

TRANSMISSION COMPANY OF NIGERIA

To: MD (S/O, M/O), TCN - Abuja

From: Director (NCC), Osogbo

DAILY OPERATIONAL REPORT FRIDAY 17/03/2017

FOR: EVENTS OF THURSDAY 16/03/2017

1.0 EXECUTIVE OPERATIONS SUMMARY:

1.1 GENERATION PROFILE: NATIONAL STATISTICS

DETAILS	MW	HRS	DATE
PEAK DEMAND FORECAST (CONNECTED + SUPPRESSED LOAD)	17,720	06:00	16/03/2017
GENERATION CAPABILITY	7147.3	-do-	-do-
UNITS ON BAR CAPABILITY AT PEAK	4291.3	-do-	-do-
PEAK GENERATION	4155.5	-do-	-do-
LOWEST GENERATION	1073.2	15:00	16/03/2017
8-HOURLY DURATION PEAK	4155.5	0000-0800	-do-
	4084.2	0900-1600	-do-
	3989.9	1700-2400	-do-
PEAK GENERATION TO DATE	5074.7	21:30	02/02/2016
MAXIMUM AVAILABLE CAPACITY TO DATE	7492.6	06:00	14/04/2014
MAXIMUM PEAK GENERATION CAPABILITY TO DATE	7099	07:00	13/04/2014
MAXIMUM ENERGY GENERATED (MWH) TO DATE	109,372.01	0000-2400	02/02/2016

1.2 CRITICAL VOLTAGE

DETAILS	KV	STATION	HRS
NOMINAL VOLTAGE	330		
STATUTORY LIMITS	280.5 - 346.6		
HIGHEST VOLTAGE FOR THE DAY	365	Omotosho T/S	16:00
LOWEST VOLTAGE FOR THE DAY	291	Akangba T/S	17:00

1.3 FREQUENCY RANGE

DETAILS	HZ	HRS
NOMINAL FREQUENCY	50	
STATUTORY LIMITS	49.75-50.25	
HIGHEST FREQUENCY	51.9	12:59
LOWEST FREQUENCY	43.4	14:47

1.4 SYSTEM COLLAPSE UP DATE

Year	Highest No of days ever attained in-between total collapses: 134												Total	
	Jan	Feb.	Mar.	Apr	May	Jun	Jul	Aug	Sep.	Oct	Nov	Dec		
2009	Total	1	--	--	--	2	5	5	4	1	--	--	1	19
	Partial	--	5	4	3	3	--	--	1	--	2	1	1	20
2010	Total	--	3	1	--	3	3	3	--	2	2	1	4	22
	Partial	1	--	--	1	1	3	4	4	3	2	--	1	20
2011	Total	--	--	--	--	4	3	1	1	1	2	1	--	13
	Partial	--	1	1	--	--	--	--	1	--	1	2	--	6
2012	Total	--	--	2	1	5	2	1	--	--	2	2	1	16
	Partial	--	--	2	3	--	--	--	--	1	--	1	1	8
2013	Total	--	1	2	2	3	4	1	1	1	4	2	2	22
	Partial	--	--	--	--	--	--	--	--	--	--	--	--	2
2014	Total	2	--	--	2	--	3	1	--	2	1	--	--	9
	Partial	--	--	--	--	1	--	1	--	--	2	1	4	4
2015	Total	1	--	1	--	2	--	1	--	--	1	--	--	6
	Partial	--	--	1	--	2	--	--	1	--	--	--	--	4
2016	Total	--	--	2	3	6	5	--	1	1	2	2	--	22
	Partial	--	--	1	--	1	3	1	--	--	--	--	--	6
2017	Total	5	3	--	--	--	--	--	--	--	--	--	--	8
	Partial	1	--	1	--	--	--	--	--	--	--	--	--	2

1.5 BREAKDOWN OF PEAK & OFF PEAK GENERATION (NATIONAL PEAK & OFF PEAK)

STATION	TURBINE	PEAK GEN. (MW)	OFF-PEAK GEN(MW)
1 KAINJI	HYDRO	409	0
2 JEBBA	HYDRO	284	0
3 SHIRORO	HYDRO	300	0
4 EGBIN ST2 - 5	STEAM	160	0
5 SAPELE	STEAM	0	0
6 DELTA	GAS	305	260
7 AFAM IV-V	GAS	0	0
8 GEREGU GAS	GAS	295	0
9 OMOTOSHO GAS	GAS	170	161
10 OLORUNSOGO GAS	GAS	118.6	0
11 GEREGU NIPP	GAS	150	0
12 SAPELE NIPP	GAS	219.6	0
13 ALAOJI NIPP	GAS	114.9	0
14 OLORUNSOGO NIPP	GAS	0	0
15 OMOTOSHO NIPP	GAS	227.1	0
16 ODUKPANI NIPP	GAS	231.7	0
17 IHOVBOR NIPP	GAS	110.7	0
18 OKPAI	GAS	429	410
19 AFAM VI	GAS	146	141
20 IBOM POWER	GAS	83.8	63.9
21 ASCO	GAS	0	0
22 A.E.S	GAS	0	0
23 OMOKU	GAS	54.9	37.3
24 TRANS AMADI	GAS	0	0
25 RIVERS IPP	(GAS)	0	0
26 EGBIN ST6	STEAM	166	0
27 PARAS ENERGY	GAS	68.5	0
28 GBARAIN NIPP	GAS	111.7	0
TOTAL		4155.5	1073.2

1.6 ENERGY GENERATED/ENERGY SENT OUT:

STATION	TURBINE	ENERGY GENERATED		ENERGY SENT OUT	
		MWH	MWH/H	MWH	MWH/H
1 KAINJI	HYDRO	7,972.00	332.17	7,955.50	331.48
2 JEBBA	HYDRO	6,170.00	257.08	6,158.84	256.62
3 SHIRORO	HYDRO	5,658.00	235.75	5,631.96	234.67
4 EGBIN ST2 - 5	STEAM	3,362.00	140.08	3,087.70	128.65
5 SAPELE	STEAM	-	0.00	-	0.00
6 DELTA	GAS	6,714.36	279.77	6,557.80	273.24
7 AFAM IV-V	GAS	-	0.00	-	0.00
8 GEREGU GAS	GAS	5,070.10	211.25	5,045.37	210.22
9 OMOTOSHO GAS	GAS	3,930.00	163.75	3,896.00	162.33
10 OLORUNSOGO GAS	GAS	1,994.31	83.10	1,972.26	82.18
11 GEREGU NIPP	GAS	2,436.25	101.51	2,422.92	100.96
12 SAPELE NIPP	GAS	4,578.81	190.78	4,557.37	189.89
13 ALAOJI NIPP	GAS	2,551.19	106.30	2,529.72	105.41
14 OLORUNSOGO NIPP	GAS	-	0.00	-	0.00
15 OMOTOSHO NIPP	GAS	3,911.50	162.98	3,888.10	162.00
16 ODUKPANI NIPP	GAS	4,233.12	176.38	4,203.52	175.15
17 IHOVBOR NIPP	GAS	1,560.00	65.00	1,539.81	64.16
18 OKPAI	GAS	9,790.00	407.92	9,615.60	400.65
19 AFAM VI	GAS	3,483.13	145.55	3,392.47	141.35
20 IBOM	GAS	1,993.08	83.05	1,983.00	82.63
21 ASCO	GAS	-	0.00	-	0.00
22 A.E.S	GAS	-	0.00	-	0.00
23 OMOKU	GAS	1,257.20	52.38	1,231.09	51.30
24 TRANS AMADI	GAS	-	0.00	-	0.00
25 RIVERS IPP	GAS	-	0.00	-	0.00
26 EGBIN ST6	STEAM	3,394.00	141.42	3,212.70	133.86
27 PARAS ENERGY	GAS	1,440.20	60.01	1,437.30	59.89
28 GBARAIN NIPP	GAS	2,280.80	95.03	2,260.90	94.20
TOTAL		83,790.05	3,491.25	82,579.93	3,440.83

GENERATION POSITION AT 06:00HRS OF FRIDAY 17/03/2017

	STATIONS	AVAILABLE UNITS	INSTALLED GENERATION CAPACITY (MW)	GENERATION CAPABILITY(MW)	UNITS ON BAR (MW)	CAPABILITY OF UNITS ON BAR (MW)	GENERATION AT 06:00HRS(MW)	REMARKS
PRIVATISED COMPANIES	KAINJI HYDRO	1G5, 6, 11 & 12 4	440	440	1G5, 6, 11 & 12 4	402	402	1G7 - Out on stator winding failure. 1G8 - Out due to loss of supply to the auxiliary. 1G9 - Out due to burnt 7.5MVA 33/0.415kV & 183.6MVA 16/330kV station service transformer and generator transformer. 1G10 - Shut down due to thrust bearing temperature problem.
	JEBBA HYDRO	2G1, 3 - 5 4	385.6	380	2G1, 3 - 5 4	366	366	2G2 - Out on maintenance. 2G6 - Out due to burnt generator winding and AVR.
	SHIRORO HYDRO	411G2 & 3 2	300	300	411G2 & 3 2	300	300	411G1 & 4 - Out on maintenance.
	EGBIN STEAM	ST2, 3 & 5 3	660	660	ST2 1	197	197	ST1 - Tripped on generator CB trouble. ST2 - Not on spinning reserve due to Egbin G/S management decision and its generation limited to 197MW due to gas constraints. ST4 - Out of production since 17/11/2016. ST3 & 5 - Shut down due to gas constraints.
	SAPELE (STEAM)	0 0	0	0	0 0	0	0	ST1 - Shut down due to shortage of clean water. ST2 - Tripped on vacuum switch problem. ST3 - Undergoing rehabilitation. ST4 & 5 - Awaiting major overhaul. ST6 - Tripped on gas control valve not following reference point.
	DELTA (GAS)	GT4, 6 - 13, 16 & 19 11	425	380	GT7, 9 - 12, 16 & 19 7	300	300	GT3 & 5 - Out due to generator winding fault. GT4, 6, 8 & 13 - Out due to gas constraints. GT14 - Out on major overhaul. GT17 - Out on excitation trouble. GT15 - Out for maintenance of combustion nozzle. GT16 & 19 - Not on spinning reserve due to Delta G/S management decision. GT18 - Tripped on inlet guide vane trouble. GT20 - Out on major inspection.
	AFAM IV & V (GAS)	0 0	0	0	0 0	0	0	GT1 - 12 - De-commissioned and scrapped. GT13 - 16 - Out on blade failure. GT17 & 18 - Out due to burnt generator transformer. GT19 & 20 - Awaiting major overhaul.
	GEREGU GAS	GT12 & 13 2	297	297	GT12 & 13 2	297	297	GT11 - Out on synchrocheck relay fault at 330kV switchyard. GT12 & 13 - On frequency response.
	OMOTOSHO GAS	GT1 - 8 8	336	304	GT2-4 & 6 - 8 6	228	170.1	GT1 - Out due to burnt isolator arm. GT2 - 4 & 6 - 8 - On frequency response. GT5 - Out due to gas constraints.
	OLORUNSOGO GAS	GT1 - 5, 7 & 8 7	294	266	GT1, 2, 4 & 5 4	152	147.3	GT1, 2, 4 & 5 - On frequency response. GT3 - Shut down due to high frequency. GT6 - Out on vibration trouble. GT7 & 8 - Out due to gas constraints.
NIPP	GEREGU NIPP	GT21 - 23 3	435	435	GT22 1	145	145	GT21 & 23 - Out due to gas constraints. GT22 - On frequency response.
	SAPELE NIPP	GT2 & 4 2	225	225	GT2 & 4 2	214.5	214.5	GT1 - Out on undisclosed fault. GT3 - Out on bearing lift pump trouble.
	ALAOJI NIPP GAS	GT1, 2 & 4 3	375	360	GT4 1	113.6	113.6	GT1 & 2 - Out due to gas constraints. GT3 - Shut down due to generator air inlet filter trouble.
	OLORUNSOGO NIPP GAS	GT1 - 3 3	375	360	0 0	0	0	GT1-3 - Out due to gas constraints. GT4 & ST2 - Out of production since 25/10/2016.
	OMOTOSHO NIPP GAS	GT1, 2 & 4 3	375	360	GT2 & 4 2	240	185.5	GT1 - Out due to gas constraints. GT2 & 4 - On spinning reserve. GT3 - Out of production since 28/11/2016.
	ODUKPANI NIPP	GT1 - 3 3	375	360	GT2 & 3 2	229.3	229.3	GT1 - Out due to gas constraints. GT4 - Out on unit transformer problem. GT5 - Tripped on loss of excitation
	IHOVBOR NIPP	GT1 1	112.5	112.5	GT1 1	108.9	108.9	GT2 & 3 - Out on fault. GT4 - On maintenance.
	OKPAI GAS/STEAM	GT11 & 12 2	300	300	GT11 & 12 2	218	218	GT11 - Generation reduce to bring in the steam turbine. ST18 - Tripped on high condenser level.
IPP	AFAM VI GAS/STEAM	GT11 - 13 & ST10 4	650	650	GT13 1	146	146	GT11, 12 & ST10 - Out due to gas constraints.
	IBOM POWER GAS	GT3 1	115.3	115.3	GT3 1	82.7	82.7	Available unit on bar.
	AES	0 0	0	0	0 0	0	0	Out of production since 27/09/2014.
	ASCO	0 0	0	0	0 0	0	0	GT1 - Shut down due to leakage in the furnace.
	OMOKU GAS	GT2, 3 & 5 3	75	60	GT2, 3 & 5 3	56	56	GT1 - Out on maintenance. GT4 - Out for overhaul. GT6 - Tripped on loss of flame.
	TRANS-AMADI	0 0	0	0	0 0	0	0	Out of production since 20/11/2016.
	RIVERS	0 0	0	0	0 0	0	0	Out of production since 16/09/2016.
	GBARAIN NIPP GAS	GT2 1	112.5	112.5	GT2 1	111.4	111.4	Available unit on bar.
	SUB TOTAL	70	6662.9	6477.3	47	3907.4	3790.3	Frequency = 51.10Hz.

1.7B GENERATION POSITION AT 06:00HRS OF FRIDAY 17/03/2017 FOR UNITS ON BILATERAL AGREEMENT

GENERATOR	ST6	220	220	ST6	192	192	Available unit on bar.
	1			1			
PARAS ENERGY	GT2 - 9	72	72	GT2 - 9	68.5	68.5	Available units on bar.
	8			8			
SUB TOTAL	9	292	292	9	260.5	260.5	
GRAND TOTAL	79	6954.9	6769.3	56	4,167.90	4,050.80	Frequency = 51.10Hz.

1.7C BILATERAL AGREEMENT UNITS DISPATCH - THURSDAY 16/03/2017

	FEEDERS NAME	MAX. LOAD (MW)	TIME (HRS)	HOURS IN SERVICE	REMARK
	120MW EGBIN ST6 GENERATION TO IKEJA ELECTRICITY DISTRIBUTION COMPANY				
OGBA	U-STEEL	on	1:00	22	Partial system collapse
	PTCEXPRESS	14	9:00	22	Partial system collapse
	SANKYO	out	out	out	cable fault
	FEEDER 8	11	11:00	22	Partial system collapse
IKORODU	PULK IT	3	9:00	22	Partial system collapse
	INDUSTRIAL	18	8:00	22	Partial system collapse
	SPINTEX	6	9:00	22	Partial system collapse
	DANGOTE	8	9:00	21	Partial system collapse
	LAND CRAFT	24	6:00	22	Partial system collapse
ALAUUSA	TR4 -15MVA	4.2	6:00	23	Partial system collapse
	TR5 -15MVA	3.2	19:00	23	Partial system collapse
	ALAUUSA	9.3	9:00	19	Partial system collapse
MLAND	PTC (MARYLAND)	18	11:00	22	Partial system collapse
	TOTAL LOAD	118.7			

BILATERAL AGREEMENT LOAD DISPATCH
60MW PARAS ENERGY GENERATION TO CEB

FEEDER	MAX	TIME	HOURS IN SERVICE	REMARK
SAKATE/IKEJA WEST 330KV LINE	68.5	01:00	21	Partial System collapse.

1.8 HYDROLOGICAL DATA: FRIDAY 17/03/2017

	KAINJI	JEBBA	SHIRORO
HEAD WATER ELEVATION (METERS)	140.40	102.13	365.50
TAIL WATER ELEVATION (METERS)	104.30	74.00	270.50
GROSS OPERATING HEAD (METERS)	36.1	28.13	95
AVERAGE TURBINE DISCHARGE (M3/SEC)	1024	1039	281
AVERAGE SPILLAGE (M3/SEC)	0	0	0
AVERAGE TOTAL STATION DISCHARGE (M3/SEC)	1024	1039	281
COMPUTED INFLOW (M3/SEC)	619	1062	0
STORAGE DIFFERENTIAL	-405	23	-281
MAXIMUM LEVEL FOR SPILLAGE COMMENCEMENT	141.73	103	382.5
MINIMUM LEVEL BELOW WHICH NO GENERATION	130	99	355

1.9 MAXIMUM/ALLOCATED LOAD/MINIMUM LOADS FOR ABUJA AND LAGOS AS AT THURSDAY 16/03/2017

DISCO	MAXIMUM LOAD(MW)	TIME(HRS)	ALLOCATED LOAD (MW)	MINIMUM LOAD(MW)	TIME(HRS)
ABUJA	423.4	01:00	413.8	4.8	17:00
EKO	490.8	09:00	400.33	23.5	15:00
IKEJA	554.2	07:00	410.45	0	16:00

2.0 GAS POSITION: FRIDAY 17/03/2017

STATION	SIGNED ACQ Annual Contracted Quantity MMSCF/D	NGC DECLARED QUANTITY (MMS317.578CF/D)	INSTALLED CAPACITY OF THERMAL STATIONS (MW)	PREVIOUS DAY OFF-TAKE (MMSCF/D)	CAPABILITY OF UNITS ON BAR OF THERMAL STATIONS (MW)	DIFFERENCE (MW)
EGBIN P/S	160		1100		389	711
DELTA (GAS)	305		765		300	465
OMOTOSHO GAS	228		336.8		228	108.8
OMOTOSHO NIPP	240		500		240	260
OLORUNSOGO (GAS)	152		336		152	184
OLORUNSOGO NIPP	0		750		0	750
SAPELE NIPP	209		500		214.5	285.5
SAPELE STEAM	0		720		0	720
AFAM IV-V	0		300		0	300
AFAM VI	147		650		146	504
GEREGU GAS	296		435		297	138
GEREGU NIPP	151		435		145	290
OKPAI (GAS/STEAM)	432		480		218	262
ALAOJI NIPP	115.3		504		113.6	390.4
IHOVBOR NIPP	102.6		450		108.9	341.1
IBOM	80.3		198		82.7	115.3
ODUKPANI NIPP	116.4		625		229.3	395.7
TOTAL	2654.3		9084.8		2864	6220.8

1 MMSCF IS EQUIVALENT TO 3.75MW

2.1 SYSTEM BLACK START CAPABILITY

- 1 Delta, Shiroro & Egbin - Available.

3.0 SYSTEM SPINNING RESERVE AS AT 0600HRS OF FRIDAY 17/03/2017 = 40 MW. FREQUENCY 51.10Hz.

S/N	POWER STATION	UNIT ON SPINNING RESERVE	RESERVE CAPABILITY	ACTUAL RESERVE (MW)	TOTAL (MW)
1	Egbin	ST2	100	0	0
		ST4		0	
		ST5		0	
		ST6		0	
3	Delta	GT16	40	0	0
		GT17	40	0	
4	Olorunsogo NIPP	GT1	40	0	0
		GT2		0	
		GT3		0	
		GT4		0	
5	Geregu NIPP	GT22	35	0	0
6	Omotosho NIPP	GT1	40	0	40
		GT2		20	
		GT4		20	
TOTAL (MW)			295	40	40

4.0 UNUTILIZED GENERATION CAPABILITY

The unutilized generation capability for Friday 17/03/2017 as at 0600Hrs was = 2275MW.

S/NO	STATION	ACTUAL GENERATION CAPABILITY (MW)	GENERATION AT 0600HRS (MW)	UNUTILIZED GENERATION CAPABILITY (MW)	SUB -TOTAL
4.1 DUE TO GAS CONSTRAINTS:					
				0	2237
1	Geregu NIPP GT21 & 23	290	0	290	
2	Olorunsogo NIPP GT1 - 3	360	0	360	
3	Omotosho NIPP GT1	120	0	120	
4	Egbin ST2, 3 & 5	660	197	463	
5	Delta GT4, 6 -13,16 & 19	380	300	80	
6	Olorunsogo Gas GT7 & 8	76	0	76	
7	Omotosho Gas GT5	38	0	38	
8	Alaoji NIPP GT1 & 2	240	0	240	
9	Odukpani NIPP GT1	120	0	120	
10	Afam VI GTs 11, 12 & ST10	450	0	450	
				0	
IT IS ENVISAGED WITH IMPROVED PLANT AVAILABILITY AND RELIEF FROM EXISTING POWER SYSTEM NETWORK RELATED CONSTRAINTS, ADDITIONAL 1614.16MMSCF OF GAS (EQUIVALENT TO 6220.8MW) WILL BE REQUIRED WHEN ALL THERMAL UNITS ARE ON BAR.					
4.2 DUE TO LINE CONSTRAINTS					
				0	0
				0	
				0	
				0	
4.3 DUE TO HIGH FREQUENCY OCCASIONED BY LOSS OF DISCOS' FEEDERS					
1	Olorunsogo Gas GT3	38	0	38	38
				0	
				0	
				0	
				0	
				0	
4.4 DUE TO WATER MANAGEMENT					
				0	0
				0	
Total					2275

5.0 OUTAGES:

5 (A) FORCED OUTAGES (GENERATION):-

- 12:59 – 13:07Hrs, Geregu NIPP GT22 went on house load due to high frequency of 51.80Hz. LHR = 88MW.
- 12:59Hrs, Geregu Gas GTs 12 & 13 went on house load due to high frequency of 51.89Hz. LHR = 130MW.
At 13:24Hrs, GT12 was tied.
- 14:44 through 24:00Hrs, Ihovbor NIPP GT3 tripped on reverse power due to tripping of ccts H7V & V7B. LHR = 104.6MW
- 16:02 - 16:51Hrs, Ibom Power GT3 tripped due to system surge. LHR = 93.6MW.
- 22:04 through 24:00Hrs, Okpai IPP ST18 tripped on high condenser level. LHR = 135MW.

5 (B) FORCED OUTAGES TRANSMISSION

- 12:57 – 13:26Hrs, Omotosho/Ikeja West 330kV line (cct M5W) CBs tripped at both ends:
At Omotosho T/S: PSL 601 & 602 GA relay – TRTIPA distance and Z5 protection O-S, protection Zone 1 trip, zone A trip, phase A grounded, distance = 58.83km.
Auxiliary relay – tripping ABC stages 1 & 2.
At Ikeja West T/S: ABB relay – fault loop L1-N, distance = 11km, weak protection, distance protection alarms. No load loss as ccts B5M, B6N & N6W were in service.
- 13:31 - 13:49Hrs, Adiorbor T/S 150MVA 330/132/33kV transformer T2 secondary breaker tripped on E/F. LHR = 42.6MW.
- 13:58 - 14:10Hrs, Ijora T/S 2X30MVA 132/33kV transformers T1A & T2B secondary breakers tripped on O/C relay each. LHR = 18MW each.
- 14:18Hrs, Osogbo/Ihovbor 330kV line (cct H7V) CBs tripped at both ends on the following relay indications:-
At Osogbo T/S: Ohmega – zone 3, Phase C, E/F, distance 161.13km 86ABCT/2.
ABB relay – start L3, start PE
At Ihovbor T/S: Micom relay – distance protection undervoltage start V<1, 3 -Phases and master trip relay. LHR = 191.1MW
- 14:18 - 15:25Hrs, Osogbo/Akure 132kV line CB tripped at Osogbo T/S on Micom relay – E/F & instantaneous E/F and MVAJ 86T trip relay. LHR = 39MW.
- 14:18 - 15:24Hrs, Osogbo/Offa/Omuaran 132kV line CB tripped at Osogbo T/S on NARI relay - inst E/F. LHR = 10MW.
- 14:19 - 14:44Hrs, Jebba/Osogbo 330kV line 2 (cct J2H) CB tripped at Osogbo T/S ohmega relay – zone 1, phase C, E/F, aided trip, carrier received 2, distance -3.5km, 86C/1 86T/1, 86T 85x2 & 86A & C. LHR = 64.1MW.
- 14:23 - 15:07Hrs, Omotosho/Ikeja West 330kV line (cct M5W) CB tripped at Ikeja West T/S on the following relay indications:-
At Ikeja West T/S: ABB relay - trip -trip, trip -TRL1, 2 & 3, PHS -STFWLI & PE, EFC CS, TEF -trip, fuse VTSZ.
At Omotosho T/S: PSL 601 & 602 relays - Trip A, distance and zero sequence protection, zero sequence, zone 1 trip, Phase A trip & grounded, location = 36.13km, auxiliary trip ABC 1 & 2. LHR = 380MW.
- 14:29 - 15:18Hrs, Egbin/Ikeja West 330kV line (cct N6W) CB tripped only at Ikeja West T/S on micom relay - Backup , E/F, trip, trip E/F start IN >1, fault duration - 1322ms, GB operating time = 4ms, relay trip time = 1.2735ms, fault location = 1.120km. LHR = 90MW.
- 14:44Hrs, Osogbo/Ihovbor and Ihovbor/Benin 330kV lines (ccts H7V & V7B) CBs tripped at Ihovbor T/S during trial restoration of cct H7V:
On cct H7V: Micom relay - distance protection start phase N, E/F start IN >12, U/V start V<1, 3 phases, fault location = 235.1km
On cct V7B: Micom relay - distance protection start phase N, E/F start IN >12, U/V start V<1, 3 phases, fault location = 259.2km
14:51Hrs, Trial restoration on ccts H7V and V7B failed. At 15:00Hrs, cct V7B was restored.
- 14:45 - 17:22Hrs, Benin/Egbin 330kV line (cct B6N) CB tripped at Benin T/S on ABB relay – trip-trip, trip-TRL1, 2 & 3 PHS-STFWL3, PHS-STFWLE ZM2-trip, EFC-CS, fuse VTSZ, ZM2-start, ZM3-start fault locator – No data MVAJ K86ABC. LHR = 310MW.
- 14:49 - 20:44Hrs, Lokoja/Gwagwalada 330kV line 1 (cct L6G) CBs tripped at both ends on the following relay indications:-
At Lokoja T/S: Over voltage relay - 356kV.
At Gwagwalada T/S: PCS 902 distance protection relay - 59P2.OP, fault Yellow Phase, distance - Nil. LHR = 300MW.
- 16:15 - 16:28Hrs, Osogbo/Akure 132kV line CB tripped at Osogbo T/S on BBC relay; Distance protection - Red & Blue Phases and time delay O/C.
- 16:43 - 17:30Hrs, Osogbo/Ikeja West 330kV line (cct H1W) CBs tripped at both ends on the following relay indications:-
At Ikeja West T/S: Siprotec relay - Relay trip , Yellow Phase, zone 3 trip, E/F trip, distance pickup L2E, PU time = 53ms, trip time = 798ms, distance = 272.6km.
At Osogbo T/S: Ohemega relay - DEF forward, O/V alarm, U/F alarm 86T2, distance = 19.07km. LHR = 224.8MW.
- 16:52 - 16:57Hrs, Adiorbor/Calabar 132kV line 2 CB tripped at Adiorbor T/S on E/F. LHR = 18.4MW.
- 19:41 - 23:13Hrs, Makurdi T/S 330kV 75MX Reactor R1 breaker tripped without relay indication. Voltage profile = 302/315kV.

5 (E) EMERGENCY OUTAGES:-

The under mentioned lines were opened on frequency control:-

- 11:07 - 11:10Hrs, 13:06 - 13:10Hrs & 18:22 - 18:25Hrs, Osogbo/Akure/Ado 132kV line. LHR = 27MW, 37MW & 30MW respectively. Frequency was 48.98Hz, 48.97Hz & 48.85Hz respectively.
- 14:49 - 14:50Hrs, New Haven T/S TR4 60MVA 132/33kV primary breaker . LHR = 22.4MW. Frequency was 48.49Hz.
- 20:20 - 21:08Hrs, Akangba/Ojo 132kV line 2. LHR = 32MW. Frequency was 49.05Hz.

5 (F) AUTOMATIC UNDER FREQUENCY OPERATION:

- 09:20 - 09:45Hrs, 16:18 - 16:22Hrs, 18:08 - 18:16Hrs & 21:15 - 21:32Hrs, Akangba T/S 10T1A 60MVA 132/33kV transformer secondary breaker. LHR = 15MW, 5MW, 10MW & 12MW respectively.
- 20:47 - 20:54Hrs & 21:16 - 21:22Hrs, Shagamu/Ijebu ode 132kV line CB. LHR = 10MW & 8MW respectively.

5 (G) 330KV LINES THAT ARE OUT ON VOLTAGE CONTROL:-

ccts, U2A, A2K, K4U & J2L.

5 (H) 330KV LINES THAT ARE OUT ON FAULT:-

ccts L7G & A1S.

4 (I) 330KV LINES THAT ARE OUT ON BREAKER PROBLEM:-

ccts K1J & N4J.

5 (J) 330KV LINES THAT ARE OUT ON PLANNED OUTAGE:-

Nil.

9 WEATHER REPORT:

Rainfall was reported in New Haven.

REPORT OF PARTIAL SYSTEM COLLAPSE OF 16- 03 - 2017 AT 14:47HRS

14:47Hrs, System frequency sharply dropped from 51.30Hz to 43.40Hz and resulted to loss of supply in the station. Investigation revealed that Lagos , Osogbo, Jebba, Shiroro, Kaduna, Kainji, Abuja & Birnin Kebbi axes lost supply while Benin, Enugu, Port Harcourt, Makurdi, Jos and Gombe axes survived.

PRIOR TO THE SYSTEM DISTURBANCE:

At 14:18Hrs, Osogbo/hovbor 330kV line (cct H7V) CBs tripped at both ends on the following relay indications:-

At Osogbo T/S: Ohmega – zone 3, Phase C, E/F, distance 161.13km 86ABCT/2.

ABB relay – start L3, start PE

At Ihovbor T/S: Micom relay – distance protection under voltage start V<1, 3 -Phases and master trip relay. LHR = 191.1MW.

At 14:23Hrs, Omotosho/Ikeja West 330kV line (cct M5W) CB tripped at both ends on the following relay indications:-

At Ikeja West T/S: ABB relay - trip -trip, trip -TRL1, 2 & 3, PHS -STFWLI & PE, EFC CS, TEF -trip, fuse VTSZ.

At Omotosho T/S: PSL 601 & 602 relays - trip A, distance and zero sequence protection, zero sequence, zone 1 trip, Phase A trip & grounded, location = 36.13km,

auxiliary trip ABC 1 & 2. LHR = 380MW.

At 14:29Hrs, Egbin/Ikeja West 330kV line (cct N6W) CB tripped only at Ikeja West T/S on micom relay - Backup, E/F, trip, trip E/F start IN >1, fault duration - 1322ms, GB

operating time = 4ms, relay trip time = 1.2735ms, fault location = 1.120km.

LHR = 90MW.

At 14:44Hrs, Osogbo/hovbor and Ihovbor/Benin 330kV lines (ccts H7V & V7B) CBs tripped at Ihovbor T/S during trial restoration of cct H7V:

On cct H7V: Micom relay - distance protection start phase N, E/F start IN >12, U/V start V<1, 3 phases, fault location = 235.1km

On cct V7B: Micom relay - distance protection start phase N, E/F start IN >12, U/V start V<1, 3- Phases, fault location = 259.2km

14:51Hrs, Trial restoration on ccts H7V and V7B failed.

14:44 through 24:00Hrs, Ihovbor NIPP GT3 tripped on reverse power due to tripping of ccts H7V & V7B. LHR = 104.6MW

At 14:45Hrs, Benin/Egbin 330kV line (cct B6N) CB tripped at Benin T/S on ABB relay – trip-trip, trip-TRL1, 2 & 3 PHS-STFWL3, PHS-STFWLE ZM2-trip, EFC-CS, fuse

VTSZ ZM2-start, ZM3-start fault locator – No data MVA.1 K86ARC. LHR = 310MW

14:45Hrs, Kaduna/Jos & Jos/Gombe 330kV lines (ccts M2S & S1E) CBs tripped at Jos T/S on SEL 421 relay – trip, lock, frequency 49.52Hz, shot 1P=0, 3P=0, PQ1 &

PQ2 opened. LHR = 58MW & 186MW respectively.

14:46Hrs, Geregu Gas GT12 tripped due to high frequency of 51.51Hz. LHR = 142MW.

14:46Hrs, Geregu NIPP GT22 went on house due to high frequency of 51.51Hz. LHR = 110MW.

Above lines tripping led to over loading of the other lines that were in service in the Lagos, Osogbo & Jebba axes leading to partial collapse.

It should be noted that the delay in accessing the relay operations on ccts M5W & N6W at Ikeja West T/S and failed restoration of ccts H7V & V7B led to over loading of the other lines.

REPORT FROM STATIONS:

14:47Hrs, Omotosho NIPP GTs 2 & 4 went on FSNL due to system surge. LHR = 190.7MW.

14:48Hrs, Odukpani NIPP GTs 1 & 2 tripped due to high frequency of 54.70Hz. LHR = 228MW.

14:49 - 20:44Hrs, Lokoja/Gwagwalada 330kV line 1 (cct L6G) CBs tripped at both ends on the following relay indications:-

At Lokoja T/S: Over voltage relay - 356kV.

At Gwagwalada T/S: PCS 902 distance protection relay - 59P2.OP, fault Yellow Phase, distance - Nil. LHR = 300MW.

14:59Hrs, Sapele NIPP GTs 2 & 4 went on Full Speed No Load due to system surge. LHR = 212.2MW. Total Load loss = 2183.9MW.

Total generation before the collapse = 3696.1MW.

RESTORATION:

15:16Hrs, cct M5W was restored.

5 (C) PLANNED OUTAGES:-

- 1 10:19 - 16:46Hrs, Aba T/S 60MVA 132/33kV transformer T2A was taken out for annual preventive maintenance on the transformer . LHR = 10.2MW.
- 2 10:25 - 12:16Hrs, Jebba/Ganmo 330kV line (cct J3G) was taken out for annual preventive maintenance on the line breaker . No load interruption as cct H3G was in service.
- 3 12:10 - 13:05Hrs, Ganmo/Ilorin 132kV line and Ganmo/Offa/Omuaran 132kV tie CB were taken out for annual preventive maintenance. No load loss as lines CB were in service.

5 (D) URGENT OUTAGES:

- 1 09:01 - 14:35Hrs, Sapele/Benin 330kV line 1 (cct S3B) was taken out due to defective gas manometer on the CB. No load interruption as ccts S4B & S5B were in service.
- 2 09:55 - 12:50Hrs, Akangba T/S 60MVA 132/33kV transformer 10TA was taken out for maintenance crew to change the glowing bolts and nuts on the secondary Red Phase CT clamp. No load loss as the transformer was on saok due to U/F relay that operated on the secondary CB.
- 3 12:30 - 19:07Hrs, Shagamu /Ijebu Ode 132kV line was taken out for maintenance crew to check and rectify the cause of the reported hissing sound from the breaker at Ijebu Ode T/S. LHR = 0.1MW.
- 4 22:05 - 23:42Hrs, Ihovbor NIPP GT1 was shut down as the compressor bleed valve failed to close. LHR = 17.1MW.

6 GENERATOR MERIT ORDER BASED ON SYSTEM RESPONSE AND GRID RELIABILITY

GROUP 1 - HYDRO IN HIGH FLOOD PERIOD SEASON, KAINJI, JEBBA AND SHIRORO.

10 INTERNATIONAL LINES:-

A IKEJA WEST/SAKATE 330KV LINE(TCN+PARAS)

Maximum load - 232MW at 10:00Hrs.

Minimum load - 36MW at 18:00Hrs.

B BIRNIN KEBBI/NIAMEY 132KV LINE

Maximum load - 77MW at 09:00Hrs

Minimum load - 0.7MW at 19:00Hrs

C KATSINA/GAZAQUA/MARADI 132KV LINE

Maximum load - 43.0MW at 21:00Hrs.

Minimum load - 9.5MW at 18:00Hrs.

11 MISCELLANEOUS:-

- 1 08:58Hrs, Shiroro G/S was instructed to increase generation by 100MW. Frequency was 49.86Hz.
- 2 11:05Hrs, Omotosho/Ikeja West 330kV line (cct M5W) main CB was restored to service at Ikeja West T/S.
- 3 18:22Hrs, Shiroro P/S was instructed to increase generation by 100MW. Frequency was 48.79Hz
- 4 18:24Hrs, Shiroro P/S attained 100MW generation increase.

- GROUP 2 - ALL UNITS OFFERING REGULATING RESERVE.
- GROUP 3 - ALL UNITS OFFERING SPINNING RESERVE.
- GROUP 4 - ALL UNITS OFFERING FREE GOVERNOR FREQUENCY RESPONSE.
- GROUP 5 - ALL UNITS OFFERING VOLTAGE SUPPORT OUTSIDE NORMAL LEVEL.
- GROUP 6 - ALL UNITS USED TO AVOID OVERLOADING TRANSMISSION LIMITS.
- GROUP 7 - ALL UNITS IN LOCATION TO DIMINISH LOSSES

8 (A) **COMMUNICATION MEDIA**

STATIONS	NO. INSTALLED	NO. WORKING
PLC/PAX	37	34
OPTIC FIBRE	13	11
PLS	14	7

8 (B) **SCADA RTU STATUS**

STATIONS	TOTAL NO OF STATIONS	NO OF RTU INSTALLED	NO OF RTU WORKING
POWER STATIONS	23	8	4
330kV	36	18	12
132kV	111	103	19

12.0 **UNAVAILABLE EQUIPMENTS**

12(A) **UNAVAILABLE TRANSFORMERS/REACTORS:**

SHIRORO REGION:

- 1 Apo T/S 60MVA 132/33kV transformer TR3 - Burnt.

KADUNA REGION:

- 1 Kumbotso 150MVA 330/132/33kV transformer T1A - Burnt control cables.

ENUGU REGION:

- 1 Onitsha T/S 90MVA 330/132/13.8kV transformer 9T2 - Out due to differential fault.

12 (B) **UNAVAILABLE BREAKERS/ISOLATORS**

LAGOS REGION:

- 1 Akangba T.S. 132kV Bus Coupler CB - Serious Air leakage.(Undergoing repair)
- 2 Egbin/Aja 330kV line 2 (cct N4J) - faulty breaker at Aja T/S.
- 3 Otta/Ogba 132kV line isolator - defective control shaft.
- 4 Osogbo/Ikeja West and Olorunsogo/Ikeja West tie CB at Ikeja West T/S - defective pole
- 5 Oke-Aro/Ikeja West 330kV lines 1 & 2 tie CB at Ikeja West T/S - Defective pole.
- 6 Jebba G.S/Jebba T.S 330kV line 2 CB at Jebba T/S.

OSOGBO REGION:

- 1 Omotosho 330kV T/S, 2nd series 330kV CB #3322 out due to control circuit problem.
- 2 Akure T/S 60MVA 132/33kV transformer T3A primary CB - defective spring charging mechanism.
- 3 Osogbo T/S 330kV bus coupler CB - Exploded Blue Phase CT
- 4 Jebba/Osogbo 330kV line 1 (cct J1H) - Defective line isolator mechanism at Osogbo T/S

ENUGU REGION:

- 1 New Haven/YendeV 132kV line CB - Faulty Red phase CB pole. Protection is transferred to the bus coupler CB.
- 2 Abakaliki T/S 30MVA 132/33kV transformer T1A and 60MVA 132/33kV transformer T2 primary CBs - Breakers were not provided since commissioning but the transformers are protected by Nkalagu 132kV line CB.

LAGOS REGION

- 1 Egbin/Aja 330kV line 2 (cct N4J) - faulty breaker at Aja T/S.
- 2 132kV Akangba/Ikire line 1- Faulty line isolator at Akangba T/S.
- 3 Aja/Alagbon 132kV line 2 - detached conductor on tower 56 and 57.
- 4 Agbara/Ojo line 1 on soak.

SHIRORO REGION

- 1 Lokoja/Gwagwalada 330kV line 2 - Cut sky wire between towers 339 & 340.

12(E) **UNAVAILABLE CAPACITOR BANK:**

- (i) Ogba T.S, (ii) Maiduguri T/S, (iii) Isolo T/S, (iv) Ado-Ekiti T/S, (v) Ilorin T/S, (vi) Akure T/S.

12 (F) **LINES WITH MISSING SKY WIRE**

LAGOS REGION

- 1 Omotosho/Ikeja West line (M5W) and Egbin/Ikeja West line 3 (N6W) - 21
- 2 Ikeja West/Olorunsogo line (cct R1W) - 80 spans.
- 3 330kV Ikeja West/Osogbo line. - 95 spans.
- 4 Ikeja West/Alimosho/Ogba 132kV lines 1 & 2 - 15 spans.
- 5 Ikeja West/Akangba 330kV line 2 - 1 span.
- 6 Ikeja West/ Ilupeju 132kV lines 1 & 2 - 8 spans.
- 7 Akangba/Ikire 132kV lines 1 & 2 - 1 span.
- 8 Ikeja West/Agbara 132kV lines 1 & 2 - 61 spans.
- 9 Ikeja West/Otta 132kV lines 1 & 2- 17 spans.

SHIRORO REGION

- 1 Jebba T/S 330kV Osogbo lines 1 & 2 and Ganmo line - 9 spans
- 2 Minna T/S 132kV Bida line - 32 spans
- 3 Apo T/S 132kV Keffi line - 36 spans

- 3 Oji River T/S 30MVA 132/33kV transformer T1A primary CB - The breaker is completely out of service and bypassed. The transformer is either protected by Onitsha/Oji 132kV line CB or New Haven/Oji 132kV line CB.
- 4 Oturkpo/Yendev 132kV By pass isolator - Canibalized to repair the line isolator.

SHIRORO REGION

- 1 Kainji/Jebba 330kV line 1 - CB problem at Kainji T/S.
- 2 Jebba T/S 75MX reactor 2R2 CB - exploded.

12 (C) UNAVAILABLE/DEFECTIVE GROUND SWITCHES

Benin Region

- 1 Irrua T/S: Benin/Irrua 132kV line Earth Switch - faulty.

ENUGU REGION:

- 1 New Haven/Nkalagu 132kV line 2 ground switch - Canibalized Red phase female contact and canibalized Yellow phase male

- 4 Shiroro T/S 330kV Jebba line 2 - 28 spans

12 (G) UNAVAILABLE SYNCHROSCOPES :

- 1 Benin , Ikeja West, Onitsha, Egbin, Uguwaji, Osogbo, Kaduna, Jos, Gwagwalada & Alaoji T/S.

FOR MORE INFORMATION: NCC Telephone Lines -

- a PAX 09/300, 309, 303 & 305.
- b NCC GSM - 08074888524, 08069379367, 08023572651 & 08051401331. CUG Nos. 08129458488, 08129458489, 08129929806; 08036665323.
- c PLS - 622
- d GM (NCC) -08033711297, 08054911239, CUG Airtel No. 08129458479.
- e AGM (S/O) - 08066067487, CUG: 09021765320
- f Coordinator (S/O) - 08037868916, 08054353904, 08028332125, CUG Airtel 08129458481.
- g SYSTEM OPERATIONS WEB SITE: www.nigeriasystemoperator.org