

## Callaway2COLPEm Resource

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**From:** Johnson, Paula A [PJohnson3@ameren.com]  
**Sent:** Wednesday, June 03, 2009 5:01 PM  
**To:** Olson, Bruce; george.last@pnl.gov  
**Subject:** Enclosure P documents from the May 15 supplement - XDCalc  
**Attachments:** Picture (Metafile).bmp; Callaway 2 XDCALC Output.pdf; Description- XDCalc Output.doc

<<Callaway 2 XDCALC Output.pdf>> <<Description- XDCalc Output.doc>>

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**Hearing Identifier:** CallawayPlant\_Unit2\_COL\_Public  
**Email Number:** 216

**Mail Envelope Properties** (4524C8117330EA429AA592E99946A50604086737)

**Subject:** Enclosure P documents from the May 15 supplement - XDCalc  
**Sent Date:** 6/3/2009 5:01:18 PM  
**Received Date:** 6/3/2009 5:03:57 PM  
**From:** Johnson, Paula A

**Created By:** PJohnson3@ameren.com

**Recipients:**

"Olson, Bruce" <Bruce.Olson@nrc.gov>  
Tracking Status: None  
"george.last@pnl.gov" <george.last@pnl.gov>  
Tracking Status: None

**Post Office:** exchcal.corp.dir.ameren.com

| Files                          | Size  | Date & Time         |
|--------------------------------|-------|---------------------|
| MESSAGE                        | 1238  | 6/3/2009 5:03:57 PM |
| Picture (Metafile).bmp         | 44975 |                     |
| Callaway 2 XDCALC Output.pdf   |       | 2007005             |
| Description- XDCalc Output.doc |       | 25152               |

**Options**

**Priority:** Standard  
**Return Notification:** No  
**Reply Requested:** No  
**Sensitivity:** Normal  
**Expiration Date:**  
**Recipients Received:**



*XD CALC RESULTS ARE PRINTED  
SCAN OF OUTPUT FOLLOWS!*

R:\NUCDEV\CALLAWAY>prun midxq

ENTER: [XQ] X/Q  
[DO] PLUME DOSE  
[AI] AIR DOSE  
[RE] POPULATION DOSE (REM)  
[RETURN] EXIT

xq

ENTER: [PR] PRINT  
[AD] ADD (ADDS LAST ACCU. TO TOTAL)  
[CL] CLEAR  
[RETURN] GO BACK TO PREVIOUS OPTION

pr

ENTER: [LA] LAST ACCU ARRAY  
[TO] TOTAL ACCU ARRAY  
[RETURN] GO BACK TO PREVIOUS OPTION

la

X/Q SELECTOR

ENTER: [1] GROUND CENTER LINE  
[2] GROUND AVERAGE  
[3] ELEVATED CENTER LINE  
[4] ELEVATED AVERAGE  
[5] DEPLETION  
[6] DEPOSITION  
[RETURN] GO BACK TO PREVIOUS OPTION

1

MIDXQ- LAST X/Q NUMBER OF GOOD HOURS, DIVISOR= 26201.0

# X/Q SELECTOR

ENTER: [1] GROUND CENTER LINE  
[2] GROUND AVERAGE  
[3] ELEVATED CENTER LINE  
[4] ELEVATED AVERAGE  
[5] DEPLETION  
[6] DEPOSITION  
[RETURN] GO BACK TO PREVIOUS OPTION

2

MIDXQ- LAST X/Q NUMBER OF GOOD HOURS, DIVISOR= 26201.0

# X/Q SELECTOR

ENTER: [1] GROUND CENTER LINE  
[2] GROUND AVERAGE  
[3] ELEVATED CENTER LINE  
[4] ELEVATED AVERAGE  
[5] DEPLETION  
[6] DEPOSITION  
[RETURN] GO BACK TO PREVIOUS OPTION

3

MIDXQ- LAST X/Q NUMBER OF GOOD HOURS, DIVISOR= 26201.0

# X/Q SELECTOR

ENTER: [1] GROUND CENTER LINE  
[2] GROUND AVERAGE  
[3] ELEVATED CENTER LINE  
[4] ELEVATED AVERAGE  
[5] DEPLETION  
[6] DEPOSITION  
[RETURN] GO BACK TO PREVIOUS OPTION

4

MIDXQ- LAST X/Q NUMBER OF GOOD HOURS, DIVISOR= 26201.0

DATES OF LAST X/Q ACCUMULATION ARE FROM 4 1 1 1 0 TO 6123124 0

X/Q ACCUMULATION FOR ELEVATED AVERAGE SEC/M3

FOR RELEASE POINT 2

\*\*DIRECTION FROM N TO THE S SECTOR

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| 4.1775E-07 | 1.0612E-07 | 6.2607E-08 | 4.2923E-08 | 3.2070E-08 |
| 2.0132E-08 | 8.6212E-09 | 4.6063E-09 | 3.6642E-09 | 2.6515E-09 |

\*\*DIRECTION FROM NNE

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| 3.7149E-07 | 9.3101E-08 | 5.5598E-08 | 3.8465E-08 | 2.8846E-08 |
| 1.5885E-08 | 6.8427E-09 | 4.2558E-09 | 2.7886E-09 | 2.0347E-09 |

\*\*DIRECTION FROM NE

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| 3.6574E-07 | 8.9419E-08 | 5.3865E-08 | 3.7633E-08 | 2.8372E-08 |
| 1.5760E-08 | 6.8536E-09 | 3.6846E-09 | 2.4581E-09 | 1.8118E-09 |

\*\*DIRECTION FROM ENE

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| 2.4125E-07 | 6.1096E-08 | 3.6984E-08 | 2.5806E-08 | 1.9458E-08 |
| 1.3207E-08 | 5.5622E-09 | 2.9116E-09 | 1.9080E-09 | 1.3909E-09 |

\*\*DIRECTION FROM E

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| 2.3540E-07 | 5.8702E-08 | 3.5080E-08 | 2.4290E-08 | 1.8256E-08 |
| 1.0760E-08 | 4.6197E-09 | 2.4585E-09 | 1.6280E-09 | 1.1935E-09 |

\*\*DIRECTION FROM ESE

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| 3.0757E-07 | 7.4288E-08 | 4.3781E-08 | 3.0270E-08 | 2.2820E-08 |
| 1.4684E-08 | 6.3867E-09 | 3.4211E-09 | 2.2717E-09 | 1.6708E-09 |

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

WAKE SPLIT  
UNDECAYED  
UNDEPLETED

DATES OF LAST X/Q ACCUMULATION ARE FROM 4 1 1 1 0 TO 6123124 0  
X/Q ACCUMULATION FOR ELEVATED AVERAGE SEC/M3  
FOR RELEASE POINT 2

\*\*DIRECTION FROM SE

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| 7.7202E-07 | 1.7065E-07 | 9.6640E-08 | 6.5878E-08 | 4.9558E-08 |
| 3.2069E-08 | 1.4169E-08 | 8.2825E-09 | 5.4629E-09 | 4.0166E-09 |

\*\*DIRECTION FROM SSE

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| 1.0334E-06 | 2.1526E-07 | 1.1906E-07 | 8.0837E-08 | 6.0922E-08 |
| 3.4559E-08 | 1.5812E-08 | 8.8468E-09 | 6.0404E-09 | 4.5325E-09 |

\*\*DIRECTION FROM S

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| 7.5528E-07 | 1.6606E-07 | 9.2063E-08 | 6.1755E-08 | 4.6117E-08 |
| 2.5630E-08 | 1.1325E-08 | 6.1649E-09 | 4.1484E-09 | 3.0820E-09 |

\*\*DIRECTION FROM SSW

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| 5.4127E-07 | 1.1252E-07 | 6.1900E-08 | 4.1654E-08 | 3.1116E-08 |
| 1.7291E-08 | 7.6875E-09 | 4.2142E-09 | 2.8481E-09 | 2.1223E-09 |

\*\*DIRECTION FROM SW

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| 4.7433E-07 | 1.0131E-07 | 5.6244E-08 | 3.7948E-08 | 2.8435E-08 |
| 1.5910E-08 | 7.1063E-09 | 3.8974E-09 | 2.6316E-09 | 1.9594E-09 |

\*\*DIRECTION FROM WSW

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| 2.8748E-07 | 6.4544E-08 | 3.6604E-08 | 2.4913E-08 | 1.8706E-08 |
| 1.2821E-08 | 5.4461E-09 | 2.8577E-09 | 1.8800E-09 | 1.3775E-09 |

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

DATES OF LAST X/Q ACCUMULATION ARE FROM 4 1 1 1 0 TO 6123124 0  
X/Q ACCUMULATION FOR ELEVATED AVERAGE SEC/M3  
FOR RELEASE POINT 2

\*\*DIRECTION FROM W

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| 4.7626E-07 | 1.0535E-07 | 6.2768E-08 | 4.2011E-08 | 3.1263E-08 |
| 1.9499E-08 | 8.1950E-09 | 4.2695E-09 | 2.7962E-09 | 2.0552E-09 |

\*\*DIRECTION FROM WNW

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| 5.0362E-07 | 1.1007E-07 | 6.0437E-08 | 4.0296E-08 | 2.9909E-08 |
| 1.9799E-08 | 8.4178E-09 | 4.4301E-09 | 2.9144E-09 | 2.1357E-09 |

\*\*DIRECTION FROM NW

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| 5.3710E-07 | 1.2569E-07 | 7.0461E-08 | 4.7095E-08 | 3.4897E-08 |
| 1.8980E-08 | 8.0954E-09 | 5.0129E-09 | 3.2738E-09 | 2.3836E-09 |

\*\*DIRECTION FROM NNW

|            |            |            |            |            |
|------------|------------|------------|------------|------------|
| 4.5498E-07 | 1.1419E-07 | 6.5935E-08 | 4.4609E-08 | 3.3097E-08 |
| 1.7926E-08 | 7.5836E-09 | 5.3859E-09 | 3.4427E-09 | 2.4838E-09 |

DISTANCES USED IN CALCULATIONS

|         |         |         |         |         |
|---------|---------|---------|---------|---------|
| 804.0   | 2416.0  | 4022.0  | 5632.0  | 7240.0  |
| 12067.0 | 24135.0 | 40225.0 | 56315.0 | 72405.0 |

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

#### X/Q SELECTOR

ENTER: [1] GROUND CENTER LINE  
[2] GROUND AVERAGE  
[3] ELEVATED CENTER LINE  
[4] ELEVATED AVERAGE  
[5] DEPLETION  
[6] DEPOSITION  
[RETURN] GO BACK TO PREVIOUS OPTION

5

MIDXQ- LAST X/Q NUMBER OF GOOD HOURS, DIVISOR= 26201.0

DATES OF LAST X/Q ACCUMULATION ARE FROM 4 1 1 1 0 TO 6123124 0

X/Q ACCUMULATION FOR DEPLETION  
FOR RELEASE POINT 2

SEC/M3

DEPLETED  
+ DECAYED  
8 HRS

```

**DIRECTION FROM N
  3.8396E-07    9.4361E-08    5.5207E-08    3.7347E-08    2.7547E-08
  1.7088E-08    7.0633E-09    3.6533E-09    2.1603E-09    1.4313E-09
**DIRECTION FROM NNE
  3.4157E-07    8.2800E-08    4.9069E-08    3.3495E-08    2.4796E-08
  1.3273E-08    5.4724E-09    3.2896E-09    2.0696E-09    1.4519E-09
**DIRECTION FROM NE
  3.3603E-07    7.9252E-08    4.7424E-08    3.2727E-08    2.4369E-08
  1.3167E-08    5.4810E-09    2.8309E-09    1.8334E-09    1.3130E-09
**DIRECTION FROM ENE
  2.2226E-07    5.4395E-08    3.2745E-08    2.2600E-08    1.6850E-08
  1.1347E-08    4.5648E-09    2.2746E-09    1.4313E-09    1.0035E-09
**DIRECTION FROM E
  2.1659E-07    5.2082E-08    3.0929E-08    2.1181E-08    1.5741E-08
  9.1148E-09    3.7686E-09    1.9334E-09    1.2437E-09    8.8582E-10
**DIRECTION FROM ESE
  2.8260E-07    6.5515E-08    3.8274E-08    2.6159E-08    1.9505E-08
  1.2509E-08    5.2690E-09    2.7348E-09    1.7685E-09    1.2642E-09

```

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

DATES OF LAST X/Q ACCUMULATION ARE FROM 4 1 1 1 0 TO 6123124 0  
X/Q ACCUMULATION FOR DEPLETION  
FOR RELEASE POINT 2  
SEC/M3

```

**DIRECTION FROM SE
  7.0899E-07    1.4891E-07    8.3066E-08    5.5796E-08    4.1459E-08
  2.6852E-08    1.1474E-08    6.1558E-09    3.8341E-09    2.6760E-09
**DIRECTION FROM SSE
  9.4808E-07    1.8667E-07    1.0126E-07    6.7572E-08    5.0247E-08
  2.7791E-08    1.2285E-08    6.6730E-09    4.4501E-09    3.2527E-09
**DIRECTION FROM S
  6.9390E-07    1.4457E-07    7.8823E-08    5.2062E-08    3.8370E-08
  2.0767E-08    8.8269E-09    4.6263E-09    3.0208E-09    2.1777E-09
**DIRECTION FROM SSW
  4.9772E-07    9.7772E-08    5.2730E-08    3.4845E-08    2.5648E-08
  1.3835E-08    5.8848E-09    3.0937E-09    2.0234E-09    1.4588E-09
**DIRECTION FROM SW
  4.3613E-07    8.8179E-08    4.8070E-08    3.1894E-08    2.3579E-08
  1.2845E-08    5.5147E-09    2.9094E-09    1.9047E-09    1.3754E-09
**DIRECTION FROM WSW
  2.6426E-07    5.6398E-08    3.1597E-08    2.1254E-08    1.5786E-08
  1.0880E-08    4.4054E-09    2.1898E-09    1.3769E-09    9.6636E-10

```

ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

DATES OF LAST X/Q ACCUMULATION ARE FROM 4 1 1 1 0 TO 6123124 0  
X/Q ACCUMULATION FOR DEPLETION  
FOR RELEASE POINT 2  
SEC/M3

```

**DIRECTION FROM W
  4.3719E-07    9.1774E-08    5.4365E-08    3.5890E-08    2.6392E-08
  1.6308E-08    6.4979E-09    3.1882E-09    1.9875E-09    1.3722E-09
**DIRECTION FROM WNW
  4.6228E-07    9.5985E-08    5.1803E-08    3.3963E-08    2.4852E-08
  1.6448E-08    6.6472E-09    3.3080E-09    2.0779E-09    1.4576E-09
**DIRECTION FROM NW

```

```

4.9323E-07    1.1032E-07    6.1059E-08    4.0236E-08    2.9427E-08
1.5569E-08    6.3726E-09    3.7292E-09    2.3113E-09    1.6046E-09
**DIRECTION FROM NNW
4.1809E-07    1.0128E-07    5.7905E-08    3.8635E-08    2.8289E-08
1.4889E-08    6.0320E-09    3.4925E-09    2.0129E-09    1.3302E-09
DISTANCES USED IN CALCULATIONS
  804.0  2416.0  4022.0  5632.0  7240.0
12067.0 24135.0 40225.0 56315.0 72405.0
ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

```

#### X/Q SELECTOR

```

ENTER: [1]    GROUND CENTER LINE
        [2]    GROUND AVERAGE
        [3]    ELEVATED CENTER LINE
        [4]    ELEVATED AVERAGE
        [5]    DEPLETION
        [6]    DEPOSITION
        [RETURN] GO BACK TO PREVIOUS OPTION

```

6

MIDXQ- LAST X/Q NUMBER OF GOOD HOURS, DIVISOR= 26201.0

```

DATES OF LAST X/Q ACCUMULATION ARE FROM  4 1 1 1 0  TO  6123124 0
X/Q ACCUMULATION FOR DEPOSITION          1/M2
FOR RELEASE POINT  2

```

DEPLETED &  
8 HR DECAY

```

**DIRECTION FROM N
  3.7333E-09    8.8950E-10    4.4135E-10    2.5747E-10    1.7282E-10
  7.9619E-11    2.6557E-11    1.0495E-11    9.2240E-12    5.8405E-12
**DIRECTION FROM NNE
  2.7900E-09    6.9727E-10    3.4822E-10    2.0512E-10    1.3837E-10
  6.1813E-11    2.1408E-11    8.7538E-12    5.2432E-12    3.6424E-12
**DIRECTION FROM NE
  2.0786E-09    5.4026E-10    2.7162E-10    1.6157E-10    1.0956E-10
  4.9344E-11    1.7275E-11    7.2310E-12    4.2362E-12    2.7879E-12
**DIRECTION FROM ENE
  1.8039E-09    4.6094E-10    2.2821E-10    1.3463E-10    9.1004E-11
  4.2999E-11    1.4521E-11    5.9709E-12    3.6182E-12    2.5271E-12
**DIRECTION FROM E
  1.8647E-09    4.4590E-10    2.1889E-10    1.2762E-10    8.5773E-11
  3.8943E-11    1.3328E-11    5.4275E-12    3.1580E-12    2.0819E-12
**DIRECTION FROM ESE
  2.2315E-09    5.1469E-10    2.5043E-10    1.4481E-10    9.6963E-11
  4.4469E-11    1.5007E-11    6.0423E-12    3.5541E-12    2.4106E-12
ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

```

```

DATES OF LAST X/Q ACCUMULATION ARE FROM  4 1 1 1 0  TO  6123124 0
X/Q ACCUMULATION FOR DEPOSITION          1/M2
FOR RELEASE POINT  2

```

```

**DIRECTION FROM SE
  5.9479E-09    1.2049E-09    5.6483E-10    3.1725E-10    2.0992E-10
  9.4358E-11    3.2108E-11    1.4552E-11    9.2766E-12    6.7528E-12
**DIRECTION FROM SSE
  7.4671E-09    1.4310E-09    6.6366E-10    3.6819E-10    2.4226E-10
  1.0584E-10    3.6422E-11    1.4923E-11    8.7016E-12    5.7532E-12
**DIRECTION FROM S
  7.6915E-09    1.4448E-09    6.6455E-10    3.6665E-10    2.4073E-10

```



```

1.0507E-10    3.6247E-11    1.4917E-11    8.7301E-12    5.7907E-12
**DIRECTION FROM SSW
5.5278E-09    1.0580E-09    4.8516E-10    2.6881E-10    1.7701E-10
7.7761E-11    2.7120E-11    1.1365E-11    6.7329E-12    4.4971E-12
**DIRECTION FROM SW
4.7890E-09    9.2378E-10    4.2551E-10    2.3647E-10    1.5590E-10
6.8539E-11    2.3889E-11    9.9939E-12    5.9104E-12    3.9426E-12
**DIRECTION FROM WSW
2.7880E-09    5.3500E-10    2.4756E-10    1.3744E-10    9.0511E-11
4.0565E-11    1.3858E-11    5.8178E-12    3.5799E-12    2.5542E-12
ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

```

```

DATES OF LAST X/Q ACCUMULATION ARE FROM 4 1 1 1 0 TO 6123124 0
X/Q ACCUMULATION FOR DEPOSITION 1/M2
FOR RELEASE POINT 2
**DIRECTION FROM W
4.6057E-09    8.7777E-10    4.1777E-10    2.3086E-10    1.5139E-10
6.6392E-11    2.2503E-11    9.3271E-12    5.6679E-12    4.0828E-12
**DIRECTION FROM WNW
4.9098E-09    9.5920E-10    4.5077E-10    2.5173E-10    1.6593E-10
7.4104E-11    2.4951E-11    1.0180E-11    6.1164E-12    4.2783E-12
**DIRECTION FROM NW
5.6258E-09    1.1351E-09    5.4050E-10    3.0446E-10    2.0135E-10
8.7993E-11    2.9995E-11    1.2439E-11    7.4978E-12    5.2450E-12
**DIRECTION FROM NNW
4.6883E-09    1.0540E-09    5.1665E-10    2.9779E-10    1.9879E-10
8.7544E-11    2.9853E-11    1.8182E-11    9.7958E-12    6.2089E-12
DISTANCES USED IN CALCULATIONS
804.0 2416.0 4022.0 5632.0 7240.0
12067.0 24135.0 40225.0 56315.0 72405.0
ENTER: [RETURN] CONTINUE, [SO] START OVER, [EX] TO EXIT

```

#### X/Q SELECTOR

```

ENTER: [1] GROUND CENTER LINE
[2] GROUND AVERAGE
[3] ELEVATED CENTER LINE
[4] ELEVATED AVERAGE
[5] DEPLETION
[6] DEPOSITION
[RETURN] GO BACK TO PREVIOUS OPTION

```

```

ENTER: [PR] PRINT
[AD] ADD (ADDS LAST ACCU. TO TOTAL)
[CL] CLEAR
[RETURN] GO BACK TO PREVIOUS OPTION

```

```

ENTER: [XQ] X/Q
[DO] PLUME DOSE
[AI] AIR DOSE
[RE] POPULATION DOSE (REM)
[RETURN] EXIT

```

MIDXQ done

XDCalc Output file was requested during the NRC ER Audit for Callaway Unit 2. The output file has been annotated for clarity.