

## Responses of Pacific Economics Group to Questions on Report and Presentation Regarding “Top Down” Estimates of DSM Savings

### Questions of the Vulnerable Energy Consumers Coalition

1. Please provide the equations estimated for Tables 1-8 inclusive, and for Tables 9 and 10.

These equations are presented below:

**Table 1:**

$$\ln(\text{Average Gas Use Per Customer}_{\text{Enbridge Revenue Class 20,t}}) = 5.672 + .288 * \ln(\text{HDD}_{\text{Enbridge Revenue Class 20,t}}) - .129 * \ln(\text{Price}_{\text{Enbridge Revenue Class 20,t}}) - 0.005 * \text{time}$$

**Table 2:**

$$\ln(\text{Average Gas Use Per Customer}_{\text{Enbridge Revenue Class 12,t}}) = 8.842 + .278 * \ln(\text{HDD}_{\text{Enbridge Revenue Class 12,t}}) - .263 * \ln(\text{Price}_{\text{Enbridge Revenue Class 12,t}}) + 0.031 * \text{time}$$

**Table 3:**

$$\ln(\text{Average Gas Use Per Customer}_{\text{Enbridge Revenue Class 48,t}}) = 7.324 + .344 * \ln(\text{HDD}_{\text{Enbridge Revenue Class 48,t}}) - .055 * \ln(\text{Price}_{\text{Enbridge Revenue Class 48,t}}) + 0.012 * \text{time}$$

**Table 4:**

$$\ln(\text{Average Gas Use Per Customer}_{\text{Union Revenue Class 01 Residential,t}}) = 5.385 + .556 * \ln(\text{HDD}_{\text{Union Revenue Class 01 Residential,t}}) - .629 * \ln(\text{Price}_{\text{Union Revenue Class 01 Residential,t}}) + 0.010 * \text{time}$$

**Table 5:**

$$\ln(\text{Average Gas Use Per Customer}_{\text{Union Revenue Class 01 Commercial,t}}) = 6.561 + .683 * \ln(\text{HDD}_{\text{Union Revenue Class 01 Commercial,t}}) - .604 * \ln(\text{Price}_{\text{Union Revenue Class 01 Commercial,t}}) + 0.012 * \text{time}$$

**Table 6:**

$$\ln(\text{Average Gas Use Per Customer}_{\text{Union Revenue Class M2 Residential,t}}) = 5.138 + .296 * \ln(\text{HDD}_{\text{Union Revenue Class M2 Residential,t}}) - 1.325 * \ln(\text{Price}_{\text{Union Revenue Class M2 Residential,t}}) + 0.037 * \text{time}$$

**Table 7:**

$$\ln(\text{Average Gas Use Per Customer}_{\text{Union Revenue Class M2 Commercial,t}}) = 7.240 + .406 * \ln(\text{HDD}_{\text{Union Revenue Class M2 Commercial,t}}) - .058 * \ln(\text{Price}_{\text{Union Revenue Class M2 Commercial,t}}) + 0.016 * \text{time}$$

**Table 8:**

$$\ln(\text{Average Gas Use Per Customer}_{\text{Union Revenue Class 10,t}}) = 9.035 + .595 * \ln(\text{HDD}_{\text{Union Revenue Class 10,t}}) - .248 * \ln(\text{Price}_{\text{Union Revenue Class 10,t}})$$

**Table 9:**

$$\begin{aligned} &\ln(\text{Average Gas Use Per Customer}_{\text{Residential,t}} - \text{Weather and Price Normalized Average Gas Use Per Customer}_{\text{Residential,t}}) \\ &= -0.047 * \ln(\text{ECOE}_t) - 0.009 * \ln(\text{DSM}_t) - 0.005 * \ln(\text{UR}_t) + 0.259 * \ln(\text{VIN}_t) + 2.385 * \ln(\text{NPHH}_t) \\ &- 2.641 * (\text{ID1}) + -2.494 * (\text{ID2}) + -2.576 * (\text{ID3}) \end{aligned}$$

Table 10:

$$\ln(\text{Average Gas Use Per Customer}_{\text{Commercial},t} - \text{Weather and Price Normalized Average Gas Use Per Customer}_{\text{Commercial},t}) \\ = -0.001 * \ln(\text{BUC}_t) + 0.017 * \ln(\text{DSM}_t) + 0.343 * \ln(\text{SEGM}_t) \\ - 0.006 * \ln(\text{CVR}_t) - 0.402 * (\text{ID1}) - 0.315 * (\text{ID2}) + -0.331 * (\text{ID3}) + -0.083 * (\text{ID4})$$

2. With respect to Table 9, please indicate how each of the three explanatory variables, ID1, ID2, and ID3 should be interpreted. Also please explain whether the sum of the estimates of these three variables is meaningful. These constants reflect the “fixed effects” associated with each of the specific classes that are driving changes in gas consumption for that class, and which are not accounted for by changes in heating degree days (HDD), changes in prices or changes in any of the independent variables included in Table 9. For example, ID1 shows that there is an approximately 2.6% decline in annual gas consumption per customer for Enbridge Revenue Class 20 customers that is not linked to changes in HDD or prices and cannot be accounted for by any other independent variable. The ID2 and ID3 coefficients can be similarly interpreted.

3. For table 9 and table 10, please provide the results of the F-test of the hypothesis that all of the coefficients, other than the intercept terms, are zero at the 1% and at the 5% levels of significance.

The F tests provided in Tables 9 and 10 test the hypothesis that all the coefficients in these regressions, including the intercepts, are jointly equal to zero. Testing the hypothesis requested here would require additional research.

4. Please explain why there is no trend variable for Table 8, i.e., did PEG find it to be statistically insignificant and drop it?

Yes, it was insignificant. We also found that including this trend variable (even though statistically insignificant) was distorting some other coefficients and making them statistically insignificant and/or implausible, so it was dropped.

5. At page 43 of the report, PEG states that it “explored a variety of second-stage regressions.” Please provide a high-level summary list of the alternatives explored along with the reasons that each was rejected, in favour of the Table 9 and Table 10 results provided in the report.

We explored different ways to measure the difference between actual and predicted consumption; we explored different ways of expressing the variables (e.g. first differences, levels); we explored a variety of different independent variables, including personal income in Ontario and personal income per capita. These specifications were rejected because they either led to less statistically significant estimates for the coefficients, less plausible estimates for the coefficients, or both.

## BOMA/LPMA Questions

### Question 1 -Tables 1 through 8

For each of the first stage regressions shown in Tables 1 through 8, please provide the following.

a) What is the functional form of the equation, i.e. is the equation based on the straight data, or some transformation of the data? If the latter, please explain the data transformation that was used in each equation (e.g. difference, natural log, etc.).

Please see the Response to VECC Question 1, which presents these equations in full. Both the dependent and the independent variables are expressed in natural logs, with the exception of the trend, which is not logged.

b) Please confirm that with the exception of the Enbridge revenue class 20 class (which shows a statistically significant reduction in average use associated with the trend variable) and the Union revenue class 10 (where there is no statistically significant trend) there are statistically significant increases in average use on a trend basis.

It is true that, in Tables One through Seven, the coefficient on the trend variable is positive and significant for all Revenue Classes except Enbridge Revenue Class 20. It is true that a trend variable was not included in the Union Revenue Class 10 regression because it was not statistically significant; please see the Response to VECC Question 4.

c) Did PEG try to estimate if the trend variable has changed over time, perhaps reflecting a slowing trend due to DSM spending?

No.

d) Is the total delivery price variable used in the equations a nominal or a real price?

Please explain why the price (nominal or real) was chose instead of the alternative.

It was a real price; this was chosen we because we wanted the price variable in this regression to reflect what is called the “substitution effect,” which takes place in response to relative price changes (e.g. the price of natural gas relative to an overall price index). The other component of the change in quantities is the “income effect,” which we attempted to quantify in the second stage regressions using variables reflecting overall economic activity.

### Question 2 -Tables 11 through 18

a) Is the total delivery price variable used in the equations a nominal or a real price?

It is a real price.

b) Is the DSM cost variable used in the equations a nominal or a real cost?

It is a nominal cost, because we did not have a good deflator for DSM expenses.

c) Please re-estimate the equations by removing any variables used in the regression (other than DSM) that have an incorrect or unexpected sign. Please provide the results of the regressions in the same format and level of detail as shown in Tables 11 through 18.

This question would require additional research.

d) Please provide a table in the format below that shows the price elasticity and the DSM elasticity and the ratio of the price elasticity to the DSM elasticity for each of the revenue classes in Tables 11 through 18.

Revenue Class	Price Elasticity	DSM Elasticity	Price Elasticity/DSM Elasticity
EGD Class 20	-0.172	-0.105	1.638
EGD Class 12	-0.263	-0.084	3.131
EGD Class 48	-0.684	-0.021	32.571
Union Class 1 Res	-0.339	-0.077	4.403
Union Class M2 Res	-0.214	-0.056	3.821
Union Class 1 Com	-0.125	-0.034	3.676
Union Class M2 Com	-0.128	-0.002	64.000
Union Class 10 Com	-0.070	-0.003	23.333

### Question 3

a) Did PEG use different heating degree days based on each of the different regions served by Enbridge? If not, please explain why not.

We used a customer-weighted average of heating degree days for each of the regions served by Enbridge. We did not investigate demand models for each region because we did not have gas DSM data provided on a disaggregated, regional basis.

b) What heating degree day figures did PEG use for the Union equations for the south (rate M2) and for the north (rates 01 and 10)? In particular, what is the location of the actual degree days used (eg. Pearson Airport)? If a weighted average of a number of locations was used to determine actual heating degree days, please explain how this figure was calculated.

We used the same heating degree day that Union used for its own gas demand equations for these classes. We are not aware of the locations at which these data were collected.