BEFORE THE ONTARIO ENERGY BOARD

Application of Union Gas Limited for Rates for the Sale, Distribution, Transmission and Storage of Gas as of January 1, 2007	))))	**Docket No. EB 2005-0520**

EVIDENCE OF

PAUL CHERNICK

ON BEHALF OF

THE SCHOOL ENERGY COALITION

Resource Insight, Inc.

APRIL 13, 2006

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I. Identification and Qualifications

Q: Mr. Chernick, please state your name, occupation and business address.

A: I am Paul L. Chernick. I am the president of Resource Insight, Inc., 5 Water Street, Arlington, Massachusetts.

Q: Summarize your professional education and experience.

A: I received an SB degree from the Massachusetts Institute of Technology in June 1974 from the Civil Engineering Department, and an SM degree from the Massachusetts Institute of Technology in February 1978 in technology and policy. I have been elected to membership in the civil engineering honorary society Chi Epsilon, and the engineering honor society Tau Beta Pi, and to associate membership in the research honorary society Sigma Xi.

I was a utility analyst for the Massachusetts Attorney General for more than three years, and was involved in numerous aspects of utility rate design, costing, load forecasting, and the evaluation of power supply options. Since 1981, I have been a consultant in utility regulation and planning, first as a research associate at Analysis and Inference, after 1986 as president of PLC, Inc., and in my current position at Resource Insight. In these capacities, I have advised a variety of clients on utility matters.

My work has considered, among other things, the cost-effectiveness of prospective new generation plants and transmission lines, retrospective review of generation-planning decisions, ratemaking for plant under construction, ratemaking for excess and/or uneconomical plant entering service, conservation program design, cost recovery for utility efficiency programs, the valuation of environmental externalities from energy production and use, allocation of costs of service between rate classes and jurisdictions, design of retail and wholesale

rates, and performance-based ratemaking and cost recovery in restructured gas and electric industries. My professional qualifications are further summarized in Exhibit PLC-1.

Q: Have you testified previously in utility proceedings?

A: Yes. I have testified approximately one hundred and ninety times on utility issues before various regulatory, legislative, and judicial bodies, including the Arizona Commerce Commission, Connecticut Department of Public Utility Control, District of Columbia Public Service Commission, Florida Public Service Commission, Maryland Public Service Commission, Massachusetts Department of Public Utilities, Massachusetts Energy Facilities Siting Council, Michigan Public Service Commission, Minnesota Public Utilities Commission, Mississippi Public Service Commission, New Mexico Public Service Commission, New Orleans City Council, New York Public Service Commission, North Carolina Utilities Commission, Public Utilities Commission of Ohio, Pennsylvania Public Utilities Commission, Rhode Island Public Utilities Commission, South Carolina Public Service Commission, Texas Public Utilities Commission, Utah Public Service Commission, Vermont Public Service Board, Washington Utilities and Transportation Commission, West Virginia Public Service Commission, Federal Energy Regulatory Commission, and the Atomic Safety and Licensing Board of the U.S. Nuclear Regulatory Commission.

Q: Have you previously presented evidence before the Ontario Energy Board?

A: Yes. I filed evidence and/or testified before the Ontario Environmental Assessment Board in Ontario Hydro's Demand/Supply Plan hearings in 1992, and before the OEB in the following dockets:

- EBRO 490, DSM cost recovery and lost-revenue adjustment mechanism for Consumers Gas Company

- EBRO 495, LRAM and shared-savings incentive for DSM performance of Consumers Gas
- RP-1999-0034; Ontario Performance-Based Rates for electric distribution utilities
- RP-1999-0044; Ontario Hydro transmission-cost allocation and rate design
- RP-1999-0017; Union Gas proposal for performance-based rates
- RP-2002-0120; Ontario transmission-system code
- RP 2004-0188; cost recovery and DSM for electric-distribution utilities

II. Introduction

Q: On whose behalf are you testifying?

A: My testimony is sponsored by the School Energy Coalition.

Q: What is the purpose of your direct testimony?

A: The School Energy Coalition has asked me to review the following aspects of Union Gas's proposal for splitting the existing M2 general service rate for its sales customers in southwestern Ontario into two rates:

- Setting the breakpoint between the new M1 rate and the new M2 rate at 50,000 m^3 per annum.
- Union's allocation of revenue requirements to the M1 and M2 rates.
- Union's rate-structure proposals for the new Rates M1 and M2.

Q: Please summarize your conclusions.

A: I conclude that Union has failed to provide any reasonable justification for any aspect of its proposed rate design, including the decisions

- Not to split the residential customers out of the M2 rate.

- Not to split the large commercial and industrial customers, which have individual contract demands, out of the M2 class.
- To keep firm and dual-fuel customers on the same rate.
- To split the M2 class into two rates, rather than three (or possibly even more).
- To split the M2 class at 50,000 m^3 per annum, a level much higher than the bulk of the residential load.
- To set the blocks and block rates as Union has proposed.
- To set the rates so that customers on the new M1 rate would pay more than customers on the new M2 rate, even for usage well below the breakpoint.

Hence, I recommend that the Board instruct Union to revisit the analysis, and to specifically address rate splits based on customer type (specifically residential and dual-fuel) and splits closer to the usage level at which residential loads cease to dominate total volumes, or roughly 8,000 m^3 per annum. Union should also be directed to design the rates (wherever they are split) to ensure a smooth transition from the lower-volume rate to the higher-volume rate, so that customers will prefer to be on the rate that is designed for them.

Q: How is your evidence organized?

A: The next section provides some background information relevant to the evaluation of Union's proposal. Section IV discusses the definition of the new rates. Section V reviews the allocation of revenue requirements between the two new rate schedules. Section VI describes the design of the two rates. Section VII summarizes my conclusions and recommendations.

III. Background

Q: What rate design-issues did the OEB direct Union Gas to address in this proceeding?

A: In its decision in RP-2003-0063, the OEB directed Union Gas to review the current M2 rate class with the objective of separating large-volume customers from low-volume ones and to redesign rates to reduce intra-class subsidization of customer-related costs

> to conduct a cost allocation and rate design study directed at separating low volume and high volume consumers currently within the M2 rate class. In designing the study, Union should consider rate implications at different volume breakpoints and should consider the appropriate level of monthly fixed charges for each sub-class.

Q: Did Union file the required study?

A: Yes. Union retained Navigant Consulting Inc. ("Navigant") to prepare the study, which was filed in this case as Exhibit H2, Tab 1. I refer to this document as the Navigant report or study.

Q: What are the conclusions of the Navigant study?

A: Navigant proposed that Union split the old M2 class into a new M1 class for customers using less than 50,000 m^3 per annum, and a new M2 class for customers 50,000 m^3 per annum and over.

Navigant also recommended that Union retain the existing monthly customer charge of $14 for Rate M1 until the Company has a cost-of-service study that differentiates between M1 and M2. For the new Rate M2, Navigant recommended increasing the fixed charge from the current level of $14 per month to $70 per month for the new rate M2.

Q: What specific rate proposals has Union Gas filed to comply with the OEB's Directive to split the existing M2 rate class?

A: Union Gas has adopted Navigant's proposed split at 50,000 m^3. Union endorses Navigant's finding that the customer charge does not fully recover customer costs. The Company proposes to raise the Rate M1 monthly customer charge to $16 and the new Rate M2 monthly customer charge to $70.

IV. Defining the New Rate Classes

A. Navigant's Analysis of Options for a Rate M2 Split

Q: Please summarize Navigant's analysis of characteristics of various sub-groups within the existing M2 rate.

A: Navigant presents the following data:

- the monthly sales to each customer class within the existing M2 rate—residential, commercial, industrial, and large industrial (Charts 1–4).
- the distribution of annual usage by customer class (Appendix D).
- the ratio of February sales to annual sales by customer, aggregated by customer class (for all classes) and size of customer for residential, commercial and industrial customer classes (Appendix E).

Based on this last analysis, Navigant concludes that load factors do not vary significantly among rate classes, but do increase as the annual usage by customers increases.

Navigant (at 30) also reviews and approves of Union's cost-of-service study, observes that Union's estimate of commercial and industrial customer costs per customer-month were several times as high as Union's estimate of residential customer costs, and concludes

> Given the material differences in unit customer costs between the residential and commercial/industrial sub-classes, and the single monthly charge applicable to all M2 customers, NCI concludes that there exists intra-class cross subsidies that need to be addressed through either a splitting of Union's M2 rate class and/or a redesign of its current rate structure.[1]

Q: What options did Navigant consider for dealing with these perceived differences?

A: Navigant lists the following four options:

- Do nothing.
- Redesign the meter charges and/or block rates within the existing M2 class.
- Split the M2 rate class into a Residential class and a General Service class.
- Split the M2 rate class by size.

Navigant (at 35) rejects the first option because it does not address the cross-subsidies, the second option because it would be too difficult, and the third option because "it would not adequately address the heterogeneity (and associated intra-class cross subsidies) among commercial and industrial customers…. [N]umerous commercial and industrial customers [have] very similar load characteristics to those of the residential sub-class."

Navigant (at 36) asserts that the splitting the existing M2 rate by volume produces more homogeneous sub-groups, best addresses intra-class cost subsidies, is consistent with Board and Union preference for volume-based rate classes, and limits administrative burdens.

Q: Does Navigant's analysis appropriately support its recommendations?

A: No. Every step of Navigant's analyses has serious problems. Navigant's major analyses—of load factor, customer costs, and alternative breakpoints between

[1]Interestingly, Navigant does not identify the direction of the subsidy.

the M1 and M2 rates—all have serious problems. In addition, these analyses do not support Navigant's conclusions regarding appropriate restructuring of the M2 rate.

Q: What problems have you found in Navigant's analysis of load characteristics?

A: The most important problems are related to Navigant's use of average February load as a proxy for peak-day load, leading it to compute so-called load factors that are not load factors, and to reach erroneous conclusions. These include the inference that larger customers within each customer class have higher load factors. In addition, Navigant's discussion of its "load-factor" analysis misses important differences in load shape among customer classes.

Q: Please explain why the statistics that Navigant refers to as "load factor" lead to erroneous conclusions.

A: The term "load factor" has a specific meaning in energy-utility contexts: the average load over a period of time (such as a year or month) divided by the peak load during that period. Some details of this definition can be interpreted and used in different ways: For gas utilities, the peak may be defined as the maximum daily sendout or the maximum hourly sendout, and the peak may be defined for an individual customer, a group of customers, or the entire utility load. The reason for these different definitions is that some costs and other planning parameters are driven by hourly sendout, and others by daily sendout, some by individual customer loads and some by group loads.

Navigant (at 23) defines "load factor" as "the ratio of average day use to peak day use." Since Navigant did not have data on peak day use, it "used the average daily use by sub-class during February…as a proxy for peak day usage." Navigant asserted that February usage "was reflective of customers'

relative consumption levels during Union's system peak day" (ibid.), but provided no support for that assertion.

Except for the sentence with this assertion, Navigant treats its February sales ratio as if it were really a measure of load factor, asserting that

> The annual load factors for the residential, commercial, and industrial sub-classes were very similar, while the large industrial sub-class had a much higher load factor in 2003, and a load factor very similar to those of the other sub-classes in 2004.
>
> The range of annual load factors by volumetric tier for the residential, commercial and industrial sub-classes were similar … within each sub-class, there was a relatively wide range of annual load factors observed.
>
> For the three major sub-classes in Union's M2 rate class, there appeared to be a direct correlation between the size of a customer and that customer's annual load factor. Navigant at 3–4
>
> We evaluated the relationship between customer size and annual load factor. This enabled us to determine to what extent the use of declining rate blocks in the Rate M2 rate structure was warranted. Navigant at 19

These assertions are incorrect. Navigant performed no analyses of load factor.

Q: Is Navigant's February sales ratio a good proxy for load factor?

A: No. February average usage is not "reflective" of customers' relative consumption levels on a design-peak day. The average Toronto temperature was −3.8°C in February 2004 and −7.0°C in February 2003, according to the National Climate Data and Information Archive.[2] In contrast, Union apparently uses a

[2]The agency's web page, http://www.climate.weatheroffice.ec.gc.ca, is the source for the average temperatures cited. While I did this analysis for Toronto, similar patterns would apply anywhere in the Union Gas territory. Navigant used data from 2003 and 2004 in its "load factor" analyses.

design-day temperature of around −26°C.[3] Since buildings of various size, efficiency and interior load require heating once the exterior temperature falls below roughly 10° to 18°C, the February temperatures Navigant used are only about half to two-thirds of the way from the balance point to design conditions.

Q: Does that just mean that Navigant should have increased its estimate of peak load and decreased load factor by some fixed factor?

A: No. As I said before, buildings of various size, efficiency, and interior load require heating for different exterior temperature. Some small old buildings (some old residential homes and small schools, for example) require heat when the temperature falls below about 18°C. Large commercial buildings (office towers, shopping malls, big-box stores, large schools) may not require heat until the temperature falls below 10°C. Below those temperatures, heating load rises roughly linearly as temperature falls.

Consequently, the February 2004 temperature of −7ºC requires about 50% as much heating energy as would a design day for much of the residential class, but about 38% for some large commercial customers. From Appendix E of the Navigant report, it appears that residential customers typical of those whom Navigant would put on Rate M-1 have a February sales factor of about 43%, while typical large commercial customers (around 150,000 m^3 annually) have a February sales factor of about 48%. Correcting Navigant's residential February sales factor to design-day peak, for a small customer with an 18° balance point, would result in a 21% load factor. Correcting Navigant's commercial February sales factor to design-day peak, for a large high-internal-load customer

[3]Navigant (at 30) refers to "Union's design heating degree-days of 44." Assuming a balance point of 18°, the design-day average temperature would be −26°.

with a 10° balance point, would result in an 18% load factor. Hence, it not at all clear how load factor really varies with customers' annual usage.

Q: What problems have you identified in Navigant's analysis of the variation of customer costs within the existing M2 rate?

A: Navigant relies on Union's cost-of-service study, which divides costs between residential and non-residential customers, rather than by customer size. Hence, the analysis on pages 27–30 of the Navigant report has little relevance to Navigant's discussion of the effects of annual usage on customer costs.

In addition, Union's cost-of-service study has a number of problems in its allocation of customer costs, as I describe below in Section VI.A of this testimony.

Q: What problems have you identified in Navigant's analysis of alternative breakpoints between the M1 and M2 rates?

A: The basic problem is that it is not clear that the analysis, as discussed on pages 37–40 of the Navigant analysis, does anything useful. Navigant (at 37) asserts that it "chose this breakpoint level based on the following criteria":

- The annual use and average use per customer in each of the current Rate M2 subclasses;
- The annual load factors by sub-class and by consumption tier in the M2 rate class; and
- The "rate switching" potential of customers between new Rate M1 and Rate M2

Navigant in its report did not provide any analysis of any of these criteria for various breakpoints. In its interrogatory response, Navigant asserted that it "considered volume breakpoints of 20,000, 27,000, 30,000, 50,000, and 65,000 m^3" (Exhibit J21.27(p)). In that analysis, provided in Attachment 9 to Exhibit

J21.27, Navigant shows the results of its computations for each of those five breakpoints of the following statistics above and below the breakpoint:

- average annual use
- February sales ratio
- residential percent of load, percent of customers, and February sales ratio
- commercial percent of load, percent of customers, and February sales ratio
- industrial percent of load, percent of customers, and February sales ratio.

Navigant also revealed in its interrogatory responses that

> the criterion of "annual use and use per customer in each of the current Rate M2 sub-classes" was a primary consideration because it directly impacted the degree of homogeneity achieved in each of the two new rate classes. On the other hand, the annual load factors by sub-class and by consumption tier in the current M2 rate class was considered a less important factor simply because over the range of alternative breakpoints there was not a material variation in load factors to warrant strongly different preferences. Exhibit J21.27(q)

In other words, the February sales ratio (which Navigant calls "load factor") really did not factor into Navigant's analysis.

Q: Has Navigant explained how the "annual use and average use per customer" for the 50,000 m^3 split was preferable to the "annual use and average use per customer" for any of the other breakpoints?

A: Navigant's explanation is:

> Generally speaking, as the volume breakpoint increased in value, there was less convergence in the average use per customer for the Residential and Commercial sub-classes relative to the average use per customer for the new Rate M1 class. This meant there was less homogeneous load characteristics achieved in that class–which was contrary to the desired objective of the effort. At the same time, however, there was a corresponding increase in the homogeneity of the load characteristics achieved in the new Rate M2 class as the volume breakpoint increased in value. The 50,000 m^3 breakpoint best balanced this tradeoff between these two classes compared to the alternative breakpoints. Exhibit J21.27(q)

Q: Does Navigant provide this analysis in its interrogatory responses?

A: No. The breakpoint analyses provided in Attachment 9 to Exhibit J21.27 do not report the average use per customer for any of the customer sub-classes within Rate M2. Since Union's responses are provided as images, not in their original spreadsheet form or as text-based Acrobat files, I have not been able to compute the average use per customer for the various customer sub-classes from the raw bill-frequency data by customer sub-class reported on pages 56 to 66 of Exhibit J21.27.[4]

Union does provide the average use per customer for the various customer sub-classes for a somewhat different set of breakpoints (20,000, 30,000, 40,000, 50,000, and 60,000 m^3) in response to Exhibit J21.26(l). I attempted to reproduce Navigant's analysis from these data, measuring "homogeneity" as the difference between 1.0 and the ratio of the average usage for the new class (M1 or M2) and the average of the customer-class load in the new class. The details are shown in Exhibit PLC-2. The following table summarizes my results.

Average of Customer-Class Deviations from Average Usage by Rate Class

Break Point	Simple Average	Excluding Large Industrial	Sales-Weighted
20,000	2.82	0.69	0.52
30,000	2.47	0.84	0.54
40,000	2.29	0.96	0.56
50,000	2.79	1.06	0.58
60,000	3.03	1.15	0.60
70,000	3.24	1.22	0.62

Taking a simple average across four customer classes and two proposed rates, homogeneity is maximized (the deviation from the average ratio is

[4]Union did not number the pages of the attachments, so I can only identify the pages by their location in the Acrobat file.

minimized) at 40,000 m^3 per annum, not the 50,000 m^3 per annum Navigant selected. Even that large size only looks attractive because of the large industrial customer group, whose ratios to average usage in either new rate class is much higher than any other customer group. Excluding the large industrial group, 20,000 m^3 per annum is the break with the greatest homogeneity. Even with the large industrial group, weighting the deviations by customer-class sales in each rate class results in 20,000 m^3 per annum having the greatest homogeneity.

In short, Navigant has not explained how it concludes that a breakpoint of 50,000 m^3 per annum best balanced the tradeoffs in homogeneity.

Q: If Navigant actually selected the breakpoint to balance tradeoffs in homogeneity among end-use class average usage within each new rate class, would that approach be appropriate?

A: No. There is no particular reason to be concerned with the ratio of customer usage to average rate-class usage, since (1) size in itself does not have much effect on unit costs and (2) differences in costs by size of customer can be reflected in the block structure. There is even less reason to be concerned about the ratio of average use in customer classes to the average use in the rate class, especially if Navigant were correct that costs do not differ across customer classes for a given usage level.

Navigant's approach does not appear to have any theoretical or practical justification.

Q: How did Navigant take "the 'rate switching' potential of customers between new Rate M1 and Rate M2" into account in selecting the 50,000 m^3 pr annum breakpoint?

A: Navigant does not say, other than claiming (at Exhibit J21.27(q)),

In addition, the level of potential "rate switching" between new Rate M1 and Rate M2 was moderated using the 50,000m^3 breakpoint.

However, we can read the tea leaves, observing that Navigant highlighted the data for the breakpoint lines in a column of Exhibit J21.27 (at 71) mysteriously labeled as "Absolute No. of bills above and below tier bills." This column appears to be the difference between the number of customers in the annual-usage tier above the breakpoint and the number of customers in the annual-usage tier below the breakpoint.[5] The tiers are 1,000 m^3 wide around the 20,000 and 25,000 breakpoints, 5,000 m^3 wide around the 50,000 and 65,000 breakpoints. At the 30,000 breakpoint, the lower tier is 1,000 m^3 wide and the higher tier is 5,000 m^3 wide; perhaps for this reason, Navigant highlighted the entry for 29,000 m^3 rather than 30,000.

Navigant gives us no hint as to why it computed the difference between the number of customers in these arbitrarily selected tiers, rather than using some measure of the total customers close enough to the breakpoint to consider switching.

In short, Navigant's analysis of switching potential appears to be irrelevant and shot full of errors.

Q: Did Navigant do any better with its analysis of load factors as a function of breakpoints?

A: No. As noted above, while Navigant says it computed load factors for the various splits, it actually computed only February sales ratios, which are of minimal usefulness. In addition, Navigant concedes that this factor was not useful in it choice (Exhibit J21.27(q)).

[5]I do not know why Navigant ignored the customers in the tier directly below the breakpoint, who are more likely to switch than those another tier down, but I suspect this was an error.

Q: How do Navigant's analyses fail to support its conclusions?

A: Apart from the errors within the analyses themselves, Navigant's analyses cannot demonstrate that the split it proposes is the best response to the Board's order, because Navigant did not even consider the full range of approaches to reforming the existing M2 rate schedule and rejected alternatives without adequate support. Of the options Navigant did consider, including the range of possible breakpoints, Navigant's method did not necessarily pick out the best option.

Q: What options did Navigant consider?

A: Navigant considered the following three alternatives to the existing Rate M2:

- Re-design the Rate M2 block structure and fixed charges to reduce intra-class subsidies.
- Separate Rate M2 by customer class into two rate schedules, Residential and General Service.
- Split Rate M2 on a volumetric basis into two rates, a Small and a Large General Service rate.

Q: What options has Navigant overlooked?

A: Navigant does not consider the following options:

- Splitting the M2 customers into classes based on load shapes as defined by customer characteristics—such as residential, general commercial and industrial, and dual-fuel classes
- Multiple breakpoints that would more effectively separate customers with different load and cost characteristics, possibly with further splits by volume where appropriate.

- Splitting off large industrial contract customers. They are essentially a different kind of customer and should be moved out of M2 rate class.[6] For example, given the focus on the differences in load and cost characteristics for residential customers (compared to commercial and industrial customers) and the fact that most of Union's cost and load data are disaggregated by customer type, Navigant's dismissal of a separate residential rate is not reasonable.[7]

Similarly, Navigant's failure to even consider usage breakpoints below 20,000 m^3 per annum—about eight times the average residential use and about three times greater than the 99^{th} percentile of residential usage—is peculiar and unexplained, especially in light of the Board's interest in distinguishing residential from commercial and industrial loads (Order in RP-2003-0063 at 147). In addition, since Navigant mentions that some of the differences in February sales ratio (which Navigant calls "load factor") with customer size are driven by

[6]While the Union tariffs appear to contemplate that contract customers would be served under Rate M4 or Rate M5, there are references in the record to certain large customers in Rate M2 being contract customers. For example, in Exhibit J21.27(c)(ii), Union reports, "There are 83 individual contract customers in the M2 rate class of which 29 are commercial and 54 are industrial," and pages 13–15 of that exhibit lists the costs of services for 83 Rate M2 contract customers. Similarly, Exhibit J21.26 at 705 and 710, lists individual contract demands for 45 customers in 2003 and 51 customers in 2004; this group may exclude the commercial contract customers.

[7]In the Order in RP-2003-0063 (147), the Board expresses some reservations about defining rate schedules along the lines of classes. However, it "is not convinced that the load profile for commercial/industrial customers is so similar to that of residential customers as to be functionally indistinguishable," suggesting that a distinction may be appropriate.

dual-fuel customers that do not use gas at peak times, Navigant should have considered a separate rate for the dual-fuel customers.[8]

B. Union Gas's Proposal for Rate Split

Q: What is Union's rationale for a volumetric breakpoint?

A: Union decided that splitting the M2 rate class by volume best met its rate design goals by

- allowing fairer allocation of customer-related costs
- reflecting load profile and load factor, without considering end use

Q: Has Union provided adequate support for a volumetric split of Rate M2?

A: No. Union and Navigant simply state that the declining block structure of Rate M2 cannot be adjusted to more-fairly allocate costs and that load profile and load factor could not be better reflected through end-use rates.

Q: What reasons does Union give for a breakpoint at 50,000 m^3?

A: The Company provide the following reasons:

- Two subclasses have less variation in average use per customer and load factor than the old M2 class as a whole.
- the OEB approved 50,000 m^3 breakpoint for the Northern and Eastern Operations Area.
- A 50,000 m^3 breakpoint was consistent with "the Board's own guidelines for determining whether a gas marketer requires a license to sell gas."

Q: What analysis does Union provide to demonstrate the 50,000 m^3 breakpoint best meets its stated goals?

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[8]Navigant (at 23) reports, "The large industrial sub-class [of Rate M2] includes customers with alternate fuel capability whose gas consumption is highly variable from year to year," resulting in February sales ratios that are variable sometimes very high.

A: It relies on the Navigant report.

Q: Does the Navigant report confirm that the new M1 and M2 rates have less variation in load factor than the old M2 class as a whole?

A: No. According to Navigant,

> the criterion of "annual use and use per customer in each of the current Rate M2 sub-classes" was a primary consideration because it directly impacted the degree of homogeneity achieved in each of the two new rate classes. On the other hand, the annual load factors by sub-class and by consumption tier in the current M2 rate class was considered a less important factor simply because over the range of alternative breakpoints there was not a material variation in load factors to warrant strongly different preferences. Exhibit J21.27, part (q).

V. Allocating Revenue Requirements Between the New M1 and M2 Rates

A. Navigant's Approach

Q: Briefly describe Navigant's approach to determining the split of the existing M2 revenue requirement between the new M1 rate and the new M2 rate.

A: Navigant estimates the revenues that would be collected on the current M2 rate from the customers Navigant proposes to move to each of the two new rates, and sets rates to collect those revenues, for the same billing determinants.

Q: Does Navigant's approach do anything to move toward equalization of sub-class rates of return?

A: No. Navigant's approach would maintain the current distribution of revenues.

B. Union Gas's Approach

Q: How did Union Gas determine its proposed M1 and M2 revenue allocation?

A: The Company claims that it used "the results of the 2007 cost of service study *adjusted* to reflect the proposed annual volume breakpoint of 50,000 m^3" (emphasis added; Exhibit H1, Tab 1, at 8–9).

Q: How did the Company "adjust" its cost-of-service study results?

A: The Company does not explain how it extrapolated from Union's allocation between residential and non-residential customers to an allocation between the under-50,000 and the over-50,000 m^3 customers. The Board cannot find the redesigned rates to be reasonable without clear documentation of this cost allocation.

VI. Designing the New Rates

A. Customer Charges

1. Navigant Analysis

Q: What is the basis of the M1 and M2 customer charges that Navigant recommends?

A: For Rate M1, Navigant retained the current $14 customer charge. Navigant reviewed Union's cost-of-service study, which indicated a higher M1 charge, but decided that a study that differentiated sub-classes by end-use rather than volume was an unreliable basis for a higher M1 customer charge (Navigant report at 41–42). Navigant set the Rate M2 customer charge at five times the Rate M1 customer charge based on a calculation of the relative station and service replacement costs in Appendix H.

Q: How reliable is Navigant's calculation of relative customer costs?

A: This computation is only a partial analysis and it is not clear why Navigant relies on it. It omits other customer-related costs from the calculation, including customer-related mains, O&M expenses, and billing and account expenses. Navigant's customer-cost computation includes at least the following two apparent inconsistencies:

- The computation places some Large Industrial customers in the small-customer group (Navigant, Appendix H).
- It assumes that small commercial customers have the same service and meter costs as large commercial customers (and similarly for industrial customers) (Navigant, Appendix H).

2. Union Gas's Proposal

Q: What customer charges does Union propose for Rates M1 and M2?

A: Union ignores Navigant's recommendation and proposes to raise the monthly customer charge for both of the new rate classes, from $14 to $16 for Rate M1 and to $70 for Rate M2. Union indicates that the charges it proposes are supported by its cost-of-service study.

Q: How did Union classify and allocate service replacement costs?

A: Union classified 100% of services as customer-related. For all but large C&I customers, the Company calculated an average unit cost for each customer type, residential, commercial and industrial. Navigant (Exhibit H2, Tab 1, at 28) describes the calculation as follows:

All pipe (classified as service-related) sized up to 1-inch diameter is assigned to residential customers and a portion of service pipe between 1 inch and 2 inch is allocated to residential. The commercial customers are allocated a portion of service pipe between 1 inch and 2 inch, with the majority of the service pipe being 1.5 inches. The industrial customers are allocated a portion of the 2-inch service pipe and are allocated all service pipe over 2 inches. A cost per meter is assigned to each service pipe size and then an average cost per meter is computed. This unit cost is applied to the average service length to obtain a service replacement cost.

Q: Is Union's allocation of the services adequately documented?

A: No. Union does not explain why it makes these three crucial assumptions:

- There is no relationship between pressure and size of customer. The size of customer affects only the diameter of pipe.
- The unit cost of pipe of a given diameter does not increase with pressure.
- The Company provides no data to support its assignment of pipe sizes to customer end-use.

Q: How did Union determine the customer-related portion of main investment?

A: The Company first determined length of pipe and unit-replacement cost separately by size and pressure of pipe. Union assigned a customer-related percentage by diameter and pressure. Union calculates the customer-related mains replacement cost, by pipe category, as the product of (1) the total length of pipe, (2) the average cost of pipe by diameter and pressure, and (3) the percentage that Union classified as customer-related. Customer-related portion of main investment is the ratio of the customer-related to the total mains replacement cost. The calculations are provided in Attachment 1 of Exhibit J21.28 (a).

Q: Does Union's cost-of-service study support the proposed customer charges?

A: No. Based on the documentation provided, Union's cost-of-service study methodology appears to overstate the customer costs of the smaller customers in each rate class M1 and M2.

Q: In what ways does Union's cost-of-service study over-allocate customer costs to the customers at the lower end of each rate class?

A: There are a number of flaws in Union's cost-of-service study, as follows:

- The study assigns more services to small customers than the number of customers in that subgroup.
- It may overlook the sharing of service lines by small customers.
- It recognizes that cost of services varies with the size of customer (as explained above), but treats 100% of the plant as customer-related and properly reflected in the customer charge.
- It allocates customer-related mains based on services and services plant, which, in turn, may be over-allocated to small customers.
- Its classification of mains fails to recognize that a significant portion of the length of main considered as 100% customer-related are installed to increase the capacity of the system and to bring in additional revenues, not just to reach new customers.
- It does not consider the possibility of demand-related mains investment and O&M associated with operating at higher pressure
- It double-counts demand-related costs by ignoring the load-carrying capability of the smaller pipe.

Q: What is the basis for your statement that Union assigns more services to small customers than the number of customers in that subgroup?

A: According to Exhibit J21.27(d), somewhere between 845,000 and 900,000 services were assigned to the residential class, while according to Navigant (at

Appendix F), there are only 833,305 residential customers. It is not clear why Union would assign the residential class more than one service per customer. More likely, residential and small customers may use an average of less than one service, since some small customers (such as in apartment buildings) share a service.

Q: In what ways does Union's method overstate the length of pipe that is customer-related?

A: There are a number of situations in which the smallest mains are installed to meet increased loads, not just to serve new customers. Additional lines are installed to bring more gas into an existing area or to meet increased load either from existing customers. The Company may loop existing main (or create other system tie-ins). When a new customer or new load from an existing customer is located along an existing but capacity-constrained main, the Company may construct a main extension to link the existing main with another.

Customer revenues may also drive extensions of the smaller pipe. The Company will extend mains at its expense if the additional revenues justify the expenditure. These expenditures should be treated as revenue-related, not customer-related.

Q: Please explain why Union's allocation method double-counts the demand-related costs by ignoring the load-carrying capability of small pipe.

A: Union's analysis is intended to exclude from the demand-related cost a "customer-related" part of the system. However, the smaller pipe is sufficient to carry a large portion of the average customer's load. For many small customers, that equipment probably carries all the load they need.

Since Union allocates demand-related plant according to design-day demand, it double-counts the demand-related costs by ignoring the load-carrying

capability of the smaller pipe. Failure to adjust for this double counting results in the allocation of too large a share of the demand-related costs to smaller customers.

B. Declining Commodity Charges

1. Navigant's Analysis

Q: How did Navigant determine the number of blocks for each of its new proposed tariffs, and the rate for each block?

A: Navigant does not explain the derivation of its rate-design proposal, other than to observe that it produces the desired revenues.

Q: Would the rate designs proposed by Navigant rates produce a smooth transition between rates M1 and M2?

A: No. The rate design recommended by Navigant does not result in a smooth transition between the new rates M1 and M2. In Exhibit PLC-3, I compute the average usage by month for the customers with annual usage between 45,000 and 55,000 m^3 per annum. The average customer in this group used 49,694 m^3 per annum, ranging from 914 m^3 in July to 8,576 m^3 in February.

In the same Exhibit, I apply Navigant's proposed rate designs for the new M1 and M2 rates for those monthly usage levels. The annual bill for Navigant's proposed new M2 rate would be $3,407, while the annual bill for Navigant's proposed new M1 rate would be $3,148, or $259 less than the M2 bill.

2. Union's Proposal

Q: Are the M1 and M2 block structures proposed by Union Gas the same as those recommended by Navigant?

A: No. They use the same blocks, but the rates differ significantly.

Q: Does Union describe the benefits of its proposed block structures?

A: In the case of M1, Union states:

> The first block volume of 100 m^3 is intended to capture baseload consumption. The second block, next 150 m^3, accommodates the consumption of the average MI customer and is priced to reflect the average price of the rate class. The final block, all over 250 m^3, accommodates customers with higher volume and is priced to ensure the smooth transition between M1 and M2. Exhibit H 1, Tab 1, at 10

For the M2 tariff, Union asserts:

> The first block volume of 1,000 m^3 is intended to capture baseload consumption. The second block and third block, next 6,000 m^3 and 13,000 m^3, accommodates the consumption of most commercial/ industria1 customers. The final block, all over 20,000 m^3, accommodates customers with higher volume and is priced to ensure the smooth transition between rates M2, M4 and M7. Exhibit H 1, Tab 1, at 12

Q: Do these statements about the block structures accurately describe Union's proposal?

A: No. Both Union's assertions about the first block for each rate and its assertion about the third block for the M1 tariff are incorrect. Since Rate M4 and Rate M7 both have demand charges, and the demand charge for Rate M7 is negotiated, it is difficult to compare the proposed new M2 tail block to the rates for small customers on Rate M4 and Rate M7. Union, which has comprehensive data on the monthly usage and bills for each Rate M4 and Rate M7 customer, could easily provide that comparison, but has not done so.

Q: What's wrong with Union's claims that "the first block volume…is intended to capture baseload consumption" for each rate schedule?

A: There are three problems. First, baseload consumption, which is even through the year, is less expensive to serve than heating load. Yet Union proposes *higher* rates for the "baseload" blocks. So if "the first block…is intended to capture baseload consumption," Union seems to have badly mispriced that block for each rate.[9]

Second, the first block of M1 covers the summer usage of customers only for customers up to about 4,500 m^3 per annum.[10] Similarly, the first block of the M2 tariff would cover the summer usage only of the smallest M2 customers. On each rate, summer use for larger customers would fall into the higher blocks, and these customers would not pay baseload prices for baseload usage.

Third, the first block of the M1 tariff would cover the entire usage of the average customer using less than 500 m^3 per annum, and almost all of the usage of the average customer using 500–1,000 m^3 per annum. These are some of the M1 customers with the most favorable load shapes (based on the monthly usage data in Exhibit J21.26), yet Union is proposing to charge them the highest rates in both summer and winter.

It is not clear what Union really meant to accomplish in the first block of each of these tariffs, or whether there is any cost basis for the block rate.

Q: Would the pricing of the final block of the M1 tariff "ensure the smooth transition between the M1 and M2" tariffs?

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[9]Union may have designed that higher first block to meet some other objective, other than pricing baseload usage, but Union does not specify any other objective, let alone show that the block design achieves that goal.

[10]I used the 2003 residential monthly usage from Exhibit J21.26, p. 701, for this computation.

A: No. The transition between the rates is not at all smooth. In Exhibit PLC-4, I repeat the computations of Exhibit PLC-3 for Union's proposed rates. The annual bill for Union's proposed new M2 tariff would be $3,179, while the annual bill for Union's proposed new M1 tariff would be $3,479, or $300 more than the M2 rate for the same consumption.[11] Union's proposal for the M2 bill at this consumption level is considerably lower than Navigant's recommendation, while Union's proposal for the M1 rate is much higher than Navigant's recommendation, reversing the relative pricing relationship.

This is not just a problem right at the breakpoint. Under Union's proposal, a customer would pay less on M1 than on M2 for usage as low as 34,000 m^3 per annum, assuming the same monthly sales distribution as in Exhibit PLC-3 and Exhibit PLC-4. The following table shows the difference between bills on the M1 and M2 tariff for various usage levels.

[11]This result is not an artifact of the specific load shape I used. For a customer using 4,167 m^3 monthly (an annual consumption of 50,000 m^3) the breakpoint, the total bill of on the M1 tariff would be $3,477. Just one additional m^3 would make this customer eligible for Rate M2 and would decrease the total annual bill to $3,202, a reduction of $275 per year.

Annual Usage	Union Proposed		Excess of M1 over M2	Extra m^3 an M2 Customer Could Buy for M1 Bill
	M1 Bill	*M2 Bill*		
34,000	$2,456	$2,448	$7	154
35,000	$2,521	$2,496	$25	539
36,000	$2,586	$2,543	$44	924
37,000	$2,651	$2,590	$62	1309
38,000	$2,717	$2,637	$80	1693
39,000	$2,782	$2,684	$98	2078
40,000	$2,847	$2,731	$116	2473
41,000	$2,912	$2,778	$134	2878
42,000	$2,978	$2,825	$153	3281
43,000	$3,043	$2,871	$172	3706
44,000	$3,108	$2,918	$190	4149
45,000	$3,173	$2,963	$210	4572
46,000	$3,238	$3,009	$229	4994
47,000	$3,304	$3,055	$248	5416
48,000	$3,369	$3,101	$268	5837
49,000	$3,434	$3,147	$287	6259
50,000	$3,499	$3,193	$307	6681
51,000	$3,565	$3,239	$326	7102
52,000	$3,630	$3,285	$345	7525
53,000	$3,695	$3,330	$365	7948
54,000	$3,760	$3,376	$384	8372
55,000	$3,825	$3,422	$403	8795
56,000	$3,891	$3,468	$423	9217
57,000	$3,956	$3,514	$442	9640

It is clear that large M1 customers would have a significant incentive to get onto the M2 tariff, and small M2 customers would have a significant incentive to stay off the M1 tariff. Not only are these rate designs inequitable, but also maintaining the rate classes, requiring small M2 customers to switch down and preventing large M1 customers from switching up would all create significant administrative burdens.

VII. Conclusions and Recommendations

Q: Please summarize your conclusions.

A: I conclude that Union has failed to provide any reasonable justification for significant aspects of its proposed redesign the M2 rate. Union's current M2 rate covers a very broad assortment of customers, from the smallest non-heating residential customers to large commercial and industrial customers, including customers with dual-fuel capability. This range of customers must have a wide variety of load shapes and cost patterns. To the extent that Rate M2 can be re-designed to segregate customers into more homogeneous groups by cost characteristics, the bills to each group of customers can more closely reflect the costs incurred to serve those customers.

Were size the only difference among customers, their demand-related costs would be the same per cubic meter of gas used. The customer-related costs would be greater for large customers, but not in proportion to their size. In this situation, the cost differences might be reflected by including the incremental customer costs in the commodity charge (especially if the increase in customer costs were close to linear), or by splitting the class into several sub-classes with different customer charges, with customers assigned to a class based on usage or on the equipment that serves them. In the real world, there are other differences in load shapes and customer characteristics, which usually justify splitting a class as broad as the existing M2 into completely separate rates, both for cost allocation in the cost-of-service study and for rate design.

For the most part, the split of customers among rates follows customer characteristics that correlate with differences in cost and/or load shape. Most energy utilities thus have different rates for residential and non-residential

customers. Most also have different rates for firm loads and interruptible loads (including dual-fuel gas customers).

In light of these patterns, it is unfortunate that Union has not seriously considered splitting off from Rate M2 the residential customers, the large commercial and industrial customers (sometimes referred to as "large industrial" by Union), or dual-fuel customers. Since Union collects most of its data by customer type (residential, commercial, industrial and large), this approach would likely be easier and allow for more precision in cost analysis.

Equally regrettably, Navigant failed to look at any split in the rates below 20,000 m^3, and Navigant did a poor job of comparing the limited range of splits it did consider. In particular, Navigant failed to examine a split between the primarily residential load below about 7,000 m^3 per annum, and the primarily commercial load above that level.

Union also should have considered the option of splitting the M2 class into three or more rates, which might include splits at 7,000 and 50,000 m^3 per annum, or separating the residential load and the large commercial and industrial load (or dual-fuel customers) from the rest of M2.

Finally, Union has not justified its proposed blocks and block rates within each of the new tariffs, and has proposed rates that do not transition smoothly.

Q: What do you recommend?

A: I recommend that the Board instruct Union to revisit the analysis, and to specifically address rate splits based on the considerations I describe in the previous response. Union should also be directed to design the rates (wherever they are split) to ensure a smooth transition from the lower-volume rate to the higher-volume rate, so that customers will prefer to be on the rate that is designed for them.

Since Union's first attempt at complying with the Board's rate-design directions has so many flaws, the Board should instruct Union to consult with the parties regarding the design of the next study.

Q: Does this conclude your testimony?

A: Yes.