ENBRIDGE GAS INC.

Undertaking Response to FRPO

To provide the historical 30-year average degree days for Union South and Union North Rate zones

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Response:

Attached is an updated version of Exhibit KT1.4. It includes data for 30 year average as well as the 20 year declining trend corrected.

Union South Rate Zone

Year	Annual Htg. Deg.Days (1)	Rolling 30 Year Average (2)	Rolling 20 Year Trend (3)
1969	3,964.5		
1970	3,942.2		
1971	3,884.3		
1972	4,282.0		
1973	3,738.0		
1974	4,035.9		
1975	3,821.1		
1976	4,255.7		
1977	4,013.9		
1978	4,370.0		
1979	4,143.0		
1980	4,264.9		
1981	3,998.1		
1982	4,010.9		
1983	3,908.1		
1984	3,997.2		
1985	3,926.2		
1986	3,881.8		
1987	3,683.6		
1988	3,986.4		
1989	4,153.9		
1990	3,571.5		3,950.3
1991	3,631.2		3,976.7
1992	4,030.7		3,872.1
1993	4,104.9		3,779.2
1994	4,054.8		3,828.5
1995	3,987.0		3,826.5
1996	4,152.5		3,846.6
1997	4,005.1		3,823.6
1998	3,174.9		3,890.4
1999	3,553.5		3,895.5
2000	3,791.6	3,965.8	3,769.8
2001	3,468.6	3,952.1	3,716.0
2002	3,652.1	3,947.1	3,739.4
2003	3,988.1	3,933.2	3,666.8
2004	3,806.6	3,912.2	3,644.2
2005	3,837.5	3,920.6	3,686.4
2006	3,407.4	3,912.9	3,700.0
2007	3,699.9	3,913.5	3,714.2
2008	3,869.1	3,885.2	3,631.9
2009	3,824.1	3,874.7	3,594.4
2010	3,573.6	3,858.0	3,632.7
2011	3,695.1	3,847.4	3,685.5
2012	3,274.2	3,824.4	3,613.6
2013	3,874.6	3,814.3	3,575.6
2014	4,221.1	3,789.7	3,498.9
2015	3,834.2	3,788.6	3,573.7
2016	3,509.8	3,796.1	3,720.1
2017	3,562.4	3,793.0	3,771.8
2018	3,839.0	3,780.6	3,778.4
2019		3,776.5	3,788.0
2020		3,771.6	3,755.3

Union North Rate Zone

Year	Annual Htg. Deg.Days (1)	Rolling 30 Year Average (2)	Rolling 20 Year Trend (3)
1969	5,120.5		
1970	5,414.3		
1971	5,274.1		
1972	5,741.8		
1973	4,941.0		
1974	5,445.9		
1975	5,134.0		
1976	5,643.3		
1977	5,188.1		
1978	5,639.5		
1979	5,457.9		
1980	5,558.7		
1981	5,092.3		
1982	5,429.7		
1983	5,195.3		
1984	5,174.7		
1985	5,437.8		
1986	5,175.2		
1987	4,722.4		
1988	5,316.7		
1989	5,654.2		
1990	4,993.8		5,193.5
1991	5,018.5		5,244.0
1992	5,488.9		5,182.4
1993	5,460.3		5,115.0
1994	5,293.6		5,214.3
1995	5,357.8		5,206.4
1996	5,550.0		5,220.3
1997	5,384.1		5,209.6
1998	4,457.4		5,303.1
1999	4,754.0		5,302.9
2000	5,065.1	5,292.1	5,160.1
2001	4,612.9	5,279.8	5,077.3
2002	5,006.5	5,268.2	5,086.7
2003	5,146.5	5,246.2	4,946.4
2004	5,216.2	5,221.7	4,943.0
2005	4,865.8	5,228.5	4,946.2
2006	4,472.7	5,220.8	4,962.4
2007	4,887.8	5,211.9	4,937.4
2008	5,039.7	5,172.9	4,803.6
2009	5,049.0	5,162.9	4,711.2
2010	4,461.5	5,142.9	4,726.8
2011	4,741.0	5,129.3	4,793.5
2012	4,367.3	5,092.7	4,657.9
2013	5,130.6	5,081.0	4,594.7
2014	5,360.7	5,045.6	4,518.1
2015	4,912.0	5,043.4	4,620.6
2016	4,627.9	5,049.6	4,756.3
2017	4,828.3	5,032.1	4,803.1
2018	5,072.0	5,013.8	4,822.0
2019		5,017.4	4,877.9
2020		5,009.2	4,873.8

Note - the average and trend calcualtions are lagged two years

ENBRIDGE GAS INC.

Undertaking to Energy Probe

To provide the calculation of capital pass-through incremental project revenue for Dawn-Parkway projects.

Response:

Please see Attachment 1.

UNION RATE ZONES
Calculation of Capital Pass-through Projects 2020 Incremental Project Revenue

Line No.	Particulars	Rate M12 Dawn-Parkway (a)	Rate M12 Kirkwall-Parkway (b)	Rate C1 Dawn-Parkway (c)	In-franchise (d)	Total (e) = (a+b+c+d)
	Ex-franchise Billing Unit Increase Reflected in Derivation of Rates ($GJ/d)					
1	Parkway West	-	-	-	-	-
2	Brantford-Kirkwall/Parkway D	363,000	-	-	-	363,000
3	Burlington to Oakville	-	-	-	-	-
4	2016 Dawn-Parkway Expansion	270,733	36,301	29,115	-	336,149
5	2017 Dawn-Parkway Expansion	362,082	84,854	5,975	-	452,911
6	Panhandle Reinforcement	-	-	-	-	-
7	Sudbury Replacement	-	-	-	-	-
8	Total Billing Unit Increase	995,815	121,155	35,090	-	1,152,060
9	2020 Demand Rate ($/GJ) (1)	3.633	0.550	3.633	-	
	Incremental Project Revenue ($000's) (2)					
10	Parkway West	-	-	-	-	-
11	Brantford-Kirkwall/Parkway D	15,825	-	-	-	15,825
12	Burlington to Oakville	-	-	-	-	-
13	2016 Dawn-Parkway Expansion	11,803	240	1,269	-	13,312
14	2017 Dawn-Parkway Expansion	15,785	560	260	-	16,606
15	Panhandle Reinforcement (3)	-	-	-	5,415	5,415
16	Sudbury Replacement	-	-	-	-	-
17	Total Incremental Project Revenue	43,414	800	1,530	5,415	51,158

Notes:
(1) Exhibit D, Tab 2, Rate Order, Appendix A.
(2) Incremental Project Revenue by project calculated as lines 1 to 7 * line 9 * 12 / 1000
(3) Panhandle Reinforcement project revenue per Exhibit D, Tab 2, Rate Order, Working Papers, Schedule 14, p. 9, line 14.

ENBRIDGE GAS INC.

Undertaking to the City of Kitchener

To provide a continuity of the Rate T1 and Rate T2 monthly charge.

Response:

Please see Attachment 1 for an update to Exhibit KT1.7 to include the Rate T1 and Rate T2 monthly charge continuity.

UNION RATE ZONES
Derivation of Rate T1, T2 and T3 2020 Monthly Charge and Transportation Fuel Ratio

Line No.	Particulars		2019 Rate (1)	2020 Rate Adjustments: 1.36% PCI (2)	2020 Rate Adjustments: 2020 Capital Pass-through Change (3)	2020 Rate Adjustments: 2020 PDO Change	2020 Rate (1)	Increase/ (Decrease)
			(a)	(b)	(c)	(d)	(e) = (a+b+c+d)	(f) = (e-a)
1	Monthly charge ($/month)	Rate T1	1,964.32	27.61	7.35	-	1,999.28	34.96
2		Rate T2	5,976.36	88.46	87.11	-	6,151.93	175.57
3		Rate T3	20,622.21	291.57	93.19	-	21,006.97	384.76
4	Transportation fuel ratio	Rate T1	0.326%	0.004%	-	0.009%	0.338%	0.012%
5		Rate T2	0.291%	0.003%	-	-0.001%	0.294%	0.003%
6		Rate T3	0.402%	0.004%	-	-0.005%	0.401%	-0.001%

Notes:
(1) Exhibit D, Tab 2, Rate Order, Appendix A.
(2) Monthly charge PCI per Exhibit D, Tab 2, Rate Order, Working Papers, Schedule 5, p. 15-20, Monthly Charges line, column (g) divided by column (a).
(3) Monthly charge capital pass-through per Exhibit D, Tab 2, Rate Order, Working Papers, Schedule 5, p. 15-20, Monthly Charges line, column (e) + (j) divided by column (n).
(4) Transportation fuel ratio PDO per Exhibit D, Tab 2, Rate Order, Working Papers, Schedule 7, p. 1, column (b) + (i).

ENBRIDGE GAS INC.

Undertaking Response JT1.4 to VECC

Question:

For the EGD and Union Rate Zones confirm whether:

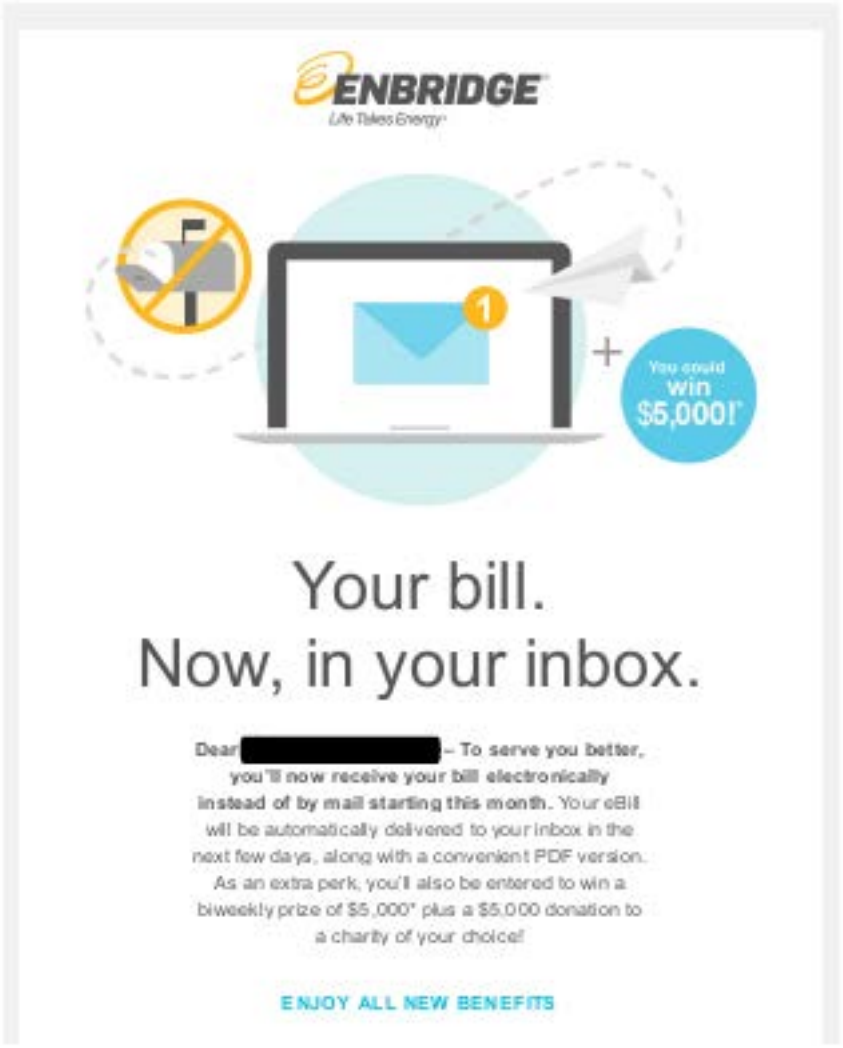
1. It remains the customer's option to enroll in e-billing.
2. The customer will only be enrolled in e-billing if the customer expressly agrees.
3. There have been no changes as of January 1, 2019 to require customers to move to e-billing.

Response:

As of January 1, 2019, Enbridge Gas began treating e-billing as the default option for its customers.

From that date, Enbridge Gas has instituted a process to enrol all new and existing customers who have provided an email address to the Company into e-billing. When Enbridge Gas moves a customer to e-billing, they will receive an email from Enbridge Gas informing them that they will receive their bills electronically. A sample copy of the email that is sent is attached.

As can be seen, the email explains how e-billing works, and informs the customer that they can contact Enbridge Gas should they prefer not to be enrolled in e-billing. When a customer contacts Enbridge Gas, they are given the option to switch back to paper bills. To date, around 10-15% of customers who have been switched to e-billing have contacted Enbridge Gas and have been switched back to paper billing.


ENBRIDGE
Life Takes Energy
1
You could
win
$5,000!*
Your bill.
Now, in your inbox.
Dear [redacted] – To serve you better, you'll now receive your bill electronically instead of by mail starting this month. Your eBill will be automatically delivered to your inbox in the next few days, along with a convenient PDF version. As an extra perk, you'll also be entered to win a biweekly prize of $5,000* plus a $5,000 donation to a charity of your choice!
ENJOY ALL NEW BENEFITS

Get your bill sooner

You'll receive an email when your monthly bill is ready, with the amount due and a PDF attachment of your bill for fast, easy viewing.

Text and email reminders

A week before payment is due, we'll send a quick note to remind you.

Reliable and convenient

With your eBill delivered right to your inbox every month, you'll always know where to find it.

We respect your preference

If you don't find eBill to be the most convenient option, you can contact us at any time.

ENBRIDGE

Life Takes Energy

*NO PURCHASE NECESSARY. Contest is only available to active account holders of Enbridge Gas Inc.'s residential customers who are at least 19 years of age and who switch to paperless billing between Oct. 1, 2019 and Dec. 31, 2019 at 11:59 p.m. EDT and are on eBilling on the date of the draw. Only one entry per household. Residents of Quebec are not eligible. There are seven prizes, each consisting of $5,000 cash and a donation from Enbridge Gas of $5,000 to a charity of the winner's choice. Random draws will be held every two weeks on Oct. 16, 30, Nov. 13, 27, Dec. 11, 27, 2019 and Jan. 8, 2020. Winners will receive a $5,000 cheque delivered by courier before February 2020 and Enbridge Gas will make a donation of $5,000 to be presented to the winner's charity of choice in the form of a cheque. Only Canadian charities registered with the Canada Revenue Agency are eligible. For certainty, the donation is made by Enbridge Gas and the winner does not receive the tax receipt for the donation. Chances of winning depend on the number of eligible entries received. Value of each prize to the winner is $5,000 and the warm feeling of helping your favourite charity. Selected entrant must correctly answer a mathematical skill testing question to be declared a winner. Full terms and conditions available here. © 2019 Enbridge Gas Inc. All rights reserved.

Sent from Enbridge, 500 Consumers Road North York, Ontario, Canada M2J 1P8

ENBRIDGE GAS INC.

Undertaking Response

Investigation of R squared on Regression results

Response:

The R squared of the linear trend model changes consistent with the variability of the data. The low R squared of the trend model shows the high variability in data. Since the weather is highly variable data, it is expected to have low R squared from those models.

To determine the most appropriate method to forecast the weather, legacy EGD uses the evaluation framework that involves the assessment of nine different methodologies used by North American utilities (Naïve, 10 yr MA, 20 yr MA, 30 yr MA, 20 yr Trend, De Bever, De Bever with Trend and Energy Probe and 50/50 (Average of 10 yr MA and 20 yr Trend)).

Some of these methodologies rely on regression equations (like 20 yr trend, De Bever and Energy Probe) while some of the popular methodologies doesn't have any statistics or R squared (like Naïve and moving average). So, the Company decided to evaluate the same nine methods using the evaluation criteria, namely: Accuracy, Symmetry and Stability (Refer to Budget Degree Day evidence at EB-2006-0034 and at EB-2011-0354). In the EB-2006-0034 hearing, EGD's witness explained why the evaluation criteria used are more appropriate than R-squared for comparing and choosing the best model. See attachment: EB-2006-0034, February 1st, 2007 Transcript Pages 10 to 17.

The methodology which generates the most accurate, symmetrical and stable results have been proposed to the Board to use and approved by the Board.

Even though the R squared of 20-yr trend model was low, it ranked best based on the selection criteria for Central zone during the Company's first IR period (2008-2012). Then for the Custom IR period, the 50/50 (average of 20 yr trend and 10 yr MA) ranked best methodology for Central zone.

The Company will re-evaluate the ranking to determine the best methodologies for each rate zone in its rebasing application for 2024.

Undertaking J3.3? Or would there be another response?

MR. LADANYI: Well, we were wondering whether it would be acceptable because I think it covers really the same area but we could look at it again if it is not acceptable. That's why I asked that at the beginning.

MR. STEVENS: Mr. Vlahos, if it would be helpful we would be happy to file it in the conventional undertaking response format.

MR. KAISER: Thank you. Mr. Shepherd, before you start, let me just go over a couple of these things with the witness. I was reading the transcript last night, Mr. Ladanyi, or maybe Mrs. Chan or Mr. Denomy, and you recall we were having this discussion about the reliability of this formula, of this variable, I suppose, as part of the equation to predict the weather.

You recall that we were concerned - or at least I was concerned - as to why the adjusted R-squared, which was 85.9 in the case of Toronto or the central region was so dramatically different from the adjusted R-squareds which were 0.15 in the case of Ottawa or the eastern region and 0.36 in the case of the Niagara region.

You told us that at least looking at the adjusted R-squared, the models weren't very useful for the two regions outside of Toronto, but they were, in your view, reliable for estimating in Toronto where you said most of your customers were, 80 percent. Then we went to the F-statistic, which again was a little bit higher, 2.7 in the case of Toronto; 0.71, I think it was, in the case of

eastern, 0.32 in the case of Niagara.

But as I read the transcript last night, you agreed that even in the Toronto area that F-statistic showed us that this model was unreliable at the 95 percent confidence level.

MR. DENOMY: Yes.

MR. KAISER: Now, I then went back and looked at the Union case, and you have said this, I think, but we can confirm this. Union in their last case proposed exactly the same methodology, the 20-year trend.

MR. DENOMY: Yes, they did.

MR. KAISER: You no doubt read the Board's decision in that case?

MR. DENOMY: Yes.

MR. KAISER: And the Board rejected that largely because they found it to be statistically unreliable. Do you agree with that?

MR. DENOMY: Yes.

MR. KAISER: Now, I went back and looked at what analysis Union did and I think I may have a copy of the exhibit. Do we have N3.2? I just want to -- this was the similar analysis that Union filed to the analysis that you filed that we have just been discussing in Exhibit C2, tab 4, schedule 1. In the Union case it was Exhibit N3.2 filed on October 15, 2003 and Allan Fogwill, QC, was the witness at the time, it turns out.

I looked at the regression analysis Union did and put before the Board at that time and, lo and behold - this is

on the first page, Mr. Denomy - I found an adjusted R-squared of 22.89 and a F-statistic of 6.6. Those would both be better results than you have. Would I be right?

MR. DENOMY: Yes, they would.

MR. KAISER: So am I putting too fine a point on it. You are here arguing the same thing that the Board rejected in the Union case, and in the Union case the model was even stronger than the model that you are putting before us today. Is that fair?

MR. DENOMY: To a certain extent. We are arguing that the 20-year trend should be accepted based on its forecasting ability.

MR. KAISER: Right.

MR. DENOMY: The regression diagnostic statistics that you are currently looking at in terms of R-squared or the F-statistic are just but one thing that you have to look at when you are examining a model in terms of its predictive ability.

MR. KAISER: That is what I wanted to understand. So what else -- so what else should we be looking at that would lead us to conclude that, in your case, it is more reliable than the Board found in the Enbridge case? What's the difference?

MR. DENOMY: If you turn to Exhibit C2, tab 4, schedule 1, page 11. Table 6.

MR. KAISER: Okay.

MR. DENOMY: Degree days are a very difficult variable to forecast and all of the models that we looked at tend to

have a very low R-squared, and the t statistics and F statistics are also quite low.

If you are throwing away a model solely on the basis of the regression diagnostics statistics, you may be throwing away a model that in fact has good predictive ability. So rather than just looking at the adjusted R-squared and the t statistics and F statistics, we decided to look at the predictive ability; in other words, the forecasting accuracy of the models. And that is what is shown in table 6.

We are concerned with getting an accurate forecast of degree days, and in table 6 you can see that we've ranked the models on the basis of accuracy, symmetry and stability. And what we found was that despite the fact that the 20-year trend does tend to have a lower R-squared than some of the other models that we have examined and the t statistics are somewhat lower than the other models that we have examined, it actually produces the most accurate forecasts of degree days.

And that is the basis upon which we are recommending the 20-year trend.

MR. KAISER: Let me understand that, then, because I think this is important.

First of all, these degree days that we are using, is this Toronto data or --

MR. DENOMY: This is strictly Toronto data.

MR. KAISER: I think we had some discussion of this. Is it -- are the results different if we start looking at

Ottawa?

MR. DENOMY: Yes, the results are different if we start looking at Ottawa.

MR. KAISER: So we have that continuing problem. All right. So when you go to the accuracy, is that simply what the model predicted compared to the actual?

MR. DENOMY: Yes.

MR. KAISER: All right. So 20-year trend is closer than any of the other models in that regard?

MR. DENOMY: That's correct.

MR. KAISER: Then we go to symmetry. What does symmetry mean?

MR. DENOMY: Symmetry is whether or not the model tends to over-forecast or under-forecast. There's two different ways you can look at it. You can look at it by examining the mean percentage error, which is just the average of the percentage variance, and what you want to see is a mean percentage error that is close to zero. It means that on average, the overages and underages are cancelling out.

You can also look at it with respect to the number of times that it over-forecasts or under-forecasts, but that doesn't give you an idea of the magnitude of the over- or the under-forecast that is captured by the mean percentage error.

MR. KAISER: All right. Then we go to stability. What is the additional qualitative --

MR. DENOMY: Stability is -- as we've examined it, we

classify that as the standard deviation of the forecasts. You simply take all of the forecast values and calculate the standard deviation.

So the higher the standard deviation, the more volatile the forecast. The lower the standard deviation, the less volatile the forecast.

One of the things with stability, however, is you will find that if you look at, for example, the 30-year moving average, which is the one model below the 20-year trend in table 6, you can see that it has a very stable forecast, but when you rank it on the basis of symmetry or accuracy, it doesn't even come close to the 20-year trend.

It is not as accurate. It tends to over-forecast; in other words, have a biased forecast.

MR. KAISER: When you add it all up in the last column --

MR. DENOMY: Yes.

MR. KAISER: -- how do you weight these three factors? Are accuracy, symmetry and stability, as you define, them the same weight?

MR. DENOMY: No, not in this table. If you look at the accuracy statistics, we have used two. Symmetry, we have used two, and stability or standard deviation, we have only used one. So the weights implicit in our ranking are 40 percent accuracy, 40 percent symmetry, 20 percent stability.

MR. KAISER: Now, I presume if we had different weights, we would have a different result?

MR. DENOMY: Yes, you could.

MR. KAISER: And how would you justify 40/40/20?

MR. DENOMY: Well, we think that accuracy and symmetry are more important than stability. From a rate-setting perspective, the more stable the model, obviously that is better. But as I previously discussed, we want to get an accurate -- we want to get the right forecast of degree days. You want to be closer to right than wrong on average, so it is more important to have a higher weighting to accuracy and symmetry.

MR. KAISER: Has anyone else done this kind of analysis? Is this a type of analysis that is used in any of the academic literature, or is this something that you guys have come up with?

MR. DENOMY: All of these statistics that you see here, the mean absolute percent error, or MAPE, route mean squared percentage error, or RMSPE, they're all standard forecast accuracy statistics that are used in the field of forecasting, as are the mean percentage error, percent over-forecast and standard deviation. They're all standard statistical tests that you would apply to a model.

We have just taken a look at all of them and ranked them on the basis of accuracy, symmetry and stability.

MR. KAISER: I understand that, but in terms of the weighting -- for instance, let me tell you a concern I had. I was wondering - and I thought this was probably the weighting you were using - you've got 80 percent of this falling into one category.

MR. DENOMY: Yes.

MR. KAISER: Which happens to be the category that your proposal does well in, as opposed to stability.

Is there some overlap between accuracy and symmetry? Are we measuring the same thing and, therefore, bumping the weight from 40 to 80?

MR. DENOMY: Is there some overlap between accuracy and symmetry?

MR. KAISER: Are we double counting in some sense? It seemed to me, just intuitively, accuracy is the difference between actual and what the model predicts. Symmetry is how close you go -- you know, there seems to be a similarity between those, between those two concepts.

In other words, a model that is high on accuracy is going to be high on symmetry. No?

MR. DENOMY: Excuse me for just one minute, please.

[Witness panel confers]

MR. DENOMY: You can -- accuracy, I think, would be the most important factor, and I think that you are correct in saying that the symmetry part would, to a certain extent, be captured by accuracy, yes.

MR. KAISER: I tried to actually do overnight a bit of analysis similar to this and without really understanding your analysis fully at C2, tab 4. But, again, what I was trying to do was compare the results of these different models.

MR. DENOMY: Okay.

MR. KAISER: I would like to put this table to you, if