN

- Cost allocations have implications for rate design related to both the class revenue requirement and how rates should be designed.
- Both of these issues are for Phase 2

OTHER COST OF SERVICE ITEMS

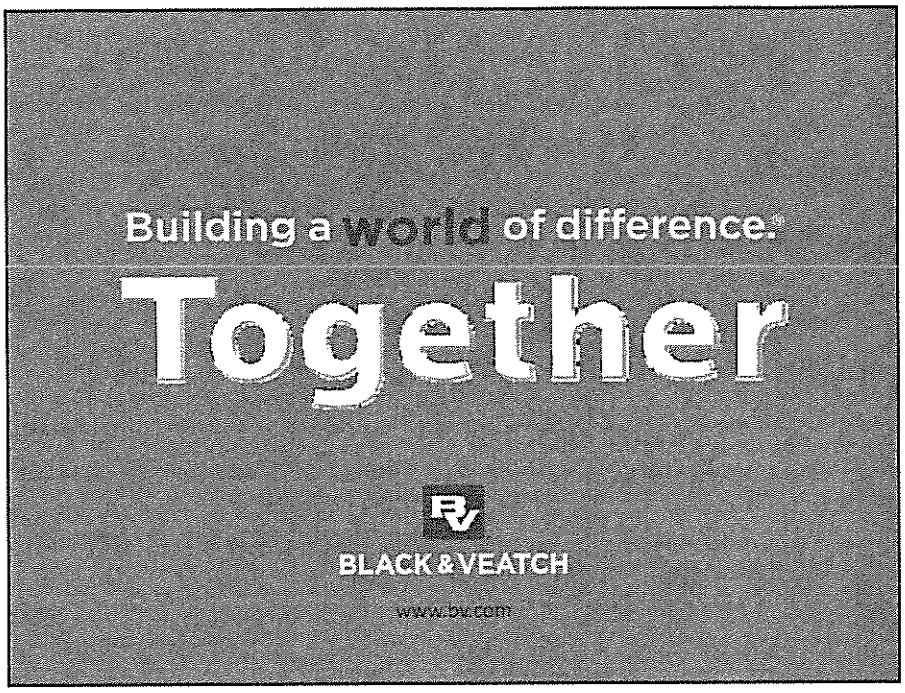
- Allocation of other costs typically based on internal allocation factors consistent with cost causation
- Operating and maintenance expenses are allocated in the same way that the plant the expenses they support is allocated- mains expense is allocated in the same way total mains cost is allocated
- Other expenses are allocated based on the underlying purpose of the expense for example benefits costs and payroll taxes are allocated based on the payroll portion of expenses in all other accounts. Office space is also allocated on labor costs. Property insurance is allocated on plant in service and so forth.
- General Plant is allocated based on the type of account. Office space is allocated on labor costs. Rolling stock and materials and equipment is properly allocated on plant.

SUMMARY OF MAJOR RECOMMENDATIONS

1. Distribution mains should be classified between customer and demand cost using the minimum system
2. The customer component should be allocated on services and the demand component of design day demand and the maximum demand for interruptible customers
3. Customers whose design day demand is served by the minimum system should not be allocated any demand
4. The zero intercept method should be rejected for both theoretical and technical reasons as a way to classify distribution mains between customers and demand
5. Allocating distribution mains on demand only should likewise be rejected because it does not follow cost causation

SUMMARY OF MAJOR RECOMMENDATIONS

6. Transmission mains should be allocated on design day demand for firm customers
7. The costs should be allocated on a total system basis
8. The Handy Whitman Index for inflating pipe costs should be used rather than a general index of inflation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