Exelon Generation®

200 Exelon Way
Kennett Square, PA 19348

www.exeloncorp.com

RS-15-175

June 15, 2015

4/30/2015
80FR24290

(3)

RECEIVED
2015 JUN 24 PM 4:09
RULES AND DIRECTIVES
BRANCH
USNRC

Ms. Cindy Bladey
Office of Administration
Mail Stop: OWFN–12–H08
U.S. Nuclear Regulatory Commission
Washington, DC 20555–0001

Subject: Comments on Draft NUREG-2178, *"Refining and Characterizing Heat Release Rates from Electrical Enclosures During Fire (RACHELLE–FIRE), Volume 1: Peak Heat Release Rates and Effect of Obstructed Plume"* (Federal Register 80FR24290, dated April 30, 2015, Docket ID NRC–2015–0059)

This letter is being submitted in response to the U.S. Nuclear Regulatory Commission's (NRC's) request for comments concerning the subject draft NUREG-2178, *"Refining and Characterizing Heat Release Rates from Electrical Enclosures During Fire (RACHELLE–FIRE), Volume 1: Peak Heat Release Rates and Effect of Obstructed Plume,"* published in the *Federal Register* (i.e., 80FR24290, dated April 30, 2015).

This draft NUREG documents the results of the RACHELLE–FIRE working group's efforts to develop technical information in three areas which include: 1) classification of electrical enclosures in terms of function, size, contents, and ventilation; 2) determination of peak Heat Release Rate (HRR) probability distributions considering specific electrical enclosure characteristics; and 3) development of a method to account for the impact of the enclosure on the vertical thermal zone of influence above the enclosure during fire.

Exelon Generation Company, LLC (Exelon) appreciates the opportunity to comment on the subject draft NUREG and offers the attached comments for consideration by the NRC. Exelon also supports the comments submitted by the Nuclear Energy Institute (NEI) on behalf of the industry related to this draft NUREG.

If you have any questions or require additional information, please do not hesitate to contact Richard Gropp at (610) 765-5557.

Respectfully,

James Barstow
Director, Licensing and Regulatory Affairs
Exelon Generation Company, LLC

Attachment

SUNSI Review Complete
Template = ADM – 013
E-RIDS= ADM-03
Add= D. Straub (DSW4)

Comments Concerning Draft NUREG-2178, *"Refining and Characterizing Heat Release Rates from Electrical Enclosures During Fire (RACHELLE–FIRE), Volume 1: Peak Heat Release Rates and Effect of Obstructed Plume"*

General Comments

1. NUREG/CR-7197, "Heat Release Rates of Electrical Enclosure Fires (HELEN-FIRE)" has also been released by the U.S. Nuclear Regulatory Commission (NRC) for public comment. Exelon Generation Company, LLC (Exelon) considers that any public comments on HELEN-FIRE could significantly impact the information described in NUREG-2178. For example, some cables in the HELEN-FIRE report are described as meeting the Institute of Electrical and Electronics Engineers (IEEE) Standard IEEE-383 (*"IEEE Standard for Qualifying Class 1E Electric Cables and Field Splices for Nuclear Power Generating Stations"*) guidance related to qualifying Class 1E electric cables and field splices for nuclear power generating stations, but appear to be non-qualified. This could shift the results discussed in NUREG-2178 significantly. Additionally, peak Heat Release Rate (HRR) reported in HELEN-FIRE for closed cabinets actually occurred when the doors were opened and the contents agitated. NUREG-2178 did not adjust for this. Exelon believes that these changes would create a more significant distinction between peak HRR for qualified and non-qualified cables than is currently discussed.

2. Exelon believes that the tests involving the substantial burning of circuit cards should not be attributed to cable. Circuit cards provide a significantly different fuel source and geometry than cables, exhibit significantly different fire behavior than cables, and should be treated separately in the report. Exelon considers that the circuit card data is causing excessive conservatism in the results for cable fires.

3. Exelon believes that additional discussion and clarification is needed for the guidance on "open" versus "closed" electrical enclosures. Currently, the only definition in the draft NUREG is two pictures. There appears to be a large difference between the two depictions, which could lead to interpretation differences between when to use "open" and "closed."

4. Despite the explanation provided in Chapter 3 and Appendix D related to the review of the tests in detail which identified conservatisms that were considered unrealistic, Exelon believes that some of the values in Tables 4-2 and 7-1 still appear extreme, and it is unclear how the values were derived. For example, the 1000 kw and 700 kw values used for the standard Large Enclosure (4a). Exelon suggests that it might be helpful and informative to include a "case study" concerning these values, to further explain and clarify how the values were determined.

5. Section 4.2 includes a discussion about special fuel loading configurations. Exelon believes that that it would be beneficial to describe the relationship between experimental ignition sources and ignition sources in actual control cabinets (e.g., electrical voltage level), such that a user could correlate their cabinets to the test data.

6. In Section 4.2.3, under Special Case 3, there is a good discussion that would allow plants to use the low and very low cases if certain criteria are met with cable separation using certain metal or non-combustible barriers (separating redundant divisions). The design basis of these barriers in a typical nuclear power plant is to prevent damage to redundant trains due to an electrical malfunction in a single train (short circuit heating). The acceptability of these designs has been demonstrated by the testing programs described in Regulatory Guide (RG) 1.75, *"Physical Independence of Electric Systems."* Exelon believes that it might be helpful to include some additional insight as to the effectiveness of these barriers for "typical" fires that exceed the short-circuit faults postulated by the RG 1.75 design basis guidance. This could be helpful in establishing that the existing separation is adequate to provide several minutes in delay of damage to essential circuits, thereby delaying the onset of spurious operations or multi-train failures during the initial states of an event. Currently, Fire Probabilistic Risk Assessments (PRAs) must make conservative assumptions about these scenarios, and the assumptions can skew the risk analyses. Any information that would lead to refinement of these scenarios would certainly be beneficial.

7. The test program described in the draft NUREG does not appear to resolve significant differences between industry and NRC opinions concerning the potential severity of electrically-initiated fires in control cabinets. For example, it would have been beneficial if the tests yielded some insights to produce better agreement with events like those discussed in an industry inspection report (reference ML112270513), where a 125 VDC control circuit short-circuited. Unfortunately, it appears that was not the case with the testing. In the cited inspection report, the NRC appears to have been forced to use a value from NUREG/CR-6850, *"EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities,"* for a fuel-ignited cabinet fire, even though there was overwhelming evidence that no such fire was credible. Numerous tests have shown that a fire cannot be ignited by electrical faults in control cabinets that use IEEE-383 cable, but since this conclusion was not carried over into NUREG/CR-6850, it was not possible for the NRC to use it. This report appears to provide the evidence necessary to dispel the over-conservative guidance in NUREG/CR-6850; however, if specific actions are not taken to revise NUREG/CR-6850, then Exelon believes these problems will continue to occur.

More specific comments are provided on the following pages.

Specific Comments

NUREG-2178, Volume 1 - Refining and Characterizing Heat Release Rates From Electrical Enclosures During Fire (RACHELLE-FIRE)

Comment No.	Page No.	Line No.	Change Text From	Change Text To	Comment Basis
1	1-6	14-17			This paragraph states that the Zone of Influence (ZOI) may be affected; however, the preceding paragraph on Page 1-5 states that analyses already completed to NUREG/CR-6850 guidance need not be revised as they are more conservative. The statement that ZOI may be affected might give the reader the impression that all ZOIs must be reassessed, even if previously performed to the more conservative guidance specified in NUREG/CR-6850. That would seem to conflict with the previous statements that specify that analyses already completed to NUREG/CR-6850 do not require revision. Exelon believes that this might be contradictory information, and may lead to confusion by a user or auditor and recommends further clarification.

Comment No.	Page No.	Line No.	Change Text From	Change Text To	Comment Basis
2	2-3	23-26	"Fire Tests have shown that ventilation characteristics have a major effect on the fire growth inside an enclosure [7, 8]."	Exelon recommends providing further clarification for this statement, or remove/revise statement, and update other parts of report accordingly.	It is a general belief for nuclear power plant Fire Protection that ventilation (doors open/closed) should have an effect on fire intensity; however, it is not clear from reviewing the cited tests (draft NUREG/CR-7197 or NUREG/CR-4527, *"An Experimental Investigation of Internally Ignited Fires in Nuclear Power Plant Control Cabinets"*) that such a strong correlation actually exists in order to make the statement of "a major effect." Exelon believes that the cited reports do not provide explicit evidence of this major effect. With regard to the VTT data, it is hypothesized in the test that the "open" versus "closed" distinction only mattered for cabinets that had reached flashover. However, the data for cabinets that reached flashover is sparse. Exelon recommends that the NRC provide additional clarification in support of the basis for the statement. It would be helpful to include more specific evidence rather than simply citing the test reports, as they do not appear conclusive. If there is no specific basis, it is suggested that the assertion should not be made. It is possible that ventilation effects were not clearly exhibited in the cited tests due to some other factor or unrealism in those tests, or the ventilation effects were seen in the raw data but not discussed. For example, the doors were often opened mid-test in the HELEN-FIRE tests, but the HRR change when the doors were opened was not discussed in the HRR summary table. If so, Exelon recommends that the NUREG provide further discussion related to the unrealisms in the cited tests, so that the data can be corrected accordingly.

Comment No.	Page No.	Line No.	Change Text From	Change Text To	Comment Basis
3	2-8; Appendix D				Section 2.2.6 and Appendix D The discussion and accounting of some of the unrealisms in the test data is considered a positive step in this draft NUREG; however, further discussion would be considered helpful. Some suggestions include: When using HRR values taken from NUREG/CR-4527, subtract the HRR of the pilot fuel. This was done for the values published in NUREG/CR-7197, but was not done for the values published in NUREG/CR-4527. With regard to the VTT tests, the data leaves the impression that their equipment is not representative of U.S. nuclear power plant equipment. Their test describes igniting the cables with one or two matches. Even non-IEEE-383 cables in U.S. nuclear power plants would be required to meet UL or IPCEA flame test standards, which would require a cable to self-extinguish under these conditions. VTT Tests 1 from Series 186 and Test 4 from Series 521 are stated as driving the 98th percentile. If a user does not have cabinets that are similar to these cabinets (many circuit cards in a crib configuration, non-flame retardant wire), then this is imposing a significant penalty on the user. Many of the tests in NUREG/CR-7197 experienced their peak HRR after a "crowbar" was used in the middle of the test to jostle the contents. This also involved opening doors in cabinets that are reported as "closed" in the test summary.

Comment No.	Page No.	Line No.	Change Text From	Change Text To	Comment Basis
4	3-1			Include discussion of effect that changing the surface area of cables has on HRR.	Section 3 includes a discussion concerning influencing factors that govern HRR. Fuel load and configuration is discussed on Page 3-2; however, this discussion appears somewhat confusing and it might be difficult for a user to apply the same logic to his/her own cabinets. As shown in the testing, the same bundle of cable will produce a higher HRR if the bundle is spread apart. This causes an increase in the surface area of combustible material. As discussed in NUREG-1805, *"Fire Dynamics Tools (FDTs) Quantitative Fire Hazard Analysis Methods for the U.S. Nuclear Regulatory Commission Fire Protection Inspection Program,"* Chapter 7, in a simplified form, HRR will be proportional to the surface area.
5	3-15				Guidance on Low and Very Low Fuel Load Cabinets There are pictures used to illustrate very low versus low loading. However, it is not clear if the pictures represent the average type of loading for the group or the pictures represent the bounding fuel loading for the group. Exelon suggests further clarification. Furthermore, there is a chart to differentiate default versus low fuel loading, but there is no chart for very low fuel loading to low fuel loading. An additional chart depicting this information might be useful.
6	4-10	Figure 4-3	Figure Caption: "Photograph of LFMC (left) and FMT (right) within electrical enclosure"	Figure Caption: "Photograph of LFMC (left) and FMC (right) within electrical enclosure"	The accompanying text describes Flexible Metal Conduit (FMC). There is no discussion of FMT in the text, perhaps this is a typographical error.

Comment No.	Page No.	Line No.	Change Text From	Change Text To	Comment Basis
7	4-4				Guidance on Fire Diameter Under fire diameter, there are only calculations that show when the plume equations become ineffective. Exelon believes that the fire diameter guidance should be clearly stated. For example: • In general, the top horizontal surface area of the ignition source should be used to back calculate the effective equivalent fire diameter (e.g., the top of a vented vertical section of a cabinet is 3' by 2'-5" - the fire diameter is 3'). If this fire diameter does not result in an acceptable fire diameter within Table 4-3, then the closest fire diameter is acceptable and should be selected.
8	4-4				Section 4.1 Establishing Fire Diameter Exelon suggests further clarification since it is not clear what this information is used for in the context of draft NUREG. Perhaps the introduction could be further explained.
9	4-5	Table 4-3			Exelon suggests further clarification since it is not clear what the practical application of Table 4-5 provides. What is the user to do when the calculated fire diameter is larger than the cabinet dimensions?
10	4-9	9-10	"Cables routed in LFMC will burn less intensely than would cables routed randomly within an enclosure."		Exelon believes the statement is stated as a fact, but it seems more of a judgment. While this appears to be a reasonable position, Exelon suggests providing some supporting basis, or simply state that it is judgment.

Comment No.	Page No.	Line No.	Change Text From	Change Text To	Comment Basis
11	5-14 5-16 5-17	Fig 5-9; Fig 5-12; Fig 5-14		Annotate graphs to show the cabinet top (obstruction) at 2.3 m.	Cabinet top (obstruction) is described in paragraph 5.2.3.3 as being 2.3 m high. Exelon suggests that this information should be carried over to the graphs and annotated on the graphs, to make their results more understandable.
12	5-14 thru 5-18	Fig 5-9; Fig 5-12; Fig 5-14; Fig 5-16;			Exelon recommends indicating on the curves where the Heskestad Correlation no longer applies (i.e., in the flaming region) so that users will not assume they can extrapolate from the curves.
13	5-17; 5-18	Fig 5-14; Fig 5-16			Exelon suggests defining the range of the y-axis so the FDS curves do not go off-scale on the charts.
14	5-19				Section 5.2.4.5, Statistical Analysis This section does not appear to provide a conclusion, and does not appear to be used by any other section of the report.

Comment No.	Page No.	Line No.	Change Text From	Change Text To	Comment Basis
15	5-26 thru 5-27				Section 5.2.6, Statistical Analysis This section does not appear meaningful to the application of the NUREG overall. As described in NUREG-1934, *"Nuclear Power Plant Fire Modeling Analysis Guidelines (NPP FIRE MAG),"* this approach is meant to compare a model prediction to an actual measured data point. In the application here in NUREG-2178, *"Refining And Characterizing Heat Release Rates From Electrical Enclosures During Fire (RACHELLE-FIRE) - Volume 1: Peak Heat Release Rates and Effect of Obstructed Plume,"* there are no actual measured data points to compare the model against. Also, the model accuracy implied by this effort seems misplaced, given the degree of subjectivity in the HRR values that are inputs into the models.
16	5-38	9-10	"The results show that for most cases the thermal radiation ZOI extends farther than the plume will be shifted by the top obstruction."		Exelon believes this sentence is confusing and requests further clarification.
17	5-40	14; 18; 24			Exelon believes the use of the term "shall" in Paragraph 5.3.8.3 to be inappropriate in a guidance document. (three instances)

Comment No.	Page No.	Line No.	Change Text From	Change Text To	Comment Basis
18	5-5		"However, no specific study associated with fire plume temperatures above obstructions was noted."		Section 5.2.1 states that prior testing does not exist. However, testing does exist. In the late 1970s and early 1980s, the industry and NRC performed testing to develop technical strategies for providing RG 1.75, *"Physical Independence of Electric Systems,"* separation guidance. Those tests included the effects of vertical fire propagation in stacked trays, with solid bottoms. Those tests showed that solid-bottom trays were effective in preventing fire propagation. Similar tests were performed to show the effect of *marinate boards between trays to prevent propagation* from one train to another.
19	6-2	7-8	"The results were plotted with both temperature predictions versus the height above the fire base as illustrated in Fig 6-1...."		Exelon believes that the term "fire base" is undefined.
20	6-5	29 thru 31	"However, the electrical enclosure has a solid top with no openings in the top surface. The electrical enclosure has sufficient side venting to fit the requirements to be treated as an obstructed plume configuration."		In reviewing Chapter 5, it was not clear that a closed cabinet with side vents was meant to be treated as a 3-sided cabinet. If this was the intent, Exelon suggests that additional clarification be included in Chapter 5 to further explain the intent. It does not appear evident from the discussion that the FDS modeling performed for a completely-open side to a cabinet would yield similar results for a cabinet with vent openings. Exelon believes that additional justification is necessary to support the position.
21	6-9	27			Exelon believes the use of "shall" in the guidance appears inappropriate.

Comment No.	Page No.	Line No.	Change Text From	Change Text To	Comment Basis
22	C-21	14-15			"Very low fuel loading" is defined as "less than 5% combustible volume." From a practical standpoint, Exelon does not necessarily agree that it is possible to objectively assess a panel and conclude that it has "less than 5% combustible volume." Some of the photos of low and high cabinets appear that they might also satisfy this 5% criterion, so on the surface, the criterion appears to be inappropriate. A switchgear might also appear to meet this "less than 5%" criterion. Exelon suggests using a more objective way of classifying panels, so that the distinction is clear, and can be applied by users without possible confusion.
23	D	Table D-1			Exelon believes that cable qualification should be clearly documented in Table D-1, and some cables may have been inaccurately reported. For example, HELEN-FIRE tests 35, 36, 37, 38, 39, 46, 47, 48, 49, 61, 62, 63, 109 state the cable is qualified, but a review of the donor report (CAROLFIRE) suggests this cable was not qualified. VTT test reports state the cable was ignited with 1 or 2 matches; however, this would not meet U.S. cable qualification standards (UL, IPCEA) that existed prior to the U.S. adoption of IEEE-383, which raises questions about relevance to U.S. nuclear power plant cabinet fire tests.

Comment No.	Page No.	Line No.	Change Text From	Change Text To	Comment Basis
24	D	Table D-1			Exelon believes that where a cable type is known (power, control, instrument, telecom), it should be reported as this will have a significant impact on the HRR of the cabinet fire. For example, telecom cable will give a higher HRR than a control or power cable, due to having a higher surface area, and lower thermal mass.
25	D-10				Table D-1. Exelon believes that "Doors open" versus "Doors closed" is not being applied consistently for HELEN-FIRE tests. For example, in Test CDB-42, HELEN-FIRE page 86 states that the door was opened at 10 minutes and then left open for the remainder of the test. Peak HRR occurred at about 19 minutes, so this appears to be a "doors open" test; however, on Table D-1 it is characterized as a "Doors closed" test. HRR is also seen ramping up sharply at the point where the doors are opened.
26	D-10				For tests where OEM wire was burned in panels (e.g., CDB-41/CDB-41B), Exelon believes that some evidence should be provided as to whether this was IEEE-383 qualified cable or not. It is categorized as qualified cable in the table; however, the HELEN-FIRE report does not provide this information. Exelon recommends clarifying whether it was an IEEE-382 qualified cable.

Comment No.	Page No.	Line No.	Change Text From	Change Text To	Comment Basis
27	D-10				Test CDB-41 and CDB-41B. In the HELEN-FIRE report, this test appeared to involve the energetic burning of circuit cards. It appears that the cable contribution to the HRR is irrelevant in this test, if the fire's severity was driven by the circuit cards. In the photos provided, the cards appear to be arranged in the optimum configuration for burning (like a crib fire). This characteristic was also seen in the VTT test data. Given the cards' significant contribution to the fire, Exelon does not believe that it is appropriate to classify the fuel source as "TS Cable." It also appears that all of the cabinet test data could be partitioned further, based on the presence of a large number of circuit cards, so as to avoid applying an over conservatism to the much more common panels that do not have arrays of circuit cards such as those described. Exelon believes that this would remove excess conservatism from control cabinets that contain an abundance of cable, and allow cabinets that contain abundant circuit cards to be assigned a more severe HRR, in line with the actual test data.
28	D-12	CBD-72			HELEN-FIRE test report states that the HRR results for test CBD-72 were invalid. Exelon suggests that the NRC consider deleting the HRR information from test CBD-72 from Table D-1.
29	D-14	CDB-104			The peak HRR for test CDB-104 is shown as "250." However, the HELEN-FIRE report states that this HRR is "220." Perhaps this a typographical error in Table D-1.

Comment No.	Page No.	Line No.	Change Text From	Change Text To	Comment Basis
30	D-24	12-13	"Test 1 from VTT test series 186 and Test 4 from VTT test series 521 were used to inform the selection of the 98th percentile value"	"Test 1 from VTT test series 186 (republished as Test 4 from VTT test series 521) were used to inform the selection of the 98th percentile value"	VTT Publication 521 is a summary of prior testing, and it does not represent a new test series. When VTT Publication 521 summarized the prior tests, they were renumbered by the VTT author, giving the impression that these are separate tests, but they are actually not. Therefore, Exelon believes that Figure D-12 and Table D-1 should not be showing duplicate data points for data published in VTT Publication 521. Removing these duplicate points may likely require recalculating HRRs and confidence ranges.
31	D-24	10			VTT Publication 186 does not publish a maximum HRR for Test 1, it only provides a graph. Some interpolation is needed to pick the maximum HRR from this graph. The value seems to fall below 400 kW (perhaps in the range of 350 to 375 kW), but the exact value is uncertain. In VTT Publication in Fire Safety Journal 38 (2003), the peak HRR in this test was described as 350 kW (page 184 of journal).
32	D-27	Fig D-12			In right figure, the X-Axis labels on the graph are truncated, so it is difficult to determine which test the data point comes from.
33	D-6				Table D-1. Fuel loading for VTT test data is shown as "N/A." In the VTT publications, fuel load was provided for these tests. Therefore, Exelon believes that the information should be included here.
34	F-19 thru F-23				The page numbers in the footer appear to be missing the "F-" prefix.

Comment No.	Page No.	Line No.	Change Text From	Change Text To	Comment Basis
35	Fig 3-7; Fig 3-7				Guidance on Open versus Closed Electrical Enclosures Currently, the only definition is two pictures. The open enclosure (Figure 3-6) shows no walls at all and the closed enclosure (Figure 3-7) shows a vented enclosure with vent slats on the back of the enclosure. There seems to be a large difference between the two pictures, which could lead to interpretation differences between when to use open and closed enclosures. Some enclosures for example have vents on the sides, but have a wire mesh only at the top (i.e., over 90% of the surface area is open). Exelon requests clarification as to whether this is considered a closed enclosure. Some additional guidance to help bridge the gap between the two pictures would seem useful.
36	General				HELEN-FIRE (NUREG/CR-7197) is out for public comment as well. Any public comments on HELEN-FIRE could significantly impact the information in NUREG-2178.

Comment No.	Page No.	Line No.	Change Text From	Change Text To	Comment Basis
37	General				The terms "Thermoset," "Thermoplastic," "TS," and "TP" are being used as surrogates throughout the report to describe Qualified and Unqualified cable. There are footnotes inserted and other remarks to say that this is not what they really mean, and that TS and TP should be read to imply Qualified and Unqualified. Exelon believes that this might add some unnecessary confusion in the report due to imprecise use of terminology. The effect of this redefinition may lead to obscuring the results. Also, in some cases it may give erroneous results, which will result in skewing the peak HRR results described in the report. Exelon believes that the actual qualification status of the cables in the test should be obtained and accurately reported, so that the data can be applied in the field accurately.
38	General				Exelon believes that in some cases, the NUREG presents opinions as factual information and not as opinions. Exelon suggests that any opinions about phenomenon presented in the report should be stated as such.
39	General				Chapter 5 of the report gives an impression that the Heskestad Correlation is valid within the cabinet itself, yet there is no basis to support this position. A fire within a cabinet would involve one or many 3-dimensional fuel sources, providing feedback on each other in ways that wouldn't be addressed by the Heskestad Correlation. Exelon suggests revising text to make it clear that this is not how the Heskestad Correlation is being used.

Comment No.	Page No.	Line No.	Change Text From	Change Text To	Comment Basis
40	General				Given the photos of switchgear, there appears to be less wiring than in a cabinet that would be considered to have "Very Low" fuel loading. Since HRR would tend to be proportional to the surface area of the combustibles in the cabinet, and the combustibles in a switchgear cabinet are diffuse, it appears that the HRR for the combustibles in a switchgear cabinet would be lower than the values given, and closer to those of a "Very Low" example. Also, the internal partitions of a switchgear cabinet would tend to allow one to consider the power and control cables separately for HRR purposes.
41	General				Despite the explanation provided in Chapter 3 and Appendix D of the report, some of the values in Tables 4-2 and 7-1 still appear extreme, and it is unclear how these were derived. For example, the 1000 kW and 700 kW values for the standard Large Enclosure (4a). Exelon believes that it would be helpful and informative to include a "case study" in the report concerning these values, in order to further explain and clarify how the values were determined.