

Fig. 1 6CT-2ST CCGT Transition diagram

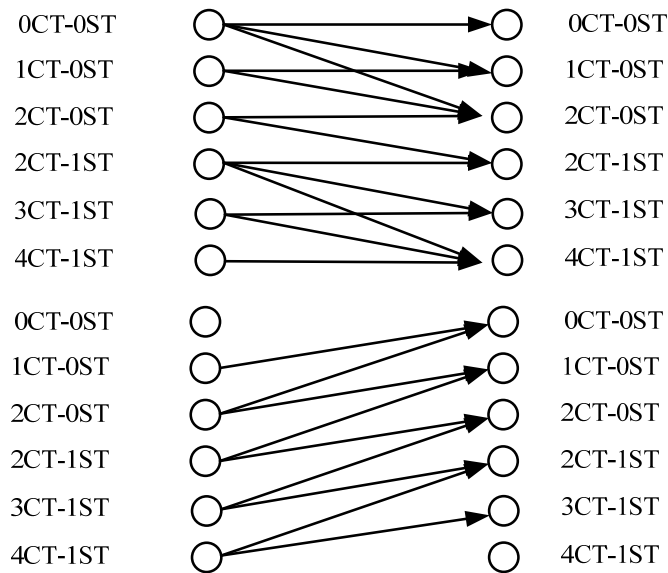


Fig. 2 4CT-1ST CCGT Transition diagram

Table 1. CCGT units data 1

Unit Name	Bus No	Quick Start Capability	CT Num	ST Num

4001	12	30	2	1
4002	61	20	6	2
4003	62	30	2	1
4004	66	40	2	1
4005	49	30	4	1
4006	49	30	2	1
4007	59	40	2	1
4008	61	40	2	1
4009	80	40	2	1
4010	111	30	4	1
4011	100	40	2	1
4012	89	40	2	1

Table 2. CCGT units data2

Unit Name	Min CT Number to Start ST	Min On hours of CTs to Start first ST	Min CT Number to Run all ST	Max CT Number without any ST	Max CT Number to Run HP ST Only	Max CT Number to Run LP ST Only	Min CT Number to Run LP ST Only	Min CT Number to Run HP ST Only	Min on hour of HP ST to Start LP ST
4001	1	2	1	2	0	0	0	0	0
4002	2	2	5	3	5	4	3	3	1
4003	1	2	1	2	0	0	0	0	0
4004	1	2	1	2	0	0	0	0	0
4005	2	2	2	2	0	0	0	0	0
4006	1	2	1	2	0	0	0	0	0
4007	1	2	1	2	0	0	0	0	0
4008	1	2	1	2	0	0	0	0	0
4009	1	2	1	2	0	0	0	0	0
4010	2	2	2	2	0	0	0	0	0
4011	1	2	1	2	0	0	0	0	0
4012	1	2	1	2	0	0	0	0	0

Table 3. CCGT units data3

Unit Name	4001	4002	4003	4004	4005	4006	4007	4008	4009	4010	4011	4012
$MaxCTN1_{i(hp)}^{su}$	2	2	2	2	2	2	2	2	2	2	2	2
$MaxCTN2_{i(hp)}^{su}$	0	1	0	0	0	0	0	0	0	0	0	0
$MaxCTN3_{i(hp)}^{su}$	0	0	0	0	0	0	0	0	0	0	0	0
$MaxCTN1_{i(hp)}^{sd}$	2	2	2	2	2	2	2	2	2	2	2	2
$MaxCTN2_{i(hp)}^{sd}$	0	0	0	0	0	0	0	0	0	0	0	0
$MaxCTN3_{i(hp)}^{sd}$	0	1	0	0	1	0	0	0	0	1	0	0

$MaxCTN1_{i(lp)}^{su}$	0	2	0	0	0	0	0	0	0	0	0	0
$MaxCTN2_{i(lp)}^{su}$	0	2	0	0	0	0	0	0	0	0	0	0
$MaxCTN3_{i(lp)}^{su}$	0	0	0	0	0	0	0	0	0	0	0	0
$MaxCTN1_{i(lp)}^{sd}$	0	2	0	0	0	0	0	0	0	0	0	0
$MaxCTN2_{i(lp)}^{sd}$	0	0	0	0	0	0	0	0	0	0	0	0
$MaxCTN3_{i(lp)}^{sd}$	0	2	0	0	0	0	0	0	0	0	0	0

Table 4 CT data

Unit Index	CT Index	Pmin (MW)	Pmax (MW)	Min ON (h)	Min OFF(h)	Fuel Price	Fuel-MW Curve c (MBtu/h)	Fuel-MW Curve b (MBtu/MWh)	Fuel-MW Curve a (MBtu/MW2h)
4001	CT1	5	20	2	2	1.9	34.3891	16.542	0.02533
4001	CT2	5	20	2	2	1.9	34.3891	16.542	0.02533
4002	CT1	5	15	2	2	1.9	23.001	13.2903	0.01501
4002	CT2	5	15	2	2	1.9	23.001	13.2903	0.01501
4002	CT3	5	15	2	2	1.9	23.001	13.2903	0.01501
4002	CT4	5	15	2	2	1.9	23.001	13.2903	0.01501
4002	CT5	5	15	2	2	1.9	23.001	13.2903	0.01501
4002	CT6	5	15	2	2	1.9	23.001	13.2903	0.01501
4003	CT1	5	20	2	2	1.9	130.002	10.6121	0.00505
4003	CT2	5	20	2	2	1.9	130.002	10.6121	0.00505
4004	CT1	8	25	2	2	1.9	58.131	14.4921	0.01736
4004	CT2	8	25	2	2	1.9	58.131	14.4921	0.01736
4005	CT1	5	20	2	2	1.9	55.5959	13.7154	0.01288
4005	CT2	5	20	2	2	1.9	55.5959	13.7154	0.01288
4005	CT3	5	20	2	2	1.9	55.5959	13.7154	0.01288
4005	CT4	5	20	2	2	1.9	55.5959	13.7154	0.01288
4006	CT1	5	20	2	2	1.9	122.002	11.4073	0.00528
4006	CT2	5	20	2	2	1.9	122.002	11.4073	0.00528
4007	CT1	8	25	2	2	1.9	70.0288	13.1083	0.01059
4007	CT2	8	25	2	2	1.9	70.0288	13.1083	0.01059
4008	CT1	8	25	2	2	1.9	70.0288	13.1083	0.01059
4008	CT2	8	25	2	2	1.9	70.0288	13.1083	0.01059
4009	CT1	8	25	2	2	1.9	70.0288	13.1083	0.01059
4009	CT2	8	25	2	2	1.9	70.0288	13.1083	0.01059
4010	CT1	5	20	2	2	1.9	58.131	14.4921	0.01736
4010	CT2	5	20	2	2	1.9	58.131	14.4921	0.01736

4010	CT3	5	20	2	2	1.9	58.131	14.4921	0.01736
4010	CT4	5	20	2	2	1.9	58.131	14.4921	0.01736
4011	CT1	8	25	2	2	1.9	58.131	14.4921	0.01736
4011	CT2	8	25	2	2	1.9	58.131	14.4921	0.01736
4012	CT1	8	25	2	2	1.9	122.002	11.4073	0.00528
4012	CT2	8	25	2	2	1.9	122.002	11.4073	0.00528
Unit Index	CT Index	Start up Fuel	Ramp Up	Ramp Down	MSR	nMSR	MW-Steam Curve	MW-Steam Curve	MW-Steam Curve
		(MBtu)	(MW/h)	(MW/h)	(MW/min)	(min)	c (MBtu/h)	b (MBtu/MWh)	a (MBtu/MW2h)
4001	CT1	30	20	20	1	10	21.3212	10.09062	0.015198
4001	CT2	30	20	20	1	10	21.3212	10.09062	0.015198
4002	CT1	40	15	15	0.8	10	14.7206	7.708374	0.0093062
4002	CT2	40	15	15	0.8	10	14.7206	7.708374	0.0093062
4002	CT3	40	15	15	0.8	10	14.7206	7.708374	0.0093062
4002	CT4	40	15	15	0.8	10	14.7206	7.708374	0.0093062
4002	CT5	40	15	15	0.8	10	14.7206	7.708374	0.0093062
4002	CT6	40	15	15	0.8	10	14.7206	7.708374	0.0093062
4003	CT1	120	20	20	1	10	80.6013	6.473381	0.00303
4003	CT2	120	20	20	1	10	80.6013	6.473381	0.00303
4004	CT1	40	25	25	1.5	10	36.0412	8.840181	0.010416
4004	CT2	40	25	25	1.5	10	36.0412	8.840181	0.010416
4005	CT1	80	20	20	1.5	10	34.4695	8.366394	0.007728
4005	CT2	80	20	20	1.5	10	34.4695	8.366394	0.007728
4005	CT3	80	20	20	1.5	10	34.4695	8.366394	0.007728
4005	CT4	80	20	20	1.5	10	34.4695	8.366394	0.007728
4006	CT1	200	20	20	1.5	10	75.6413	6.958453	0.003168
4006	CT2	200	20	20	1.5	10	75.6413	6.958453	0.003168
4007	CT1	120	25	25	1.5	10	43.4179	7.996063	0.006354
4007	CT2	120	25	25	1.5	10	43.4179	7.996063	0.006354
4008	CT1	120	25	25	1.5	10	43.4179	7.996063	0.006354
4008	CT2	120	25	25	1.5	10	43.4179	7.996063	0.006354
4009	CT1	120	25	25	1.5	10	43.4179	7.996063	0.006354
4009	CT2	120	25	25	1.5	10	43.4179	7.996063	0.006354
4010	CT1	40	20	20	1	10	36.0412	8.840181	0.010416
4010	CT2	40	20	20	1	10	36.0412	8.840181	0.010416
4010	CT3	40	20	20	1	10	36.0412	8.840181	0.010416
4010	CT4	40	20	20	1	10	36.0412	8.840181	0.010416
4011	CT1	40	25	25	1.5	10	36.0412	8.840181	0.010416
4011	CT2	40	25	25	1.5	10	36.0412	8.840181	0.010416
4012	CT1	200	25	25	1.5	10	75.6413	6.958453	0.003168
4012	CT2	200	25	25	1.5	10	75.6413	6.958453	0.003168

Table 5 ST data1

Unit Index	ST Index	High or Low Pressure	Pmin	Pmax	Min ON	Min OFF	Ramp Up	Ramp Down
					(h)	(h)	(MW/h)	(MW/h)
4001	ST1	HP	4	35	2	2	35	35
4002	ST1	HP	6	50	2	2	50	50
4002	ST2	LP	5	35	2	2	35	35
4003	ST1	HP	4	35	2	2	35	35
4004	ST1	HP	6	50	2	2	50	50
4005	ST1	HP	8	60	2	2	60	60
4006	ST1	HP	4	35	2	2	35	35
4007	ST1	HP	6	50	2	2	50	50
4008	ST1	HP	6	50	2	2	50	50
4009	ST1	HP	6	50	3	2	50	50
4010	ST1	HP	8	60	2	2	60	60
4011	ST1	HP	6	50	2	2	50	50
4012	ST1	HP	6	50	2	2	50	50

Table 6 ST data2

Unit Index	ST Index	MSR	nMSR	Steam-MW Curve	Steam-MW Curve	Steam-MW Curve
		(MW/min)	(min)	c (MBtu/h)	b (MBtu/MWh)	a (MBtu/MW2h)
4001	ST1	1.5	10	24.0853	12.0164	0.01123
4002	ST1	2	10	177.752	3.5564	0.01557
4002	ST2	1.5	10	209.085	4.8164	0.01835
4003	ST1	1.5	10	46.6853	5.7264	0.01035
4004	ST1	1.8	10	53.6853	8.8264	0.01307
4005	ST1	3.5	10	61.8052	12.3115	0.01461
4006	ST1	1.5	10	84.0561	8.0767	0.01332
4007	ST1	1.8	10	58.0435	8.6764	0.01063
4008	ST1	1.8	10	58.0435	8.6764	0.01063
4009	ST1	1.8	10	58.0435	8.6764	0.01063
4010	ST1	3.5	10	45.6973	7.2543	0.01979
4011	ST1	1.8	10	53.6853	8.8264	0.01307
4012	ST1	1.8	10	84.0561	8.0767	0.01332

Table 7. Thermal Unit data

Unit Index	Fuel Price	Bus No	Pmin	Pmax	Min ON	Min OFF	Ramp Up	Ramp Down	Quick Start Capability
1001	1	4	5	30	1	1	15	15	30
1002	1	6	5	30	1	1	15	15	30
1003	1	8	5	30	1	1	15	15	30

1004	1	10	150	300	8	8	150	150	0
1005	1	12	100	300	8	8	150	150	0
1006	1	15	10	30	1	1	15	15	30
1007	1	18	25	100	5	5	50	50	0
1008	1	19	5	30	1	1	15	15	30
1009	1	24	5	30	1	1	15	15	30
1010	1	25	100	300	8	8	150	150	0
1011	1	26	100	350	8	8	175	175	0
1012	1	27	8	30	1	1	15	15	30
1013	1	31	8	30	1	1	15	15	30
1014	1	32	25	100	5	5	50	50	0
1015	1	34	8	30	1	1	15	15	30
1016	1	36	25	100	5	5	50	50	0
1017	1	40	8	30	1	1	15	15	30
1018	1	42	8	30	1	1	15	15	30
1019	1	46	25	100	5	5	50	50	0
1020	1	49	50	250	8	8	125	125	0
1021	1	54	50	250	8	8	125	125	0
1022	1	55	25	100	5	5	50	50	0
1023	1	56	25	100	5	5	50	50	0
1024	1	61	50	200	8	8	100	100	0
1025	1	62	25	100	5	5	50	50	0
1026	1	65	100	420	10	10	210	210	0
1027	1	66	100	420	10	10	210	210	0
1028	1	69	80	300	8	8	150	150	0
1029	1	70	30	80	4	4	40	40	0
1030	1	72	10	30	1	1	15	15	30
1031	1	73	5	30	1	1	15	15	30
1032	1	74	5	20	1	1	10	10	20
1033	1	76	25	100	5	5	50	50	0
1034	1	77	25	100	5	5	50	50	0
1035	1	80	150	300	8	8	150	150	0
1036	1	82	25	100	5	5	50	50	0
1037	1	85	10	30	1	1	15	15	30
1038	1	87	100	300	8	8	150	150	0
1039	1	89	50	200	8	8	100	100	0
1040	1	90	8	20	1	1	10	10	20
1041	1	91	20	50	1	1	25	25	50
1042	1	92	100	300	8	8	150	150	0
1043	1	99	100	300	8	8	150	150	0
1044	1	100	100	300	8	8	150	150	0
1045	1	103	8	20	1	1	10	10	20
1046	1	104	25	100	5	5	50	50	0
1047	1	105	25	100	5	5	50	50	0

1048	1	107	8	20	1	1	10	10	20
1049	1	110	25	50	2	2	25	25	50
1050	1	111	25	100	5	5	50	50	0
1051	1	112	25	100	5	5	50	50	0
1052	1	113	25	100	5	5	50	50	0
1053	1	116	25	50	2	2	25	25	50
Unit Index	MSR	nMSR	IniT	IniMW	Fuel-MW Curve (c)	Fuel-MW Curve (b)	Fuel-MW Curve (a)	Startup Fuel	Shutdown Fuel
1001	1	10	1	0	31.67	26.24382	0.0696629	40	0
1002	1	10	1	0	31.67	26.24382	0.0696629	40	0
1003	1	10	1	0	31.67	26.24382	0.0696629	40	0
1004	3	10	8	0	6.78	12.8875	0.010875	440	0
1005	3	10	8	0	6.78	12.8875	0.010875	110	0
1006	1	10	1	0	31.67	26.24382	0.0696629	40	0
1007	1	10	5	0	10.15	17.82	0.0128	50	0
1008	1	10	1	0	31.67	26.24382	0.0696629	40	0
1009	1	10	1	0	31.67	26.24382	0.0696629	40	0
1010	3	10	8	0	6.78	12.8875	0.010875	100	0
1011	3.5	10	8	0	32.96	10.76	0.003	100	0
1012	1	10	1	0	31.67	26.24382	0.0696629	40	0
1013	1	10	1	0	31.67	26.24382	0.0696629	40	0
1014	1	10	5	0	10.15	17.82	0.0128	50	0
1015	1	10	1	0	31.67	26.24382	0.0696629	40	0
1016	1	10	5	0	10.15	17.82	0.0128	50	0
1017	1	10	1	0	31.67	26.24382	0.0696629	40	0
1018	1	10	1	0	31.67	26.24382	0.0696629	40	0
1019	1	10	5	0	10.15	17.82	0.0128	59	0
1020	2.5	10	8	0	28	12.329897	0.0024014	100	0
1021	1	10	8	0	28	12.329897	0.0024014	100	0
1022	1	10	5	0	10.15	17.82	0.0128	50	0
1023	1	10	5	0	10.15	17.82	0.0128	50	0
1024	2	10	10	0	50	16.29	0.014	100	0
1025	1	10	5	0	10.15	17.82	0.0128	50	0
1026	4.2	10	10	0	64.16	8.3391471	0.0105904	250	0
1027	4.2	10	10	0	64.16	8.3391471	0.0105904	250	0
1028	3	10	10	0	6.78	12.8875	0.010875	100	0
1029	1	10	4	0	74.33	15.470773	0.0459227	45	0
1030	1	10	1	0	31.67	26.24382	0.0696629	40	0
1031	1	10	1	0	31.67	26.24382	0.0696629	40	0
1032	1	10	1	0	17.95	37.696792	0.0283019	30	0
1033	1	10	5	0	10.15	17.82	0.0128	50	0
1034	1	10	5	0	10.15	17.82	0.0128	50	0
1035	3	10	10	0	6.78	12.8875	0.010875	440	0

1036	1	10	5	0	10.15	17.82	0.0128	50	0
1037	1	10	1	0	31.67	26.24382	0.0696629	40	0
1038	3	10	10	0	32.96	10.76	0.003	440	0
1039	2	10	10	0	6.78	12.8875	0.010875	400	0
1040	1	10	1	0	17.95	37.696792	0.0283019	30	0
1041	1	10	1	0	58.81	22.942256	0.0097744	45	0
1042	3	10	8	0	6.78	12.8875	0.010875	100	0
1043	3	10	8	0	6.78	12.8875	0.010875	100	0
1044	3	10	8	0	6.78	12.8875	0.010875	110	0
1045	1	10	1	0	17.95	37.696792	0.0283019	30	0
1046	1	10	5	0	10.15	17.82	0.0128	50	0
1047	1	10	5	0	10.15	17.82	0.0128	50	0
1048	1	10	1	0	17.95	37.696792	0.0283019	30	0
1049	1	10	2	0	58.81	22.942256	0.0097744	45	0
1050	1	10	5	0	10.15	17.82	0.0128	50	0
1051	1	10	5	0	10.15	17.82	0.0128	50	0
1052	1	10	5	0	10.15	17.82	0.0128	50	0
1053	1	10	2	0	58.81	22.942256	0.0097744	45	0