

## Miles City Converter Outages

Shutdown		Start		Duration (hours)	Forced Outage	Scheduled Outage	Forced Reduction	Cause of Outage
Date	Time	Date	Time					
08/07/95	22:03:05	08/07/95	22:06:32	0.06	✓			Snubber Overload West, Power W-E
08/23/95	21:28:05	08/23/95	21:30:12	0.04	✓			Snubber Overload West
08/23/95	23:00:44	08/23/95	23:03:06	0.04	✓			Snubber Overload West
08/30/95	1:00:25	08/30/95	1:07:43	0.12	✓			Snubber Overload West
12/26/95	16:24:46	12/26/95	16:47:51	0.38	✓			Unwanted power reversal
12/26/95	16:49:55	12/26/95	17:47:08	0.95	✓			Unwanted power reversal
<b>Total 1995 (hours)</b>				<b>1.59</b>	<b>1.59</b>	<b>0.00</b>	<b>0.00</b>	
<b>Unavailability (%)</b>				<b>0.02</b>	<b>0.02</b>	<b>0.00</b>	<b>0.00</b>	
01/29/96	23:08:46	01/30/96	15:14:00	16.09	✓			External stop ordered - PCB 3882 SF6 lockout caused 74-38A relay to pick up thru red indicating lamp, 3586 was open - elem sh 122A
02/18/96	7:01:35	02/18/96	8:12:27	1.18	✓			Unwanted power reversal
02/20/96	7:07:29	02/20/96	18:44:25	11.62		✓		Shutdown to replace 7184 interrupter A; also worked on valve hall crane
02/24/96	6:37:10	02/24/96	7:14:13	0.62	✓			Unwanted power reversal
02/27/96	3:21:57	02/27/96	3:55:05	0.55	✓			Unwanted power reversal
02/27/96	16:39:23	02/27/96	16:46:40	0.12	✓			Unwanted power reversal - had just ordered 125 MW W-E at 5 MW/min
03/04/96	19:46:45	03/04/96	19:48:34	0.03	✓			Unwanted power reversal
03/10/96	1:50:55	03/10/96	2:21:00	0.50	✓			Unwanted power reversal
03/10/96	21:00:31	03/10/96	21:03:11	0.04	✓			Unwanted power reversal
03/14/96	15:30:22	03/14/96	15:39:01	0.14	✓			Unwanted power reversal, replaced HVDC control boards
03/14/96	16:39:27	03/14/96	16:41:37	0.04		✓		Shutdown to reinstall HVDC control boards for power supply failure that came in when boards were swapped while down for unwanted power reversal @ 15:30:22
03/15/96	2:55:44	03/15/96	3:29:37	0.56	✓			Unwanted power reversal
03/15/96	19:08:40	03/15/96	19:13:41	0.08		✓		Shutdown to replace ECCC B4M RMS - regulator mode selector suspect cause of unwanted power reversal - VIMD OP AMP
03/29/96	3:55:26	03/29/96	3:58:36	0.05	✓			Unwanted power reversal
04/02/96	20:58:51	04/02/96	21:03:11	0.07	✓			Unwanted power reversal
04/03/96	6:18:28	04/03/96	6:20:31	0.03		✓		Shutdown to replace ECCC B4K RO - suspect cause of unwanted power reversal
04/04/96	6:59:13	04/04/96	7:00:56	0.03	✓			DC Harmonic Protection - when disconnected #1 input on digitizer for thermal Gould - had VSP & ground on
04/07/96	4:42:53	04/07/96	4:48:50	0.10	✓			Unwanted power reversal
04/09/96	10:01:29	04/10/96	9:34:01	23.54	✓			CRO-CU line relayed
04/11/96	11:09:38	04/11/96	11:11:25	0.03	✓			Unwanted power reversal
04/16/96	8:05:57	04/16/96	16:55:00	8.82		✓		Shutdown for MDU work at Rosebud Creek
04/17/96	14:26:45	04/17/96	14:40:57	0.24	✓			Cooling system trip - 52F2 had tripped at 12:59:35 and was still open - MCC-B was on backup feed from 52F3
04/18/96	9:20:03	04/18/96	9:22:16	0.04	✓			External stop ordered - when 3CHA1-A door was closed. 74-38A1 or 74-38A2?
04/22/96	6:02:54	05/09/96	11:42:02	413.65		✓		Annual Maintenance
05/18/96	22:18:31	05/18/96	23:06:07	0.79	✓			DC Harmonic Protection
05/18/96	23:17:44	05/19/96	3:09:40	3.87		✓		Shutdown to replace valve modules with thyristor failures; E3UJ5,6; E3UK1,5,7,8

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Shutdown		Start		Duration (hours)	Forced Outage	Scheduled Outage	Forced Reduction	Cause of Outage
Date	Time	Date	Time					
05/31/96	23:58:33	06/01/96	0:12:57	0.24	✓			DC Zone Primary Trip - loss of both grade 2 supplies - K6 from MC1 had 2 blown fuses, de-energized K5 by mistake when preparing to change fuses.
06/09/96	23:13:51	06/10/96	0:55:50	1.70	✓			Cooling system trip - power supply failure in cooling system PC-A
06/19/96	3:17:10	06/19/96	4:30:11	1.22	✓			Cooling system trip - PC-A ordered trip
06/30/96	23:53:44	06/30/96	23:56:17	0.04	✓			Snubber overload east - power order jump - unorderd; WT says it went to 175 MW by itself. Our W-E power order limit is 180 MW - DFR POE went from 127 to 203 MW at ~ 1300 MW/sec.
07/09/96	6:24:16	07/09/96	6:29:50	0.09		✓		Shutdown to replace PMCC - B4J 2205 G2 MW100 in, MW102 out; B4K 2281 G4 HX100A in, HX100 out. These are suspect cards in the 6/30/96 power order jump that caused a snubber overload.
08/13/96	23:01:06	08/14/96	1:41:11	2.67	✓			Cooling system trip - west transformer cooling fan in bank #1 failed
08/19/96	7:09:49	08/19/96	12:34:01	5.40		✓		Shutdown to replace E6PJ - this module has 4 thyristor failures
10/07/96	5:01:00	10/07/96	15:46:15	10.75		✓		Scheduled shutdown for CRO MODS - repaired thyristors while down
10/28/96	16:45:27	10/28/96	17:12:07	0.44	✓			DC-Zone primary & back-up trip - cooling fan motor in east transformer failed
11/19/96	3:31:30	11/19/96	3:36:43	0.09	✓			BPA RAS TT
12/10/96	7:07:09	12/10/96	13:01:36	5.91		✓		Shutdown to replace W2PL - this module had 3 thyristor failures
<b>Total 1996 (hours)</b>				<b>511.40</b>	<b>61.89</b>	<b>449.51</b>	<b>0.00</b>	
<b>Unavailability (%)</b>				<b>5.84</b>	<b>0.71</b>	<b>5.13</b>	<b>0.00</b>	
03/05/97	8:59:56	03/05/97	12:24:34	3.41	✓			East Transformer KV64A LTC Low Oil Trip - oil level was normal & no problem could be found - did not receive a low oil alarm prior to trip
03/18/97	7:13:24	03/18/97	7:17:01	0.06	✓			MC2 386 trip - external stop ordered - relay changeout at MC2 - MC2-BK 230kV line
03/20/97	10:27:10	03/20/97	10:35:10	0.13	✓			MC2 386 trip - external stop ordered - relay changeout at MC2 - MC2-BK 230kV line
04/21/97	7:09:46	05/02/97	17:58:32	274.81		✓		Annual Maintenance
05/02/97	23:30:38	05/03/97	3:31:07	4.01	✓			Valve Hall Smoke Detected - Trip - Valve Hall Clearance - replace E6PJ
05/03/97	4:20:22	05/03/97	9:59:54	5.66		✓		Shutdown to replace valves - valve hall clearance - replace E2PL, W3PJ
05/19/97	16:03:37	05/19/97	17:16:58	1.22	✓			DC-Zone trip - west transformer tap changer 1 hour timeout
07/06/97	18:52:43	07/06/97	19:20:19	0.46	✓			Emergency stop - MC3-CU line relayed - stormy
09/03/97	14:11:14	09/03/97	23:03:31	8.87		✓		Shutdown to replace valve modules
09/22/97	7:21:16	09/22/97	11:59:50	4.64		✓		Shutdown to replace valve modules
10/08/97	8:09:30	10/08/97	18:16:53	10.12		✓		Shutdown to replace valve modules - rerouted pulse transformer cables
10/20/97	21:24:06	10/20/97	23:14:10	1.83	✓			DC-Zone trip - east transformer tap changer 1 hour timeout
12/01/97	8:03:07	12/01/97	11:48:12	3.75		✓		Shutdown to replace valve modules
12/25/97	5:26:57	12/25/97	9:15:36	3.81	✓			Valve thermal trip - east transformer cooling fan failed and tripped MCC A&C
<b>Total 1997 (hours)</b>				<b>322.80</b>	<b>14.94</b>	<b>307.86</b>	<b>0.00</b>	
<b>Unavailability (%)</b>				<b>3.68</b>	<b>0.17</b>	<b>3.51</b>	<b>0.00</b>	
03/05/98	6:33:42	03/05/98	9:49:40	3.27		✓		Shutdown to replace valve module
03/31/98	8:04:41	03/31/98	9:10:59	1.11	✓			DC-Zone trip - east transformer tap changer 1 hour timeout
04/12/98	19:32:19	04/12/98	20:24:15	0.87	✓			Excess commutation failures west - valve W3P MFV failure
04/14/98	6:50:24	04/14/98	6:57:02	0.11	✓			DC harmonic protection - valve W3P MFV failure
04/18/98	18:55:10	04/18/98	20:18:54	1.40	✓			DC-Zone trip - east transformer cooling fan failed and tripped MCC A&C
04/19/98	7:00:41	05/08/98	22:43:16	471.71		✓		Annual Maintenance

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Shutdown		Start		Duration (hours)	Forced Outage	Scheduled Outage	Forced Reduction	Cause of Outage
Date	Time	Date	Time					
08/06/98	18:51:06	08/06/98	18:54:12	0.05	✓			BPA RAS TT-Broadview-Garrison-2 500kV Line removed by dispatch
08/09/98	18:16:50	08/09/98	18:18:44	0.03	✓			Unexplained trip
08/31/98	14:52:02	08/31/98	14:57:28	0.09	✓			BPA RAS TT
09/02/98	17:37:01	09/05/98	1:10:54	55.56			✓	100MW External Contingency Limit - MC2-Baker line trip - due to prairie fire
09/08/98	20:10:30	09/08/98	20:21:41	0.19			✓	100MW External Contingency Limit
12/15/98	13:03:09	12/15/98	13:05:29	0.04	✓			MC3 relay operated when the wrong test switches were opened
12/26/98	1:24:22	12/26/98	1:27:16	0.05	✓			BPA RAS TT - Loss of Taft-Dworshak 500kV
12/26/98	1:49:48	12/26/98	1:51:07	0.02	✓			BPA RAS TT - Loss of Taft-Dworshak 500kV
12/28/98	11:09:12	12/28/98	11:17:27	0.14	✓			Excess commutation failures west - west disturbance, subsequent valve W6P MFV failure tripped converter
<b>Total 1998 (hours)</b>				<b>534.62</b>	<b>3.90</b>	<b>474.98</b>	<b>55.75</b>	
<b>Unavailability (%)</b>				<b>6.10</b>	<b>0.04</b>	<b>5.42</b>	<b>0.64</b>	
01/07/99	21:06:21	01/07/99	22:49:09	1.71	✓			West Transformer Tap Changer 1 hour timeout
01/23/99	23:14:37	01/23/99	23:15:18	0.01	✓			WT dispatch was preparing to reverse power direction
02/02/99	18:58:41	02/02/99	19:00:01	0.02	✓			BPA RAS TT-loss of both Broadview-Garrison 500kV lines
02/02/99	19:06:50	02/02/99	19:09:03	0.04	✓			BPA RAS TT-loss of both Broadview-Garrison 500kV lines
02/02/99	19:10:21	02/02/99	19:16:16	0.10	✓			BPA RAS TT-loss of both Broadview-Garrison 500kV lines
04/29/99	0:39:16	04/29/99	0:48:17	0.15	✓			BPA RAS TT-loss of Broadview-Garrison-1 500kV line
05/03/99	7:01:59	05/21/99	16:27:25	441.42		✓		Annual Maintenance
07/21/99	18:36:16	07/21/99	18:38:06	0.03	✓			West & East DOV trip due to station service undervoltage dropping relay
08/28/99	16:24:51	08/28/99	16:27:54	0.05	✓			External stop ordered - Miles City 3-Custer 230kV line relayed
09/15/99	15:13:50	09/15/99	15:27:54	0.23	✓			Emergency stop - i-I153nadvertent press of the emergency stop button by EEC person
11/04/99	6:40:40	11/04/99	7:30:18	0.83		✓		Shutdown to check out new WT SCADA system
12/19/99	4:31:43	12/19/99	4:36:41	0.08	✓			BPA RAS TT, loss of both 500kV lines
<b>Total 1999 (hours)</b>				<b>444.68</b>	<b>2.43</b>	<b>442.25</b>	<b>0.00</b>	
<b>Unavailability (%)</b>				<b>5.08</b>	<b>0.03</b>	<b>5.05</b>	<b>0.00</b>	
03/17/00	16:29:34	03/17/00	17:06:54	0.62	✓			Excess commutation failures west - valve module W3PK failure
03/17/00	19:20:53	03/17/00	21:11:19	1.84		✓		Shutdown to replace valve module W3PK
03/20/00	8:24:13	03/20/00	8:32:29	0.14	✓			DC Harmonic Protection valve module W3P MFV failure
05/01/00	5:09:50	05/12/00	16:34:01	275.40		✓		Annual Maintenance
06/08/00	17:40:42	06/08/00	18:18:54	0.64	✓			Excess commutation failures west - valve MFV failure
06/24/00	1:58:28	06/24/00	2:02:14	0.06	✓			BPA RAS TT
06/28/00	4:53:33	06/28/00	4:59:10	0.09			✓	60MW External Contingency Limit - MC2-DC 230KV line trip
07/03/00	23:28:30	07/03/00	23:38:10	0.16			✓	60MW External Contingency Limit - MC2-DC 230KV line trip
07/13/00	19:50:31	07/13/00	20:02:07	0.19	✓			Snubber overload west trip
07/15/00	21:50:05	07/15/00	21:56:29	0.11	✓			Snubber overload west trip
07/24/00	8:48:09	07/24/00	9:08:05	0.33	✓			East bus neutral OC trip - MC2 482 replacement in progress, shorting CT's
07/25/00	8:09:25	07/25/00	17:42:48	9.56		✓		Shutdown to repair 7184
08/23/00	13:15:49	08/24/00	0:03:16	10.79	✓			Problems with new MC2 482 breaker a/b contacts

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Shutdown		Start		Duration (hours)	Forced Outage	Scheduled Outage	Forced Reduction	Cause of Outage
Date	Time	Date	Time					
08/24/00	1:53:30	08/24/00	2:38:40	0.75	✓			East bus differential trip - new MC2 482 had 2 CT ratios reversed
08/30/00	1:02:12	08/30/00	1:07:45	0.09	✓			Emergency stop - HVDC control failure - PMCC 5V power supply failed
08/30/00	7:17:17	08/30/00	7:19:39	0.04		✓		Shutdown to replace PMCC 5V power supply that failed at 01:02:12
10/05/00	7:23:29	10/05/00	7:29:28	0.10			✓	60MW External Contingency Limit - MC2-DC 230KV line trip, 173MW E-W prior loading
<b>Total 2000 (hours)</b>				<b>300.92</b>	<b>13.73</b>	<b>286.84</b>	<b>0.35</b>	
<b>Unavailability (%)</b>				<b>3.44</b>	<b>0.16</b>	<b>3.27</b>	<b>0.00</b>	
01/23/01	6:46:12	01/23/01	6:54:14	0.13			✓	100MW External Contingency Limit - DC-FP 230KV line trip, 197MW E-W prior loading
01/30/01	11:33:25	01/30/01	12:05:38	0.54	✓			Emergency stop - valve thermal trip - wiring changes being made to cooling controllers, valve thermal computer sensed that cooling fans were not functioning, 190 MW E-W
03/11/01	7:48:21	03/11/01	8:44:10	0.93	✓			Emergency stop - excess commutation failures west trip, DC harmonic protection trip, 15 comm fail west, 187 MW E-W
03/14/01	6:16:18	03/14/01	6:19:46	0.06	✓			Emergency stop - excess commutation failures west trip, DC harmonic protection trip, when WCCC door was closed, 17 comm fail west, 188 MW E-W
03/21/01	14:37:47	03/21/01	14:53:02	0.25	✓			Emergency stop - DC harmonic protection trip, 12 comm fail west, 191 MW E-W
03/29/01	15:29:06	03/29/01	15:32:22	0.05	✓			Excess commutation failures west trip, 15 comm fail west, 156 MW E-W
05/01/01	7:06:55	05/10/01	14:38:58	223.53		✓		Annual Maintenance
06/23/01	19:39:20	06/23/01	19:48:11	0.15			✓	100 MW External Contingency Limit - DC-FP 230KV line trip, 190MW E-W prior loading
06/23/01	20:37:23	06/23/01	20:39:36	0.04	✓			100 MW External Contingency Limit - DC-FP 230KV line trip, 190MW E-W prior loading, Snubber Overload East
07/20/01	19:17:31	07/20/01	19:52:46	0.59	✓			100 MW External Contingency Limit - DC-FP 230KV line trip, 60 MW External Contingency Limit - MC2-DC 230 KV line undervoltage, MC3-CU 230KV line trip - MC3 relay overvoltage, 154 MW E-W
07/31/01	1:43:46	07/31/01	1:50:02	0.10			✓	60 MW External Contingency Limit - MC2-DC 230KV line trip, 160 MW E-W prior loading
08/09/01	14:00:47	08/09/01	16:45:44	2.75		✓		Shutdown to replace valve modules E6PK and W6PK due to thyristor failures
<b>Total 2001 (hours)</b>				<b>229.13</b>	<b>2.46</b>	<b>226.28</b>	<b>0.39</b>	
<b>Unavailability (%)</b>				<b>2.62</b>	<b>0.03</b>	<b>2.58</b>	<b>0.00</b>	
04/13/02	17:53:34	04/13/02	18:14:31	0.35	✓			DC-Zone trip - west transformer tap changer 1 hour timeout
05/06/02	7:02:20	05/22/02	13:01:45	389.99		✓		Annual Maintenance
05/22/02	14:39:58	05/22/02	16:28:02	1.80		✓		Lack of power sales
05/24/02	11:49:53	05/24/02	16:53:31	5.06	✓			MOI 5284 trouble, pole 3 not closing, replaced brain
05/25/02	6:57:04	05/25/02	11:16:41	4.33		✓		Painting on MC2 structures
05/28/02	7:55:50	05/28/02	8:16:47	0.35	✓			DOV trip, switching at MC2, station service source #1 dropped
05/31/02	15:34:22	05/31/02	15:39:45	0.09	✓			DC harmonic trip, energized MC2 KV1A transformer from 230 KV bus
06/06/02	16:12:52	06/06/02	16:23:53	0.18	✓			BPA RAS TT
06/08/02	20:52:46	06/08/02	20:59:31	0.11			✓	20 MW External Contingency Limit - MC2-DC 230KV line trip, 30 MW E-W prior loading
06/26/02	23:19:49	06/26/02	23:27:11	0.12	✓			Snubber overload east trip, 20 MW W-E
07/08/02	2:16:33	07/08/02	2:27:55	0.19	✓			Snubber overload east trip, ramping to 20 MW W-E
07/14/02	22:57:49	07/14/02	23:00:20	0.04	✓			Snubber overload east trip, 20 MW W-E
07/16/02	20:18:31	07/16/02	20:23:17	0.08	✓			Trip, MC3-CU 230KV line relayed
07/17/02	0:23:01	07/17/02	0:26:02	0.05	✓			Trip, MC3-CU 230KV line relayed

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Shutdown		Start		Duration (hours)	Forced Outage	Scheduled Outage	Forced Reduction	Cause of Outage
Date	Time	Date	Time					
08/20/02	7:04:30	08/20/02	7:11:31	0.12	✓			WT dispatch was preparing to reverse power direction, accidental stop
08/20/02	10:13:13	08/20/02	10:17:06	0.06		✓		WT dispatch stopped to test software changes
11/17/02	5:47:44	11/17/02	5:50:04	0.04	✓			BPA RAS TT, false trip due to comm noise, no signal sent from BPA
11/28/02	21:04:42	11/28/02	21:54:17	0.83	✓			Excess commutation failures west
11/30/02	7:47:10	11/30/02	7:50:23	0.05	✓			Unwanted power reversal, 9 commutation failures
<b>Total 2002 (hours)</b>				<b>403.85</b>	<b>7.55</b>	<b>396.18</b>	<b>0.11</b>	
<b>Unavailability (%)</b>				<b>4.61</b>	<b>0.09</b>	<b>4.52</b>	<b>0.00</b>	
01/16/03	14:58:25	01/16/03	15:02:33	0.07	✓			WT dispatch was preparing to reverse power direction, accidental stop
02/14/03	9:24:14	02/14/03	9:26:34	0.04	✓			BPA RAS TT, inadvertent operation during routine testing by BPA personnel
04/09/03	6:58:47	04/09/03	6:59:38	0.01	✓			WT dispatch was preparing to reverse power direction, accidental stop
04/14/03	8:07:09	04/14/03	9:32:18	1.42		✓		Shutdown to replace broken insulator on 8284
04/28/03	7:05:52	05/16/03	14:32:09	439.44		✓		Annual Maintenance
05/28/03	8:41:50	05/28/03	8:57:21	0.26	✓			Valve cooling trip, when replacing floor panel in front of control cabinet
07/29/03	7:22:21	08/01/03	13:03:06	77.68		✓		Shutdown to replace vacuum interrupters in east and west converter transformer LTC's
08/06/03	7:58:56	08/06/03	12:57:05	4.97		✓		Shutdown due to 3 Eupec thyristor failures in valve W2U, replaced 4 valve modules
08/08/03	18:52:06	08/08/03	19:03:06	0.18	✓			Snubber overload east trip, 20 MW W-E
08/09/03	2:45:25	08/09/03	5:23:10	2.63	✓			DC-CR 115 KV line relayed, emergency stop - converter fault trip - due to oscillations on DC bus
08/27/03	20:29:47	08/27/03	21:01:38	0.53	✓			West converter cooling fan failed and tripped MCC-B and D
12/14/03	11:35:10	12/14/03	14:24:25	2.82	✓			West reactor 7284 high temperature - due to failure of phase A brain in MOI 7284 - replaced brain
<b>Total 2003 (hours)</b>				<b>530.05</b>	<b>6.54</b>	<b>523.51</b>	<b>0.00</b>	
<b>Unavailability (%)</b>				<b>6.05</b>	<b>0.07</b>	<b>5.98</b>	<b>0.00</b>	
02/24/04	7:03:01	02/24/04	18:48:57	11.77		✓		Shutdown to crimp Eupec thyristors - manufacturing problem on 2003 units, replaced phase B interrupter and brain on MOI 7484
04/15/04	0:33:41	04/15/04	1:03:43	0.50	✓			BPA RAS TT, Garrison-Taft #2 500KV line removed from service for voltage control, BPA had not disabled RAS trip
04/26/04	7:34:07	5/14/2004	17:43:31	442.16		✓		Annual Maintenance
06/28/04	19:50:18	6/28/2004	19:58:17	0.13	✓			BPA RAS TT, Garrison-Taft #1&2 500KV lines relayed
08/06/04	8:07:16	08/06/04	8:39:39	0.54			✓	100MW External Contingency Limit - DC-BEF 230KV line trip, 60 MW External Contingency Limit - DC 86BF1 de-energized DC-FP 230KV line and DC-MC2 230KV line, 150MW E-W prior loading
09/01/04	0:03:27	09/01/04	0:13:16	0.16	✓			BPA RAS TT
11/04/04	12:34:54	11/04/04	12:59:20	0.41			✓	100 MW External Contingency Limit - Blown fuse simulated MC2-BK 230KV line trip, MC2 relay upgrade was in progress, 125 MW E-W prior loading
12/06/04	9:02:01	12/06/04	17:46:54	8.75		✓		Repair MC3 3581 disconnect, repair MOI 5284 - replaced phase A interrupter and brain
<b>Total 2004 (hours)</b>				<b>464.41</b>	<b>0.80</b>	<b>462.67</b>	<b>0.95</b>	
<b>Unavailability (%)</b>				<b>5.30</b>	<b>0.01</b>	<b>5.28</b>	<b>0.01</b>	
01/20/05	7:04:09	01/20/05	10:31:42	3.46		✓		Shutdown to replace valve module E5PL, three thyristor failures in E5P, 20 MW E-W
02/07/05	23:04:30	02/08/05	0:43:54	1.66	✓			East bus differential trip - MOI 5684 open, phase A interrupter failure, Ramping ~145 MW E-W
04/07/05	10:10:58	04/07/05	10:26:58	0.27	✓			86 DC zone lockout - valve hall smoke, painter washing wall above valve hall fire protection system panels, 79 MW E-W

## Miles City Converter Outages

Shutdown		Start		Duration (hours)	Forced Outage	Scheduled Outage	Forced Reduction	Cause of Outage
Date	Time	Date	Time					
04/07/05	10:36:09	04/07/05	10:58:27	0.37	✓			86 DC zone lockout - valve hall smoke, still problems from painter washing wall above valve hall fire protection system panels, 20 MW E-W
05/02/05	7:16:57	05/27/05	15:41:21	608.41		✓		Annual Maintenance, extended for Custer substation insulator replacement, 20 MW E-W
06/01/05	14:36:09	06/01/05	14:40:07	0.07	✓			BPA RAS TT, 55 MW E-W, Taft-D'Vorshak 500KV line relayed
06/16/05	13:11:30	06/16/05	13:13:36	0.03			✓	60/100 MW External Contingency Limit, No indication/reason - mis-operation, 107 MW W-E
06/16/05	23:28:16	06/17/05	2:56:15	3.47	✓			Excess Commutation Failure Stop, 110 MW E-W
06/21/05	7:40:50	06/21/05	7:46:22	0.09	✓			Emergency stop - DC harmonic protection trip, 50 MW W-E
09/19/05	11:26:18	09/19/05	11:58:49	0.54	✓			West bus neutral OC, CU-MC3 relay replacement in progress, wrong ct block shorted at breaker, 176 MW E-W
09/21/05	15:29:27	09/21/05	15:31:19	0.03	✓			CU-MC3 230KV Line Trip, CU-MC3 relay replacement in progress, fuses removed for set "B" relays that were mislabeled as for set "A", 40 MW W-E
10/04/05	9:32:34	10/04/05	9:36:23	0.06	✓			CU-MC3 230KV Line Trip, CU-MC3 relay replacement in progress, checking wiring with ohmmeter and energized trip circuit, 160 MW E-W
10/05/05	9:44:12	10/05/05	9:54:13	0.17			✓	60 MW External Contingency Limit, DC-DK EMGD TT, wet-heavy snow storm, 101 MW E-W
10/05/05	9:54:13	10/05/05	14:01:12	4.12	✓			Emergency stop - Snubber overload east, BAL 2752 tripped & reclosed, wet-heavy snow storm, 20 MW E-W
12/07/05	19:09:58	12/07/05	19:54:55	0.75	✓			Shutdown to prevent thermal damage in valve hall, west transformer KV84A cooling fan failed and tripped MCC B & D
<b>Total 2005 (hours)</b>				<b>623.49</b>	<b>11.42</b>	<b>611.87</b>	<b>0.20</b>	
<b>Unavailability (%)</b>				<b>7.12</b>	<b>0.13</b>	<b>6.98</b>	<b>0.00</b>	
01/17/06	8:33:48	01/17/06	8:42:39	0.15	✓			BPA RAS TT, 162MW E-W, Taft-Bell 500KV line relayed
02/15/06	13:15:31	02/15/06	15:50:42	2.59		✓		Shutdown to replace valve module E5PJ, four thyristor failures, 20MW W-E
05/01/06	7:06:27	05/12/06	15:49:51	272.72		✓		Annual Maintenance, 20MW W-E
07/13/06	15:24:53	07/13/06	16:47:42	1.38	✓			CRO DTT Received, CRO-Cu 230KV Line Relayed, smoke from range fire
07/13/06	18:15:21	07/13/06	18:20:03	0.08	✓			CRO DTT Received, CRO-Cu 230KV Line Relayed, smoke from range fire
08/17/06	23:30:09	08/18/06	0:44:00	1.23			✓	100MW External Contingency Limit, DC-BEL 230KV Line Relayed, 95MW E-W, WT received the 60MW Limit alarm and software forced them to ramp below 60MW to reset
08/25/06	5:15:52	08/25/06	5:19:16	0.06	✓			MC3-CU 230KV Line Relayed
09/06/06	22:20:51	09/06/06	22:24:03	0.05			✓	100MW External Contingency Limit, DC-BEL 230KV Line Relayed, 160MW E-W, WT received the 60MW Limit alarm and software forced them to ramp below 60MW to reset
10/15/06	9:41:59	10/15/06	9:51:50	0.16	✓			BPA RAS TT, 90MW E-W, Taft-Bell 500KV line relayed
10/15/06	9:54:01	10/15/06	9:57:01	0.05	✓			BPA RAS TT, Ramping 20-90MW E-W, Taft-Bell 500KV line relayed
10/23/06	7:18:25	10/23/06	7:20:05	0.03	✓			Snubber overload east trip, 20MW W-E
11/13/06	5:16:19	11/13/06	5:43:24	0.45	✓			BPA RAS TT, 70MW E-W, Lower Granite-Hatwai 500KV line relayed
11/15/06	23:06:38	11/15/06	23:42:21	0.60	✓			West bus differential, ramping 45-185MW E-W, phase B-C fault, 7284 opened ~ 1 second prior
11/24/06	2:37:55	11/24/06	2:43:45	0.10	✓			BPA RAS TT, 140MW E-W, Taft-Bell 500KV line relayed
11/24/06	2:50:11	11/24/06	3:32:49	0.71	✓			BPA RAS TT, ramping 20-100MW E-W, Taft-Bell 500KV line relayed
11/24/06	6:54:33	11/24/06	7:00:16	0.10	✓			BPA RAS TT, ramping 119-170MW E-W
12/15/06	1:35:57	12/15/06	1:43:08	0.12	✓			BPA RAS TT, 161MW E-W

## Miles City Converter Outages

Shutdown		Start		Duration (hours)	Forced Outage	Scheduled Outage	Forced Reduction	Cause of Outage
Date	Time	Date	Time					
12/16/06	13:59:46	12/16/06	14:56:59	0.95			✓	60-100MW External Contingency Limit, DC-BEL 230KV Line Relayed - steel structure down, 134MW E-W
12/16/06	18:05:43	12/16/06	18:13:53	0.14	✓			West DOV Trip - due to loss of power from station service undervoltage when HET capacitor PCB 1462 closed and HET-BOW 230KV line relayed, 110MW E-W
<b>Total 2006 (hours)</b>				<b>281.66</b>	<b>4.11</b>	<b>275.31</b>	<b>2.24</b>	
<b>Unavailability (%)</b>				<b>3.22</b>	<b>0.05</b>	<b>3.14</b>	<b>0.03</b>	
04/11/07	11:25:53	04/11/07	11:32:01	0.10	✓			West DOV Trip - 5211 station service undervoltage trip when MC2 Xfmr KV1A Bus Diff LKOT Relay 86B2 operated when M&R testing relay, 65MW E-W
04/11/07	12:30:00	04/11/07	12:34:21	0.07	✓			West DOV Trip - restoring station service to normal, 52BT opened and 5211 closed, 31MW E-W
04/23/07	8:00:33	05/11/07	11:23:05	435.38		✓		Annual Maintenance, 20MW E-W
06/05/07	22:05:56	06/05/07	22:35:48	0.50	✓			86 DC Zone trip - west transformer tap changer lower 60 minute trip timer
06/08/07	1:17:25	06/08/07	1:24:25	0.12	✓			Snubber overload east trip, 20MW E-W
07/09/07	14:13:39	07/09/07	14:17:46	0.07	✓			West DOV Trip - station service undervoltage, MC2-OF 115KV Line relay, 85MW W-E
07/09/07	14:21:30	07/09/07	14:23:30	0.03	✓			West DOV Trip - station service undervoltage, MC2 1362 closed to test MC2-OF 115KV Line, ramping 20-85MW W-E
09/16/07	0:57:16	09/16/07	2:10:20	1.22	✓			East transformer KV64A differential
09/16/07	2:11:22	09/18/07	19:00:08	64.81	✓			East transformer KV64A differential, phase B tap changer failed
09/18/07	19:26:30	09/18/07	19:50:23	0.40	✓			Snubber overload east trip, 20MW E-W, RTU upgrade problems
10/22/07	7:12:24	10/27/07	16:11:55	128.99		✓		Replace MOI 5984 and 7784
11/08/07	3:17:40	11/08/07	3:24:17	0.11	✓			BPA RAS TT, 175MW E-W, 500KV line relayed
11/08/07	11:54:17	11/08/07	11:57:10	0.05	✓			BPA RAS TT, 68MW E-W, Taft-Bell #1 500KV line relayed
11/27/07	9:05:07	11/27/07	17:15:53	8.18		✓		Replace failed MOI interrupters, 7184 phase B and 7484 phase A
12/26/07	4:08:58	12/26/07	4:10:56	0.03	✓			BPA RAS TT, 190MW E-W, Taft-Bell #1 500KV line relayed
12/26/07	5:23:43	12/26/07	5:28:11	0.07	✓			BPA RAS TT, 190MW E-W, Taft-Bell #1 500KV line relayed
<b>Total 2007 (hours)</b>				<b>640.13</b>	<b>67.59</b>	<b>572.55</b>	<b>0.00</b>	
<b>Unavailability (%)</b>				<b>7.31</b>	<b>0.77</b>	<b>6.54</b>	<b>0.00</b>	
01/30/08	16:12:07	01/30/08	16:14:24	0.04	✓			86BF-4A 482 Breaker Failure - MC2 relay replacement, nut dropped onto indicating light
02/05/08	17:12:57	02/05/08	17:15:10	0.04	✓			BPA RAS TT, 155MW E-W, Taft-Dworshak 500KV line relayed
02/07/08	6:27:37	02/07/08	6:35:05	0.12	✓			BPA RAS TT, 170MW E-W, Lower Granite-Hatwai 500KV line relayed
02/16/08	20:00:21	02/16/08	20:47:47	0.79	✓			West bus differential, ramping 150-180MW E-W, phase A-B fault, 7284 opened ~ 2 seconds prior
03/25/08	6:30:56	03/25/08	6:36:26	0.09	✓			Valve cooling trip, updating cooling system software
04/14/08	4:00:38	04/14/08	5:04:36	1.07	✓			Excess Commutation Failure West Trip, PO jumped to 200MW at end of ramp to 133MW E-W
04/28/08	7:08:02	05/16/08	15:00:00	439.87		✓		Annual Maintenance, 20MW E-W, problems with remote start capabilities from WT... started locally
05/16/08	15:03:33	05/16/08	16:04:41	1.02		✓		Shutdown to test problems with remote start capabilities from WT, had to start locally
05/16/08	16:25:07	05/16/08	16:26:48	0.03		✓		Shutdown to test problems with remote start capabilities from WT, started okay remotely
07/26/08	22:51:36	07/27/08	0:33:08	1.69	✓			Valve cooling trip, valve cooling computer program locked up
07/30/08	7:08:09	07/30/08	10:51:20	3.72		✓		Shutdown to repair MOI 7184 phase B
09/05/08	18:48:31	09/05/08	20:29:30	1.68	✓			Valve Cooling Trip - west transformer cooling fan motor failed and tripped MCC B&D
09/19/08	18:18:21	09/19/08	18:22:13	0.06	✓			DOV Trip - station service loss due to MC2 KV1A lockout

## Miles City Converter Outages

Shutdown		Start		Duration (hours)	Forced Outage	Scheduled Outage	Forced Reduction	Cause of Outage
Date	Time	Date	Time					
10/01/08	13:15:48	10/01/08	13:27:28	0.19	✓			CRO breaker failure transfer trip - CU-CRO 230KV line relayed
11/13/08	7:06:56	11/13/08	7:20:50	0.23	✓			Valve Cooling Trip - east transformer cooling fan motor failed and tripped MCC A&C, then MCC D tripped
<b>Total 2008 (hours)</b>				<b>450.65</b>	<b>6.01</b>	<b>444.63</b>	<b>0.00</b>	
<b>Unavailability (%)</b>				<b>5.14</b>	<b>0.07</b>	<b>5.08</b>	<b>0.00</b>	
01/02/09	8:33:18	01/02/09	8:39:27	0.10	✓			BPA RAS TT, 130MW E-W, Taft-Bell 500KV line relayed
03/12/09	14:18:44	03/12/09	14:23:11	0.07	✓			BPA RAS TT, 107MW E-W, Lower Granite-Little Goose #1 500KV line relayed
03/15/09	4:34:49	03/15/09	4:38:39	0.06	✓			BPA RAS TT, 130MW E-W, Taft-Bell #1 500KV line relayed
04/27/09	6:59:56	05/16/09	4:19:26	453.33		✓		Annual Maintenance, 20MW E-W, problems on startup with East AC Bus VV50A input
05/16/09	4:32:41	05/18/09	20:21:35	63.82		✓		No power sales until Belfield is put back online
06/16/09	12:40:44	06/16/09	14:19:24	1.64	✓			HVDC Converter Fault Emergency Stop - MC2-DC 115KV line relayed
06/19/09	8:46:08	06/19/09	12:00:52	3.25	✓			Valve Cooling Trip - digital read error
06/20/09	13:24:16	06/20/09	16:41:12	3.28	✓			DOV Trip - station service loss due to MC2 KV1A lockout
08/05/09	10:08:47	08/05/09	10:10:54	0.04			✓	20MW External Contingency Limit, MC2-DC 230KV line relayed, normally 60MW but temporarily set to 20MW for construction work out east
11/22/09	6:19:37	11/22/09	7:24:29	1.08	✓			Excess Commutation Failure West - 20 Comm Fail - CRO-Hardin 230KV line relayed
12/26/09	6:54:06	12/26/09	7:03:51	0.16	✓			DC Harmonic Protection - tripped when trying to energize BK-BOW 230KV line from Baker
<b>Total 2009 (hours)</b>				<b>526.83</b>	<b>9.66</b>	<b>517.14</b>	<b>0.04</b>	
<b>Unavailability (%)</b>				<b>6.01</b>	<b>0.11</b>	<b>5.90</b>	<b>0.00</b>	
01/05/10	0:03:33	01/05/10	0:08:58	0.09	✓			HVDC Internal Stop - Master Pole 5V power supply board failure
01/05/10	8:42:45	01/05/10	8:45:27	0.05		✓		Shutdown to replace HVDC Master Pole 5V power supply board
04/26/10	7:11:21	05/16/10	15:42:19	488.52		✓		Annual Maintenance, 20MW E-W, problems with remote startup, started locally
05/16/10	15:53:08	05/16/10	15:54:22	0.02		✓		20MW E-W, test remote startup, wasn't able to remote start on previous attempt
05/19/10	12:47:08	05/19/10	12:55:53	0.15	✓			Excess Commutation Failure West - 15 Comm Fail
06/17/10	1:35:51	06/17/10	12:58:44	11.38	✓			Snubber Overload East, Charlie Creek - Belfield 345KV line fault
06/21/10	13:49:09	06/22/10	17:48:46	27.99	✓			Smoothing Reactor Trip, oil hose failed
09/12/10	23:27:38	09/12/10	23:29:18	0.03			✓	20MW External Contingency Limit, DC-FP 230KV line relayed, normally 100MW but temporarily set to 20MW for Rhame-Bowman 230KV line outage
<b>Total 2010 (hours)</b>				<b>528.22</b>	<b>39.61</b>	<b>488.58</b>	<b>0.03</b>	
<b>Unavailability (%)</b>				<b>6.03</b>	<b>0.45</b>	<b>5.58</b>	<b>0.00</b>	