From: <ken.nicely@exeloncorp.com>
To: <mxb@nrc.gov>
Date: 5/17/05 12:12PM
Subject: MathCad Excerpt

Maitri,

Here is an excerpt from the MathCad worksheet. Gary indicated that the numbers he calculated were approximately 115,000 pounds and 109,660 pounds for the 1.5% and biased cases, respectively.

<<MathCad Excerpt.pdf>>

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Subject:	MathCad Excerpt
Creation Date:	5/17/05 12:11PM
From:	<ken.nicely@exeloncorp.com>
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MXB (Maitri Banerjee)

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MESSAGE	1119	05/17/05 12:11PM
MathCad Excerpt.pdf	68457	
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Excerpt from the Mathcad worksheet that sums the 0.5% bias M/C and compares with the "as found" case

Notes:
M_{mc}=0.5% bias M/C case flow integration

M_{mca}="as found case" flow integration

M_{1}= all valves drifted 1% high flow integration

$M_{1.5}$= all valves drifted 1.5% high flow integration

Integrating the flow pressure curves

integrating the flow vs pressure functions and converting to lb/sec yields

$$M_1 := \frac{\int_{1150}^{1350} Q1tot(p)\,dp}{3600} \qquad M_1 = 1.252 \times 10^5$$

$$M_{mc} := \frac{\int_{1150}^{1350} Qmctot(p)\,dp}{3600} \qquad M_{mc} = 1.097 \times 10^5$$

$$M_{mca} := \frac{\int_{1150}^{1350} Qmctota(p)\,dp}{3600} \qquad M_{mca} = 1.114 \times 10^5$$

$$\frac{M_{mca}}{M_{mc}} = 1.016$$

the ratios between the base 1% case and the others is generated

$\frac{M_{mc}}{M_1} = 0.876$ Monte Carlo

1.5% drift case

the identical approach is applied for the 1.5% drift case

$SP1 := 1135 \cdot 1.015 + 15$ $\quad SP1 = 1.167 \times 10^3$

$SP2 := 1240 \cdot 1.015 + 15$ $\quad SP2 = 1.274 \times 10^3$

$SP3 := 1250 \cdot 1.015 + 15$ $\quad SP3 = 1.284 \times 10^3$

$SP4 := 1260 \cdot 1.015 + 15$ $\quad SP4 = 1.294 \times 10^3$

$$Q115(p) := \begin{cases} 0 & \text{if } p < SP1 \\ \min\left[Q_{TR}(p), \dfrac{Q_{TR}(p)}{2} + \dfrac{Q_{TR}(p)}{2} \cdot \left(\dfrac{p - SP1}{.03 \cdot SP1}\right)\right] & \text{otherwise} \end{cases}$$

$$Q215(p) := \begin{cases} 0 & \text{if } p < SP2 \\ \min\left[Q_{mssv}(p), \dfrac{Q_{mssv}(p)}{2} + \dfrac{Q_{mssv}(p)}{2} \cdot \left(\dfrac{p - SP2}{.03 \cdot SP2}\right)\right] & \text{otherwise} \end{cases}$$

$$Q315(p) := \begin{cases} 0 & \text{if } p < SP3 \\ \min\left[Q_{mssv}(p), \dfrac{Q_{mssv}(p)}{2} + \dfrac{Q_{mssv}(p)}{2} \cdot \left(\dfrac{p - SP3}{.03 \cdot SP3}\right)\right] & \text{otherwise} \end{cases}$$

$$Q415(p) := \begin{cases} 0 & \text{if } p < SP4 \\ \min\left[Q_{mssv}(p), \dfrac{Q_{mssv}(p)}{2} + \dfrac{Q_{mssv}(p)}{2} \cdot \left(\dfrac{p - SP4}{.03 \cdot SP4}\right)\right] & \text{otherwise} \end{cases}$$

$$Q15tot(p) := Q115(p) + 2 \cdot Q215(p) + 2 Q315(p) + 4 Q415(p)$$

$$M_{15} := \frac{\int_{1150}^{1350} Q15tot(p)\, dp}{3600} \qquad M_{15} = 1.149 \times 10^5$$

$$\frac{M_{15}}{M_1} = 0.917 \qquad M_{mc} = 1.097 \times 10^5$$

$$\frac{M_{mc}}{M_{15}} = 0.955$$

shows that Monte Carlo result and 1.5% are fairly equivalent