STUDY REPORT TO DETERMINE TOTAL TRANSFER CAPABILITY FOR MOD-029

May 27, 2014

EXECUTIVE SUMMARY

This report describes the steps taken and results of studies used to determine the Total Transfer Capability (TTC) for the Colorado Springs Utilities (CSU) Available Transfer Capability (ATC) paths for June 1, 2014 through November 1, 2015. This study was completed in compliance with MOD-001, MOD-029, and the CSU Available Transfer Capability Implementation Document (ATCID).

CSU has 6 posted ATC paths. These ATC Paths are:

- CSU System to Midway (WAPA bus)
- CSU System to Monument
- CSU System to Fuller
- Midway to CSU System
- Monument to CSU System
- Fuller to CSU System

CSU has no non-radial transmission lines remote from the Colorado Springs area which is located mostly within El Paso County, Colorado. The CSU transmission system is a local area network used exclusively for serving the loads of the City of Fountain and CSU. CSU is not a participant in any WECC Rated Paths. The TTC studies were conducted based on evaluating import and export limits to and from the CSU system. CSU has not received any requests to wheel power through the CSU system. When such a request is made, CSU would conduct the addition studies necessary to determine TTC for power that will be wheeled through the CSU system.

These TTC numbers may change with different load levels, during maintenance outages and unplanned outages. The revised numbers will be posted on the CSU Open Access Same Time Information (OASIS) site.

CSU TTC Values for 6/1/2014 through 10/1/2014

CUS – MIDWAY TIE LINE SOLs

MIDWAYBR	230.00	RD_NIXON	230.00	1	478.0	478.0	478.0
MIDWAYBR	115.00	RD_NIXON	115.00	1	159.0	159.0	159.0

Import

	SOL	LTE	STE

June 1, 2014 - October 31, 2014

Import	Export
Midway to CSU 285 MW	CSU to Midway 478 MW**
Fuller to CSU 183 MW	CSU to Fuller 376 MW**
Monument to CSU 13 MW	CSU to Monument 60 MW

*Flow into CSU could not be simulated. Use export TTC per MOD-029-1a R2.2.
**Total Export Limit is Flow Limited - use Facility Rating

November 1, 2014 - May 31, 2015

Import	Export
Midway to CSU 299 MW	CSU to Midway 478 MW**
Fuller to CSU 129 MW	CSU to Fuller 376 MW**
Monument to CSU 97 MW*	CSU to Monument 97 MW

*Flow into CSU could not be simulated. Use export TTC per MOD-029-1a R2.2.
**Total Export Limit is Flow Limited - use Facility Rating

June 1, 2015 - October 31, 2015

Import	Export
Midway to CSU 278 MW	CSU to Midway 478 MW**
Fuller to CSU 186 MW	CSU to Fuller 376 MW**
Monument to CSU 15 MW	CSU to Monument 60 MW

*Flow into CSU could not be simulated. Use export TTC per MOD-029-1a R2.2.
**Total Export Limit is Flow Limited - use Facility Rating

TTC Study Methodology

CSU used the WECC Base Cases; modified 14hs for June 1, 2014 through October 31, 2014 and modified 14hw November 1, 2014 through May 31, 2015 and modified 15hw for November 1, 2014 through May 31, 2015. The models include the entire Western Electricity Coordinating Council (WECC) area. The model includes all in service elements, generation, additions and retirements, and loads. Phase shifters were in the non-regulating mode. Series compensation was modeled as shown in the base case. No uncontrolled separation was allowed.

The contingency list included selected buses from Zones 700, 704, 712 and 757 which includes CSU and the neighboring zones. Facilities 100 kV and above were included. Facilities overloaded in the base N-1 case (no adjustment to generation dispatch) were not considered a limiting factor.

CSU has 6 posted ATC paths. These ATC Paths are:

- CSU System to Midway (WAPA bus)
- CSU System to Monument
- CSU System to Fuller
- Midway to CSU System
- Monument to CSU System
- Fuller to CSU System

The CSU System to and from Midway is comprised of the Nixon-Midway 230 kV line and the Nixon-Midway 115 kV line. The CSU system to and from Fuller is comprised of the Claremont-Fuller 230 kV, Cottonwood-Fuller 230 kV, and Tri-State owned Fuller 230-115 transformer. The CSU System to Monument is comprised of the Flying Horse-Monument 115 kV line.

Using PTI PSSE software studies of the import and export limits for the CSU system were conducted. The import TTC was established by reducing CSU generation and increasing generation remote to CSU until a thermal, voltage, or stability limit was reached. The export TTC was established by increasing the CSU generation and reducing generation in the Denver area until an N-1 thermal, voltage, or stability limit was reached. In some cases no reliability limit was reached and the paths were flow limited. N-1 contingency studies were run at each CSU generation level until some facility rating limit or flow limit was reached. The TTC for the export scenarios was established by increasing CSU generation and reducing generation in the Denver area until some facility rating limit was reached. Facilities showing overloads in the N-1 base case were not considered limits to the TTC. Once the TTC limit was established steady state voltage was checked and in all cases was with N-0 limits of 0.95 to 1.05 per unit and N-1 limits of 0.9 to 1.1 per unit. Voltages stability analysis was completed on the most stressed cases and exceeded the 5% margin limit for Category A and B outages. Dynamic stability simulations were run for 26 Category A, B, and C outages on the CSU system for the maximum import case and for the maximum export cases.

When the total import limit was established the flow on each of the three ATC paths was recorded and is the TTC for that path. Except that the import TTC for the Monument to CSU path is set at the value for prevailing direction (out of CSU) per MOD-029-1a R2.2. When the total export limit was established the result was flow limited (all CSU generation on except reserve requirements). The TTC for CSU to Midway and CSU to Fuller were set at the facility rating.

The load flow summaries used to establish the TTC's for the CSU ATC Paths are included in Appendix A.

Voltage stability results are summarized in appendix B.

Dynamic stability results are summarized in Appendix C.

Appendix A

Load Flow Summary

2014 HS LOAD FLOW STUDIES SUMMARY
EFFECTIVE JUNE 1, 2014 THROUGH OCTOBER 31, 2014

2014 HS Base – Expected Load and Interchange

```
      PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E     TUE, MAY 27 2014   9:57
   WESTERN ELECTRICITY COORDINATING COUNCIL                          AREA TOTALS
   2013 HS2-OP BASE CASE                                              IN MW/MVAR
                 FROM ------AT AREA BUSES-------              TO                                -NET INTERCHANGE-
                GENE- FROM IND   TO IND       TO   TO BUS  GNE BUS  TO LINE     FROM     TO     TO TIE  TO TIES
DESIRED
 X-- AREA --X  RATION GENERATN   MOTORS     LOAD    SHUNT  DEVICES    SHUNT CHARGING   LOSSES    LINES  + LOADS  NET
INT

    3           616.8      0.0      0.0   1011.0      0.0      0.0      0.0      0.0     14.1   -408.3   -408.3     0.0
 CSU            170.3      0.0      0.0    310.5   -267.6      0.0      0.0     91.4    188.5     30.2     30.2

 COLUMN         616.8      0.0      0.0   1011.0      0.0      0.0      0.0      0.0     14.1   -408.3   -408.3     0.0
 TOTALS         170.3      0.0      0.0    310.5   -267.6      0.0      0.0     91.4    188.5     30.2     30.28
```

2014 HS Maximum Import – 616 MW

```
      PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E     TUE, MAY 27 2014   8:45
  WESTERN ELECTRICITY COORDINATING COUNCIL                          AREA TOTALS
  2014 HS4-OP OPERATING CASE NOVEMBER 7, 2013                        IN MW/MVAR
                 FROM ------AT AREA BUSES-------              TO                                -NET INTERCHANGE-
                GENE- FROM IND   TO IND       TO   TO BUS  GNE BUS  TO LINE     FROM     TO     TO TIE  TO TIES
DESIRED
 X-- AREA --X  RATION GENERATN   MOTORS     LOAD    SHUNT  DEVICES    SHUNT CHARGING   LOSSES    LINES  + LOADS  NET
INT

    3           394.0      0.0      0.0   1000.0      0.0      0.0      0.0      0.0     10.6   -616.7   -616.7   616.7
 CSU            114.7      0.0      0.0    301.4   -269.0      0.0      0.0     91.2    146.7     26.8     26.8

 COLUMN         394.0      0.0      0.0   1000.0      0.0      0.0      0.0      0.0     10.6   -616.7   -616.7   616.7
 TOTALS         114.7      0.0      0.0    301.4   -269.0      0.0      0.0     91.2    146.7     26.8     26.8
```

Rated Path TTC Import to CSU System – Reliability Limit – Thermal rating WAPA Midway 230-115 kV auto-transformer

Dispatch changes from 2013 HW base case

```
PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E     TUE, MAY 27 2014  10:00
 COMPARISON OF THE WORKING CASE AND THE SAVED CASE
F:\Winter_Summer_operation_study\...\DK_STUDY_OUT_LOOK\Load_1000_1\CSU_Dynamics_dispatch_1000.sav

 BUSES WITH MW GENERATION DIFFERING BY MORE THAN   5.0 MW:
                              IN WORKING CASE   IN
F:\Winter_Summer_operation_study\...\DK_STUDY_OUT_LOOK\Load_1000_1\CSU_Dynamics_dispatch_1000.sav
 X---------- BUS ----------X     MW     MVAR       MW     MVAR   DELTA MW   %     MVAR    %
  70083 [CANON_55    13.800]    14.0     4.8     GEN. OFF LINE     -14.0 100.0    -4.8 100.0
  70084 [CANON_59    13.800]    20.0     4.4     GEN. OFF LINE     -20.0 100.0    -4.4 100.0
  70119 [COMAN_1     24.000]   355.0    45.2     345.0    35.4     -10.0   2.8    -9.8  21.7
  70120 [COMAN_2     24.000]   360.0    40.2     350.0    30.4     -10.0   2.8    -9.8  24.4
  70314 [MANCHEF1    16.000]   130.0    -2.9     120.0     0.6     -10.0   7.7     3.5 120.8
  70315 [MANCHEF2    16.000]   130.0    -2.9     100.0    -0.5     -30.0  23.1     2.4  81.8
  70409 [ST.VRAIN    22.000]   300.0    79.9     335.0    82.7      35.0  11.7     2.8   3.5
  70446 [VALMONT     20.000]   160.0   125.0     150.0   125.0     -10.0   6.2     0.0   0.0
  70448 [VALMONT6    13.800]    50.0    30.0       0.0     0.0     -50.0 100.0   -30.0 100.0
  70490 [QF_TC-T3    13.800]    85.4    18.0      79.7    16.9      -5.7   6.7    -1.1   6.0
  70498 [QF_BCP2T    13.800]    38.7     3.2      64.8     3.0      26.1  67.4    -0.2   6.9
  70499 [QF_B4-4T    13.800]    40.0     3.2      29.0    -0.6     -11.0  27.5    -3.8 118.1
  70500 [QF_CPP1T    13.800]    40.0    21.8      34.8    19.3      -5.2  13.0    -2.5  11.5
  70501 [QF_CPP3T    13.800]    27.0    11.6       0.0     0.0     -27.0 100.0   -11.6 100.0
  70548 [APT_DSLS    4.1600]     0.0     0.0      10.0    -0.4      10.0 999.9    -0.4 999.9
  70556 [QF_B4D4T    12.500]    50.0     2.5       0.0     0.0     -50.0 100.0    -2.5 100.0
  70561 [RAWHIDEF    18.000]   125.0    29.8     135.0    29.5      10.0   8.0    -0.3   1.1
  70562 [SPRUCE1     18.000]   130.0    62.2      90.0    57.9     -40.0  30.8    -4.3   6.9
  70563 [SPRUCE2     18.000]   130.0    62.1      90.0    57.8     -40.0  30.8    -4.3   6.9
  70566 [BRTNNUG2    13.800]    64.0    10.2      40.0    11.5     -24.0  37.5     1.3  12.6
```

70569	[RAWHIDEC	13.800]	54.0	14.1	0.0	0.0	-54.0	100.0	-14.1	100.0
70588	[RMEC1	15.000]	95.0	5.3	135.0	8.7	40.0	42.1	3.4	63.7
70589	[RMEC2	15.000]	90.0	5.1	135.0	8.7	45.0	50.0	3.6	70.5
70591	[RMEC3	23.000]	255.0	83.4	300.0	87.1	45.0	17.6	3.7	4.4
70593	[SPNDLE1	18.000]	110.0	-22.0	80.0	-27.3	-30.0	27.3	-5.3	24.1
70594	[SPNDLE2	18.000]	110.0	-22.0	80.0	-27.3	-30.0	27.3	-5.3	24.1
70950	[ST.VR_5	18.000]	150.0	2.9	100.0	-0.6	-50.0	33.3	-3.5	119.6
71001	[BAC_MSA	13.800]	100.0	11.3	90.0	11.7	-10.0	10.0	0.4	3.9
71002	[BAC_MSA	13.800]	100.0	11.3	90.0	11.7	-10.0	10.0	0.4	3.9
71009	[BUSCHRWTG1	0.7000]	28.8	-1.5	3.6	0.5	-25.2	87.5	2.1	136.0
72714	[KIT.CARSON	0.6900]	NO GENERATOR		10.2	6.6	10.2	999.9	6.6	999.9
73129	[MBPP-1	24.000]	605.0	101.5	506.7	110.3	-98.3	16.2	8.9	8.7
73288	[NSS1	13.800]	18.6	6.8	GEN. OFF LINE		-18.6	100.0	-6.8	100.0
73293	[RCCT4	13.800]	1.4	-1.1	17.0	13.5	15.6	999.9	14.6	999.9
73302	[BRLNGTN1	13.800]	0.0	0.0	30.4	-7.2	30.4	999.9	-7.2	999.9
73303	[BRLNGTN2	13.800]	0.0	0.0	30.4	-7.2	30.4	999.9	-7.2	999.9
73418	[RD_NIXON	20.000]	224.8	70.1	212.0	45.4	-12.8	5.7	-24.7	35.2
73424	[TESLA1	13.800]	28.0	-1.2	15.0	-0.5	-13.0	46.4	0.6	54.7
73507	[FTRNG1CC	18.000]	131.0	29.0	121.0	49.1	-10.0	7.6	20.1	69.3
73508	[FTRNG2CC	18.000]	131.0	29.1	121.0	49.0	-10.0	7.6	19.9	68.3
73509	[FTRNG3CC	21.000]	102.0	43.2	138.0	68.3	36.0	35.3	25.1	58.0
73532	[LINCOLN1	13.800]	50.0	-1.9	0.0	0.0	-50.0	100.0	1.9	100.0
73631	[COHIWND_G1	0.6900]	67.0	17.0	18.1	0.0	-48.9	73.0	-17.0	100.0
74042	[CLR_1	0.6000]	29.4	0.6	20.0	-1.1	-9.4	32.0	-1.7	275.8
74043	[SS_GEN1	0.6000]	42.0	0.9	20.0	-2.0	-22.0	52.4	-2.9	325.6
74399	[BHPLPLAN	13.800]	100.0	24.7	80.0	22.3	-20.0	20.0	-2.5	9.9
79040	[HAYDEN1	18.000]	175.0	-35.6	183.0	-0.4	8.0	4.6	35.1	98.8
79041	[HAYDEN2	22.000]	250.0	-78.6	280.0	130.0	30.0	12.0	208.6	265.4
79161	[NUCLA 4	13.800]	72.0	-8.1	64.0	-10.1	-8.0	11.1	-2.0	24.6

2014 HW Maximum Export – 105 MW - All CSU Generation on except for reserve requirements

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     PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E     TUE, MAY 27 2014  10:49
  WESTERN ELECTRICITY COORDINATING COUNCIL                          AREA TOTALS
  2014 HS4-OP OPERATING CASE NOVEMBER 7, 2013                        IN MW/MVAR
                 FROM ------AT AREA BUSES-------              TO                                -NET INTERCHANGE-
                GENE- FROM IND   TO IND       TO   TO BUS  GNE BUS  TO LINE     FROM     TO     TO TIE  TO TIES
DESIRED
 X-- AREA --X  RATION GENERATN   MOTORS     LOAD    SHUNT  DEVICES    SHUNT CHARGING   LOSSES    LINES  + LOADS  NET
INT

    3           764.0      0.0      0.0    650.0      0.0      0.0      0.0      0.0      8.2    105.8    105.8
 CSU            115.2      0.0      0.0    197.4   -289.8      0.0      0.0     99.1    136.9    169.8    169.8

 COLUMN         764.0      0.0      0.0    650.0      0.0      0.0      0.0      0.0      8.2    105.8    105.8
 TOTALS         115.2      0.0      0.0    197.4   -289.8      0.0      0.0     99.1    136.9    169.8    169.8
```

Flow limited – Use Facility Rating for Import TTC

Dispatch changes from 2013 HW base case

```
   BUSES WITH MW GENERATION DIFFERING BY MORE THAN   0.0 MW:
                              IN WORKING CASE   IN
F:\Winter_Summer_operation_study\...\DK_STUDY_OUT_LOOK\Load_650\CSU_Dynamics_dispatch_650.sav
 X---------- BUS ----------X     MW     MVAR       MW     MVAR   DELTA MW   %     MVAR    %
  30000 [PTSB  7     20.000]    32.0   325.3     162.8   316.7     130.8 408.9    -8.6   2.6
  73381 [BIRDSAL1    13.800]    17.0     0.6       0.0     0.0     -17.0 100.0    -0.6 100.0
  73382 [BIRDSAL2    13.800]    17.0     0.6       0.0     0.0     -17.0 100.0    -0.6 100.0
  73383 [BIRDSAL3    13.800]    23.0     1.0       0.0     0.0     -23.0 100.0    -1.0 100.0
  73507 [FTRNG1CC    18.000]   140.0    26.4     121.0    25.9     -19.0  13.6    -0.5   2.0
  73508 [FTRNG2CC    18.000]   140.0    26.4     121.0    25.9     -19.0  13.6    -0.5   2.0
  73509 [FTRNG3CC    21.000]   200.0    34.4     138.0    32.4     -62.0  31.0    -2.0   5.9
```

2014 HW2 LOAD FLOW STUDIES SUMMARY
EFFECTIVE NOVEMBER 1, 2014 THROUGH MAY 31, 2015

2014 HW2 Base – Expected Load and Interchange

```
    PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E     THU, OCT 31 2013  13:09
  WESTERN ELECTRICITY COORDINATING COUNCIL                          AREA TOTALS
  2013-14 HW2 OPERATING CASE                                         IN MW/MVAR
                FROM  TO LOAD              TO                              -NET INTERCHANGE-
               GENE-  AT AREA   TO BUS  GNE BUS  TO LINE     FROM     TO     TO TIE  TO TIES  DESIRED
 X-- AREA --X  RATION    BUSES    SHUNT  DEVICES    SHUNT CHARGING   LOSSES    LINES  + LOADS  NET INT

    3           759.2    887.8      0.0      0.0      0.0      0.0      9.4   -138.0   -138.0      0.0
 CSU            110.5    239.5   -153.7      0.0      0.0     92.0    144.1    -27.4    -27.4

 COLUMN         759.2    887.8      0.0      0.0      0.0      0.0      9.4   -138.0   -138.0      0.0
 TOTALS         110.5    239.5   -153.7      0.0      0.0     92.0    144.1    -27.4    -27.4
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2014 HS Maximum Import – 449 MW

```
    PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E     THU, OCT 31 2013  12:27
  WESTERN ELECTRICITY COORDINATING COUNCIL                          AREA TOTALS
  2013-14 HW2 OPERATING CASE                                         IN MW/MVAR
                FROM  TO LOAD              TO                              -NET INTERCHANGE-
               GENE-  AT AREA   TO BUS  GNE BUS  TO LINE     FROM     TO     TO TIE  TO TIES  DESIRED
 X-- AREA --X  RATION    BUSES    SHUNT  DEVICES    SHUNT CHARGING   LOSSES    LINES  + LOADS  NET INT

    3           457.4    900.0      0.0      0.0      0.0      0.0      6.7   -449.3   -449.3   -449.3
 CSU             90.0    242.8   -151.3      0.0      0.0     90.6    110.5    -21.4    -21.4

 COLUMN         457.4    900.0      0.0      0.0      0.0      0.0      6.7   -449.3   -449.3   -449.3
 TOTALS          90.0    242.8   -151.3      0.0      0.0     90.6    110.5    -21.4    -21.4

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Rated Path TTC Import to CSU System – Reliability Limit – Thermal rating WAPA Midway 230-115 kV auto-transformer

Dispatch changes from 2014 HS base case

```
     PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E     THU, OCT 31 2013  13:15
 COMPARISON OF THE WORKING CASE AND THE SAVED CASE
E:\Winter_Summer_operation_study\Base_case\2013_2014_Winter_case\14hw2p_CSU Updated_v1_CSU.sav

 BUSES WITH MW OR MVAR GENERATION DIFFERING BY MORE THAN   5.0 MW OR MVAR:
                              IN WORKING CASE   IN
E:\Winter_Summer_operation_study\Base_case\2013_2014_Winter_case\14hw2p_CSU Updated_v1_CSU.sav
 X---------- BUS ----------X     MW     MVAR       MW     MVAR   DELTA MW   %     MVAR    %
  10318 [SJUAN_G1    22.000]   360.0    13.8     360.0    28.7       0.0   0.0    14.9 107.8
  10319 [SJUAN_G2    24.000]   350.0    13.8     350.0    28.7       0.0   0.0    14.9 107.8
  10320 [SJUAN_G3    22.000]   544.0    20.7     544.0    43.0       0.0   0.0    22.3 107.8
  10321 [SJUAN_G4    22.000]   438.7    20.7     438.7    43.0       0.0   0.0    22.3 107.8
  10909 [REDMESA4    0.6900]     5.0    -8.4       5.0   -15.8       0.0   0.0    -7.4  87.9
  14914 [FCNGN4CC    22.000]   798.0    24.0     798.0     0.4       0.0   0.0   -23.7  98.4
  14915 [FCNGN5CC    22.000]   798.0    65.8     798.0    56.0       0.0   0.0    -9.8  15.0
  30000 [PTSB  7     20.000]   341.2   261.7     332.6   261.7      -8.6   2.5     0.0   0.0
  70106 [CHEROK4     22.000]   360.0   243.9     360.0   237.3       0.0   0.0    -6.6   2.7
  70314 [MANCHEF1    16.000]   100.0    11.4       0.0     0.0    -100.0 100.0   -11.4 100.0
  70315 [MANCHEF2    16.000]    90.0    10.9       0.0     0.0     -90.0 100.0   -10.9 100.0
  70350 [RAWHIDE     24.000]   300.0    26.2     300.0    32.3       0.0   0.0     6.1  23.4
  70561 [RAWHIDEF    18.000]   128.0    26.2       0.0     0.0    -128.0 100.0   -26.2 100.0
  70777 [COMAN_3     27.000]   800.0   188.5     800.0   181.5       0.0   0.0    -7.0   3.7
  73418 [RD_NIXON    20.000]     0.0     0.0     224.8    58.9     224.8 999.9    58.9 999.9
  73424 [TESLA1      13.800]     0.0     0.0      28.0    -3.4      28.0 999.9    -3.4 999.9
  73427 [DRAKE 5     13.800]     0.0     0.0      49.0    16.2      49.0 999.9    16.2 999.9
  73428 [DRAKE 6     13.800]    82.3    31.4      82.3    22.7       0.0   0.0    -8.7  27.7
  73429 [DRAKE 7     13.800]   139.1    41.2     139.1    31.7       0.0   0.0    -9.5  23.1
  73507 [FTRNG1CC    18.000]    70.0   -14.2      70.0   -23.3       0.0   0.0    -9.2  64.5
  73508 [FTRNG2CC    18.000]    70.0   -14.2      70.0   -23.3       0.0   0.0    -9.2  64.5
  73509 [FTRNG3CC    21.000]    96.0    45.9      96.0    31.1       0.0   0.0   -14.8  32.2
```

2014 HS Maximum Export – 119 MW - All CSU Generation on except for reserve requirements

```
    PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E     THU, OCT 31 2013  14:21
  WESTERN ELECTRICITY COORDINATING COUNCIL                          AREA TOTALS
  2013-14 HW2 OPERATING CASE                                         IN MW/MVAR
                FROM  TO LOAD              TO                              -NET INTERCHANGE-
               GENE-  AT AREA   TO BUS  GNE BUS  TO LINE     FROM     TO     TO TIE  TO TIES  DESIRED
X-- AREA --X  RATION    BUSES    SHUNT  DEVICES    SHUNT CHARGING   LOSSES    LINES  + LOADS  NET INT

   3          1144.2    750.0      0.0      0.0      0.0      0.0     11.5    382.7    382.7      0.0
CSU             95.7    202.3   -156.3      0.0      0.0     93.3    190.6    -47.7    -47.7

COLUMN         1144.2    750.0      0.0      0.0      0.0      0.0     11.5    382.7    382.7      0.0
TOTALS           95.7    202.3   -156.3      0.0      0.0     93.3    190.6    -47.7    -47.7
```

Flow limited – Use Facility Rating for Import TTC

Dispatch changes from 2014 HW2 base case

```
--------------------------------------------------------------------------------

     PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E     THU, OCT 31 2013  14:26
 COMPARISON OF THE WORKING CASE AND THE SAVED CASE
E:\Winter_Summer_operation_study\Base_case\2013_2014_Winter_case\14hw2p_CSU Updated_v1_CSU - Copy.sav

 BUSES WITH MW OR MVAR GENERATION DIFFERING BY MORE THAN   5.0 MW OR MVAR:
                                IN WORKING CASE   IN
E:\Winter_Summer_operation_study\Base_case\2013_2014_Winter_case\14hw2p_CSU Updated_v1_CSU - Copy.sav
 X---------- BUS ----------X      MW     MVAR       MW     MVAR   DELTA MW   %     MVAR    %
  30000 [PTSB  7     20.000]   292.8   262.5     332.6   261.7      39.8  13.6    -0.8   0.3
  70119 [COMAN_1     24.000]   250.0    59.5     350.0    66.1     100.0  40.0     6.6  11.1
  70120 [COMAN_2     24.000]   325.0    16.7     355.0    20.7      30.0   9.2     4.0  24.1
  70310 [PAWNEE      22.000]   505.0    85.9     505.0    92.6       0.0   0.0     6.7   7.8
  70350 [RAWHIDE     24.000]   150.0    21.9     300.0    32.3     150.0 100.0    10.4  47.3
  70409 [ST.VRAIN    22.000]   150.0     5.3     200.0     8.5      50.0  33.3     3.2  60.4
  70446 [VALMONT     20.000]   100.0   110.1     150.0   110.7      50.0  50.0     0.6   0.6
  70588 [RMEC1       15.000]    70.0   -22.2     120.0   -19.2      50.0  71.4     3.1  13.8
  70589 [RMEC2       15.000]    50.0   -22.8     100.0   -20.3      50.0 100.0     2.6  11.3
  73381 [BIRDSAL1    13.800]    16.0    -2.5       0.0     0.0     -16.0 100.0     2.5 100.0
  73382 [BIRDSAL2    13.800]    16.0    -2.1       0.0     0.0     -16.0 100.0     2.1 100.0
  73383 [BIRDSAL3    13.800]    23.0    -2.5       0.0     0.0     -23.0 100.0     2.5 100.0
  73418 [RD_NIXON    20.000]   224.8    49.5     224.8    58.9       0.0   0.0     9.4  18.9
  73427 [DRAKE 5     13.800]    49.0    10.0      49.0    16.2       0.0   0.0     6.2  62.2
  73428 [DRAKE 6     13.800]    82.3    14.4      82.3    22.7       0.0   0.0     8.3  57.4
  73429 [DRAKE 7     13.800]   139.1    22.5     139.1    31.7       0.0   0.0     9.1  40.6
  73434 [NIXONCT1    12.500]    35.0    17.7       0.0     0.0     -35.0 100.0   -17.7 100.0
  73435 [NIXONCT2    12.500]    35.0    15.2       0.0     0.0     -35.0 100.0   -15.2 100.0
  73507 [FTRNG1CC    18.000]   158.0   -22.9      70.0   -23.3     -88.0  55.7    -0.5   2.1
  73508 [FTRNG2CC    18.000]   158.0   -22.9      70.0   -23.3     -88.0  55.7    -0.5   2.1
  73509 [FTRNG3CC    21.000]   180.0    23.8      96.0    31.1     -84.0  46.7     7.3  30.8
```

2015 HW LOAD FLOW STUDIES SUMMARY
EFFECTIVE NOVEMBER 1, 2014 THROUGH MAY 31, 2015

2015 HW3 Base – Expected Load and Interchange

```
      PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E     TUE, MAY 27 2014  13:00
  WESTERN ELECTRICITY COORDINATING COUNCIL                          ZONE TOTALS
  2014-15 HW3 OPERATING CASE FEBRUARY 10, 2014                       IN MW/MVAR
                 FROM ------AT ZONE BUSES-------              TO                                -NET INTERCHANGE-
                GENE- FROM IND   TO IND       TO   TO BUS  GNE BUS  TO LINE     FROM     TO     TO TIE  TO TIES
 X-- ZONE --X  RATION GENERATN   MOTORS     LOAD    SHUNT  DEVICES    SHUNT CHARGING   LOSSES    LINES  + LOADS

  757           686.9      0.0      0.0    982.9      0.0      0.0      0.0      0.0     10.3   -307.9   -297.0
 ZONECS         245.5      0.0      0.0    266.3    -71.0      0.0      0.0    105.7    148.8      9.5      9.5

 COLUMN         686.9      0.0      0.0    982.9      0.0      0.0      0.0      0.0     10.3   -307.9   -297.0
 TOTALS         245.5      0.0      0.0    266.3    -71.0      0.0      0.0    105.7    148.8      9.5      9.5
```

2015 HS Maximum Import – 423 MW

```
        PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E     TUE, MAY 27 2014  13:13
  WESTERN ELECTRICITY COORDINATING COUNCIL                          ZONE TOTALS
  2014-15 HW3 OPERATING CASE FEBRUARY 10, 2014                       IN MW/MVAR
                 FROM ------AT ZONE BUSES-------              TO                                -NET INTERCHANGE-
                GENE- FROM IND   TO IND       TO   TO BUS  GNE BUS  TO LINE     FROM     TO     TO TIE  TO TIES
 X-- ZONE --X  RATION GENERATN   MOTORS     LOAD    SHUNT  DEVICES    SHUNT CHARGING   LOSSES    LINES  + LOADS

  757           568.8      0.0      0.0    982.9      0.0      0.0      0.0      0.0      9.6   -423.8   -412.9
 ZONECS         170.8      0.0      0.0    266.3    -71.6      0.0      0.0    103.9    132.4    -52.4    -52.4

 COLUMN         568.8      0.0      0.0    982.9      0.0      0.0      0.0      0.0      9.6   -423.8   -412.9
 TOTALS         170.8      0.0      0.0    266.3    -71.6      0.0      0.0    103.9    132.4    -52.4    -52.4
```

Rated Path TTC Import to CSU System – Reliability Limit – Thermal rating WAPA Midway 230-115 kV auto-transformer

Dispatch changes from 2014 HS base case

```
     PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E     THU, OCT 31 2013  13:15
      PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E     TUE, MAY 27 2014  13:14
 COMPARISON OF THE WORKING CASE AND THE SAVED CASE ...\2014_2015_Winter_Heavy_Load\WECC Case 2015HW3-
OP with CSU update.sav

 BUSES WITH MW GENERATION DIFFERING BY MORE THAN   0.0 MW:
                              IN WORKING CASE   IN ...\2014_2015_Winter_Heavy_Load\WECC Case 2015HW3-OP
with CSU update.sav
 X---------- BUS ----------X     MW     MVAR       MW     MVAR   DELTA MW   %     MVAR    %
  30000 [PTSB  7     20.000]   507.2   257.6     405.3    256.8    -101.9  20.1    -0.8   0.3
  73507 [FTRNG1CC    18.000]    60.0    46.9     122.4     32.1      62.4 104.0   -14.8  31.6
```

```
73509 [FTRNG3CC    21.000]     0.0     0.0      55.7   111.5      55.7 999.9   111.5 999.9
```

2014 HS Maximum Export – 61 MW - All CSU Generation on except for reserve requirements

```
     PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E     TUE, MAY 27 2014  13:22
 WESTERN ELECTRICITY COORDINATING COUNCIL                          ZONE TOTALS
 2014-15 HW3 OPERATING CASE FEBRUARY 10, 2014                       IN MW/MVAR
                FROM ------AT ZONE BUSES-------              TO                                -NET INTERCHANGE-
               GENE- FROM IND   TO IND       TO   TO BUS  GNE BUS  TO LINE     FROM      TO     TO TIE  TO TIES
X-- ZONE --X  RATION GENERATN   MOTORS     LOAD    SHUNT  DEVICES    SHUNT CHARGING   LOSSES    LINES  + LOADS

 757           686.9      0.0      0.0    982.9      0.0      0.0      0.0      0.0     10.3   -307.9   -297.0
ZONECS         245.5      0.0      0.0    266.3    -71.0      0.0      0.0    105.7    148.8      9.5      9.5

COLUMN         686.9      0.0      0.0    982.9      0.0      0.0      0.0      0.0     10.3   -307.9   -297.0
TOTALS         245.5      0.0      0.0    266.3    -71.0      0.0      0.0    105.7    148.8      9.5      9.5
```

Flow limited – Use Facility Rating for Import TTC

Dispatch changes from 2014 HW2 base case

```
--------------------------------------------------------------------------------
PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E     TUE, MAY 27 2014  13:25
 COMPARISON OF THE WORKING CASE AND THE SAVED CASE ...\2014_2015_Winter_Heavy_Load\WECC Case 2015HW3-
OP with CSU update.sav

 BUSES WITH MW GENERATION DIFFERING BY MORE THAN   0.0 MW:
                              IN WORKING CASE   IN ...\2014_2015_Winter_Heavy_Load\WECC Case 2015HW3-OP
with CSU update.sav
 X---------- BUS ----------X     MW     MVAR       MW     MVAR   DELTA MW   %     MVAR    %
  30000 [PTSB  7     20.000]   107.3   264.7     405.3   256.8     298.0 277.9    -7.9   3.0
  73381 [BIRDSAL1    13.800]    17.0     0.6       0.0     0.0     -17.0 100.0    -0.6 100.0
  73382 [BIRDSAL2    13.800]    17.0     0.6       0.0     0.0     -17.0 100.0    -0.6 100.0
  73383 [BIRDSAL3    13.800]    23.0     3.6       0.0     0.0     -23.0 100.0    -3.6 100.0
  73507 [FTRNG1CC    18.000]   140.0    37.6     122.4    32.1     -17.6  12.6    -5.5  14.7
  73508 [FTRNG2CC    18.000]   140.0    35.9       0.0     0.0    -140.0 100.0   -35.9 100.0
  73509 [FTRNG3CC    21.000]   200.0    53.1      55.7   111.5    -144.3  72.2    58.5 110.2
```

Appendix B

Voltage Stability

A PV analysis was completed for each maximum import case. Zones 712 and 757 were the sink and all areas except 70 and 73 were the source. The PV studies were run evaluating all N-1 outages within the zones included in the sink.

The established WECC voltage stability criteria for acceptable real power (MW) margins are 5% for Category A and B outages. All cases exceeded the 5% margin.

Appendix D

Dynamic Stability

Dynamic voltage stability cases were run for the maximum import and export Expected Load and Interchange cases. Twenty six Category A, B, and C events were simulated.

NERC Standards require that the system remain stable for Category A and B

The *WECC Disturbance – Performance Table of Allowable Effects on Other Systems:*

> Category B: Any transient voltage dip must not exceed 25% at load buses or 30% at nonload buses. The dip also must not exceed 20% for more than 20 cycles at load buses. Frequency must not drop below 59.6 Hz for 6 or more cycles at a load bus.
>
> Category C: Any transient voltage dip must not exceed 30% at any bus or 20% for more than 40 cycles at load buses.
>
> Post transient voltage deviation must not exceed 5% for Category B or 10% for Category C.

All cases demonstrated dynamic stability and met the WECC Disturbance criteria.

Dynamic Stability Outages

```
no-fault
NO DISTURBANCE RUN
TESTING NO DISTURBANCE
done
nixon-clarmt-3
special
3-PHASE, 6 CYCLE FAULT AT NIXON 230KV
LOSS OF NIXON-CLAREMONT 230KV
APPLY FAULT AT BUS 73419 ADMITTANCE 0 -2E10 MVA
RUN FOR 6 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73419 TO BUS 73380 CKT 1
done
nixon-midway-3
special
3-PHASE, 6 CYCLE FAULT AT NIXON 230KV
LOSS OF NIXON-MIDWAY 230KV
APPLY FAULT AT BUS 73419 ADMITTANCE 0 -2E10 MVA
RUN FOR 6 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73419 TO BUS 73413 CKT 1
done
nixon-frpp-3
special
3-PHASE, 6 CYCLE FAULT AT NIXON 230KV
LOSS OF NIXON-FRTRANGE 230KV
APPLY FAULT AT BUS 73419 ADMITTANCE 0 -2E10 MVA
RUN FOR 6 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73419 TO BUS 73559 CKT 1
done
kelker-nixon-3
special
3-PHASE, 6 CYCLE FAULT AT KELKER 230KV
LOSS OF KELKER-NIXON 230KV
APPLY FAULT AT BUS 73446 ADMITTANCE 0 -2E10 MVA
RUN FOR 6 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73446 TO BUS 73419 CKT 1
done
fuller-danielpk-3
special
3-PHASE, 6 CYCLE FAULT AT FULLER 230KV
LOSS OF FULLER-DANIELPK 230KV
APPLY FAULT AT BUS 73477 ADMITTANCE 0 -2E10 MVA
RUN FOR 6 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73477 TO BUS 70139 CKT 1
done
fuller-midway-3
special
3-PHASE, 6 CYCLE FAULT AT FULLER 230KV
LOSS OF FULLER-MIDWAY 230KV
```

```
APPLY FAULT AT BUS 73477 ADMITTANCE 0 -2E10 MVA
RUN FOR 6 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73477 TO BUS 70286 CKT 1
done
cttnwd-fuller-3
special
3-PHASE, 6 CYCLE FAULT AT COTTONWOOD 230KV
LOSS OF COTTONWOOD-FULLER 230KV
APPLY FAULT AT BUS 73392 ADMITTANCE 0 -2E10 MVA
RUN FOR 6 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73392 TO BUS 73477 CKT 1
done
cttnwd-stetson-3
special
3-PHASE, 6 CYCLE FAULT AT COTTONWOOD 230KV
LOSS OF COTTONWOOD-STETSON 230KV
APPLY FAULT AT BUS 73394 ADMITTANCE 0 -2E10 MVA
RUN FOR 6 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73394 TO BUS 73421 CKT 1
done
kelker-bradley-3
special
3-PHASE, 6 CYCLE FAULT AT KELKER 115KV
LOSS OF KELKER-BRADLEY 115KV
APPLY FAULT AT BUS 73409 ADMITTANCE 0 -2E10 MVA
RUN FOR 6 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73409 TO BUS 73388 CKT 1
done
kelker-rockisld-3
special
3-PHASE, 6 CYCLE FAULT AT KELKER 115KV
LOSS OF KELKER-ROCKISLD 115KV
APPLY FAULT AT BUS 73409 ADMITTANCE 0 -2E10 MVA
RUN FOR 6 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73409 TO BUS 73420 CKT 1
done
drake-atmel-3
special
3-PHASE, 6 CYCLE FAULT AT DRAKE 115KV
LOSS OF DRAKE-ATMEL 115KV
APPLY FAULT AT BUS 73397 ADMITTANCE 0 -2E10 MVA
RUN FOR 6 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73397 TO BUS 73496 CKT 1
done
drake-drake7-3
special
3-PHASE, 6 CYCLE FAULT AT DRAKE 115KV
LOSS OF DRAKE7 115KV
APPLY FAULT AT BUS 73397 ADMITTANCE 0 -2E10 MVA
RUN FOR 6 CYCLES PRINT 0 PLOT 3
```

```
CLEAR FAULT
DISCONNECT BUS 73429
done
rockisld-load-3
special
3-PHASE, 6 CYCLE FAULT AT ROCKISLD 115KV
LOSS OF ROCKISLD LOAD
APPLY FAULT AT BUS 73420 ADMITTANCE 0 -2E10 MVA
RUN FOR 6 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73420 TO BUS 73566 CKT 1
DROP LOAD CS AT BUS 73420
done
rampart-cttnwd-3
special
3-PHASE, 6 CYCLE FAULT AT RAMPART 115KV
LOSS OF RAMPART-COTTONWOOD 115KV
APPLY FAULT AT BUS 73490 ADMITTANCE 0 -2E10 MVA
RUN FOR 6 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73490 TO BUS 73393 CKT 1
done
templton-cttnwd-3
special
3-PHASE, 6 CYCLE FAULT AT TEMPLETON 115KV
LOSS OF TEMPLETON-COTTONWOOD 115KV
APPLY FAULT AT BUS 73422 ADMITTANCE 0 -2E10 MVA
RUN FOR 6 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73422 TO BUS 73393 CKT 1
done
cttnwd-kettleck-3
special
3-PHASE, 6 CYCLE FAULT AT COTTONWOOD 115KV
LOSS OF COTTONWOOD-KETTLECK 115KV
APPLY FAULT AT BUS 73391 ADMITTANCE 0 -2E10 MVA
RUN FOR 6 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73391 TO BUS 73410 CKT 1
done
kettleck-flyhorse-3
special
3-PHASE, 6 CYCLE FAULT AT KETTLECK 115KV
LOSS OF KETTLECK-FLYHORSE 115KV
APPLY FAULT AT BUS 73391 ADMITTANCE 0 -2E10 MVA
RUN FOR 6 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73410 TO BUS 73576 CKT 1
done
drake-SLG-1
SPECIAL
SLG, 6 CYCLE FAULT ON DRAKE N 115KV BUS
LOSS OF DRAKE#7
APPLY FAULT AT BUS 73397 Z 0.88435 5.93244 OHMS
RUN FOR 6.00 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
```

```
DISCONNECT BUS 73429
DONE
fuller-SLG-1
SPECIAL
SLG, 6 CYCLE FAULT ON FULLER 230KV BUS
LOSS OF FULLER-COTTONWOOD 230KV
APPLY FAULT AT BUS 73477 Z 3.99600 24.8603 OHMS
RUN FOR 6.00 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73477 TO BUS 73392 CKT 1
DONE
nixon-SLG-1
SPECIAL
SLG, 6 CYCLE FAULT ON NIXON 230KV BUS
LOSS OF NIXON 230KV-115KV AUTO
APPLY FAULT AT BUS 73419 Z 1.15884 12.2201 OHMS
RUN FOR 6.00 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN BRANCH FROM BUS 73419 TO BUS 73417 CKT 1
DONE
frpp-SLG-1
SPECIAL
SLG, 6 CYCLE FAULT ON FRONTRANGE 230KV BUS
CLEAR FRONTRANGE-NIXON
APPLY FAULT AT BUS 73559 Z 0.7756 16.3064 OHMS
RUN FOR 6.00 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73419 TO BUS 73559 CKT 1
DONE
kelker-SLG-1
SPECIAL
SLG, 6 CYCLE FAULT ON KELKER N 115KV BUS
LOSS OF KELKER-TEMPLETON 115KV
APPLY FAULT AT BUS 73408 Z 0.9805 6.3989 OHMS
RUN FOR 6 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73408 TO BUS 73422 CKT 1
DONE
cttnwd-SLG-1
SPECIAL
SLG, 6 CYCLE FAULT ON COTTONWOOD 115KV BUS
LOSS OF COTTONWOOD-KETTLECK 115 KV
APPLY FAULT AT BUS 73391 Z 1.3563 6.1788 OHMS
RUN FOR 6.00 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73391 TO BUS 73410 CKT 1
DONE
RDNIX-SLG-1
SPECIAL
SLG, 6/17-CYCLE FAULT ON NIXON 230KV BUS 230NX5 FAILS
CLEAR NIXON AUTO (6) & NIXON-CLAREMONT (17) 230KV
APPLY FAULT AT BUS 73419 Z 1.156 12.227 OHMS
RUN FOR 6.00 CYCLES PRINT 0 PLOT 3
OPEN LINE FROM BUS 73419 TO BUS 73417
RUN FOR 11.00 CYCLES PRINT 0 PLOT 3
CLEAR FAULT AT BUS 73419
```

```
OPEN LINE FROM BUS 73419 TO BUS 73380 CKT 1
DONE
RDNIX-SLG-2
SPECIAL
SLG, 6/17-CYCLE FAULT ON FRONTRANGE 230KV BUS
CLEAR FRONTRANGE-NIXON (6) & NIXON-MIDWAY (17) 230KV
APPLY FAULT AT BUS 73559 Z 1.156 12.227 OHMS
RUN FOR 6.00 CYCLES PRINT 0 PLOT 3
OPEN LINE FROM BUS 73419 TO BUS 73559 CKT 1
RUN FOR 11.00 CYCLES PRINT 0 PLOT 3
CLEAR FAULT AT BUS 73559
OPEN LINE FROM BUS 73419 TO BUS 73413 CKT 1
DONE
RDNIX-SLG-3
SPECIAL
SLG, 6/17-CYCLE FAULT ON NIXON 230KV BUS
CLEAR NIXON 1 (6) & NIXON-KELKER (17) 230KV
APPLY FAULT AT BUS 73419 Z 1.156 12.227 OHMS
RUN FOR 6.00 CYCLES PRINT 0 PLOT 3
DISCONNECT BUS 73418
RUN FOR 11.00 CYCLES PRINT 0 PLOT 3
CLEAR FAULT AT BUS 73419
OPEN LINE FROM BUS 73419 TO BUS 73407 CKT 1
DONE
FULL-SLG-1
SPECIAL
SLG, 6/17-CYCLE FAULT ON FULLER 230KV BUS
CLEAR FULLER-COTTONWOOD (6) & FULLER-CLAREMONT (17) 230KV
APPLY FAULT AT BUS 73477 Z 3.812 23.695 OHMS
RUN FOR 6.00 CYCLES PRINT 0 PLOT 3
OPEN LINE FROM BUS 73477 TO BUS 73392 CKT 1
RUN FOR 11.00 CYCLES PRINT 0 PLOT 3
CLEAR FAULT AT BUS 73477
OPEN LINE FROM BUS 73477 TO BUS 73380 CKT 1
DONE
CW-SLG-1
SPECIAL
SLG, 6/17-CYCLE FAULT ON COTTONWOOD 230KV BUS
CLEAR CW-CW 230 TIE AND CW AUTO (6) & COTTONWOOD-FULLER (17) 230KV
APPLY FAULT AT BUS 73392 Z 3.953 23.223 OHMS
RUN FOR 6.00 CYCLES PRINT 0 PLOT 3
OPEN LINE FROM BUS 73391 TO BUS 73392
OPEN LINE FROM BUS 73392 TO BUS 73394
RUN FOR 11.00 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73392 TO BUS 73477 CKT 1
DONE
KE-SLG-1
SPECIAL
SLG, 6/17-CYCLE FAULT ON KELKER 230KV BUS
CLEAR KELKER-KELEKR 230 AUTO (6) & KELEKR-NIXON (17) 230KV
APPLY FAULT AT BUS 73446 Z 3.489 22.355 OHMS
RUN FOR 6.00 CYCLES PRINT 0 PLOT 3
OPEN LINE FROM BUS 73446 TO BUS 73407 CKT 1
RUN FOR 11.00 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
```

```
OPEN LINE FROM BUS 73446 TO BUS 73419 CKT 1
DONE
nx-ke-simul
SPECIAL
LLG, 6 CYCLE FAULT ON NIXON 230KV BUS
CLEAR BOTH NIXON-KELKER 230 LINES
APPLY FAULT AT BUS 73419 Z 0.356 6.24 OHMS
RUN FOR 6.00 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73419 TO BUS 73446
OPEN LINE FROM BUS 73419 TO BUS 73407
DONE
nx-ct-fr-simul
SPECIAL
LLG, 6 CYCLE FAULT ON NIXON 230KV BUS
CLEAR BOTH NIXON-CLAREMONT 230 LINES
APPLY FAULT AT BUS 73419 Z 0.356 6.24 OHMS
RUN FOR 6.00 CYCLES PRINT 0 PLOT 3
CLEAR FAULT
OPEN LINE FROM BUS 73419 TO BUS 73380 CKT 1
OPEN LINE FROM BUS 73419 TO BUS 73380 CKT 2
DONE
```

Revision History

Revision Number	Revision Date	Brief Description of Change
0	04/01/2011	Original
1	07/01/2011	Added 2011-12 winter and 2012 summer studies and modified TTC for flow limited paths
2	09/1/2011	Added 2012-13 winter
3	01/23/2012	Update 2012 HS and added 2013 HS
4	09/24/2012	Added 2013 Winter
5	04/05/2013	Update 2013 Summer and added 2014 HS
6	10/31/2013	Update 2013-2014 Winter
7	5/27/2014	Update 2014 Summer and Added 2015 Winter